Sand Hills State Forest

South Carolina Forestry Commission

Working Document

February, 2023

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Scope

This management plan was developed for the improved long-term management of Sand Hills State Forest. Sand Hills State Forest is comprised of over 46,000 acres of land, with pine stands, both natural and planted, dominating the landscape with the remainder in hardwood drains, open fields, or wildlife plots. SHSF has a total of 40,000 acres of forestland that is managed for pine. Fifty-five percent of the forestland is made up of pine plantations while the remaining 45% consists of natural pine stands. Sand Hills State Forest is considered to be a Forest of Recognized Importance (FORI), as well as a Forest with Exceptional Conservation Value (FECV).

Unique to the State Forest system, Sand Hills State Forest main objective is to serve as a recovery site for the Red Cockaded Woodpecker (RCW). The natural landscape of Longleaf pine on sand ridges serves as ideal habitat for this endangered species, and we are mandated to manage for its recovery, as described in greater detail in Appendix B (Long Range Plan and Population Goal Determination for the Red Cockaded Woodpecker). Much of the information in this document was taken from this Appendix, to ensure that our language is in agreement with our plan currently approved by the United States Fish and Wildlife Service. All harvest operations discussed within must be explicitly approved by this agency, and are done in coordination with the long-term objective of providing sustainable habitat to this species.

Since the inception of the pinestraw enhancement program in 1998, the quality of habitat for the RCW has improved greatly on Sand Hills State Forest. There are 21,000 acres of longleaf pine in which the understory has been controlled and 90% of the scrub oaks have been eradicated. These stands will be maintained in this “park-like appearance” condition through the use of prescribed fire. Now that the hardwood understory has been eliminated there has been a return of native wiregrass and flowers that were once abundant in the longleaf pine ecosystem. By controlling the understory through the pinestraw enhancement program the risk of a catastrophic wildfire that could destroy RCW habitat is greatly reduced.

The conversion of slash pine to longleaf pine on the state forest is nearly complete. Slash pine is considered an off-site species that is susceptible to insect, disease, and storm damage. All of the slash pine plantations will be clear cut once they reach maturity and replanted with longleaf, which is native to the area and grows best on deep, sandy soils.

Loblolly pine makes up less than ten percent of SHSF. Loblolly that is already growing on SHSF will be maintained and managed. These stands are thinned when needed. Longleaf is predominately the species of choice when planting

new ground on SHSF, but in some cases loblolly may be planted due to site conditions.

Company Description

Sand Hills State Forest may be subdivided into 8 discontinuous blocks (Figure 1). Within these blocks, stands are delineated at an appropriate scale for management application (Figures 2-9). Data for these stands is maintained in a GIS, which contains all relevant stand level data. As a State Forest, we are committed to long-term sustainable management of the resource for multiple use purposes. However, unique to our Agency, our State Forests are mandated to be self-supporting, with the majority of our income coming from forest products. Therefore, within the scope of our management approach, and our attempt to provide the people of South Carolina with greatest and best use of the Forest, we do so with the over-arching requirement that significant timber harvesting will be required.

Figure 1. Sand Hills State Forest, Block Delineations.

