A Forest Stewardship Plan for the Property of Alana Ennis



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Table of Contents

Introduction	3			
General Location and Property Description				
Landowner Objectives				
Forest Stewardship Resource Elements				
Soil and Water	5			
Biological Diversity	6			
Aesthetic Quality	7			
Recreation	8			
Timber	8			
Fish and Wildlife	9			
Threatened and Endangered Species	10			
Forest Health	11			
Archeological, Cultural and Historic Sites	12			
Wetlands	12			
Fire	13			
Carbon Cycle	14			
Range/Silvopasture/Agroforestry	14			
Forest Stand Evaluations and Recommendations				
Stand 1	16			
Stand 2	19			
Stand 3	20			
Stand 4	21			
Stand 5	23			
Stand 6	24			
Stand 7	25			
Stand 8	28			
Stand 9	30			
Stand 10	30			
Conclusion	31			
Management Activity List	32			
Stand Map				
Soil Map	34			
Appendix Material List	35			

Introduction

The Forest Stewardship Program is a cooperative project between the USDA Forest Service and, for this property, the North Carolina Forest Service. The purpose of the program is to "enable active, long-term management of non-industrial private forestlands." The North Carolina Forest Service facilitates development of comprehensive multi-resource management plans to assist landowners in managing their property for multiple objectives. Forest Stewardship Plans motivate landowners to become more active in planning and managing their forests, greatly increasing the likelihood that their forests will remain intact, productive and healthy, and that the social, economic, and environmental benefits of these lands will be sustained for future generations.



This Forest Stewardship Plan was prepared, with funding through The Eno River Association, for the property of Alana Ennis. The purpose of the plan is to provide an evaluation of the current condition of the property and recommendations for management action to best achieve the landowner's objectives.

General Location and Property Description

The subject property is located in western Orange County approximately two miles northwest of Efland, NC. The property consists of two parcels located to the east of Frazier Rd. with limited access off the end of Faye St., a private road. The property totals 114.175 acres, of which 92.3 are forested. The remainder is composed of cultivated fields, hayfields, and a small farm pond.

The property encompasses land to the west of McGowan Creek including portions of a small unnamed tributary which flows east into the main channel. McGowan Creek is a tributary of the Eno River which joins the Little River, feeds Falls Lake, then forms the Neuse River.

The elevation ranges from 636 feet above sea level where McGowan Creek leaves the property at the southeastern corner, up to 730 feet on a broad ridgetop on the northwestern corner. Generally the topography is gently rolling and slopes rarely exceed fifteen percent. The exception to this rule is a limited area of land paralleling the main channel of McGowan Creek, where the land drops sharply to the floodplain and slopes up to fifty percent are present.

Landowner Objectives

Forest management objectives are the overarching goals that the landowner wishes to work towards. Setting realistic and well-defined objectives is the first step in determining the direction that management will take. Ms. Ennis' objectives include:

- 1) **Protection and enhancement of soil and water resources:** Growing trees almost always improves soil tilth, stability, water holding capacity, and fertility. Threats to soil and water quality most often occur during or after poorly executed forest management practices as erosion from forest roads, chemical run-off, compaction from logging equipment, or damage to stream banks. Protecting soil and water through the implementation of Best Management Practices (BMPs) and thoughtful harvest planning can reduce negative impacts on and off the property and is an important consideration with any management activity.
- 2) Generation of income from sound silvicultural practices: Long-term forest management for income not only includes the planning of timber harvests, but also the implementation of strategies for promoting the most profitable species for each site and controlling competing species that may reduce stem quality and growth rates in crop trees. Frequently seen only as a source of income, well planned harvesting operations often present the best opportunities to achieve other forest management objectives as well.
- 3) **Conservation of open space through the sale of development rights:** Conservation of working lands is important for the long-term prosperity of our region. As more and more productive farm and forestland is converted to residential or commercial uses, the remaining lands become more critical both for the environmental services they provide and their contribution to the rural economies that the region depends on. For the private landowner, conservation frequently means making a personal commitment to maintain their property in an agricultural or forested state. This commitment can often be leveraged to generate cost-share assistance from government agencies, income from NGO's for the purchase of development rights, or to take advantage of tax incentives.
- 4) Facilitate the use of permaculture concepts: Permaculture is a system of ecological design that builds on the relationships between living things to create low maintenance horticulture systems modeled on natural ecosystems. In essence, permaculture is applied ecology with a focus on achieving productive and stable systems to sustain human life. Many permaculture writings focus more heavily on food production than on timber production, but the principles are transferrable. Experimentation with production models is completely compatible with the other management objectives and almost unlimited opportunities are present on this property for agroforestry, forest gardening, and production of non-timber forest products.
- 5) Maintenance and improvement of wildlife habitat: Healthy, well managed forests provide habitat for a wide variety of game and non-game wildlife species. In central North Carolina, common species include white-tailed deer, wild turkey, woodcock, bobcat, beaver, as well as many species of woodpeckers, waterfowl, raptors, songbirds, small mammals, reptiles, amphibians, insects and other invertebrates. Typically,

manipulation of the plant communities to provide a high diversity of habitats is a good strategy for accomplishing this objective. If a particular species is of concern, forest management can be tailored to provide the necessary elements for that species.

6) **Family legacy:** Including family legacy as a management objective exemplifies American tradition and sustainable forestry. Throughout history, property owners have gained immeasurable satisfaction from living, working, and playing on their own land. Ensuring that this satisfaction is transferrable to the next generation requires that current management decisions do not forfeit future potential for short term gains. Just as important as managing for long-term productivity is cultivating in future landowners a connection to, and a sense of responsibility for the property.

Forest Stewardship Resource Elements

The following thirteen (13) natural resource elements are addressed in all Forest Stewardship Management Plans when they are present and/or applicable to the landowner and the management of their property:

This portion of the document provides information on the 13 required Forest Stewardship Program natural resource elements. This plan may not address one or more of these resource elements if they were not observed on the property or were not identified as one of the land owner's management objectives. For more information, contact the author of this plan or local NC Forest Service (NCFS) office. Additional information and brochures may be available through NCFS offices or at: <u>http://www.ncforestservice.gov/publications.htm</u>

Soil and Water

Soil fertility is of major importance when it comes to forest management. Just as fertile soil is needed to produce high quality agricultural crops, specific soil conditions are required to grow good quality timber stands. Soil requirements vary by tree species and in the forestry field, soil productivity is expressed as "Site Index." Site index (SI) is the measure of height growth in a tree species over a 25 or 50-year period. Soil type and conditions will influence management strategies and production potential. It is important to understand the nature of a tract's soils, as their characteristics may require different types of management. Information on local soils and accompanying data can be found on the Natural Resources Conservation Service (NRCS) website: http://soils.usda.gov/

All forestry activities must protect water quality and comply with, among others, the North Carolina Forest Practices Guidelines Related to Water Quality (FPGs). Refer to the following website on FPGs: <u>http://ncforestservice.gov/publications/Forestry%20Leaflets/WQ01.pdf</u>. NCFS personnel can perform FPG site inspections upon request.

