NORTH CAROLINA Wildlife RESOURCES COMMISSION

Van Swamp Game Land Management Plan

2017 – 2027

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.

N.C. Wildlife Resources Commission staff has extensively contributed to the development and preparation of this plan through their various fields of professional expertise. All content, management strategies, recommendations, goals, and needs for change were developed using the best available science and professional working knowledge of Van Swamp Game Land, its habitats, and terrestrial and aquatic species. Careful consideration has been given to all input received from the public, external agencies, and organizations that have an interest in or use the game land to ensure a that comprehensive management program is administered on Van Swamp Game Land. The successful implementation of the plan will depend on the continued input and support from all interested parties.

Plan Development Team Members

- **Joe Fuller**, Migratory Game Bird Coordinator, Division of Wildlife Management
- **Isaac Harrold**, Program Manager, Land and Water Access
- **Tommy Hughes**, Coastal EcoRegion Supervisor, Land and Water Access
- **Colleen Olfenbuttal,** Bear/Furbearer Biologist, Division of Wildlife Management
- **William Ridgeway,** Northern Coastal EcoRegion Technician Supervisor, Land and Water Access
- **Sara Sherman**, Facility Construction Engineer, Engineering Services
- **Chris Turner**, District 1 Wildlife Biologist, Division of Wildlife Management
- **David Turner**, Northern Coastal EcoRegion Management Biologist, Land and Water Access
- **Brent Wilson**, Northern Coastal EcoRegion Wildlife Forester, Land and Water Access
- **Craig Wolff**, Conservation Technician II, Land and Water Access

Executive Summary

The North Carolina Wildlife Resources Commission charged North Carolina Wildlife Resources Commission staff to develop Game Land Management Plans for all state-owned game lands. The creation of this plan was a joint effort from North Carolina Wildlife Resources Commission biologist and land managers, natural resource conservation groups and agencies, and the public. The primary goal for this plan was to establish a clear path for management activities for the Van Swamp Game Land for the next ten years and set a "Desired Future Condition" for habitat types beyond that ten-year horizon.

Van Swamp Game Land is only a portion of the original Van Swamp that once covered over 13,500 acres of southwestern Washington County and northern Beaufort County. As a result of agricultural and forestry development around the tract, Van Swamp Game Land is isolated from other natural areas found in the East Dismal Swamp and the Roanoke River floodplain. Without much opportunity to connect this site to other natural areas, the importance of Van Swamp Game Land in providing critical habitat is significant. Due to the tracts size and relatively intact mature pond pine pocosin, the majority of Van Swamp Game Land is considered a Significant Natural Heritage Area by the North Carolina Natural Heritage Program.

Ditching during the mid to late 20th century dried much of the area and the sandy and loamy soils that were once wet, have largely been converted to pine plantations. The cypress and swamp tupelo are mostly absent on Van Swamp Game Land because of logging and ditching. Today, the sites that were once suitable for cypress and tupelo are dominated by red maple, sweetgum, and sweetbay.

The 5,504 acres known as Van Swamp Game Land offers hunting, trapping, and birding opportunities. Black bears, white-tailed deer, and wild turkey are commonly seen on Van Swamp and Van Swamp Game Land is also part of the North Carolina Birding Trail.

Introduction

North Carolina Wildlife Resources Commission

The North Carolina Wildlife Resources Commission, hereafter known as NCWRC, was established in 1947. Prior to 1947, the tasks of managing state owned Wildlife Management Areas were executed by the Department of Conservation and Development. General dissatisfaction with the program led to the creation of the Wildlife Resources Law in 1947 that established the North Carolina Wildlife Resources Commission.

Since 1947, the NCWRC has been dedicated to the conservation and sustainability of the state's fish and wildlife resources through research, scientific management, wise use, and public input. The NCWRC is the state regulatory agency responsible for the enforcement of fishing, hunting, trapping, and boating laws and provides programs and opportunities for wildlife-related educational, recreational, and sporting activities.

Game Land Program Mission Statement

Consistent with the original establishment legislation for the NCWRC, 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 land conservation 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

History

Prior to 1971, game lands in North Carolina were limited to designated and tightly controlled Wildlife Management Areas. In 1971, the current Game Lands Program was established. This change involved the expansion of game lands from about 700,000 acres to 1.5 million acres, changes in regulations, and reductions in fees to hunters and fishermen (Dean 1971). The old Wildlife Management Areas were incorporated into the new Game Lands Program and the new

program allowed the Commission to lease/incorporate additional lands as game lands to expand the land base. Beginning in the 1980s, land owners, both corporate and private, realized they could lease their properties for a higher rate to hunting clubs and private individuals and began to do so. These properties were subsequently removed from the Game Lands Program. Fortunately, the Natural Heritage Trust Fund was established in 1987 and the Clean Water Management Trust Fund in 1996. These funds provided money for the fee simple acquisition of select properties, many of which have been incorporated into the Game Lands Program. These funds greatly compensated for the loss of game lands leased from the private sector and currently over 2 million acres are enrolled in the Game Lands Program.

Administration of the new Game Lands Program was assigned to the Division of Wildlife Management. Depot locations with equipment and habitat development crews were established and strategically located in the vicinity of all game lands in the state. All law enforcement on these properties was assigned to the Division of Law Enforcement. With some minor organizational changes, this system remained intact until 2012. In 2012, land management staff in the Division of Wildlife Management and certain similar positions in the Division of Inland Fisheries were merged with Division of Engineering staff into the Division of Engineering and Lands Management, now named Land and Water Access Section. This organizational change was made to deliver a more comprehensive and efficient wildlife and fisheries management program on all public lands and waters in the state. Depots remained at former locations with the establishment of new depots/crews at certain remote locations that were not efficiently served under the former program.

Purpose and Need

The purpose of this Game Land Management Plan is to provide a guide for managers to follow in the creation of wildlife and land management prescriptions. Fish and wildlife habitat needs were given priority; outdoor and wildlife related requests/activities were considered individually depending on compatibility and appropriateness. All aspects of game land management were considered in the development of this plan and include but are not limited to; fish and wildlife communities, forest management, infrastructure development and maintenance, public uses, fish and wildlife information needs, financial assets and future needs, future plans for acquisition, regulations and enforcement, and existing and needed partnerships and collaborations. While this plan was written to a ten-year horizon, it will remain a living document able to adapt to change.

More specifically, this plan will:

- Provide a clear direction for game land management.
- Provide the public, local, state, and federal officials with a better understanding of game land management and objectives.
- Provide clear management objectives to ensure that these actions are consistent with the game lands program goals.
- Provide a basis for future budgetary operational expenses and manpower needs.

Regional Context

Van Swamp Game Land (VSGL) is located in the Mid Atlantic Coastal Plain. In North Carolina, a huge diversity of fish and wildlife habitats exist across the three distinctive regions of the state: the Coastal Plain, the Piedmont, and the Mountains. These regions fall within larger ecoregions that span state borders and link North Carolina to neighboring states (Fig. 1). Elevations ranging from sea level to over 6,000 feet provide habitat for over 1,000 species of birds, mammals, fish, reptiles, amphibians, mollusks, and crustaceans, in addition to thousands of other invertebrate species.

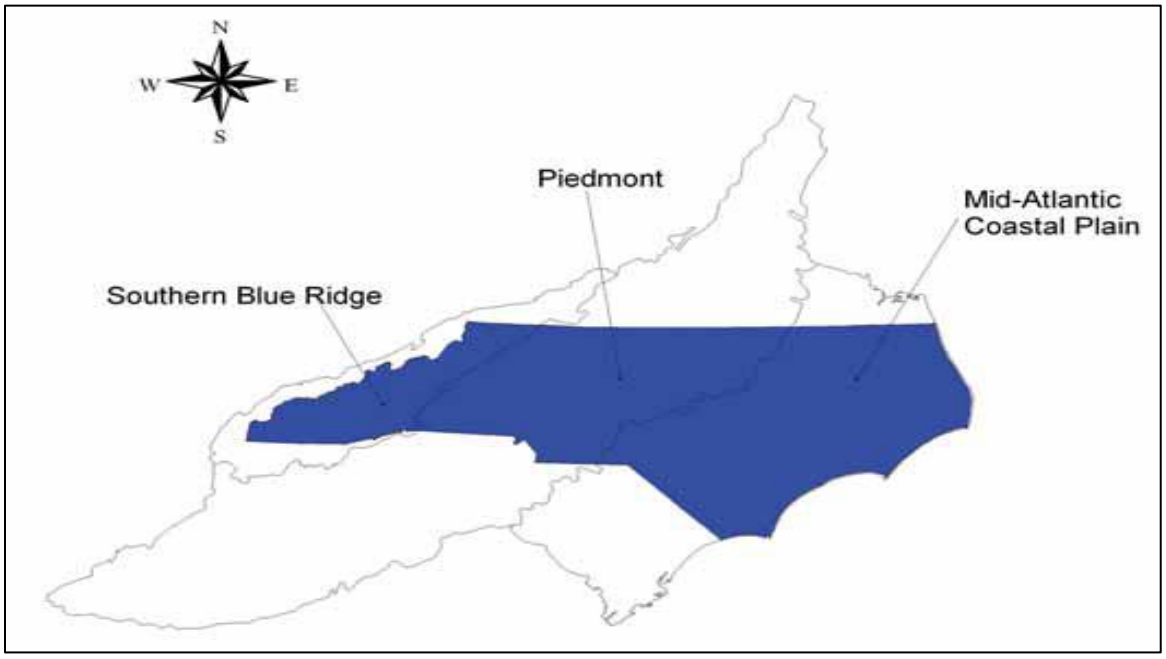


Fig. 1. Ecoregional delineations in North Carolina (Bailey 1995).

The Coastal Plain region is characterized by flat lands extending from the coast inland an average of 125 miles. Elevations in the region increase inland at approximately one foot per mile. The region covers almost two-fifths of the area of the state.

Van Swamp Game Land lies in the Tar-Pamlico River Basin. The Tar River's headwaters are just east of Roxboro, in Person County, North Carolina. The basin encompasses 6,148 square miles and the cities and towns of Oxford, Henderson, Louisburg, Nashville, Rocky Mount, Tarboro, Greenville, and Washington. The Tar River flows to Washington, NC where it becomes the Pamlico River. The Pamlico River is joined with smaller creeks and the Pungo River before emptying into the Pamlico Sound. All of the Tar-Pamlico River basin lies in North Carolina. The entire basin is considered NSW "Nutrient Sensitive Waters" since 1989 (North Carolina Division of Water Quality 2014).

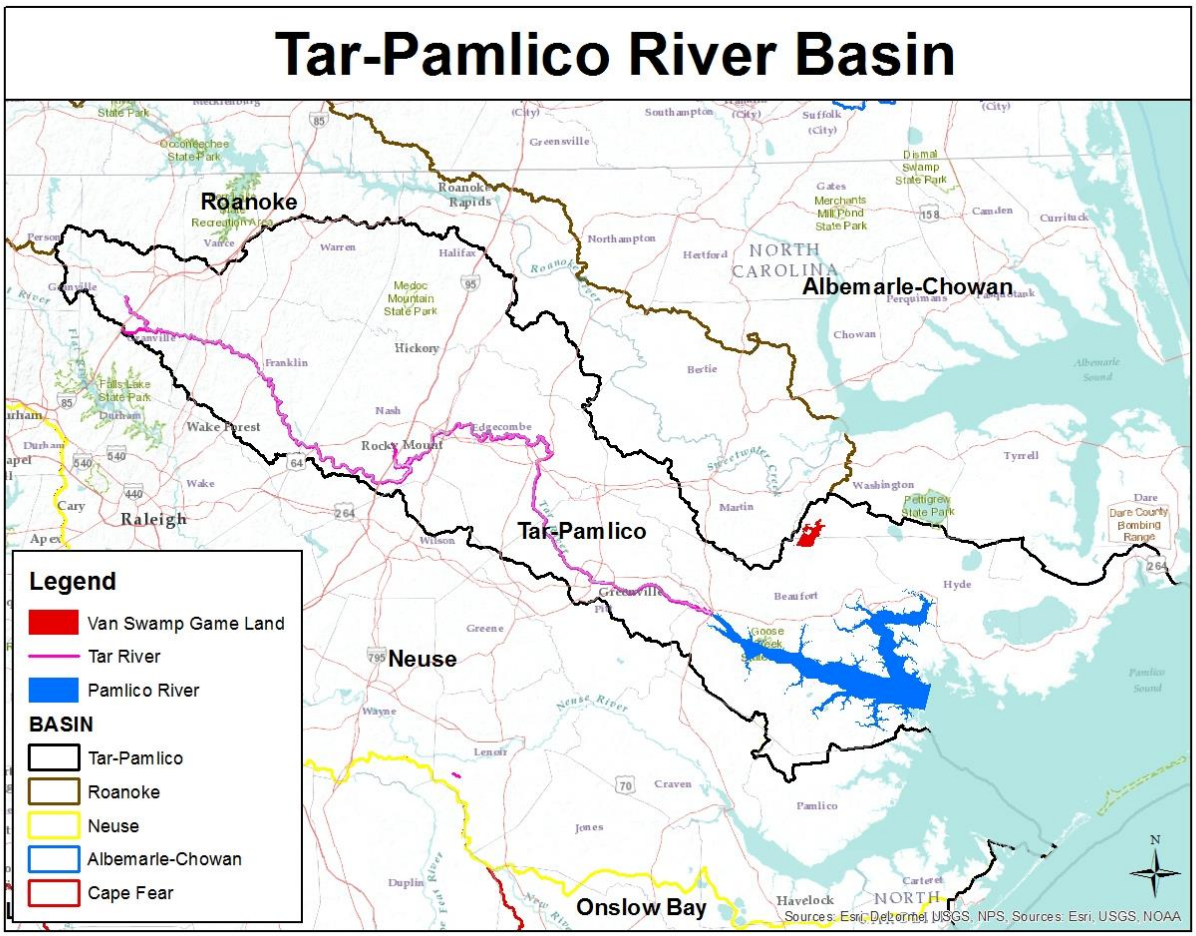


Fig. 2. Tar-Pamlico River Basin.

Role of the Van Swamp Game Land in Regional Conservation

Van Swamp Game Land is only a portion of the original Van Swamp that once covered over 13,500 acres of southwestern Washington County and northern Beaufort County (Frost et al. 1990). As a result of agricultural and forestry development around the tract, VSGL is isolated from other natural areas found in East Dismal Swamp and the Roanoke River floodplain. Without much opportunity to connect this site to other natural areas, the importance of VSGL in providing critical habitat is significant. Due to the tracts size and relatively intact mature pond pine pocosin, the majority of VSGL is considered a Significant Natural Heritage Area by the North Carolina Natural Heritage Program (2013).

Ditching during the mid to late 20th century dried much of the area and the sandy and loamy soils that were once wet have largely been converted to pine plantations. The cypress and swamp tupelo are mostly absent on the VSGL because of logging and ditching. Today, the sites that were once suitable for cypress and tupelo are dominated by red maple, sweetgum, and sweetbay.

Although much of the habitat types on VSGL are different than they were in the mid-1900's, the game land offers important large-scale habitats for neo-tropical migrant songbirds and provides soft mast for wintering songbirds. As a protected tract from future development and deforestation, VSGL is an important travel corridor for dispersing black bears. Due to the property's size and unique habitat qualities, the site has been listed as Regionally Significant by the Natural Heritage Program.

Van Swamp lies in a basin between the Suffolk and Pinetown scarps. The extensive drainage system in and around VSGL accelerates dewatering of the landscape. Although not as effective at filtering stormwater runoffs as it was prior to ditching, VSGL does offer some stormwater retention and filtering benefits. With intensive agriculture and timber production practices upstream of VSGL, stormwater runoff is slowed allowing some sediment and nutrient settling before leaving the game land where the water is channelized and emptied into Pantego Creek. Parts of the Pantego Creek and Pungo River have been classified as Strategic Habitat Areas by the North Carolina Division of Marine Fisheries (2016).

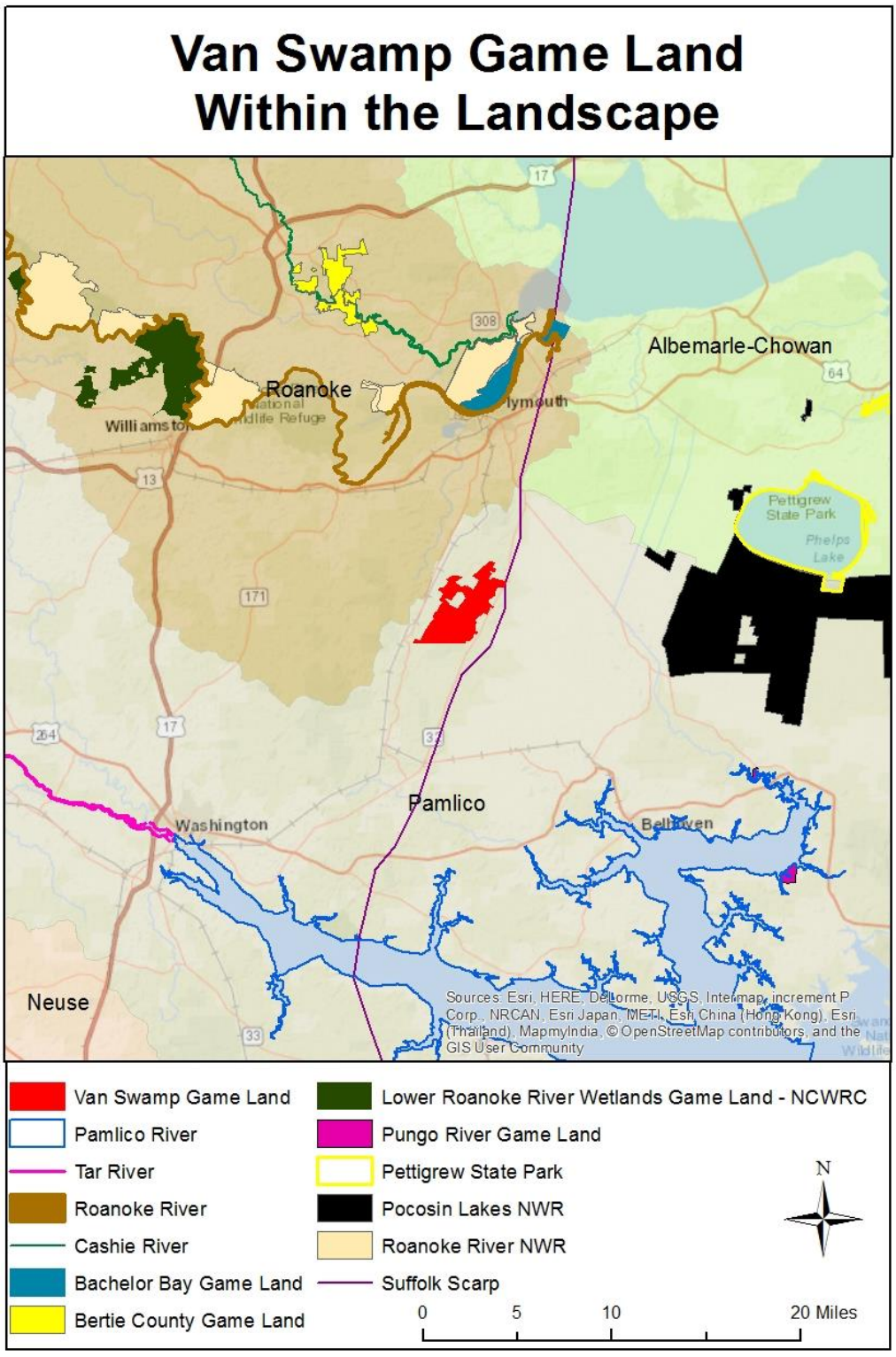


Fig. 3. Conservation lands near Van Swamp Game Land.

Game Land Specific Information

Location and Size

Van Swamp Game Land is located in southwestern Washington County and northern Beaufort County, 12 miles south of Plymouth, NC. The game land encompasses 5,504 acres and has one 360-acre inholding that is owned by Weyerhaeuser. The game land is largely a hydrologically altered basin between the Suffolk Scarp, which is roughly North Carolina Highway 32, to the east and along the Pinetown Scarp which is roughly Long Ridge Road to the west.

Climate

Beaufort and Washington counties fall into the humid subtropical climate zones as does most of North Carolina. Average annual temperature for the years 1981-2010 is 61.9 degrees Fahrenheit. July and August typically being the warmest months with daytime temperatures near 90 degrees Fahrenheit (National Oceanic and Atmospheric Administration 2016). The average yearly precipitation is 51.9 inches, with June, July, August, and September being the wettest months (National Oceanic and Atmospheric Administration 2016). The first freeze for Plymouth averages October 30th and the average last freeze is April 8 (National Weather Service 2016). Winds are typically out of the west and northwest during the fall and winter months and south and south west through the spring and summer (State Climate Office of North Carolina 2013).

Significant rainfall occurs with tropical systems. Hurricanes that have severely impacted the area in recent history were Floyd in 1999, Isabel in 2003, Irene in 2011, Matthew in 2016.

Soils

Since VSGL lies in a basin between two scarps, or ridges, the lack of natural drainage has had a significant impact on the soil types found on the game land. Pungo muck represents 35.8%, or 1,970 acres, of the soils on the game land. Pungo muck is nearly level and poorly drained. This soil type has a high organic component and is highly acidic. Within the game land, Pocosin-Pond Pine Woodlands are a representative habitat found on these soils. The primary use for Pungo muck soils are woodland and wildlife habitat.

Belhaven muck makes up 33%, or 1,817 acres, of the soils on VSGL. Like Pungo muck, Belhaven muck is nearly level and poorly drained. It is also highly organic and acidic. Unlike Pungo muck, Belhaven muck can be suitable for agriculture if drained and the proper nutrients are added. On VSGL, the Non-riverine Wet Hardwood Forest dominate this soil type.

Most of the loblolly pine stands are on Portsmouth fine sandy loam soils. These soils represent 24.2%, or 1,332 acres, of the game land. Portsmouth soils are nearly level and very poorly drained. Wetness is a limiting factor on its use.

The remaining 385 acres, 7% of the game land, is represented by 12 soil types. Half of these are represented by less than 5 acres each and are located on the fringes of the game land. USDA-NRCS online Web Soil Survey data were used to create the soils map (U.S. Department of Agriculture 2016*a*, *b*)(Fig. 4).

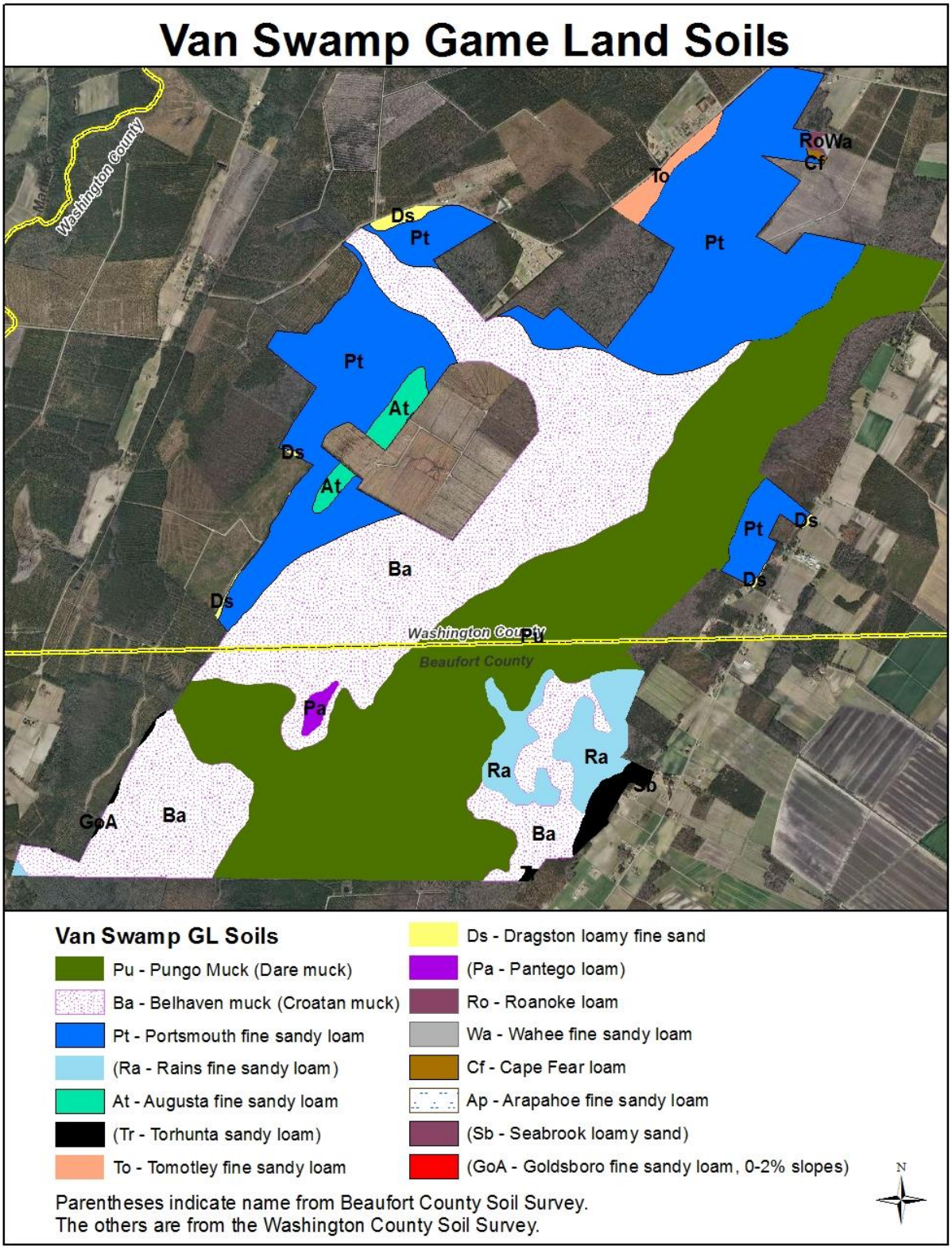


Fig. 4. Soils of Van Swamp Game Land.

