Sandhills Game Land Management Plan

2015 – 2025

NC WILDLIFE'S CROWN JEWELS

North Carolina's game land system is based on science-driven management practices and is an exceptional asset for the people of the State of North Carolina. The 2 million acres of NCWRC owned and managed land create HIGH Ecosystem value in flood protection with positive effects on property values and air and water quality, while helping to prevent additional restrictive environmental regulations.

The primary purpose of our game lands is the conservation of North Carolina wildlife species and the provision of public hunting, trapping and fishing opportunities. Our game lands are important players in the preservation of rare, threatened and endangered species. Prescribed burning and early successional habitat management allow for healthy habitats for thriving wildlife. Fields left fallow and disked on alternating years promote natural herbaceous regeneration. Water levels of impounded wetlands are drawn down at appropriate times to create conditions beneficial to waterfowl. Protection of stream buffers ensures that precious fish species are protected and encouraged along with thriving game fishes. Heritage forest land is worked and preserved and rare forestlands are protected.

The game lands also provide broad expanses of public recreational opportunities. North Carolina has more acreage of managed game lands than all states east of the Mississippi, with the exceptions of Florida and Michigan, both of which include lake and ocean frontage as managed land. There is overwhelming public endorsement of conserving the land along with documentation of the economic benefits of doing so. According to the outdoor recreation industry, over $3.3 billion is spent annually on wildlife related recreation in our state alone. As North Carolina transitions from a traditional economy based on tobacco, furniture and textiles to a global economy driven by knowledge-based enterprises, our managed public game lands help preserve our economy and our way of life.

Game lands include:

- A great treasure in the largest intact and least disturbed bottomland forest ecosystem in the mid-Atlantic Region and some of the oldest cypress-tupelo trees on the East Coast, many at least 800 years old;
- One of the largest, most intact remnants of longleaf pine ecosystems in North Carolina, a high priority wildlife habitat in the Lands Management program. Among the species dependent upon this type of habitat are bobwhite quail, a variety of songbirds, fox squirrels and the federally endangered red-cockaded woodpecker;
- The densest populations of black bear, white-tailed deer and turkey, and the highest density of nesting birds in the state. Most of our 32 black bear sanctuaries are on game lands;
- A system of floating waterfowl blinds, 19 public hunting blinds for disabled sportsmen, 32 public boating access areas, 33 public fishing areas, six wildlife observation platforms, four public WRC shooting ranges with plans to build and manage many more as opportunities occur;
- And some of the finest examples of multiple conservation collaborations in the country.

As in the past, it is anticipated that future projected expenditures will be funded by North Carolina's apportionment of Pittman Robertson Federal Assistance in Wildlife Restoration funding and license receipts, as well as from contributions from various conservation partners. The opportunity provided by these managed public game lands to our mission of conserving North Carolina's wildlife and habitat for future generations is priceless.

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Game Land Program Mission Statement

Consistent with the original establishment legislation for the WRC, the mission of the game lands program is to enhance, facilitate, and augment delivery of comprehensive and sound wildlife conservation programs. Inherent in delivery of a lands program consistent with this mission is the feasibility and desirability of multiple uses on lands owned by the state within the system. In addition to hunting, fishing, trapping, and wildlife viewing as primary uses, we recognize the desirability of providing opportunities for other activities on state-owned game lands that are feasible and consistent with the agency's mission, and compatible with these traditional uses.

Game Land Program Management Objectives

- To provide, protect, and actively manage habitats and habitat conditions to benefit aquatic and terrestrial wildlife resources
- To provide public opportunities for hunting, fishing, trapping, and wildlife viewing
- To provide for other resource-based game land uses to the extent that such uses are compatible with the conservation of natural resources and can be employed without displacing primary users
- To provide an optimally sustainable yield of forest products where feasible and appropriate and as directed by wildlife management objectives.

Purpose and Need for the Plan:

The plan will help identify goals and objectives for managing and conserving the wildlife and other natural resources on the Sandhills Game Lands using current scientific knowledge and management techniques. The management plan will guide game land staff as they develop specific management strategies for identified feature species while integrating a sustainable yield forest and open land management program that creates, enhances and maintains quality habitat for native wildlife and plant communities. The Plan will also incorporate the recreational needs of the game land users into its management goals and objectives. The North Carolina Wildlife Action Plan states five goals as part of its core plan. Those goals have been modified and adapted to assist with the development of the Sandhills Game Land Management Plan. Those 5 goals are 1) Identify key species in the Sandhills Ecosystem used to base conservation and management decisions on. 2) Identify, conserve and enhance habitats and the communities they support, 3) Identify and state conservation priorities and list challenges and conservation threats for SGL, 4) support educational efforts to improve understandings of wildlife resources among general public and conservation stake holders and 5) to support and improve existing regulations and programs aimed at conserving habitats and communities.

Regional Context

Information on ecoregion: The greater Sandhills Region of North Carolina is located in all or parts of eight counties in NC (see appendix 10). Historically the region supported a mostly agriculture-forestry-textile based economy. The last four decades the area has experienced a decline in agriculture and the loss of the textile industry. The eight county area remains a rural based economy with the exception of an expanding military presence on Fort Bragg and an increase in recreational and retirement communities in the Southern Pines/Pinehurst Area. The forest industry has survived and is doing quite well. Inexpensive lands that were abandoned by agriculture in the 1970 – 80's were purchased by the timber industry and pension fund managers and are now managed for short rotation timber crops. Several industrial timber companies are located in the Sandhills and surrounding counties. There are several locally owned sawmills, a cogeneration plant and pulpwood mills in the area.

Role and importance of Sandhills Game Lands: Sandhills Game Land (SGL), in conjunction with surrounding managed lands such as Fort Bragg, supports the largest and most intact remnants of the longleaf pine ecosystem in NC, and one of the best remaining on the in the southeast. As one of the largest and oldest state-owned game lands, the SGL plays an important role in providing outdoor recreation opportunities. It is also important for military training and contributes significantly to the local economy.

NC Wildlife Resources Commission is one of the members in the North Carolina Sandhills Conservation Partnership (NCSCP). The NCSCP includes state, federal, nongovernmental organizations, private organizations and private landowners. The NCSCP has played an important role in protecting, restoring and enhancing critical habitat for many wildlife and plant populations. Cooperative efforts between members of the partnership have helped recover the NC Sandhills population of red-cockaded woodpeckers, acquired land through the fee simple purchase to protect critical habitat, and provide workshops to help advised and educate local landowners on land stewardship. One of the primary objectives of the partnership is to link large tracts of public and private owned lands providing corridors of managed habitat to facilitate the exchange of genetic viability between otherwise isolated wildlife populations. This is being done using a variety means including fee simple acquisition, conservation easements, safe harbor agreements, landowner education and/or a combination of these approaches. Sandhills Game Land and other large tracts of high quality habitat provide a surplus source of rare species like the red-cockaded woodpecker and the unique southeastern fox squirrel that disperse into other locations, exchanging genetic material and in some cases expanding the population to new areas.

Adjacent lands – Use & Management; The majority of adjoining lands are managed for timber production. Other significant land uses include horse farms, low density residential, small towns, agriculture, and two sand mines. Most of the larger tracts are in private hunt leases to local and out of town clubs. A few local landowners supplement their income by leasing land to saddle clubs for camping and social events. Many of these saddle clubs ride on the Sandhills Game Land. Several small communities share common boundary with the game land. The towns of Hoffman, Marston and Pinebluff have game lands within their town limits.

Game Land Specific Information

Location: Sandhills Game Land is found in south central NC, straddling Richmond, Scotland, Moore and Hoke counties. The Sandhills Game Lands is a small fragment of an ecosystem that once covered over 90 million acres in the southeastern United States. Longleaf pine forest is one of the most endangered habitats in the country (Noss and Peters 1995). SGL is being threatened by urban expansion as development continues to fragment the remaining longleaf forest.

Physical attributes: The rolling hills associated with the Sandhills are a prominent feature of the area. The topography is comprised of dry sandy ridges with coarse, excessively drained soils that gently slope down to evergreen shrub wetland drainage systems. Embedded within the Sandhills are unique topographical features that add to the rich diversity of plant communities. These features include hillside seeps, vernal pools, upland depressions and rock out-crops.

The Sandhills is a transition region with one foot in the coastal plain and one in the piedmont, and SGL has forest types associated with both regions. Over 90% of the forests found on the game land are dominated by longleaf pines. In the western reaches small stands of oak/hickory can be found mixed with longleaf and loblolly pines. Small rock outcrops are more common also. The eastern portion features more coastal plain characteristics. Flat uplands with broad evergreen shrub drainages share many of the characteristics found in eastern region of the state. Both loblolly and pond pines can be found in the large wetland evergreen shrub drains.

Climate: The North Carolina Sandhills has a temperate climate with warm summers and cool winters. Richmond, Scotland, Moore and Hoke Counties receive 46 inches of precipitation annually, almost exclusively rainfall, which is fairly well-distributed throughout the year. Precipitation in the cooler months generally falls in longer, less intense events, while warmer months bring shorter bursts of rain during afternoon thunderstorms, as well as major rain events associated with hurricanes and tropical storms.

CLIMATE DATA- POPE AFB, CUMBERLAND COUNTY, NC (1948-2000)

	Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Annual*
Average Max. Temperature (F)	52.5	57	64.7	73.7	81.1	87.8	91	88.7	83.1	74.3	65.2	55.9	72.9
Average Min. Temperature (F)	32.7	35.7	41.7	49.9	59.1	67.5	72.1	70.5	63.9	51.3	42.3	35.2	51.8
Average Total Precipitation (in.)	3.74	3.27	3.86	3.24	3.13	4.77	5.93	4.47	4.13	3.18	3.17	2.76	45.65

Table 1 (Adapted from Southeast Regional Climate Center data, 2003)

Soils: The Fall Line Sandhills of the southeast stretch in pieces from Georgia into southern North Carolina. Sand dunes created by past wind erosion and shallow seas are underlain by Cretaceous age sediments, that are older than other coastal plain soils (USDA 1984). A network of drainages divides broad upland ridges with deep sandy soils. Layers of clay interbedded in the sandy soils are deposits from these drainage systems that dissect the landscape. The clay deposits are essential to the diversity of natural communities, many of which occur on more fertile side slopes (Schafale, 1994). In some locations the impermeable clay layer forces groundwater to the surface, resulting in herb-rich sandhill seeps. Streamheads of creeks and tributaries originating within the physiographic region have organic soils.

Hydrology: Despite relatively wet conditions (46" of annual rainfall), upland portions of the Sandhills region more closely resemble a desert due to the presence of deep, extremely well-drained sandy soils. All but the heaviest rainfall is absorbed into sub-surface water supplies, and consequently hydrology is dominated by groundwater flow and seepage. Dry upland ridges are dissected by slow-moving blackwater streams, which are highly acidic and relatively low in nutrients. Because streams in the Sandhills are predominantly fed by groundwater, they have a relatively steady stream flow.

Landscape context: The Sandhills is a section of the state that is partly in the coastal plain and partly in the piedmont. Parts of or all of 8 counties are located within the Sandhills region. The fall line separating the piedmont from the coastal plain is located in Richmond County and parts of the Sandhills Game Land. Western parts of the game land have piedmont rocks and soils. Within close proximity are coastal plain soils and topography. Having the fall line within the region increases the plant and animal diversity. The Sandhills were formed by ancient oceans as they expanded and receded between ice ages. They have deep excessively drained, nutrient poor soils. Elevations range from 230 to 550 feet above sea level on SGL. There are over 970 documented plant species on the Sandhills Game Land (Sorrie 1998). The 2001 plant inventory by the Natural Heritage Program documented 43 rare plants and 30 rare animals on SGL.

Within the NC Sandhills landscape, Sandhills Game Land provides one of two key "core" areas of longleaf pine habitat, with Fort Bragg as the other. Maintaining ecological connectivity between these two habitat cores has been a focus of conservation efforts. Across the broader Sandhills landscape, SGL sits close to the northern edge of the range, and represents the northern limit for many longleaf-associated species (see appendix 10). Sandhills National Wildlife Refuge in South Carolina is the next longleaf habitat "core" to the south.

In NC, the range of longleaf pine forests (see appendix 5) and associated species runs from the Sandhills through a narrow band going through Bladen Co to the Cape Fear Arch in the southern outer coastal plain. Small remnant stands of longleaf and associated species still occur in the Uwharries and along the northern NC fall line, and SGL sits in a strategic spot if landscape connectivity is ever to be restored to these locations.

History of Acquisition;

The land that is now Sandhills Game Land was purchased in the early 1900's by wealthy individuals for private farms and shooting preserves. Frederick Gates, an assistant to John D. Rockefeller, bought 22,000 acres and established the Broad Acres Plantation. The DuPont family and a Victor Recording Machine Company executive also bought large tracts of land in the area. The new landowners attempted to grow peaches, grapes and cattle on the poor soils. Soon the Great Depression hit and futile attempts to make the poor soils of the Sandhills turn a dollar were abandoned. Prior to any interest by the military, the Land Utilization Division of the Resettlement Administration of the USDA began buying up land in the area to develop a federal wildlife management area. Landowners who could not pay taxes lost their land and those that could, sold out. During the Great Depression the Works Projects Administration (WPA) program was created to help provide jobs. They began building the many lakes on the area, local air fields and Camp Millstone which is now in the 4-H program. In the late 1930's and early 1940's rumors of a military base being considered for the area piqued the interest of many of the local political leaders.

In 1942 the War Department selected the Hoffman Area to build a new airborne training facility on land purchased by the USDA. Camp Mackall was established to train soldiers for WWII and the base remained in US Department of Defense ownership until it was deeded to the State of NC for wildlife management. After World War II all 57,435.82 acres were deeded to the State of North Carolina on May 19, 1948 by authority contained in Public Law 537 and the 80th Congress. The North Carolina Wildlife Resources Commission assumed management responsibilities for the land in the early 1950's.

Today SGL is approximately 63,000 acres. Recent acquisitions have been collaborative, with several involving The Nature Conservancy and the US Army. Funding for recent acquisitions has come from the US Fish and Wildlife Service Section 6 (endangered species), NC Clean Water Management Trust Fund, NC Natural Heritage Trust Fund, Army Compatible Use Buffer program, and mitigation funds. These funding sources obligate WRC to provide for public access and military training and to manage for red-cockaded woodpeckers, water quality, and rare habitats and species.

Purpose of Sandhills Game Land

The primary purpose of Sandhills Game Land (SGL) is to conserve and manage rare habitats and provide wildlife-related recreational opportunities to the citizens of North Carolina. Traditional uses include hunting, fishing, trapping, wildlife viewing and photography, field trials and horseback riding. Other important uses of the SGL include military training, research and education. Commercial uses include selling timber, pine straw, and pine cones. There is interest in using the Sandhills Game Land for other uses including geo caching, hiking, and running. Many of the Game Land users live within an hour's drive of the game lands but there is significant interest from users living further away.

The Sandhills Game Land is noted for its natural and biological significance. It is one of the largest, ecologically intact remnants of the once expansive longleaf pine forest that once occupied over 98,000,000 acres prior to European settlement. The number of acres of quality longleaf habitat remaining across the range is now less than 5,000,000 acres. Many of the plant and wildlife species that flourished in the expansive longleaf forests are now rare and threatened species found in isolated tracts of the longleaf remnants. Sandhills Game Land is unique in supporting most of the rare plant and animal species

affiliated with longleaf pine and embedded habitats, and along with nearby Fort Bragg supports the most robust concentration of many of these species in North Carolina.

Longleaf forests have been shaped by thousands of years of influence from manmade and natural disturbances, most importantly the occurrence of fire on the landscape. Thousands of years of frequent fires that burned thousands of square miles prior to European settlement helped determine the flora and fauna found in the Sandhills and the southeastern US. Fire exclusion as a result of human expansion contributed significantly to the degradation and loss of wildlife habitat. Many of the wildlife and plant species experienced a decline in population as a result.

One of the unique things about the Sandhills Game Land is the success the staff has had in reintroducing fire on a landscape scale, to uplands as well as fire-dependent wetlands and riparian habitats. Approximately 15,000 -20,000 acres are burned annually. The effort has contributed to the restoration of many rare plant communities. The endangered red cockaded woodpecker (RCW) population on the Sandhills Game Land has expanded (see appendix 6). Part of the Ft. Bragg and Southern Pines population, it is the only population in the world that has surpassed its recovery goal. The success of the RCW recovery is a tribute to research, partnerships with US Fish and Wildlife Service and Department Of Defense, intensive management, and the success of the prescribed fire program. The combination of prescribed fire, provisioning of artificial cavities, and implementation of timber management activities including thinning stands and controlling midstory hardwoods has enhanced RCW habitat.

The Sandhills Region has historically been known for plant and animal diversity. There have been numerous studies by local universities on reptiles and amphibians. Many amateur herpetologists come to Sandhills Game Land to observe rare herps. Several plant inventories on SGL have discovered numerous rare plant communities and species, including two federally endangered plant species. Sandhills Game Land is popular with botanists who find species and natural communities that are rare elsewhere. There are numerous rare avian species found on the SGL, and birdwatchers travel from afar to see rare species such as red-cockaded woodpecker and Bachman's sparrow.

Researchers and recreational users enjoy the expanse of 96 square miles of land open for public use. Having large tracts of land managed with fire creates an aesthetically pleasing landscape that attracts wildlife viewers. Unique game species like the fox squirrel bring hunters from all regions of the state in hopes of harvesting a trophy squirrel. Local universities bring classes of forestry and wildlife students to learn more about the management of the longleaf pine ecosystem and to see the results of work being done by the Wildlife Resources Commission staff.

Sandhills Game Land provides what is widely considered the premier public bird dog field trial facility in the country. Work on clearing for the course was started by the North Carolina Wildlife Resources Commission in 1949, but the first trial was not run until 1954. A combination barn and kennel building was constructed in 1955 and a meeting hall was erected the next year. The barn has 56 box stalls for riding horses. The field trial course and facilities are booked for the entirety of the season, drawing participants from throughout the United States.

Sandhills Game Land has a long-standing relationship with the US military, and supports extensive military training including navigation and Special Forces activities, among others. SGL is considered an essential component of the military's training and readiness for units stationed at Fort Bragg and Camp Mackall.

Goals for the Sandhills Game Land include:

- restoration and maintenance of the fire maintained ecosystem
- recovery of the red cockaded woodpecker
- maintain rare and threatened plants and plant communities
- enhance or maintain populations of rare wildlife species identified in the NC Wildlife Action Plan
- provide hunters opportunities to harvest game species
- provide anglers opportunities to harvest sport fish
- provide recreational opportunities for field trial participants
- provide wildlife viewing opportunities
- manage game populations for sustained harvest
- manage longleaf forest for sustainable yield forest products in the service of wildlife habitat management
- continue to meet the training needs of the US military

Specific measures of success for the Sandhills Game Land include;

- Number of acres prescribed burned each year (annual fire report)
- Potential Breeding Groups of red-cockaded woodpecker (RCW)
- Breeding success of RCW population (number of birds fledged each year)
- Egg mass counts (measure of population size and breeding effort) of rare amphibians associated with isolated ephemeral wetlands
- Counts of Bachman's sparrows from long term monitoring surveys
- Population size and extent of federally endangered plants
- Level of hunter participation and harvest rates through hunter surveys and special hunt permit applications
- Deer and turkey harvest reported
- Counts of bobwhite quail and measure of useable habitat on CURE area
- Implement updated forest inventory program and implement annual timber management prescription.
- Number and acres of wetlands restored
- Number of acres of longleaf pine restored (including conversion from off-site species, mechanical or chemical control of midstory, native groundcover restoration, etc.)
- Number of acres of land added to game land
- Participation in field trials

Habitat Types

Habitat types are discussed with closely associated target species listed for each habitat along with a "desired future condition" (DFC). Management strategies and needs are developed to help achieve desired future condition.

Upland Pine (Total Acres 54,237)

The upland pine habitat type is the major type occurring on 87% of Sandhills Game Land. This type is further divided into 3 more detailed types which are Dry Coniferous Woodlands, Oak Forests, and Dry Longleaf. Prior to the late 1800's, the area in and around Sandhills Game Land was comprised of old-growth virgin longleaf pine and was maintained by frequent low to medium intensity fires. With the advent of the narrow gauge logging railroad and the westward migration of the naval store industry, these old-growth stands were all logged by the mid 1930's. Also, beginning after World War II, a program of fire exclusion and suppression was implemented. These two historical periods shaped the 2nd growth forests that occur on Sandhills Game Land today. Yet despite these periods, the forested habitat types on Sandhills Game Land continue to fulfill many important ecosystem functions such as habitat for: the endangered red-cockaded woodpecker, rare and endangered plants and animals, and many game species such as white-tailed deer, northern bobwhite, eastern wild turkey, eastern cottontail rabbit, gray squirrel, and eastern fox squirrel.

- Dry Coniferous Woodlands (Acres 2,671) Current Extent and Condition

Sites once occupied by longleaf pine but were converted to loblolly/slash pine through silvicultural practices or were allowed to revert to natural loblolly through fire exclusion and removal of the original longleaf component. This conversion commenced in the 1930's and continued until the late 1990's. These stands are characterized by 40-60 year old loblolly and slash pine with scattered longleaf about the same age. Some longleaf regeneration occurs on the edges of these stands. Scattered oak and hickory components occur due to exclusion of growing season fire for most of the life of these stands. The extent of ground cover in the form of warm season grasses is very limited due to the fact that most of these stands occur on abandoned agricultural sites where native ground cover was extirpated by farming practices. Since the late 1990's a majority of these stands have been thinned and put in burning rotations, due to these practices wind disseminated species such as bluestem and others have re-colonized these stands. Also a significant number of stands were planted to Atlantic coastal panic grass after thinning from 2000-2007. Conversion to longleaf has occurred to a fair number of stands by clear-cutting and planting longleaf with significant success. Priority species associated with this type, primarily in open canopy stands with herbaceous groundcover, include: Cooper's Hawk, Bachman's Sparrow, Chuck-wills Widow, Northern Bobwhite, Red-cockaded Woodpecker, Eastern Fox Squirrel, and Pygmy Rattlesnake. Common game species associated are White-tailed Deer, Eastern Cottontail Rabbit, and Eastern Wild Turkey.

Desired Future Condition: This habitat type should be converted to Dry Longleaf Pine with ground cover components restored. This will be achieved in a 20-30 year time frame, by tree removal and subsequent natural and artificial regeneration of longleaf pine and ground cover components. Maintenance of the desired future condition would be achieved by burning these stands on a 2-3 year growing season fire rotation and selective tree harvest when needed.

Open-canopy pine stand with reduced mid-story, mature and young trees

- Oak Forests (1,044 acres) Current Extent and Condition

These sites were once longleaf forests, but through longleaf over story removal and fire exclusion, regenerated to mixed hardwoods and pine. These stands are characterized by an oak/hickory and pine over story with a crowded mid-story of hardwoods, and little to no herbaceous ground cover. With the use of growing season fire at Sandhills Game Land for the last 20 years a significant portion of these stands have been put in a burning rotation and have achieved a more oak savannah like characteristic (more diverse ground cover and pockets of longleaf pine regeneration). Around half of these stands are still closed canopy oak/hickory due to constraints of man-power and equipment, and also liability issues associated with burning in the Wildland-Urban Interface (WUI). Priority species associated with this type include: Cooper's Hawk, Chuck-will's Widow, Whip-poor-will, Red-headed Woodpecker, Eastern Fox Squirrel, Spotted Salamander, and Eastern Box Turtle. Game species utilizing oak forests to forage for mast include White-tailed Deer and Eastern Wild Turkey.

Desired Future Condition: Approximately 50 to 65 percent of these stands should be restored to more open-like savannah characteristics in the next 10 years. This would be achieved by growing-season prescribed fire, and tree harvest. This condition would be maintained by routinely burning in the growing season on a 2-3 year rotation. On sites where prescribed fire cannot be used either by man-power/equipment constraints or by liability issues associated with the WUI; these stands would be maintained by essentially being left alone. Stands with larger and/or more diverse hardwood trees, particularly mast-producing trees, should be maintained as hardwood forest. The main threat to this type is introduction of non-native pests such as gypsy moth and to a lesser degree the pathogen responsible for sudden oak death.

- Dry longleaf Pine (50,522 acres) Current Extent and Condition

The upland longleaf forest type is the major forest habitat on Sandhills Game Land. These stands are characterized by a well-stocked to under-stocked over story of longleaf pine with a minor component of turkey and blackjack oak in the mid-story. There is also great diversity of native ground cover species. These stands have been burned on a 2-5 year rotation, since Sandhills Game Land was acquired in the late 1940's. Recently, many of these stands have been put into a growing season burn rotation of 2-3 years. As more acreage of the Dry Coniferous Type is converted, the total acreage of the Dry Longleaf type will increase.

Sub-types of this habitat type that occur on Sandhills Game Land include Mesic Pine Flatwoods, Pine/Scrub Oak Sandhill, and Xeric Sandhill Scrub. The Pine/Scrub Oak Sandhill is the most dominant of these sub-types.

Priority species associated with Dry Longleaf Pine include: Bachman's Sparrow, Red-cockaded Woodpecker, Brown-headed Nuthatch, Northern Bobwhite, American Kestrel, Red-headed Woodpecker, Loggerhead Shrike, Eastern Fox Squirrel, and rare snakes, frogs, and salamanders associated with longleaf pine habitats. Dry Longleaf Pine forests are used to a limited extent by deer, turkey, dove, and other game species.

The Red-cockaded Woodpecker has been a focus of management efforts in Dry Longleaf Pine forests, and all forestry actions take into account the RCW habitat requirements outlined in the recovery plan and associated guidance documents from US Fish and Wildlife Service. Michaux's Sumac is a federally endangered plant associated with Dry Longleaf Pine forest and gets special management attention in locations where it is found.

Desired Future Condition: A mixed-age stand of longleaf pine that includes mature trees (80-100+ years old) with an open canopy (basal area ~30-60 square feet per acre) and a reduced midstory, allowing adequate light to reach the forest floor. The desired future condition (DFC) includes a lush, diverse understory of native herbaceous plants dominated by "clump grasses" such as wiregrass and various bluestems. Also scattered pockets of mature mast producing hardwoods are desired. The DFC includes an adequate number of Red-Cockaded Woodpecker cavities to support at least 155 potential breeding groups with at least 4 useable cavities per group. It is desired to have an average of >1 standing snag per acre, of various size classes ($\geq$ 6 inch diameter), with sporadic clusters of snags. It is desired to have scattered coarse woody debris on the forest floor for the benefit of reptiles, amphibians, small mammals, and invertebrates. There should be an abundance of older and larger stumps which provide stump holes which are critical for a wide variety of herps, small mammals, and invertebrates.

Currently this condition is being achieved by thinning and burning. Prescribed burning also helps to create snags and coarse woody debris, controls some plant diseases and pests, and facilitates the creation of stump holes. Artificial and natural regeneration of longleaf pine will be relied upon to achieve adequate stocking levels in stands that were once dominated by upland hardwoods. This sub-climax type can only exist by regular prescribed burning and other silvicultural treatments (artificial and natural regeneration, tree harvests, and chemical control of invasives).

Dry longleaf pine Desired Future Condition

Infrastructure needs

Prescribed Fire Program: prescribed fire is a critical tool in maintaining all forest habitat types found on Sandhills Game Land. A successful prescribed burning program requires the development and maintenance of an extensive network of fire breaks, gates to limit access to remote areas via firebreaks, trained and properly equipped personnel and specialized equipment. Equipment needs include dozers for firebreak development and fire control, farm tractors with specialized disk for maintaining firebreaks, slip-on pumper units for mop-up and spot-over containment, 2-way radios for communications during prescribed burns and a cache of hand tools. Man-power needs for the burning program historically included the wildlife forester, a wildlife forestry technician, and a burn-crew of four temporary technicians. With the permanent re-assignment of the wildlife forestry technician to the coastal eco-region, the ability to conduct burns especially in the late summer and fall has decreased.

*Timber Sale Program***:** the timber sale program is vital to the restoration and maintenance of forested habitat types on Sandhills Game Land. Each year approximately 500 -800 acres of timber sales are marked and sold to improve timber stands and wildlife habitat. Man-power needs were also met for this program by the wildlife forester, assistant wildlife forester, and the wildlife forestry technician. Recently with increased Red-cockaded Woodpecker management duties by the assistant wildlife forester and the re-assignment of the wildlife forestry technician, the fieldwork associated with the timber sale program has become the sole responsibility of the wildlife forester.

Forest Inventory and Management: an accurate and up to date forest inventory is vital to the successful management of the forested habitat types on Sandhills Game Land. Also cutting-edge forest management software and hardware is needed to keep inventory data updated and to plan prescription needs. These tools are especially needed to help meet restoration goals and to guide red-cockaded woodpecker management.

Threats

The development of new, smoke-sensitive areas on the borders of the game land threatens to limit prescribed burning. This is a significant threat whereby activities outside of SGL beyond the Wildlife Resources Commission's control could impact our most important management tool and thus degrade habitat. It is critical to maintain a strong working relationship with the NC Forest Service and ensure that new regulations governing prescribed fire do not diminish our capacity for burning.

Timber management should be done in a manner to achieve the desired future conditions. A timber harvest regime that maximizes short-term revenues will be unsustainable and will compromise desired habitat conditions.

Pine straw raking maintains a closed canopy forest with limited ground cover, and the act of raking limits herbaceous plant growth, disturbs ground-dwelling animals, and removes nutrients from the stand. Pine straw raking on SGL will be phased out over the next 15 years.

Invasive species are a present and future threat. The most significant current invasive species threat is fire ants. Most of the current problems with non-native plants are localized and many of these species do not spread as rapidly or thoroughly in a well-managed longleaf forest. One of the more significant potential threats is from cogon grass which has the potential to out-compete native plant communities and significantly alter fire behavior.

Incompatible land uses adjacent to SGL threatens ecological connectivity of game land blocks. The proposed expansion of NC 15/501 between Aberdeen and Laurinburg would threaten connectivity of game land blocks on either side. The expansion of a sand mine threatens connectivity between blocks C, O, T, and B. A multi-state landfill has been proposed adjacent to SGL which would have negative direct and indirect impacts.

The Sandhills have highly erodible soils. Certain activities, like off-road vehicle use, have the potential to cause erosion problems while other uses, such as horseback riding, need to be carefully managed.

Open Land (Total Acres 2249)

- Current Extent Field Trial Courses (1249acres) Consists of 6 linear opening approximately 100 yards wide 5 – 7 miles long used by field trial participants during field trial events, Oct-March. They are composed of permanent herbaceous cover and shrubs, including many plum thickets; annually planted patches; fallow fields; and scattered mature pines.
- Small openings (241 acres): primarily hunt courses created for small game hunters and old logging decks maintained as openings, usually less than 1 acre in size scatted throughout upland pine stands. These occur on a range of soils, but most are on well-drained, nutrient poor sites. There are 297 small man made openings included in this section. These small openings are maintained as annual grain patches, perennial grasses (primarily Atlantic coastal panicgrass) and fallow fields.
- Larger openings (739 acres): includes old home/farm sites that predate ownership by NCWRC, a few clear-cuts that were not re-planted to pine, an abandoned air field, and a drop zone used periodically by the military for training. These openings are often greater than 10 acres in size (Table 2). Many of these are managed for dove hunting and early successional habitats and consist of annual patches, fallow habitat, perennial grasses, and shrub thickets.