Additionally, the state and some local governments have also established rules to protect vegetated riparian buffers found along streams, rivers, and reservoirs in various parts of North

Carolina. Refer to the following website to view these buffer rules: <u>http://ncforestservice.gov/water_quality/buffer_rules.htm</u>

This plan will address the water bodies that should be protected during forest management activities. This may include the establishment of streamside management zones (SMZs), which are meant to prevent sedimentation and maintain healthy water temperatures. Proper pre-harvest planning prior to cutting timber can help ensure protection of both soil and water resources. Information on forestry activities and water quality issues can be found on the NCFS website: http://ncforestservice.gov/water_quality/water_quality.htm

Soil and Water on This Property: The majority of the soils on the property consist of welldrained clay and silt loams in the series Georgeville, Cecil, Enon, and Herndon. Many of these soils have been heavily impacted by agricultural use over the last few centuries. Most of the upland areas are best suited to production of a mixture of pine and upland hardwood tree species.

The creek bottoms and floodplains are dominated primarily by Chewacla series loam. In general, these soils are somewhat poorly drained, moderately deep, and highly productive. Wetness and occasional flooding limited agricultural use of these areas in the past, but evidence of timber harvesting during wet conditions is evident in some areas where rutting has occurred. The Chewacla soils are best suited to production of hardwood tree species including tulip poplar, bottomland oaks, sycamore, elm and black walnut.

The major hydrologic features on the property include: McGowan Creek, a small unnamed tributary of McGowan Creek, and a small farm pond located at the head of the tributary. The waterways have been dammed extensively by beavers which have several lodges on the property. The majority of McGowan Creek is impounded into several ponds and the lower portion of the tributary is heavily impounded as well.

Where the creek bottoms are narrower and beaver activity is not influencing hydrology, many of the stream banks are steep and incised. This degradation is a result of past agricultural practices. Nonetheless, the hydrologic function of the property is largely intact and with good planning, negative off-site impacts can be avoided.

Biological Diversity

Biodiversity is the variety of life (including diversity of species, genetic diversity and diversity of ecosystems) and the processes that support it. Landowners can contribute to the conservation of biodiversity by managing for a diversity of habitats. It is important to select management options that offer the greatest opportunities for promoting wildlife habitat and conserving biodiversity while fulfilling other land ownership objectives. Some of these options include, but are not limited to:

- 1. Managing stand-level habitat features.
- 2. Promoting *aquatic* and riparian areas.
- 3. Managing landscape features.
- 4. Conserving rare species and communities.
- 5. Protecting special features and sites.
- 6. Developing partnerships with natural resource agencies and conservation organizations.

For more information on managing for biological diversity, refer to the following website: <u>http://www.fs.fed.us/ecosystemservices/biodiversity.shtml</u>

Biological Diversity on This Property: Cropland, pasture, wetlands, riparian areas, and multiple ages of mixed species forest provide a mosaic of habitats on this property. Because of this diversity in both landforms and land-uses, this property has the potential to support a wide range of species and communities. Protection of riparian areas, ponds, and active beaver populations will help protect biodiversity, wildlife habit, soil and water resources, and aesthetics simultaneously. This combined with forest management that attempts to maintain high productivity, mixed species stands, and multiple stages of stand development, will likely increase the species and community richness on the property.

Aesthetic Quality

By definition aesthetic quality (pleasing in appearance) means different things to different people. It can be anything from buffering a timber harvest from a busy road to managing for an open forest understory that is enjoyable to walk through. There are numerous management techniques that may be employed to achieve the landowner's desired level of aesthetic quality and many are discussed at the following websites:

- www.ncrs.fs.fed.us/pubs/viewpub.asp?key=4866.
- <u>http://ncforestservice.gov/fsandfl/stewardship_aesthetics.htm</u>

Aesthetic Qualities on This Property: The pastoral and wooded setting, well buffered from surrounding roads and residential development define the aesthetics for this property. Highlighting the diversity of habitats and the working landscape, while avoiding the negative visual impacts of forest management operations, will be the challenge. Visual disturbances can be mitigated by reducing the size of major canopy disturbances, buffering higher use areas from timber harvests, and feathering the edges between different land-uses. Some management operations may disturb the aesthetic qualities in the short term, but will improve aesthetics and meet other objectives over time.

Focusing on management of the edges between forest and agricultural land will improve aesthetics and mitigate future disturbances. Managing these edges using permaculture principles can also help to create a transition zone between agricultural and potential residential areas of the property. Many species of native trees and shrubs that provide benefits such as showy flowers, brilliant fall colors, or evergreen foliage are already present in the forest or commercially available. These species could be favored or planted along edges to improve aesthetics and ease transitions.

Recreation

Management practices which enhance recreation opportunities may be easy to implement depending on the types of forest-oriented recreational activities valued by the landowner. For tips on recreational management visit the following websites:

- Birding website (Partners in Flight): http://faculty.ncwc.edu/mbrooks/pif/bird%20profiles/bird_profiles.htm
- Trail construction/maintenance: http://www.ces.ncsu.edu/nreos/forest/woodland/won29.pdf
- Wildflowers: <u>http://www.wncwildflowers.info/</u>
- Wildlife viewing: <u>http://www.ncwildlife.org/tarheelwildlife/documents/Tarheel_Wildlife.pdf</u>
- Fishing/hunting: <u>http://www.ncwildlife.org/</u>
- Hiking/biking/horseback riding: <u>http://www.naturalresources.msstate.edu/business/trail-</u> riding.html

Recreation Opportunities on This Property: Numerous possibilities to facilitate recreational use of the property are present. The most obvious step that could be taken in the short term is to construct a network of trails that provides access to the woodland and allows the landowner and other users to more easily visit and monitor the majority of the property. Trails following the western bank of McGowan Creek and the northern bank of the drainage flowing from the farm pond would be an easy initial development. Depending on future needs or wishes, additional trails could be constructed that access the southern portion of the property. A trail system would provide a backbone for development of other recreational opportunities such as picnicking areas, bird watching or wildlife viewing.