Hydrology

Van Swamp Game Land lies in a basin between the Suffolk Scarp on the east and the Pinetown Scarp on the west. Van Swamp once occupied over 13,500 acres (Frost et al. 1990). Historically, a portion of the area was a flooded non-riverine swamp forest dominated by swamp tupelo, bald cypress, and Atlantic white cedar. Aerial photography suggests that the majority of the ditching on VSGL occurred in the 1960's to access timber resources. Through the dewatering of the landscape, VSGL and the lands that surround it, have been permanently altered. Today, only a few scattered cypresses can found on the game land. Atlantic white cedar and swamp tupelo are largely absent, replaced by red maples and sweetbay.

The Pond Pine Woodlands are located on hydric soils with peat deposits. The altered hydrology due to artificial ditching has lowered the water table in this habitat community likely leading to some soil subsidence.

All the precipitation from VSGL and from adjacent privately owned parcels eventually works its way through the extensive ditch network on the game land before draining under NC Highway 32 at the Van Swamp bridge. The water then is channelized through the Albemarle Drainage District. Ultimately the water drains to Pantego Creek and the Pungo River.

Hydrologic engineers will have to conduct a study to determine if hydrologic restoration could occur on a portion of the game land. Such a study must take into consideration negative effects to surrounding landowners and game land infrastructure.

Habitats

Other than the road and ditch infrastructure, VSGL is completely forested. The four habitat types identified on VSGL are Dry Coniferous Woodlands, Nonalluvial Mineral Wetlands, Oak and Mixed Hardwood/Pine Forest, and Pocosin.

Nonalluvial Mineral Wetlands, more specifically classified as Non-riverine Wet Hardwood Forest, occurs on 2,205 acres of the game land. Prior to the ditching of the land in the 1960's, this area likely exhibited qualities more associated with the Non-riverine Swamp Forest habitat type with a large portion of the canopy dominants being bald cypress and swamp tupelo. Today, the habitat features red maple, sweetgum, sweetbay magnolia, scattered loblolly pine, and oaks, with the occasional bald cypress and swamp tupelo (swamp black gum).

Dry coniferous woodlands make up 34.5% (1,900 acres) of the game land. The two communities in this habitat can be represented as managed loblolly pine plantations and more natural stands of loblolly pine with mixed hardwoods like red maple, sweetgum, and yellow poplar. The loblolly pine plantations offer land managers the greatest flexibility in habitat manipulation of the forest types existing on VSGL.

"Pocosin" is an Algonquin Indian term meaning "swamp on a hill" and was fitting for the Pond Pine Woodlands type of Pocosin habitat that is present on VSGL prior to ditching. The Pond Pine Woodland occupies 1,355 acres (25%) of the game land and is drier since the ditch network was installed. The understory is a nearly impenetrable tangle redbay, fetterbush, and laurel greenbrier. Pond pines are slowly being replaced with red maple and sweetbay magnolia as the thick understory is preventing pond pine recruitment.

Oak Forest and Mixed Hardwoods/Pine make only a small component of the game land with 44 acres. Oaks, sweetgum, red maple, and yellow poplar with a scattering of pines are the canopy dominants. Over time, some of the pine plantations will be converted stands with site appropriate mast producing hardwoods.

Surrounding Land Use

Washington and Beaufort counties are mostly rural counties with 2015 estimated populations of 12,385 and 47,651 respectively (U.S. Department of Commerce 2016*a,b*). The largest towns in each county are Plymouth in Washington County and Washington in Beaufort County.

Agriculture accounts for 140,155 acres in Beaufort County and 87,036 acres in Washington County (U.S. Department of Agriculture 2016*c*). Major crops for both counties were cotton, soybeans, peanuts, corn, potatoes, and wheat.

Beaufort and Washington counties are heavily forested. Beaufort County has 277,300 forested acres accounting for 52% of the county's land area. Corporate and forest industry landowners make up 38.5% of the forest ownership. Thirty-eight percent (84,200 acres) of Washington County is forested with corporate and forest industry landowners accounting for 27% of the forested area (Brown 2002).

Corporate forest, private forest, and agricultural lands are the primary land uses that border the game lands.

Cultural Resources

North Carolina is not only known for its natural history, but also its rich historical/cultural resources. No known archaeological sites have been identified on VSGL. Unauthorized artifact collecting activities on all state owned property including Commission owned lands are prohibited by the Archaeological Resources Protection Act (G.S 70 Article 2)(Appendix I).

Acquisition History

Working with The Nature Conservancy, the NCWRC leveraged funds from the North Carolina Natural Heritage Trust Fund and the Clean Water Management Trust Fund to acquire VSGL from Georgia-Pacific Corporation in 2000.

Purpose of Van Swamp Game Land

Van Swamp Game Land lies in an area of the coast that has historically experienced conversion of natural habitats to agriculture and intensively managed forests. Ultimately, VSGL is largely an island of intact, maturing natural habitats surrounded by intensively managed pine plantations and agricultural fields. Because of its isolation from other natural areas, VSGL's role in providing critical habitat is significant. The Non-riverine Wet Hardwood Forests are important for many neo-tropical migrant songbirds. The Pond Pine Woodlands offer soft mast forage for black bear and wintering songbirds.

The North Carolina Department of Natural Resources has designated VSGL as a Dedicated Nature Preserve. The Articles of Dedication designations recognize the natural importance, and many times, the sensitive nature that the habitats have to human interference (Fig. 5). The Articles of Dedication terms and conditions guide land managers on appropriate uses of the land (Appendix II). Furthermore, the North Carolina Natural Heritage Program has identified portions of the Pond Pine Woodlands and Nonalluvial Mineral Wetlands a Significant Natural Heritage Areas (North Carolina Natural Heritage Program 2013).

Van Swamp lies in a basin between the Suffolk and Pinetown scarps. The extensive drainage system in and around VSGL accelerates dewatering of the landscape. Although not as effective at filtering stormwater runoffs as it was prior to ditching, VSGL does offer some stormwater retention and filtering benefits. With intensive agriculture and timber production practices upstream of VSGL, stormwater runoff is slowed allowing some sediment and nutrient settling before leaving the game land where the water is channelized and emptied into Pantego Creek.

A comprehensive species inventory has not been completed for VSGL. Table 1, lists the state and federally listed species that are known or thought to occur on the game land and their conservation status based on NC Gap Analysis Project (McKerrow et al. 2006, North Carolina Natural Heritage Program 2016).

The diversity and scale of the habitats on VSGL are attractive to many wildlife species and hunters. Van Swamp Game land was acquired primarily to provide public hunting, trapping, and wildlife observation opportunities. Hunting has a long tradition on VSGL. The game lands offer hunters the opportunity to pursue white-tailed deer, black bear, wild turkey, and small game associated with forested habitats. The diverse habitats and species richness also attracts wildlife viewers. Van Swamp Game Land is part the NC Birding Trail.

Table 1. Potential federal or state listed species found on the Van Swamp Game Land. See Appendix III for status and ranking descriptions.

Taxonomic Group	Scientific Name	Common Name	NC Status	US Status	NC Ranking	US Ranking
Bird	*Setophaga virens waynei*	Wayne's Black-throated Green Warbler		FSC	S_2S_3B	G_5T_3
Mammal	*Corynorhinus rafinesquii macrotis*	Rafinesque's Big-eared Bat - Coastal Plain subspecies	SC	FSC	S_3	$G_3G_4T_3$
Mammal	*Condylura cristata*	Star-nosed Mole	SC		S_2	G_5T_2Q
Reptile	*Sistrurus miliarius miliarius*	Carolina Pigmy Rattlesnake	SC		S_3	$G_5T_4T_5$
Reptile	*Crotalus horridus*	Timber Rattlesnake	SC		S_3	G_4

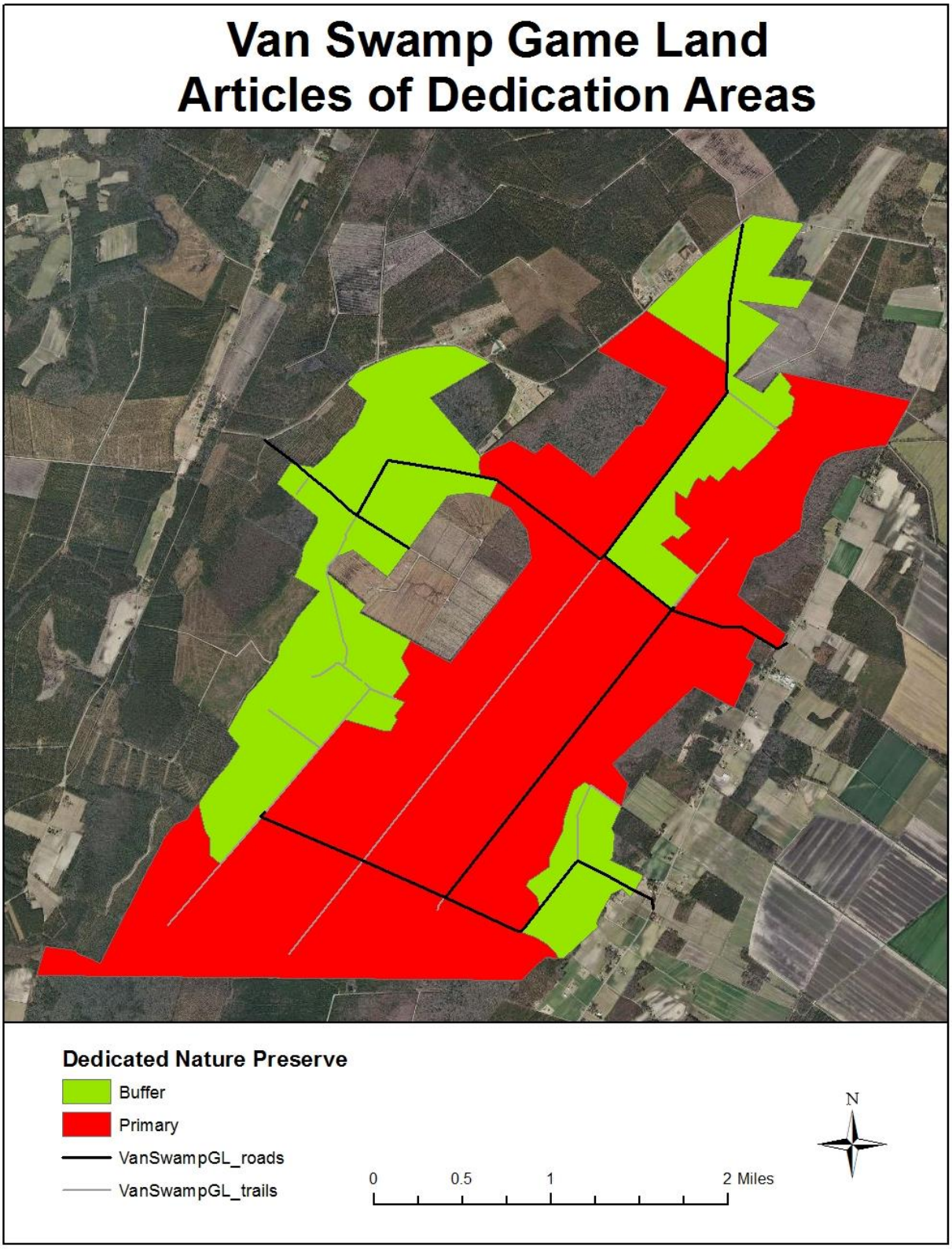


Fig. 5. Dedicated Areas on Van Swamp Game Land.

Game Land Goals and Measures of Success

Goals

- Provide for a diversity of habitat types through science based land management practices to ensure that a wide variety of terrestrial and aquatic wildlife species are conserved on the game land.

- Conserve popular game species at huntable levels through science based land management and sound regulations.

- Provide quality habitat across the game land for endangered, threatened, and rare species to promote sustainable and perpetual populations.

- Provide sufficient infrastructure and opportunity to allow game lands users a quality experience while on the game land with minimal habitat degradation and minimal conflict among user groups.

Measures of Success

- Introduce prescribed burning in Pond Pine Woodlands and Nonalluvial Mineral Wetlands were appropriate.

- Increase Oak and Mixed Hardwood-Pine Forest stand type by 5% throughout the game land on appropriate sites as pine plantations reach the end of their rotation.

- Monitor, suppress, and control invasive plant species.

- Continue prescribed burning program in the Dry Coniferous Woodlands as conditions allow with a goal of a 5-year or less return interval.

- Address priority roads and projects outlined in the *Infrastructure Development and Maintenance* section of this plan.

- Evaluate potential hydrological restoration.

- Efforts are made to monitor and provide information from the Green Growth Toolbox to planners for long range transportation planning and local land use planning that may affect habitat quality and the ability to manage habitats on the game land.

Habitat Communities

Pocosin

The Algonquin Indian term "pocosin" means "swamp on a hill". On VSGL, the Pocosin habitat is characterized as Pond Pine Woodlands. Pond Pine Woodlands typically occur on outer parts of domed peatlands on poorly drained interstream flats, and peat-filled Carolina bays and shallow swales (Schafale and Weakley 1990). Schafale and Weakley (1990) generally characterizes the vegetation component of Pond Pine Woodlands to be an open to nearly closed canopy of pond pine, sometimes codominant with loblolly bay, and with lesser amounts of sweetbay magnolia, red maple, loblolly pine, swamp bay, and Atlantic white cedar. With the lack of frequent fire, the shrub layer is typically tall and dense with titi, maleberry, fetterbush, dangleberry, gallberry, large gallberry, and sweet pepperbush (Schafale and Weakley 1990). Laurel greenbrier (*Smilax laurifolia)* is usually present entangled in thick patches. Where frequent fires have occurred over a long time period, the Pond Pine Woodland understory is dominated by switchcane, with few shrubs (Schafale and Weakley 1990).

Pond Pine Woodland with laurel greenbrier thicket.

A. Location and Condition of Habitat (Fig 6)

Pond Pine Woodlands account for 1,355 acres (25%) of the habitat on VSGL. This habitat type is mapped as a single unit although there are several roads and trails built for access from previous landowners (Fig. 6).

The Pond Pine Woodlands on VSGL are largely characteristic of the Schafale and Weakley (1990) descriptions of that habitat. Pond pine is a dominant canopy species shared with loblolly bay, red maple, and sweetbay magnolia. The understory is a nearly impenetrable tangle of redbay, fetterbush, and laurel greenbrier (Frost et al. 1990). Pond pines are slowly being replaced with red maple and sweetbay magnolia as the thick understory is preventing pond pine recruitment.

The ditching of the site has caused to ground to be drier than what would be typical in a more natural setting. The lack of fire in this habitat contributes to the thick shrub layer and buildup of fuels.

Logging likely took place in the Pond Pine Woodlands; however large pond pines are present throughout most of the habitat. High wind events are the major reason for pond pine mortality. The Pond Pine Woodlands on VSGL are important habitats because of the availability of soft mast for black bears and wintering songbirds.

B. Priority Species

Van Swamp Game Land is somewhat isolated from other protected lands in the region which increases the value of the habitats found there. The priority game species identified for Pond Pine Woodlands include white-tailed deer and black bear. The following table lists protected nongame species potentially found in this habitat type and their conservation status. The timber rattlesnake and Wayne's black-throated green warbler are confirmed as present on the game land. Rafinesque's big-eared bats are not confirmed but possibly occur there.

Table 2. Listed non-game species associated with Pocosin habitats (North Carolina Wildlife Resources Commission 2015).

Taxonomic Group	Common Name	Scientific Name	State Status (Federal Status)	Natural Heritage State and Global Rank
Birds	Wayne's Black-throated Green Warbler	*Setophaga virens waynei*	(FSC)	S_2S_3B, G_5T_3
Mammal	Rafinesque's Big-eared Bat	*Corynorhinus rafinesquii macrotis*	SC(FSC)	S_3, $G_3G_4T_3$
Reptile	Timber (Canebrake) Rattlesnake	*Crotalus horridus*	SC	S_3, G_4

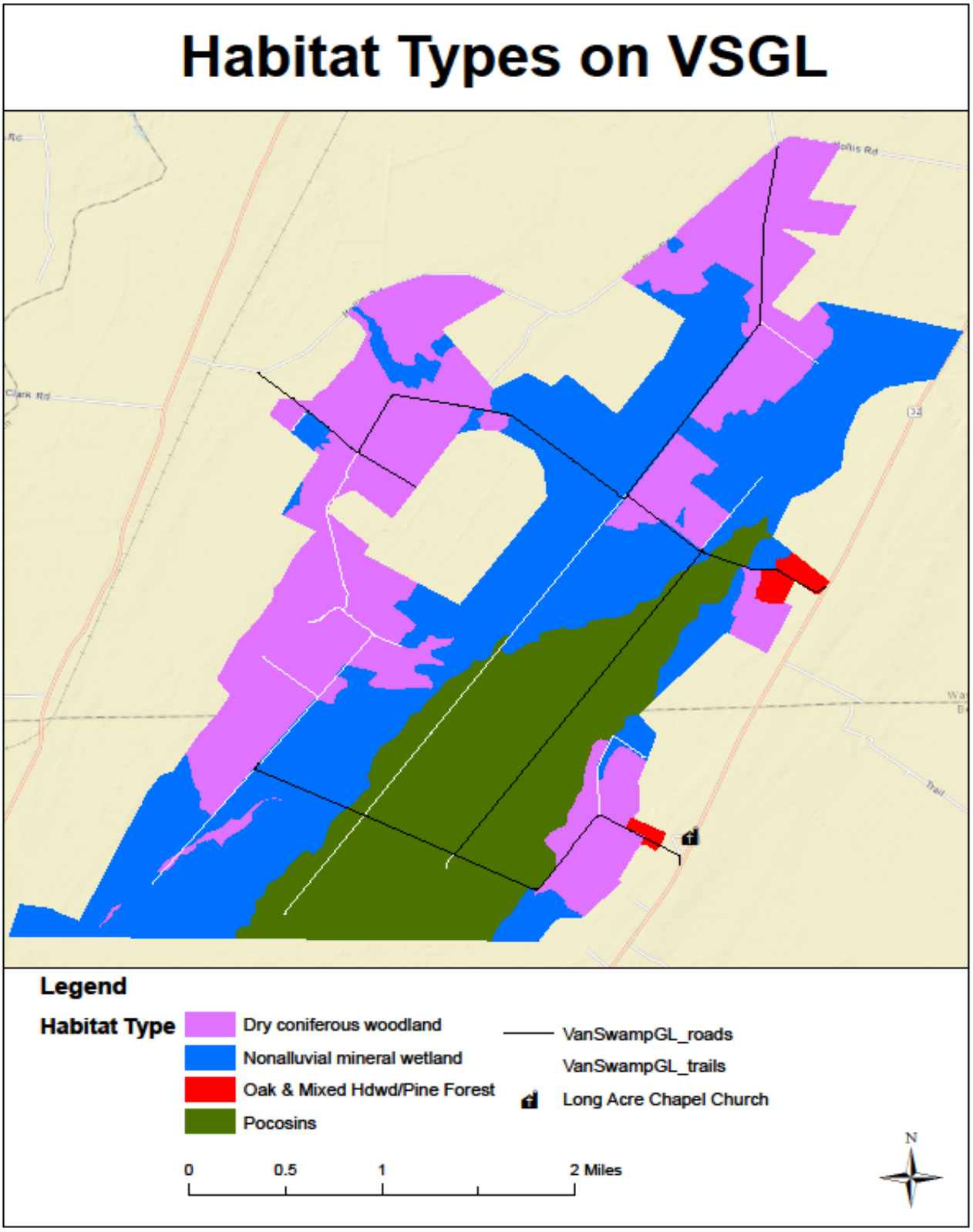


Fig. 6. Habitat types on VSGL.

B. Priority Species

Van Swamp Game Land is somewhat isolated from other protected lands in the region which increases the value of the habitats found there. The priority game species identified for Pond Pine Woodlands include white-tailed deer and black bear. The following table lists protected nongame species potentially found in this habitat type and their conservation status. The timber rattlesnake and Wayne's black-throated green warbler are confirmed as present on the game land. Rafinesque's big-eared bats are not confirmed but possibly occur there.

Table 2. Listed non-game species associated with Pocosin habitats (North Carolina Wildlife Resources Commission 2015).

Taxonomic Group	Common Name	Scientific Name	State Status (Federal Status)	Natural Heritage State and Global Rank
Birds	Wayne's Black-throated Green Warbler	*Setophaga virens waynei*	(FSC)	S_2S_3B, G_5T_3
Mammal	Rafinesque's Big-eared Bat	*Corynorhinus rafinesquii macrotis*	SC(FSC)	S_3, $G_3G_4T_3$
Reptile	Timber (Canebrake) Rattlesnake	*Crotalus horridus*	SC	S_3, G_4

C. Management Challenges

An appropriate management action for the Pond Pine Woodlands would be to introduce prescribed fire on a 3 to 5-year rotation, however, conditions on VSGL make conducting prescribed fire in pocosin habitats difficult. Because of lower water tables due to ditching, when, forest fuels are conducive to burning, the organic soils may also burn creating smoke management issues. Since fire has been absent in this habitat, fuel loads are high thereby increasing the fire intensity and potential mature tree mortality. Many pocosin type plants have waxy leaves that can be difficult to burn under controlled conditions. Many times, when the pocosin will burn, conditions are approaching hazardous.

The lack of natural fire breaks and the difficulty in installing temporary plow lines within the pond pine stands limits managers ability to divide the site into small enough burn units that can be managed. The large blocks and heavy fuels create smoke management issues, further limiting the number of acceptable burn days. When considering the short window of opportunity to burn when the surface fuels are able to burn and the risk of substantial ground fire is low, it is not impossible to reintroduce fire into this habitat. However, being able to continue a burning program on rotation to significantly improve the wildlife habitat value is a major challenge when it may be more beneficial to burn elsewhere with the limited equipment and manpower resources.

D. Management Strategies and Needs

The Articles of Dedication would limit timber management activities to a salvage operation of damaged trees following a catastrophic event, such as a hurricane. Since large rain events typically accompany a hurricane, timber salvage operations in these sites are an unlikely scenario. Therefore, passive management with minimal site disturbance is the intended strategy.

Suppression of exotic plant species would be a desirable and a conservation easement permissible activity within this habitat. Initially, monitoring to identify affected areas, species identification, and determination if control is feasible is the current priority. Development and implementation of a control plan before an infestation is too widespread could be within the temporal scope of this document with specific treatment measures formulated in annual planning documents.

E. Desired Future Conditions

In most cases, the desired future conditions in the Pond Pine Woodlands with soft mast production and maintaining a pond pine dominant canopy have been met. Introducing prescribed fire and being able to maintain a prescribed burning regime would shift the sub-canopy shrub layer to a switchcane dominant understory. Using fire as a management tool could help reduce the intensity of wildfires. Without management actions to promote pond pine regeneration the pond pine canopy will be succeeded by maples and bays.