Site Name	**Acres**	**Location**	**County**	
Gardner Farm	36	Block B, Slate Circle Rd	Scotland	
Odom Place	10	Block B, off Laurel Hill Rd	Scotland	
Officer's Club	55	Block B, south of Broadacres	Richmond	
Parsons Tract	145	Derby Rd & Pappi Rabb Rd	Richmond	
Thomas Tract	16	Block Y off West End Rd	Moore	
Depot fields	74	Block A at SGL office	Richmond	
Drop Zone	151	Scotland Lane	Scotland	
Block C Airstrip	40	Block C off Currie Road	Scotland	
Carrington Tract	116	Block F & Peach Orchard Rd	Scotland	
Slate Circle	26	Slate Circle & Carpenter Rd	Scotland	
Cole Place	25	Hitchcock Crk & McDonald Rd	Richmond	
Rifle Range	35	Scotland Lane & Angling Rd	Scotland	
TOTALS	**739**			

Table 2 (Pre-WRC Farm & Military Openings)

Desired Future Condition (DFC)

The open lands are intended to benefit species that utilize early successional habitats and to provide hunting opportunities. Some species are area-sensitive and utilize only larger openings (e.g. eastern meadowlark), some species utilize small openings but avoid the larger fields (e.g. Bachman's sparrow) and many species utilize fields for only a portion of their life history (e.g. white-tail deer, wild turkey, eastern kingbird, etc.). The 3 categories of open land listed above have different human uses. The field trial course is used for bird-dog field trials from October – March. The smaller openings are used primarily to facilitate harvest by deer and turkey hunters. The larger openings support a wider array of hunting opportunities including deer, turkey, quail, dove, and rabbit. The drop zone is used periodically for military training. Horseback riding, dog training, and bird watching are other common uses of open land.

There are costs associated with the benefits of open land management. Maintaining open land, and in particular planting annual crops, requires an investment of manpower, money and equipment. There is anecdotal evidence to suggest that some priority non-game species, such as pine snake, box turtle, gopher frog, and tiger salamander, may be negatively impacted by disking or planting. The largest openings may act as barriers to movement by forest specialists such as red-cockaded woodpecker. Future decisions about the amount and type of open land desired for Sandhills Game Land should attempt to optimize benefits for traditional user groups and priority species, while minimizing negative impacts and costs.

The optimal amount and type of open land varies by user groups and target species:

- The amount and type of open land on the field trial area is adequate to support current and anticipated future demand for field trial activities, and should be maintained. The shrub thickets should be maintained and occasionally rejuvenated by partial mowing or fire. In general, native perennial bunch grasses managed with fire should be favored over annual food plantings. Annual food plantings should be adequate to meet field trial and hunter needs.
- There should be an adequate number of dove fields to accommodate all hunters during the opening week of dove season. There should be at least one dove field available on each of game land blocks A, B, C, F, and Parsons tract. A study should be initiated to assess whether the current amount and distribution of dove fields is adequate to meet hunter demand. Dove fields need to be planned several months prior to planting. Their location, desired planting materials, fertilizer and lime needs and public access should be incorporated into an "Annual Planting Prescription".
- There should be an adequate number and type of smaller fields to accommodate deer hunters and turkey hunters. Those fields in poorer soils or that get little use by hunters should be planted in perennial grasses, re-forested, or abandoned. An emphasis should be placed on maintaining appropriate fields on the CURE area.
- The drop zone should be maintained in a condition that is compatible with Army training needs.
- The larger field complexes should be maintained in a mix of fallow habitats, perennial grasses, annual plantings, shrub thickets and hedgerows.
- All open lands should be void of invasive, exotic species.
- There is not presently a need to create more openings on Sandhills Game Land. If the opportunity for additional open lands arises (such as through acquisition of existing open land or through timber operations) these lands should be managed as open land if there is a demonstrated specific need for more open land which outweighs the need for forested land. Otherwise, these lands should be reforested or left fallow and native herbaceous groundcover restored where needed. If native groundcover is present, it should be maintained.

Fallow field with diverse plant community (Photo 1)

Target game species:

- Northern Bobwhite Quail utilize edge habitat found along the field/forest borders. Bird surveys show that quail favor larger fields and utilize fields more heavily when other forms of dense cover (such as drains) are not available.
- Mourning Doves are migratory species that feed heavily on planted crops found in cultivated open land.
- Eastern Cottontail Rabbits are dependent on shrubby habitat. Old home sites are particularly attractive to rabbits for the cover they provide from predators.
- White-tail Deer and Eastern Fox Squirrel forage in fields planted to annual grains.
- Wild Turkey will forage in fields planted to chufa and annual grains and may nest in fallow habitats and perennial grasses.

Target Non-game species:

- Loggerhead Shrikes are dependent on shrubby vegetation for perching and nesting and forage over low-growing herbaceous vegetation.
- Eastern Meadowlarks use larger open tracts of grassland for nesting and feeding habitat. Meadowlarks are primarily found on Sandhills GL only on the Currie Place and the Drop Zone.
- Bachman's Sparrows forage and may nest in fields planted to perennial clump grasses and preferentially locate their territories adjacent to small (<1ac) openings.
- American Woodcock utilize fields in small numbers during winter.
- A variety of winter resident songbirds, primarily sparrows, forage heavily in fields
- Priority upland snakes may be attracted to the rodents which are more abundant in fields. Amphibians and other burrowing species may be attracted to the looser soils found in fields.

Management Strategies:

- Maintain >50% of the area of the larger openings in herbaceous perennial clump grass & forb habitat to provide forage and bugging habitat. Grassland habitat is maintained through repeated disturbances that control woody stem invasion. The most cost efficient and effective disturbance treatment is prescribed fire. Other treatments include mechanical and chemical treatments.
- Maintain 5-20% of the area of the field trial course and larger openings in shrubby habitat such as blackberry patches, plum thickets, or other dense woody cover to meet critical needs for escape cover, nesting, foraging and perching habitat. Many species such as Loggerhead Shrikes benefit from the development of a scattered shrub layer closely associated with more open herbaceous habitat. Shrubs can provide a source for soft mast, browse, as well as nesting habitat for many wildlife species.
- Develop an "Annual Planting Prescription" (APP) to help coordinate the establishment of annual food and cover plots. The APP should identify and map all annual field locations for the upcoming planting season, the type of planting material to be used (corn, sun flowers, millet, etc.), rate and amount of herbicides, lime and fertilizers needed and a projected cost. Manpower and equipment needs will need to be identified. Planning the establishment of annual food and cover plots will allow Management Biologist to coordinate with Technician Supervisors the sharing of manpower and equipment. The Annual Planting Prescription will be developed by the Management Biologist with assistance from Technician Supervisors and Team Leaders.
- Evaluate potential for and cost of no-till planting methods for annual crops.
- Evaluate timing and methods for disking to minimize mortality of nests and burrowing species, particularly on Block A where there is a higher density of priority snakes and ground-nesting birds. Disking should be minimized within 2.5 miles of 17 Frog Pond from January through May to reduce mortality to rare amphibians.
- Inventory invasive exotic species and develop plan for eradication, where practical
- NCWRC will not plant invasive exotic species
- For perennial plantings, native species and ecotypes should be favored. Non-native plants should be used only when native species are not available.
- Explore alternatives to releasing pen-reared quail and routine feeding of quail on the field trial area. Phase these practices out when/if other approaches can meet the need for holding a quality field trial.
- Minimize mowing during the breeding season. Maintain as much winter cover as possible in conjunction with human uses.

Infrastructure needs:

- Prescribed fire is a critical tool in maintaining open land. A successful prescribed burning program requires the development and maintenance of an extensive network of fire breaks, gates to limit access to remote areas via firebreaks, trained and properly equipped personnel and specialized equipment. Equipment needs include dozers for firebreak development and fire control, farm tractors with specialized disk for maintaining firebreaks, slip-on pumper units for mop-up and spot-over containment, 2-way radios for communications during prescribed burns and a cache of hand tools. Existing fire breaks should be adequate where fields are incorporated

into existing burn blocks. Where smaller-scale management is desired (e.g. burning only a portion of a field) new fire breaks may need to be developed, but this will likely be uncommon.

- Mechanical treatment is a labor intensive method that requires the use of farm and heavy equipment and/or hand tools. Mowing is a common treatment used to control undesirable invasion of woody stems. Smaller areas can be treated with chainsaws, brush saws and hand and brush axes. To continue current open land management objectives and acreage requires numerous farm tractors, disking equipment, planters, mowers, dozers and specialized drum choppers. Existing equipment (circa 2013) is adequate to meet present needs. If no-till planting is pursued, additional planting equipment may be required.
- Chemical treatment involves the use of chemical herbicides to control targeted plant species. Smaller scale applications (0 - 50 acres) are usually done in-house with the use of spray rigs with 50 – 100 gallon tanks and boom applicators. Larger scale treatments are done through private contractors with aerial and ground application. Numerous chemicals are used to target specific pests with specialized equipment. Highly trained personnel familiar with mixing chemicals, calibrating, modifying, repairing and maintaining equipment are essential for following US and NCDA labels and guidelines. Each Technician is required to possess a government applicators license.

Threats:

- Major threats to maintaining open land management are associated with budget and manpower cuts. Open land management is a common practice that is highly mechanized and labor intensive. Reductions and/or reassigning of personnel to other projects can negatively affect the amount and type of open land treatment conducted.
- Conflict with game and non-game species management such as mowing and chopping during nesting season can delay or eliminate certain treatments.
- Invasive species threaten native plant communities.
- Sandhills Game Land has nutrient poor, highly erodible and excessively drained soils. Proper management is required to maintain soil productivity and avoid movement of soils or fertilizers.
- In some cases competing uses must be balanced. In particular, hunting, recreational horseback riding, and field trials are competing uses for the field trial area.

Riparian Habitat Types (Total acres 9,000)

Current Extent and Condition:

The riparian habitats found on the Sandhills Game Land are small free flowing streams. They are nutrient poor, slightly acidic streams that divide and drain the adjoining sandy ridges making up the Sandhills. The vegetative composition varies with management and stream size.

The riparian zone adjacent to headwater streams that are not frequently burned may have a closed canopy of hardwoods and pond pines and an understory dominated by dense shrubs and vines while headwaters managed with fire may have an open canopy and an understory dominated by switch cane. Larger streams with wider floodplains typically have a closed canopy of pines, hardwoods and in some locations Atlantic white cedar. The soils are mostly Johnston soils capped with a layer of organic peat. The organic peat is less than 12 inches thick and is comprised of a dense root zone with black muck soil. Sandhills Game Land has approximately 9,000 acres of riparian habitat.

There are two river basins that drain Sandhills Game Land: the Yadkin/Pee Dee River and Lumber River Basins. The Pee Dee River Basin drains approximately 19,000 acres of SGL, most in Richmond County. The Lumber River Basin drains the remaining 43,000 acres in Moore, Richmond and Scotland Counties.

The Pee Dee River Basin has three intermediate size tributaries; Rocky Fork, Beaver Dam and Hitchcock Creeks, that drain the western section of the SGL. The Rocky Fork Creek is fed by Paradise and Millstone Branches and Hitchcock Creek is fed by Bones Fork Branch.

The Lumber River Basin has 6 intermediate tributaries, Naked, Big Muddy, Beaver Dam, Little Muddy, Hills and Watery Creeks that drain the eastern portion of Sandhills Game Land into Drowning Creek which flows into the Lumber River. There are 5 tributaries, Gum Swamp, Upper Beaver Dam, Jordan Juniper and Little Shoe Heel Creeks that drain the southern portion of Sandhills Game Land. The Lumber River Basin contains three Outstanding Resource Waters (NCDWQ 2004). Two are located on Sandhills Game Land: Naked Creek and Rocky Ford Creek.

Current condition of the riparian vegetative habitat is best described as being in an intermediate stage of being restored to the desired future condition. Historically, fire breaks were plowed at the edge of drains to exclude fire. In the last ~20 years WRC has worked to incorporate drains into burn blocks and currently riparian vegetation is managed primarily with fire. Drains are treated with both growing season and non-growing season fires. Some of the most diverse plant communities on SGL are found within and at the edge (or "ecotone") of drains managed with fire, and these areas are a focal point of wildlife activity including turkey nesting, deer foraging and bedding, quail foraging and escape cover, tree frog foraging and breeding, and songbird nesting and foraging.

Forestry activities within wetlands are being used to help achieve a mosaic of canopy types and densities which indirectly impact the midstory and ground cover plant communities. This activity mimics some of the historic role that fire played on the landscape. Thinning dense pine stands and reducing the hardwood component of the forest canopies make the evergreen shrub communities more responsive to fire treatments. Open canopies allow more sunlight to reach the forest floor which facilitates drying and development of finer fuels such as grasses and cane on the forest floor. These fuel types are more readily consumed by fire helping to restore native plant communities that have been suppressed by closed canopy conditions.

The streams are mostly headwaters of their respective basins and are not exposed to immediate problems associated with urban encroachment such as contamination from waste treatment facilities, exposure to surface water runoff and industrial/agriculture contaminants. Potential siltation from forestry activities can be avoided by closely monitoring logging operations. Timber sales on the Sandhills Game Land do allow thinning within wetlands when needed to achieve habitat objectives, but typically avoid clear cuts. Stream crossing by logging equipment is limited to smaller streams and may require closer scrutiny to determine if problems exist.

Desired Future Condition:

Riparian wetlands divide the surrounding sandy ridges and offer many benefits to the local wildlife population found in the Sandhills. Sandhills streams and wetlands vary in orientation, width and aspect with respect to topography which can influence their exposure to fire and fire intensity. This can result in a mosaic of habitat types within a single drainage system. The narrowest fingers of the riparian wetland where fires burn through the drain consuming all fuels produce a grassland/cane dominated open pine canopy habitat type. Broad wide basins that are rarely exposed to penetrating fires are dominated by closed canopy hardwood stands. These contrasting habitat types are usually found within the same drainage systems with varying degrees of fire adapted/suppressed habitat found next to one another.

A mosaic of successional stages that include grassland/cane/open canopy pine wetland habitat with closed canopy hardwood dominated basins connected by mixed pine/hardwood stands of varying densities and amounts of ground cover are the DFC for our Sandhills riparian wetlands. Riparian areas around headwater streams should have an open canopy, reduced midstory, and dense understory dominated by cane and sporadic shrubs and small trees. The transition zone between drain and upland should support a lush and diverse herbaceous plant community. Riparian areas adjacent to larger streams should consist of a closed canopy of diverse, large diameter trees, a well-developed midstory, and an understory of shrubs and/or herbaceous plants. In all drains, forestry practices should favor maintaining larger diameter trees, den trees, snags, mast-producing trees, and Atlantic white cedar where present.

Photo 2
Open-canopy, cane-dominated streamhead drain

Photo 3
Closed canopy riparian zone by perennial stream

Target game species:

Many game species use the riparian habitats to meet critical habitat needs. Hard mast, travel corridors and escape cover are key features of riparian areas. Hardwood dominated drains provide habitat for Gray Squirrels, Fox Squirrels, turkey, and deer. Den trees are found in old mature hardwoods and provide

nesting habitat for squirrels, Wood Ducks and an occasional black bear. Feral pigs are beginning to establish themselves in the Sandhills by utilizing the dense cover offered by riparian habitats and present a potential threat to this habitat.

Open pine canopy wetlands maintained by prescribed fire offer unique habitat for eastern fox squirrels, bob white quail, deer and wild turkey. Ground cover found in open canopy wetlands offer high quality nesting habitat for ground nesting birds. Green sprouts that follow spring and summer prescribed burns are high in nutrition and attract insects that are high in protein, which are critical for the development of young turkey and quail. Fresh sprouts are utilized by all wildlife species including deer and fox squirrels.

Target non-game species:

Non-game species seek out the riparian habitat types for the same habitat needs as game species. Escape cover, nesting cover, den sites, travel corridors and sources of food are located within the mosaic of habitats types found in fire maintained and fire suppressed wetlands. Fire-managed headwater drains are heavily utilized by shrub nesting birds including prairie warbler and yellow-breasted chat. Common Yellowthroat is more closely associated with fire-managed headwater drains than any other habitat on SHG. Cavity nesting birds, including Red-Headed Woodpecker and Brown-Headed Nuthatch, are more abundant in drains managed with fire. Rare frogs also depend on cane-dominated, fire-managed drains with small pools. Many rare and unique herbaceous plants are found in association with fire-managed drains including Sandhills lily and several species of pitcher plants and orchids.

Target non-game wildlife species associated with closed canopy, hardwood dominated, broad floodplains include Swainson's Warbler, Kentucky Warbler, Box Turtle, Southeastern Myotis bat, Rafinesque Big-eared Bat, and aquatic salamanders. Atlantic white cedar is a tree species of management interest in larger drains where it is found.

Management Strategies:

Managing riparian areas will incorporate practices to protect water quality, prevent soil movement, compaction and erosion and manipulation of wetland vegetation to achieve desired future condition.

Protecting water quality will be a priority for all activities. Best Management Practices outlined in NC Forest Service BMP manual will be followed. Maintenance of roads, trails, and fire breaks will follow water quality guidelines where appropriate.

Achieving desired future condition for wetland vegetation will require the use of prescribed fire and commercial logging. Both practices are compatible with managing wetlands, but will require guidance and oversight by skilled experienced professionals in fire and forestry management.

Commercial timber sales will be used to remove selected trees to help create desired stand densities and to alter stand types. Frequent monitoring of logging operations will insure BMP's, water quality and soils erosion and compaction concerns are addressed.

Prescribed burns will be conducted according to the prescribed burn plan. The burn plan for the Sandhills Game Land has identified burn blocks which include all upland and wetland acres. The return interval or frequency of burn will vary depending on local conditions. A two to five year burn interval that includes both dormant and growing season burns will create the desired future conditions stated above.

Infrastructure needs:

Roads and stream crossings will need to be monitored and maintained to prevent excessive movement of soils into streams. Culverts will need to be inspected for debris, turn outs will need to be periodically maintained. Periods of frequent and high rainfall will require more frequent monitoring. When new culverts are installed or old ones replaced, they should allow for the passage of aquatic organisms.

Preparation of fire breaks using disk and plows need to be planned and minimized. Utilization of existing roads and firebreaks should help minimize the need for development of new firebreaks. Stream crossings need to be inspected and improved where needed. Improvements should include installation of culverts where needed and practical. Firebreaks through wetlands can be brushed and widened using the Fecon mulcher.

To properly monitor the maintenance of roads and firebreaks will require a systematic approach of identifying those that are scheduled for inspection and treatment. A shape file with an attribute table will be created, maintained and used to track routine maintenance, inspections and repairs.

Threats:

Water quality can be threatened by excessive erosion. The ability to control access and utilization of roads and firebreaks should help maintain the condition of roads and firebreaks minimizing the movement of soils into streams.

Managing wetland vegetation with prescribed fire requires educating and informing the public about the importance of fire as a management tool. Past efforts to educate the public of the importance of prescribed fire have been successful. This will require continued effort as new people move into the area. Strategic land acquisition and management agreements can help to head off negative impacts to burning from incompatible development near SGL. Future climate changes that lead to more intense periods of drought and flooding may impact vegetation associated with drains and complicate the availability of suitable environmental conditions for burning in drains.

Novel diseases and exotic pests (e.g. laurel wilt) could threaten plant species associated with drains. Exotic species such as feral pigs and fire ants could also negatively impact vegetation and wildlife in drains.

Connectivity of riparian habitats across the larger landscape may be threatened by incompatible land uses off of SGL. The Sandhills Conservation Partnership has focused recent land conservation efforts along Drowning Creek, and these efforts should be continued and expanded.

Isolated Ephemeral Wetlands (Total acres 45)

Current Extent & Condition:

Isolated, ephemeral wetlands (referred to as "small depression ponds" or "vernal pools" by the NC Natural Heritage Program) are scattered across the Sandhills Game Land (SGL) landscape, mainly south of US 1 in Scotland County. Isolated, ephemeral wetlands are regarded as one of the most endangered, and simultaneously one of the most biologically productive habitats in North America. Wetlands of this type are characterized by unique assemblages of flora and fauna that are not associated with permanent-water wetlands. Isolated wetlands on SGL occur as shallow basins with a clay layer several feet below the surface, allowing them to hold water for at least a portion of the year, depending on rainfall. There are currently 14 identified natural isolated wetlands on SGL and these features range in size from <1/2 acre to over 20 acres. Man-made isolated wetlands, including borrow pits, are scattered throughout SGL and can be managed the same as natural isolated wetlands.

The best example of an isolated, ephemeral pond on SGL, "17-Frog Pond", is known for being one of the best sites in the state for rare pond-breeding amphibians. It remains a completely open-canopy pond with numerous species of grasses and sedges, as well as multiple rare plant species associated with the wetland. Other upland depressions throughout the SGL are in various stages of succession and forest encroachment because of ditching, fire exclusion, or the use of prescribed winter fire when the wetlands are usually holding water. Restoration of isolated wetlands by removing trees and restoring summer fire has been ongoing on SGL since 2010.

All of the isolated wetlands on SGL dry completely during most years, but some may hold water for several years in a row depending on weather conditions. In a typical year, these wetlands fill with water in the fall and dry by mid- to late-summer of the following year. Periodic fires that burn through these wetlands when they are dry (usually mid-summer or fall) are essential for maintaining an open canopy, reduced shrub layer, and rich herbaceous emergent vegetation.

Of the 14 isolated wetlands on the SGL, several do not currently support an open, grassy basin with little or no canopy cover. The best examples of open ponds continue to support rare salamanders, whereas none of the closed-canopy ponds support these rare species. Rare frogs are found in even fewer ponds. Closed-canopy ponds on the SGL tend to support few, very common species of amphibians because of reduced hydroperiods and other factors related to canopy closure. Removal of trees and years of leaf litter accumulation in isolated wetland basins is needed to promote conditions necessary for rare amphibian populations, as well as rare plants, to once again thrive on this portion of the NC Sandhills.

As of 2013, restoration efforts have been largely completed at 4 natural wetlands (Block T, Slate Circle, Mini Dismal, Mabee's Pond) and are in process at 1 large pond (Little Dismal). Major restoration efforts remain to be done at Block O pond, and minor restoration is needed at Wildfire Pond and Pulpwood Pond. The rest of the natural isolated wetlands should be maintained in roughly current condition. Major improvements have been done at one borrow pit and we have created one large ephemeral wetland and 5 small wetlands.

Desired Future Condition (DFC):

Most isolated wetlands on SGL should consist of herbaceous vegetation types with few, if any, canopy trees. Wetlands that are already open-canopy should be maintained by burning the wetlands and adjacent uplands when ponds are dry (usually mid-summer and fall). Ponds that have been ditched or degraded because of lack of appropriate fire regimes historically should be restored to open-canopy, herbaceous wetlands. Ideally, restoration efforts should lead to natural systems that will be self-sustaining in an open-canopy state with seasonally appropriate fire regimes.

Isolated, ephemeral wetland (Photo 4)

Sandhills Seepage Bog (Photo 5)

Target game species:

Isolated wetlands are used by wood ducks for foraging and nesting when they are holding water. Other game species such as deer use these wetlands for drinking water and turkeys and quail forage in the herbaceous vegetation when water levels are down.

Target Non-game species:

Numerous priority non-game species, especially frogs, salamanders, and turtles rely on this wetland type for breeding. Wading birds forage in the larger wetlands.

Management Strategies:

Removal of trees and leaf litter accumulation in degraded isolated wetland basins is badly needed to promote conditions necessary for rare amphibian populations, as well as rare plants, to once again thrive on the SGL. In some cases, hot fires during the growing season and when wetlands are dry can have some effect on removing woody vegetation from these wetlands. Ponds that have become overgrown with canopy trees and large shrubs should be restored to open-canopy with the use of heavy equipment followed by prescribed burning when the basins are dry.

Restoration techniques have involved pushing trees and heavy duff layers out of basins using heavy equipment (bulldozers). This effectively restores the pond basin back to mineral soil and wetland plant seedbanks that remain in the soil are oftentimes enough for the wetland to naturally return to an herbaceous understory condition. In instances where ditches are present, ditches should be removed and/or plugged after hardwood overstory and shrubs have been removed. Finally, all precautions should be taken to avoid rutting and over compaction of soil in wetland basins, and rare plants should be identified and avoided during restoration activities.

In restored and naturally-open isolated wetlands, it is imperative that fire is allowed to burn through the wetland basin every 2 – 4 years, when the pond basin is dry. Some maintenance of woody vegetation (hand cutting shrubs or young pines) may be necessary if conditions or staffing do not allow for appropriate fire regimes.

Infrastructure needs:

Isolated wetlands should require little maintenance in a currently healthy state or after restoration except for the use of appropriately timed prescribed burning. Fire breaks may need to be strategically placed in some compartments so that fire can be applied to these wetlands when appropriate, however, breaks should not be placed within the watershed of the pond basins (i.e. place firebreaks at crest of hill above basin).

Threats:

The main threat to isolated wetland habitat types is woody vegetation encroachment due to lack of appropriate fire regimes. Another significant threat is altered rainfall patterns and periods of drought. Many species are adapted to breed at a certain time of the year, and require a very specific hydroperiod (long enough to allow larval development, but not permanent water). Significant changes in the timing and amount of rainfall, including changes that affect the groundwater table, can have a huge impact on breeding success. The best way to mitigate this threat is to restore natural hydrology, provide for multiple ponds of a variety of sizes and hydroperiods, and maintain and enhance upland habitat connectivity between these ponds.

Other threats include military operations (driving vehicles through wetlands), damage from illegal ATV use, placement of food plots near wetland basins (which can increase fire ant abundance), and fire lines near or through pond basins. All of these should be avoided to maintain the integrity of these wetland systems. Overuse by wildlife viewers (leading to trampling of vegetation, egg masses, etc.) and illegal collecting of rare species are also potential threats, though these are not major concerns at this time. Finally, feral hogs may become a threat in the future by destroying vegetation in pond basins, and this situation should be monitored.

Impoundments (Total Acres 315)

Current Extent and Condition:

There are nine impoundments on the SGL ranging in size from 3 acres to 67 acres. Impoundments are used for fishing, boating, wildlife viewing, and hunting and provide habitat for game and non-game species. All impoundments are very shallow and most contain several species of aquatic vegetation. Water flow in these impoundments is high and nutrient levels within the impoundments are low.

Desired Future Condition (DFC)

The desired future condition for the impoundments are that they are accessible to all users of Sandhills Game Land for wildlife-related recreational opportunities, while maintaining adequate habitat for target game and non-game species. These impoundments should have adequate riparian buffers and continued water quality adequate to sustain aquatic life at all trophic levels. They should provide fishing and hunting opportunities for users.

Paddlers on Sandhills GL Lake (Photo 6)

Target game species:

Largemouth Bass are the primary game species targeted by anglers in these impoundments. They are ambush predators that prefer areas with adequate cover for foraging and they need stable water levels during the spawning period (April-May) to ensure adequate reproduction.

Chain Pickerel are also targeted by anglers in these systems. They prefer areas with significant submersed aquatic vegetation.

Bluegills, Redbreast Sunfish, and Redear Sunfish are also present in Sandhills Game Land impoundments. These species are adaptable to many habitats.

Wood ducks nest in and around many of the SHG impoundments. Modest numbers of several species of ducks forage on impoundments in the winter.

Target Non-game species:

Blackbanded, Bluespotted, Dollar, and Spotted Sunfish are present in Sandhills Game Land impoundments.

Wading birds and shore birds utilize impoundments during migration, and in particular utilize mud flats and shallow water areas.

Several species of turtles, including one rare species, utilize SGL impoundments.

Management Strategies:

Maintain adequate water levels in each impoundment to support aquatic life, specifically viable sport fisheries, and allow reasonable access for users. Water levels will be adjusted in some impoundments periodically to provide habitat for waterfowl and migrating shorebirds and wading birds.

Conduct population surveys as needed for game and non-game species. Maintain current regulations for game species and modify as necessary.

Continue to stock channel catfish at Indian Camp Lake to provide a consistent, quality angling experience.

Crawford Lake and Scotland Lake will be managed at below full-pool water levels to benefit riparian plant communities and high priority terrestrial species.

One or two impoundments that are not heavily used for fishing or boating will be periodically drawn down a moderate amount in the spring (mid-March through May) or fall (mid-August – mid-October) to provide mud-flat habitat for migrating wading birds and shore birds.

Infrastructure needs:

Maintain access for small boats at Kinney Cameron, Gum Swamp, Broad Acres, Baggett's and McKinney Lake. Identify other impoundments where access is limited for small boats and provide access when feasible.

Maintain fishing piers at McKinney Lake and Indian Camp Lake. Identify other impoundments where fishing piers could provide improved access and install as needed and feasible.

Continue to maintain dams and water control structures on each impoundment. Inspect these structures periodically and work with staff engineers to maintain compliance with dam safety laws. Evaluate the cost/benefit of repairing vs. breaching a dam when out of compliance with dam safety laws.

Threats:

Invasive species are a major threat to Sandhills Game Land impoundments. This is particularly true for invasive plant species (e.g. Hydrilla). Early intervention should be undertaken if any invasive species is identified in these impoundments.

Sedimentation can negatively affect littoral fish habitat. Riparian buffers should be maintained around all impoundments to minimize sediment transport from terrestrial areas into the impoundments.

Blackwater Streams (Total Miles 23)

Current Extent and Condition: The most important management strategies to protect blackwater streams are to maintain forested riparian corridors and to minimize sedimentation and erosion from roads and firebreaks. To protect water quality, the recommended buffer on perennial streams is 200ft and 100ft on intermittent streams. Within this buffer there should be a minimum of impervious surfaces, utility crossing, roads, trails, or fire breaks. Within the buffer forestry operations should follow best management practices to protect water quality. In addition, road crossings should not impact the connectivity of the streams (i.e. bridging where feasible or using appropriately sized culverts buried to provide a natural bottom). Techniques for reducing impacts to water quality are published in the NC Department of Transportation's "Best Management Practices for Construction and Maintenance Activities".

Larger, perennial streams in the Sandhills Game Land are commonly known as "blackwater streams" for the color of the tannins that leach from decaying vegetation. Stream bottoms are typically sandy with snags and woody debris. The water is very acidic, low in nutrients, and has low turbidity. These streams are moderate to swift-flowing and are supplied by rainfall and ample groundwater. Because of this groundwater input, these streams have more stable flow rates that other coastal plain streams.

The streams on the Sandhills Game Land are part of the Yadkin-Pee Dee River Basin (Hitchcock Creek watershed) and the Lumber River Basin (Gum Swamp watershed, Juniper Creek watershed, Big Muddy Creek watershed, and Drowning Creek watershed; Figure 1). Streams in this area support a variety of North Carolina Wildlife Action Plan priority fish species and the main impact to their habitat is sedimentation.

Desired Future Condition (DFC) The desired future condition for the blackwater streams on the Sandhills Game Lands are to maintain and/or improve biological diversity in the streams and to ensure that sedimentation into the creeks is minimized.

Blackwater Stream (Photo 7)

Target game species: Chain Pickerel and Redbreast Sunfish are the primary game species targeted by anglers in these streams.

Target Non-game species: The Thinlip Chub, Pinewoods Darter, Sandhills Chub, Broadtail Madtom, Blackbanded Sunfish, Bluespotted Sunfish, Spotted Sunfish, Dollar Sunfish, Banded Pygmy Sunfish, Everglades Pygmy Sunfish, and Snail Bullhead are present in the Sandhills region and may occur in the Sandhills Game Lands streams. Sandhills Eurycea salamander and Mud Snake are two priority semi-aquatic species.