<u>Timber</u>

The Forest Stewardship Program assists landowners in sustainably managing their forest so they can be productive, vigorous and healthy. The type of management your forest will require is based on your management objectives, site capabilities and current condition of the forest. This plan will recommend practices to regenerate or initiate, tend, and harvest timber consistent with the long term objectives.

The land units used for timber management are called stands. In some cases stand boundaries

are clearly defined on the ground, particularly when an even aged stand developed naturally on an old agricultural field or when a uniform site was planted to a stand of loblolly pine. In other cases, where topography and soils are more variable and the impact of human activity less intense, species composition changes gradually and stand boundaries are less easily defined. For the purposes of this plan, stand boundaries were determined by slope, soils, species composition, access, and tree ages, and were mapped using 2010 aerial photographs and the Orange County GIS system parcels layer.

Timber on This Property: Much of the property is very well suited for timber production. The soil types and conditions on the majority of the upland sites lend themselves to production of pine and mixed hardwoods depending on slope position and aspect. The more concave sites and creek bottoms will be most productive growing stands of bottomland hardwoods and species that can tolerate a high water table.

Much of the property was heavily cutover in the late 1990's. Following this timber harvest, a site prep burn was conducted to remove logging slash and facilitate artificial regeneration of loblolly pines, which were planted around 1999. The pines have performed well on the higher and drier sites, but competition from less desirable species is inhibiting growth in many of the wetter areas. Some older trees on the property include those left around the old homesite, a narrow and patchy buffer along the riparian areas, and residual timber where quality was somewhat poorer. A few small areas of older pines remain along the northern boundary of the property.

For this property, timber management will be focused primarily on the upland sites with rotation lengths between 30 and 60 years. The emphasis in these areas will be on restoring mixed species stands, cultivating the current timber crop to ensure success of desirable species, and maintaining high growth rates. These upland areas represent the greatest potential for income generation on the property and this income can be used to drive sustainable management on the entire property. Some timber harvesting, during management activities in the upland stands, may be recommended in the other areas to achieve the other objectives for the property.

Fish and Wildlife

Fish and other aquatic species depend on healthy water quality and quantity. Forest management decisions have a direct impact on both of these. Proactive and positive things landowners can do include establishing streamside management zones (SMZs), preventing or mitigating sources of sedimentation, and leaving un-mown areas around ponds. Landowners that have water bodies present on their property may contact various natural resource professionals to obtain technical assistance on improvement, aquatic maintenance, and fish stocking. Visit the following website for information on pond management and fishing opportunities:

http://www.ces.ncsu.edu/nreos/wild/fisheries/mgt_guide/chapter1.html

Forestry activities and how they relate to water quality are discussed at:

http://ncforestservice.gov/water_quality/water_quality.htm

An explanation of streamside management zones is located at:

http://www.woodlandstewardseries.com/landowner-information-for-managingwoodland/documents/ExplainingStreamsideManagementZones.pdf

Wildlife has four basic requirements: food, cover, water and space. Different wildlife species require different stages of forest growth to meet these needs. For example, quail and partridge feed on seeds of annual and perennial weeds and grasses that occur in young stands of timber, where sunlight reaches the forest floor. This is early successional habitat. Pileated woodpeckers depend on dead and rotting trees found in mature forests. This is late successional habitat. Still other wildlife prefer mid-successional habitat. Several factors determine how many species a forest can support - plant cover, harvest operations, water resources and topography. Many properties may have woodland, streams, swamps, rivers, ponds, and areas that adjoin fields, pastures, roads and other openings. Managing these "edges" is crucial to abundant populations of some wildlife species. The relationship between vegetation management and wildlife species habitat is well established. Understanding relationships is the first step in determining how property can be managed to promote the intended species. For more information on managing fish and wildlife and ponds contact a Forest Stewardship Biologist at http://ncforestservice.gov/fsandfl/stewardship_contacts.htm or visit the North Carolina Wildlife Resources Commission webpage: http://www.ncwildlife.org/

Wildlife on This Property: As noted earlier, many habitat types are represented on the property and thus a high diversity of animal species inhabits the property as well. Several effective strategies that will maintain and enhance wildlife species on this property include:

- -Managing for edge habitat with irregularly shaped harvest areas
- -Maintaining scattered older mast producing trees across the forest
- -Protecting the pond, riparian buffers, and beaver populations
- -Cultivating soft mast producing species in the forest gardens and permaculture areas
- -Reducing the mowing cycle to three years in some areas
- -Attempting to maintain a mixture of young, middle-aged, and old timber stands

Threatened and Endangered Species

The North Carolina Natural Heritage Program provides information on state and federal threatened and endangered (T&E) plants and wildlife, habitats of particular conservation concern, and stewardship actions designed to benefit these important natural resources. The site has an online mapping tool, "The Virtual Workroom", that can provide geographic information on T&E species and natural communities of concern that are within a 2-mile radius of a specified location. A searchable database that can provide county-level and US Geological Survey (USGS) information is also available. The North Carolina Natural Heritage Program lists T&E species information at the following websites:

- http://www.ncnhp.org/Pages/heritagedata.html
- <u>http://www.ncnhp.org/Pages/guide.htm</u>
- http://www.ncnhp.org/Images/2010%20Rare%20Animal%20List.pdf

Threatened and Endangered Species on This Property: A comprehensive assessment of threatened and endangered species populations was not conducted during the site visits for this Forest Stewardship Plan. During the evaluation of the property, no known endangered or threatened species were found.

Forest Health

A healthy forest is a forest that possesses the ability to sustain the unique species composition and processes that exist within it. The health of our forests must be maintained to ensure the survival of plant and animal species that make the forest their home, and to protect those processes that maintain a healthy environment. A healthy forest must also be able to accommodate the present and future needs of people for a variety of values, products, and services. Forest health protection issues are often directly related to the active management of insects and diseases, invasive plants and wildfire. Yearly inspections for signs of insects, diseases or invasive plant infestations should be completed by the landowner. More forest health information can be found on the following websites:

www.forestpests.org http://www.fs.fed.us/foresthealth/ http://www.fs.fed.us/r8/foresthealth/ http://ncforestservice.gov/forest_health/forest_health.htm

Forest Health on This Property: Some losses due to insects and disease are normal throughout a forest's development, but in many cases management action is necessary to prevent insects, disease, or invasive plant species from greatly reducing the forests ability to realize the landowner's objectives. Over the next several decades invasive plant species and southern pine beetle will probably pose the greatest threats to forest health.