Nonalluvial Mineral Wetlands

Nonalluvial Mineral Wetlands occur on poorly drained areas of the eastern coastal plain (North Carolina Wildlife Resources Commission 2005). The two types of Nonalluvial Mineral Wetlands are Non-riverine Swamp Forest and Non-riverine Wet Hardwood Forest. Non-riverine Swamp Forest typically contain a canopy of varying mixtures of bald cypress, pond cypress, swamp tupelo, loblolly pine, pond pine, Atlantic white cedar, yellow poplar, and red maple depending on previous disturbances (Schafale and Weakley 1990). Non-riverine Wet Hardwood Forest are typically found in the less wet sites as opposed to the Non-riverine Swamp Forest and are dominated by various hardwood trees typical of bottomlands. Typical species include swamp chestnut oak, laurel oak, cherrybark oak, yellow poplar, sweetgum, American elm, and red maple (North Carolina Wildlife Resources Commission 2005, Schafale and Weakley 1990).

A. Location and Condition of Habitat (Fig. 6)

Prior to the ditching of the land in the 1960's, this area likely exhibited qualities more associated with the Non-riverine Swamp Forest habitat type with a larger portion of the canopy dominants being bald cypress and swamp tupelo. Today, the habitat can be classified as Non-riverine Wet Hardwood Forest that features red maple, sweetgum, and sweetbay magnolia as dominants with

scattered loblolly pine, oaks, and the occasional bald cypress represented sparsely. This habitat type occurs on 2,205 acres of the game land.

According to Lynch and Peacock (1982), all of the designated natural area at the time had been selectively logged at least once. Large cypress stumps can be found in this habitat and bear witness to previous timbering. The cypress dominants are largely absent today with a few relic trees being found on the game land. The resulting transformation form draining and timbering the Non-riverine Swamp Forest to a habitat that is characteristic of a Non-riverine Wet Hardwood Forest is complete.

Non-riverine Wet Hardwood Forest on VSGL dominated by red maples.

B. Priority Species

Priority game species identified for these habitats include: white-tailed deer, black bear, and wild turkey. Woodcock is likely found in this habitat. The following table lists protected nongame species potentially found in this habitat type and their conservation status. The timber rattlesnake and Wayne's black-throated green warbler are confirmed as present on the game land. Rafinesque's big-eared bats and the Carolina pigmy rattlesnake are not confirmed but possibly occur there. Non-riverine Wet Hardwood Forest are important for a variety of neo-tropical migrant songbirds during the migration and breeding season (Hunter et al. 2001).

Table 3. Listed non-game species associated with Non-riverine Wet Hardwood Forest habitats (North Carolina Wildlife Resources Commission 2015).

Taxonomic Group	Common Name	Scientific Name	State Status (Federal Status)	Natural Heritage State and Global Rank
Birds	Wayne's Black-throated Green Warbler	*Setophaga virens waynei*	(FSC)	S_2S_3B, G_5T_3
Mammal	Rafinesque's Big-eared Bat	*Corynorhinus rafinesquii macrotis*	SC(FSC)	S_3, $G_3G_4T_3$
Reptiles	Carolina Pigmy Rattlesnake	*Sistrurus miliarius miliarius*	SC	S_3, $G_5T_4T_5$
	Timber (Canebrake) Rattlesnake	*Crotalus horridus*	SC	S_3, G_4

C. Management Challenges

The Articles of Dedication Primary designation protects this habitat from potential active management prescriptions.

Van Swamp is a basin between two scarps receiving water from thousands of surrounding acres that drain through VSGL. The extensive ditch network facilitates draining the game land but also the private and industrial timberland on its borders. Before restoring portions of the natural hydrology on the game land, planners must consider impacts to existing infrastructure, habitat and timber value, wildlife, and neighboring landowner needs.

The 2015 North Carolina Wildlife Action Plan (2015) states that the use of fire is an important factor in restoring Non-alluvial Mineral Wetland sites. On VSGL, the size of the hardwood stands and the difficulty of heavy equipment being able to plow lines and negotiate standing and downed timber are challenges to introducing fire into this habitat. Significant coordination with NCWRC's Wildlife Diversity biologist will be needed to address timing of any largescale prescribed burns in the hardwood forest. Non-riverine Wet Hardwood Forest pose a risk of ground fires due to the organic characteristics of the soils and duff layer. Land managers should consider the possibility of soil ignition when prescribed burning during periods of drought, late dormant season, and during the growing season. If conditions are present that would not contain a fire, then fire breaks will be installed between the pine and hardwood stands. Being able to continue a burning program on rotation to significantly improve wildlife habitat value is a major challenge when it may be more beneficial to burn elsewhere with the limited equipment and manpower resources.

D. Management Strategies and Needs

The NCWRC will continue to work with neighboring landowners and state and federal agencies to address drainage through VSGL. Restoring some of water holding potential will benefit the NCWRC during periods of drought, during prescribed burns, and in the event of wildfires.

Introducing fire into portions of the Non-riverine Wet Hardwood Forest is a long-term management possibility. This management plan opens the possibility of introducing fire into these habitats but developing a prescribed burn plan will require further logistical considerations not covered by this plan. Fire planners will have to consider timing of a burn and wildlife use of the habitat, fire control line installation, smoke management, potential loss of canopy trees as a result of fuel buildup around the base of trees, ground fire potential, and the size of the burn unit. With limited manpower, other burn blocks within a work area may take priority over burning in these habitats.

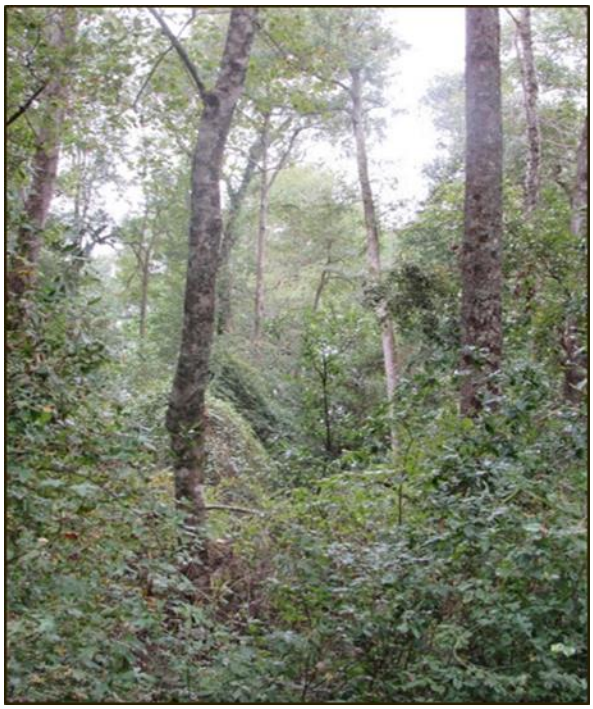
Suppression of nonnative invasive plant species would be a desirable and a conservation easement permissible activity within this habitat. Initially, monitoring to identify affected areas, species identification, and determination if control is feasible is the current priority. Development and implementation of any control plan with specific treatment measures will be formulated in annual planning documents when the need arises.

E. Desired Future Condition

In some cases, the desired future condition in the Non-riverine Wet Hardwood Forest of ample mast production, adequate numbers and size of tree cavities, an abundance of coarse woody debris, and conditions for habitat specialists have been met or are proceeding in that direction without additional active management activities. Some stands are considerably younger and characteristics of a more mature forest are not present. Oak species are limited in abundance or absent altogether in most of these stands. Ideally, oaks would represent a larger component in the forest canopy. Toward that goal, small restoration areas in this forest type on the game land have focused on oak reestablishment through planting desired species. As pine plantations on the game land reach the end of the timber rotation, larger sites suitable for this forest type may be artificially regenerated with appropriate canopy species.

The wetland habitats that lie adjacent to managed pine stands will undergo changes in the understory where fire is reintroduced on the drier sites. An ideal condition where the managed uplands meet the hardwood forest is to restore the "feathered edge effect" in the transition zone by limiting the use of fire breaks in this ecotone and allowing prescribed fires to burn into the wetlands.

Overall, a hands-off approach to management in the Non-riverine Wet Hardwood Forest is an acceptable management prescription. Older, mature stands offer important wildlife benefits, especially to neo-tropical migrant songbirds. Younger stands will continue to grow and overtime provide mast and tree cavities.



Non-riverine Wet Hardwood Forest on VSGL.

Oak and Mixed Hardwood-Pine Forest

Timber stands classified as Oak and Mixed Hardwood-Pine Forest are a minor component of VSGL, comprising less than 1% (44 ac.) of the property. In addition, there are inclusions within adjacent stands that have the appropriate tree species but are too small to map. Two factors influence the small percentage of the tract in this forest type. Site soils combined with hydrology are not appropriate on most sites to support the canopy species and suitable sites have been converted to pine plantations by the previous landowner. Several stands, grouped in two locations on the game land, are mapped as Oak and Mixed Hardwood-Pine Forest type and lie between the 30 and 38 feet above sea level contours on sandy loam soils. The land formations for these stands are nearly-level upland flats rarely subject to flooding. Unless intentionally applied, fire does not play a role in shaping this forest type on the tract. The naturally regenerated portions of these stands are 40 years old or greater, while planted sections are less than 10 years old. The occurrence of the natural stands resulted from odd areas being left out of stand conversions to pine plantations. The planted stands are a deliberate attempt to reestablish oak-dominated hardwood stands where ecologically appropriate.

Dominant tree species of the VSGL Oak and Mixed Hardwood-Pine Forest type include: Southern red oak, water oak, and willow oak, sweetgum, tulip poplar, and loblolly pine. Sourwood, American holly, and sparkleberry are typical mid-story species. Understory species, depend upon successional stage and range from grasses and sedges to woody stems, such as greenbrier and grapes.

A. Location and Condition of Habitat (Fig. 6)

The locations of the current and potential future Oak and Mixed Hardwood-Pine Forest stands are at the tracts perimeter on the shoulders of the scarps that frame the Van Swamp basin. Species composition in the older stands meets desired condition objectives. As expected, the younger stands have a significant component of pioneer tree species more adept at utilizing resources at an early age. Upon reaching merchantable size, a mechanical thinning treatment will be needed in the regeneration stands to achieve future desired conditions within the current timber rotation. As the presently young to mid-rotation stands age, they will have increased value for mast production and cavity development.

B. Priority Species

Priority game species for management in this forest type are wild turkey and gray squirrel. Opportunistic use of mast-producing resources by black bear and white-tailed deer occurs seasonally as well. Wood thrush is a representative songbird species in the mid-rotation forest stands, while eastern towhee prevails in the sapling-age stands.

The following table lists selected nongame species potentially found in this habitat type and their conservation status.

Table 4. Listed non-game species associated with Oak and Mixed Hardwood-Pine Forest habitats.

Taxonomic Group	Common Name	Scientific Name	State Status (Federal Status)	Natural Heritage State and Global Rank
Mammal	Rafinesque's Big-eared Bat	*Corynorhinus rafinesquii macrotis*	SC(FSC)	S_3, $G_3G_4T_3$
Reptile	Timber (Canebrake) Rattlesnake	*Crotalus horridus*	SC	S_3, G_4

C. Management Challenges

Two primary challenges have been identified involving restoration of the Oak and Mixed Hardwood community type on the game land. First, attempting to establish a forest canopy with later successional species in the small units available on the game land presents difficulties with readily available natural seed sources for pioneer tree species. Second, what is a suitable site now may not be over the long term and should be evaluated on that basis before reestablishment is undertaken. Previously installed drainage measures have created suitable conditions for this forest type on what were wetter soils. The absence of ditch maintenance or future intentional modifications to the existing drainage network may negatively influence the suitability of site conditions for desirable oak and hardwood establishment. An additional challenge involving specific sites are that some practices may be regulated by NCNHP Articles of Dedication, so are

not available for active management involving mechanical removal of trees, regardless of the management intent. Sites with dedication restrictions applied will take much longer to meet desired future conditions through natural succession processes.

D. Management Strategies and Needs

Identification of applicable sites and continued reestablishment of this forest type as pine plantations reach the end of their rotation is a primary need. Concurrent with establishment, a planned mechanism to maintain desired tree species composition needs to be in place, given that pioneer tree species will otherwise dominate the site. A variety of methods may be employed involving chemical, mechanical, or fire treatments to benefit development of desired species. As these stands reach a dynamic equilibrium, long-term management action will be passive in nature. Well beyond the scope of this plan, monitoring species composition with as-needed maintenance measures as individual stems cycle out of the stand would be prudent.

E. Desired Future Conditions

The target condition for this forest type is a fairly continuous canopy of mature uneven-aged trees, populated by predominately mast-producing species providing a sustained yield of snags, cavities, and downed woody material for wildlife habitat. Most of these elements are in place to some extent with the exception of age class diversity. In the natural stands, the attrition of individual stems has been through competition rather than old age and the compressed crowns of suppressed stems have not created canopy gaps for new regeneration. In addition, all trees in planted stands have the same origin date, therefore essentially all the stands, both natural and planted, are even-aged. However, all these stands are progressing toward the desired future condition, requiring time for tree maturity and the development of desired stand characteristics. Recognizing that developing more of the Oak & Mixed Hardwood-Pine Forest type on the game land is an appropriate long-term goal, working towards five percent of the game land acreage in this forest type is realistically attainable.

Dry Coniferous Woodlands

The Dry Coniferous Woodland type comprises slightly more than one-third (1,900 acres) of the forest at VSGL. The Dry Coniferous Woodland type primarily consists of loblolly pine, most which was established by planting for fiber production. Where the tree canopy is open, a hardwood mid-story is prevalent. The understory is quite variable depending upon hydrology, soil type, canopy closure, and time since last management treatment.

Thinned pine plantation on VSGL.

A. Location and Condition of Habitat (Fig. 6)

All the Dry-Coniferous Woodland stands at Van Swamp are situated on the 30 foot above sea level contour or greater. While there are naturally regenerated stands on mineral soil pockets or areas influenced by drainage measures, approximately 90% of all stands in this forest type on the game land were planted. All the planted pine stands are associated with the road system whereas some of the naturally regenerated stands are more remotely located. All of the stands were established prior to acquisition by the State, with planted stands ranging in age from 17-46 years. The oldest loblolly pine stands are two isolated natural stands on the properties southwest side where a topographical rise allowed for pine establishment and difficulty in access limited harvesting activity. Most of the naturally occurring stands are small units averaging 12 acres in size, while planted stands average 53 acres. The planted stands were developed with commercial timber production in mind, so stand size relates to the minimum acreage needed to be economically feasible for logging and other stand treatments.

According to published soil surveys for Beaufort and Washington counties, approximately 10% of the forest type lies over soils mapped as organic Croatan and Pungo series mucks (U.S.

Department of Agriculture 2016a, b). The remaining stands overlie loamy soils with varying degrees of organic content and hydrology regimes, possessing high productivity ratings for loblolly pine growth. Most of the planted stands have some drainage measures installed, while natural stands only benefit incidentally from ditches where they border roads. Stands fronting on Hollis Road at the north end of the tract, ranging from mature thinned stands to younger regeneration nearing first thin age, offer a representative look at pine stands at Van Swamp on loam soil types.

Canopy closure within loblolly pine plantations not yet thinned are limited to red maple and shade-tolerant herbs. About 450 acres, which constitutes about 26% of the plantations, are in this condition. The rest of the merchantable stands have received at least one thinning treatment. In addition to soil type, forest stand treatments have significantly influenced midstory and understory plant characteristics. Stands underlain by sandy loams tend to be dominated by sweetgum regeneration. In general, the poorer-drained loams have understory species characteristic of the prior converted stand type. The vegetation gradient runs from sweet pepper bush, bracken fern, switchcane, and blackberry on mineral loams to red maple, loblolly bay, gallberry, and greenbrier on soils with an organic component. Where prescribed burning or herbicide treatments have been applied, blackberry, grasses, and ferns have prevailed.

B. Priority Species

The primary game species frequenting the Dry Coniferous Woodland type on VSGL are black bear, white-tailed deer, and wild turkey. Management regimes promoting blackberry-dominated understory has seasonal benefits for deer and bear with soft mast production. Prescribed burning has developed and maintained turkey nesting habitat that is limited on the tract. Marsh rabbit occur in adjacent forest stands and utilize pine stands with early successional characters. Pine warbler is well represented in the mature thinned stands, while ovenbird is commonly occurring in plantations yet to be thinned. All records for red-cockaded woodpeckers are historic with no recent observations, relict cavities on the tract, or known active clusters in the vicinity. Timber rattlesnakes have been observed utilizing this habitat type at VSGL. The following table lists nongame species potentially found in this habitat type and their conservation status.

Table 5. Listed non-game specie associated with Dry Coniferous Woodlands habitat.

Taxonomic Group	Common Name	Scientific Name	State Status (Federal Status)	Natural Heritage State and Global Rank
Mammal	Rafinesque's Big-eared Bat	*Corynorhinus rafinesquii macrotis*	SC(FSC)	S_3, $G_3G_4T_3$
Reptile	Timber (Canebrake) Rattlesnake	*Crotalus horridus*	SC	S_3, G_4

C. Management Challenges

The soil types in the tract interior have severe limitations for equipment operability due to wetness. Those site conditions limit mechanical timber treatment activities to the summer months. This factor has limited timely timber harvests, so that during wet years, ground conditions are not suitable for work even in summer months. Despite high site productivity, where loblolly pine plantations are merchantable for a first thinning by age 15, most are not thinned on a schedule promoting improved growth rate and fostering better wildlife habitat.

Implementation of a prescribed burning program is confronted with the potential for ignition of organic soils. Magnifying this issue are existing drainage measures, which dry upper soil horizons at a faster rate resulting in a higher susceptibility for ignition, that shorten the usual window of opportunity for burning.

While thinning plantations, some of the adjacent naturally-regenerated stands could be receiving a thinning treatment for forest stand health and wildlife habitat improvement. However, areas outside of plantations were included in primary dedication designations restricting timber harvesting activities.

D. Management Strategies and Needs

The primary management strategy in this forest type has been two-fold. First, is to thin stands as soon as merchantability specifications are reached, when site conditions will allow. As noted, it is not always on the optimum schedule, but eventually the harvest prescriptions have been applied. The second is to opportunistically treat stands with prescribed fire as soil moisture will allow. This method has not developed a consistent burn rotation or treated all stands, but on treated stands has averaged a burn one out of every five years.

With an interest by landowners in the downstream watershed in having the NCWRC retaining some water within the game land tract during storm events, there is potential for hydrology restoration on portions of the tract. Hydrology restoration could have benefits in terms of natural forest type reestablishment and mitigating risks of soil ignition in prescribed burning.

Four timber stands have eclipsed their financial lifespan with no growth response anticipated from another thinning treatment. Consequently, a replacement plan needs to be in place prior to reaching the end of their biological lifespan or prior to loss of significant timber value. The trigger to implement a rotation-ending treatment is when desired habitat values decline. Evaluation of site conditions dictating suitability for continuation in a pine rotation or conversion to another forest type, as well as consideration of tract habitat goals are important considerations. There are options on how to accomplish the stand replacement, that may involve final harvest and replanting, natural regeneration through retention of parent trees, or a phased-in approach using selection harvests toward developing a multi-aged mixed-species stand.

Following site evaluations for the stands in question, selection of specific appropriate treatments will be defined in annual forest management plans.

E. Desired Future Conditions

Stands that have been thinned and have had a burn treatment applied have achieved the desired future condition for the current planning period. Although outside the scope of this plan, it is anticipated that as loblolly pine plantations reach the end of their rotation, many of the timber stands in this type will be converted to either Non-Riverine Wet Hardwood or Oak and Mixed Hardwood-Pine forest types to address habitat needs.

Infrastructure Development and Maintenance

Assessments of existing infrastructure throughout VSGL were conducted by Land and Water Access Section staff on September 28, 2016. The infrastructure map (Fig. 7) shows the locations of existing public roads, administrative access roads, trails, parking areas, and gates within VSGL. The results of the assessments along with recommendations for maintenance and improvements are discussed by category below.

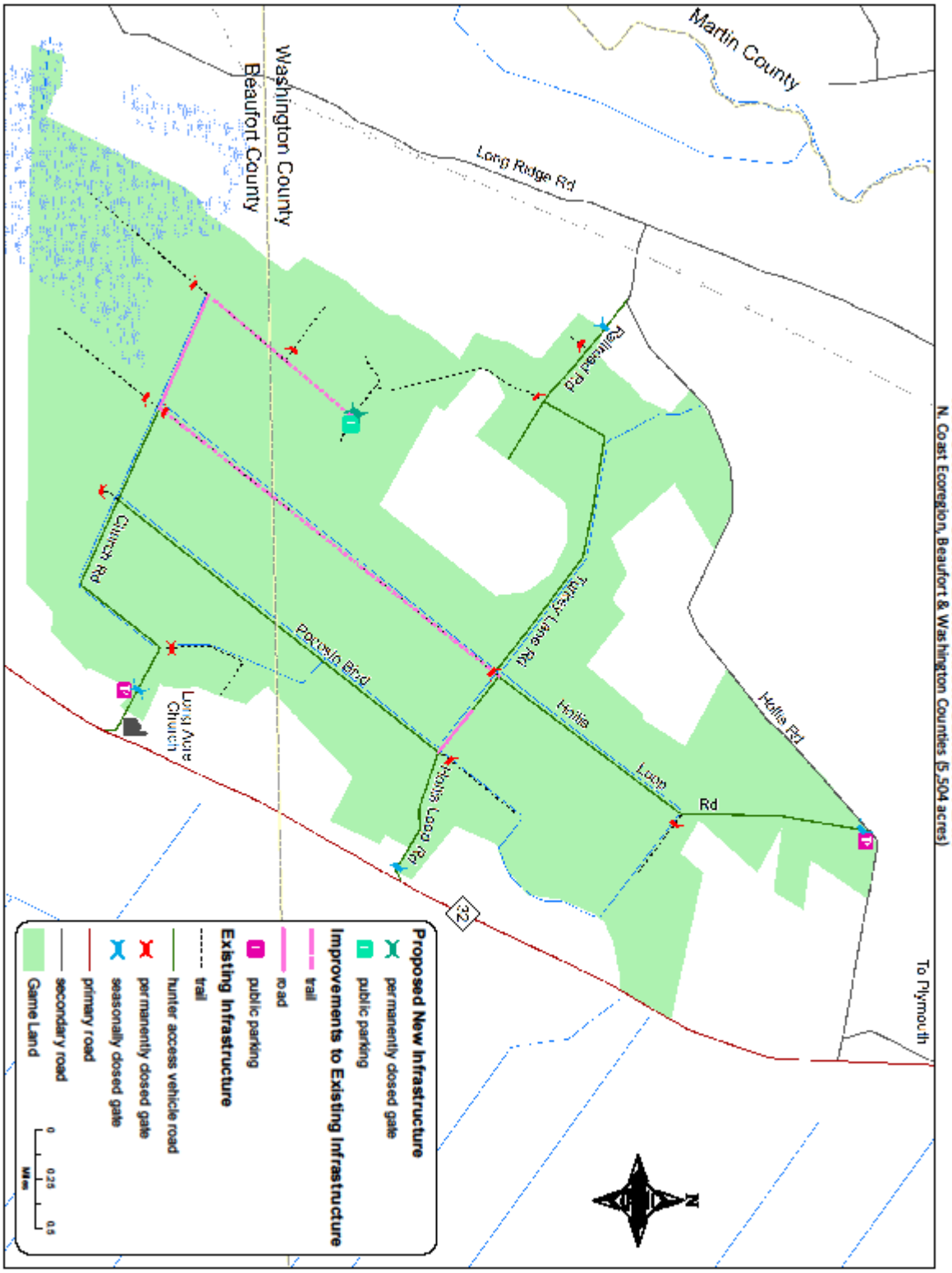


Fig. 7. Infrastructure Map

Road Assessment

Van Swamp Game Land has an existing road network of 18.8 miles. Of those, 10.8 miles are public access gravel roads and 8 miles are NCWRC access roads/public foot trails (referred to as trails). The majority of the roads run parallel with canals and were constructed as the area was ditched. The road network was constructed prior to the NCWRC acquiring the property and establishing the public game land.

Good access is provided to the majority of the game land. The roads on VSGL are used by NCWRC staff to access the game land for maintenance and conservation work. They are also used by the public for hunting, hiking, geo-caching, wildlife viewing, and other outdoor recreational purposes.

Existing Road Conditions

The roads within VSGL are generally in good condition with most of the open roads able to handle vehicular traffic during wet conditions. There are isolated areas where additional gravel is needed.

The major roads in the best condition include the following:

Railroad Road

This 1.0-mile road veers off Hollis Road near the game land entrance and dead ends at an inholding property. This road accesses 2 trails. This road has a gravel surface and plenty of shoulder room for vehicles to pass and pull over.

Turkey Lane Road

This 1.7-mile road is part of the central east-west route through the game land in conjunction with Railroad Road and Hollis Loop Road. This road has a gravel surface and plenty of shoulder room for vehicles to pass and pull over.