Management Strategies: Ensure that Stream flow is maintained downstream of the dam and adequate riparian corridors are protected. A general recommendation is to release the same amount of water at the dam that is entering the impoundment from upstream.

Periodic biological surveys are needed to assess the distribution and status of fish, mussels, and crayfish. These surveys will also help to determine the distribution of any non-native aquatic species in the game lands and how are they affecting native species.

Threats: Invasive species and sedimentation are the major threats to Sandhills Game Land streams. Early intervention should be undertaken if any invasive species is identified.

Forest Management

Objective

Application of sound forest management techniques will provide for optimal quantity and quality of wildlife habitat, recovery of endangered species and a sustained yield of forest products in the service of habitat enhancement.

Timber Management

Forest Organization: Sandhills Game Land (SGL) is divided into ten planning units. Each averages over 6000 acres in size and utilizes land features such as roads and streams and compartment divisions as boundaries. Each planning unit is further divided into 10 examination areas. This method of inspection ensures a systematic approach of inspecting the area for future wildlife habitat and forest management needs.

Forest Description: The upland timber stands on SGL are predominantly longleaf pine with minor components of upland hardwoods (oak, hickory). Most of these stands are 80+ years in age. The majority of these have been regenerated naturally with the exception of a few old field sites which were hand planted 50-60 years ago. There are residual flat topped longleaf pines scattered throughout the area that are over 200 years old.

The wetland areas are characterized by two distinct forest types Mixed Pine and Mixed Pine and Hardwood. Pine species found in the drains are Pond, Longleaf, and Loblolly. Hardwoods include yellow poplar sweet gum, black gum, and red maple.

The upland ground cover is dominated by wiregrass with various members of the legume and aster family found in association with vaccinium and numerous other species. The various plant communities found on the area are closely associated with soil types, stand basal areas, fire occurrence and land use history.

Endangered Species Consideration: Endangered species management is incorporated into each planning unit as management recommendations are made. The red-cockaded woodpecker is the most prominent listed species and influences most proposed projects on the Sandhills. Endangered plant sites have been inventoried and delineated in recent years and potential impacts are mitigated if not negated on a case by case basis.

All proposed projects are closely studied to determine potential impacts to any state or federally listed species. In most cases involving the red cockaded woodpecker, a foraging habitat analysis is needed (1989 Gary Henry).

Forest Inventory: The current forest inventory on Sandhills was done by NCSU's College of Forest Resources, Forest Biology Research Center in 1994. Deliverables included the following items; an updated timber inventory, foraging habitat analysis data for red cockaded woodpecker cluster sites, GIS-based maps of the game lands and a collection of data for fire fuels models.

The 1994 inventory filled a great void but its usefulness has significantly waned in the last 11 yrs. due to its inability to be updated, absence of growth and yield models in the software, and technological advances in GIS, GPS, and forest/RCW management software. This waning usefulness has significantly impacted the ability of staff to plan forest management activities more than 1-2 years in the future (a 15-25 year window is needed), predict and mitigate impacts on wildlife habitat, and estimate an optimal sustained yield of forest products.

At this time a new inventory is being completed on 40,500 acres. Also new forest management software that includes growth and yield and RCW management capabilities will be included. Once this project is completed the following can be achieved which will result in optimal habitat management and forest resource management on the area.

- Determine optimal sustained yield of forest products that will maximize habitat for target game and non-game species
- Plan future timber harvest and RCW foraging sites based on projected volume growth and yields
- Continuously update the forest inventory as management prescriptions are completed.

Forest Management Guidelines for Sandhills Game Land

Designated planning units are inspected each year to determine management needs. Recommendations are based on the following guidelines.

Maintain the entire area on a perpetual all aged management system, including old, larger diameter trees and younger regeneration within the same stand. Selective thinning, regeneration cuts and prescribed burning have and will be used to implement this management approach on Sandhills Game Land.

Areas selectively thinned are reduced to basal areas of approximately 40-60 ft^2/acre of longleaf pine. Residual trees will be selected based on the form, size, quality, age and position in the stand. Dominant and co-dominant trees of good quality will be left to naturally regenerate current and future canopy gaps.

In cases where stands need to be regenerated (wildfires, hurricanes, and other natural disasters) they will be regenerated naturally where possible. This will be accomplished by using the shelterwood method of stand regeneration. Basal areas of approximately 30 to 40ft^2/acre will be left for a seed source. Residual trees will not be removed after the new stand has been established so they may contribute to RCW expansion, aesthetics and mast production.

Mid-story hardwoods are controlled to facilitate use of prescribed fire which in turn allows the majority of the game land to be characterized as a pine grassland. Prescribed fire is the most cost-effective and efficient silvicultural method of hardwood control. In most instances prescribed fire in the growing season will control hardwoods and allow small clumps of mast producing sized oaks and hickories to remain. Mast producing hardwoods play an important role and are critical for adequate Fox Squirrel habitat. When fire is not effective in controlling hardwoods, mechanical and chemical means will be used on as needed. Mechanical treatment involves harvesting hardwoods for fuel chips and/or removal by the use of a Fecon mulcher. Limited broadcast application of hexazinone may be used to treat areas where fire or mechanical means have been deemed poor solutions due to topography, smoke management issues, or other constraints. Chemicals are not used on sensitive sites such as Registered Natural Areas, Dedicated Nature Preserves, endangered or threatened plant sites or wetlands.

Midstory oaks have been reduced in numbers over large acres. For the effective time period of this plan, hardwood control by chemical and mechanical means will focus on small areas 10 acres and less and will retain ¼ to ¾ acre clumps of hardwoods DBH>10".Through the selective use of chemicals and mechanical controls along with prescribed fire a mosaic of habitat types will be created and maintained. Scattered stands of larger oaks will be retained for mast and den trees within larger open stands of longleaf pine.

Young stands (Average age 25-35) will be thinned when they approach marketable size. A residual basal area of approximately 45-65 ft^2 /acre will be retained leaving the best formed trees. This treatment will improve the growth and vigor of the stand and facilitate native ground cover enhancement.

Small off-site stands of loblolly and slash pine are found on the area. The conversion of these sites to longleaf will be considered during the scheduled examination period for each planning unit. Once stands have been selected for conversion they will be clear-cut and site prepared as needed. Planting at appropriate stocking rates will occur between November and January. Seedling survival inspections will be conducted the following winter to determine if replanting will be needed. Groundcover status will also be assessed and native grass and forb communities will be artificially established as needed.

Pine Straw Harvesting

Status: An important source of revenue generated from the area comes from the sale of longleaf pine straw. Approximately 14 sites totaling 1000acs are sold annually. Sale areas range from 50 to 200 acres in size. Annual sales receipts average $150,000. Sale areas are posted prior to sale identifying sale boundaries. Contract periods usually last 120 days and are inspected periodically for trespass and contract compliance. Illegal removal of pine straw is a recurring problem. Violations are turned over to the Division of Law Enforcement for prosecution.

Concerns and Impacts: Harvesting pine straw on state owned land has generated interest from a variety of groups. The interest has centered on the potential impact raking has on the longleaf pine ecosystem. Major concerns are listed below:

- Potential interruption of the cycling of nutrients.
- Destruction of native plants (tearing, breaking or uprooting).
- Heating, drying and erosion of soils due to the removal of the organic layer.
- Disturbing ground nesting species during nesting season.
- Excluding areas from fire management.

The degradation of native plants is being minimized by concentrating harvest efforts in old field sites. Tree stocking in these sites is high allowing very little light to reach the forest floor, as a result very little ground vegetation exist in these areas. A past history of being cultivated has also reduced the quality of ground vegetation.

To avoid soil movement, sites that are subject to erosion will are not raked. All straw sites are old fields and have a relatively flat topography. They also have thick canopies which reduce the potential of soil heating, drying and movement.

The destruction of ground nesting habitat has been minimized by concentrating harvest efforts on old field sites where the potential for nesting habitat is remote.

The concern for loss of nutrients has been studied by the Forest Nutrition Program at NCSU. Studies indicate the amount of nutrients being removed is substantial and can have a detrimental effect on vigor. Nutrient losses can be replaced with periodic fertilization if needed. But with current man-power and budgetary constraints a $100,000 + fertilizer program is un-attainable.

Site vigor has been affected on these old field sites and will continue to be negatively affected as long as they are in an annual raking program. To alleviate this loss of nutrients and to not permanently affect stand site-index, these old field sites will be thinned, ground cover in the form of native grasses and herbs will be established, and burned on a 2-3 year rotation. Pine straw sales on the Sandhills Game Land will be phased out over the next 15 years.

Prescribed fire and wildfire control

The prescribed burning program uses a combination of dormant and growing season fire to manage the forested lands on Sandhills Game Land. Both practices are proven wildlife and forest management tools. They are both cost efficient and effective and are having a positive effect on a large number of acres on Sandhills Game Land. Two of the more noticeable effects are the reduction in both the number of damaging wildfires and the amount of pine mortality experienced as a result of our prescribed burning. Some of our wetland drains are beginning to be burned bi-annually to produce higher quality browse and more herbaceous diversity (See figure 1).

Annually Burned Drain (Photo 8)

This is partly due to the strategy of burning from road to road, which increases the acreage per block treated. It also creates a safer burning environment by surrounding most of our drains with lighter, more controllable fuels allowing the interiors to burn hotter while maintaining control of the fire.

Dormant season fires are used to reduce fuel hazards and to prepare an area for growing season fire in the future. They are conducted between December and March. The table below from 2009-2010 indicates typical dormant season goals.

Month	Moore	Richmond	Scotland	Totals
December	0	547	0	547
January	151	2366	610	3127
February	0	360	545	905
March	0	2032	1787	3819
Totals	151	5305	2942	8398

Table 3 (Acres prescribed burned during dormant season 2009 - 10).

Growing season prescribed burns start with the onset of green up, which usually occurs by mid-April. Several factors mostly related to weather determine the extent and the amount of growing season fire that can be used during the spring and early summer. Fires during the growing season are used where fuel loads have accumulated for 2 -3 years. This amount of fuel is sufficient to top-kill many mid-story hardwood stems and stimulate herbaceous plants and grasses to flower. The table below from 2009-2010 indicates typical goals for growing season fire on Sandhills Game Land.

Month	Moore	Richmond	Scotland	Totals
April	0	941	1221	2162
May	0	2559	886	3445
June	0	2197	2721	4918
July	0	141	1357	1498
Totals	0	5838	6185	12023

Table 4 (Acres prescribed burned during the growing season 2009 - 10).

Preparing firebreaks during the prescribed burning season requires a great deal of effort. The burn crews are manned with temporary employees that require close supervision during all aspects of preparing and executing a prescribed burn. Detailed maps and aerial photos are used to navigate crews to the various burn sites. Preparing an area to be burned requires disking or plowing existing firebreaks and locating and securing red-cockaded woodpecker cavity trees.

A total of 297.4 miles of firebreaks are maintained during fire season and approximately 800 red-cockaded woodpecker cavity trees are visited and/or secured to protect them from burning (see table 3).

Month	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July	Totals
Miles of Firelines	0	0	8.41	41.81	12.61	59.57	35.79	52.21	66.18	20.82	**297.4**
RCW Trees secured	0	0	4	66	31	119	119	178	176	50	**743**

Table 5 (Summary of firebreaks maintained and RCW secured 2009 – 10).

In addition to the prescribed burning program, permanent staff assist the NC Forest Service with the control of wildfires. Sandhills Game Land is used extensively by military personnel for combat training. Their routine activities involve the use of tools and equipment that under normal conditions can and do start woods fires. Some incendiary or arson related fires also occur on the area. A typical season of wildfires occurred during the 2009-10 burn season, 14 wildfires totaling 877.9 acres occurred on Sandhills Game Land (Table 4). Three wildfires occurred in Richmond County burning 188.2 acres and eleven occurred in Scotland County burning 689.7 acres thru the month of July 2010.

Month	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	Totals
# of Fires	2	2	0	0	0	0	0	0	2	3	1	4	**14**
Acres	25.8	0	0	0	0	0	0	0	283.2	162	22.1	351.4	**877.9**

Table 6 (Summary of wildfires 2009 - 10).

Infrastructure Development & Maintenance

Objectives

The built infrastructure should provide for sufficient access and use for wildlife-related recreation and military training, support management activities, and should not negatively impact sensitive habitats or wildlife resources. Some guiding principles for developed infrastructure on Sandhills Game Land are listed below:

- Many visitors come to Sandhills Game Land for the wilderness feel and enjoy the opportunity to "get away from it all." Many of the species found on SGL are sensitive to the direct and indirect impacts of roads and other development. Large tracts of forest free from roads and other infrastructure should be maintained.
- 2-wheel drive, all weather access should be provided to popular, key locations on the game land
- Through traffic (i.e. cars driving *through*, not *to* the game land) should be discouraged
- Traffic speeds should be slow (<30mph) for public safety, to support those users who enjoy a slower, scenic drive, and to minimize wildlife-vehicle collisions and reduce road-kill wildlife mortality, particularly in areas with high concentrations of rare amphibians and reptiles
- The aesthetic appeal of the longleaf pine forest should be maintained
- Handicap access should be made to facilities (fishing piers, hunting blinds) where possible
- Erosion related to infrastructure should be avoided, minimized and/or mitigated
- Trails, firebreaks, and roads will not be designated for the exclusive use of particular user groups
- While meeting user and management needs, built infrastructure should leave a minimal footprint on the game land

Roads

Assessments of existing infrastructure throughout the Sandhills Game Land were conducted by Engineering and Lands Management Staff in 2013. The infrastructure maps included show the location of existing roads, parking areas, and dams within the Sandhills Game Land. The results of the assessments along with the recommendations for maintenance and improvements are discussed by category below.

Assessments

The Sandhills Game Land has an extensive road network. These roads were inspected by engineering staff over several dates in July and August of 2013 with the assistance of Wildlife Management staff. Meetings were also held between Engineering and Wildlife Management staff to discuss the current infrastructure conditions and future needs.

Good access is provided to nearly all tracts/blocks of the game land. There are three main types of roads on the game land: roads open to public travel, fire lines/breaks, and field trial trails. For the purposes of this assessment, the fire lines and fire breaks and field trial trails have not been inspected. Currently, there are only a few gates and no seasonally opened or closed roads, which means that the entire game land is open to the public at all times. The roads are used by WRC staff to access the game land for maintenance and conservation work. They are also used by the public for hunting, horse riding, dog trials and training, military training, wildlife viewing, pine straw gathering, and logging.

Existing Road Conditions

All of the roads on the Sandhills Game Land are made up of sand. There aren't any hard surfaced or all-weather roads (gravel or pavement) on the game land with the exception of the roads to the hatchery. These roads require constant maintenance due to erosion of the sand. At the time of the inspections, the conditions of the roads ranged from minor erosion and relatively good condition to impassable.

Overall, the Sandhills Game Land has a good road network that allows access to most of the game land. However, the majority of the roads require constant maintenance and grading due to the nature or sand roads. The sand does not make a stable road surface, and the sand moves considerably due to erosion. With the constant grading, maintenance, and traffic, it is not possible to stabilize the road surface or the adjacent ditches (if present) to eliminate the erosion. The majority of the roads on the game land also have trees just adjacent to the road. This prevents sunlight from drying the road out. Continuously wet conditions can lead to road deterioration.

In order to improve the conditions of the roads, the trees need to be cut back to allow drying on most of the roads. Trees will also need to be removed to allow a proper cross-section with ditches to be installed. Tree removal will also allow sunlight to help establish groundcover. The amount of trees that need to be removed will be specific to the road segment. If warranted, tree removal will require RCW Foraging Habitat Analysis and concurrence of the US Fish and Wildlife Service. In order to stabilize the road surface and provide a fully passable road, an all-weather surface should be installed on steep slopes. Due to cost, gravel is the best option for the majority of the sloping sections of roads on the game lands in need of repair. In addition to gravel, filter fabric may also be installed below the stone on the subgrade. The road must be graded with a crown to provide drainage off of the road surface and to extend the life of the gravel. Drainage ditches may also need to be installed on the sides of the road. These ditches will provide a place for runoff from the road and adjacent areas to flow without causing damage to the road itself. The ditches will either drain to culverts or other points of discharge. Energy dissipators, such as rip rap aprons, may need to be installed where ditches discharge into streams. Finally, native, grassy groundcover should be established on all disturbed and/or bare areas adjacent to the roads. Established groundcover will minimize erosion by stabilizing the sand. In steep areas, wildlife friendly turf reinforcing mat should be installed in the ditch lines and on steep slopes to minimize erosion.

Numerous public comments have been received (See Appendix 11) during the online comment period regarding the road improvements on Sandhills Game Land. Their concerns included negative impacts to native groundcover/habitat, opposition to gravel or hardened high speed roads, concerns that improved roads will turn into short cuts for non-GL users, increased vehicle speeds affecting the "visitor charm of the SGL experience," increased vehicle speed leading to more road killed wildlife and possibility of endangering hunting dogs and hunters operating near these roads, and budgeted road improvement monies would be better spent on habitat management or land acquisition. The road sections listed below are in need of repair in order to allow safe transit for GL users as well as WRC staff. Over the life of this plan, the road sections that have been identified for repair will be evaluated and fixed as budgets allow. Care will be taken to make sure the repairs have minimal impacts to surrounding wildlife habitat.

Future Road Repairs

Maintenance and needs for future repairs were identified on several sections of game land roads. The recommended road repairs are discussed in this section and grouped by priority as follows:

High Priority

As mentioned above, the majority of the roads on the Sandhills Game Land are made of sand, and the condition of the roads may require different levels of repair. Over the next ten years, the highest priority roads (in descending order) to repair are the following:

- Nursery Lane
- Baggett's Lake Lane
- Scotland Lake Lane
- McKinney Lake Road

Nursery Lane

At the time of inspection, Nursery Lane was impassable by truck from Deaton Lane to Derby Road. It is a one lane sand road that contains several large water bars and holes. In order to make the road passable, it needs to be graded, and drainage ditches need to be installed. In addition, gravel needs to be installed on the travel surface to withstand traffic from logging trucks. Trees need to be cut down adjacent to the road to allow sunlight to keep the road dry, and all disturbed areas and areas that do not currently have good groundcover need to be seeded and stabilized to minimize erosion. If warranted, tree removal will require RCW Foraging Habitat Analysis and concurrence of the US Fish and Wildlife Service. Currently, this portion of Nursery Lane is scheduled to be renovated in the summer of 2014 to create a one-lane all-weather road. The section of road needing repair is approximately 1.50 miles long and will have an estimated cost of $225,000. However, if only the areas in disrepair are addressed, the cost would be significantly less.

Baggett's Lake Lane

At the time of inspection, Baggett's Lake Road was passable. It runs from the south edge of Block A to the north to its terminus at Naked Creek. However, there are no main roads that run from the north to the south in Block A of the game lands. There are two two-lane, main roads that run from east to west (Ellerbe Tower Lane and County Road). So, it would be good to have one main road that is passable running from north to south for game land access. In addition, a culvert replacement project is currently underway on Baggett's Lake Lane to replace multiple culverts that are either undersized or not functioning properly. Ideally, the trees need to be cut back from the road to allow sunlight to dry the area out. If warranted, tree removal will require RCW Foraging Habitat Analysis and concurrence of the US Fish and Wildlife Service. A gravel surface should be installed that is at least 12' wide, and ditches should be installed and stabilized along the sides of the road to provide proper drainage on steep slopes. Pull-offs should also be installed at strategic locations to allow passing. All disturbed and bare areas should be seeded to minimize erosion, the movement of sand, and clogging of culverts. The section of road needing repair is approximately 2.25 miles long and will have an estimated cost of $337,500. However, if only the areas in disrepair are addressed, the cost would be significantly less.

Scotland Lake Lane

Scotland Lake Lane, from Laurel Hill Road to Strausburg Lane, was in relatively good shape at the time of inspection. It is a one lane road for its entire length. This is a popular, heavily used road by game lands staff, visitors, and the military. This road is also frequently used for public tours and is part of a route described in the NC Birding Trail. Particular areas of concern are located near the annual burn (a particularly sensitive habitat area) and at the intersection of Laurel Hill Road. Proper drainage, erosion control measures, and an all-weather surface on steep slopes should be added in these areas to allow passage of 2-wheel drive vehicles. The entire length of the road should also be further inspected to identify other areas that need work to minimize erosion, provide access, and improve drainage. The entire length of this road is approximately 2.75 miles. In order to upgrade the entire road, the estimated

cost would be $412,500. However, if only the areas in disrepair are addressed, the cost would be significantly less.

McKinney Lake Road

McKinney Lake Road, or Fish Hatchery Road, was also in relatively good shape at the time of inspection. It runs south from McDonald Church Road to the McKinney Lake Fish Hatchery and McKinney Lake. This road is heavily used by NCWRC staff and visitors to access the hatchery and McKinney Lake, which is a popular fishing destination and a stop on the NC Birding Trail. This road needs additional gravel installed to improve the riding surface. It could also be re-graded to improve the cross-section by adding more defined crown to improve drainage and provide a smoother ride. The ditches also need to be graded to provide proper drainage. The section of the road from McDonald Church Road to the lake is approximately 0.75 miles. The road does not need to be completely renovated like some of the other roads on the game land. As a result, the estimated cost for the proposed scope of work is $75,000.

Medium Priority

The roads listed above have been rated as the highest priority for repair over the next ten years. However, they are not the only roads on the game land in need of repair. The roads listed below (in descending order) are considered as medium priority and should be repaired after the high priority projects are completed.

- Angling Road
- Whiskey Still Lane
- Pulpwood Lane
- Strausburg Lane

Angling Road

Angling Road was passable at the time of inspection. However, it contains numerous water bars that limit access for certain types of equipment from Strausburg Lane to Tyner Lane. The water bars are installed as result of erosion caused by the relatively steep slopes on portions of the road. In order to remove these features and make the road more accessible, the road should be graded, and gravel should be installed on sloping sections. In addition, the trees should be cut back to allow sunlight to dry the road, and drainage ditches should be installed. If warranted, tree removal will require RCW Foraging Habitat Analysis and concurrence of the US Fish and Wildlife Service. All disturbed or bare areas should be seeded to minimize erosion. Wildlife friendly turf reinforcing mat may also be needed in the ditches to prevent erosion due to high flow velocities. The section of road needing repair is approximately 0.80 miles long and will have an estimated cost of $120,000. However, if only the areas in disrepair are addressed, the cost would be significantly less.

Whiskey Still Lane

Whiskey Still Lane from Watson Road to Tyner Lane is also in bad shape. There are multiple water bars installed as a result of the steep slopes. These features trap water, and make it difficult to navigate the road. The water bars were installed to minimize erosion caused by high flow velocities down the steep slopes. In order to avoid these features and make the road more easily passable, the road should be graded, and gravel should be installed. In addition, the trees should be cut back to allow sunlight to dry the road, and drainage ditches should be installed as necessary. If warranted, tree removal will require RCW Foraging Habitat Analysis and concurrence of the US Fish and Wildlife Service. All disturbed or bare areas should be seeded to minimize erosion. Wildlife friendly turf reinforcing mat may also be needed in the ditches to prevent erosion due to high flow velocities. The section of road needing repair is approximately 2.00 miles long and will have an estimated cost of $300,000. However, if only the areas in disrepair are addressed, the cost would be significantly less.

Pulpwood Lane
Pulpwood Lane from Watson Road to Tyner Lane is in similar condition as Whiskey Still Lane. Similarly, the trees need to be cut back, gravel needs to be installed on sloping sections, and drainage ditches need to be installed. If warranted, tree removal will require RCW Foraging Habitat Analysis and concurrence of the US Fish and Wildlife Service. The section of road needing repair is approximately 1.80 miles long and will have an estimated cost of $270,000. However, if only the areas in disrepair are addressed, the cost would be significantly less.

Strausburg Lane
Strausburg Lane from Tucker Lane to Scotland Lake Road was in really bad shape at the time of inspection. This section of the road is almost impassable due to erosion, areas of clay soils that become slick when wet, and areas of deep sand. In order to make the road passable, it needs to be graded, and drainage ditches need to be installed. In addition, gravel needs to be installed on steep sections of the travel surface to withstand traffic from logging trucks. Trees need to be cut down adjacent to the road to allow sunlight to keep the road dry, and all disturbed areas and areas that do not currently have good groundcover need to be seeded and stabilized to minimize erosion. If warranted, tree removal will require RCW Foraging Habitat Analysis and concurrence of the US Fish and Wildlife Service. The section of road needing repair is approximately 0.75 miles long and will have an estimated cost of $112,500. However, if only the areas in disrepair are addressed, the cost would be significantly less.

Low Priority

Other roads on the Sandhills Game Land in need of repair are listed below. These are considered the lowest priority for this assessment. However, there are more roads not listed that also need repairs.

- County Road
- Ellerbe Tower Lane
- Tyner Lane

County Road
County Road is a major two-lane road that runs northeast to southwest from Derby Road to Millstone Road. This road provides access to the field trial clubhouse and a frequently used military camp. At the time of inspection, it was in relatively good condition. However, it is a sand road, and it requires constant grading. Since this is a major road that runs across the game land with relatively high use, it would be good to provide an all-weather surface. So, the road needs to graded, gravel should be installed on sloping sections, and drainage ditches should be installed. Traffic calming measures should also be investigated and installed as necessary to discourage high speeds and cut-through traffic. The trees should also be cut back as necessary to allow sunlight to dry the road. If warranted, tree removal will require RCW Foraging Habitat Analysis and concurrence of the US Fish and Wildlife Service. All disturbed and bare areas should be seeded and stabilized to minimize erosion. The section of road needing repair is approximately 5.75 miles long and will have an estimated cost of $575,000. However, if only the areas in disrepair are addressed, the cost would be significantly less.

Ellerbe Tower Lane
Ellerbe Tower Lane is a major two-lane roadway that runs east to west through Block A from Derby Road to Gibson Mill Road. It leads to the field trial building and the field trial area. At the time of inspection, it was in relatively good condition. However, it is a sand road, and it requires constant grading. Since this is a major road that runs across the game land, it would be good to provide an all-weather surface. So, the road needs to graded, gravel should be installed on sloping sections, and drainage ditches should be installed. The trees should also be cut back as necessary to allow sunlight to dry the road. If warranted, tree removal will require RCW Foraging Habitat Analysis and concurrence of the US Fish and

Wildlife Service. Similar to County Road, traffic calming measures should also be investigated and installed as necessary to discourage high speeds and cut-through traffic. All disturbed and bare areas should be seeded and stabilized to minimize erosion. The section of road needing repair is approximately 4.20 miles long and will have an estimated cost of $420,000. However, if only the areas in disrepair are addressed, the cost would be significantly less.

Tyner Lane

Tyner Lane is similar to Angling Road. The section from Angling Road to Gardner Farm Road contains numerous water bars that limit access for certain types of equipment. The water bars are installed as result of erosion caused by the relatively steep slopes on portions of the road. In order to remove these features and make the road more accessible, the road should be graded, and gravel should be installed on sloping sections. In addition, the trees should be cut back as necessary to allow sunlight to dry the road, and drainage ditches should be installed. If warranted, tree removal will require RCW Foraging Habitat Analysis and concurrence of the US Fish and Wildlife Service. All disturbed or bare areas should be seeded to minimize erosion. Wildlife friendly turf reinforcing mat may also be needed in the ditches to prevent erosion due to high flow velocities. The section of road needing repair is approximately 1.25 miles long and will have an estimated cost of $187,500. However, if only the areas in disrepair are addressed, the cost would be significantly less.

New Road Construction

As mentioned above, the Sandhills Game Land has an extensive road network. The majority of the game land can be accessed by existing roads. The only new road proposed at this time is on Block O. Currently, there is a road into Block O off of Marks Creek Church Road. However, this road is in poor condition and the entrance is not accessible by large vehicles. There are pine straw sales, future timber sales, and habitat restoration projects planned in this Block that will require access by large trucks. So, a new entrance that provides better alignment, flatter slopes, and better site distance needs to be installed. The remainder of the road needs to be widened to a minimum width of 12', and gravel should be installed on slopes to provide all-weather access. In addition, there are some culverts that need to be replaced, and ditches need to be installed as necessary to provide proper drainage. The trees should also be cut back from the sides of the road to allow the area to dry and to allow the installation of a proper road cross-section. If warranted, tree removal will require RCW Foraging Habitat Analysis and concurrence of the US Fish and Wildlife Service. The entire length of the new road is approximately 1.50 miles and will have an estimated cost of $250,000.

Road Maintenance

All roads require inspection and maintenance to function well and avoid damage and deterioration. Maintenance should be performed regularly, as the longer the delay in needed maintenance, the more damage will occur and the more costly the repairs will be.

Typical Road Maintenance Practices

- Inspect Roads regularly, especially before the winter season and following heavy rains.
- Keep ditches and culverts free from debris (see also Culvert Maintenance Section of this Management Plan).
- Remove sediment from the road or ditches where it blocks normal drainage.
- Regrade and shape the road surface periodically to maintain proper surface drainage.

    - Typical road should be crowned at approximately 4%, or ½" per foot.
    - Some roads may not require a crown, but should have a constant cross slope (super-elevation).
    - Gravel should be distributed at an even depth across the road.
    - Gravel should have an even distribution of fine and course materials.
    - Keep downhill side of the road free of berms, unless intentionally placed to control drainage.
    - Proper maintenance and grading of the road will require a motor grader and a roller.
- Avoid disturbing soil and vegetation in ditches, shoulders, and cut/fill slopes to minimize erosion.
- Maintain shoulders on both sides of the road to ensure oncoming vehicles have enough room to pass. Shoulders should be relatively flat, with a mowed grass surface.
- Maintain an erosion-resistant surfacing such as grass or rip rap in ditches.
- If it is determined that a road needs major repairs or upgrade, contact Regional Supervisor and Design Services to schedule an assessment.

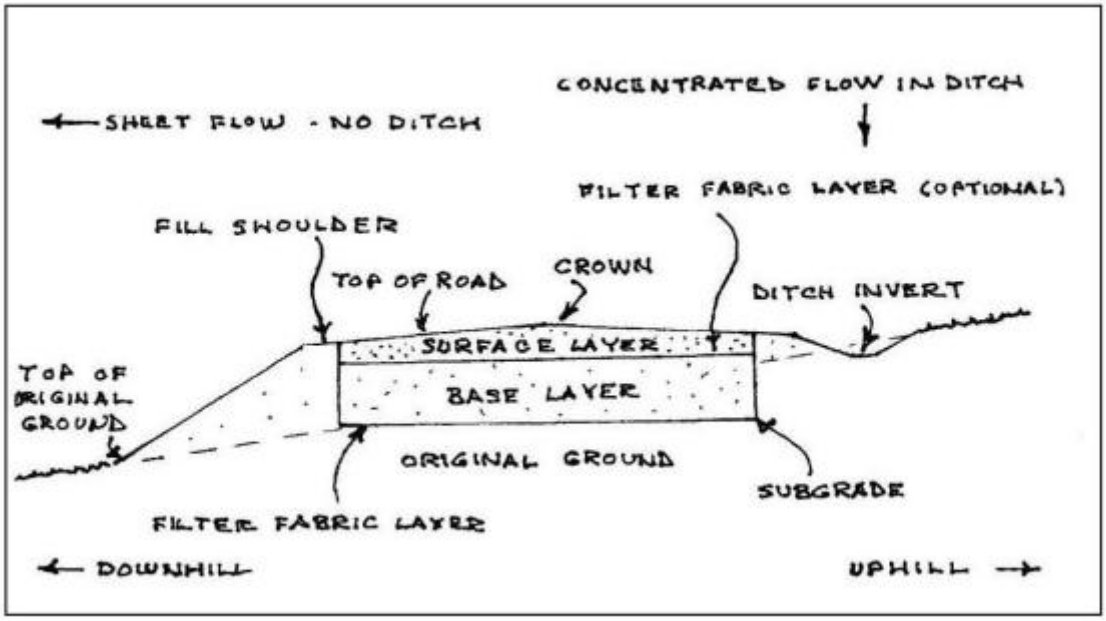


Figure 1 – Typical Road Cross-Section – Canaan, NH Highway Department

Road Safety Features

- Remove trees and other vegetation as necessary to provide adequate sight distance and clear travel way.
- Install and maintain road signage. This includes:
    - Stop signs –Should be installed at every intersection, with the signs on the minor roads.
        - Prioritize installation at intersection of DOT maintained & game land roads
        - Prioritize installation at major game land road intersections
    - Warning signs – Should be installed to warn the public of any road closures or problems in the game land.
    - Road/Route signs – Should be installed at every road intersection on a game land.