Non-native plant species threaten forest productivity across the continent and the problem is causing environmental and economic damage on a rapidly growing number of acres every year. Invasive plant species, once established, are capable of severely inhibiting natural regeneration, out-competing native tree species, and in some cases killing mature stands of timber. The best method to protect the long term productivity of the property from this threat is to monitor for and control invasive species infestations aggressively before they become well established. Specific species will be addressed later in the plan.

Southern Pine Beetle is an insect native to North Carolina that has become the most important insect pest for management of southern pines. The species is always present in areas where pines are growing, and under normal conditions trees' natural defenses prevent large scale mortality. When conditions are dry, growth rates are low, or stem densities are high, Southern

Pine Beetle infestations can become severe and widespread, killing pines on several hundred acres at a time. The best way for landowners to prevent large scale Southern Pine Beetle damage is by maintaining vigorous growth through all stages of stand development. Typically, a precommercial thinning by age fifteen, and commercial thinnings around ages twenty and thirty, will offer the remaining trees the resources necessary to keep their natural defenses high. Government cost share is frequently available for completion of pre-commercial thinning in plantations that meet certain criteria.

Archeological, Cultural and Historic Sites

Cultural resources refer to landscapes, structures, archeological artifacts, and vegetation that represent a culture or society. These remains are pieces of history that can provide a glimpse into the technology, culture, and environment of earlier societies and reveal much about our country's origins and development. Make sure you alert your forester or ranger to any such sites as they begin to develop your Forest Stewardship Plan. If you have specific questions about such sites, it may also be possible to work with a trained expert from the North Carolina Cultural Resources staff. It is especially critical to understand where such sites may be located prior to conducting ground disturbing projects. Information concerning Archeological, Cultural and Historic sites can be found at these websites:

- http://www.ces.ncsu.edu/forestry/resources/publications/documents/won45.pdf
- North Carolina Cultural Resources (<u>http://www.ncdcr.gov/</u>)
- North Carolina Office of Archives and History (<u>http://www.history.ncdcr.gov/</u>)

Archeological Cultural and Historical Sites on This Property: A comprehensive assessment of archeological, cultural, and historical sites was not conducted during the site visits for this Forest Stewardship Plan. There is clear evidence of past agricultural use, and an area that was probably an old homesite was noted near the center of the property. This area will be addressed in more detail later in the plan.

Wetlands

Wetlands are highly productive areas for timber production, water quality protection, wildlife habitat, and aesthetics. Due to their wet-natured soils and unique species composition, these ecosystems need to be managed carefully to maintain the full breadth of benefits that they provide. Some of the forestry activities done on "high ground" may still be carried out in wetland areas, but others practices may not. It is the responsibility of the landowner to understand the regulations related to forestry before engaging in forestry practices or contracting with a forest management service to work on their land. This can seem a daunting responsibility, especially when it comes to wetland areas, but many resources are available to answer questions. The NCFS; private consulting foresters; the NC Forestry Association; and the NC Forestry Extension Program can be good sources of information on allowable forestry practices in wetlands. The two primary agencies that regulate activities in wetlands are the NC Division of Water Quality and the US Corps of Engineers.

More information on North Carolina wetlands, as well as forestry activities that may be carried

out in them, can be found at these websites: <u>http://dcm2.enr.state.nc.us/wetlands/brochure.htm</u> <u>http://ncforestservice.gov/publications/WQ0107/BMP_chapter06.pdf</u>

Wetlands on This Property: Wetlands are a significant feature on this property. As mentioned earlier, the majority of McGowan Creek and the lower portions of the drainage from the pond are inhabited by American beavers. The construction of beaver dams back up water in these lower areas, raising the water table, and flooding large areas of the creek bottoms. These wetlands are helping to protect water quality in McGowan Creek and beyond, and are providing unique habitats for wetland plant communities as well as waterfowl and other wildlife species.

Any management action on the property should be planned to minimize negative impacts to these areas. Equipment should be largely restricted from the creek bottoms except during very dry weather and access the southern portion of the property should be limited to one stream crossing at the narrowest point in the channel. A temporary bridge mat or a permanent culvert crossing, with a device to prevent blockage by beavers, should be used for equipment access.

Fire

Prescribed fire is the planned use of fire under pre-determined weather and fuel conditions to obtain specific management objectives. This is also known as "controlled" burning, and when done correctly it mimics the frequent burning that used to occur in NC naturally. Prescribed burning is a critical management tool that benefits North Carolina's forests, wildlife and overall environment. It also helps reduce the devastating impacts of uncontrolled wildfire hazards. Prescribed fire is especially important in North Carolina due to the large amount of land lying in the <u>Wildland/Urban Interface</u> (WUI). The N.C. General Assembly recognized the importance of prescribed burning in the NC Prescribed Burning Act, which may be reviewed at the following website:

http://www.ncleg.net/EnactedLegislation/Statutes/PDF/ByArticle/Chapter_106/Article_80.pdf

The NC Forest Service and its partners train, plan and coordinate with local fire services before a prescribed fire is started in order to ensure that all burning regulations are obeyed. There are also private contract burners that provide this service in various parts of the state.

Additional information on prescribed burning may be found at:

http://ncforestservice.gov/Managing_your_forest/managing_your_forest.htm http://www.ces.ncsu.edu/forestry/pdf/ag/AG-616.pdf http://www.ncfirewise.org/ http://ncforestservice.gov/fire_control/fc_wui.htm

Prescribed Fire Opportunities on This Property: Historically, the upland areas of the property may have burned naturally, or as a result of human activities, every 5-15 years. Many ecologists attribute the decline of oak-hickory-pine forests in the Carolina piedmont to the disruption of this fire regime for the last century. Recently prescribed fires have become an

accepted and valuable management tool to restore ecosystem processes.

Prescribed fire has the potential to provide many benefits on the upland portions of the property. Burning these mixed stands after the first commercial thinning would help to control undesirable native and non-native species, allow for development of grasses and herbaceous plants in the understory, promote development of oak and hickory regeneration, and improve wildlife habitat by providing sources of browse, soft mast, and cover on the forest floor.

Carbon Cycle

All forest plants and soils "store" carbon, so your management influences the natural cycles of that storage in both living and dead plant material. The removal of carbon from the atmosphere is the process of carbon sequestration. Trees are roughly 50% carbon, based on dry weight. Certain forest management practices can promote more plant growth per acre. Timber harvests can lead to durable wood products that store carbon for long periods of time. Carbon sequestration rates can be increased by maintaining forest health, replanting areas that have been harvested and actively managing a dynamic growing forest.