Pocosin Boulevard

This 2.1-mile road serves as an interior north-south connection between the game land's Church Road and Hollis Loop Road. This road has a gravel surface and plenty of shoulder room for vehicles to pass and pull over.

The remaining roads within the game land have recommended improvements. The roads with recommended improvements are in fair condition and need additional gravel and/or gravel maintenance. The future road improvements have been prioritized as high, medium, or low. It should be a goal to perform the high priority projects over the next ten years, with the medium priority projects done next as resources allow. At the end of this ten-year period, a new assessment will be performed and new priorities set.

Future Road Improvements

Maintenance and needs for future improvements were identified on the remaining existing sections of NCWRC access roads. The recommended road improvements discussed in this section are grouped by priority.

High Priority

While the above-mentioned roads are in good condition, there are many more roads that need different levels of upgrades. Over the next ten years, the highest priority roads for upgrade are the following:

- Church Road
- Church Road Extension
- Daylighting of trails
- Unnamed trail
- Annual gravel funding

Church Road

This 2.6-mile road accesses the game land off of NC 32 on a ROW easement near Long Acre Chapel Christian Church. The westernmost 0.6 miles is in poor condition due to a cluster of large holes and additional rock is needed. This will have an estimated upgrade cost of $60,000.

Church Road Extension

Beyond the current dead end of the Church Road, it is recommended that 0.95-miles of trail to the north (right hand turn at current dead end) be improved to a public access gravel road. This section of the Church Road was used as a public road in the past. The road was gated and converted to a trail due to poor conditions. This improvement will also result in the need to remove 1 existing gate, install 1 new gate, and create 1 new parking area. Reopening this portion of the road will provide better interior access to hunters. This will have an estimated upgrade cost of $190,000.

Daylighting of Trails

It is recommended that trails be daylighted. A contractor should be hired to mulch all trees and saplings on the canal sides of the roads and trails and remove all vegetation to the tree line and up to 20' high on the woods side of the roads and trails. This will have an estimated cost of $50,000

Unnamed Trail

This 2.2-mile trail with no official name is a connector between Church Road and Hollis Loop Road and parallels Pocosin Boulevard. This road should be improved for NCWRC equipment access. Holes should be filled in and the road should be regraded. This will have an estimated upgrade cost of $15,000.

Annual Gravel Funding

The road network within VSGL is overall in good condition. However, the roads' subgrade is organic and "spongy" so small problems can quickly intensify without prompt attention. To maintain the good condition of the road network, it is recommended that the game land have a dedicated allotment of $15,000 to spend on gravel and small trouble areas so they are quickly addressed.

Medium Priority

The following road is considered medium priority and should be repaired after the high priority projects are completed.

- Hollis Loop Road

Hollis Loop Road

This 3.3-mile road connects from the NC 32 game land entrance to the north to the Hollis Road entrance and accesses 3 trails. This road has a gravel surface and plenty of shoulder room for vehicles to pass and pull over. The majority of the road is in good condition. There is 1 low spot to the west of the intersection with Pocosin Boulevard that is regularly overtopped with high rain events. It is recommended that this portion or road should be raised with an estimated upgrade cost of $10,000.

In October 2016, Hurricane Matthew caused overtopping that washed a 2-3 feet deep ditch through the above-mentioned section of road. Emergency repairs were planned by field staff to safely reopen the game land to the public.

New Road Construction

As previously mentioned, there is an extensive road network currently in the VSGL. In addition, the game land is a Dedicated Natural Heritage Area where new development is not permitted. Due to these two factors, no new roads are recommended.

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 costlier the repairs will be.

Typical Road Maintenance Practices

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 costlier the repairs will be.

- Inspect Roads regularly, especially before the winter season and following heavy rains.
- Keep ditches and culverts free from debris (see 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 motorgrader 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.

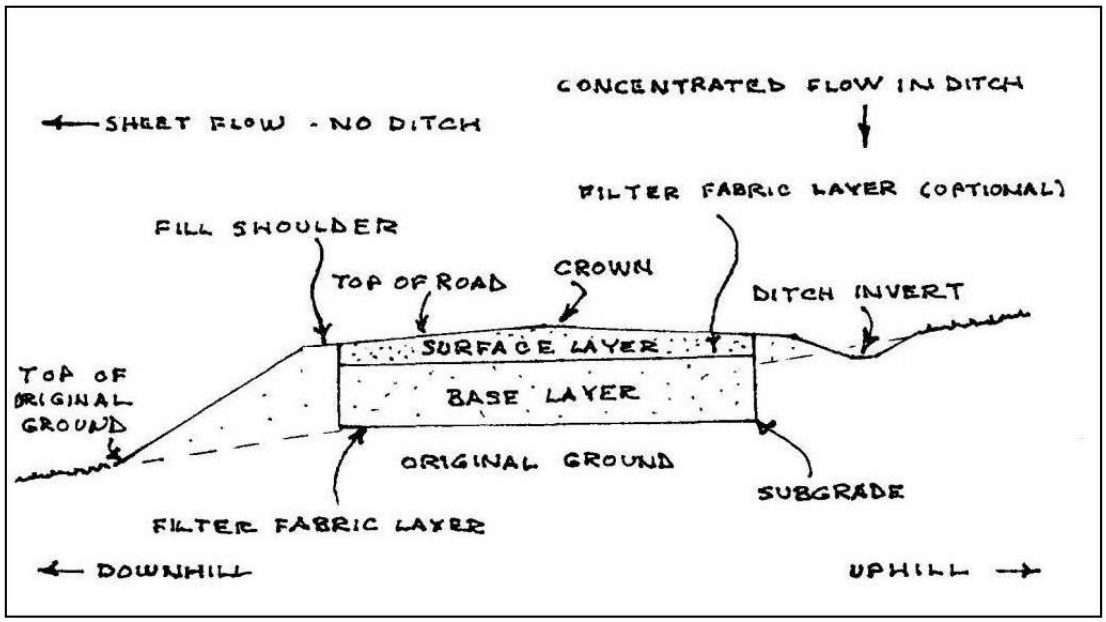


Fig. 8. Typical Road Cross Section (Canaan, New Hampshire Highway Department 2013).

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.
  - 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 entrance to a game land off of a DOT road. Information kiosks should be located near the entrances and in parking areas.

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 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 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 additional 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

Van Swamp Game Land has 2 designated parking areas: at the Hollis Road entrance and at the Church Road entrance. The roads within the game land have wide shoulders and vehicles are able to park on the sides of roads without blocking traffic.

Both existing parking areas are recommended for maintenance. Both need additional gravel and new fencing. Maintenance cost would be approximately $2,500 each.

One new parking area is recommended to be constructed in conjunction with the Church Road extension. It should be constructed at the north end of the road.

Any new parking area should provide a gravel surface (approximately 6" layer of compacted ABC stone) and provide enough parking for three to five vehicles. Depending on the amount of clearing and grading required, it is estimated that each parking area will cost between $5,000 and $15,000.

Gates

There are several gates located throughout the game land, which limit access to certain roads and portions of the game land. Most the gates on the game land are swing gates and appear to be in good condition. The game land is typically closed to public vehicles during spring turkey season, with all gates closed and locked. Interior gates on the game land are closed year round to keep public vehicles off of trails and are open for public foot traffic.

One new gate is recommended at the end of the Church Road extension. The existing gate at the existing dead end of Church Road is recommended to be removed in conjunction with the extension being upgraded.

Drainage Structure Assessment

Dams

Van Swamp Game Land has no lakes/ponds or associated dams to be inspected.

Waterfowl Impoundments

Van Swamp Game Land has no impoundments.

Culverts

Due to the size of the game land, and total quantity of culverts, there is no feasible way to locate and inspect every existing pipe. However, during the road investigation with field staff, several culverts were identified as needing repair or upgrade. These include the following:

Hollis Loop Road at Pocosin Boulevard Intersection
This is a 60" aluminum culvert, approximately 42' long, running under Hollis Loop Road. This is the last pipe in the network of canals within the game land and nearly all water that leaves the game land leaves through this culvert. Adjacent to the game land is an agricultural area and allowing additional water to leave the game land is not desired and therefore a larger size is not recommended. This culvert should be considered for replacement with a water control structure. This would be beneficial in a wildfire event or control burn situations.

Hollis Loop Road at Bend/Spur Trail
Two 48" steel culverts, approximately 43' long, running under Hollis Loop Road where there is a slight bend and a spur trail at a 90^{o} canal bend. This culvert has a wood headwall with a high level of scour on the invert. It is recommended to repair the scoured areas around the headwall, assessing the need to lengthen the headwall during the repair and fill and rip rap be added to inlet and outlet for protection. The area of road at this culvert location has equipment tracks that appear to be creating secondary ditching. While this is not the suspected primary cause of the headwall scour, it is recommended to regrade this small area of road and eliminate the tracks as part of the maintenance work.

Turkey Lane Road & Unnamed Trail (3 culverts)
The intersection of Turkey Lane Road and the unnamed trail has 3 culverts: 1 on the northeast quadrant under Turkey Lane which is a 36" steel culvert, approximately 36' long and 2 on the southeast quadrant under the unnamed trail which are 36" culverts, approximately 35' long, 1 steel and 1 aluminum. All 3 of these culverts are recommended for replacement. The culvert under Turkey Lane Road experienced wash out during Hurricane Matthew subsequent to the initial infrastructure assessment and will receive emergency maintenance to reopen the game land.

This road and canal intersection creates a U-turn in the water flow and pathway. All 3 of these culverts should be analyzed to determine the appropriate sizes and rip rap or headwalls should be added to provide inlet and outlet protection. If regulations for development allowed, this entire section should be evaluated to see if the U-turn in the water system can be eliminated.

Church Road at Existing End/Trail T-intersection

Two 36" steel culverts, approximately 36' long, runs under the southwest quadrant of the Church Road trail. These pipes are in a very swampy location and in poor condition. These culverts are recommended for replacement. These culverts should be analyzed to determine the appropriate size and rip rap or headwalls should be added to provide inlet and outlet protection.

Railroad Road

This culvert is a 30" steel culvert, approximately 24' long, that runs under Railroad Rad near the seasonal gate. This culvert is clogged and should be replaced.

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 near 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.

Recreational Facilities Assessment and Non-Traditional Uses

Van Swamp Game Land experiences few recreational activities other than hunting and trapping. There are no boating access areas, fishing access areas, or shooting ranges. The game land is part of the NC Birding Trail so non-traditional uses such as hiking and bird watching do occur.

There are no recreational facilities on VSGL, and no new facilities are recommended.

Shooting Ranges

There are no existing public shooting ranges within VSGL. No new public shooting ranges are recommended.

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. 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. Van Swamp

Game Land currently has no existing geocaches, therefore no parking areas or trail improvements are recommended related to that activity.

Hiking/Bird Watching

The game land contains many miles of roads, which have typically been used for hunter access. Hiking is becoming a more popular activity and will continue to be a demand on game lands. Van Swamp Game Land is part of the NC Birding Trail and it is marked as such with signage on existing entrance kiosks. Parking and signage improvements would benefit these users in addition to the hunters. Hiking trails should be on existing roads and trails which will allow NCWRC staff to maintain the trails.

Horseback Riding

Currently, unregulated horseback riding may occur on the game land. Existing infrastructure is considered adequate to meet the needs of horseback riders at VSGL.

Hunter Bridges

Hunter bridges are used to cross the large ditches and canals. There are existing wooden crossovers that hunters and research projects have put in place. Consideration should be given to replacing the wooden structures with steel or aluminum bridges that will provide more stability and longevity as bears damage wooden structures on other game lands. The estimated cost to replace the bridges could range from $5,000 to $10,000 per bridge depending on the size and foundation requirements.

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)

Signage

- Kiosk (entrance, regulation and information)
  - ADA
  - No Parking

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.

Public Uses

As stated previously in the Game Lands Program Mission Statement, primary public uses of North Carolina game lands are hunting, fishing, trapping, and wildlife viewing. However, the NCWRC recognizes 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.

As the human population of North Carolina has rapidly grown, state-owned game lands have received increasing pressure to provide public outdoor recreation opportunities. These uses include traditional activities such as hunting, fishing, trapping, and wildlife viewing, as well as other outdoor recreational pursuits. While hunting, fishing, trapping and wildlife viewing are the primary public uses of state-owned game lands, the NCWRC has always allowed other dispersed and non-developed recreational activities. The funding sources of the NCWRC; however, are focused on natural resources management rather than recreational development. 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 these lands.

As a response to these increasing pressures, the NCWRC developed a Game Lands Use Evaluation Procedure to provide a statewide framework for determining appropriate uses for Commission-owned or controlled game land properties.

Different User Groups of Van Swamp Game Land

Based off anecdotal information and input received from the public input processes that opened with a public input meeting held in Plymouth, NC on October 24, 2017 and with online comments received October 24, 2016 through January 13, 2017, we have made our best determination of different user groups that occur on the VSGL. Only 4 individuals provided comments through the online system and no comments were received at the public input meeting on October 24, 2016.

Traditional Game Land Users

- Hunters
- Fishermen
- Trappers
- Wildlife viewers

Discussion of Traditional Game Land Users

Hunters make up the largest user group on the game land with deer hunting being the most popular. Wildlife viewers are likely only a small percentage of users with most people joyriding through the game land. Overall, we believe that traditional users are satisfied with opportunities provided by an open game land.

Deer Hunters

Good deer hunting opportunities are available on the VSGL. The large blocks and thick habitats along with good road access make VSGL a popular dog deer hunting game land. Still hunters can also use the 8 miles of trails to find secluded areas to hunt. According to registered harvest data from the 2011-2015 hunting seasons, hunters not using dogs accounted for 69.2% of the deer harvest (North Carolina Wildlife Resources Commission, Big Game Reporting, 2011-2015, unpublished data). Overall, we currently believe that deer hunting opportunities, which include hunter access, habitat management, and the numbers of deer are adequate to satisfy this user group.

Bear Hunters

Van Swamp Game Land, in southwestern Washington and northern Beaufort counties, contains high-quality habitat for many wildlife species, but is especially significant in providing habitat for black bears. Van Swamp was added to the game lands program for the 2001-2002 hunting season as a Six Day Per Week Area. Hunters were able to hunt bears for the entire county seasons in November and December and all roads and trails on the game land were open to vehicles. Recognizing the interests from hunters of Van Swamp, the NCWRC commissioned a study to examine hunter attitudes on bear hunting VSGL (Palmer et al. 2006). Palmer et al. (2006) reported that 18 bears were harvested from VSGL in 2001. In 2002 and 2003, hunters reported 2 and 6 bears, respectively, harvested from Van Swamp and reported at NCWRC check stations.

To manage the black bear resource and the game land, the NCWRC staff installed gates effectively restricting vehicular access from 8 miles of road. This action in conjunction with shortening the length of Van Swamp's bear season to 3 days during the November season and 3 days during the December season has helped Van Swamp continue to have a black bear resource. Van Swamp Game Land is a small game land when considering the needs of a bear. Increasing access to more roads or increasing the number of hunt days for bear harvest could have a negative effect on bear numbers. Although bear hunting opportunities on VSGL may not meet the needs of some hunters, opportunities provided at Alligator River Game Land, Buckridge Game Land, and Lantern Acres Game Land in Tyrrell County offer excellent bear hunting.

Turkey Hunters

Van Swamp Game Land generally consist of a mix of Nonalluvial Mineral Wetlands, mature Pocosin Woodlands, and pines stands with many pine stands having undergone thinning that provide turkey habitat. The roads during the spring and summer offer brooding habitat.

To provide turkey hunters a better hunting experience, the NCWRC keeps all gates closed. Hunters can walk in and not have to worry about other hunters searching for a spot or joyriders driving by. The 2014-2016 3-year average wild turkey harvest on VSGL is 6.33 birds/year.

We currently believe that turkey hunting opportunities on VSGL are sufficient. We believe that infrastructure, habitat management, and the numbers of turkeys available to harvest are at levels to satisfy this user group.

Waterfowl Hunters

Waterfowl hunting opportunities on VSGL are very limited. There are no waterfowl impoundments. Possible opportunities arise when beavers dam ditches and canals flooding the adjacent timber. Articles of Dedication restrictions prohibit the creation of waterfowl impoundments.

Small Game Hunters

Small game hunting opportunities are thought to be good on this property. This determination is based on anecdotal information alone as hunters are not required to report small game harvests. Currently, small game hunters have the opportunity to harvest quail, rabbits, gray squirrels, opossums, bobcat, raccoon, and fox.

An effort has been underway to increase the early-successional habitats on the game land through timber thinning and prescribed burning to provide cover, brooding, and nesting areas for quail and rabbits. The Non-riverine Wet Hardwood Forests should provide opportunities for raccoon and woodcock hunting. No additional infrastructure is needed to serve this group.

Webless Migratory Game Bird Hunters

Webless migratory game bird hunting opportunities on this property are thought to be very low. There are no openings on the game land that can be managed for mourning doves.

Although our management activities typically are not focused on woodcock, there are several excellent areas to pursue them on the game land. According to a statewide survey of woodcock hunters, 0.6% of hunters listed VSGL as one of three game lands where they hunted woodcock most often during the previous 5 years (North Carolina Wildlife Resources Commission, 2012 Woodcock Hunter Survey, unpublished data). Working inside existing game land boundaries and through the Articles of Dedication requirements, the NCWRC offers appropriate opportunities to hunt webless migratory birds.

Fishermen

There are no fishing opportunities on VSGL.

Trappers

Trapping of furbearers is currently thought to occur at low levels. No public comments were received that indicated satisfaction, or the lack of, with trapping opportunities on the VSGL. The NCWRC is currently unaware of any specific infrastructure needs that would provide better opportunities for trappers. Additionally, we believe that ample opportunity is provided to trappers.

Wildlife Viewers

Wildlife viewing is thought to occur on a small scale. The long roads with no good loop likely discourages some users. Van Swamp Game Land is part of the NC Birding Trail and most wildlife viewing may be attributed to the NC Birding Trail. Parking lots on the Church Road and the Hollis Loop Road are adequate to meet the needs of this user group when the gates are closed.

The Roanoke River National Wildlife Refuge may be a more popular location for this activity. According to the Roanoke River National Wildlife Refuge Comprehensive Conservation Plan, approximately 2,000 visitors use the refuge for wildlife viewing every year (USFWS 2005). With the proximity to the Refuge and very low participation on the game land, we feel that needs are met for this user group.

Non-traditional Game Land Users

- Bicyclist
- Campers
- Geocachers
- Outfitters and eco-tourism
- Hikers and runners
- Horseback/trail riders
- Photographers
- Researchers, universities, and museums
- Target shooters
- Joyriders and sightseers
- ATV riders and other off-road vehicles
- Other illegal activities

Discussion of Non-traditional Game Land Users

We have attempted to determine all game land users of VSGL and have made determinations of appropriateness and compatibility for each use based on the fact that hunting, fishing, trapping, and wildlife viewing are the primary uses. As long as non-traditional uses do not negatively influence the wildlife resources that the NCWRC manages or negatively impact traditional uses, they may be determined appropriate and compatible. Some non-traditional uses require special consideration and are only considered to be appropriate and compatible under certain circumstances. These conditions are outlined in the following sections of the Plan.

Non-traditional users are strongly encouraged to refer to the *North Carolina Inland Fishing, Hunting, and Trapping Regulations* to identify hunting and trapping seasons as well as specific days and times that hunting and trapping occurs on the game land. Out of safety concerns, game land users are also strongly encouraged to wear blaze orange while using game lands. Hunting occurs on nearly every day starting the first week in September until the end of February. The youth turkey season starts in early April and the regular turkey season closes in mid-May. No hunting is allowed on Sundays on game lands.

Bicyclist

Bicycling on VSGL is considered compatible as long as bicyclists stay on designated roads and trails. Impacts to natural resources can be minimized by regulating use through numbers, timing, and conditions of trails. The use of VSGL by bicyclists is currently very low. No new trails will be created as the extensive road system meets the needs for this user group.

Campers

There are no camping opportunities at VSGL. Interest in camping has been very low on this game land. Should interests increase, managers will evaluate potential camping sites that would be permissible under the Articles of Dedication agreement.

Geocachers

We are currently unaware of any geocaching activities that take place on this game land. However, geocaching is considered a compatible activity as long as the NCWRC's geocaching policy is adhered to.

Outfitters and Eco-tourism

Guided hunts are not thought to occur on VSGL.

Eco-tourism on game lands are experiencing a surge in interest from local governments, groups, and entrepreneurs. These people see the game land as a resource to draw in tourism to boost the local economy. It is important for land managers to monitor these activities and document any

issues that may arise. Over use by these activities can negatively impact the resource and traditional users. VSGL does not have the attributes that make eco-tourism a major draw for users.

Hikers and Runners

The use of VSGL by hikers and runners is considered compatible because it creates minimal disturbance to natural resources and is consistent with NCWRC policies and objectives. Hikers and runners traditionally stick to established roads and trails and their impact to the road systems is essentially non-existent.

Out of safety concerns and respect for traditional game land users, hikers and runners should realize and be considerate of all hunting activities on VSGL and the times that they are likely to occur.

Horseback/Trail Riders

Care must be taken when a use is being considered for appropriateness. Horseback riding on the VSGL can be compatible as long as certain restrictions are in place. Horseback riding, above all other non-traditional uses, has the ability to cause more harm to the habitats and wildlife. Currently, there are no regulations restricting where riders can go. Although regulations do not exist on the VSGL, riding in certain areas can violate terms of agreement with the Articles of Dedication with the NC Department of Environment and Natural Resources.

Other potential threats to the game land include the introduction of invasive plants and the disturbance to wildlife. Nesting birds in the spring and summer may abandon a nest if disturbed. Newsome *et. al* (2002) conducted a study on the effects of horse riding on national parks and other natural ecosystems in Australia and determined that environmental impacts include, but are not limited to, soil degradation and compaction, erosion, loss of vegetation height and cover, change in plant species composition, degradation of existing roads and trails, the introduction of invasive grass and weed species, accidental transport of fungal pathogens, and the loss of vegetation.

Horseback riding is thought to occur at low levels on VSGL. The existing road system on the game land meets the needs for this group. Riders should be considerate of the hunting season and ride during times when hunting is not occurring.

Photographers

The use of VSGL by photographers is considered compatible. Photographers create very little impact to the natural resources of the game land and their impacts to roads and trails is minimal.

Researchers, Universities, and Museums

The use of VSGL by researchers, universities, and museums is considered compatible and does not impact management objectives of the game lands program. These entities use the game land for the collection of data for research and educational purposes. It poses very minimal threats to traditional game land users and does not interfere with or disturb the natural resources of this property. These activities are usually handled through NCWRC's permitting process. At times, research activities provide information that may be beneficial to managing the property.

Target Shooters

There are currently no restrictions to target shooting on VSGL outside of designated safety zones. Limited target shooting is allowed as long as it does not create safety concerns for game land users and staff, does not cause destruction to NCWRC property, and litter is removed.

The NCWRC is currently involved in the design and implementation of shooting ranges on game lands across the state. Upon construction of a shooting range on VSGL or other nearby game land, all target and recreational shooting activities will be limited to the shooting range.

Joyriders and Sightseers

Joyriding and sightseeing via vehicle on VSGL is allowed. This activity has similar impacts to infrastructure as other uses and is compatible as long as they do not displace traditional users. This group should be considerate of other users and be aware of hunting seasons to reduce conflicts between user groups.

ATV Riders and Other Off-road Vehicles

The use of ATV's and other off-road vehicles on VSGL is considered an inappropriate use. More times than not, these vehicles create disturbance and cause destruction to valuable resources on game lands. They greatly degrade roads and trails and create erosion and water quality concerns when driven in and around streams. Because these vehicles are very agile and maneuverable, riders tend to stray away from developed roads and trails and into areas that land managers desire to be undisturbed. These actions can be detrimental to various plant and animal communities and offset previous efforts made to conserve and manage these areas. Because ATV's and other off-road vehicles have such a great potential to cause harm and create disturbance to natural resources and other game land users, their use on VSGL is prohibited.

Other Illegal Activities

Illegal activities include wildlife/plant/artifact/mineral theft, vandalism, drug use, and trash dumping. These activities are monitored by the Enforcement Division of the NCWRC.

Information Needs

Our current state of knowledge about wildlife occurrences on VSGL is somewhat limited. Our best knowledge is of big game species. Successful big game hunters are required to identify the game land from which they harvest big game during the registration process. Some surveys of songbirds have been conducted. The distribution and occurrence of many cryptic taxa such as reptiles, amphibians, and small mammals (including bats) are under-surveyed and their relative distribution and abundance are unknown and misunderstood. It would be appropriate to work closely with the Natural Heritage Program or other entities to develop a biological inventory.