- Information kiosks with Game Land road map – Entry signs should be installed at every major entrance to a game land off of a DOT road. Information kiosks should be located near the entrances and in parking areas.
- Signs should be initially installed at areas with higher traffic volumes. Additional signs should be installed as deemed necessary.

Gates

Gates should be used on game lands for maintenance and habitat conservation. For maintenance purposes, gates should be used to limit access to roads that are unsafe or are in disrepair, or to limit use on roads to certain times a year in order to minimize the wear and deterioration of the road. If a road is considered unsafe or in disrepair, field staff should contact an engineer. The engineer will perform an inspection to determine the best course of action to repair or upgrade the road.

All gates installed on game lands should be the standard swing gate and painted orange for maximum visibility. No cable gates should be installed, and any existing cables should be replaced.

Troubleshooting

Road Surface Problems

Problem: Longitudinal erosion of the road surface
Possible Causes:

- Flat or U-Shaped road. A crown or super-elevation of the road is needed to shed water laterally off the outer edges of the road surface
- Small ridge of soil or grass growth along the outer edge of the road is preventing water from draining off the road surface. Edge needs to be graded to remove this ridge.
- Water is traveling in a wheel rut. Road needs to be re-graded. This problem often results from soft roads.
- Road ditch is not large enough and overflows onto road surface. Install more frequent turnouts to get water away from the road or increase the size of the ditch.

Problem: Lateral erosion cutting across the road surface
Possible Causes:

- Most often occurs at a low spot in the road or where a ditch filled in and no longer functions. Water builds up and overtops and erodes the road surface. A culvert should be installed in this location.

Problem: Potholes
Possible Causes:

- Potholes are typically caused by insufficient crown or road cross slope. The road should be re-graded to remove the potholes, then re-crown or super-elevate the road as necessary.

Ditch Problems

Problem: Bottom of ditch is eroding
Possible Causes:

- Slope of ditch is too steep to handle the flow without additional protective measures, which include addition vegetation, erosion control mats, rip rap, check dams, etc.

- Ditch is too small to handle the volume of water flowing through it. May need to install periodic turnouts to reduce flow through the ditch.
- Bottom of ditch is too narrow and needs to be widened to a parabolic shape.

Problem: Sides of ditches are slumping or eroding
Possible Causes:

- Side slopes are too steep and need to be lessened by digging the back.
- Side slopes need to be stabilized with additional vegetation, erosion control mat, or rip rap.

Parking Areas

At the time of inspection, there are several parking areas on the Sandhills Game Land. The largest lot is located at the Sandhills Depot. The parking lot at the Depot is sand, which requires constant maintenance. The lot is periodically graded using a motor grader, however rain storms constantly erode the lot's surface. During wet periods, the sand is tracked into the buildings, which can lead to deterioration of the floors and unsightly conditions. An all-weather surface, such as gravel, should be installed on the lot similar to what is required on the roads. Upgrades to the Depot parking lot will have an estimated cost of $25,000.

There are parking areas at a number of the lakes in the Sandhills Game Land. Lots are located at the east end of the Cameron Lake dam, the southern side of the Broad Acres Lake dam, the eastern end of the Scotland Lake dam, and the southern end of the Crawford Lake dam just to name a few. These lots are primarily sand, although some gravel has been installed over the years. These lots should have an all-weather surface, such as gravel, and they should consist of approximately six parking spaces. Additional parking lots should also be installed at the other lakes on the game land provided that there is adequate demand, and the site is conducive to their installation. The estimated cost of construction for each of these lots would be approximately $10,000.

Currently, game land staff and users can park wherever they want. As such, there are no designated lots for hunters. In order to concentrate users, minimize traffic conflicts, and minimize erosion caused by vehicular traffic in undesignated and potentially environmentally sensitive areas, parking lots could be installed at strategic locations as demand warrants. Parking should also be installed at gates to encourage users to not block access roads as necessary. Due to the immense size of the game land, multiple smaller lots (approximately three to five spaces) could be installed in locations centered on high use areas that cater to hunters and sportsmen as well as non-traditional users such as horseback riders and field trial users. Post and cables can be erected to restrict vehicles from driving around closed gates, and the area will need to be properly signed. Once an area is designated a public parking area, it will need to be routinely inspected to replace damaged signs, cables, and post. All public parking areas will need to be included in the game land map book and incorporated into a GIS project for infrastructure needs. The estimated cost of construction for each of these lots ranges from $5,000-$10,000 depending on the size.

In addition to the small lots, the Field Trial Building may be a good place to install a large parking lot as there are large gatherings in the building on a routine basis. If demand warrants a more formal lot, it should contain twenty to thirty spaces. An all-weather surface, such as gravel, should also be installed to minimize future maintenance and erosion. It would also be good to delineate the spaces in these larger lots. However, the desires of the potential user groups should be evaluated before proceeding with the construction of the lot. The design of the lot may also need to incorporate enough maneuvering area for large horse trailers. The estimated cost of construction for this lot would be $25,000.

Gates

There are very few gates on the Sandhills Game Land. Due to the extensive road network and the ability to drive through the open, flat woods, it is very difficult to close off or isolate portions of the game land to public access. So, gates aren't used extensively in the Sandhills.

Drainage Structure Assessments

Dam Assessments

There are ten lakes located on the Sandhills Game Land with constructed dams with outlet structures and emergency outlets. There are numerous smaller ponds consisting of beaver ponds, natural low areas, and small impoundments. These water bodies and outlet works have not been included in this section of the assessment. For the purpose of this assessment, the existing outlet works and dam embankment have been investigated to determine the type, material, and the overall condition of the structure. Recommendations for maintenance and possible future construction needs have also been included.

Broad Acres Lake

Broad Acres Lake Dam Information (from Dam Safety)	
Identification	RICHM-018 / NC00643
Hazard Classification	Intermediate
Year Built	1934
Dam Height (ft)	18
Hydraulic Height (ft)	15
Freeboard (ft)	3
Crest Length (ft)	675
Crest Width (ft)	10
Upstream Slope	N/A
Downstream Slope	N/A
Normal Pool Elevation	N/A
Normal Pool Area (ac)	20
Normal Pool Storage Capacity (ac-ft)	86
Max. Storage Capacity (ac-ft)	104
Drainage Area (ac)	858
Maximum Discharge (cfs)	76
Condition Assessment	Fair
Last Inspection Date	4/19/2012

Broad Acres Lake is located just west of Butler Drive, south of US 1 at 35°01'01" N, 79°32'43" W. The dam consists of an earthen embankment. At the time of the inspection, the vegetation was very thick, and there were a number of large trees on the embankment. The alignment of the dam seemed to be straight and no erosion, undermining, ruts, slides, cracks, seepage, wetness, or rodent burrows were observed. However, the vegetation needs to be cleared from the dam to complete a more thorough inspection. Vegetation should also be removed to avoid future problems caused by tree roots and to allow periodic inspections. The principal spillway consists of a concrete flashboard riser and concrete outlet pipe. The outlet structure and pipe appear to be in working condition, however removal of the vegetation and a

more detailed inspection of the riser (a piece of heavy equipment is needed to remove the lid) should be conducted. There is an existing cast-in-place concrete overflow spillway. The spillway appears to be in good condition with only a few cracks. It appears that no water has flowed through the spillway in some time, so the water level is currently regulated using the flashboards only. The first recommendation is to clear all of the existing vegetation from the dam and establish a grassy, native groundcover to facilitate inspections and eliminate problems potentially caused by trees. Once the vegetation is removed, the dam should be inspected further for erosion, ruts, undermining, cracks, seepage, wetness, and rodent burrows. The outlet pipe should also be inspected further to ensure the pipe is straight and all joints appear to be connected once the vegetation is removed. Overall, the dam appears to be in good condition. The estimated cost for the removal of the vegetation is $25,000.

Cameron Lake

Cameron Lake Dam Information (from Dam Safety)	
Identification	SCOTL-012 / NC01086
Hazard Classification	Low
Year Built	1935
Dam Height (ft)	26
Hydraulic Height (ft)	18
Freeboard (ft)	6
Crest Length (ft)	743
Crest Width (ft)	12
Upstream Slope	2:1
Downstream Slope	2:1
Normal Pool Elevation	380
Normal Pool Area (ac)	30
Normal Pool Storage Capacity (ac-ft)	324
Max. Storage Capacity (ac-ft)	389
Drainage Area (ac)	1158
Maximum Discharge (cfs)	79
Condition Assessment	Fair
Last Inspection Date	11/14/2012

Cameron Lake is located west of Watson Road at the end of one lane dirt road, south of US 1 at 34°59’41” N, 79°32’38” W. The dam consists of an earthen embankment. Just prior to inspection, all of the trees and woody vegetation was removed from the dam. All of the large stumps and root balls were removed, and the dam was graded to a smooth surface. So, no erosion, undermining, ruts, slides, cracks, seepage, wetness, or rodent burrows were observed. The vegetation should be mowed and maintained to allow future inspections. The principal spillway consists of a concrete flashboard riser and concrete outlet pipe. The outlet structure and pipe appear to be in good, working condition. As part of the tree removal, a new reinforced concrete emergency spillway was just installed in 2013. Overall with the recent construction project and dam maintenance, the dam appears to be in good condition.

Scotland Lake

Scotland Lake Dam Information (from Dam Safety)	
Identification	SCOTL-009 / NC01081
Hazard Classification	Low
Year Built	1936
Dam Height (ft)	20
Hydraulic Height (ft)	13
Freeboard (ft)	7
Crest Length (ft)	458
Crest Width (ft)	13
Upstream Slope	2:1
Downstream Slope	2:1
Normal Pool Elevation	340
Normal Pool Area (ac)	85
Normal Pool Storage Capacity (ac-ft)	182
Max. Storage Capacity (ac-ft)	218
Drainage Area (ac)	1389
Maximum Discharge (cfs)	83
Condition Assessment	Not Rated
Last Inspection Date	7/1/2013

Scotland Lake is located just south of Scotland Lake Lane, east of Butler Drive, and south of US 1 at 34°59'58" N, 79°31'01" W. The dam consists of an earthen embankment. At the time of the inspection, the vegetation was very thick, and there were a number of large trees on the embankment. The alignment of the dam seemed to be straight and no erosion, undermining, ruts, slides, cracks, seepage, wetness, or rodent burrows were observed. However, the vegetation needs to be cleared from the dam to complete a more thorough inspection. Vegetation should also be removed to avoid future problems caused by tree roots and to allow periodic inspections. The principal spillway consists of a concrete flashboard riser and concrete outlet pipe. The outlet structure and pipe appear to be in working condition, however removal of the vegetation and a more detailed inspection of the riser should be conducted. There is an existing cast-in-place concrete and stone overflow spillway and downstream channel. The spillway appears to be in good condition with only a few cracks. The stones appear to be in stable condition. The condition of the spillway and channel should be monitored. A similar structure at Cameron Lake was just replaced due to deterioration and cracking of the concrete and stones falling out of the walls. The first recommendation is to clear all of the existing vegetation from the dam and establish a grassy, native groundcover to facilitate inspections and eliminate problems potentially caused by trees. Once the vegetation is removed, the dam should be inspected further for erosion, ruts, undermining, cracks, seepage, wetness, and rodent burrows. The outlet pipe should also be inspected further to ensure the pipe is straight and all joints appear to be connected once the vegetation is removed. Overall, the dam appears to be in good condition. The estimated cost for removal of the vegetation is $25,000.

Crappie Lake

Crappie Lake Dam Information (from Dam Safety)	
Identification	RICHM-024 / NC00649
Hazard Classification	Low
Year Built	1933
Dam Height (ft)	20
Hydraulic Height (ft)	17
Freeboard (ft)	3
Crest Length (ft)	480
Crest Width (ft)	12
Upstream Slope	N/A
Downstream Slope	N/A
Normal Pool Elevation	N/A
Normal Pool Area (ac)	20.5
Normal Pool Storage Capacity (ac-ft)	136
Max. Storage Capacity (ac-ft)	163
Drainage Area (ac)	N/A
Maximum Discharge (cfs)	230
Condition Assessment	Fair
Last Inspection Date	4/19/2011

Crappie Lake is located at the west end of Ellerbe Tower Lane, west of Derby Lane, north of US 1 at 35°03'21" N, 79°34'07" W. The dam consists of an earthen embankment. At the time of the inspection, the vegetation was very thick on the embankment. No large trees were observed on the dam. The alignment of the dam seemed to be straight and no erosion, undermining, ruts, slides, cracks, seepage, wetness, or rodent burrows were observed. However, the vegetation needs to be mowed to complete a more thorough inspection. Vegetation should be maintained to allow periodic inspections. The principal spillway consists of a concrete flashboard riser and concrete outlet pipe. The outlet structure and pipe appear to be in working condition, however removal of the vegetation and a more detailed inspection of the riser (a boat is needed to access the structure) should be conducted. The existing spillway is an overland earthen spillway. Vegetation should be maintained on the spillway to prevent erosion, and the spillway should be regularly inspected to catch any potential problems. The first recommendation is to clear all of the existing vegetation from the dam to further inspect for erosion, ruts, undermining, cracks, seepage, wetness, and rodent burrows. The outlet pipe should also be inspected further to ensure the pipe is straight and all joints appear to be connected once the vegetation is removed. Overall, the dam appears to be in good condition.

Lake Baggett

Lake Baggett has a surface area of approximately 12 acres, however it is not listed on Dam Safety's inventory. It is located just west of Baggett's Lake Lane, north of Thrower Lane, and north of US 1 at 35°02'31" N, 79°37'18" W. The dam consists of an earthen embankment. At the time of the inspection, the vegetation and trees were being removed from the dam. The alignment of the dam appeared to be straight and no erosion, undermining, ruts, slides, cracks, seepage, wetness, or rodent burrows were

observed. The dam should be graded to a smooth surface and seeded following tree removal. The principal spillway consists of a concrete or masonry flashboard riser and concrete outlet pipe. The outlet structure and pipe appear to be in working condition, however a more detailed inspection of the riser (a boat is needed to access the structure) should be conducted. There is an existing concrete and rock channel downstream of the outlet pipe. There were a few cracks observed, however these do not appear to be major. There is an existing cast-in-place concrete and stone overflow spillway. The spillway appears to be in relatively good condition, however there are a few cracks in the floor of the channel that need attention. The condition of the spillway and channel should be monitored. A similar structure at Cameron Lake was just replaced due to deterioration and cracking of the concrete and stones falling out of the walls. Overall, the dam appears to be in relatively good condition.

McKinney Lake

McKinney Lake Dam Information (from Dam Safety)	
Identification	RICHM-026 / NC00651
Hazard Classification	High
Year Built	1939
Dam Height (ft)	17.8
Hydraulic Height (ft)	12.8
Freeboard (ft)	5
Crest Length (ft)	455
Crest Width (ft)	10
Upstream Slope	3:1
Downstream Slope	3.5:1
Normal Pool Elevation	N/A
Normal Pool Area (ac)	73
Normal Pool Storage Capacity (ac-ft)	320
Max. Storage Capacity (ac-ft)	834
Drainage Area (ac)	6620
Maximum Discharge (cfs)	1355
Condition Assessment	Fair
Last Inspection Date	11/20/2012

McKinney Lake is located at the south end of Fish Hatchery Road, south of McDonald Church Rd, north of US 1 at 35°00’29” N, 79°37’38” W. The lake is used to feed the McKinney Lake Fish Hatchery just downstream. The dam consists of an earthen embankment with a concrete section in the center of the dam. A portion of the upstream face of the earthen embankment is lined with rip rap. At the time of inspection, the earthen embankment portion of the dam had a well maintained stand of grass. No erosion, undermining, ruts, slides, cracks, seepage, wetness, or rodent burrows were observed. The concrete portion of the dam also appeared to be in good condition. This portion of the dam also serves as the primary and emergency spillway. There is a concrete channel downstream that also appears to be in good condition. There is a concrete flashboard riser with drawdown valves that feed the hatchery at the northern end of the dam. This structure appears to be in good condition. Overall, the dam and outlet works appear to be in good condition with no apparent recommendations. Routine inspections and regular maintenance should be ongoing.

Gum Swamp Lake

Gum Swamp Lake Dam Information (from Dam Safety)	
Identification	RICHM-017 / NC00642
Hazard Classification	Low
Year Built	1934
Dam Height (ft)	12
Hydraulic Height (ft)	9
Freeboard (ft)	3
Crest Length (ft)	360
Crest Width (ft)	10
Upstream Slope	N/A
Downstream Slope	N/A
Normal Pool Elevation	N/A
Normal Pool Area (ac)	55
Normal Pool Storage Capacity (ac-ft)	144
Max. Storage Capacity (ac-ft)	173
Drainage Area (ac)	15808
Maximum Discharge (cfs)	76
Condition Assessment	N/A
Last Inspection Date	2/20/2008

Gum Swamp Lake is located just north of Gum Swamp Lake Road, east of Cognac Road, and south of US 1 at 34°54'38" N, 79°33'44" W. The dam consists of an earthen embankment. At the time of the inspection, the vegetation was very thick, and there were a number of large trees on the embankment. The alignment of the dam seemed to be straight and no erosion, undermining, ruts, slides, cracks, seepage, wetness, or rodent burrows were observed. However, the vegetation needs to be cleared from the dam to complete a more thorough inspection. Vegetation should also be removed to avoid future problems caused by tree roots and to allow periodic inspections. The principal spillway consists of a concrete flashboard riser and concrete box culvert. The outlet structure and pipe appear to be in working condition, however removal of the vegetation and a more detailed inspection of the riser (a piece of heavy equipment is needed to remove the lid) should be conducted. There is an existing rip rap lined overflow spillway. The spillway appears to be in good condition. The first recommendation is to clear all of the existing vegetation from the dam and establish a grassy, native groundcover to facilitate inspections and eliminate problems potentially caused by trees. Once the vegetation is removed, the dam should be inspected further for erosion, ruts, undermining, cracks, seepage, wetness, and rodent burrows. Overall, the dam appears to be in good condition. The estimated cost for removal of the vegetation is $25,000.

Crawford Lake

Crawford Lake Dam Information (from Dam Safety)	
Identification	SCOTL-007 / NC00641
Hazard Classification	Low
Year Built	1850
Dam Height (ft)	12
Hydraulic Height (ft)	12
Freeboard (ft)	N/A
Crest Length (ft)	336
Crest Width (ft)	N/A
Upstream Slope	N/A
Downstream Slope	N/A
Normal Pool Elevation	N/A
Normal Pool Area (ac)	28
Normal Pool Storage Capacity (ac-ft)	58
Max. Storage Capacity (ac-ft)	69
Drainage Area (ac)	3398
Maximum Discharge (cfs)	158
Condition Assessment	N/A
Last Inspection Date	2/7/2001

Crawford Lake is located just west of Crawford Lake Road, south of Gum Swamp Road, and south of US 1 at 34°53'42" N, 79°34'00" W. The dam consists of an earthen embankment, and Crawford Lake Road actually passes across the top of the dam. At the time of the inspection, the vegetation was very thick, and there were a number of large trees on the embankment. The alignment of the dam seemed to be straight. Minimal erosion and rutting was observed on top of the dam and on the slopes. This is likely due to a lack of a stable roadway. No undermining, slides, cracks, seepage, wetness, or rodent burrows were observed. However, the vegetation needs to be cleared from the dam to complete a more thorough inspection. Vegetation should also be removed to avoid future problems caused by tree roots and to allow periodic inspections. The principal spillway consists of a concrete flashboard riser and concrete outlet pipe. The outlet structure and pipe appear to be in working condition, however removal of the vegetation and a more detailed inspection of the pipe should be conducted. At the time of inspection, the lake was drawn down, and I was informed that the lake would remain down. Since the road passes over the top of the dam, there is no emergency spillway. The first recommendation is to clear all of the existing vegetation from the dam and establish a grassy, native groundcover to facilitate inspections and eliminate problems potentially caused by trees. Once the vegetation is removed, the dam should be inspected further for erosion, ruts, undermining, cracks, seepage, wetness, and rodent burrows. The outlet pipe should also be inspected further to ensure the pipe is straight and all joints appear to be connected once the vegetation is removed. It would also be good to provide an all-weather surface (gravel or pavement) on top of the dam to prevent future erosion and rutting from traffic. This will also prevent water intrusion and saturation of the embankment. Overall, the dam appears to be in good condition. The estimated cost for removal of the vegetation and installing gravel on the road is $70,000.

Carrington Pond

Carrington Pond actually has two lakes, neither of which is on Dam Safety's inventory. The lower lake has a surface area of approximately 4 acres, and the upper lake has a surface area of approximately 3 acres. They are located east of US 15 and west of Peach Orchard Road at 34°55'50" N, 79°26'11" W. The lower dam consists of an earthen embankment that was just recently reconstructed. At the time of the inspection, the vegetation was very thick. The alignment of the dam seemed to be straight and no erosion, undermining, ruts, slides, cracks, seepage, wetness, or rodent burrows were observed. However, the vegetation needs to be cleared from the dam to complete a more thorough inspection. Vegetation should also be removed to avoid future problems and to allow periodic inspections. The principal spillway consists of a corrugated metal flashboard riser and corrugated metal outlet pipe. The outlet structure and pipe were replaced when the embankment was reconstructed, so it is in good condition. The top of the riser should be lowered below the elevation of the top of the dam to allow large storms to pass over the top of the riser. There is an existing earthen overflow spillway. Vegetation should be maintained on the spillway to prevent erosion, and the spillway should be regularly inspected to catch any potential problems. The first recommendation is to maintain the vegetation to facilitate inspections. Once the vegetation is mowed, the dam should be inspected further for erosion, ruts, undermining, cracks, seepage, wetness, and rodent burrows. Overall, the dam appears to be in good condition. The estimated cost for the repair of the dam is $100,000.

The upper dam was recently breached during a large rain event. The plan is to rebuild the embankment and install a corrugated metal flashboard riser and corrugated metal outlet pipe. Any existing vegetation will be cleared and the embankment will be graded to a smooth surface and a native grass will be established.

Dixie Pond

Dixie Pond Dam Information (from Dam Safety)	
Identification	SCOTL-003 / NC00056
Hazard Classification	Low
Year Built	1962
Dam Height (ft)	20
Hydraulic Height (ft)	22
Freeboard (ft)	3
Crest Length (ft)	420
Crest Width (ft)	N/A
Upstream Slope	N/A
Downstream Slope	N/A
Normal Pool Elevation	N/A
Normal Pool Area (ac)	12
Normal Pool Storage Capacity (ac-ft)	130
Max. Storage Capacity (ac-ft)	138
Drainage Area (ac)	N/A
Maximum Discharge (cfs)	N/A
Condition Assessment	N/A
Last Inspection Date	3/18/2009

Dixie Pond is located east of US 15 and north of Peach Orchard Road at 34°57'56" N, 79°25'31" W. The dam consists of an earthen embankment, which was recently breached due to a large rain event. At the time of the inspection, the vegetation was very thick, and there were a number of large trees on the embankment. Since that time, the trees have been removed. The existing outlet structure looked like it consisted of a metal pipe and valve, however it has severely deteriorated. The emergency outlet consisted of two HDPE pipes installed through the dam. It is believed that these pipes clogged, which caused the dam to overtop and breach. The plan is to install a new concrete riser and barrel outlet structure. The riser will have two gate valves (one and the bottom and one midway from the top to the bottom) to regulate the water level and drop the lake down. The top of the riser will be set at the permanent water surface elevation. The alignment of the dam appeared straight and no erosion, undermining, ruts, slides, cracks, seepage, wetness, or rodent burrows were observed in the embankment. When the outlet structure is replaced, the surface of the dam will be graded to a smooth surface and a grassy, native groundcover will be installed. In addition, and emergency overflow spillway will be installed. Since there is a road currently on the top of the dam, the spillway will be drivable, and it will be designed to withstand the design flows. The estimated cost for the repair of the dam is $200,000.

Millstone Lake/Millstone 4-H Camp Dam

Millstone Lake Dam Information (from Dam Safety)	
Identification	RICHM-052 / NC05379
Hazard Classification	High
Year Built	N/A
Dam Height (ft)	16
Hydraulic Height (ft)	11
Freeboard (ft)	5
Crest Length (ft)	N/A
Crest Width (ft)	N/A
Upstream Slope	N/A
Downstream Slope	N/A
Normal Pool Elevation	N/A
Normal Pool Area (ac)	6
Normal Pool Storage Capacity (ac-ft)	26
Max. Storage Capacity (ac-ft)	38
Drainage Area (ac)	N/A
Maximum Discharge (cfs)	N/A
Condition Assessment	Fair
Last Inspection Date	3/19/2013

Millstone Lake is located just north of Millstone Road, east of Gibson Mill Road at 35°03'21" N, 79°41'21" W. The lake and dam are located on property owned by the NC Wildlife Resources Commission that is leased to the Millstone 4-H Camp. The dam is maintained by NC Wildlife staff. The dam consists of an earthen embankment on each side of a combination concrete spillway and flashboard riser. There was no principal spillway or outlet structure visible other than the flashboard riser. At the time of inspection, there were several large trees on the west side of the concrete spillway. The embankment on the east side of the spillway only had a few trees. There is a significant amount of vegetation on the lake side of the embankment that needs to be removed. At the time of inspection, no erosion, undermining, rutting, cracks, seepage, or wetness was observed on the embankment. The

concrete spillway and flashboard riser both appeared to be functioning and in good condition. The first recommendation is to put a lid or fence around the flashboard riser. In the future, it may be good to look at installing a riser-barrel outlet structure to eliminate the flashboards. At the time of inspection, there was no lid on this structure which poses a safety risk. The large trees and other woody vegetation should be removed from the dam. At that time, the embankment should be further inspected for erosion, ruts, undermining, cracks, seepage, wetness, and rodent burrows. Overall, the dam appears to be in fair condition. The estimated cost for removal of the vegetation is $15,000. Installation of a riser-barrel outlet structure and removal of the flashboard riser could cost approximately $150,000.

Overall, the dams on the Sandhills Game Lands are in relatively good condition with the exception of the breached dams at Carrington Pond and Dixie Pond. Dixie Pond and Carrington Pond are the highest priority dams to be repaired and brought into compliance with Dam Safety's requirements. The remainder of the dams should have the brushy vegetation removed as soon as possible. Following tree removal, a healthy stand of grass should be established. The dams and outlet structures should also be inspected further to see if any of them need to move up the priority list due to deficiencies observed.

An operations and maintenance plan needs to be put together and followed for maintaining the dam embankments and outlet works. The majority of the dams need to have heavy vegetation and trees removed to facilitate further, more detailed inspections and to prevent future problems. Problems identified during these inspections should be addressed immediately. All of the Sandhills Game Lands lakes have flashboard risers. These structures are effective at maintaining specific water levels, however they can be dangerous to adjust and maintain. As a result, extreme caution must be used when working around these structures. Consideration should also be given to converting these structures to risers with a set elevation and draw down valve as opposed to flash board risers.

Incidental Impoundments

In addition to the numerous lakes, there are several more impoundments. These areas may exist for many reasons such as beaver dams, clogged culverts, and roads acting as embankments. Although these features do not have official dams and outlet structures, inspections and routine maintenance similar to that required on dams may be advisable.

If the impoundment is not deemed to be beneficial for wildlife or some other purpose, the area should be drained. The source of the water blockage should be identified, and the cause of the blockage should be mitigated to avoid future problems. The area should be cleaned and all obstructions should be removed to allow the area to drain. If the impoundment is deemed to be a desirable feature, the flow of water should be handled in a manner that does not create a safety and maintenance concern. If water overtops a road, the road surface should be designed and maintained to prevent erosion. If water flows under a road through a culvert, an outlet structure should be installed on the upstream side of the road. In this situation, the road should be treated as an embankment. All trees and brushy vegetation should be removed, a permanent and maintained ground cover should be established, and an all-weather surface should be installed to prevent saturation of the road. The road and outlet structure should be inspected and maintained on a routine basis. An engineer should be contacted to appropriately size any outlet structure that may be installed and evaluate the flow velocity over a road to ensure that no erosion occurs.

Dam/Impoundment Maintenance

Dams are complex structures that consist of many parts (see Figure 1). In order to prevent failures, dams must be inspected to identify potential problems, and maintenance must be performed to prevent deterioration of the structure that may result in failures. Because of their complexity, dams can fail in many ways including, but not limited to, overtopping, seepage failure, and structural failure.