In recent years, programs dealing with "carbon sequestration", "carbon credits" and "biomass" have been in the news. While the resulting financial benefit to forest landowners is still in question, this may still be a topic to watch. The amount of carbon credits on a property can be computed based on a forest inventory. Age, stocking levels, species and site index are factors that can affect this inventory. Many consulting foresters can complete the base-line inventory for an associated fee. Prior to engaging in carbon markets, landowners need to consider the commitment period, contracts, associated fees, market access, inventory methods, aggregators, certification programs, afforestation and required silvicultural treatments. More information on this topic can be found at:

http://www.ces.ncsu.edu/forestry/programs/woody_biomass/pubs_and_research.php

Carbon Cycle on This Property: At this time, opportunities to participate in carbon markets are limited for this property. As the climate change issue evolves in the future, opportunities may become more certain. Until then, sustainable forest management should be practiced for the multitude of other benefits it provides.

Range/Silvopasture/Agroforestry

Silvopasture dates back to when humans first started burning and thinning forests to promote forage for the animals they relied on for food. The practice is increasingly popular in the South as a way to supplement timber income on small pine plantations and some hardwood stands. Trees can provide longer-term returns from saw logs for lumber, while livestock in a rotational grazing system provides steady annual income. There can be, however, problems with combining the two management schemes if it is not done correctly. Before any new silvopasture

system is established, landowners should thoroughly explore the associated economic and environmental considerations along with local land use, zoning, cost-share program, and tax regulations. Forest and agricultural land may have separate zoning and land-use regulations accompanied by tax assessments. Environmental requirements (ex. planting trees, stream-side protection, and wildlife habitat maintenance) also may vary with land use.

More information on silvopasture may be found at these websites: <u>http://www.srs.fs.usda.gov/compass/issue15/03pastures.html;</u> <u>http://www.srs.fs.usda.gov/compass/issue15/03top.html</u> <u>http://www.silvopasture.org/pdf_content/silvopasture_handbook.pdf</u> <u>http://www.srs.fs.usda.gov/compass/issue15/03what.html</u>

Range/Silvopasture on This Property: At this time, livestock are not grazed on the property. If, the need to graze the woodland arises in the future, this issue can be addressed.

Forest Stand Evaluations and Recommendations

Stand 1

Stand 1 is located on the northeast portion of the property between a 10 acre cultivated field, the riparian area along McGowan Creek, and the tributary flowing from the west. Located on top of a broad ridgetop, slopes are relatively gentle and rarely exceed 10 percent, except along the border with Stand 7 where they increase somewhat. Soils are Georgeville and Cecil series and were probably cultivated and grazed heavily in the past. The convex site and well drained, but somewhat degraded, soils are ideal for production of loblolly pine with associates of upland hardwoods. After a rotation of pine, site quality will probably improve to the point where a shift toward upland hardwoods can be considered. The fifty year site index for loblolly pine is 100 feet.

This area was a hardwood stand that was clearcut in 1999, burned, and planted to loblolly pine immediately following the harvest. Overall, the pines have performed well, reaching heights of about 40 feet and diameters averaging 7 inches. Some mixed hardwoods are present in the canopy including white oak, willow oak, black oak, southern red oak, sweet gum, winged elm and red maple. Red mulberry, American holly, American beech, and Florida dogwood are present in the midstory.

Along the edges with the field, many invasive plants are present, including, tree-of-heaven, common privet, Japanese stiltgrass, multiflora rose, and Japanese honeysuckle. Within the stand, tree-of-heaven and princesstree have reached the canopy and are producing seed and competing with more desirable species.

Some damage to the pine stems on the southern boundary has occurred from the beaver populations in Stand 7. See Figure 1



Figure 1: Beaver damage on southern edge of Stand 1

Access to the stand is excellent from the field edge and slope will not limit management.

The following table offers a general summary of the stand:

Stand	1	Acreage:	13	Age:	14		
Site							
	Soils:		Georgeville, Cecil				
	Slope:		0%-10%				
	Aspect:		East				
	Landform:		Convex				
	Site Index:		100	for	loblolly pine		
Vegeta	tion						
	Primary Tr	ee Species:	loblolly pine				
	Secondary '	Free Species:	upland oaks, red maple				
	Stocking:		fully stocked: 150 square feet per acre				
	DBH of tim	ber species:	7				
	Shrubs:		sumac, blackberry (declining)				
	Herbs:		grasses, forbs (declining)				
	Vines:		catbrier, grapes				
	Advance Re	egeneration:	NA				
	Invasive Pla	ants:	tree-of-heaven, princesstree, multiflora rose, Japanese honeysuckle, Japanese stiltgrass				

Recommendations:

The invasive trees in the canopy should be cut and the stumps should be treated with a 25% solution of a triclopyr herbicide to prevent resprouting. It is likely that after this treatment, little invasive species control will be necessary within the stand as the pines will probably shade out most of the species in the understory over the next several years. This can be completed inhouse or a licensed pesticide applicator can be hired to do the work.

In about 8 years or sooner if volumes allow, a commercial thinning should be conducted. Residual basal areas should be determined just before the thinning is conducted. This thinning will help to maintain high growth rates in the pines, and can also be used to promote hardwood mast producers in the canopy. This thinning, if marketed with pulpwood harvests and improvement work in other stands, should generate modest returns which could be used to finance stewardship work on other portions of the forest. This sale should be negotiated on a per unit basis with a reputable pulpwood buyer.

After the first thinning, another thinning will probably be necessary around age thirty.

Stand 2

Stand 2 is located on the southern portion of the property, to the west of McGowan Creek and to the south of the tributary. Slopes are relatively moderate, mostly under 10 percent and the landform is rolling, containing both concave and convex sites which face northeast. Soils are Georgeville series, and portions of the stand may have been cultivated in the past (but not to the extent as in Stand 1). Fifty year site index for loblolly pine is 90 feet.

Like Stand 1, this hardwood stand was clearcut in 1999, burned, and planted to loblolly pine immediately following harvest. Hardwood stump sprouts have competed effectively with the pines in many areas and the hardwood species are playing an important role in the canopy in these areas. White oak, black oak, southern red oak, and hickories occupy the higher slopes, while tulip poplar, sweetgum and elm are competing on the wetter sites. The hardwood stems are typically between 3 and 5 inches DBH and multiple sprouts have grown from the cut stumps. Where pines are dominant, they have reached diameters averaging 6 inches.

Access to the stand is limited by the required crossing of the riparian area. This limitation, along with the low pine volumes, may reduce options for management, especially improvement harvesting or commercial thinnings.