Our current knowledge of game animals is limited, even though we know the reported harvest of big game on VSGL. Currently, there are no surveys in place to track changes in population trends for big game animals. At present, we must make assumptions based on hunter harvest data and county-wide deer density estimates (Appendix IV).

The following is our current knowledge of our priority species. These priority species were identified because they are game animals that are hunted or trapped on VSGL or they have a state or federal concern. They are either known to or thought to occur on this game land. The appropriateness of tracking population trends for some wildlife species will be evaluated and appropriate techniques will be identified when it is determined such actions are warranted and only when appropriate levels of staff and funding are available.

The identification of game land hunters (or other users) would allow the NCWRC to generate a general observation survey in which data on the observations of multiple species could be collected by hunters or any game land user interested in recording the requested information. This cooperation by game land users would supplement our survey efforts and potentially reduce workloads required by NCWRC staff to collect this information. Information derived from these surveys coupled with other information collected by field staff can give NCWRC biologists the ability to better estimate and track population trends. This valuable information will help staff determine the best management techniques to implement to achieve our desired future conditions.

Reports of diseased animals should be investigated and, when possible, attempts will be made to diagnose the cause of infection or cause of death. Also, as specific disease surveillances are conducted (Chronic Wasting Disease, Lymphoproliferative Disease Virus, etc.), the game land will be incorporated into the effort when appropriate.

Non-game Wildlife Species

- ***Bird***

Wayne's Black-throated Green Warbler (Setophaga virens waynei)

Current Knowledge

The 2015 North Carolina Wildlife Action Plan (2015) states that the Wayne's black-throated green warbler is nearly confined to Non-riverine Swamp Forest throughout a narrow range from Virginia to South Carolina and that the largest population is thought to be on the Albemarle-Pamlico Peninsula. Although VSGL's Non-riverine Wet Hardwood Forests have different canopy characteristic as Non-riverine Swamp Forests do, Wayne's black-throated green warblers have been documented on VSGL. Wayne's black-throated green warblers are Federally listed as a species of "Special Concern".

Management Needs

The habitats that are associated with Wayne's black-throated green warblers are protected from most management activities through NCNHP Articles of Dedication. Instituting a prescribe burn program in Wayne's black-throated green warbler habitat may be an appropriate management action as Fussell et al. (1995) suggests that the warbler is often found in the vicinity of tall conifers that emerge above the hardwood canopy. A prescribed fire conducted under the right conditions will help control hardwood encroachment on conifer dominants.

Inventory and Monitoring Needs

NCWRC staff should continue with bird surveys in VSGL. Other surveys and inventories are not warranted at this time.

Research Needs

There are currently no known research needs.

- ***Mammal***

Rafinesque's Big-eared Bat (Corynorhinus rafinesquii macrotis)

Current Knowledge

Rafinesque's big-eared bat is a non-migratory bat that uses Pocosins, Non-riverine Wet Hardwood Forest, and Oak-Mixed Hardwood Forest habitats on the game land as roost sites and foraging areas. Hollow trees are probably the most preferred roosting and hibernating sites. Unlike many other bat species that are crepuscular, this bat species is nocturnal. They are

insectivores and are moth-specialists. They are considered a species of "Special Concern" in North Carolina and by the US Fish and Wildlife Service.

Management Needs

Protection of the Pond Pine Woodlands, Non-riverine Wet Hardwood Forest and Oak-Mixed Hardwood Forest should continue. As stands continue to age and mature, hollow trees should develop providing adequate roosting sites for the bats.

Inventory and Monitoring Needs

Van Swamp Game Land may have been involved in an acoustic monitoring of bats project. Researchers may use acoustic listening devices and mist net surveys to detect bats on the game lands.

Although no positive case of White Nose Syndrome (WNS) has been reported in Rafinesque's big-eared bats in North Carolina, NCWRC staff and game land users should report any cases of a white fungus on the nose of bats to the NCWRC.

Research Needs

Research should be focused to determine seasonal roost site selection and specific maternity sites.

- ***Reptiles***

Timber (Canebrake) Rattlesnake (Crotalus horridus)

Current Knowledge

Timber rattlesnakes are known to occur on VSGL. In the Coastal Plain, their use of habitat varies from pocosins to pine woodlands. They primarily feed on small rodents but adults are capable of consuming small rabbits and squirrels. They are a long-lived species with recorded lifespans of up to 28 years in captivity. Declining trends in populations can be attributed to loss of habitat, wanton killing, road kills, and poaching. Timber rattlesnakes are listed as a species of "Special Concern" in North Carolina.

Management Needs

Protection and management of upland forest communities will benefit timber rattlesnakes. Techniques include maintaining open canopies of forested areas and the use of prescribed fire. Management of early successional habitat for small game will also prove beneficial for this species.

Inventory and Monitoring Needs

Observations should be reported to staff or recorded on the NCWRC's online Wildlife Observation Application to document occurrences and/or range expansion for this species.

Research Needs

There are currently no known research needs.

Carolina Pigmy Rattlesnake (Sistrurus miliarius miliarius)

Pigmy rattlesnakes are not known to occur on VSGL but are identified as occurring in habitats within VSGL (NCWRC 2015). The NC Gap Analysis Project also lists the Carolina pigmy rattlesnake as possible occurring at VSGL (McKerrow et al. 2006). Pigmy rattlesnakes feed on lizards, mice, and frogs and will sometimes eat other small snakes. Declining trends in populations can be attributed to loss of habitat, wanton killing, road kills, and poaching. Carolina pigmy rattlesnakes are listed as a species of "Special Concern" in North Carolina.

Management Needs

The habitats that are associated with pigmy rattlesnakes are protected from most management activities through NCNHP Articles of Dedication. Although not documented on VSGL, enforcement officers should be aware of illegal collections.

Inventory and Monitoring Needs

Observations should be reported to staff or recorded on the NCWRC's online Wildlife Observation Application to document occurrences and/or range expansion for this species.

Research Needs

There are currently no known research needs.

- ***Game Animals***

White-tailed Deer

Current Knowledge

White-tailed deer is the most abundant big game species on the game land with Beaufort and Washington county deer densities averaging 15 to 29 deer/mi^2 (NCWRC 2016). Deer hunting on VSGL follows the eastern deer season. VSGL is a 6-day per week game land and deer hunting is allowed the entire season, excluding Sunday's. Maximum harvest (either sex the entire season) is allowed. The size of this game land and the fair to good condition of the road infrastructure make this a popular game land for hunters using dogs, which was a traditional method of hunting

the property before state acquisition. With 8 miles of trails that are closed to vehicles, most still hunters have adequate hunting spots to go to escape vehicle traffic from hunters using dogs. According to registered harvest data from 2011-2015 hunting seasons, hunters not using dogs accounted for 69.2% of the deer harvest (North Carolina Wildlife Resources Commission, Big Game Reporting, 2011-2015, unpublished data).

Based on the 2013-2015 registered harvest, the total deer harvest per square mile on VSGL was 8.47 deer per square mile, which is much higher than the counties averages (Fig. 9). Antlered buck harvest per square mile was much higher on the game land than it was on all lands in Beaufort and Washington counties. The doe harvest per square mile was also high on the game land but closer to the counties harvest than the antlered buck harvest was. This information comes from the registered harvest and gives a snapshot of harvest and its use may provide for a consistent index of the harvest over time. Van Swamp Game Land sees a high level of deer hunting pressure combined with low selectivity of which deer are harvested, good access, and timber management work which influence the annual high harvest levels.

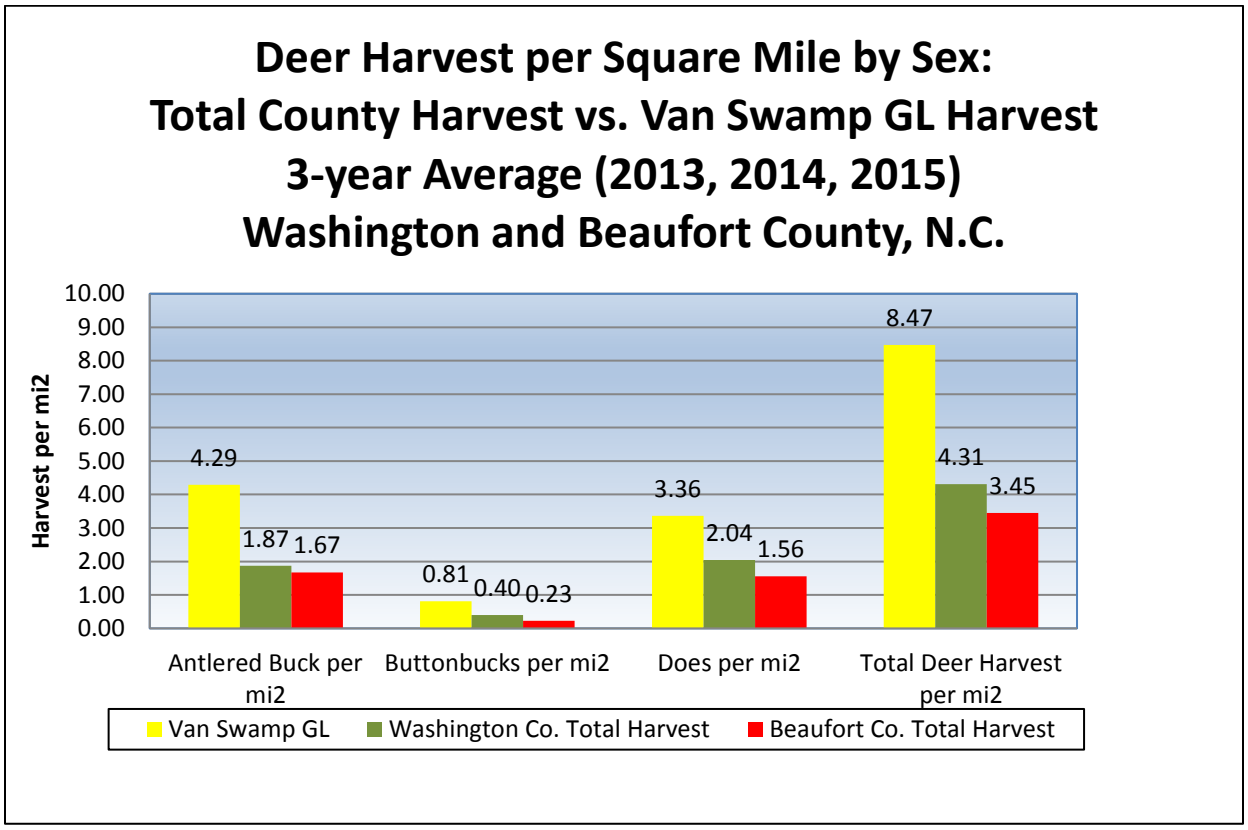


Fig. 9. Harvest per square mile.

The deer harvest on the Game Lands is composed of a higher percentage of male deer (includes button bucks) than Beaufort and Washington counties (Fig. 10). The reasons for the difference in hunter selection between private lands and games lands may vary. Game land users may not be willing to drag harvested deer great distances, yearling buck movement may increase the

bucks' chances of being seen and therefore harvested, game land users may be content harvesting any antlered deer and not pass up the smaller bucks, or private land hunters/clubs may have adopted antler restrictions therefore reducing harvest mortality on the younger bucks. A management goal set by the deer evaluation tool calls for a total harvest comprised of at least 50% does. According to the registered harvest data, hunters that reported not using dogs harvested fewer does, 39.5% compared to 48% of does in the harvest from hunters using dogs (North Carolina Wildlife Resources Commission, Big Game Reporting, 2011-2015, unpublished data).

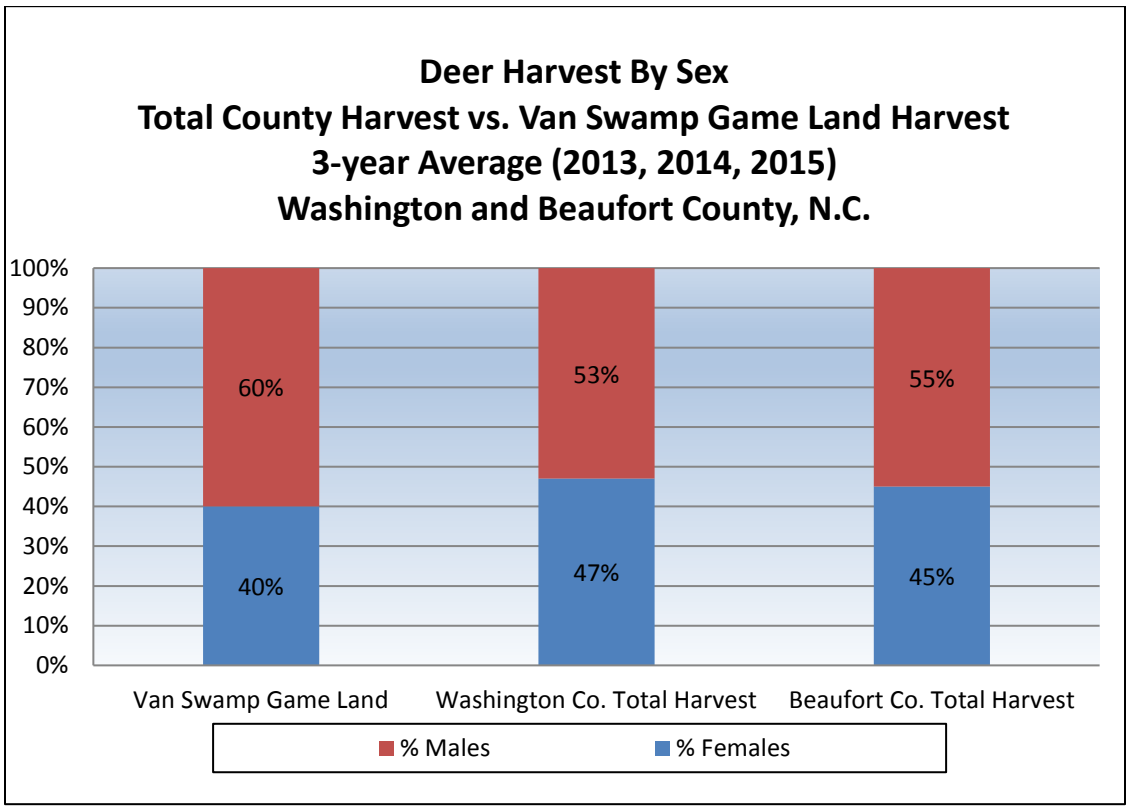


Fig 10. Percent harvest by sex.

Adequate biological data can provide some index of age-composition of the harvest. For VSGL, very little biological data has been gathered from hunter harvested deer that could aid biologist to make management recommendations. Collection of biological data from hunter harvested deer on and off the game land is extremely labor intensive. More biological data must be collected on both the game land and private land in order to use age and sex data to guide deer management actions.

Management Strategy

As a habitat generalist, white-tailed deer will benefit from the continuation of current land management practices. NCWRC will continue to manage the game lands in a manner that supports a wide array of wildlife species. Timber management with an objective to convert loblolly pine plantations into desirable mast producing hardwoods on appropriate sites should increase habitat quality for deer. Active habitat management, particularly forestry activities (thinning, clearcutting, burning, and roadside management, should continue to maintain and increase forest habitat quality for deer, particularly quality browse. Annual food plots will be considered on trails that are closed to vehicles.

Deer management recommendations for the game land to meet the parameters for a well-managed deer herd set by the ad hoc deer evaluation tool are only possible if collection of biological data is increased. Management parameters addressed in the ad hoc deer evaluation tool include:

- "Harvest of at least 1.0 antlered buck/mi^2…."
- "Total harvest comprised of at least 50% does".
- "Total adult doe harvest (excluding fawns) is comprised of 30-35% yearling does (1.5 years old)".
- "Total antlered buck harvest (excluding button bucks) is comprised of no more than 30% yearling bucks (1.5 years old)".

Van Swamp Game Land deer harvest does not meet all the goals set for statewide deer herd goals. Hunters are harvesting at least 1.0 antlered buck/mi2 (4.29 bucks/mi^2). VSGL hunters are not harvesting does at a rate to reach the goal of at least 50% of harvest should be comprised of does (Fig. 10). It may not be possible or desirable on VSGL to implement specific harvest guidelines to achieve the herd composition changes that would meet goals set by the deer evaluation tool. Figure 11 reports registered deer harvest on VSGL from 2011-2015. These numbers can only be used as an index through time as they do not consider deer densities, hunter effort, hunter selectivity, habitat changes, or hunting methods. The reason for the sharp increase in harvest in 2012 is not known. At this time, management recommendations are to maintain the current hunting structure until better data is gathered.

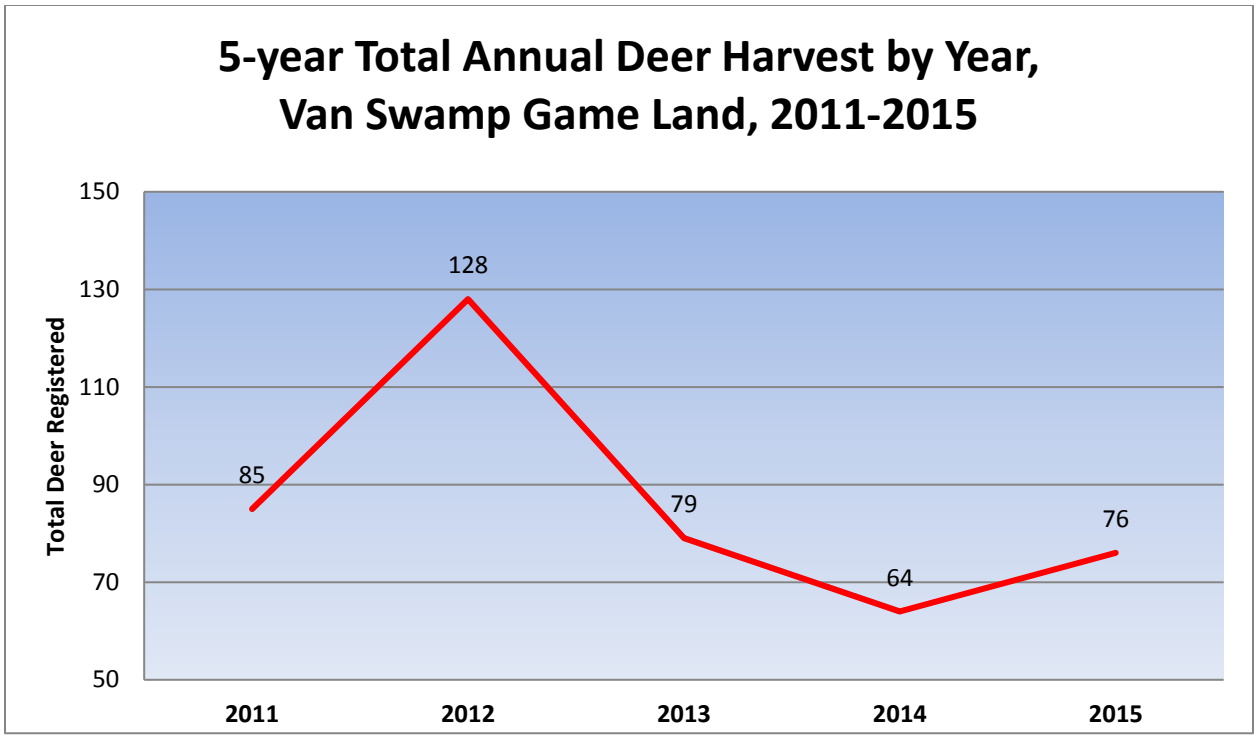


Fig 11. Reported deer harvest for VSGL for the 2011-2015 hunting seasons.

Inventory and Monitoring Needs

Based on an evaluation of registered harvest and limited biological data, deer harvest levels and harvest composition on VSGL likely represent more "traditional" deer hunting activities (e.g., low selectivity by hunters, focus on antlered deer, etc.). Staff will continue investigating whether other methods may better assist in monitoring and managing the deer population trends on the game lands.

The NCWRC could implement a jawbone/biological data mail survey and/or mail surveys that estimate hunter effort on VSGL that could provide an index of changes in the harvest over time. Baseline information should be collected for deer densities and/or population trends. Staff should continue to develop ways of annually collecting biological data from deer taken from the game land that will allow monitoring of the deer harvest over time while at the same time contributing to NCWRC statewide and local biological data collection goals. Biological data collection should also be collected from private land harvest to compare to game land harvest. Collection of biological data from hunter harvested deer on and off the game land is extremely labor intensive and should occur opportunistically and as funding and staffing allows. More biological data must be collected on both the game land and private land in order to use age and sex data to guide deer management actions.

Staff should continue to investigate reports of diseased animals. When a diseased animal is reported on the game land, attempts will be made to diagnose what disease process is occurring.

Also, as disease surveillance is conducted, the game land will be incorporated into the surveillance effort when appropriate.

Research Needs

No known research needs at present.

Eastern Wild Turkey

Current Knowledge

Although not particularly known for its turkey hunting opportunities, VSGL habitats do support turkeys. The Dry Coniferous Woodlands and the miles of linear habitat along the road shoulders act as nesting and brood habitat. The Nonalluvial Mineral Wetlands and Oak and Mixed Hardwood-Pine Forest generally are considered favorable habitats for turkeys on this game land.

The game land wild turkey harvest of 0.7 birds per square mile (Fig. 12) is high relative to the harvest on private lands in Beaufort and Washington counties. The 2014-2016 3-year average wild turkey harvest on VSGL is 6.33 birds/year.

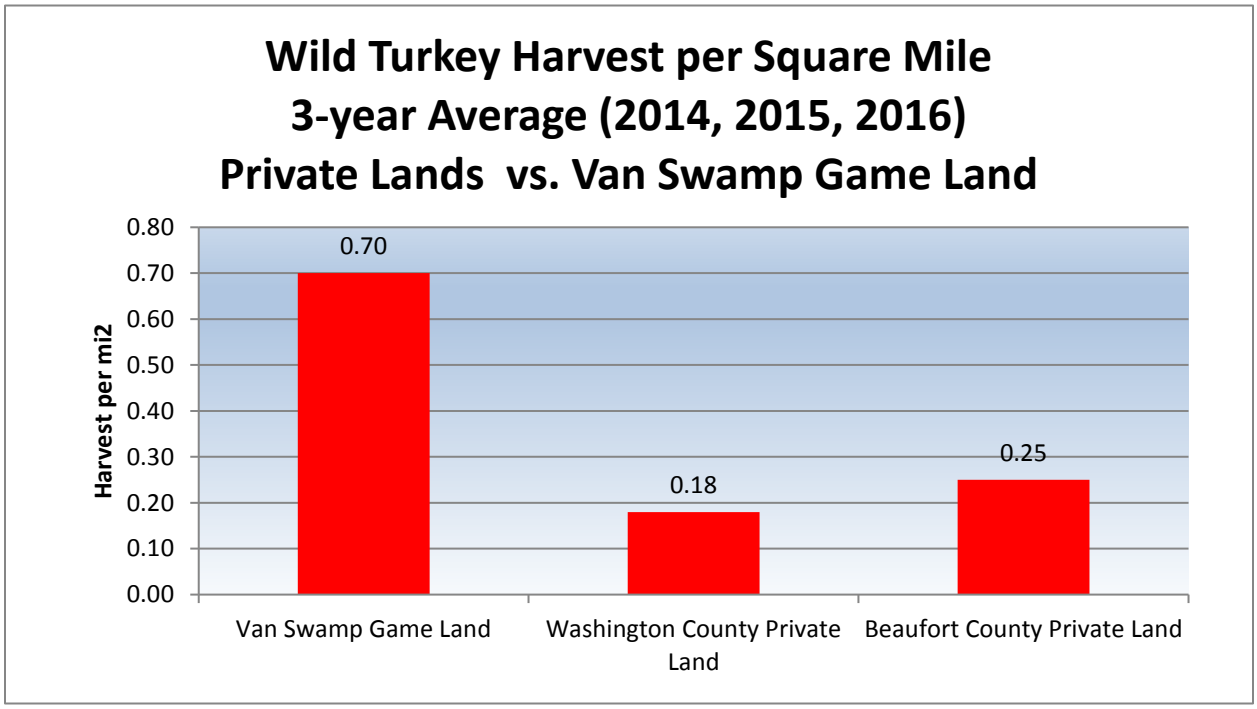


Fig. 12. Wild turkey harvest per square mile.

Management Strategy

A turkey goal for VSGL is to manage for quality spring gobbler hunting opportunities on the game land. NCWRC staff should monitor hunter densities and harvests and look for trends that may indicate overuse and overharvest. Currently, a special hunt opportunity permit is not

required to hunt turkeys on VSGL. If overharvest is suspected or hunters feel that the area is overcrowded with other hunters, NCWRC staff will consider including the VSGL in the permit hunt program.