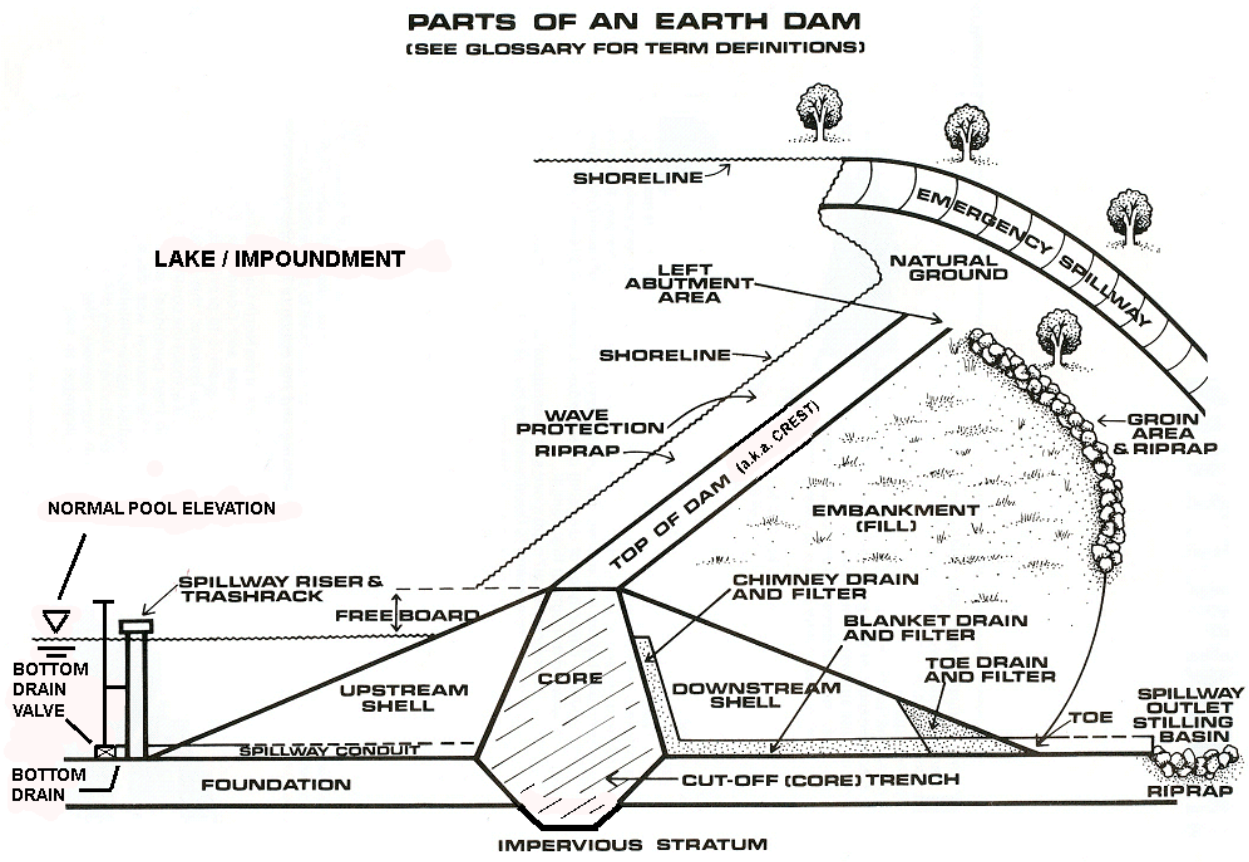


Figure 2– Parts of an Earthen Dam (from Dam, Operation, Maintenance, and Inspection Manual – NCDENR Land Quality Section)

Periodic Inspection of dams is very important. Dams should be thoroughly visually inspected by technician staff at least twice a year, once in the summer and once in the winter. A closer inspection of the embankment can be made in the winter when the vegetation is dormant and in the summer after the embankment has been mowed. An engineer should be contacted after the embankment has been mowed. Ideally, an engineer will inspect the dam once per year. An engineer should be contacted any time of the year if a problem is observed. Each component of the dam should be inspected for problems, and corrective action should be taken as necessary. Records of inspections and corrective measures should be kept on hand to monitor any problems that may be observed. Checklists for inspections are available in the "Dam, Operation, Maintenance, and Inspection Manual" published by NCDENR.

A healthy stand of grass should be maintained on the dam embankment, toe, groin, top (if a road is not present), and in the emergency spillway to prevent erosion. Shrubs and woody vegetation should not be allowed on the embankment or in the spillway. Roots can cause seepage paths, and trees that fall can leave large holes that can weaken the dam. Brush and trees can also make it difficult to visually inspect the embankment for other issues, and they also provide a haven for burrowing rodents. They also prevent grass growth. As such, all trees, shrubs, and bushy vegetation should be removed from the dam. Embankments should be mowed at least once a year with equipment capable of navigating the potentially steep slopes and capable of removing small woody growth. Emergent vegetation on the shoreline of the embankment should also be controlled. Commercial herbicides can be used in these areas, however all application instructions, environmental precautions, and safety practices should be followed.

Any and all erosion observed on the embankment, on the groin, and in the emergency spillway should be addressed immediately. Vegetation should be re-established in the eroded area by adding soil as necessary and installing topsoil and fertilizer if necessary prior to seeding. Turf reinforcing mat may also be required to stabilize the repair. The cause of the erosion should also be addressed. The upstream face/shoreline of the embankment should also be checked for erosion. This may be caused by wave action. These areas should be repaired immediately by excavating out the eroded material and installing filter fabric and rip rap to prevent further damage.

Dam inspections should also address seepage that is observed. Seepage can occur anywhere on the downstream face, around principal spillway pipes, or beyond the toe of the dam. Seepage may vary in appearance from a soft, wet area to a flowing spring. These areas may show up as areas where the vegetation is lusher and darker green. Marsh or wetland vegetation may also be present in these areas. Seepage can lead to weakening of the embankment evidenced by slides caused by soil saturation or pressures in the soil pores. Seepage can also lead to piping, or the movement of soil particles, which can lead to dam failure. A continuous or sudden drop in the water level may also be an indication that seepage is occurring. Regular inspections and record keeping (seepage flow rates, water levels, content of flow, size of wet areas, and type of vegetation growth) are important to monitor the seepage conditions to determine whether the seepage is steady or in a state of change. If seepage is observed, an engineer should be notified.

The embankment should also be inspected for cracks, slides, sloughing, and settlement. Short, isolated cracks are not usually significant, however larger (wider than ¼ inch), well-defined cracks indicate problems. Transverse cracks that appear across the embankment may be due to differential settlement, and they can provide paths for seepage and piping. Longitudinal cracks that appear parallel to the embankment mat indicate the early stages of a slide. Small cracks should be filled to prevent water intrusion. Slides are serious threats to dam safety as they can lead to instability of the embankment and failure. If a slide develops, the water level should be lowered to investigate the cause and facilitate the construction of a repair. An engineer should be contacted to examine all cracks, slides, and settlements observed.

During the dam inspection, evidence of rodents (groundhogs, muskrat, and beavers) should be noted. Burrows can weaken the embankment and serve as pathways for seepage. Beavers can also plug spillways causing the water level to rise above the design level. Rodents should be removed from the dam by acceptable means and burrows should be filled. Trash racks, spillways, and other outlets should be inspected for clogging and cleaned as necessary.

Roads on top of dams should be maintained to prevent damage to dam embankments. They should be constructed using a proper base and wearing surface. If a wearing surface is not constructed, traffic should not be allowed on the dam during wet conditions. Water trapped in ruts can lead to saturation and weakening of the embankment. A wearing surface will prevent or minimize ponding water and infiltration. A wearing surface should be constructed to drain into the impoundment, and stormwater runoff should not be concentrated at one point.

Principal Spillway pipes should be inspected thoroughly once a year. They should be inspected for improper alignment (sagging), elongation and displacement at joints, cracks, leaks, surface wear, and loss of protective coating, corrosion, and blockage. Special attention should be paid to pipe joints. The pipe should also be checked for signs of water seeping along the outside. Small or minor problems can be patched, however major problems may require replacement of the pipe. An engineer should be contacted if problems with the pipe are observed. Erosion at the pipe outlet should also be inspected. Severe undermining can lead to pipe joint displacement and weakening of the dam embankment. Rip rap may be installed to mitigate against continued erosion, however an engineer should be contacted if there is severe erosion. Inspection reports should be kept to monitor the progression of any observed problems.

Riser structures should be thoroughly inspected at least once a year. They should be examined for spalling and deterioration. Any cracking, staining, exposed reinforcing bars, and broken out sections that are observed should be further examined as this may lead to structural instability. They should also be checked for alignment and settlement. Mechanical equipment such as valves, gates, stems, and couplings should be inspected for corrosion, broken, or worn parts. It would also be good to operate these devices at least once a year to ensure that they are functioning and seating properly. An engineer should be contacted if problems in riser structures are observed, and they should be addressed immediately.

Trash racks and flashboards should be inspected on a more frequent basis. Clogging of these features can lead to higher water levels that may compromise the stability of the dam. Clogs should be cleared and all trash should be removed. If possible, the cause of the clogging should be identified and addressed. Broken trash racks and boards should be repaired or replaced. Broken trash racks can allow trash and debris to enter the riser and/or principal spillway pipe and can lead to clogging of these features.

Vegetated emergency spillways should be inspected at least twice per year (at the same time as the embankment). Spillway should be mowed to prevent trees, brush, and weeds from becoming established and to promote the growth of grass. Any erosion should be repaired immediately, and any obstructions should be removed. Periodic reseeding and fertilization may be necessary to avoid erosion and bare areas.

Concrete and other lined emergency spillways should be thoroughly inspected at least once a year. Concrete should be inspected for floor or wall movement, improper alignment, settlement, joint displacement, undermining, and cracking. Structural repairs should begin by removing all unsound concrete. Cracks must be repaired carefully to prevent water intrusion. An engineer should be notified if any structural problems are observed with the spillway. Rip rap lined spillways should be inspected for erosion and displacement of stone. All woody vegetation should be removed, and any obstructions should be removed. Inspection forms and notes should be kept to monitor the progression of any observed deficiencies.

It is important to keep detailed and accurate records of all observations, inspections, maintenance, rainfall and pool levels, drawdowns, and other operational procedures. These records can aid in monitoring the progression of deficiencies as well as diagnosing problems. More information on dam inspections, operation, and maintenance can be found in the "Dam, Operation, Maintenance, and Inspection Manual" prepared by NCDENR Division of Land Resources Land Quality Section.

Culvert Assessments

As mentioned in the Roads Summary section, the Sandhills Game Land has an extensive road network. As a result of the amount of roads, there are a large number of culverts on the game land. Due to the size of the game land, and the total quantity of culverts, there is no feasible way to locate and inspect every existing pipe. However, during the road investigations and based on information provided by Wildlife Management staff, several culverts were identified as needing repair or upgrade. A number of the pipes that need to be replaced are either undersized or in poor condition. Problems with culverts should be noted and reported to an engineer as soon as possible as a lack of culvert maintenance could lead to road failures and flooding. The estimated cost to replace culverts ranges from $1,000 to $10,000 depending on the pipe size, length, and stream conditions. Replacement culverts should maximize potential for passage of aquatic organisms.

Culvert Maintenance

Culvert maintenance is performed to extend the life and ensure proper function of the installed drainage structure. The accumulation of sediment and/or debris at the inlet or outlet of a culvert or damage such as crimping of the pipe effectively reduces the diameter and flow capacity of the pipe.

Culvert maintenance includes removal of accumulated sediment and/or debris that prevents passage of water (and organisms) through culvert inlets, outlets and connected drainage ways. It may also include reinforcement of eroding inlets and outlets by installing riprap or other erosion control measures. Damaged culverts and culverts requiring frequent repeat maintenance should be considered for future remediation via redesign and reinstallation.

The following items should be checked for and addressed as part of routine maintenance inspections:

- partial or complete blockage of the inlet or outlet of the pipe with sediment, stone, leaves, woody debris, refuse or any other items that could affect flow through the culvert
- evidence of scour, bank or channel bed erosion near the inlet or outlet of the culvert
- evidence of flow overtopping the road at the culvert location
- damage to the pipe including crimping of the inlet or outlet, crushing or piercing of the pipe
- severe corrosion of the pipe
- damage to headwalls

Staff should inspect ditches and culverts as part of their regular road maintenance activities. This inspection is especially important during leaf fall and following periods of heavy rain. Staff should consider the location of the culvert before performing maintenance using heavy equipment. Culverts located in active stream channels, dedicated or critical habitat areas may require special permission or installation of erosion control measures before maintenance can commence.

Leaves and woody debris that have accumulated in or around the inlet of the culvert should be removed immediately using hand tools if possible. Removal of accumulated silt and/or gravel from ditches approaching the culvert inlet should be performed using a small excavator, backhoe or a tractor equipped with a scrape blade. Sediment in or around the immediate vicinity of the pipe inlet or outlet should be removed using hand tools to prevent damaging the culvert. Cleaned out material is to be pulled away from the culvert then hauled and spread at a site where it cannot be washed back to the culvert area.

Repeat problems with sediment collecting around the inlet may indicate the existence of an erosion problem originating from the slopes, streams or ditch lines in the vicinity of the culvert. Identification and stabilization of these problem areas through practices such as seeding or matting could improve performance of the culvert and reduce maintenance requirements.

Flow overtopping the road at the culvert location generally indicates that the pipe is undersized and could warrant resizing and replacement. Any damage to the culvert, as described above, may also necessitate replacement of the pipe. If maintenance staff identifies any culverts that may need replacement, they should contact engineering staff to calculate the peak flow capacity and diameter of the new pipe.

Any culvert upgrade consisting of a single pipe 36” and greater or a crossing utilizing multiple lines of pipe should include design considerations for fish passage. Specific considerations can be obtained by contacting the Division of Inland Fisheries, Habitat Conservation Program - Technical Guidance section.

Recreational Facility Assessments (See Appendix 3)

The Sandhills Game Land provides a variety of opportunities for public recreation. This section will review existing recreational facilities and describe sites identified for potential new development.

Boating Access Areas

At the time of inspection, there are no existing boating access areas (BAA) on the Sandhills Game Land. However, some future ramp locations have been identified. The eastern edge of the game land borders the Lumber River/Drowning Creek which provides opportunities to hunt and fish for various species. Three potential BAA locations have been identified to provide access to the river: Double Bridges on Camp Mackall, 15-501, and Turnpike Road, with the 15-501 and Turnpike Road locations being the highest priorities. Due to the nature and depth of the river, mostly small boats and canoes and kayaks would use these sites to float the river.

The Double Bridges on Camp Mackall site is the northern most location of the three proposed locations. It is located adjacent to the bridge where Blues Bridge Rd/Ashemont Rd crosses the river. It is actually located on Camp Mackall, not on the Sandhills Game Land. Permission would have to be obtained from the US Army to install a BAA and parking lot at this site. Likely, a ramp sufficient to launch canoes and kayaks would be installed along with a parking lot. The facility would also be constructed to provide ADA accessibility. The estimated cost for this project would be $100,000.

The 15-501 site is the central ramp site. It's located in the southwest quadrant where US 15-501 crosses the river on the game land. The biggest challenge on this site will be the significant change in elevation from the road down to the river. This site would also likely only need to provide access for canoes and kayaks. However it could potentially provide access to larger vessels and require a single lane, 14' wide ramp. A parking lot with ADA access would also be installed. The estimated cost for this project would be from $100,000 to $200,000 depending on the type of access that is constructed.

The Turnpike Road site is the southernmost ramp site. It's located on the west side of the river where North Turnpike Road crosses the river on the game land. This area is currently used by local residents as a swimming area. Similar to the 15-501 site, canoes and kayaks would likely be the only boats that use this area. However an evaluation could be performed to determine whether or not it would be advantageous to install a facility for larger vessels. So, this site could include a single lane, 14' wide ramp with a floating dock. A parking lot with ADA access would also be installed. The estimated cost for this project would be from $100,000 to $200,000 depending on the type of facility that is constructed.

All three of the proposed sites will need further evaluation as the projects move forward. The sites and designs will need to address environmental impacts (streams and wetlands). They will also need to be reviewed and approved by multiple review agencies prior to beginning construction. However, they will provide access to the Lumber River/Drowning Creek for sportsmen.

Public Fishing Areas

At the time of inspection, there are two Public Fishing Areas on the Sandhills Game Land. One of the PFA's is located on Indian Camp Lake just off of James G Watson Road adjacent to the Sandhills Depot. The PFA consists of two wooden fixed piers and a gravel parking lot with paved ADA access. The other PFA is located on McKinney Lake. It consists of a floating pier and gravel parking lot with paved ADA access. Both PFA's appear to be in good condition, however ongoing maintenance of the pier and the parking lot is required.

A PFA is currently planned at Dixie Pond. An existing wooden pier that was in poor condition was removed in 2013. A floating pier is proposed in its place and will be constructed following the repairs to the dam and outlet structure.

Given the large number of lakes on the game land and the relatively high amount of use these areas see, it would be good to evaluate the feasibility of installing additional floating PFA's at other lakes. The installation of PFA's should be coordinated with the Inland Fisheries Division to determine the viability and status of the fish population. New PFA's should include parking lots that also include ADA accessible spaces and accessible paths to the PFA. The estimated cost for each PFA would be between $25,000 to $50,000 depending on the size of the pier/dock and the size of the parking lot.

Shooting Ranges

At the time of the inspections, there are no active shooting ranges on the Sandhills Game Land, itself. There is an old range on the game land that is no longer in operation. However, the John E. Lentz Hunter Education Complex is located on NC Wildlife Resources Commission owned land that is leased by the Millstone 4-H Camp. This range consists of two skeet/trap ranges, an archery range, two 50-yard ranges, a 100-yard range, and a 3-D archery stand. The range is in need of some maintenance, however it could be a beneficial feature of the Sandhills Game Land if the lease with the 4-H Camp is renewed so that the site is properly maintained and the general public can use the facility.

Historically, WRC has had issues and complaints about people shooting on game lands. On some game lands, there are no rules to prohibit shooting. This can lead to numerous safety concerns. By installing a shooting range, shooting can be prohibited at all other locations on the game land (with hunting being an exception). The addition of a range will concentrate all target and recreational shooting at one, safe location and minimize the unsafe shooting activities elsewhere on the game land.

Non-Traditional Uses

Geocaching: Geocaching is a recreational activity, in which participants use a GPS receiver or mobile device to hide and locate hidden containers, or caches, located somewhere outdoors. While this activity has not become popular on the Sandhills game land as of yet, there is a good possibility that it could grow as a potential non-traditional use given the size of the game land. There are no major infrastructure elements required for this non-traditional use, but it would be beneficial to the participants to provide parking areas near the start/end of the geocaching trails if there is sufficient demand.

Hiking: Currently, there are no designated hiking trails on the Sandhills Game Land. Foot travel is allowed and encouraged throughout the entire game land. Hiking is becoming a more popular activity and will continue to be a demand on the game land. It is recommended that staff works on a long term plan for trails, which can be used for both hunter access and recreational hikers. The extensive network of roads and firebreaks provide good access to most of the game land. Conflicts among different user groups should also be evaluated to avoid conflicts between different users.

Camping: The Sandhills game land currently restricts camping to designated camping sites during hunting seasons (September – February and April – May). All of the camping areas are primitive camp sites and are typically used by hunters. At the present time, available camping areas seem to be sufficient to meet current demand. However, as non-traditional uses are becoming more popular, it is recommended that we investigate locations for additional recreational campsites to be designated in the future.

Horseback Riding: Horseback riding is growing in popularity. The Sandhills Game Land is currently used for horseback riding, particularly in the field trial area. However, there are no designated horseback riding trails on the game land. Horseback riders currently use the extensive network of sand roads. Since this is a growing activity, staff should work on a long term plan to identify potential locations for trails. It would also be beneficial to identify potential camping areas with ample space for horse trailer parking and

potential grazing/walking areas for the horses. Special care and considerations should be taken due to potential damage to roads, trails, and native habitat that can be caused by horse traffic.

Dog Trials/Training: Historically, the Sandhills Game Land has been used for dog trials. The existing 9,000 acre J. Robert Gordon Field Trail Facility has an existing field house building and six heat field trial course on the game land which is widely considered to be one of the best public field trial courses in the southeastern United States. Despite the historic use, there is not an official map of the field trial area. So, a map should be created to designate areas for field trial use. The present facility is adequate to meet current demands, however NCWRC staff should periodically re-evaluate if the demand continues to be met by the facility. If demand exceeds the capacity of the facility, a long term plan should be developed that includes the existing field trail area, identifies potential areas for expansion, and includes the potential for creation of amenities that will aid user in this category such as camping areas in close proximity to the field trial area.

Dog training has become more popular in recent years. There are companies that have agreements with NCWRC to use the game lands for training purposes. A plan needs to be developed that identifies areas of the game land where this activity can take place and signage or some other method of designation could be installed to delineate areas for this use. The plan could also include the addition of amenities that may aid in this use as needed.

Military Use: The Sandhills Game Land is located adjacent to Camp Mackall. The military can use the game land for training activities. There are only a few restrictions on military activity on the game land. Coordination between the NCWRC staff and the military will greatly reduce military impact. Special consideration may need to be given when designing infrastructure for some of the equipment used by military personnel.

Recreational Facility Maintenance

Maintenance of recreational facilities is critical to the overall operation of the game land program. Typical use of the game lands is dispersed, however, recreational facilities concentrates users on a specific area or feature. This concentration of users, whether it is a boating access, fishing access, shooting range, or other use, results in a need to ensure the facility is safe and functional. Routine site visits for inspection and maintenance will accomplish this goal. Site visits should consist of two actions: (1) Inspection for safety issues and functionality; (2) Actual maintenance activities.

1. Inspections should examine the following items
   a. Safety inspection items:
      Facility components
      - Decking
      - Handrails
      - Structural supports (piles, substructure, and floats)
      - Fasteners (bolts, screws, and nails)

      Slip or trip hazards
      - Uneven walking surfaces
      - Mud on walking surfaces
      - Ponded water on walking surfaces
      - Drop offs

      Overhead
      - Dead trees or limbs
      - Overhead utilities

   b. Functionality Inspection Items

Parking
- Surface condition (ruts, potholes, gravel)
- Delineation (wheel stops, paint)

Ramp
- Blockages (sediment, wood)
- Surface condition

Pier/Dock
- Bollards
- Wooden components
- Bumpers

Shooting range
- Berms
- Target area
- Benches
- Shelter (roof, structure, and floor)

Signage
- Kiosk (entrance, regulation and information)
    - ADA
    - No Parking
    - Keep Ramp Clear

2. Maintenance activities should include routine and corrective activities
    a. Routine Activities include:
        - Litter and debris removal
        - Grass mowing
        - Woody vegetative growth control
    b. Corrective activities can include but not be limited to:
        - Lumber replacement
        - Sign replacement
        - Minor grading
        - Tree or limb removal

Over time recreational facilities degrade to the point that routine maintenance activities cannot provide corrective action. Examples of this level of degradation include but are not limited to: structural problems, persistent and/or severe erosion issues, and broken/or severely degraded concrete. Once this level of degradation is reached, supervisory personnel should inspect the facility and determine the scope of the needed repairs. If major repairs are required supervisor personnel should contact an engineer for assistance.

Parking

Parking is divided into Staff/Visitor, Game Land Hunter/User parking and Lake User Access. Parking plays in important role in managing access, providing for special needs and minimizing negative impacts to sensitive environmental plant and animal communities. Parking will be designed and located to help user's access game lands for public recreation. Currently there are no designated parking areas identified or posted on the Sandhills Game Land.

Staff/Visitor Parking: (Sandhills Wildlife Depot)

Current Status: The parking surface is packed sand. There is adequate space for current user demand. Area is maintained by periodic grading using a motor grader. During heavy rain events sheet erosion creates run off that can erode entrance roads and wash over water bars. During wet weather sand is tracked into the depot office damaging the floor and creating an unsightly condition.

Future needs: A man made hard packed surface (gravel/crush & run) should be installed to correct soil movement problems and tracking sand into the wildlife depot. Estimated cost $25,000.

Role in meeting habitat needs, species management and game land access for recreation: Above mentioned improvements will help create a cleaner work environment in the office building and help eliminate movement of soil during heavy rain events.

Game Land Hunter/User Parking: (Game Land wide)

Current status: There are no designated hunter/user parking areas on the Sandhills Game Land. There is limited need for creating designated parking areas for hunters and other users, mainly in higher use destination points. Most parking is done on the side of the road, which helps to spread users out and minimize conflicts.

Future needs: Some parking areas will need small trees and brush removed, the area graded flat. Post and cables will need to be erected to restrict vehicles from driving around closed gates and the area will need to be properly signed. Once an area is designated a public parking area it will need to be routinely inspected to replace damaged signs cables and post. All public parking areas will need to be included in the game land map book and incorporated into a GIS project for infrastructure needs. Proposed locations are identified in the appendixes with the Game Land User Parking Map. Estimated cost of $5,000 - $10,000 depending on size.

Role in meeting habitat needs, species management and game land access for recreation: Designated parking will help minimize parking in sensitive or unsafe areas.

Lake User Access Parking: (Lakes and Streams see appendix 2)

Current status: The numerous lakes scattered across the Sandhills Game Land have unimproved parking and boating access. The lakes are used by fishermen year round and waterfowl hunters during the designated season. Parking areas have a packed sand surface or a crushed stone surface. The parking areas do have surface water runoff problems during heavy rain events.

Future needs: Make improvements that minimize surface run off and soil movement into lakes and streams. Install crushed rock on parking surface. Take necessary steps to install liner to prevent rock from sinking into deep sand.

Name	Location (County)	Type	Cost
Kinney-Cameron	Block B (Scotland)	6 parking spots/gravel	$10,000
Broadacres	Block B (Richmond)	6 parking spots/gravel	$10,000
Baggett's Lake	Block A (Richmond)	6 parking spots/gravel	$10,000
Dixie Lake	Block F (Scotland)	6 parking spots/gravel	$10,000
Gum Swamp	Block C(Richmond & Scotland)	4 parking spots/gravel	$10,000

Table 16 (Lake access)

Drowning Creek BAA will need to have stream banks stabilized, 14' wide ramp, floating dock and parking lot developed.

Drowning Creek BAA	Block D & E (Scotland -15/501 & Turnpike Road locations, Camp Mackall)	6 parking spots/gravel (each)	$200,000

Table 17 (Proposed Drowning Creek BAA)

Role in meeting habitat needs, species management and game land access for recreation: Improved parking areas will reduce soil movement into lakes and improve access to BAA.

Public Fishing Area (PFA) Parking: (Indian Camp Lake)

Current Status: The only PFA's on the Sandhills Game Land are located on Indian Camp Lake adjacent to the Wildlife Depot off James G. Watson Road and McKinney Lake at the Fish hatchery. The PFA's are used by local fishermen year round. The parking areas are improved with a crushed rock hard surface.

Future needs; if additional PFA are developed on SGL parking areas will need to be improved and maintained similar to Indian Camp.

Role in meeting habitat needs, species management and game land access for recreation: Improved parking areas will reduce soil movement into lakes and improve access to BAA.

Boundary (See Appendix 7)

Establishing game land boundary is essential for designating property ownership, identifying areas where special regulations may apply and assisting users in locating specific game lands. State owned game lands use the same protocol for establishing and maintaining game land boundaries. Their boundaries are both signed and painted. Private lands that are in the game land program all use the same protocol. Their boundaries are signed.

Current Status: Sandhills is a state owned game land and is posted using both game land signs and boundary paint. Game land signs are 6" X 6" diamond shaped made of metal or plastic. They are attached to boundary trees using nails. Signs are placed every 300 feet and painted trees are established approximately 100 feet apart preferably within sight of each other. Painted boundaries are identified by two parallel bands of orange boundary paint. Game land signs help identify which set of regulations apply for an area. In some areas special regulations may apply. Sandhills Game Land has two areas where special regulation apply; the J. Robert Gordon Field Trial Grounds and the CURE Area. Different colored boundary signs are used to identify these areas. The field trial grounds are posted using orange and black signs and the CURE area is posted with red and black signs. These two areas have special regulations that users must follow. Special regulations are listed in the "Regulations Digest" that is published by the NC Wildlife Resources Commission every year.

Designation	Miles of boundary	Sign color	County
Game Land	270.32	White & Black	Richmond, Scotland, Moore and Hoke
Field Trial Area	18.65	Orange & Black	Richmond
CURE Area	27.8	Red & Black	Richmond and Scotland

Table 18 (Boundary Designation)

Future Needs: Boundary lines follow property ownership and traverse the landscape as dictated by property deeds. Most of the boundary on SGL has been cleared by dozers and are used as fire breaks. Upland fire/boundary lines are maintained every 2 to 3 years by disking with a farm tractor and disk harrow. Where fire/boundary lines cross wetlands hand crew are used to clear brush and prepare the line for prescribed burns. Boundary Lines are inspected for painting and signage every 7 years. The recent acquisition of a Fecon track dozer with a mulcher head will aid in maintaining game land boundary. The Fecon can be used to maintain open boundary lines in both upland and wetlands. There are approximately 300 miles of boundary line on Sandhills Game Land. A GIS shape file has been created to establish an inspection cycle. A seven year cycle will require 43 miles of boundary be painted and signed every year.

As new tracts are acquired they will need to be posted with appropriate signage and or paint. Some tracts require surveying to establish property lines.

Role in meeting habitat needs, species management and game land access for recreation: Properly maintained game land boundaries are necessary for identifying game lands for hunters and other users, for enforcing game land regulation, resolving property line disputes and protecting the agency against trespass by adjoining landowners. Signage is used to identify areas where special regulation may apply which includes:

- The CURE Area with special regulations in place to help with the recovery of northern bobwhite quail. If permit hunts on the CURE are no longer in place, this boundary will not need to be maintained.
- The J. Robert Gordon Field Trial Area with special regulations in place to facilitate the running of the specialized field trial events.

Boundaries are posted along all state maintained roads making them easily identified by motorist. Visitors with the aid of the online game land maps can find game lands they wish to visit.

Gates and Road Closures

Current Status: Sandhills Game Land has approximately 100 miles of maintained roads that are open to the public for vehicular use year round. There are approximately 50 firebreaks and logging roads that are not maintained for public access. They either gated or signed closed to vehicular traffic. All roads and firebreaks are open to foot traffic. Regulations restrict access behind closed gates. Disabled permits held by users allow vehicle access behind roads signed as closed.

Future needs: Road closures and installation of gates should be included as topics to be discussed in staff meetings. Closing roads should be thoroughly reviewed for possible impact to users and possible benefit

to wildlife resources. All gates and signed closed roads need to be mapped using the GIS program at the Sandhills Wildlife Depot. Signs and gates need to be routinely inspected and repaired and/or replaced as needed.

Role in meeting habitat needs, species management and game land access for recreation: Road closures play an important role in managing the impact vehicles play on roads, trails and firebreaks. Many wildlife species, especially reptiles and amphibians are negatively impacted by vehicular traffic. Having large tracts of land (2000 acres minimum) without busy roads facilitates the movement of these species without threat of being harmed. Hunters utilize large wooded tracts for hunting and appreciate the solitude and privacy found in road less tracts of land. Other users visit game lands to enjoy horseback riding, birding, hiking etc. and also benefit from restricting vehicular traffic.

Routine management activities including the use of prescribed fire, logging, running heavy equipment for vegetation control and planting food plots needs to be considered when allowing public access to game lands. To help avoid accidents public access should be limited to properly maintained roads.

Firebreaks

The Sandhills Game land is prescribed burned on a 2 – 3 year return interval. There are 190 designated burn units with over 400 miles of firebreaks on the area. The average burn unit is 190 acres with 3.5 miles of firebreak. Firebreaks are maintained with crawler dozers and farm tractors with disk harrows. They are 8 to 15 feet wide with limited ability to turn around and no public parking. Approximately1/2 (about 225 miles) of the firebreaks are prepared for prescribed burning each year. They are closed to vehicular use however foot travel is encouraged and are used extensively by hikers, hunters and military personal.

Current status: The prescribed burning program has been in place for many years. Most of the firebreaks were established prior to NCWRC ownership. Limited disturbance has left most of the firebreaks in stable condition. They are wide enough to allow single lane traffic in most locations, there are limited places to turn vehicles around.

There are some isolated spots that need stabilization to prevent soil movement during heavy rain events.

Future needs: Firebreaks may need to be developed as new parcels are incorporated into the prescribed burning program. Precautions to prevent soil movement into streams will be taken. Where needed culverts will be installed. Existing firebreaks will be monitored for stabilization needs. Where necessary firebreaks may be widened and improved to facilitate access and safety.

Role in meeting habitat needs, species management and game land access for recreation: Firebreaks are critical to the prescribed burning program. They help define a designated burn unit, provide means of controlling the spread of a fire and are used by visitors to access remote sections of the game land.

Public Uses

Owing to its large size and scenic landscapes, SGL is currently used by a diverse community of visitors ranging from those seeking traditional outdoor pursuits such as hunting, fishing, and wildlife observation, to newly emerging activities such as recreational horseback riding. A primary management goal for SGL is to provide a diverse range of quality natural resource based recreation opportunities, within financial and environmental constraints. Since its inception, SGL has been utilized regularly by the DOD as a military training area. It is important to consider the compatibility of current and proposed future uses to the frequent military maneuvers conducted on SGL.