Stand	: 2	Acreage:	26	Age:	14			
Site								
	Soils:		Georgeville)				
	Slope:			0-15%				
	Aspect:		northeast					
	Landform:		rolling: gen	rolling: gentle ridges and drains				
	Site Index:		90	for	loblolly pine			
Vegeta	tion							
Primary Tree Species:			mixed oaks, tulip poplar, loblolly pine					
	Secondary T	red maple,	red maple, American beech, sweetgum, hickories					
	Stocking:	120 square feet per acre						
	DBH of timber species:			3"-6"				
	Shrubs:	sumac, blackberry (declining)						
	Herbs:		grasses, for	bs (decli	ning)			
	Vines:	catbrier, grapes						
	Advance Re	generation:	NA					
	Invasive Pla	nts:	multiflora r	ose, Japa	anese honeysuckle			

The following table offers a general summary of the stand:

Recommendations:

If possible, the stand should be thinned in about 8 years along with Stand 1. If a timber crop worth managing can be cultivated in the pines, the pines and hardwoods can be more easily managed in the future.

If commercial thinning is not economically feasible, one alternative is to complete a crop-treerelease treatment where desirable species of good stem quality are selected and released through mechanical removal of competing trees and vines. The treatment should select for loblolly pine and well-formed oaks on the upland sites and for loblolly pine and tulip poplar on the lower sites. Stump sprouts should be approached by removing all but the best quality stem. Ideally, this work could be completed in-house over several years.

The other alternative is to allow this stand to grow on its own until enough volume is present to justify a commercial harvest. This may not be until the stand is thirty or forty years old, between the years 2030 and 2040. At this time a commercial removal of pine and hardwood pulp should be feasible if markets persist.

Stand 3

This stand is located along both sides of the small tributary flowing from the pond on the west end of the property. Slopes are moderate, mostly under 10 percent and the landform is rolling, containing both concave and convex sites which face either north or south. Soils are primarily Georgeville series, but some Herndon soils are present on the western end. The soils have been used heavily in the past, both cultivated and grazed, though some areas were likely too wet for cultivation. The fifty year site index for loblolly pine is 90 feet.

This stand was about 40 years old at the time of the last harvest, and probably established on an old pasture in the 1960's. A mixed stand of pine, sweetgum, and tulip poplar with a fairly diverse mid-story, the previous stand was nearly clearcut, burned, and planted to loblolly pine, like Stands 1 and 2. Some exceptionally poor quality residual stems were left standing along the field edges and on the wetter sites. The success of the pine has been patchy with pine density higher on the better drained sites, and lower elsewhere. To the south of the stream, white oak, southern red oak, maple and hickory are the dominant hardwoods and to the north of the stream, sweet gum, tulip poplar, red maple, and winged elm are dominant.

Access to the stand is good except for the areas to the south of the stream. A temporary crossing on this stretch should not be difficult and if properly installed will have minimal impact on water quality. Wet soils in some areas will require limiting equipment use within the stand to dry weather.

The following table offers a general summary of the stand:

Stand	: 3	Acreage:	16.7	Age:	14			
Site								
	Soils:		Georgeville					
	Slope:		5-15%	5-15%				
	Aspect:		south and north					
	Landform:		rolling: low	rolling: lower slopes and drains				
	Site Index:		90	for	loblolly pine			
Vegeta	tion							
Primary Tree Species:			loblolly pine, mixed oaks, sweetgum					
	Secondary T	tulip poplar	tulip poplar, red maple, hickories					
	Stocking:	120 square feet per acre						
	DBH of timber species:			3-7"				
	Shrubs:			blueberry, blackberry				
	Herbs:		grasses and	forbs (de	eclining)			
	Vines:	catbrier, grapes						
	Advance Re	generation:	NA					
	Invasive Pla	nts:	multiflora r	ose, Japa	nese stiltgrass, Japanese honeysuckle			

Recommendations:

It is likely that portions of this stand can be thinned during the work in Stand 1, 8 years from now. Wherever economically operable, pine densities should be reduced to maintain high growth rates. Because the upland sites are more suited to timber production than the lower areas, it is important to produce a renewable timber crop where feasible to fund good management on the balance of the property.

Stand 4

Stand 4 is the 8 acre riparian zone surrounding the tributary to the east of the pond. Slopes are gentle, rarely exceeding 5%. Chewacla soils dominate the creek bottom, with a few areas where the upland soils extend into the stand as well. These areas were probably rarely cultivated, but livestock grazed the bottoms extensively in the past and the stream channel is somewhat incised in places. American beavers move up and down the stream channel and several old, filled-in ponds are present. An active population uses the area immediately below the farm pond heavily.

Like Stand 3, 30-40 year old timber was removed in the late nineties, but pines were either not planted or quickly died in the wet soils. The stand is dominated by hardwoods, mostly sweetgum, black willow, tulip poplar, eastern sycamore, red maple, and occasional oaks. Timber production potential in this area is low because of beaver damage, high densities of low value species, and an abundance of vines in the canopy.

The stand is providing excellent wildlife habitat. The beaver activity provides a constant supply of young tree sprouts and several areas of open, grassy cover. Common cattails, rushes, sedges, and bunch grasses are all present to varying degrees. Many of the older trees left along the stream channel are providing den sites, feeding sites for insects and birds, and some canopy structure as well. Native grapes are common and an excellent source of soft mast within the stand. Smooth alder is scattered throughout the stand providing some winter food sources and good bank stabilization.

Non-native species, Japanese stiltgrass and multiflora rose are both inhibiting growth of more desirable native plants, particularly where more sun is reaching the forest floor.

Stand : 4 Acreage:	8 Age: 14			
Site				
Soils:	Chewacla			
Slope:	0-55			
Aspect:	east			
Landform:	concave: creek bottom			
Site Index:	100 for tulip poplar			
Vegetation				
Primary Tree Species:	sweetgum, tulip poplar, red maple			
Secondary Tree Species:	winged elm, hickories, oaks			
Stocking:	80 square feet per acre			
DBH of timber species:	3"-6"			
Shrubs:	smooth alder			
Herbs:	grasses, sedges, rushes, forbs			
Vines:	grapes, catbrier			
Advance Regeneration:	NA			
Invasive Plants:	Japanese stiltgrass, multiflora rose			

The following table offers a general summary of the stand:

Recommendations:

Little action is necessary in the short term for this stand to continue providing its non-timber benefits. Roses could be removed from the stand using mechanical or chemical control, but the Japanese stiltgrass is not feasible to control.

A trail following the southern stream bank east from the pond, crossing the stream at the approximate midpoint of the stand, and following the northern bank to the southern edge of Stand 1 would make an excellent route for easy hiking, viewing wildlife or wildflowers, or monitoring the property.