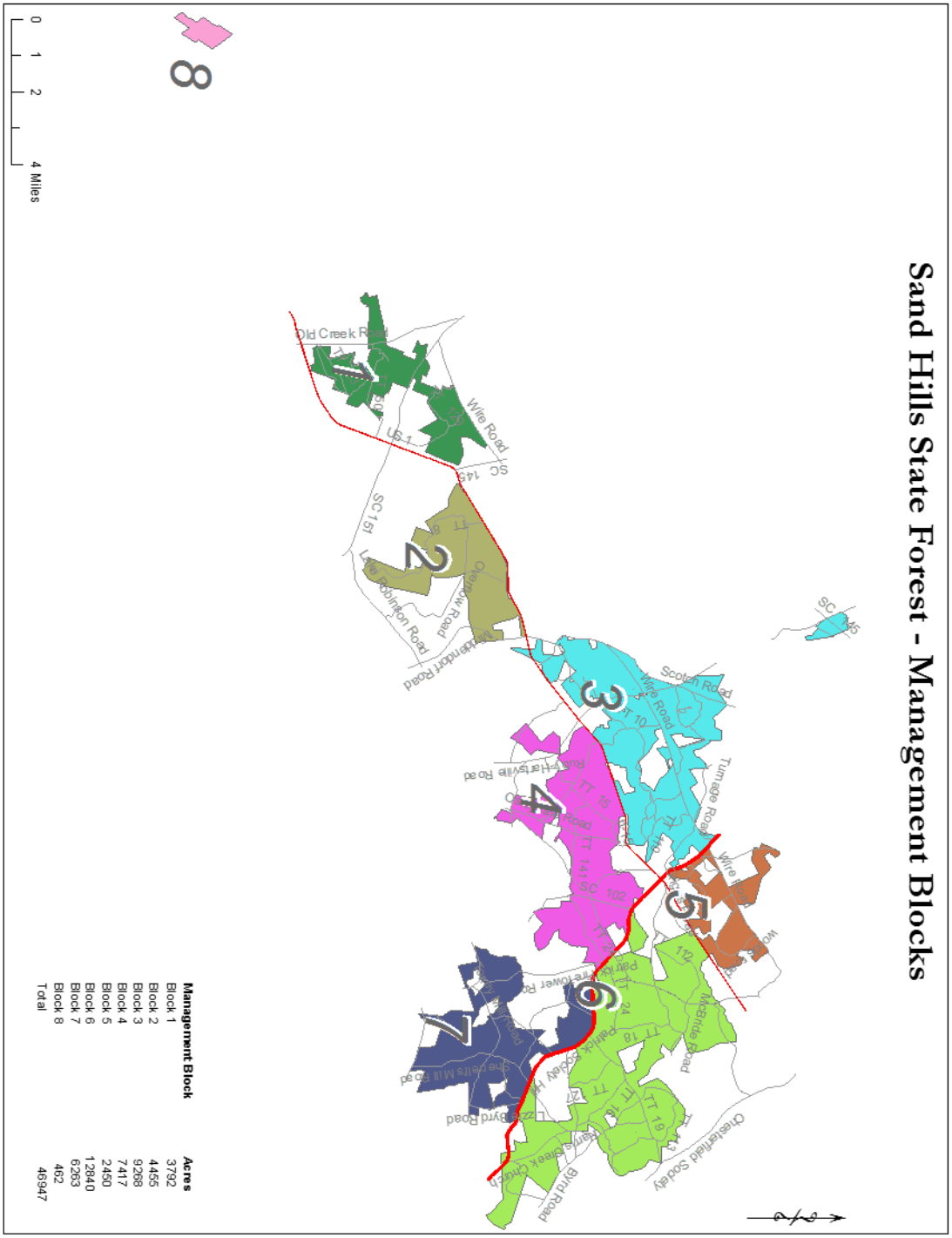

Sand Hills State Forest - Management Blocks
Management Block
Acres
Block 1 3792
Block 2 4455
Block 3 9268
Block 4 7417
Block 5 2450
Block 6 12840
Block 7 6263
Block 8 462
Total 46947
0 1 2 4 Miles
8
7
6
5
4
3
2
1
Old Creek Road
Wire Road
US 1
SC 145
SC 151
Lake Robinson Road
Scotch Road
Turnage Road
Wire Road
Byrd Road
Ostenfield Sodaly
Hemlet Creek Church
Pantoon Tower Road
Ruth Harlsville Road
Old Road
Wire Road
Wire Road
Wire

Figure 2. Sand Hills State Forest, Block 1 stand delineations.