The primary user groups on SGL fit broadly into the following major use categories:

Hunting /Fishing: The largest group of visitors to SGL includes those users pursuing opportunities to hunt, fish, or trap wildlife, including those persons involved in dog field trials. Though visitation from this user group has declined in recent years, hunters and fisherman remain the largest group of visitors to SGL. Recent declines in the number of people interested in this type of outdoor recreation have been attributed to changes in societal and cultural values, as well as to the diminishing availability of useable ground. Providing opportunities to pursue this type of outdoor activity will remain a primary focus of SGL.

Wildlife Observation/Sightseeing**:** A broad and diverse user group that includes individuals interested in viewing or photographing rare species and/or habitats, as well as visitors interested in experiencing the high quality scenic integrity of SGL. This user group has grown in recent years, and increases in this type of outdoor recreation will likely continue in the future.

Research/Education**:** Because of the increasing rarity of habitat types and species that are still found on SGL, this historically small user group has grown in recent years. As recognition of the significance of SGL continues to grow, so too will the presence of this user group.

Horseback Riding**:** One user group that has grown dramatically in recent years. Historically, this user group was mostly centered on the field trial facilities when the area was not being utilized for its primary intended purpose of bird dog field trials. In these instances, the facility has been made available by fee to large groups of riders. Recently however, pressure from this user group has spread to other areas of SGL, most notably on Block B where the presence of individual and small group riders is becoming more evident.

Possible Future User Groups**:** The North Carolina Wildlife Resources Commission recognizes that there may be other user groups interested in utilizing the landscapes and resources of SGL. To this end, a land use committee composed of Game lands staff from around the state have developed a document to guide the inclusion of newly emerging, non-traditional game lands user groups.

Information Needs

Current Survey, Research and Monitoring efforts: Quite a few research and survey projects have been conducted on Sandhills Game Land. The efforts that are current or ongoing include:

- Spring point count surveys for quail on the CURE area and reference routes (B-D and C-L)
- Fall covey counts with covey call playback on the CURE area
- Spring point count surveys for songbirds on the CURE area, SE Block B, and Block C
- Spring point count surveys with call playback for Bachman's Sparrow on CURE area and SE Block B
- Useable habitat evaluation for quail on CURE area
- Useable habitat evaluation for Bachman's Sparrow on CURE area and SE Block B
- Early fall dove trapping and banding near depot or on field trial area
- Annual stem counts of rough-leaf loostrife
- Annual inventory for new Red-cockaded Woodpecker cavity starts (~10,000 acres/year)
- Status update on all RCW clusters
- Monitoring reproductive success and banding nestling RCWs on all of Block A and a subset of clusters on other game land blocks
- Frog call surveys at selected ephemeral wetlands
- Egg mass and larval surveys for rare pond-breeding amphibians
- Radio-tracking of rare reptiles by NC Museum of Natural Sciences
- Records are kept of incidental observations of NC Wildlife Action Plan priority species
- Record observations of first arrival of winter and breeding migrant birds and all "pass through" migrant birds

These efforts should be continued as long as they are providing relevant and useful information.

Wildlife Habitat/Inventory/ Monitoring Needs: Southeastern Fox Squirrels are a feature game species found on the Sandhills Game Land. Partial hunter surveys have been conducted in the past. However, we currently do not have sufficient data on Fox Squirrel population size, hunter effort, or harvest levels. Development of a hunter harvest survey card and mailing list would help monitor harvest and hunter effort data. Surveys to determine Fox Squirrel population size and trend would help to inform decisions about appropriate harvest levels and could help to inform population enhancement efforts elsewhere.

We currently lack adequate information on population size or trend for rare upland snakes. While logistically difficult to obtain, this information would be useful for what is likely one of the last strongholds in NC for several species associated with longleaf pine habitat.

There is anecdotal information that reptiles and amphibians are killed while disking fields. The extent of this mortality is not known and we do not know if fields, as currently managed, are overall beneficial or harmful to these species. It would be helpful to measure these parameters and if current field management is harmful, to develop management strategies that minimize negative impacts.

Wild Turkey is a popular game species that is managed by permit hunts on SGL. In portions of the Southeastern US, there is concern about declining turkey populations. We currently have data on hunter-

reported harvest levels, but do not know population size or trend. This information could help to inform management decisions and set permit levels.

There is anecdotal evidence that non-native, invasive Fire Ants have been spreading in distribution on SGL over the past decades. It would be helpful to have more information on the extent, rate, and cause of the spread and to develop strategies to minimize the spread and impact of this detrimental species.

It is important to rapidly detect and eradicate new invasive species and pathogens. A formal monitoring regime should be developed to detect emerging invasive problems (such as cogon grass and laurel wilt) on and around SGL.

Loggerhead Shrike is a priority species that occurs in low to moderate densities on and around SGL. Found more often in pasture and other grassland habitats throughout its range, there has been little research on habitat use and factors limiting populations within longleaf pine woodlands. This information could help inform how we might enhance habitat for this species.

The NC Sandhills Conservation Partnership is collecting data on various habitat and management parameters and wildlife species in order to track progress toward conservation goals in the region. NCWRC should share existing data and help to collect new data for the Partnership as resources permit.

Wildlife Habitat/ Management Needs: Habitat management needs are summarized within each habitat section and goals described in the "desired future conditions" subsection. The overall management objective for SGL will focus on restoring and enhancing the longleaf pine ecosystem. Specific management focus will continue to be on popular game species (Bobwhite Quail, White-tail Deer, Wild Turkey, Fox Squirrel, Eastern Cottontail, Mourning Dove), Red-cockaded Woodpecker, Bachman's Sparrow, rare pond breeding amphibians, rare upland snakes, and Federal and State listed endangered plants.

Financial Assets and Future Needs

Current staffing and available equipment are sufficient to meet immediate needs for maintaining the infrastructure and management needs of the game land. Older pieces of equipment will need to be replaced as they begin to age and become outdated. The single bay shop is scheduled to be replaced in the immediate future with a new two bay/storage building.

<u>Current assets:</u>

- Personnel - The staff located at the Sandhills Wildlife Depot includes the following permanent positions; Southern Piedmont Management Biologist, Wildlife Forester, Wildlife Biologist I, Wildlife Technician III, and 4 Wildlife Technician II's. There are four 11 month seasonal positions assigned to the Wildlife Forester. In addition, a Wildlife Diversity Biologist and seasonal wildlife diversity technician (s) have offices at the Depot.
- Equipment- Sandhills Depot has crawler dozers, farm tractors, fecon mulcher, grain drills, mowers, slip-on fire suppression units, motor grader, dump trucks, utility trailers, seed harvester, gators, all-terrain vehicles and hauling units.
- Structural – There is a single bay shop, 3 bay storage garage, office building, 2 pole barns, old seed house, one residence and 3 warehouses. The office building has recently been upgraded with new storm windows, central heat and air conditioning and wireless internet service.

Future needs: With emphasis on increasing user base of game lands new groups will expect higher level of maintenance to game land infrastructure. In the next 10 years we anticipate the following needs:

- Personnel – Reinstatement of the 11 month seasonal position for SGL to assist game land crew.
- Equipment – An excavator will allow game land staff to better maintain crossings and culverts. The excavator can be used to create man made wetlands for rare aquatic species. A larger motor grader may be needed in the future to help make improvements and increase ability to maintain roads.
- Funding for acquisition of 3000 acres over 10 years to help meet partnership goals of connecting game land parcels
- Funding for contract boundary work
- Funds to make road repairs
- Funds to purchase gravel, culverts and gates
- Funds to install 2 BAA on Drowning Creek/Lumber River
- Funds for research and surveys
- Funds to complete forest inventory and mapping on 20,000 acres
- Funds to create and distribute paper maps of game lands

Acquisition Plan

History: In 1999 the Sandhills Conservation Partnership (NCSCP) began a coordinated effort to conserve additional land in the Sandhills through fee simple purchase. Prior to that time, the size of the Sandhills Game Land remained largely unchanged since it was acquired from the Department of Army in 1949. What began as a means to leverage partner assets to recover the local population of Red-cockaded Woodpeckers has continued as a holistic, ecosystem approach to conserving rare landscapes of the Sandhills and protecting and enhancing military training. Since then, over 5,100 acres have been added to the Sandhills Game Land with an additional 25,000 acres added to the land holdings of other partners.

Partners: The NC Sandhills Conservation Partnership has been invaluable to NCWRC's land acquisition program. Several of the partners are capable of responding more rapidly to opportunities as they arise then the State is able to do. The Nature Conservancy, for example, will often make the initial purchase from the landowner and hold the property until the NCWRC's funding sources are available. Once grant or other funding is secured, the property is transferred to NCWRC. Funding sources used on NCWRC acquisition projects since 1999 include the Clean Water Management Trust Fund, Natural Heritage Trust Fund, Army Compatible Use Buffer program, NCWRC timber receipts, mitigation funds, USFWS Section 6 Endangered Species funds, and Nature Conservancy funds.

Acquisition Priorities: The primary goals of the SGL land acquisition program are to:

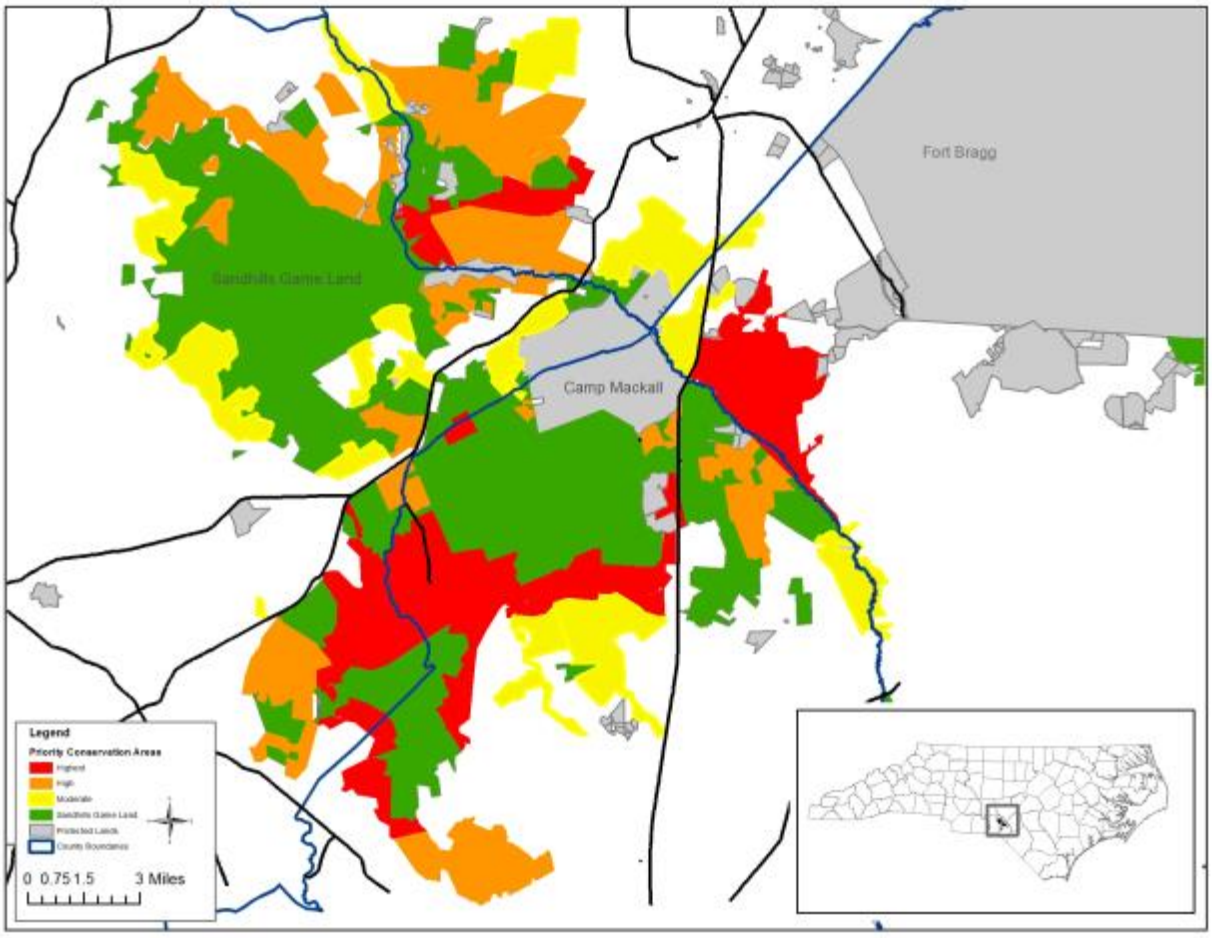
- Protect rare habitats in good, or restorable, condition around SGL, particularly parcels that are key to the conservation of rare species
- Avoid incompatible land uses on our boundary which may negatively impact game land activities, particularly prescribed burning
- Maintain or restore habitat connectivity between disconnected blocks of SGL
- Enhance access or opportunity for traditional user groups

Partnership acquisition priorities are formed with input from the NCSCP Land Protection Working Group, Reserve Design working group and the RCW working groups as well as individual Partner needs. Parcels falling within NCWRC's larger priority acquisition area are then evaluated for:

- Presence of Endangered species
- High Biodiversity and Wildlife Habitat Assessment rating
- Proximity to and shared boundary with existing NCWRC property
- Presence of high quality aquatic resources
- Presence of high quality intact habitats or those that are capable of being restored
- Benefits to making existing GL blocks easier to controlled burn
- Benefits to GL user access

Future Needs: There is still a great need to continue the SGL land acquisition program. Many of the rare or specialized species that require well managed Longleaf pine habitat are found only in healthy numbers on large blocks of public lands that have active land management programs that include frequent use of controlled burns, including SGL. Private land surrounding SGL is for the most part heavily fragmented and extremely difficult to keep adequate amount of controlled fire in the woods.

Staff have identified priority areas to focus future acquisition efforts to maximize benefits for game land users, species, habitats, and management activities (Map 1). These priority areas cover 70,820 acres (27,737 acres Highest priority, 27,483 acres High priority, and 19,600 acres Moderate priority). Protection through acquisition, conservation easement, or landowner agreement of a majority of these acres would help to maximize the long term security and sustainability of game land activities and priority species. It is not our intent to limit acquisition only within these priority areas, but to pursue and heavily favor projects that fall within these priority areas.



Map 1. Areas around Sandhills Game Land that are a priority for protection through acquisition, conservation easement, or landowner agreement. Existing game land is in green, other protected lands (including federal, NGO, Department of Agriculture, private conservation easements) in grey. Highest priority areas are designated in red, High priority in orange, and Moderate priority in yellow.

An outstanding achievement would be to protect 5000 acres through acquisition, conservation easement, or landowner agreement during the 10 year life of this plan. If 3000 of these acres were acquired fee simple at an average land value of $3000/acre it would cost approximately $9 million.

Regulations and Enforcement

Regulations specific to game lands are in place to help manage natural resources. They are developed by NCWRC staff members, state legislatures, county officials and the general public. Wildlife Enforcement Officers (WEO) are responsible for enforcing the all statutes and regulations that pertain to the state owned game land program. Each game land has its unique needs for special regulations that are in place to help manage it natural resources. There is also a permit system in place to allow game land managers the ability to permit the use of local or specialized resources within the existing frame work of statutes

and regulations. The Lands and Use Committee developed a set of guidelines to assist field staff in permitting the use of or the harvesting of resources from game lands (Appendix 12).

Enforcement Issues and specific regulations: Managing the illegal removal of wildlife and forest products is one of the many problems that occur on SGL. Regulations have been developed to help WEO prosecute cases where collectors have removed wildlife species for resale to the pet trade. Amphibians and reptiles are vulnerable to collectors and can be over harvested if not regulated. The illegal removal of longleaf pine straw for resale to local vendors has become a problem that directly impacts the agency's ability to generate income from designated pine straw sale areas. WEO have work hard in making cases against to discourage the illegal removal of pine straw. The use of ATVs on game lands is prohibited. WEO play an important role reducing the amount of illegal use of ATVs which have a detrimental effect on game land roads, fields and feed & cover plots.

Partnerships and Collaboration

Partnership with the North Carolina Sandhills Conservation Partnership (NCSCP) has played a vital role in conserving and protecting the natural resources in the greater Sandhills region. The NCSCP has helped to identify conservation priorities, conducted outreach to private landowners and the general public, provided funds and other assistance to acquire land, provided assistance with controlled burning and control of invasive plants, provided assistance with monitoring and managing red-cockaded woodpeckers, and facilitated communication and collaboration among partners.

The NCSCP has played a major role in recovering the local population of red cockaded woodpeckers within the Sandhills Region. Future needs include continued funding of the acquisition program. The table below is a summary of the amount of acres and number of parcels acquired through the NCSCP for each county.

County	**Acres**	**Number of Tracts**
Scotland	2596	9
Richmond	944	6
Moore	1636	4
Totals	**5176**	**19**

Table 19 (Sandhills Game Land Acquisitions see appendix 1)

Other partnerships that are important to Sandhills Game Land include the NC Prescribed Fire Council, America's Longleaf initiative, and the South Atlantic Landscape Conservation Collaborative, among others. It is important the WRC continue working with partnerships. Restoring and managing wildlife and plant communities or ecosystems is a collaborative effort the NCWRC and its partners continue to work on. NCWRC collaborates with a large number of agencies and organizations outside of formal partnership. One notable example is collaboration with the NC Department of Environment and Natural Resources on wetland restoration and enhancement projects.

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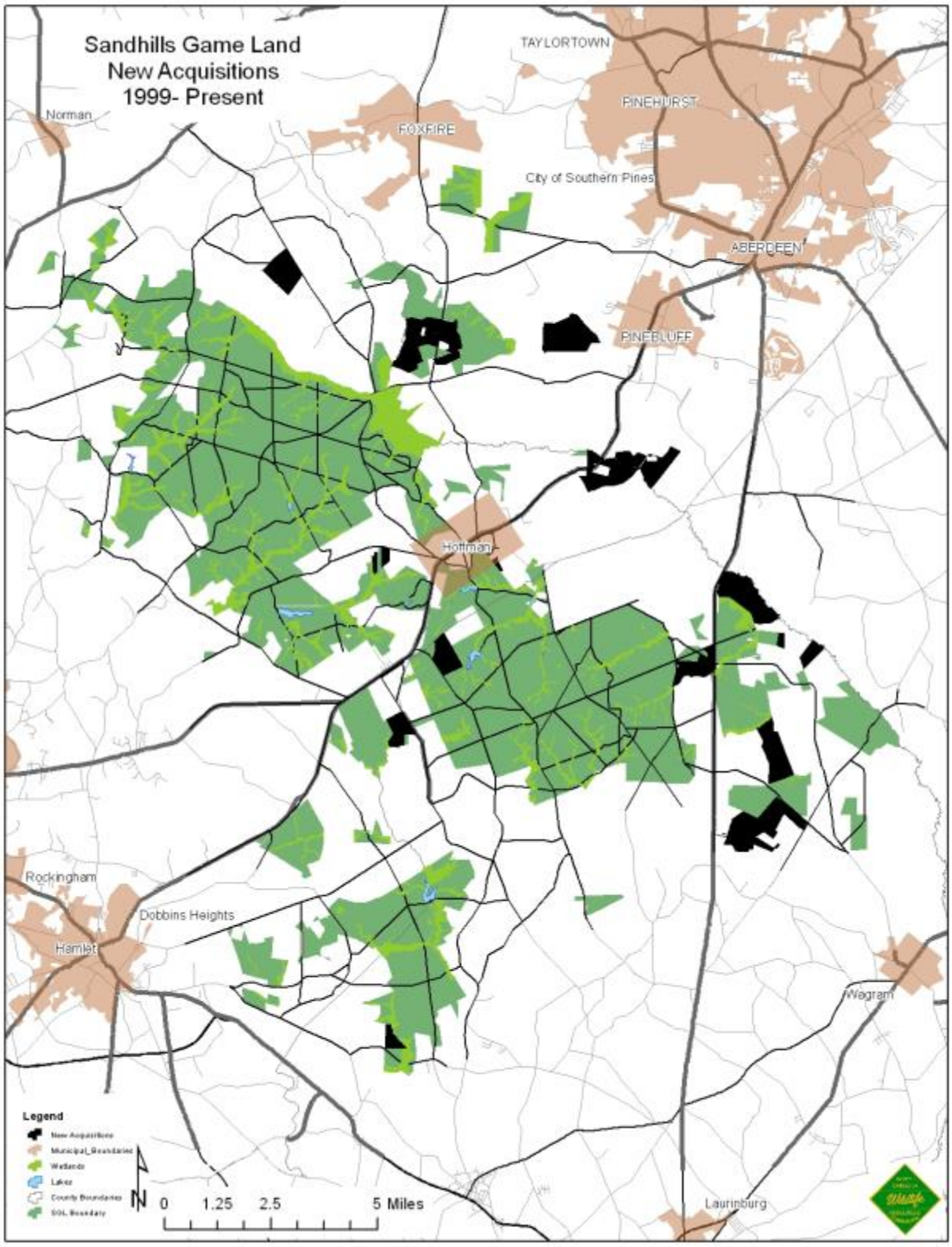
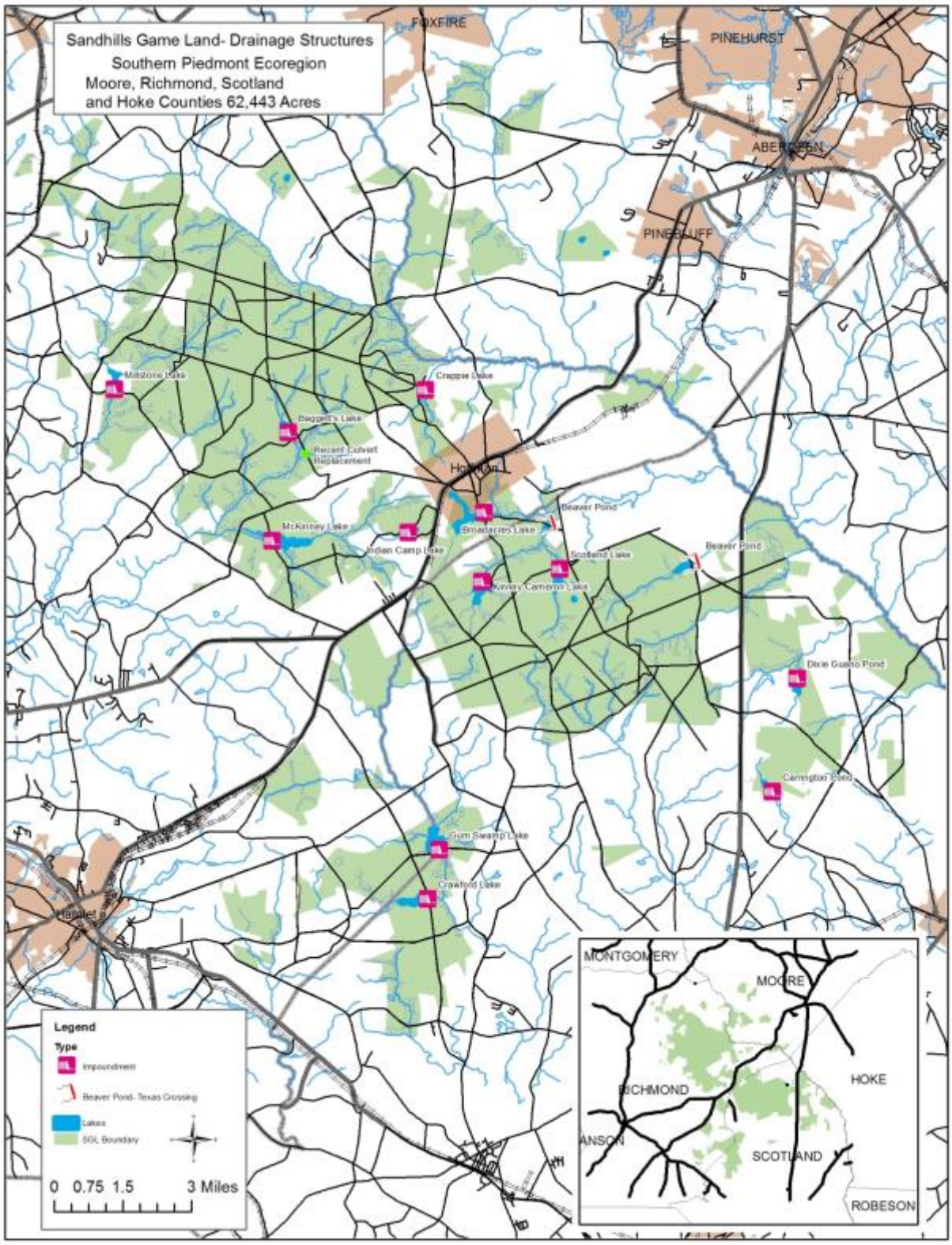
United States Department of Agriculture, Soil Conservation Service. 1984. “Soil survey of Cumberland and Hoke counties.”

Sandhills Game Land Management Plan

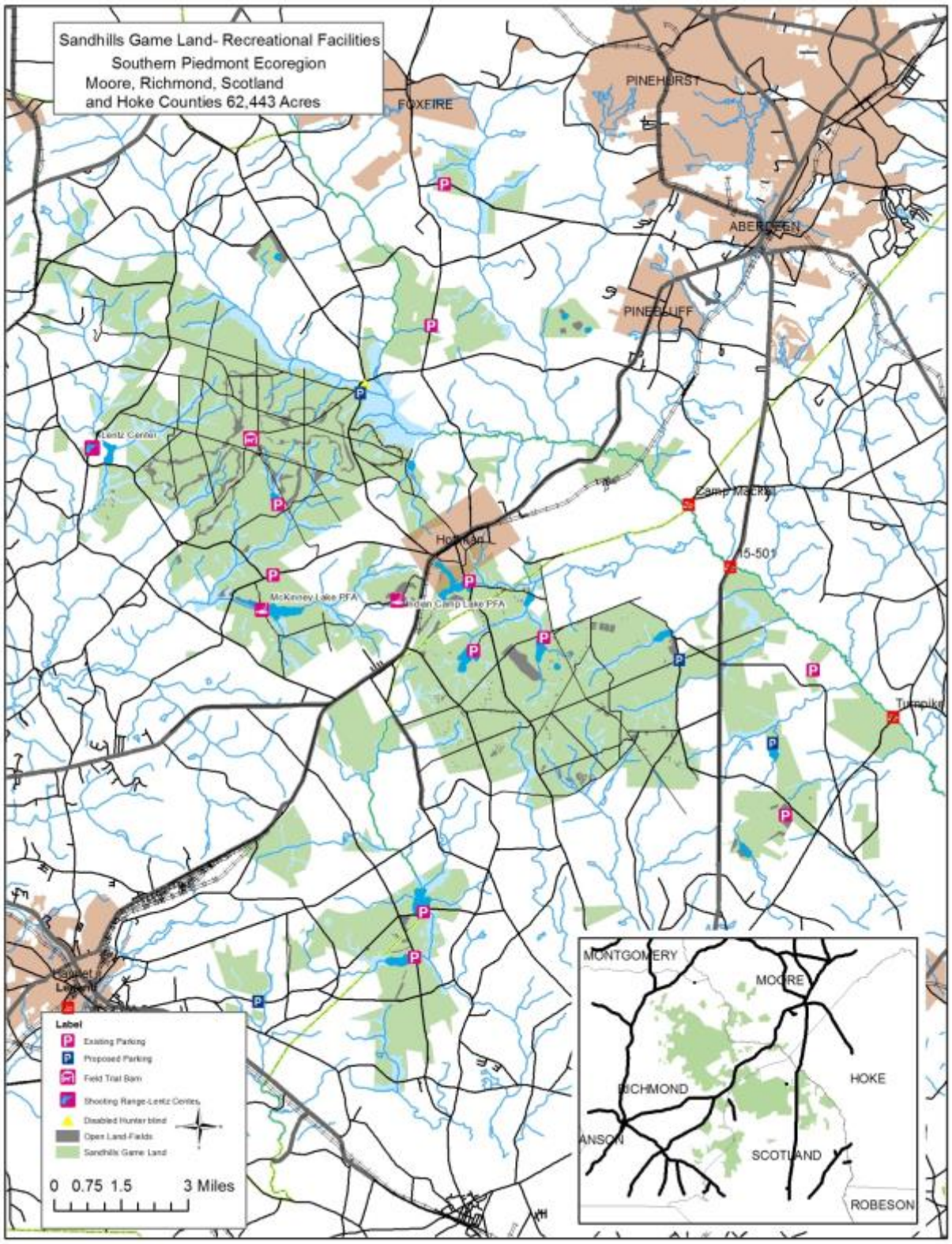
Appendices



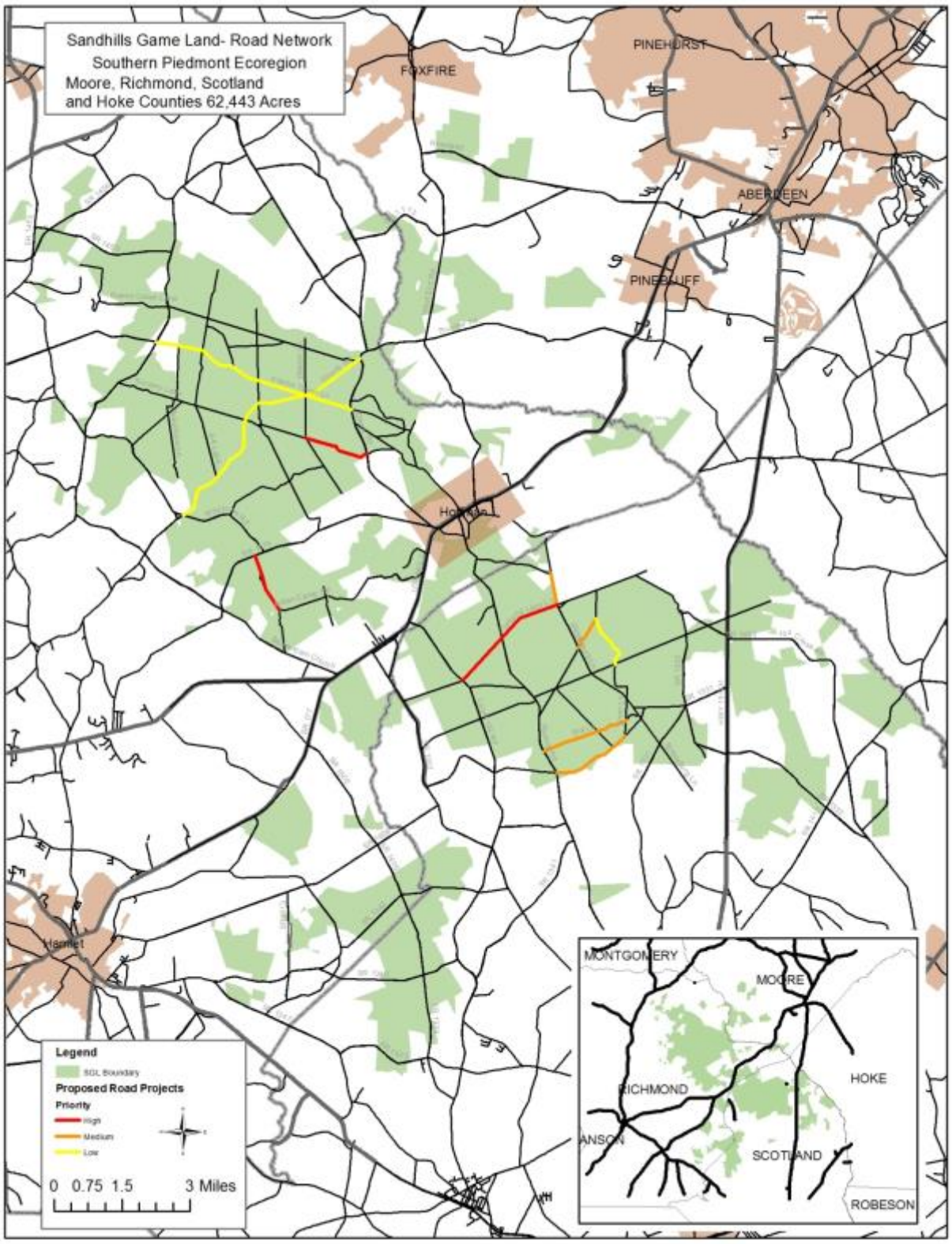
Appendix 1 (Map # 2 - New Acquisitions)