Stand 5

Stand 5 is 5 acres on the northwest property corner. The land slopes gently to the southeast with slopes to 10%. Though the stand is small, the soils are diverse. It contains Herndon, Cecil, Appling, Enon, and Georgeville. The stand was probably cultivated in the past, was definitely grazed heavily, and has been abandoned for agriculture over the last 25 years.

Trees established naturally on old pastureland beginning in the early nineties and a mixture of early successional hardwoods and pines have slowly colonized the site. The stand contains Virginia and loblolly pines between 6 and 14 inches DBH, sweetgum, tulip poplar, and black cherry between 4 and 12 inches DBH, and scattered eastern red cedar throughout.

Goldenrod, broom sedge, and tall fescue are still present in some areas as well as scattered patches of blackberries. These areas of early successional habitat located close to the farm pond are used heavily by small mammals, birds, and insects.

Multiflora rose, common privet, Japanese honeysuckle and Japanese stiltgrass are all present.

Stand	: 5	Acreage:	5	Age:	10-25			
Site								
	Soils:		diverse upland soils					
	Slope:			0-10%				
	Aspect:	southeast						
	Landform:	gently rolling sideslope						
	Site Index:		90	For	loblolly pine			
Vegeta	tion							
	Primary Tr	loblolly pine, Virginia pine, sweet gum						
	Secondary 7	tulip poplar, black cherry, eastern red cedar						
	Stocking:	Patchy, 50-140 square feet per acre						
	DBH of tim	ber species:	4-14 inches					
	Shrubs:		blackberry					
	Herbs:			fescue, broom sedge, goldenrod				
	Vines:		grapes, catb	grapes, catbrier				
	Advance Re	generation:	NA					
	Invasive Pla	nts:	Multiflora r Japanese sti	ose, Jap ltgrass	panese honeysuckle, common privet			

The following table offers a general summary of the stand:

Recommendations:

This stand does not warrant intensive timber management. During future thinnings elsewhere on the property, Virginia pine and sweetgum could be removed from the stand as pulpwood which would create growing space for more desirable species, improving aesthetics and wildlife habitat.

If, during future farming or forestry activities, gaps of early successional habitat can be created or perpetuated by removal of timber, this should be considered. Another option may be using a heavy duty bush-hog. There are some younger patches within the stand that could be mowed once every three to five years.

Stand 6

Stand 6 is 6 acres located on the northern portion of the property and includes the smaller parcel. Located on Georgeville soils on the top of the main ridge, slopes are nearly flat throughout. The fifty year site index for loblolly pine is 100.

The stand is composed of two separate age classes of pine, but should be managed as one unit in the future. The northern portion is about thirty five year old planted loblolly that has never been thinned. The southern portion is about fifty years old and established on old fields, but was not cut during the last harvest. Diameters in the younger trees are between 7 and 16 inches and the older trees are between 14 and 20 inches. Understory and mid story hardwoods include red maple, sourwood, sweetgum, and tulip poplar.



Figure 2: Stand 6 needs thinning

Except for Japanese stiltgrass, few invasive plants are present within the stand. The southern boundary, however, contains tree-of-heaven which will begin producing seed soon.

Stand: 6 Acreage:	6 Age: 35 and 50			
Site				
Soils:	Georgeville			
Slope:	0-5%			
Aspect:	NA			
Landform:	convex: broad ridgetop			
Site Index:	100 for Loblolly pine			
Vegetation				
Primary Tree Species:	loblolly pine			
Secondary Tree Species:	red maple, sweetgum, tulip poplar			
Stocking:	200 square feet per acre			
DBH of timber species:	7"-20"			
Shrubs:	NA			
Herbs:	grasses and forbs			
Vines:	NA			
Advance Regeneration:	red maple, sweetgum			
Invasive Plants:	tree-of-heaven, Japanese stiltgrass			

The following table offers a general summary of the stand:

Recommendations:

If the small acreage is not a limiting factor, the stand should be thinned as soon as possible (see figure 2 above). Trees up to 12 inches should be removed from the northern portion, leaving mostly trees from 12-16 inches with excellent form. The southern portion should be thinned for quality, removing the poorest quality trees. This thinning should be negotiated on a per unit basis with a reputable timber buyer. This thinning will allow for resumed diameter growth in the remaining trees and make a sale of mature sawtimber possible in about 15 years.

Stand 7

Stand 7 is located along the eastern boundary of the property, following McGowan Creek and encompassing 13 acres of creek bottom land and the somewhat steeper land between the Georgeville and Chewacla soils. The site is extremely productive with a fifty year site index of 110 feet for tulip poplar.

What merchantable timber was present in the stand was removed in the late nineties with the exception of trees immediately adjacent to the stream channel and trees of exceptionally poor quality. The stand now contains two age classes of trees. The first is composed of larger residual trees, mostly between 80 and 100 years old, including tulip poplar, American beech, sweetgum and red maple. Where the land drops sharply to the creek bottom, older American beech, upland oaks, and tulip poplar are common with the more water tolerant trees growing adjacent to the streams. The younger cohort regenerated naturally after the last harvest and is now between 1 and 12 years old.

The beaver population in this stand is high and these animals are a major force of change here, actively expanding their territory and changing the vegetation and hydrology. Ponds, active and abandoned, are present throughout the stand (see figure 3 below). The active ponds are providing excellent habitat for waterfowl, fish, reptiles and amphibians. The abandoned ponds are becoming re-vegetated with diverse early successional wetland plant species and providing a unique cover type on the property, used by a wide variety of animal species.



Figure 3: Active beaver pond, lodge in front left

The beavers have recently cleared several areas on higher ground for food and materials, creating areas that are actively regenerating to hardwood stump sprouts, but also contain a diverse layer of more upland bunch grasses and forbs.

Invasive plant species are playing a major role in the ecology of the stand, competing for growing space throughout the majority of the bottomland. Japanese stiltgrass has formed a dense mat over many of the recently flooded soils. Japanese honeysuckle is in the crowns of many of the younger trees and recent sprouts. Multiflora rose is present along the margins between the wetlands and uplands and is thriving in the high light environment.