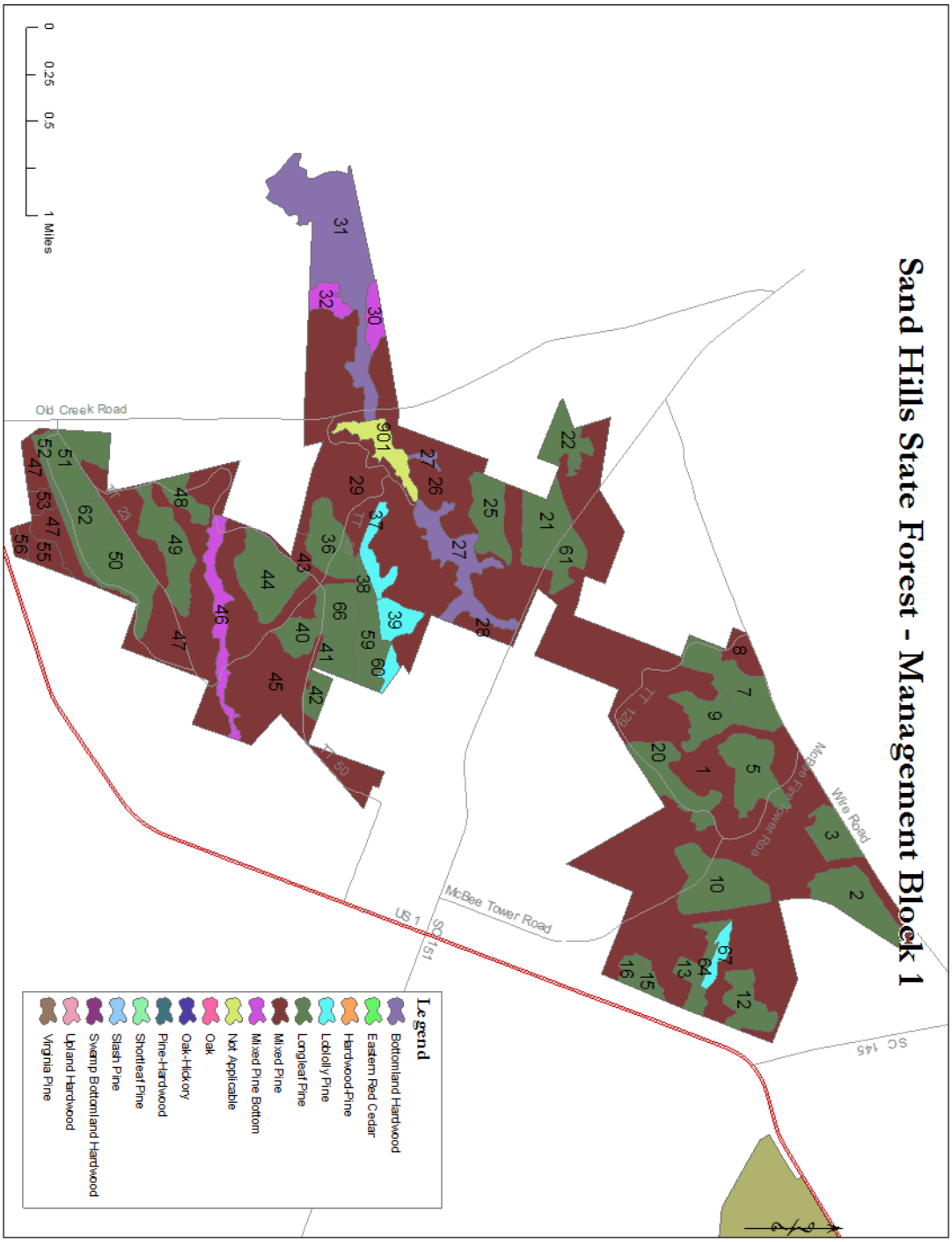


Figure 3. Sand Hills State Forest, Block 2 stand delineations.