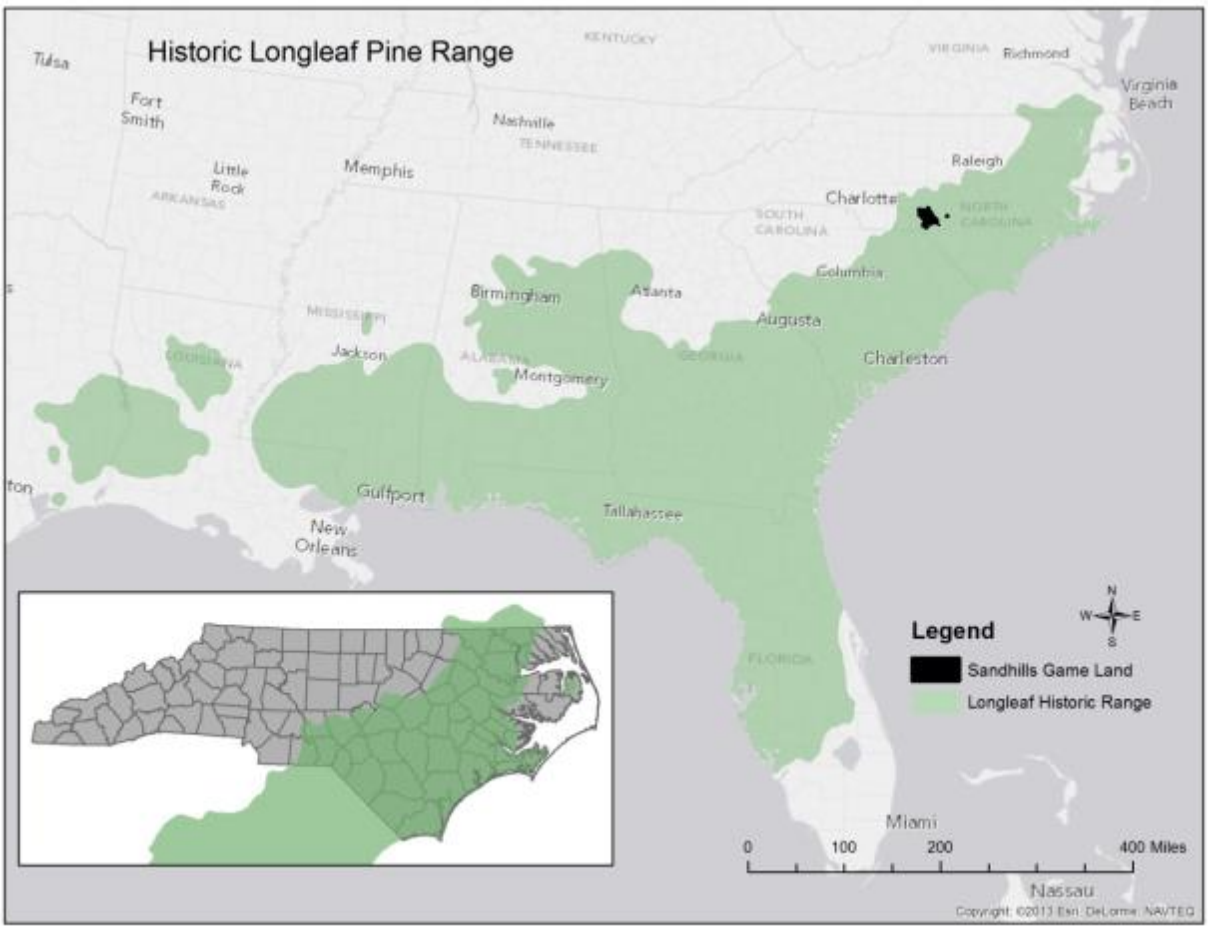
Appendix 2 (Map #3 - SGL Lakes & fishing access)



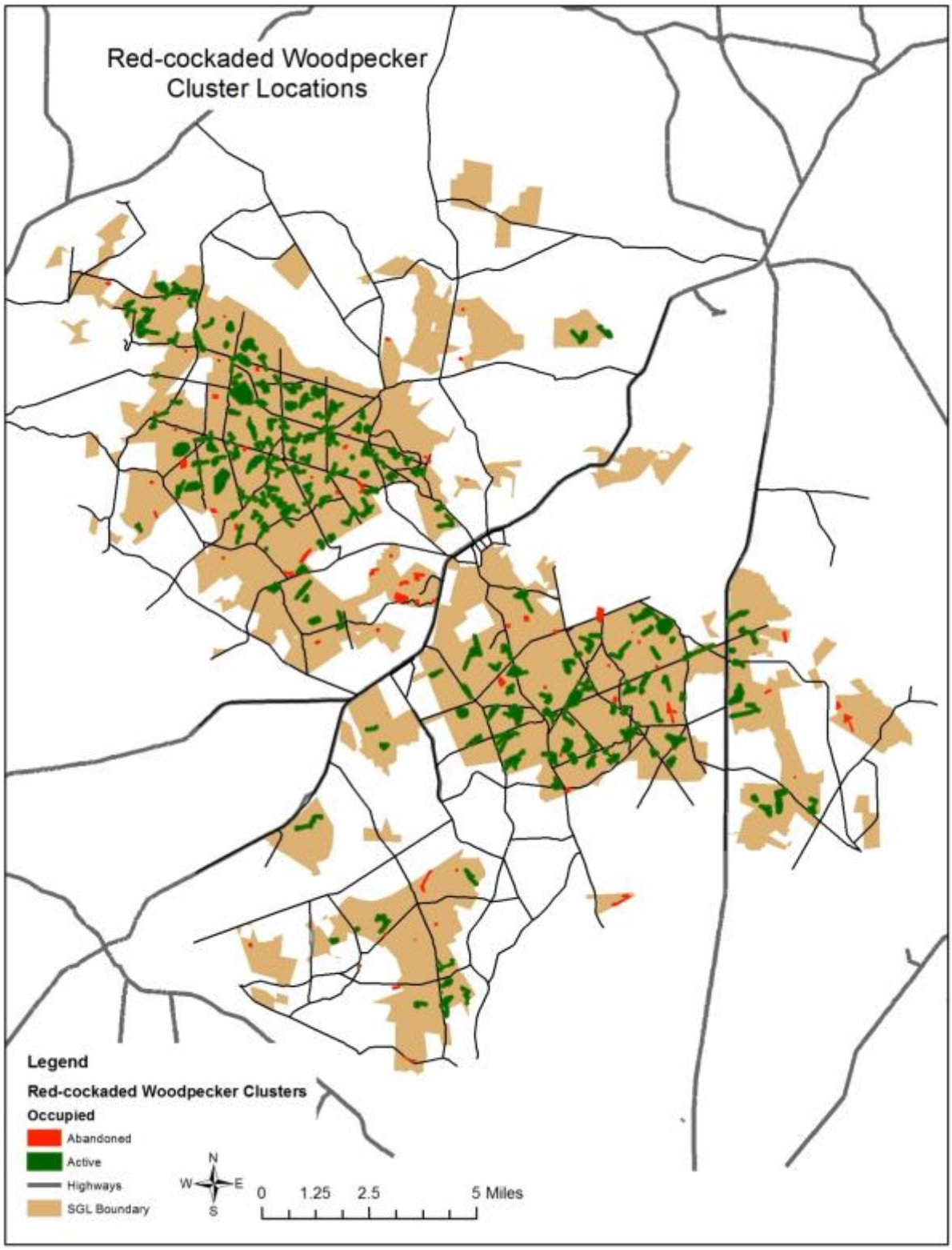
Appendix 3 (Map #4 - Recreational Facilities)



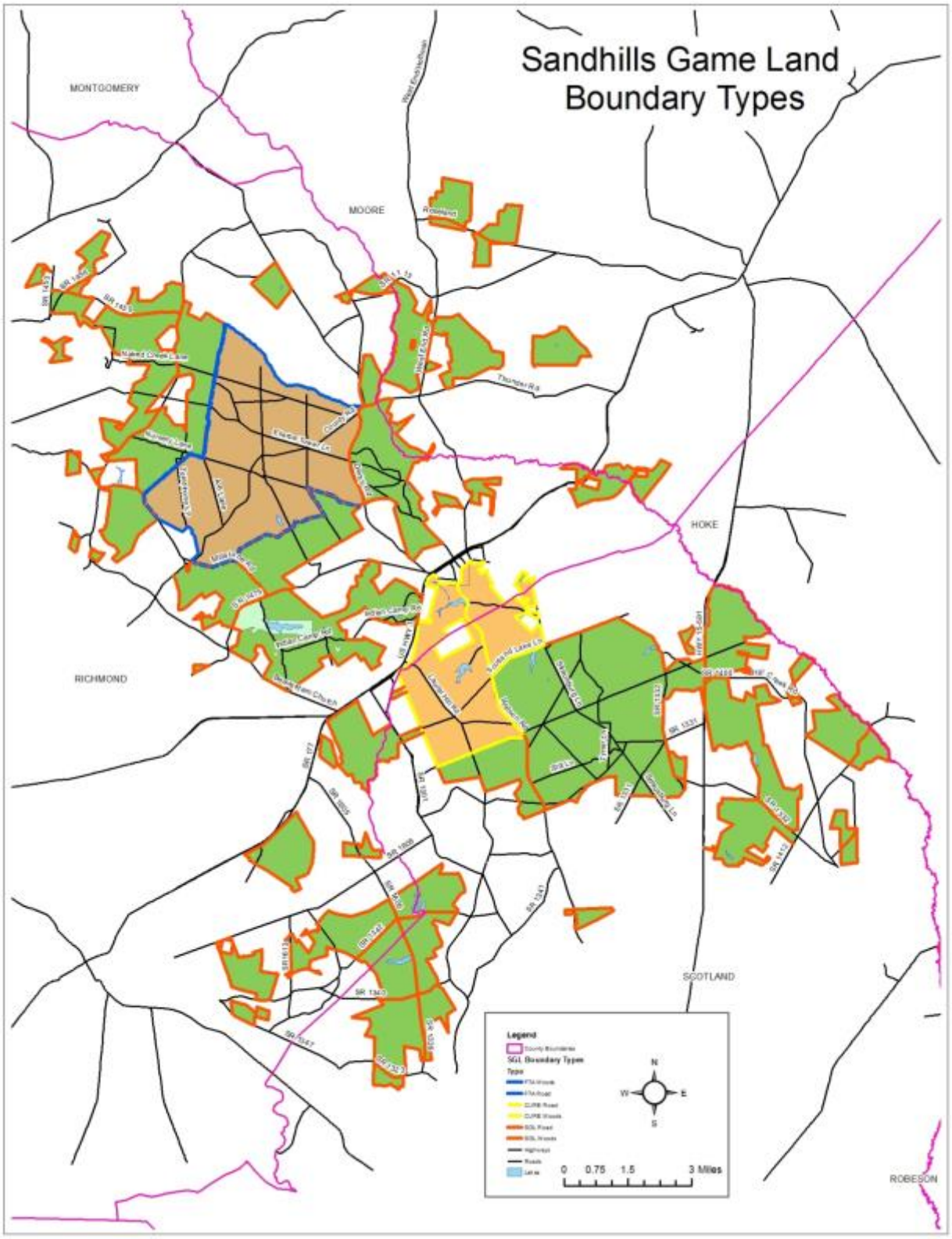
Appendix 4 (Map # 5 – Road Network)



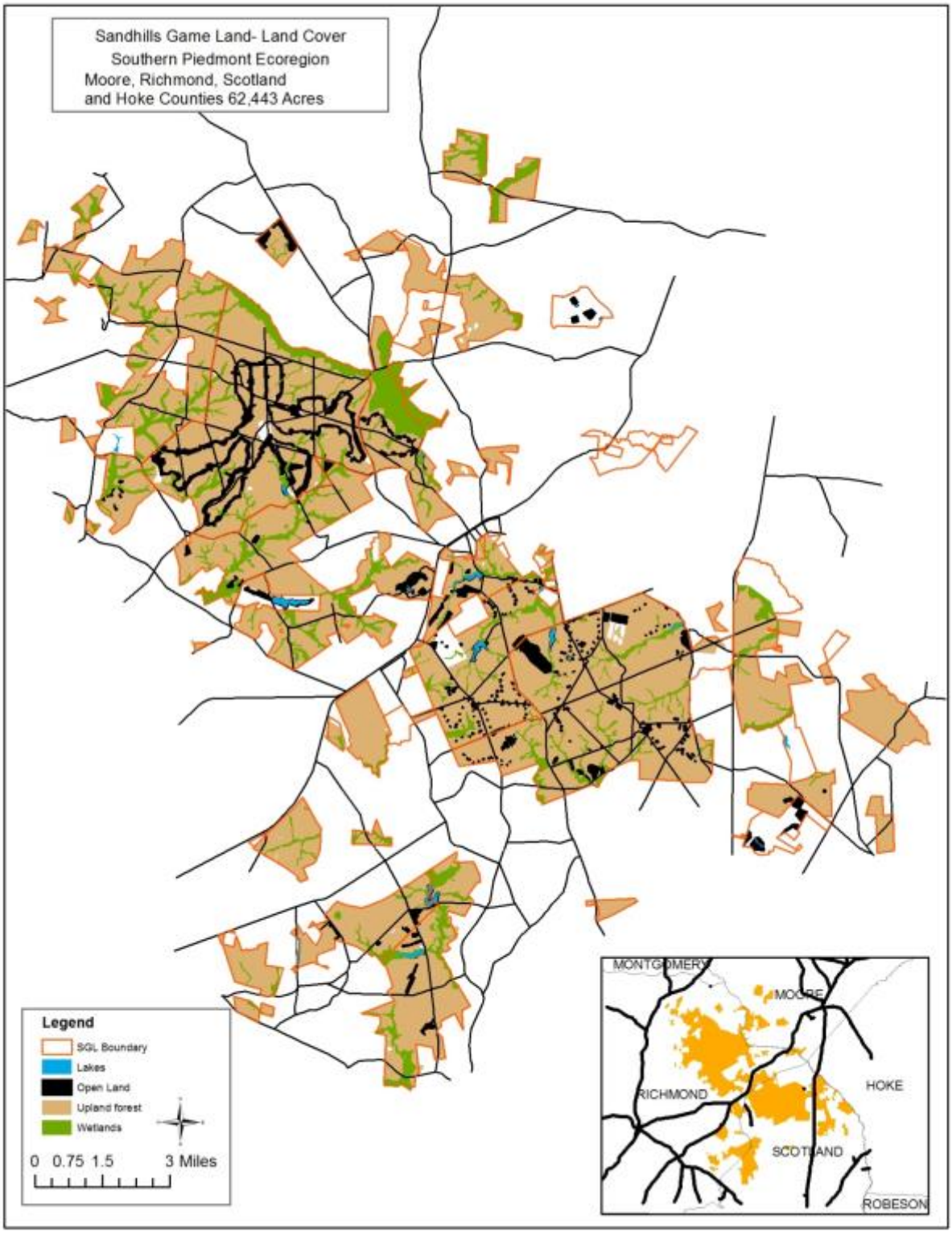
Appendix 5 (Map#6 – Historic Longleaf Range)



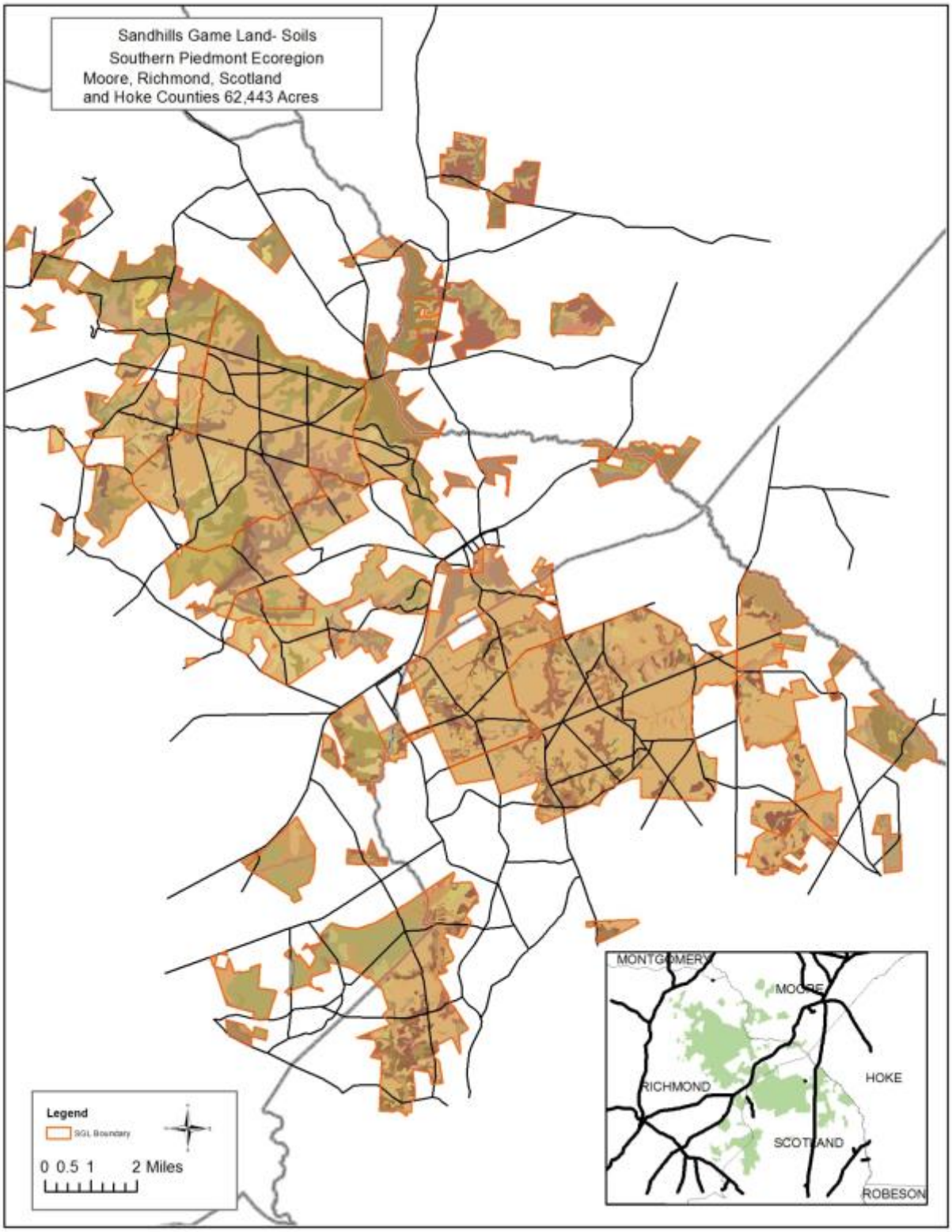
Appendix 6 (Map#7 – Red Cockaded Woodpecker Cluster Locations)



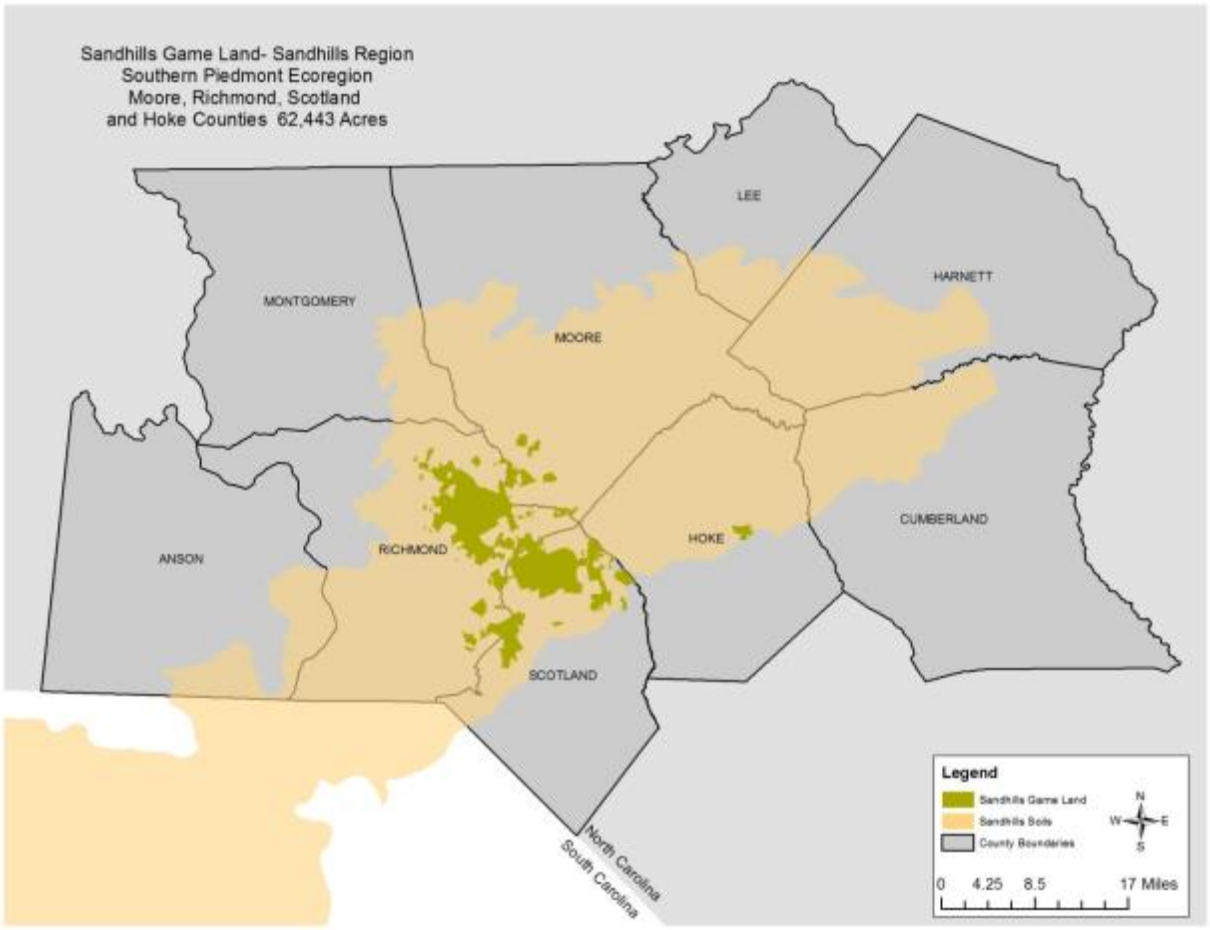
Appendix 7 (Map#8 – Boundary Designations)



Appendix 8 (Map#9 – Land cover)



Appendix 9 (Map#10 – Soils)



Appendix 10 (Map#11- NC Sandhills Region)

Appendix 11

Public Comments and Staff Response

The public comments for Sandhills Game land Management Plan originated from a public meeting and an online portal that allowed comments to be made via the internet. Listed below are the questions that appear on the questionnaire and the comment count from each input source. Twenty eight individuals attended the public meeting in Rockingham, NC.

Proposal	Question	Position	Comment type
29	What habitats do you think are most important to protect and/or improve on the Sandhills Game Land	21 comments 16 comments	Online Public Meeting
30	Considering those that live on land and in water, what species do you think are most important to protect and/or improve on the Sandhills Game Land?	20 comments 16 comments	Online Public Meeting
31	How do you use the Sandhills Game Land?	23 comments 16 comments	Online Public Meeting
32	Please explain why you think the current level of access is, or is not, satisfactory on the Sandhills Game Land?	14 comments 16 comments	Online Public Meeting
33	What suggestions, if any, do you have for changing how the Sandhills Game Land is managed and maintained?	21 comments 16 comments	Online Public Meeting
34	What would encourage you to start using the Sandhills Game Land, or to continue using it more actively?	16 comments 16 comments	Online Public Meeting
35	What additional comments do you have about the Sandhills Game Land?	14 comments 16 comments	Online Public Meeting

Listed below is each proposal with the public comments and staff input/response in relation to the management plan.

1. What habitats do you think are most important to protect and/or improve on the Sandhills Game Land?
    - Public comments included the need to continue incorporating longleaf ecosystem management into our management supporting current goals and management to comments desiring a game land that focuses on increase development of food and cover plots, less burning and more oak midstory.

- Staff response: Managing longleaf pine forest systems requires using prescribed fire. Our management approach will always incorporate a healthy hardwood (oak) component. Many years of dormant season burns in the past resulted in midstory stands of hardwoods that shaded out ground cover degrading habitat for quail and other species that depend on diverse plant communities. Food and cover plots will continue to be established and maintained.

2. What species do you think are important to protect and/or enhance on the Sandhills Game land?
    - Public comments included managing native species with emphasis on quail, fox squirrels, turkey, reptiles, amphibians and red cockaded woodpeckers. There is concern from the public about the number of deer being harvested off SGL. Some feel the deer herd is being over harvested, does should not be hunted or a permit system for harvesting does should be in place. There where comments concerning the spread of feral hogs and coyotes across the game land.
    - Staff response: Our current management program emphasizes the management of native species of wildlife. We are focused on recovering quail, turkey and red cockaded woodpeckers. We are interested in monitoring all game species including deer, fox squirrels, dove, waterfowl, raccoons etc. as time and money will allow. There is a permit hunt in place for harvesting does from on the SGL. One hundred and twenty permits are issued each year with a 2 doe limit per permit. The doe harvest over the last 3 seasons has been less than 20% of the total deer harvest. There are 4 bucks killed for every doe on Sandhills Game Land on average for the last 3 years.

3. How do you use the Sandhills Game Land?
    - Public comments included fox hunting, field trial events, deer hunting, small game hunting enjoying nature, bird watching, horseback riding, dog training, fishing, canoeing, exercise etc…
    - Staff Response: Managing the many interest on SGL is challenging. Most are compatible with management goals. Minimizing impact conflict on natural resources and user conflict is essential.

4. Please explain why you think the current level of access is, or is not, satisfactory on the Sandhills Game Land?
    - Public comments included both the need to increase access and the need to keep access at current level or reduce for the benefit of wildlife.
    - Staff response: There are over 300 miles of public roads open to the public on SGL. SGL is one of the most accessible game lands in the state.

5. What suggestions, if any, do you have for changing how the Sandhills Game Land is managed and maintained?
    - Public comments included the desire to see more food plots, continue with the prescribed burning program while some feel there is too much fire being used. The use of dogs to hunt deer on SGL is a concern, and some expressed a desire to see improvements to how we prepare dove fields.
    - Staff response: Food plots are recognized as being important for attracting wildlife for viewing and hunting. The SGL staff prepare and plant over 100 acres annually. Food plots

require a lot of time and are expensive. As time and money will allow food plots will continue being a priority. The use of prescribed fire is essential for managing all of the native wildlife species found in the Sandhills. There are portions of the game lands that are burned every 2 – 3 years and other parts are burned once every 5 – 10 years. The conditions created by different burn frequencies can be found on the SGL. Dog hunting is a legal on SGL. Any attempt to change the use of dogs will require change is state regulations.

6. What would encourage you to start using the Sandhills Game Land, or to continue using it more actively?
    - Public comments included maintained roads better, more hunter access to the field trial grounds, and increase hunting days on the SGL. The use of dog hunting on SGL discourages some deer hunters, they would like to see that banned, and interest in more hunter camping areas is of interest.
    - Staff response: Roads maintenance is being addressed in the new management plan. Where needed gravel will be spread to improve road surfaces and they will be maintained with frequent grading. Limited hunting is allowed on the Field Trial Grounds where and when possible. The field trial grounds are used extensively by sanctioned field trial events from October through March. Hunting is limited to avoid conflict and assure safety to the participants. Dog hunting is legal on SGL, many hunters use dogs to hunt deer on the area.

7. What additional comments do you have about the Sandhills Game Land?
    - Public comments included a desire to see dog hunting banned on SGL, the concern of loss of hard mast trees due to prescribed burning, some love the effects of prescribed fire has had on the area, some feel the field trial grounds are a treasure. There is concern about collecting reptiles off the game land and some enjoy horseback riding.
    - Staff response: Concern about collecting reptiles off game lands has been addressed through a set of new regulation prohibiting removal without a permit.

Additional comments were received during a 30 day online public comment period.

Comment 1:

I have hunted the Sandhills Gameland for over 30 years and want to comment on the draft plans for this gameland. The deer hunting has become awful since more prescribed burns have occurred and the permit either-sex season was instituted. The gun either sex season needs to be eliminated and the burns need to be eliminated for periods of time to allow the cover to regrow, the deer have very few places anymore to hide in and feel secure from sight. I used to see dozens of deer each time I hunted this gameland, in past three years I not seen a deer still hunting. I would like to urge the elimination of the gun either sex permit system until the deer population recovers in numbers sufficient to reinstate the permit system.

Comment 2:

The following comments are for the Sandhills Game land Draft:

1. It is important the game land management crews be given the time and resources to continue the current wildlife management practices. Continued use of prescribed fire in critical, may want to consider additional staff and resources to assure the goals are met.

2. Rare plant and wildlife species management is very important. Partnerships have been built and all have benefitted from them to help ensure sound management of your rare communities and wildlife species are continued.

3. Providing outdoor recreational opportunities including hunting, fishing, birding, photography needs to be one of the top priorities of your game land crews and management staff.

4. Continue to acquire land to facilitate and expand the game land program.

5. Do not believe WRC needs to be spending as much money as projected on road improvements. Critical improvements such as upgrading culverts, stabilizing erosion problems, improving boating access and establishment of the boat/canoe access for Lumber River on US Hwy 15/501 and Turnpike Road will greatly enhance access and recreational opportunities.

Comment 3:

Keep running deer with dogs on Sandhills game land

Comment 4:

Please remove all dog hunting for deer from NC state game land. Until the wildlife commission and more importantly the state legislature addresses this problem - I will have my son's find other activities besides hunting.