Stand :	7	Acreage:	13	Age:	1-12 and 80-100			
Site								
Se	oils:		Chewacla					
SI	Slope:			0-50%				
A	Aspect:			east				
La	Landform:			concave: wide creek bottom				
Si	ite Index:		110	for	tulip poplar			
Vegetatio	n							
Pı	Primary Tree Species:			tulip poplar, sweetgum, American beech, red maple				
Se	Secondary Tree Species:			black willow, hickory, box-elder, oaks				
St	Stocking:			patchy, 0-100 square feet per acre				
D	BH of timb	er species:	NA					
Sł	hrubs:		smooth alde	mooth alder, sumac, blackberry				
Herbs:			rushes, sedges, grasses, forbs					
Vi	ines:		grapes, catbrier					
A	dvance Reg	NA						
In	ivasive Pla	nts:	tree-of-heav	ven, Japa ullein	anese stiltgrass, Japanese honeysuckle,			

The following table offers a general summary of the stand:

Recommendations:

The best use of this stand is as protected wetlands. The hydrology, unique plant communities, high wildlife value, and the soil and water quality protection attributes make leaving this stand largely un-managed a good option. Additionally, because of the dynamics of this ecosystem, with the changing water levels and the beaver impacts, investing in vegetation management is a highly uncertain proposition.

Improving wildlife habitat with plantings, wood duck box installations, or invasive species control could be considered. Encouraging human use of the area through trail construction or installation of a bird blind for wildlife viewing is another option. Otherwise this stand should remain undisturbed.

Stand 8

Stand 8 includes four small areas located mostly along field edges where existing vegetation or other current conditions make good opportunities for installation of permaculture projects. The following is a description of each small area and initial ideas for development.

a. This area is 0.7 acres located in a low wet spot that extends into the southwestern edge of the hayfield. The area was probably abandoned for hayfield because of wet soils which made mowing difficult. Hardwood tree species established in this area and most of these were harvested in 1999. The current stand contains high densities of sweetgum, but also scattered persimmon, pecan, and walnut.

Removing all sweetgums, all invasive plant species, and cutting vines from the remaining trees would allow for these species to grow well and begin to produce fruit, probably within a few years. The wetter conditions in the understory would be good for berry production on the edges where more light is available and mushroom cultivation on the interior of the unit.

b. This 0.9 acre area encompasses the southern portion of the old homesite. The location is relatively high and dry and centrally located. Several scattered older opencrown trees cover the majority of this area, including a 47 inch white oak, a 36 inch pecan with a large spreading crown, and a 36 in black walnut. Under the larger trees, a dense stand of tree-of-heaven has developed as well as smaller walnuts and pecans.

The tree-of-heaven here needs to be removed. Mechanical removal of trees and stumps followed by frequent mowing would be effective if the area will be closely monitored and managed in the future. Otherwise, a cut stump treatment with a triclopyr based herbicide should be considered. This work will greatly improve the aesthetics in this highly visible area, preserve the integrity of the remains of the homesite, and facilitate future establishment of other productive trees and shrubs.



Figure 4: Stand 8b, large mast producers over tree-of-heaven midstory

c. This 0.4 acre area is a small finger of hayfield surrounded by taller pines.

This area might make a good place to establish a permaculture project beginning from something of a clean slate. The higher light environment would allow for quick establishment of a wide variety of crops.

d. This is 0.2 acres of pure tree-of-heaven located on the southern edge of the cultivated field. Somewhat wetter soils, probably damaged during logging, allowed the species to quickly outcompete native tree species here after the last timber harvest.

Intensive management will be necessary here to eliminate the threat posed by the tree-of-heaven. Establishment of a forest garden in this area would necessitate high labor inputs early on and would allow for removal of this forest health threat while simultaneously achieving the permaculture goal.



Figure 5: Stand 8d, pure tree-of-heaven. Stand 1 back left.

Stand 9

This area includes a 12 acre hayfield (9a) and a 10 acre cultivated field (9b). Management of these units is not within the scope of this plan. Nonetheless, it should be noted that the invasive species issues on the property are spreading from the margins of the agricultural land. The ease of access and high visibility makes effective control within reach at this time. An investment now, removing seed producing populations first and moving towards eradication of the invasive trees will go a long way towards protecting the long-term productivity of the entire property.

Stand 10

The farm pond, 2.5 acres, is a positive feature on the landscape that should be maintained and protected. Resources are available from NRCS, NC Cooperative Extension, and the NC Wildlife Resources Commission regarding management of farm ponds.



Figure 6: Farm pond with Stand 3 in background, smooth alder in right foreground

Conclusion

While there are numerous challenges to overcome, this property still maintains good potential to effectively meet Ms. Ennis' objectives. Generally the recommendations for the next twenty years are geared towards investments in forest health and improving long term timber potential. The diversity of this tract makes it feasible to manage for multiple objectives, none of which is mutually exclusive, and with proper management we can achieve the goals of protection of soil and water, timber income, conservation, permaculture, wildlife habitat, and family legacy.

Cost-share opportunities are available for many of the recommended actions including wildlife habitat improvement, invasive species control, wetland management, and when the time comes, reforestation and pre-commercial thinning of pine stands. Before investing in any of these projects, the cost share opportunities should be researched. The Natural Resource Conservation Service, The North Carolina Forest Service, The Wildlife Resources Commission, and the Soil and Water Conservation District are all good sources of cost-share funding. A consulting forester created this plan, and can assist with plan execution. Many actions can be completed or subcontracted by the landowner, but a consulting forester can contract for improvement work, invasive species control, tree and boundary marking, and ensure that harvesting operations are lucrative, silviculturally sound, and achieve the landowner's objectives.

Forest management plans are working documents, recommending actions within the next decade or two to achieve results over the next century or two. This plan should be considered a proposal subject to change as objectives, conditions (environmental, economic and regulatory), and ownership change. Recommended management actions are outlined in the table below.

Stand	Management Action	When
1	Cut stump treatment of invasive tree species	2013-2015
	First commercial thinning of loblolly pine	2020-2023
	Consider 2 nd commercial thinning of loblolly pine	2030-2033
2	Consider first commercial thinning of pine and hardwood or	2020-2023
	non-commercial crop-tree-release treatment or	
	no action	
3	First commercial thinning of loblolly pine	2020-2023
	Consider 2 nd commercial thinning of pine and hardwood	2030-2033
4	Consider trail construction	2013-2020
5	Consider partial mowing	every 3-5 years
	Consider pulpwood harvest of Virginia pine and sweetgum	2030-2033
6	Consider thinning if feasible	2013-2014
7	Consider habitat improvement or trail construction	2013-2020
8	Begin installation/maintenance of permaculture systems	2013-????
9	Invasive species control	2013-????

Upcoming Forest Management

Ennis Property Stand Map Prepared by Richard Sanders, NCRF #1564



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Ennis Property Soil Map Prepared by Richard Sanders, NCRF #1564

Appendix Material List

Silviculture Terminology A Management Guide for Invasive Plants in Southern Forests Timber Sales: A Planning Guide for Landowners The Southern Pine Beetle Prevention Program and You