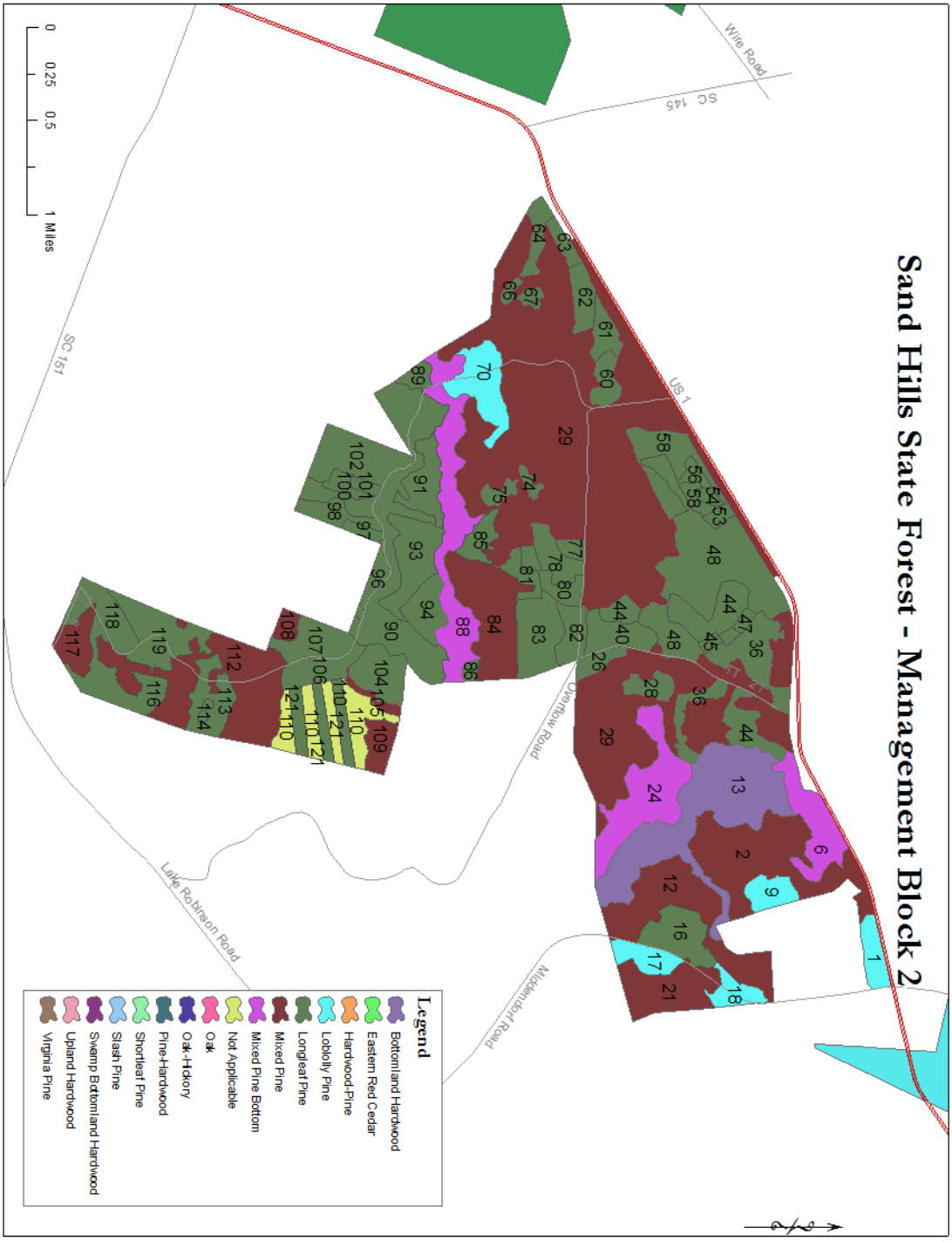


Figure 4. Sand Hills State Forest, Block 3 stand delineations.