Current pine stand thinning activities and prescribed fire in those stands on a regular rotation maintains valuable turkey brood habitat. Conversion of pine stands to native hardwood species would be a beneficial long-term management prescription for turkeys on VSGL. Continued habitat management on the game land, particularly for quality brood habitat areas, will play a key role in maintaining annual turkey numbers on the game land while allowing continued expansion into adjacent lands.

Inventory and Monitoring Needs

Currently there are no baseline data for turkey abundance. Several options are available to gather these data. One that could be utilized could be the direct observation by chance encounters similar to the Wild Turkey Summer Observation Survey, a turkey hunter observation survey, and/or a deer hunter survey. Another could be gobbling bird point counts.

Staff should continue to investigate reports of diseased animals. When a diseased turkey is reported on the game land, attempts will be made to diagnose what disease process is occurring. Also, as disease surveillance is conducted, the game land will be incorporated into the surveillance effort when appropriate.

Research Needs

No known research needs at present.

American Black Bear

Current Knowledge

Van Swamp Game Land, in southwestern Washington and northern Beaufort counties, contains high-quality habitat for many wildlife species, but is especially significant in providing habitat for black bears. Situated near large agricultural areas, VSGL helps meets the year-round needs of bears.

Van Swamp was added to the game lands program for the 2001-2002 hunting season as a Six Day Per Week Area. Hunters were able to hunt bears for the entire county seasons in November and December and all roads and trails on the game land were open to vehicles. Recognizing the interests from hunters of Van Swamp, the NCWRC commissioned a study to examine hunter attitudes on bear hunting VSGL (Palmer et al. 2006). Palmer et al. (2006) reported that 18 bears were harvested from VSGL in 2001. In 2002 and 2003, hunters reported 2 and 6 bears, respectively, harvested from Van Swamp and reported at NCWRC check stations.

In order to manage the black bear resource and the game land, the NCWRC staff installed gates effectively restricting vehicular access from 8 miles of road. This action in conjunction with shortening the length of Van Swamp's bear season to 3 days during the November season and 3 days during the December season has helped Van Swamp to continue to have a black bear resource, although these actions were not supported by the hunters surveyed in the Palmer et al. (2006) study. Table 6 lists number of bears reported harvested from VSGL.

Table 6. The number of black bears registered as being harvested from Van Swamp Game Land.

Bears Harvested on Van Swamp Game Land			
2001	**18**	**2009**	**5**
2002	**2**	**2010**	**5**
2003	**6**	**2011**	**7**
2004	**data not available**	**2012**	**4**
2005	**data not available**	**2013**	**2**
2006	**data not available**	**2014**	**5**
2007	**data not available**	**2015**	**1**
2008	**6**		

Management Strategy

Bears on the game land should be managed following the guidelines outlined in the NC Black Bear Management Plan (NCBBMP) available to the public on the NCWRC website.

Many studies have concluded that black bear habitat preferences are simply a function of food. Therefore, any land management practices to improve/sustain food availability (soft and hard mast) will benefit black bears. The Pond Pine Woodland habitat on VSGL that include sweetbay magnolia, redbay, sweet gallberry, and laurel greenbrier help meet the needs of black bears in the fall and winter. Through timber thinnings and prescribe fire, blackberry flourish providing for summertime forage.

Black bears move extensive distances during certain times of the year. It is important for movement to occur between the various subpopulations of bears across the state to help maintain bear numbers and genetic diversity. Corridors can also assist in reducing human-bear

interactions by decreasing the proximity of traveling bears to human development. Forested corridors for movement are important and VSGL helps fill this need.

Continued acquisition of adjacent lands would support efforts to meet the NCBBMP objective 4, strategies 3, 4, 5, and 6 listed below (North Carolina Wildlife Resources Commission, 2012).

- 3. Identify, acquire, and maintain property that would provide habitat for black bears.
- 4. Identify key movement corridors and work, either through acquisition, easements, or agreements, to conserve these areas.
- 5. Identify game lands that can be managed to create or maintain bear habitat and bear travel corridors.
- 6. Support habitat management practices that benefit bear management objectives on both private and public lands.

As demonstrated through the first years of VSGL being incorporated into the game lands program, the bear population cannot be managed on an open public hunting area, with no restriction on hunter numbers or vehicular access. Gated trails for foot traffic only and limiting the number of hunt days that are open to harvest bears on the game land reduce the pressure on the resource. On years when inclement weather affects the 6 hunt days' bear hunting is allowed, less bears are likely harvested. Although no single management action taken in the early years of VSGL to control bear harvest were overwhelmingly supported by hunters in Palmer et al. (2006), annual bear harvest numbers have somewhat stabilized and VSGL continues to offer most still hunters and hunters using hounds opportunities to harvest bears.

Inventory and Monitoring Needs

Continue to monitor harvest records that could indicate trends. Inventory and monitoring should be considered on an as needed basis.

Research Needs

No known research needs at present.

Furbearers

Current Knowledge

Overall, furbearers are thought to be "common" on VSGL. Hunting opportunities exist for bobcat, fox, coyote, opossum, and raccoon. Trapping opportunities exist for beaver, bobcat, coyote, opossum, raccoon, river otter, mink, muskrat, nutria, and long-tailed weasel. Fox trapping is not allowed by local law in Washington County.

Management Strategy

Maintain current trapping season to allow for trapping opportunities and the harvest of surplus furbearers. Continue current land management techniques to benefit furbearers in each habitat type. Encourage trappers to utilize the game lands.

United States Department of Agriculture-Wildlife Services, NCWRC staff, and Animal Damage Control Agents may be required to remove beaver from sites impacting infrastructure or significant timber resources.

Inventory and Monitoring Needs

Inventory and monitoring should be considered on an as needed basis. Scent stations and track counts could be used for some species.

Research Needs

No known research needs at present.

Gray Squirrel

Current Knowledge

Gray squirrels inhabit numerous forest types, although they are most abundant in hardwood forests containing a variety of mast-producing trees. On this game land, they commonly occur in the Nonalluvial Mineral Wetlands, mixed hardwoods and pine forests, and occasionally in the Pond Pine Woodlands.

Management Needs

Current hunting opportunities should be maintained. Maintaining mature forest types on the game land will provide for the habitat needs of squirrels.

Inventory and monitoring needs

There are currently no inventory and monitoring needs but they should be considered on an as-needed basis.

Research needs

There are currently no known research needs.

Eastern Cottontail Rabbit and Marsh Rabbit

Current Knowledge

Eastern cottontail rabbits and marsh rabbits occur on the VSGL in thinned stands, regenerated clear-cuts, and in transition zones between uplands and wetter drains where shrubs, grasses, and forbs dominate. Briar patches, brush piles, and other dense vegetation are needed for escape cover. Interspersion of different cover types is ideal for rabbits.

Management Needs

Current hunting opportunities should be maintained. Land management techniques that provide brushy cover will be beneficial for rabbits. These include thinning and burning of pine communities, early-successional habitat management, and the creation and/or protection of brush piles and briar thickets.

Inventory and Monitoring Needs

There are currently no inventory and monitoring needs but they should be considered on an as-needed basis.

Research Needs

There are currently no known research needs.

Northern Bobwhite Quail

Current Knowledge

Northern bobwhite quail inhabit early-successional habitat found in non-forested areas and in forested communities with open canopies and an herbaceous understory. Transitional areas found between community types are critical for quail, especially areas between upland sites and agricultural fields. Most of the birds observed on VSGL are utilizing the road shoulders. The amount of area considered suitable quail habitat is only a very small portion of the game land. Quail numbers on the game land are extremely low. Very little hunting pressure occurs on these birds.

Management Needs

Current hunting opportunities should be maintained. Existing land management practices should continue to provide suitable habitat with an emphasis on improving the quality and acreage of early-successional habitat. Long-term habitat goals for maintaining early-successional habitats on Van Swamp are outside the scope of this management plan. Habitat conversions from pine plantations to habitats that favor mast producing hardwoods on appropriate sites is a Desired

Future Condition. As pine plantations reach merchantable stages, thinnings and prescribed burning will promote early-successional habitats.

Inventory and Monitoring Needs

There are currently no inventory and monitoring needs but they should be considered on an as-needed basis.

Research Needs

There are currently no known research needs.

Webless Migratory Birds

Current Knowledge

Woodcock may be found in the Nonalluvial Mineral Wetlands and the regenerating stands dominated with hardwoods. Limited dove hunting opportunities exist as open areas to support dove fields are not present on VSGL. Regenerating clear cuts may provide the best habitat for doves on VSGL.

Management Needs

Maintaining current habitat protections and working to meet habitat conversion goals on appropriate existing pine stands will benefit woodcock. Mourning doves will utilize new clearcuts. Dove hunting will be opportunistic on Van Swamp and no management prescriptions will target mourning doves.

Inventory and Monitoring Needs

There are currently no inventory and monitoring needs but they should be considered on an as-needed basis.

Research Needs

There are currently no known research needs.

Waterfowl

Current Knowledge

Prior to ditching Van Swamp, the Non-riverine Swamp Forest likely held good numbers of wood ducks, mallards, and black ducks. Currently, waterfowl hunting is restricted to pockets that have been dammed by beavers and hunting participation is thought to be extremely low.

Management Needs

Dedication agreements limit to some degree the management actions that can be taken to improve waterfowl habitat on Van Swamp. With an interest by landowners in the downstream watershed in having the NCWRC retaining some water within the game land tract during storm events, there is potential for hydrology restoration on portions of the tract. Hydrology restoration could have benefits in terms of natural forest type reestablishment and the potential to created waterfowl habitat.

Inventory and Monitoring Needs

There currently are no inventory or monitoring needs known.

Research Needs

There are currently no known research needs.

- ***Fish***

Current Knowledge

There no fishing opportunities on VSGL. Although, actions taken on VSGL do affect downstream water quality. The extensive drainage system in and around VSGL accelerates dewatering of the landscape. Although not as effective at filtering stormwater runoffs as it was prior to ditching, VSGL does offer some stormwater retention and filtering benefits. With intensive agriculture and timber production practices upstream of VSGL, stormwater runoff is slowed on VSGL allowing some sediment and nutrient settling before leaving the game land where the water is channelized and emptied into Pantego Creek. Parts of the Pantego Creek and Pungo River have been classified as Strategic Habitat Areas by the North Carolina Division of Marine Fisheries (2016).

Management Needs

Current habitat protection actions will benefit downstream water quality. Actions to hold storm water on the game lands longer would allow for sediment and nutrient settling before leaving the game land.

Inventory and Monitoring Needs

No inventory or monitoring is needed on VSGL.

Research Needs

There are currently no known research needs for the game land.

- ***Aquatic and Wildlife Diversity***

Current Knowledge

Little is known about the non-game species of Van Swamp. The natural drainages may contain some species of priority concern but no extensive survey has been conducted to determine presence.

Management Needs

Culvert replacement projects should consider improvements to allow for aquatic organism passage. Protection of waterways from sedimentation by maintaining forested riparian corridors and minimizing sedimentation and erosion from roads, firelines, and other soil disturbance activities should continue.

Inventory and Monitoring Needs

Division of Inland Fisheries and Wildlife Diversity, or North Carolina Natural Heritage staff could conduct sampling and survey activities near VSGL.

Research Needs

There are currently no known research needs for the game land

Financial Assets and Future Needs

The financial assets of the VSGL include a variety of assets in the form of infrastructure, personnel, vehicles, and heavy equipment. It should be noted that the large majority of these assets are also used to manage other game lands in the Northern Coastal Ecoregion and some assets, including personnel, are periodically used in other areas of North Carolina where they may be needed by the NCWRC to achieve management objectives in those areas. Equipment and other asset needs are evaluated annually and operating budgets are allocated annually based on equipment needs, upcoming projects, the costs of normal operations, and the availability of funds. The financial report below is an estimate based on existent infrastructure and habitat maintenance and future infrastructure development (Table 7). The figures use the 2006-2015 10-year average Consumer Price Index annual inflation rate of 1.95%.

Table 7. Financial Summary of Activities for Van Swamp Game Land.

Van Swamp Game Land																
Financial Summary of Activities																
Habitat Activities																
Project	**Description**	**Activity**	**Quantity**	**Unit**	**Unit Cost**	**2017-2018**	**2018-2019**	**2019-2020**	**2020-2021**	**2021-2022**	**2022-2023**	**2023-2024**	**2024-2025**	**2025-2026**	**2026-2027**	**Total**
H	Vegetation Control	Prescribe burning	200	ac	$ 30	6000	6117	6236	6378	6524	6673	6825	6980	7140	7302	$ 66,175
H	Herbaceous Seeding	Seed or maintain	5	ac	$ 175	875	892	909	927	945	964	982	1002	1021	1041	$ 9,559
H	Firebreaks	Maintain firebreaks	4	mile	$ 525	2100	2141	2183	2225	2269	2313	2358	2404	2451	2499	$ 22,942
H	Population Controls	Beaver trapping	1	game land	$ 3,000			3118			3304			3501		$ 12,923
															Subtotal	**$ 111,599**
Operation and Maintenance Activities																
Project	**Description**	**Activity**	**Quantity**	**Unit**	**Unit Cost**	**2017-2018**	**2018-2019**	**2019-2020**	**2020-2021**	**2021-2022**	**2022-2023**	**2023-2024**	**2024-2025**	**2025-2026**	**2026-2027**	**Total**
O & M	Road and Trails	Maintain gates	17	gate	$ 100	1700	1733	1767	1801	1837	1872	1909	1946	1984	2023	$ 18,572
O & M	Road and Trails	Maintain road	10.8	mi	$ 2,500	27000	27527	28063	28611	29168	29737	30317	30908	31511	32125	$ 294,968
O & M	Road and Trails	Maintain trail	8	mi	$ 2,500	20000	20390	20788	21193	21606	22028	22457	22895	23341	23797	$ 218,494
O & M	Signs and Boundaries	Maintain boundary	5	mi	$ 135	675	688	702	715	729	743	758	773	788	803	$ 7,374
O & M	Bridge Maintenance	Replace culverts	2	culvert	$ 2,500	5000	5098	5197	5298	5402	5507	5614	5724	5835	5949	$ 54,624
O & M	Public Use Facilities	Maintain parking areas	1	ea	$ 250	250	255	260	265	270	275	281	286	292	297	$ 2,731
O & M	Road Upgrade	Annual gravel allocation	1	ea	$ 15,000	15,000	15293	15591	15895	16205	16521	16843	17171	17506	17847	$ 163,871
O & M	Replace culverts	Hollis Loop Road at Pocosin Blvd	1	ea	$ 40,000	40,000										$ 40,000
O & M	Replace culverts	Turkey Lane at unnamed trail	1	ea	$ 40,000		40780									$ 40,780
O & M	Replace culverts	Church Road at T - intersection	1	ea	$ 10,000				10596							$ 10,596
O & M	Replace culverts	Railroad Road	1	ea	$ 10,000				10596							$ 10,596
O & M	Replace culverts	Repair bulkhead-Hollis Loop and spur	1	ea	$ 10,000				10596							$ 10,596
															Subtotal	**$ 873,202**
Development Activities																
Project	**Description**	**Activity**	**Quantity**	**Unit**	**Unit Cost**	**2017-2018**	**2018-2019**	**2019-2020**	**2020-2021**	**2021-2022**	**2022-2023**	**2023-2024**	**2024-2025**	**2025-2026**	**2026-2027**	**Total**
D	Road Upgrade	Church Road	0.6	mi	$ 100,000		61170									$ 61,170
D	Road Upgrade	Church Road Extension - Upgrade	0.95	mi	$ 100,000			98741								$ 98,741
D	Road Upgrade	Daylight trails	1	lump sum	$ 50,000					54,106						$ 54,106
D	Road Upgrade	Repair unnamed trail - 2.2 miles	1	ea	$ 15,000								17,171			$ 17,171
D	Road Upgrade	Hollis Loop Road	1	lump sum	$ 10,000	10,000										$ 10,000
															Subtotal	**$ 241,188**
Inflation rate is calculated from the Consumer Price Index (CPI-U) which is compiled by the U.S. Bureau of Labor Statistics																
2006(3.2%), 2007(2.8%), 2008(3.8%),2009(-0.4%),2010(1.6%), 2011(3.2%), 2012(2.1%), 2013(1.5%), 2014(1.6%), 2015(0.1)=10 Year AVG(1.95%)														**Grand Total**		**$1,225,989**

Staffing

The current game land management staff for VSGL are located in Williamston, NC and includes 3 permanent, full-time technicians and 1 temporary person. Additional staff that assist with management of the game lands includes the Northern Coastal Ecoregion Management Biologist, Northern Coastal Ecoregion Wildlife Forester, and Northern Coastal Ecoregion Technician Supervisor. Technician staff from other depots located throughout the Northern Coastal Ecoregion also aid with larger projects such as prescribed burning, boat ramp renovations, and large road improvements. Overseeing all previously mentioned staff is the Coastal Ecoregion Supervisor that supervises personnel throughout the entire Coastal Region. The Northern Coastal Ecoregion work area consists of 22 game lands totaling 218,006 acres, 51 boating access areas, and 12 public fishing areas (Fig. 13).

There are currently no needs for additional personnel at the Williamston Depot. However, because the previously mentioned staff also conduct management activities on other game lands and boating access areas within the work area, additional staffing needs will be evaluated if demands for more intensive management increases or additional lands are acquired.

Infrastructure

A wildlife management depot is located on the Lower Roanoke River Wetlands Game Land and serves as a headquarters for land management operations, Boating Access Area, and Public Fishing Area maintenance. This location includes a large metal building that includes a shop area, office, and restrooms. In compliance with rules for storing hazardous materials, two small storage sheds are on-site for the storage of containerized combustible liquids and herbicides. Additional buildings include an enclosed 5-bay metal building and an open-air pole shed used to house equipment. The buildings located at the depot are in good condition and only normal maintenance is required.

Other infrastructure throughout the game land includes over 30 culverts for drainage, 17 gates that are used to control access, 2 parking areas, and kiosks at major entrances.

Major infrastructure upgrades planned over the ten-year planning horizon for VSGL include repairs to bulkheads, culvert replacements, and road improvements. These improvements are covered in the Infrastructure Development and Maintenance section.

Heavy Equipment and Vehicles

There is currently an adequate supply of heavy equipment and vehicles to conduct management activities on the game lands. Heavy equipment includes farm tractors with various implements, an excavator, motor grader, and a bulldozer. Tractor implements include, but are not limited to, disk harrows, rotary mowers, a no-till grain drill, a 4-row planter, sprayer, and box blade.

Personnel at the Williamston Depot are currently outfitted with an adequate supply of vehicles. These include 4 pickup trucks, one of which is used for prescribed burning operations and the application of herbicide on roadsides. Additional vehicles and equipment often shared with other depots include a hauling unit, dump truck, and a belly-mounted side mower unit.

As previously stated, the replacement or addition of these assets is evaluated annually based on existing and predicted needs and are acquired if funding is available.

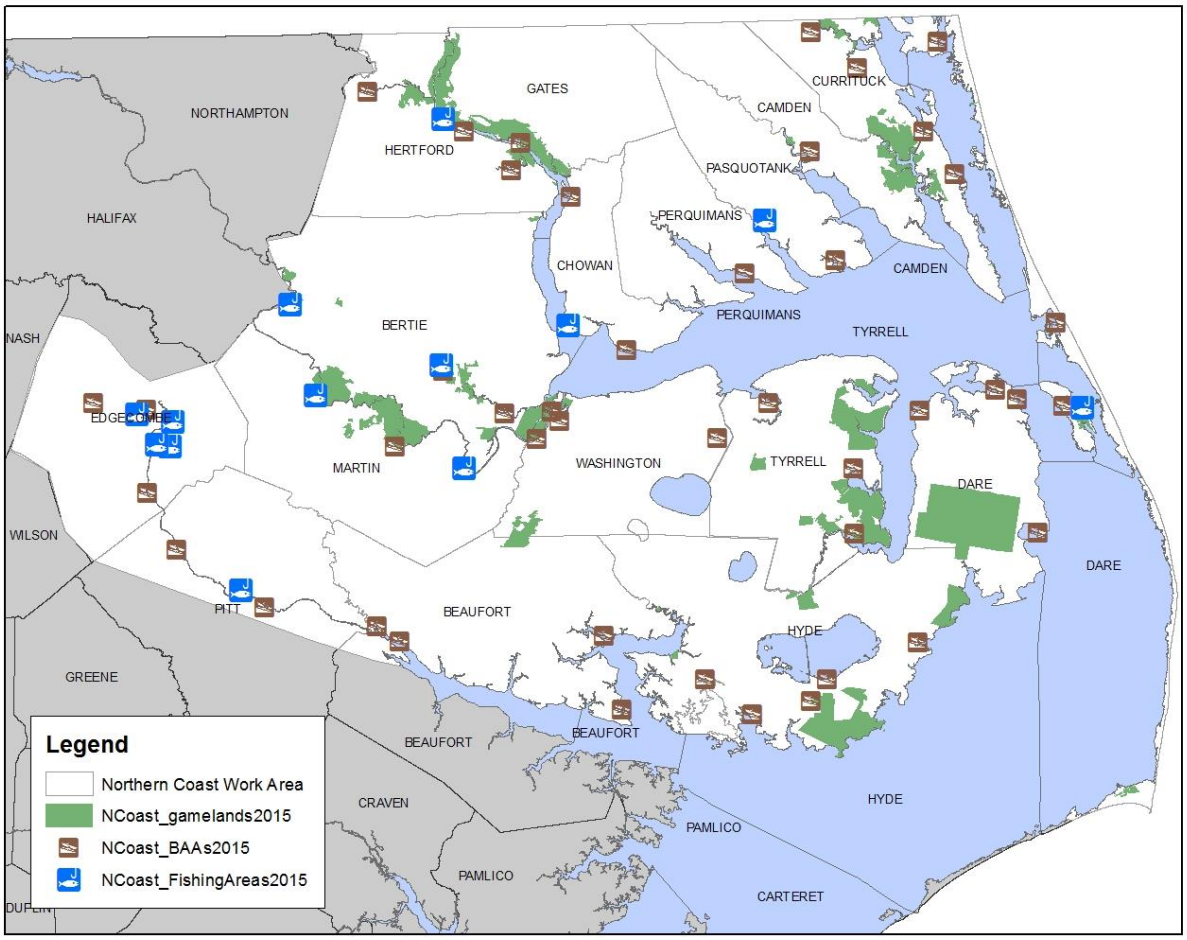


Fig. 13. Northern Coastal EcoRegion Lands and Facilities.

Acquisition Plan

The NCWRC's plans for future acquisition will include inholdings, adjacent lands, and critical habitats. Critical habitats that have rare and/or endangered species, provide outstanding ecological benefits, or provide outstanding opportunities for game land users will be high priority. Special considerations will be given to; lands that provide corridors for the connectivity of key parcels or are critical to enhance the NCWRC's ability to protect rare habitats, the land management needs of a property, and the public access and public uses that a property provides.

Prior to any acquisition, initial land investigations will be conducted by NCWRC staff and evaluations will be submitted to the North Carolina Wildlife Resources Commission for consideration. Land will only be acquired from willing sellers and/or through donations, and all purchases will be based on available funding.

Regulations and Enforcement

Enforcement of all rules and regulations falls to the Wildlife Enforcement Division of the NCWRC. Primary enforcement activities on the game land include: aircraft patrols, check points for license and game compliance, foot and boat patrols, remote camera setups on bait and littering sites, nighttime poaching setups and surveillance, and routine road patrols. These activities occur throughout the year across the game land, with the highest frequency of enforcement activities occurring during hunting season. Critical times for the Enforcement Division on the game land occur during the bear, deer, and turkey seasons.

As with most game lands, the major enforcement problems on the VSGL pertain to littering, regulation violations, license/permit issues, ATV riding, drug use, baiting, and adjoining landowner issues and conflicts.

Refer to the current North Carolina Inland Fishing, Hunting, and Trapping Regulations Digest for regulations specifically for Van Swamp Game Land.

Partnerships and Collaborations

Partnerships and collaborations among various conservation groups, universities, state and federal agencies, non-governmental agencies, non-profit groups, national organizations, clubs, and private citizens have been pivotal to the successful management of VSGL. Newly created and continued partnerships between the NCWRC and these groups will be essential for meeting the goals and needs outlined in this plan. Below is a list of partners that have assisted with conservation efforts on the VSGL.