Comment 5:

I looked over this plan and I am somewhat more interested in hunting deer and turkey. In the staff response about the doe harvest, I don't think the reported numbers are representative of what is actually is happening. I feel that a much larger number on does are kill than is reported. A few years ago I was hunting the first day on gun season on a tract between Marston Road and the Unimin facility. A somewhat other of view location. A group had organized a dog hunt, so me and my young boy chose to stand near the hunter by off the immediate location. We could hear their dog and most of the hunt. There must have been 30-40 shot fired that morning in about a two hour period. I didn't see anyone shot a doe but I don't think all that was buck shooting. I don't think this was one isolated event, besides all you need to do is get the does off onto private land without meeting a warden, where it is legal to harvest does anytime of the season. I have been hunting SGL for about 40 yrs. I begin as a bow hunter when there were a large amount of does. I was good for me at that time but didn't real know how to harvest with bow, but had a great time seeing and shooting at them. Now me and several bow hunter friend done even bother to bow hunt there because the low population of deer. Maybe there should be more designated Archery Hunting areas. I don't know but I don't think the game warden are adequate to enforce the regulation. The coyotes are also making a large impact on the deer and turkey populations. About five years after the turkey restoration, I was bow hunt on the SGL about once or twice a week and I would see

turkey about every outing. Not seeing them much now. I know that there are good numbers of turkey in key areas, along the river and bottom land. But I think there should be more. However, I think the plan is overall great.

Comment 6:

I looked through the Sandhills Game land Plan and it appears to be well written and comprehensive. The one thing that jumped out at me was the amount of money proposed for upgrading roads (there is money elsewhere for maintaining them) and building parking lots. If all road upgrades are implemented WRC would spend $3,285,000.00 of hunters money on upgrading roads in the next 10 years.

As a Richmond County hunter, fisherman, birdwatcher, lifetime license holder, and one who enjoys just walking around on Sandhills Game Land I would request that resources be expended on habitat management activities or land acquisition that benefit wildlife instead of the millions of dollars proposed for upgrading roads and building parking areas. Roads that are a little rough keep cars moving slowly where they are less likely to kill wild birds and animals or hunting dogs and visitors are more likely to see something interesting.

Game Lands are not the place for major thoroughfares: Just keep roads so folks can navigate them at a slow speed and provide minimal areas for hunters to park where there is no option, but to park alongside public roads.

Thanks for the opportunity to comment on the Sandhills Game Land Plan.

Comment 7:

I'm proud of the work done on this management plan. I think that on the whole it is an excellent plan that should provide for the continued sound management of Sandhills Game Land which makes it one of the true gems of NC, and indeed the entire southeast. I would like to reiterate strong support for some of the important elements in the plan, including:

- Clarifying the forest management objectives for longleaf pine, including the emphasis on mixed-age forest management that includes an old-growth component and maintenance and enhancement of herbaceous groundcover
- Improvements to our management of pine straw stands
- A strong emphasis on the importance of prescribed fire, and the need to maintain and expand resources for prescribed fire
- Highlighting the importance and need for special management attention for isolated wetlands, drains, and other "embedded" habitats
- Identifying, and addressing where feasible, research and survey needs
- Pursue an ambitious land protection strategy that makes a reality out of the vision outlined in the Acquisition Plan

A few items that I think could deserve even greater emphasis in the plan and in implementation of the plan:

- Expanded efforts to collaborate with NC Forest Service to minimize plowed lines around wildfires and re-habbing existing plow lines

- Emphasize enhanced collaboration between DELM staff and Research and Surveys, Wildlife Diversity, Fisheries, and Enforcement staff and provide opportunities for input from all these staff members in management decisions. I think that there is a risk that one result of the recent re-organization is the formation of new "silos" within WRC in the future.
- Ensure that the infrastructure Objectives outlined on page 43 guide all decisions on new infrastructure and infrastructure upgrades
- *Budgets should reflect the priorities of the plan.* The financial summary does a nice job of outlining the costs for proposed actions, with the exception of land acquisition. While new and upgraded roads are a relatively small part of fulfilling the broad vision and objectives of this plan, they are a disproportionately large part of the potential costs. *The emphasis of the plan is on habitat maintenance, restoration, and improvement, and the budgets, manpower, and other resources to implement this plan should reflect that.*

Thank you for providing the opportunity to comment, and thank you for all the great work you continue to do for Sandhills Game Land.

Comment 8:

Below are comments I have on the Sandhills Game Land Management Plan:

1. Continue to allow deer hunting with dogs on the Sandhills Game Lands with no restrictions. There are multiple vehicle roads throughout the game lands which allows dog hunts to be contained. The vast acreage of the Sandhills Game Lands is very conducive to the acreage needed to conduct deer hunts with dogs, and when considering the number of access roads throughout the game lands, allows the hunts to be contained without hunter and dog trespass issues on private land. Deer hunting with dogs on the Sandhills Game Lands has a longstanding tradition. Haven hunted deer with dogs on the Sandhills Game Lands myself for 36 years, I have never encounter a hunter conflict nor a private landowner conflict.
2. Increase the number of doe permits for the Sandhills Game Lands or open the season for all hunters to take 1 doe from the game lands. This is specific for the Richmond County portion. We hunt the Sandhills Game Lands multiple times a year and there is a huge population of does that can withstand a more aggressive doe season. This will also enhance the buck population by thinning out the does. This comment can be supported by private landowners bordering the Richmond County portion of the Sandhills Game Lands as the doe population is extremely large.
3. Increase the food plot planting specific to the deer population. Given the nature of the habitat (mostly pines with limited hardwoods with mast production), food plots specific to the deer population will enhance the population.

Comment 9:

I am a resident of Richmond County, am enrolled in the CURE program, and own 115 acres surrounded by the Sandhill Game Land (SGL) Block B. I applaud the NC Wildlife Resources Commission on a very good Draft Management Plan for the SGL. The plan seems very comprehensive. It recognizes the critical importance of the use of Prescribed Fire to manage the fire-dependent habitats of the Sandhills. WRC has been doing a great job of getting fire management done on SGL and is recognized

widely for its great burn program, which improves wildlife habitats while, at the same time, manages fuels that protect homeowners like me and my family that live adjacent to the Game Land. As a wildlife enthusiast, I also appreciate the effort that WRC staff invests in managing non-game species that contribute to the recovery of rare and endangered species.

My only concerns are the financial implications to WRC's habitat management mission of a huge program to upgrade and improve roads and other infrastructure that constitutes more than 45% of the long-term budget for the SGL, as shown on the last page of the plan. This is over and above the money that is projected for management and maintenance of existing roads, etc. I am very concerned that this expansion of infrastructure will impact the Sandhill Game Land by competing for financial resources that are needed to manage natural resources and by creating un-necessary improved roads that promote higher speed driving and diminish the wildlife experience offered to visitors to the SGL. The unique habitat value and the visitor charm of the SGL experience is benefitted by a quiet, slow-paced transportation system that is well-maintained, but not paved or improved so much as to encourage high speed driving. The other concern that I would like to voice is that the financial statement on the last page values prescribed burning at $10 per acre. I know from 20+ years of controlled burning that this is a very low number and can only be achieved with extremely large burn blocks. There are many smaller burn blocks in the SGL that rarely see prescribed fire because they are small and expensive on a per acre basis. These small blocks often build up very high fuel loads that become dangerous over the years. I would prefer that more money is budgeted to deal with these small blocks while at the same time continuing the great record of burning larger blocks. Also, investment in new technologies for burn prep and habitat management, such as cutting machines like Gyro-Tracs or similar restoration equipment, will be essential to restoring fire suppressed habitats with excessive fuel loads.

Thank you for the opportunity to comment on the Sandhills Game Land Plan, and for the wonderful management that already happens there.

Comment 10:

No road through the Sandhills Game Lands should be paved. Paving will provide no benefit to the resource nor to the hunter. It will only benefit the persons who use the Game Lands as a shortcut. It will, on the other hand, provide a lethal threat to my bird dog. It will also be an impediment to Commission staff personnel in their efforts to carry out prescribed burns

Several years ago NCDOT threatened to pave some of our Sandhills Game Lands roads. I was instrumental in getting legislation passed in the General Assembly which prevented them from doing it without Commission approval. The Commission held the line then and must continue to do so.

In follow-up to my message below about paving, I would like to express the same sentiments about graveling. No road on the Sandhills Game Lands should be graveled. It will bring no benefit to the resource nor to the hunter. It will only benefit the persons who are passing through. For better use by hunters and managers, our Game Lands roads should be sandy lanes only.

Comment 11:

Please use the bulk of funding for the Sandhills Gamelands on conservation and wildlife habitat management, not roads for people.

Comment 12:

The North Carolina Natural Heritage Program appreciates the opportunity to review the draft Sandhills Game Land Management Plan. We also welcome a continued partnership with the NC Wildlife Resources Commission (WRC) as it moves forward to implement the final management plan. The North Carolina Natural Heritage Program (NAP) was pleased to see that management of all areas and habitat types focused on promoting or restoring high quality natural communities and species diversity. We also appreciate that maintaining rare plant populations and natural communities were included in the Plan's goals and measures. For the specific measures, we would recommend that the population size and extent of state listed plant species would also be considered in addition to federally listed species. NCNHP would be willing to provide species data and assist with collecting data on those populations to monitor their viability over time.

NHP appreciates the Plan's recognition of the importance of fire and the emphasis on prescribed burning in past and intended future management. The frequent bums in longleaf pine habitats, the ongoing practice of burning ecotones whenever possible, and the emphasis on minimizing impacts of firebreaks are all aspects of an excellent fire management program that is bringing many benefits to the game land. We are pleased with the emphasis on longleaf pine communities and the recognition of their value, including the goal of restoring ground cover vegetation as well as the tree canopy, and the intent of frequent prescribed burning.

We appreciate that other management activities described will avoid impacts to high quality natural areas such as limiting food plots to existing open land and fallow fields; placing new parking spaces in locations to minimize negative impacts to sensitive plant and animal populations and natural communities; and avoiding the use of herbicides in Registered natural areas, endangered, or threatened plant sites or wetlands, as described in the Forest Management Guidelines section. We request that Dedicated Nature Preserves would also be included where Registered Areas are taken into consideration. Some of the lakes that need regular infrastructure maintenance have rare plant species that occur along the lake margins (McKinney, Baggett, Gum Swamp, and Broad Acres Lakes), and some populations are within the general vicinity of boat ramps or fishing piers. These species include wetland and aquatic species. Care should be taken to avoid damage or impacts to those rare wetland or aquatic plant populations when doing routine maintenance of these structures.

In developing plans for non-traditional uses such as geocaching, hiking trails, camping, horseback riding, and dog trials/training, we recommend that careful consideration should be taken to prevent and avoid impacts to sensitive natural areas, unique natural communities and rare species. We are particularly concerned with trampling or poaching of rare species from these activities.
The proposed plans to improve the roads within the Game Land will be a significant expense, which we hope would not detract from rare species and natural community management or monitoring efforts. Should road shoulders need to be extended during construction, care should be taken to avoid impacts to rare plant species that occur along roadsides, and there should be consideration of the important amphibian and reptile populations known from the Sandhills Game Land.

We appreciate the ecosystem management approach that the WRC has historically applied to managing the Game Lands and encourage WRC to continue with this management philosophy, especially as natural habitats across North Carolina are degraded, and habitat fragmentation increases. Maintaining

high-quality examples of North Carolina's natural ecosystems is important for native wildlife - including rare species - and for the citizens of our state. NHP therefore supports the acquisition plan noted in the draft, as it identifies promoting connectivity and protecting important natural resources as primary goals. Maintaining the integrity of natural areas and connectivity for wildlife within the Game Lands will provide a much greater opportunity for North Carolina's native diversity to remain viable. Thank you for your contribution to the conservation of our natural resources in North Carolina. Please contact me or other NHP staff if you have any questions, or would like additional information.

Appendix 12:

North Carolina Wildlife Resources Commission
Game Lands Use Evaluation Procedure

I. PURPOSE

The North Carolina Wildlife Resources Commission (NCWRC) is the principal advocate for and steward of the wildlife resources of North Carolina and is the primary custodian of numerous tracts of state-owned lands in the Game Lands Program. As the human population of North Carolina continues to grow at a rapid rate, state-owned Game Lands will be subject to increasing pressure to provide public outdoor recreation opportunities. These uses will include traditional activities such as hunting, fishing, trapping, and wildlife viewing, as well as other outdoor recreation pursuits. While hunting, fishing, trapping and wildlife viewing are the primary public uses of state-owned Game Lands, the NCWRC has always allowed and supported other dispersed and non-developed recreational activities. The funding sources of the NCWRC, however, are focused on natural resources management rather than recreational development and there is no on-site staff stationed at each Game Land. Because of this, the NCWRC must exercise care in providing for recreational activities that may not be compatible with the natural resources for which the lands are valued and the primary management objectives of those lands. This document will establish a process to evaluate such activities as they are considered by NCWRC staff, or are requested by the public, on state-owned Game Lands where NCWRC is the primary custodian. These activities will first be evaluated to determine if they are “appropriate” and second to determine whether they are “compatible” with respect to the following management objectives of the Game Lands program:

1. To provide, protect, and actively manage habitats and habitat conditions to benefit aquatic and terrestrial wildlife resources,
2. To provide public opportunities for hunting, fishing, trapping, and wildlife viewing,
3. To provide for other resource-based game land uses to the extent that such uses are compatible with the conservation of natural resources and can be employed without displacing primary users,
4. To provide an optimally sustainable yield of forest products where feasible and appropriate and as directed by wildlife management objectives.

This document provides a statewide framework for determining appropriate uses of NCWRC-owned or controlled Game Land properties (NCWRC Game Lands). In addition, it provides the procedure for determining if appropriate uses are compatible on a particular property.

II. ENABLING LEGISLATION

Statement of Purpose NCGS § 143-239. The purpose of this article is to create a separate State agency to be known as the North Carolina Wildlife Resources Commission, the function, purpose, and duty of which shall be to manage, restore, develop, cultivate, conserve, protect, and regulate the wildlife resources of the State of North Carolina, and to administer the laws relating to game, game and freshwater fishes, and other wildlife enacted by the General Assembly to the end that there may be provided a sound, constructive, comprehensive, continuing, and economical game, game fish, and wildlife program directed by qualified, competent, and representative citizens, who shall have knowledge of or training in the protection, restoration, proper use and management of wildlife resources. (1947, c. 263, s. 3; 1965, c. 957, s. 13)

III. APPLICATION OF PROCEDURE

This procedure must be considered within the context of the Game Lands Program Mission Statement (GLPMS):

> "Consistent with the original establishment legislation for the WRC, the mission of the game lands program is to enhance, facilitate, and augment delivery of comprehensive and sound wildlife conservation programs. Inherent in delivery of a lands program consistent with this mission is the feasibility and desirability of multiple uses on lands owned by the state within the system. In addition to hunting, fishing, trapping, and wildlife viewing as primary uses, we recognize the desirability of providing opportunities for other activities on state-owned game lands that are feasible and consistent with the agency's mission, and compatible with these traditional uses." (*From motion made December 5, 2007 by Doug Parsons, Chairman, WRC Use and Lands Committee and unanimously approved).*

This procedure applies to all proposed and existing recreational uses of NCWRC Game Lands. It does not apply to the following circumstances:

A. **Situations where reserved rights or legal mandates provide that certain uses must, or must not, be allowed**. For example, there may be prescriptive purposes or other uses that are specifically required or not allowed in the deed or grant that conveyed the property to the state.

B. **Property management activities**. Property management activities are specified in Federal Assistance Work Plans for lands NCWRC purchases or manages with federal assistance, and are updated every five years. These plans specify wildlife, fish, and forest management activities that are not subject to this procedure when conducted by NCWRC staff or an approved cooperator.

C. **Emergencies**. The Director (or a designee) may temporarily suspend, allow or initiate any use of a property if it is determined necessary to immediately act in order to protect the health and safety of the public or any plant, fish or wildlife population.

D. **Specialized uses**. There are many uses (most of them non-recreational) that require

specific authorization from NCWRC in the form of a special use permit, letter of authorization or other permit document. Some of the specialized uses that may be considered include scientific research or collections, educational pursuits, field trial use, use of buildings or other facilities, rights-of-way and other encroachments, telecommunications facilities, military, national defense uses, and public safety training. Requests for specialized uses are covered by other NCWRC policies, procedures, or rule, and are subject to separate review procedures. (*See NC Administrative Code, Title 15A, Chapter 10, Subchapter 10D - Game Land Regulations, Rule .0102; General Statutes 113-264*).

E. **Other NCWRC properties.** The NCWRC owns and/or manages lands outside of the Game Land program (e.g., boat ramps and Wildlife Conservation Areas). The use and management of those properties are covered by other NCWRC policies, procedures, or rule and are subject to separate review procedures. (*See NC Administrative Code, Title 15A Chapter 10, Subchapter 10E - Fishing and Boating Access Areas, Rule .0104; NC Administrative Code, Title 15A Chapter 10, Subchapter 10J - Wildlife Conservation Area Regulations, Rule .0102; General Statues 113-264*).

If a proposed use falls under one of the above five circumstances, it is exempt from review under this procedure. Any other Game Land use requests, whether originating from the public or from NCWRC staff, must be reviewed under this procedure and with consideration of the following guidance:

- **Natural resources-dependent recreational uses** (see definitions below), when compatible with each other, should be considered the priority general public uses of Game Land properties.
- **Other general public uses** that are not natural resources-dependent recreational uses as described herein, and do not contribute to the fulfillment of property purposes or goals or objectives, as described in the GLPMS, are lower priorities for consideration. These uses may conflict with priority general public uses, and may divert property management resources away from priority general public uses or from the responsibility of the NCWRC to protect and manage fish, wildlife, plants and their habitats. Therefore, procedure and practice have a general presumption against allowing such uses on Game Land properties. Regardless of how often they occur or how long they last, appropriateness and compatibility determinations for each use request must be made, as defined in Section V and VI of this procedure.

IV. DEFINITIONS

A. **Natural resources-dependent recreational use** is a use of a property involving: (1) hunting; (2) fishing; (3) trapping; (4) wildlife or other natural resource observation/ education.

B. **Property managers** are the officials employed by NCWRC who direct the management of a property, or the authorized representatives of such officials.

C. **Professional judgment** is a finding, determination or decision that is consistent with the

principles of fish and wildlife management and administration, and that makes use of all available science and resources.

V. DETERMINING APPROPRIATE USE

A property use is appropriate if it meets Criterion A ***or*** if it meets all of Criteria B – F (and G, when applicable).

A. It is a natural resources-dependent recreational use of a property. These are: (1) hunting; (2) fishing; (3) trapping; (4) wildlife or other natural resource observation/education.

B. The NCWRC has jurisdiction over the use and, therefore, authority to allow or not allow the use.

C. The use complies with all laws and regulations (federal, state and local).

D. The use is consistent with NCWRC policies and objectives.

E. The use is consistent with public safety. *If the use creates an unreasonable level of risk to visitors or NCWRC staff, or if the use requires NCWRC staff to take unusual safety precautions to assure the safety of the public or other NCWRC staff, the use is not appropriate*.

F. Proceeds of revenue generating uses, by for-profit entities, will be provided to the NCWRC.

G. The use was evaluated under previous administrative review, was deemed inappropriate, and conditions have changed that would now make the use appropriate.

Property managers and other NCWRC staff shall consider the above criteria and complete Exhibit 1 (appended to this document) for each use subjected to the appropriateness test. The findings shall be forwarded to Regional Supervisors and through the chain of supervision to the Director (or a designee) for concurrence. This will serve to promote consistency in determining appropriate uses of NCWRC Game Lands.

VI. DETERMINING COMPATIBILITY

Uses that are determined to be appropriate for Game Land properties will then be evaluated for compatibility to determine if the use will be allowed, and under what conditions the use will be allowed on a specified property. Property managers are required to exercise professional judgment in making these determinations. Compatibility determinations are inherently complex and require the property manager to use field experience and knowledge of land management and of the property's resources, particularly its biological resources. When a property manager is exercising professional judgment, the property manager will use available information that may include consulting with others inside and/or outside the NCWRC. At a minimum, the property manager should consider the following questions.

A. Can the use be accommodated without substantially interfering with or detracting from the fulfillment of Game Lands program management objectives (see page 1, section I)?

B. Is the use compatible with the physical and natural resource characteristics of the property (e.g., topography, soils, plant communities, endangered species concerns)? *The use is generally incompatible if it has a high probability of causing erosion, or sedimentation, or disturbance of plant or animal resources.*

C. Is the use compatible with Natural Heritage Articles of Dedication, Clean Water Management Trust Fund (CWMTF) designations, and/or any deed restrictions or other legal limitations placed upon the property, including those specified for land purchased with Pittman-Robertson Wildlife Restoration Act funds?

D. Is there infrastructure present on the property to support the requested use (e.g., graveled roads, parking areas, facilities)?

E. Is the requested activity not adequately provided for on other nearby public lands? *If a proposed use is available on other nearby lands, the NCWRC may not feel as strong an obligation to consider that use on Game Lands. Even if a use is <u>not</u> adequately provided for on other nearby public lands, the NCWRC still may not feel such an obligation, but should consider the unique nature of the request.*

F. Will the use necessitate facility, infrastructure development or maintenance and is this use manageable within available budget and staff? *If a proposed use diverts management efforts away from the proper and reasonable management of a property or natural resources-dependent recreational use, the use is generally incompatible.*

G. Will the use be manageable in the future within existing resources? *If the use would lead to recurring requests for the same or similar activities that will be difficult to manage in the future, then the use is generally incompatible. If the use can be managed so that impacts to natural and cultural resources are minimal or inconsequential, or if clearly defined limits can be established, then the use may be compatible.*

H. Is the requesting entity capable of providing any funding, labor, or materials for the development of, and maintenance support for, the activity, if applicable (e.g., trail or road maintenance, rehabilitation to areas that may be damaged by the activity)?

I. If a use is not compatible as initially proposed, can it be made compatible by implementing stipulations that avoid or minimize potential adverse impacts?

Property managers shall consider the above questions, and any other information or issues deemed necessary to make a determination based on professional judgment, and complete Exhibit 2 (appended to this document) for each property use subjected to a compatibility determination. The findings shall be forwarded to the Regional Supervisor and through the chain of supervision to the Director (or a designee) for concurrence. This will serve to promote consistency in determining compatible uses of NCWRC Game Lands.

VII. EVALUATION

The Director (or a designee) shall consider each request and the derived appropriateness and compatibility, and then make a determination as to whether the request will be approved or denied. The Director will forward use requests deemed significant in scope to the Commission's Use and Lands Committee, such as those involving: a) rule change, b) revenue generation, c) expenditure of NCWRC funds, or d) substantial alteration to infrastructure or natural resources.

All approved uses will be evaluated periodically by NCWRC field staff to determine whether such activities remain appropriate and compatible. All efforts will be made by field staff to inform participants of approved uses that issues of incompatibility will be grounds for immediate termination of the approved activity.

This is a living document that may be modified and updated as needed.

EXHIBIT 1

APPROPRIATE USE DETERMINATION

Property Name: _____

Requested or Considered Use: _____

DECISION CRITERIA *(refer to section V)*	YES	NO
A. Is the use a natural resource-dependent recreational use of a property?		
If 'NO' above, then consider the following criteria.		
B. Does the NCWRC have jurisdiction over the use?		
C. Does the use comply with laws and regulations (federal, state or local)?		
D. Is the use consistent with NCWRC policies and objectives?		
E. Is the use consistent with public safety?		
F(i). Is the requesting entity a non-profit? F(ii). If NO to F(i), will any proceeds of the use be provided to the NCWRC? (*Describe for-profit entity and supply information on proceeds to be provided to the NCWRC in the Comments section below*)		
G. If the use was evaluated under previous administrative review and deemed inappropriate, have circumstances changed that would now make the use appropriate? (*leave blank if not applicable*)		

To be found appropriate, answers to Criterion A **OR** Criteria B – F (and G, if applicable) must be YES.

Determination (check one below):

_____ Appropriate _____ Not Appropriate

Comments:

Property Manager: _____ Date: _____

Regional Supervisor: _____ Date: _____

EXHIBIT 2

COMPATIBILITY DETERMINATION

(*Use as much space as needed*)

Property Name: _____

Requested or Considered Use: _____

To be found compatible, answers to ALL of the above questions must be YES.

DECISION CRITERIA *(refer to section VI)*	YES	NO	Comments
A. Use will not interfere with or detract from fulfillment of Game Land program management objectives?			
B. Use is compatible with the physical and natural resource characteristics of the property?			
C. Use is compatible with Natural Heritage Articles of Dedication, CWMTF designations, and/or any deed restrictions or other legal limitations placed upon the property? **OR** (in the absence of the above) do acquisition funding partners otherwise agree to the proposed use?			
D. Infrastructure is present on the property to support the requested use?			
E. Requested activity is not adequately provided for on other nearby public lands?			
F. Use is manageable within available budget & staff?			
G. Will the use be manageable in the future within existing resources?			
H. Is the requesting entity capable of providing any maintenance support for the activity, if applicable?			
I. If the use is not compatible as initially proposed, can it be modified with stipulations that avoid or minimize potential adverse impacts and make the use compatible?			
Other (*insert*):			

Determination (Check one below):

_____ Compatible _____ Not Compatible

Stipulations necessary to ensure compatibility (*e.g., Memorandum of Agreement; performance bond; time, space, or size limitations*):

Justification/Comments:

Property Manager: _____ Date: _____

Regional Supervisor: _____ Date: _____

Appendix 13 Financials Summary

Inserted on Next Page

APPENDIX 13 Sandhills Game Land Financial Summary of Activities

Habitat Activities

Project	Description	Activity	Quantity	Unit	Unit Cost	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025	Total
H	Firebreaks	Establish firebreaks	2	mi	2000	4000	4000	4000	4000	4000	4000	4000	4000	4000	4000	40000
H	Firebreaks	Maintain firebreaks	250	mi	100	25000	25000	25000	25000	25000	25000	25000	25000	25000	25000	250000
H	Firebreaks	Install culverts on firebreaks	3	ea	200	600	600	600	600	600	600	600	600	600	600	6000
H	Firebreaks	Maintain culverts on firebreaks	3	ea	100					300	300	300	300	300	300	1800
H	Herbaceous Seeding	Seed or maintain	200	ac	175	35000	35000	35000	35000	35000	35000	35000	35000	35000	35000	350000
H	Herbaceous Seeding	Admin. Co-Op farm leases	1	gl	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	10000
H	Nest Structures	Maintain Wood Duck Boxes	100	box	50	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000	50000
H	Population Control	Control feral pig population	1	gl	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	30000
H	Vegetation Control	Prescribe burning	18500	ac	10	185000	185000	185000	185000	185000	185000	185000	185000	185000	185000	1850000
H	Vegetation Control	Mowing/Succession Disking	375	ac	30	11250	11250	11250	11250	11250	11250	11250	11250	11250	11250	112500
															Sub-total:	2700300

Operation and Maintenance Activities

Project	Description	Activity	Quantity	Unit	Unit Cost	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025	Total
O & M	Buildings	Maintain building/grounds	42	blg	4000	168000	168000	168000	168000	168000	168000	168000	168000	168000	168000	1680000
O & M	Dams and Dikes	Maintain dams and dikes	13	mi	500	6500	6500	6500	6500	6500	6500	6500	6500	6500	6500	65000
O & M	Signs and Boundaries	Maintain boundary	75	mi	135	10125	10125	10125	10125	10125	10125	10125	10125	10125	10125	101250
O & M	Public Use Facilities	Maintain campground	2	camp	225	450	450	450	450	450	450	450	450	450	450	4500
O & M	Public Use Facilities	Maintain hunter parking areas	5	park	225	1125	1125	1125	1125	1125	1125	1125	1125	1125	1125	11250
O & M	Road and Trails	Maintain Road	5	mi	2500	12500	12500	12500	12500	12500	12500	12500	12500	12500	12500	125000
O & M	Road and Trails	Install or Replace Culverts	10	ea	1000	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	100000
O & M	Road and Trails	Maintain Culverts	40	ea	50	2000										2000
O & M	Road and Trails	Install gates	10	gate	1000	10000										10000
O & M	Road and Trails	Maintain gates	10	gate	100	1000										1000
O & M	Non-Highway Equipment	Maint. & repair of non-hwy. equip.	1	Depot	30000	30000	30000	30000	30000	30000	30000	30000	30000	30000	30000	300000
															Sub-total:	2400000

Development Activities and Renovation

Project	Description (priority)	Activity	Quantity	Unit	Unit Cost	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025	Total
D	Road Repair (1)	Nursary Lane*	1.5	mi	150,000	225,000										225,000
D	Road Construction	Block O timber sale access	1.5	mi	166,667	250,000										250,000
D	Road Repair (1)	Scotland Lake Lane	2.75	mi	150,000	412,500										412,500
D	Road Repair (1)	Baggetts Lake Lane	2.25	mi	150,000		337,500									337,500
D	Road Repair (1)	McKinney Lake Hatchery Road	0.75	mi	100,000			75,000								75,000
D	Road Repair (2)	Angling Road	0.8	mi	150,000			120,000								120,000
D	Road Repair (2)	Whiskey Still Lane	2	mi	150,000				300,000							300,000
D	Road Repair (2)	Pulpwood Lane	1.8	mi	150,000					270,000						270,000
D	Road Repair (3)	Strausburg Lane	0.75	mi	150,000						112,500					112,500
D	Road Repair (3)	Tyner Lane	1.25	mi	150,000						187,500					187,500
D	Road Repair (3)	Ellerbe Tower Lane	4.2	mi	100,000							420,000				420,000
D	Road Repair (3)	County Road	5.75	mi	100,000								575,000			575,000
D	Parking Area upgrade	Depot	1	ea	25,000		25000									25,000
D	Parking Area upgrade	Broad Acres Lake	1	ea	10,000			10000								10,000
D	Parking Area upgrade	Baggetts Lake	1	ea	10,000				10000							10,000
D	Parking Area upgrade	Kinney Cameron Lake	1	ea	10,000						10000					10,000
D	Parking Area upgrade	Dixie Lake	1	ea	10,000							10000				10,000
D	Parking Area upgrade	Gum Swamp Lake	1	ea	10,000								10,000			10,000
D	Parking Area construction	TBD	2	ea	7,500									7500	7500	15,000
D	Dam Repair/maintenance	Broad Acres Lake- veg removal	1	ea	25,000			25000								25,000
D	Dam Repair/maintenance	Gum Swamp Lake- veg removal	1	ea	25,000				25000							25,000
D	Dam Repair/maintenance	Scotland Lake- veg removal	1	ea	25,000						25000					25,000
D	Dam Repair/maintenance	Crawford Lake- veg removal & gravel	1	ea	70,000							70000				70,000
D	Dam Repair/maintenance	Carrington Pond- veg clearing	1	ea	100,000		100000									100,000
D	Dam Repair	Dixie Pond	1	ea	200,000									200000		200,000
D	Dam Repair	Millstone Lake	1	ea	165,000					165000						165,000
D	Boating Access Area constructio	Drowning Creek 15/501	1	ea	150,000		150000									150,000
D	Boating Access Area constructio	Drowning Creek Turnpike Rd	1	ea	150,000			150000								150,000
D	Boating Access Area constructio	Drowning Creek Camp Mackall	1	ea	100,000						150000					150,000
D	Public Fishing Area	Dixie Pond	1	ea	50,000				50000							50,000
D	Public Fishing Area	TBD	1	ea	35,000									35000		35,000
D	New Shop construction	depot shop*	1	ea	500,000	425,000										425,000
** Denotes activity and cost incurred in 2014-2015; this cost not included in sub-total*																
	Totals					**662,500**	**612,500**	**380,000**	**385,000**	**435,000**	**485,000**	**500,000**	**585,000**	**242,500**	**7,500**	**4,295,000**
	Grand Total all Activities															**9,395,300**