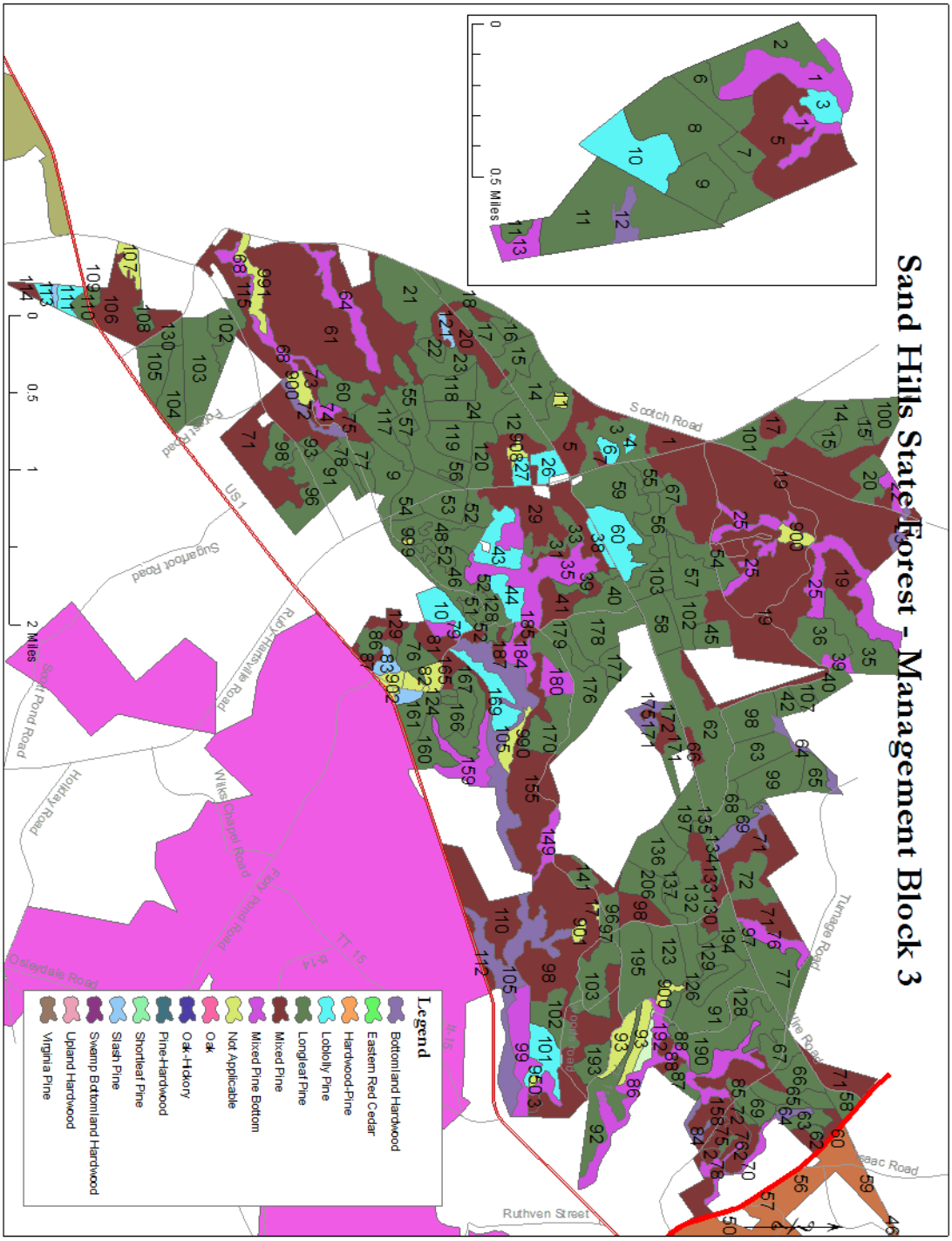


Figure 5. Sand Hills State Forest, Block 4 stand delineations.