North Carolina Clean Water Management Trust Fund

> Mission Statement*: "to clean up pollution in the State's surface waters and to protect, preserve and conserve those waters that are not yet polluted."*

North Carolina Forest Service

> Mission Statement: "*To protect, manage and promote forest resources for the citizens of North Carolina."*

North Carolina Natural Heritage Program

Mission Statement: "*To provide science and incentives to inform conservation decisions and support conservation of significant natural areas in our state."*

The Nature Conservancy

Mission Statement: "*To conserve the lands and waters upon which all life depends.*"

References

Bailey, R. G. 1995. Descriptions of the Ecoregions of the United States. U.S. Department of Agriculture. Miscellaneous Publication No. 1391, 2nd, Edition, Washington D.C., USA.

Brown, M. J. 2004. Forest Statistics for North Carolina, 2002. Southern Research Station. US Department of Agriculture, Forest Service, Ashville, NC, USA.

Canaan, New Hampshire Highway Department. 2013. Dirt Road Reconstruction. <http://canaannh.org/departments/highway/index.html>. Accessed 31 Dec 2013.

Dean, J. 1971. What about the game lands expansion? Wildlife in North Carolina. August:4-6.

Frost, C. C., H. E. LeGrand, and R. E. Schneider. 1990. Regional Inventory for Critical Natural Areas, Wetland Ecosystems, and endangered Species Habitats of the Albemarle-Pamlico Estuarine Region: Phase 1. Department of Environment, Health, and Natural Resources, Division of Parks and Recreation, North Carolina Natural Heritage Program, Raleigh, North Carolina, USA.

Fussell J. O., W. D. Webster, S. P. Hall, H. E. LeGrand, M. P. Schafale, M. J. Russo. 1995. Ecosystem Survey of Dare County Air Force Range, North Carolina. North Carolina Department of Environment, Health, and Natural Resources, North Carolina Natural Heritage Program, Raleigh, North Carolina, USA.

Gadd, L. E., and J. T. Finnegan. 2013. Natural Heritage Program List of the Rare Plant Species of North Carolina 2012. Revised 27 February 2013. North Carolina Department of Environment and Natural Resources, North Carolina Natural Heritage Program, Raleigh, North Carolina, USA.

Hunter, W. C., L. Peoples, J. Collazo. 2001. Partners in Flight Bird Conservation Plan for the South Atlantic Coastal Plain. American Bird Conservancy, The Plains, Virginia, USA.

LeGrand, H. E., J. T. Finnegan, S. P. Hall, A. J. Leslie, and J. A. Ratcliffe. 2013. Natural Heritage Program List of the Rare Animal Species of North Carolina 2012. Revised 25 March 2013. North Carolina Department of Environment and Natural Resources, North Carolina Natural Heritage Program, Raleigh, North Carolina, USA.

Lynch, J. M., and S. L. Peacock. 1982. Natural areas inventory of Washington County, North Carolina. CEIP Report No. 30. North Carolina Coastal Energy Impact Program, Office of Coastal Management, North Carolina Department of Natural Resources and Community Development, Raleigh, North Carolina, USA.

McKerrow, A.J., S.G. Williams, and J.A. Collazo. 2006. The North Carolina Gap Analysis Project: Final Report. North Carolina Cooperative Fish and Wildlife Research Unit, North Carolina State University, Raleigh, North Carolina, USA.

National Oceanic and Atmospheric Administration [NOAA]. 2016. National Weather Service. Climate Data Online, Data Tools, Data Tools: 1981-2010 Normals, Plymouth, North Carolina. <http://www.ncdc.noaa.gov/cdo-web/datatools/normals>. Accessed 2 Nov 2016.

National Weather Service [NWS]. 2016. Newport/Morehead City, North Carolina Local Climate Studies, Freeze Climatology, Plymouth, North Carolina. <http://www.nws.noaa.gov/climate/local_data.php?wfo=mhx>. Accessed 2 Nov 2016.

Newsome, D., A. Milewski, N. Phillips, and R. Annear. 2002. Effects of Horse Riding on National Parks and Other Natural Ecosystems in Australia: Implications for Management. Journal of Ecotourism. 1(1):56.

North Carolina Division of Marine Fisheries [NCDMF]. 2016. Strategic Habitat Areas. <http://portal.ncdenr.org/web/mf/habitat/SHAs>. Accessed 2 Nov 2016.

North Carolina Division of Water Quality. 2014. Tar-Pamlico River Basinwide Water Resources Management Plan. North Carolina Department of Environmental Quality, Division of Water Quality, Raleigh, North Carolina, USA.

North Carolina Natural Heritage Program. 2013. North Carolina Natural Heritage Program 2013 Biennial Protection Plan, List of Significant Natural Heritage Areas. Office of Conservation, Planning, and Community Affairs, Department of Environment and Natural Resources. Raleigh, North Carolina, USA.

North Carolina Natural Heritage Program. 2016. Species/Community Search. Division of Land and Water Stewardship, North Carolina Department of Natural and Cultural Resources. < http://www.ncnhp.org/data/species-community-search>. Accessed 10 Nov 2016.

North Carolina Wildlife Resources Commission [NCWRC]. 2005. North Carolina Wildlife Action Plan. Raleigh, North Carolina, USA.

North Carolina Wildlife Resources Commission [NCWRC]. 2012. North Carolina Black Bear Management Plan: 2012-2022. Raleigh, North Carolina, USA.

North Carolina Wildlife Resources Commission [NCWRC]. 2015. 2015 North Carolina Wildlife Action Plan. Raleigh, North Carolina, USA.

North Carolina Wildlife Resources Commission [NCWRC]. 2016. 2015 North Carolina White-tailed Deer Density Map. <http://www.ncwildlife.org/Portals/0/Hunting/Documents/Deer-Density-2015.pdf>. Accessed 16 Dec 2016.

Palmer, D., D. T. Cobb, S. Cross, M. D. Jones. 2006. Managing Black Bears on a Public Game Land in North Carolina: Are the Desires of Hunters Compatible with Unrestricted Public Hunting? Proceedings of the Annual Conference of the Southeastern Association of Fish and Wildlife Agencies 60: 94-100.

Schafale, M. P., and A. S. Weakley. 1990. Classification of the natural communities of North Carolina. Third approximation. North Carolina Department of Environment and Natural Resources, Natural Heritage Program, Raleigh, North Carolina, USA.

State Climate Office of North Carolina. 2013. CRONOS Database. Monthly Data Retrieval. <http://nc-climate.ncsu.edu/cronos?station=WILL&temporal=monthly>. Accessed 18 Nov 2013.

U.S. Department of Agriculture [USDA]. 2016*a*. Natural Resources Conservation Service. Beaufort County, North Carolina. Soil Survey 2013. <http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>. Accessed 8 Nov 2016.

U.S. Department of Agriculture [USDA]. 2016*b*. Natural Resources Conservation Service. Washington County, North Carolina. Soil Survey 2013. <http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>. Accessed 8 Nov 2016.

U.S. Department of Agriculture. [USDA]. 2016c. Farm Service Agency. Crop Acreage Data. 2016 Acreage Data as of October 1, 2016. < http://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/NewsRoom/eFOIA/crop-acre-data/zips/2016-crop-acre-data/2016_fsa_acres_1003016_gs4.zip>. Accessed 9 Nov 2016.

U.S. Department of Commerce [USDC]. 2016a. US Census Bureau. North Carolina, State & County QuickFacts. < http://www.census.gov/quickfacts/table/PST045215/37187,00>. Accessed 9 Nov 2016.

U.S. Department of Commerce [USDC]. 2016b. US Census Bureau. North Carolina, State & County QuickFacts. <http://www.census.gov/quickfacts/table/PST045215/37013,00>. Accessed 9 Nov 2016.

U.S. Fish and Wildlife Service. 2005. Roanoke River National Wildlife Refuge: Comprehensive Conservation Plan and Final Environmental Impact Statement. U. S. Fish and Wildlife Service, Atlanta, Georgia, USA.

Development Team and Public Input

A Van Swamp Game Land Management Plan Development Team was formed in September 2016 consisting of NCWRC biologist and staff from various areas of expertise. Consultation with staff covered topics including guiding policies and partnerships, adjacent land uses and management, what makes the VSGL special, key game and non-game species, game land user groups, landscape and habitat level goals, future acquisitions, existing data and data gaps, threats to the game lands and game land goals, forest management, game land infrastructure, natural resources stakeholders, and enforcement issues.

Public comment was gathered at a Public Input Meeting held at Washington County Cooperative Extension building on October 24, 2016 which was attended by 3 people. No comments were received during the meeting regarding the management plan. Attendees to the meeting could provide comments using the online "Comment on Game Land Plans" link that was found on the NCWRC website. The online comment period ended January 13, 2017. Twenty-two comments were recorded from 4 individuals for the same seven questions that were presented at the public input meeting (Appendix V).

A draft version of this plan was available online February 14, 2018 through March 15, 2018 for public comment. No comments were received.

Appendices

I. Archeological Resources Protection Act

Archaeological Resources Protection Act North Carolina General Statutes Chapter 70, Article 2

This statute applies to all state-owned, occupied or controlled property except for highway rights-of-way.

The purpose of the statute is to provide for the protection of archaeological resources on state lands. Major provisions of the law are as follows:

1. Archaeological resources are defined as any material remains of past human life or activities which are at least 50 years old and which are of archaeological interest, including pieces of pottery, basketry, bottles, weapons, weapon projectiles, tools, structures or portions of structures, rock paintings, rock carvings, intaglios, graves or human skeletal materials.
2. Permits are required in order to conduct archaeological investigations on state lands.
3. (The 1991 amendment to ARPA, effective July 1, 1991, transferred to the Department of Cultural Resources--from Department of Administration--the authority to issue permits under G.S. 70, Article 2.)
4. Information on archaeological site locations is exempted from unrestricted public access may result in damage to or destruction of the archaeological resources
5. All archaeological resources, equipment and vehicles utilized in conjunction with violation of the law are subject to forfeiture.

Prohibitions and penalties under the law are as follows:

1. No person may excavate, remove, damage or otherwise alter or deface any archaeological resource located on state lands without a permit.
2. No person may sell, purchase, exchange, transport, receive or offer to sell, purchase, exchange, transport or receive any archaeological resource excavated or removed from state lands in violation of the law.
3. Any person who knowingly and willfully violates or employs any other person to violate any prohibition of the law, shall upon conviction, be fined not more than $2,000 or imprisoned not more than six months, or both.
4. Each day on which a violation occurs shall be a separate and distinct offense.
5. Civil penalties may also be assessed against any person who violates the provisions of the act.

II. Articles of Dedication through the North Carolina Natural Heritage Program

NAT-89.3

North Carolina
Department of Administration

Michael F. Easley, Governor

Gwynn T. Swinson, Secretary

March 12, 2003

Secretary William G. Ross, Jr.
Department of Environment and Natural Resources
512 N. Salisbury Street
Raleigh, North Carolina 27603-8003

Mr. Charles R. Fullwood, Executive Director
N.C. Wildlife Resources Commission
512 N. Salisbury Street
Raleigh, North Carolina 27603-8003

Subject: Dedication of Portions of the **Van Swamp Game Land**, Washington and Beaufort Counties

Gentlemen:

Pursuant to Article 9A, Chapter 113A of the North Carolina General Statutes, this letter of allocation is executed for the purpose of dedicating the State-owned lands hereinafter described as a North Carolina Nature Preserve. These articles of dedication replace the articles of dedication dated September 6, 2001. The articles were amended to reflect a reallocation of primary acreage to buffer acreage.

These real properties are currently administered by the North Carolina Wildlife Resources Commission as the **Van Swamp Game Land** and consist of approximately 5,512 acres located in Washington and Beaufort Counties and composed of:

1. Van Swamp tract (Primary Area)	3,628 acres
2. Van Swamp tract (Buffer Area)	1,884 acres

which are specifically described in Exhibit A, attached hereto and by reference made a part hereof. The dedicated lands shall be known collectively as the **Van Swamp Game Land Nature Preserve**.

The Van Swamp tract has been acquired with funding from the Natural Heritage Trust Fund and from the Clean Water Management Trust Fund. Dedication of the qualified portions of the tract fulfill the terms of the grant agreements.

Mailing Address:
1301 Mail Service Center
Raleigh, NC 27699-1301

Telephone: (919) 807-2425
Fax (919) 733-9571
State Courier #51-01-00
e-mail: Gwynn.Swinson@ncmail.net

Location Address:
116 West Jones Street
Raleigh, North Carolina

THIS DEDICATION OF THE VAN SWAMP GAME LAND NATURE PRESERVE IS MADE SUBJECT TO THE FOLLOWING TERMS AND CONDITIONS:

1. As used in this Letter, the terms "natural area" and "nature preserve" shall have the same meaning as contained in North Carolina General Statutes, section 113A-164.3.

2. Pursuant to North Carolina General Statutes 113-164.8, all State-owned lands lying within the above designated area are hereby dedicated as a nature preserve to be known collectively as the Van Swamp Game Land Nature Preserve (hereinafter "preserve") for the purposes provided in the North Carolina Nature Preserves Act, as amended, and other applicable law, and said State-owned land, shall be held, maintained, and used exclusively for said purposes.

3. **Primary Custodian**: The primary custodian of the Van Swamp Game Land Nature Preserve will be the North Carolina Wildlife Resources Commission, which will be responsible for managing the preserve in accordance with State Administrative Code 15 NCAC 12H.300.

4. **Primary Classification**: The primary classifications and purposes of the preserve will be conservation, nature education, wildlife management, hunting, fishing, trapping, and other recreational uses authorized by the Primary Custodian. The ecological significance of the preserve is described in Exhibit A.

5. **Management Areas:** For the purposes of management, the preserve shall be considered to consist of a Primary Area (approximately 3,628 acres), and a Buffer Area (approximately 1,884 acres), as more particularly described in Exhibit A attached thereto and by this reference made a part hereof. The Primary Area consists essentially of high quality examples of Nonriverine Swamp Forest and Pond Pine Woodland natural communities and their associated rare species.

   The Primary Area is deemed by the Secretary of the North Carolina Department of Environment and Natural Resources to qualify as an outstanding natural area under statutory criteria for nature preserve dedication (G.S. 113A-164.6) and further serves all of the public purposes for a dedicated preserve as stated in Administrative Rules 15 NCAC 12H.0301(b).

   The Buffer Area, which contributes to the management and protection of the Primary Area, consists of pine plantations and cleared areas which can contribute habitat for wider ranging species, especially if they are restored to a more natural condition.

6. **Rules for Management of the Primary Area(s)**:

   A. Character of Visitor Activity: The principal visitor activities in the preserve shall be hunting, fishing, trapping, walking, research, and observation. These activities shall be regulated by the Custodian to prevent significant disturbance of the preserve. These activities may specifically be regulated by the Custodian to protect and conserve the natural values of the preserve.

      Activities and uses unrelated to those listed above are prohibited except as otherwise provided in these Articles or unless necessary to carry out the purposes of the preserve. Prohibited activities include, but are not limited to: construction; commercial activities and development; commercial silviculture; agriculture and grazing; gathering of native species of plants or plant products; the removal, disturbance, molestation, or defacement of minerals, archaeological and natural resources, except for research purposes as approved by the Custodian; and those activities specifically restricted in these Articles.

There shall be no fires, except as necessary for ecological management of the preserve or in conjunction with supervised educational activities of the Custodian, or further excepted as herein provided or otherwise expressly permitted.

B. Consumptive Wildlife Uses: Hunting, fishing, and trapping shall be permitted within the preserve subject to regulations and management by the North Carolina Wildlife Resources Commission.

C. Orientation and Guidance of Visitors: The Custodian reserves the right to orient and guide visitors for educational programs, hunting and fishing uses, scientific research, and for preserve management. Exhibits, programs, and printed materials may be provided by the Custodian in service areas. The Custodian may restrict access to visitors in those instances or in such areas that restrictions may be determined necessary to safeguard sensitive environmental resources in the preserve.

D. Disturbance of Natural Resources: The cutting or removal of trees, dead or alive, or the disturbance of other natural resources is prohibited except as necessary for removal of hazards to visitors, control of disease that would damage or reduce the significance of the preserve, restoration after severe storm damage, trail clearance and maintenance, or for purposes of maintenance or restoration of natural communities or rare species populations as stipulated in the preserve management plan and that which is consistent with the purposes of these Articles. Salvage timber cuts which may be necessary due to natural catastrophe will be allowed in the preserve, but in a manner that will contribute to the recovery of the prevailing natural conditions of the forest and in consultation with the North Carolina Natural Heritage Program.

E. Wild Fire Control: Wild fires may mimic natural processes historically occurring in an ecosystem on a landscape level. When the extent of a wild fire does not threaten human life or structures, it may be allowed to burn with minimal control. If wild fire control is necessary, firebreaks may need to be established. When possible, existing roads and firebreaks will be utilized for wild fire control. When new firebreaks need to be established, environmentally sensitive areas will be avoided when possible. Old firebreaks which affect the natural hydrology of wetlands will be filled and allowed to revegetate. Planning of firebreak restoration should occur in consultation with the North Carolina Natural Heritage Program.

F. Water Control: The purpose of water control shall be to maintain the preserve's natural water regime. Water levels that have been altered by man may be changed if necessary to restore the preserve to its natural condition. In a preserve with a long history of managed hydrology, water levels may be managed to perpetuate the ecosystems that have evolved around the hydrology or may be restored to natural condition. This decision should be made in consultation with the Natural Heritage Program. Millponds are an example of situations in which water levels have been historically managed.

G. Pollution and Dumping: There will be no storage or dumping of ashes, trash, garbage, hazardous substances, toxic waste, other unsightly or offensive material, or fill material, including dredge spoil in, on, or under the preserve. No underground storage tanks may be placed within the preserve. No surface or ground waters of the preserve may have pollutants added within the preserve.

H. Control of Vegetational Succession: Control of vegetational succession may be undertaken if necessary to maintain or restore a particular natural ecosystem type or to preserve endangered, threatened, rare, or other unusual species. Controls will be done in the manner that best imitates the natural forces believed responsible for maintaining the natural ecosystem type, or that minimizes unnatural effects on non-target portions of the ecosystem. Prescribed burning is particularly essential to ecosystems where natural wild fire historically suppressed woody vegetation and promoted herbaceous diversity.

I. Control of Populations: Any control of animal or plant populations on the preserve shall be for the purpose of correcting those situations where those populations are significantly affecting natural conditions on the preserve, and in accordance with the Custodian's established regulations for hunting, trapping, or fishing of designated game animals. The Custodian may, in consultation with the North Carolina Natural Heritage Program, apply biological controls, herbicides and pesticides, and other means deemed necessary or appropriate to control or eradicate exotic or native species of plant or animal that are degrading the natural character of the preserve. Because of potential impacts on native species, no exotic flora or fauna shall be introduced into the preserve.

J. Research and Collecting Permits: Any person wishing to engage in scientific research requiring collecting or otherwise affecting anything within the preserve shall first secure written permission from the Custodian.

K. Roads and Trails: Construction and maintenance of roads, trails, and other access structures within Primary and Buffer Areas of the preserve will be limited to the level necessary to appropriately manage the preserve. New roads shall not be constructed in the Primary Area, with the following exception. When necessary, the Custodian may construct and maintain access limited to staff use for management purposes, such as service paths (single lane vegetated paths) for patrol, right-of-way maintenance, and other management activities, within the Primary Area. Number and width of new paths will be minimized, and sensitive areas avoided when possible. Existing roads that occur within or form a boundary of the Primary Area may be maintained by grading of the roadbed, replacing culverts, or adding stone as needed in order to maintain the integrity of the road for vehicular use. Some of the existing roads may be closed to vehicular traffic and maintained as linear food plots. Daylighting of roads within the Primary Area should be minimized, but may be used if necessary to maintain the condition of the road. Parking and turn-around areas will be constructed and maintained within the footprint of the existing road system. Access management and construction will be part of the overall management planning process and will include consultation with the North Carolina Natural Heritage Program.

L. Other Structures and Improvements: Structures or facilities shall not be erected by the Custodian within a preserve, except as may be consistent with the purposes of the preserve as stated in this dedication. Site selection shall be consistent with this dedication.

M. Management Plan: The Wildlife Resources Commission, as Primary Custodian of the preserve, shall be required to prepare and submit for approval to the Secretary of the Department of Environment and Natural Resources a management plan for the preserve. The management plan will be part of the larger management plan developed for the gamelands. This plan shall be subject to all the provisions of this dedication and shall additionally be consistent with the management principles set forth in the North Carolina

Administrative Code 15 NCAC 12H.0300 and such other regulations as may be established from time to time by the Secretary of the Department of Environment and Natural Resources. In any case where contradictions may arise between this instrument of dedication and other management regulations, the terms of this dedication shall take precedence.

7. **Rules for Management of the Buffer Area(s)**: Primary area rules also apply to buffer areas except that forestry and wildlife management activities may be planned and carried out as needed. These activities will be conducted in accordance with policy of the N.C. Wildlife Resources Commission and general management philosophy as outlined in Commission planning documents. These rules and guidelines require the protection and enhancement of wildlife populations and habitat so that hunting, fishing, trapping and other wildlife recreational opportunities are available to citizens of this State. Forest management is primarily conducted to enhance wildlife habitat. Based on these general objectives, the following buffer functions will be addressed in the management plan: 1) retention of naturally occurring plant and animal species, 2) maintenance of habitat connectivity and continuity, 3) management needs of rare animal and plant species populations occurring within the buffer area, and 4) protection of soil and hydrologic resources. Management plans will be reviewed, as appropriate, by the Natural Heritage Program staff to ensure that the integrity of the Nature Preserve is protected.

* "Retaining naturally occurring plant and animal species assemblages, to the extent that they are known" primarily includes the following:

a) avoidance of type conversion of forest canopy, except in instances where type conversion restores the canopy to a more natural composition;
b) avoidance of introduction of invasive exotics, which damage the integrity of the naturally occurring herbaceous layer;
c) minimization of direct mechanical or chemical impacts to the naturally occurring herbaceous layer;
d) as required during restoration, understory control may be needed to promote establishment of desired overstory species.

** "Maintenance of habitat connectivity and continuity" primarily includes the following:

a) preservation of functional riparian corridors;
b) preservation of functional connecting corridors between primary areas within the dedicated area and to high quality natural areas outside the dedicated area;
c) in planning active management, utilization of methods which most closely approximate natural processes when possible;
d) in planning active management, retention of other habitat features which serve specific wildlife functions (see Wetland Forestry and Wildlife Management section of draft 1996 Best Management Practices for Forestry in North Carolina's Wetlands).

8. **Amendment and Modification**: The terms and conditions of this dedication may be amended or modified upon agreement of the Wildlife Resources Commission and Secretary of the Department of Environment and Natural Resources, and approved by the Council of State. Any portion of the tract dedicated pursuant to this instrument may be removed from dedication in accordance with the provisions of North Carolina General Statutes 113A-164.8.

9. **Permanent Plaque**: The Custodian should erect and maintain a permanent plaque or other appropriate marker at a prominent location within the preserve bearing the following statement: "This Area is Dedicated as a State Nature Preserve."

The Governor and Council of State have approved the dedication of the State-owned lands hereinabove described as the **Van Swamp Game Land Nature Preserve** to be held in trust by the Custodian for the uses and purposes expressed in the Nature Preserves Act at a meeting held in the City of Raleigh, North Carolina, on the 7th of August, 2001.

Sincerely,

Gwynn T. Swinson

GTS/BR

CONSENTED AND AGREED TO:

Bill Ross Jr. 24 April 2003

Secretary Bill Ross
Department of Environment and Natural Resources

Charles R Fullwood

Charles R. Fullwood, Executive Director 3-18-03
Wildlife Resources Commission

EXHIBIT A (Vers. 2002)

VAN SWAMP GAME LAND DEDICATED NATURE PRESERVE

DESCRIPTION

COUNTIES: Washington, Beaufort TOPOGRAPHIC QUADS: Hoke, Pike Road

PHYSIOGRAPHIC PROVINCE: Coastal Plain

SIZE OF AREA: ca. 5,512 acres (primary area 3,628 acres, buffer area 1,884 acres)

OWNER/ADMINISTRATOR: State of North Carolina
Wildlife Resources Commission

LOCATION: Extreme southwestern Washington County and adjacent Beaufort County. The site lies west of NC 32 and south of Hollis Road.

DESCRIPTION: Van Swamp is a nonriverine basin lying between two scarps - - the Pinetown Scarp on the west and the Suffolk Scarp on the east. Generally speaking, the western 40% of the 5378-acre tract has been converted to loblolly pine plantations. Some of this area consists of recently cleared lands that have not been replanted. Most of the remaining 60% of the tract is medium-aged to mature, with the northern two-thirds forested primarily in Nonriverine Swamp Forest and most of the southern third forested in Pond Pine Woodland. In addition, a few of the swamp forest portions are somewhat young. Tornados spawned by Hurricane Bertha in July 1997 damaged over ten acres of swamp forest.