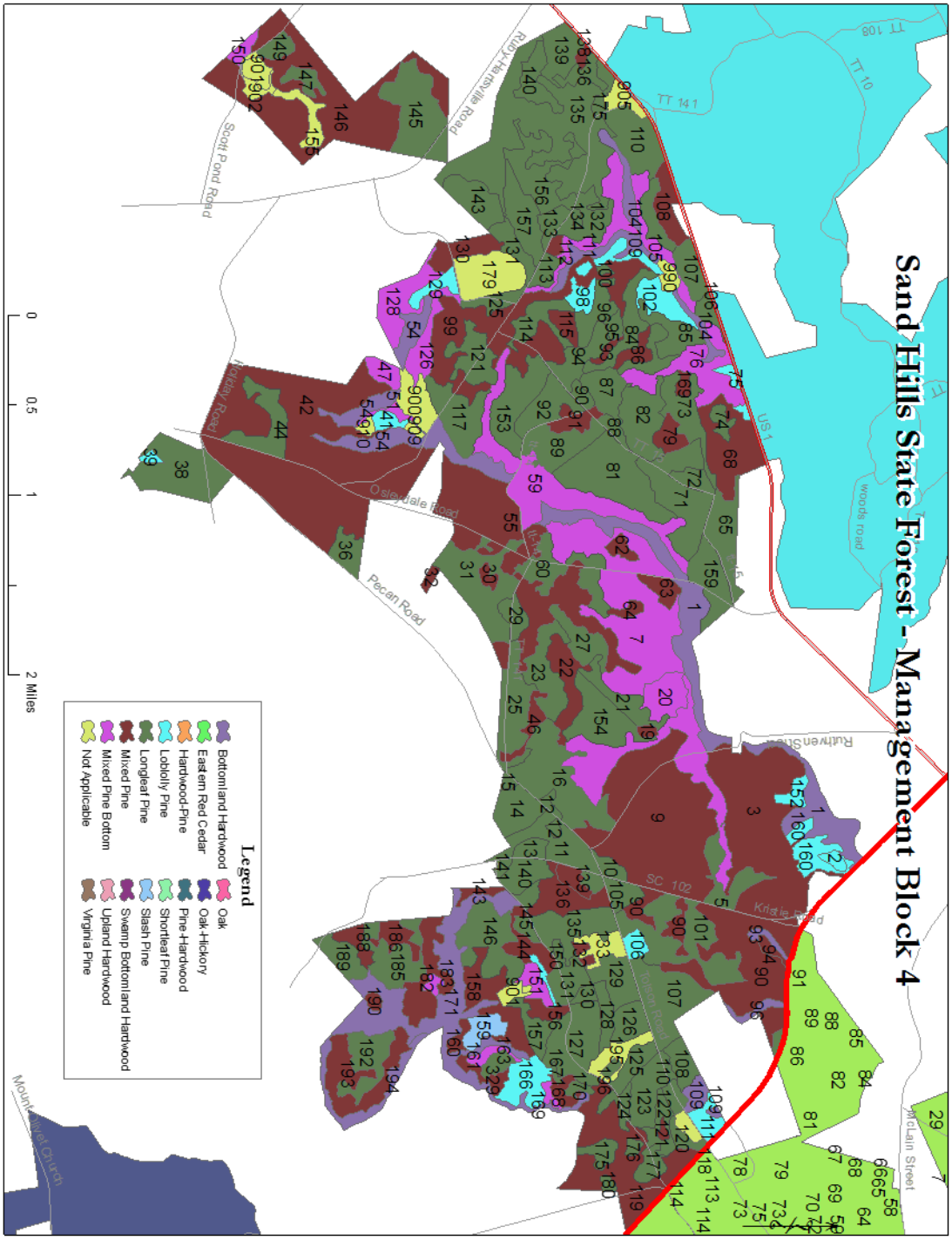


Figure 6. Sand Hills State Forest, Block 5 stand delineations.