The Nonriverine Swamp Forests are dominated by a mixture of tulip poplar (*Liriodendron tulipifera*), red maple (*Acer rubrum*), swamp tupelo (*Nyssa biflora*), and other trees. Bald-cypress (*Taxodium distichum*) is widely scattered; only a few individuals of Atlantic white cedar (*Chamaecyparis thyoides*) are present. The wettest areas, dominated by swamp tupelo are in the southwestern corner of the natural area. The understory, shrub, and herb layers are quite well developed. Shrubs typically associated with pocosins are not common, other than sweet pepperbush (*Clethra alnifolia*). Ferns are abundant in the ground layer.

The Pond Pine Woodland portion of the tract is quite mature, with a nearly complete pond pine (*Pinus serotina*) canopy over dense pocosin shrubs, such as shining fetterbush (*Lyonia lucida*) and gallberry (*Ilex coriacea*). Loblolly-bay (*Gordonia lasianthus*) is fairly common in this natural community.

The large extent of natural vegetation, and the contiguous nature of the natural area, indicate that the site is important for mammals and birds, and likely for other animal groups as well. A study of the site in the early 1980s identified 43 species of nesting birds, including the significantly rare black-throated green warbler (*Dendroica virens*). Larger mammals such as black bear (*Ursus*

americanus), bobcat (*Lynx rufus*), and white-tailed deer (*Odocoileus virginianus*) were also found in that inventory.

BOUNDARY JUSTIFICATION: The primary area boundary contains the high quality natural communities, including less mature examples, present on the tract. Pine plantations and cleared areas are included within the buffer area.

MANAGEMENT AND USE: Van Swamp Game Land will be used primarily for public hunting and other forms of low intensity recreational use. Public use will be limited to foot access other than on existing roads. Portions of the buffer area currently cleared or in pine plantation will be restored to historic community composition, based on the best available information. Ditches will be modified or blocked where possible so as to restore the hydrology of the natural communities. Restoration activities are subject to the availability of funding.

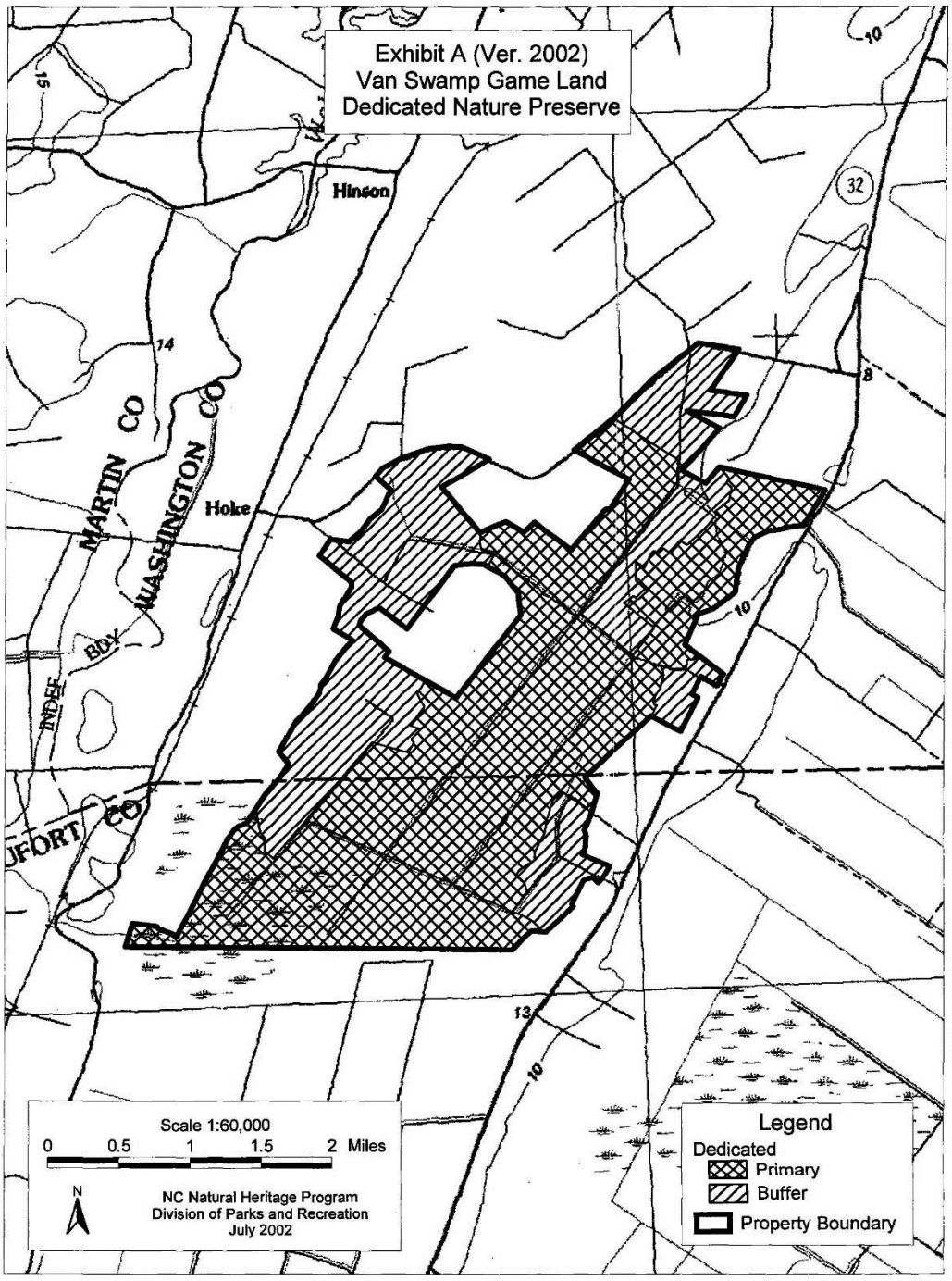


Exhibit A (Ver. 2002)
Van Swamp Game Land
Dedicated Nature Preserve
Hinson
Hoke
MARTIN CO
WASHINGTON CO
BDY
INDEF
UFORT CO
Scale 1:60,000
0 0.5 1 1.5 2 Miles
N
NC Natural Heritage Program
Division of Parks and Recreation
July 2002
Legend
Dedicated
Primary
Buffer
Property Boundary

III. Species Ranking Sheet

Descriptions and definitions are gathered from LeGrand et al. (2013) and Gadd and Finnegan (2013).

North Carolina Status Designations for Animals

Status Code	Status	Definition
T	Threatened	"Any native or once-native species of wild animal which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range, or one that is designated as a threatened species pursuant to the Endangered Species Act." (Article 25 of Chapter 113 of the General Statues; 1987).
SC	Special Concern	"Any species of wild animal native or once-native to North Carolina which is determined by the Wildlife Resources Commission to require monitoring but which may be taken under regulations adopted under the provisions of this Article." (Article 25 of Chapter 113 of the General Statues; 1987).
SR	Significantly Rare	Any species which has not been listed by the N.C. Wildlife Resources Commission as an Endangered, Threatened, or Special Concern species, but which exists in the state (or recently occurred in the state) in small numbers and has been determined by the N.C. Natural Heritage Program to need monitoring. This is a NC Natural Heritage Program designation.) Significantly Rare species include "peripheral" species, whereby North Carolina lies at the periphery of the species' range as well as species of historical occurrence with some likelihood of re-discovery in the state. Species considered extirpated in the state, with little likelihood of re-discovery, are given no N.C. Status (unless already listed by the N.C. Wildlife Resources Commission as E, T, or SC).

North Carolina Rank Designations of Animals by the North Carolina Natural Heritage Program

Rank	Number of Extant Occurrences	Description
S1	1-5	Critically imperiled - Critically imperiled in North Carolina due to extreme rarity or some factor(s) making it especially vulnerable to extirpation (local extinction) from the state. Typically 5 or fewer occurrences or very few remaining individuals (<1000).

S2	6-20	Imperiled - Imperiled in North Carolina due to rarity or some factor(s) making it very vulnerable to extirpation from the state. Typically 6-20 occurrences or few remaining individuals (1,000-3,000).
S3	21-100	Vulnerable - Vulnerable to extinction in North Carolina either because rare or uncommon, or found only in restricted range (even if abundant at some locations), or due to other factors making it vulnerable to extirpation. Typically 21 to 100 occurrences or between 3,000 and 10,000 individuals.
S4	100-1000	Apparently secure - Apparently secure and widespread in North Carolina, usually with more than 100 occurrences and more than 10,000 individuals.
_B	1-?	Rank of the breeding population in the state. Used for migratory species only.
_N	1-?	Rank of the non-breeding population in the state. Used for migratory species only.
_?	---	Uncertain - Denotes inexact or uncertain numeric rank.

Federal Status Designations for Animals

Status Code	Status	Definition
SC	Species of Concern	"The Service remains concerned about these species, but further biological research and field study are needed to resolve the conservation status of these taxa. Many species of concern will be found not to warrant listing, either because they do not qualify as species under the definition in the [Endangered Species] Act. Others may be found to be in greater danger of extinction than some present candidate taxa. The Service is working with the States and other private and public interests to assess their need for protection under the Act. Such species are the pool from which future candidates for listing will be drawn." (Federal Register, Feb 28, 1996). The Service suggests that such taxa be considered as "Species of Concern" which as no official status.

Global Rank Designations of Animals by NatureServe

Rank	Number of Extant Occurrences	Description
G1	1-5	Critically imperiled – Critically imperiled globally because of extreme rarity or because of some factor(s) making it especially vulnerable to extinction. Typically 5 or fewer occurrences or very few remaining individuals (<1,000) or acres (<2,000) or linear miles (<10).

G2	6-20	Imperiled –Imperiled globally because of rarity or because of some factor(s) making it very vulnerable to extinction. Typically 6 to 20 occurrences or very few remaining individuals (1,000 to 3,000) or acres (2,000 to 10,000) or linear miles (10 to 50).
G3	21-100	Vulnerable - Vulnerable globally either because very rare throughout its range, found only in restricted range (even if abundant at some locations), or because of other factors making it vulnerable to extinction. Typically 21 to 100 occurrences or between 3,000 and 10,000 individuals.
G4	100-1000	Apparently secure - Uncommon but not rare (although it may be rare in parts of its range, particularly on the periphery) and usually widespread. Apparently not vulnerable in most of its range, but possibly cause for long-term concern. Typically with more than 100 occurrences and more than 10,000 individuals.
G5	1000+	Secure - Common, widespread, and abundant (although it may be rare in parts of its range, particularly on the periphery). Not vulnerable in most of its range. Typically with considerably more than 100 occurrences and more than 10,000 individuals.
T_	-	The rank of a subspecies or variety. As an example, G4T1 would apply to a subspecies of a species with an overall rank of G4, but the subspecies warranting a rank of G1.
Q	-	Questionable taxonomy that may reduce conservation priority. Distinctiveness of this entity as a taxon at the current level is questionable. Resolution of this uncertainty may result in change from a species to a subspecies or inclusion of this taxon in another taxon, with the resulting Element having a lower-priority conservation status rank.

North Carolina Status Designations for Plants

Status Code	Status	Definition
T	Threatened	"Any resident species of plant which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (GS 19B 106:202.12).

SR	Significantly Rare	Any species not listed by the N.C. Plant Conservation Program as Endangered, Threatened, or Candidate, which is rare in North Carolina, generally with 1-100 populations in the state, frequently substantially reduced in numbers by habitat destruction (and sometimes also by direct exploitation or disease).
SR-D	Disjunct	The species is disjunct to North Carolina from a main range in a different part of the country or world.
SR-P	Peripheral	The species is at the periphery of its range in North Carolina. These species are generally more common somewhere else in their ranges, occurring in North Carolina peripherally to their main ranges, mostly in habitats which are unusual in North Carolina.

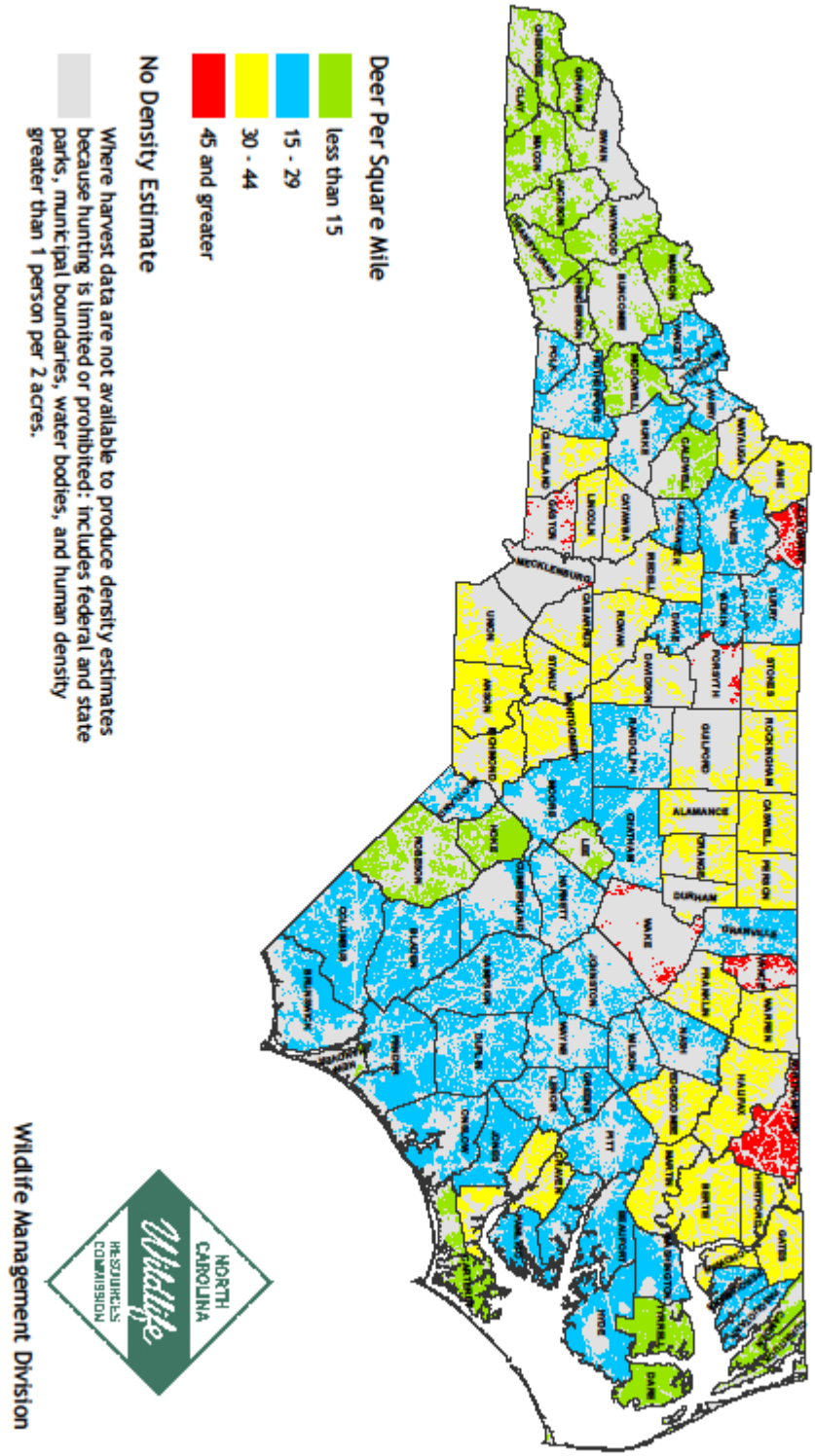
North Carolina Rank Designations of Plants by the North Carolina Natural Heritage Program

Rank	Number of Extant Populations	Description
S1	1-5	Critically imperiled - Critically imperiled in North Carolina due to extreme rarity or some factor(s) making it especially vulnerable to extirpation (local extinction) from the state. Typically 5 or fewer occurrences or very few remaining individuals (<1000).
S2	6-20	Imperiled - Imperiled in North Carolina due to rarity or some factor(s) making it very vulnerable to extirpation from the state. Typically 6-20 occurrences or few remaining individuals (1,000-3,000).
_?	---	Uncertain - Denotes inexact or uncertain numeric rank.

Global Rank Designations of Plants

Rank	Number of Extant Populations	Description
G3	21-100	Vulnerable - Vulnerable globally either because very rare throughout its range, found only in restricted range (even if abundant at some locations), or because of other factors making it vulnerable to extinction. Typically 21 to 100 occurrences or between 3,000 and 10,000 individuals.
G4	100-1000	Apparently secure - Uncommon but not rare (although it may be rare in parts of its range, particularly on the periphery) and usually widespread. Apparently not vulnerable in most of its range, but possibly cause for long-term concern. Typically with more than 100 occurrences and more than 10,000 individuals.
G5	1000+	Secure - Common, widespread, and abundant (although it may be rare in parts of its range, particularly on the periphery). Not vulnerable in most of its range. Typically with considerably more than 100 occurrences and more than 10,000 individuals.

IV. 2015 Deer Density Map



Game Land Management Plan

Public Input Meeting

Your input is important to us, so please participate. You can provide written comments on this form, comment online at @ www.ncwildlife.org then click on "Comment on Game Land Plans", or provide verbal comments during the breakout session.

Core Questions

1. What habitats do you think are most important to protect and/or improve on this game land?

2. Considering those that live on land and in water, what species do you think are most important to protect and/or improve on this game land?

3. How do you use this game land?

4. Please explain why you think the current level of access is, or is not, satisfactory on this game land?

5. What suggestions, if any, do you have for changing how this game land is managed and maintained?

6. What would encourage you to start using this game land, or to continue using it more actively?

7. What additional comments do you have regarding this game land?

Game Land:

Date:

Affiliation:

1. What habitats do you think are most important to protect and/or improve on this game land?

HABITAT TYPE	NUMBER OF REPONSES	PERCENTAGE OF REPONSES
Hardwoods	2	50%
Open Areas	1	25%
Food Plots	2	50%

Public Input Meeting/Online	COMMENT
Online	Hardwood forested areas and possibly create some open areas.
Online	Hardwood forests
Online	Food plots and have a few blocks that are blocked off to hunting. More prescribed burning on the property.
Online	I think it native habitat is good. Could probably improve property by planting food plots of oats in strategic areas throughout property in either micro food plots or lanes.

2. Considering those that live on land and in water, what species do you think are most important to protect and/or improve on this game land?

SPECIES	NUMBER OF REPONSES	PERCENTAGE OF REPONSES
Deer	2	67%
Turkey	1	33%
All Game/Species	2	67%
Bear	1	33%

PUBLIC INPUT MEETING/ONLINE	COMMENT
Online	Think you need to manage deer and bear better on this game land as well as others. Manage for better quality deer and animals in general.
Online	Any animal (small or large) on the property is important to protect. The hunts days M-T-W for small game and T-F-S for large game. This will help all species on the property.
Online	Deer and Turkey

3. How do you use this game land?

NUMBER OF REPONSES	NUMBER OF RESPONSES	PERCENTAGE OF REPONSES
Deer Hunting	3	100%
Small Game Hunting (Dove, Rabbit, Squirrel, Quail, Raccoon	1	33%

PUBLIC INPUT MEETING/ONLINE	COMMENT
Online	Deer hunting
Online	Deer hunting.
Online	I have deer hunted there one time and rabbit hunted several times. All with not much luck!

4. Please explain why you think the current level of access is or is not, satisfactory on this game land?

CURRENT LEVEL OF ACCESS	NUMBER OF REPONSES	PERCENTAGE OF REPONSES
More Restrictive	2	67%
Keep As Is	1	33%
Install Hunter Bridges	2	67%

PUBLIC INPUT MEETING/ONLINE	COMMENT	PLAN RESPONSE
Online	The current level of access is a big thing with me. First i would like to say there is way too much vehicle access through the property. There could be more designated parking areas and make it more accessible for walking in only on the property and not having someone drive by you while you are hunting. Think there should also be a vast amount of ditch crossings made on the property by using simple RR ties or beams. Ditches are too deep and wide to even try to cross them so people are forced to use the roads and unfortunately just hunt from the roads.	Van Swamp Game Land has a good mix of roads (10.8 miles) that are open for vehicular use to access the interior of the game land and trails (8 miles) that are closed to vehicles where hunters can walk to access portions of the game land. Most of the roads and trails have a ditch or canal on only one side of the road allowing hunters to access to the forests without needing to cross a ditch or canal.

Online	To many people just riding the roads making a mud pit. I would like to see parking areas and shorter roads to stop the riding. The canals surrounding most of the blocks are deep and so wide you can't cross. I want foot bridges to spread out hunting areas.	Since the State acquired the property in 2000, the NCWRC has upgraded many of the roads open to vehicular use. Wet hunting seasons does impact the condition of the roads requiring off season maintenance. Refer to the Infrastructure section in the plan. See response above about hunter bridges.
Online	The vehicle access is good to almost excessive. The roads are open to the point it gets used almost as much by people "mudding" and tearing up the roads as it does for hunting. Also there seems to be a lot of dumping. I have seen literal carcass piles in places.	See response above about roads.

5. What suggestions, if any, do you have for changing how this game land is managed and maintained?

SUGGESTIONS ON HOW THE GAME LAND IS MANAGED	NUMBER OF REPONSES	PERCENTAGE OF REPONSES
Limit Access	2	67%
Designate Parking Areas	1	33%
Install Hunter Bridges	2	67%
Designate as a 3 Day/Week Game Land	1	33%
Create Openings/Food Plots	3	100%
Designate 3 Days for Big Game Hunting and 3 Days for Small Game Hunting	1	33%

PUBLIC INPUT MEETING/ONLINE	COMMENT	PLAN RESPONSE
Online	I would like to see vehicle access limited, potentially designate parking areas. I would like to see foot bridges in some of the areas over the canals that are far to wide and deep to cross safely. Potentially making it a three day per week area.	Van Swamp Game Land has a good mix of roads (10.8 miles) that are open for vehicular use to access the interior of the game land and trails (8 miles) that are closed to vehicles where hunters can walk to access portions of the game land. Most of the roads and trails have a ditch or canal on only one side of the road allowing hunters to access to the forests without needing to cross a ditch or canal. Van Swamp is a 6-day/week game land which offers users the maximum opportunity to hunt.
Online	Most of the property is so thick you can't walk in it. I would clear some areas for grass to grow giving more hunting areas. This will also keep people from shooting down the roads. Have Monday, Tuesday and Wednesday small game hunting and Thursday, Friday and Saturday large game. This would help get the deer population back up because this property is hunted heavily. Maybe plant food plots.	Van Swamp Game Land is a Dedicated Nature Preserve. The Articles of Dedication outline appropriate management activities that can be done on the game land. Creating openings in the forested areas is not an approved activity. The NCWRC is allowed to plant the road shoulders and the trails that closed to vehicles.
Online	Again I would like to see it with limited access via walking in. No vehicles allowed. Add micro food plots of oats in area through the property. Manage animals so as to kill more quality animals. Add vast amounts of ditch crossings via RR ties or simple beams so people can get off the roads away from other people making it more safe and give people more access to the property.	Addressed above.

6. What would encourage you to start using this game land, or to continue using it more actively?

SUBJECT	NUMBER OF REPONSES	PERCENTAGE OF REPONSES
Limit Access	2	67%
Install Hunter Bridges	2	67%

PUBLIC INPUT MEETING/ONLINE	COMMENT	PLAN RESPONSE
Online	If the property was walk in only and had ways to cross the ditches i would use more. limiting vehicles would also encourage wildlife to use area more.	There are adequate areas for hunters to go on VSGL where vehicles are prohibited. Hunter bridges will be considered as funding allows.
Online	It is the closet large game land for me to access.	
Online	Foot bridges over canals Limiting the vehicle access. Seen far to many people hunting from the truck.	Addressed above.

7. What additional comments do you have about Van Swamp Game Land?

SUBJECT	NUMBER OF REPONSES	PERCENTAGE OF REPONSES
Install Hunter Bridges	1	33%
Limit Vehicular Access	2	67%
Restrict Use of Dogs	1	33%

PUBLIC INPUT MEETING/ONLINE	COMMENT	PLAN RESPONSE
Online	I would really like to see foot bridges for increased access to the large amount of land on the tract. I would like see vehicle traffic limited. Currently I see many people drive through from NC 32 to Hollis Rd that are just riding through or worse road hunting. Also too many people just sitting in their trucks hunting along the driving paths. Some areas are so torn up by people 4-wheeling walking the road even becomes a chore.	Addressed above.

Online	The way the roads and how people ride and shoot down them is unsafe. Addressing this problem help wildlife and people in the future.	
Online	In addition to everything i have said already i would also like to see running of deer and bear hounds on the property be made illegal. This type of hunting disrupts others trying to use the property and hunting in general.	The NCWRC recognizes the tradition of hunting with hounds and supports their use where appropriate.