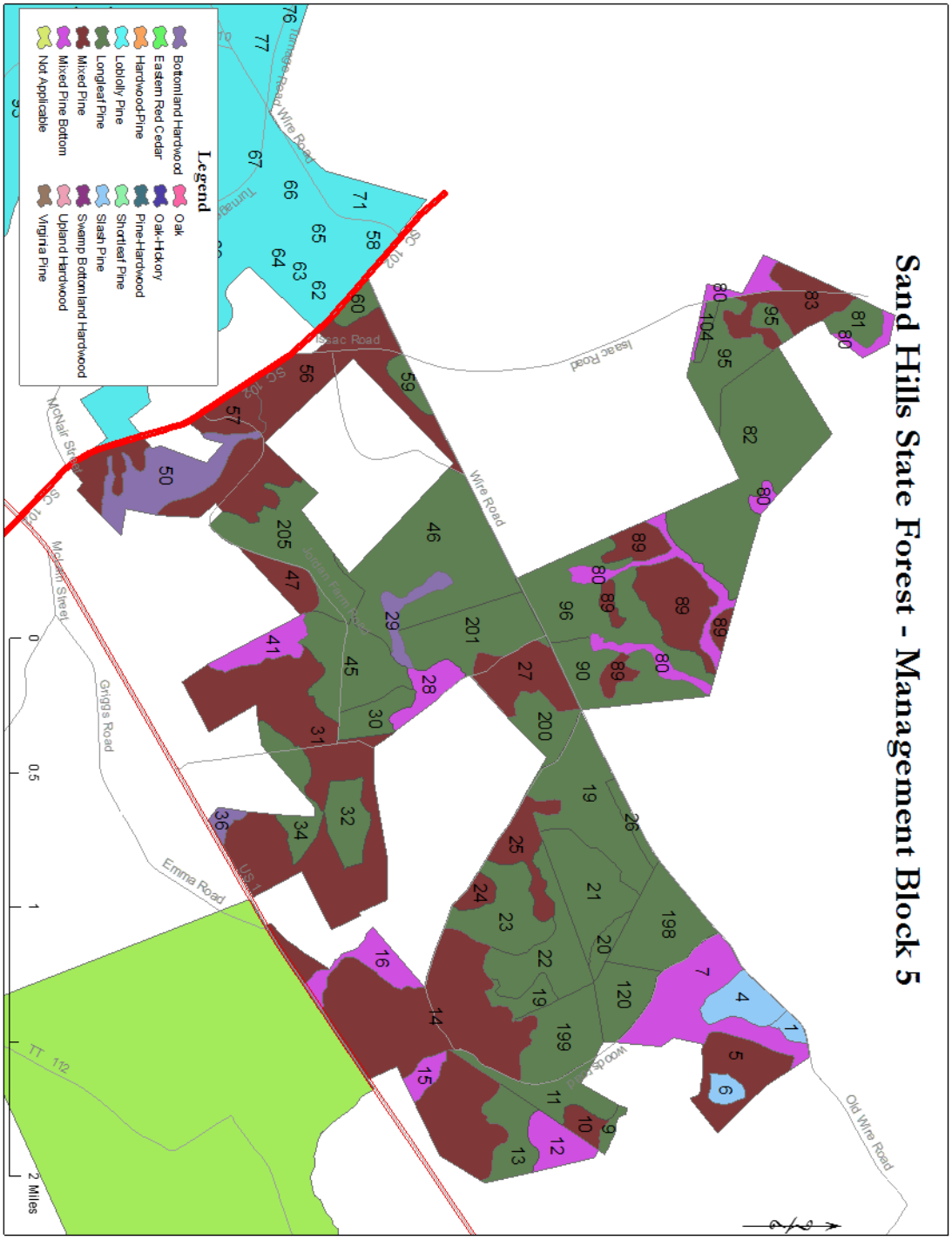


Figure 7. Sand Hills State Forest, Block 6 stand delineations.

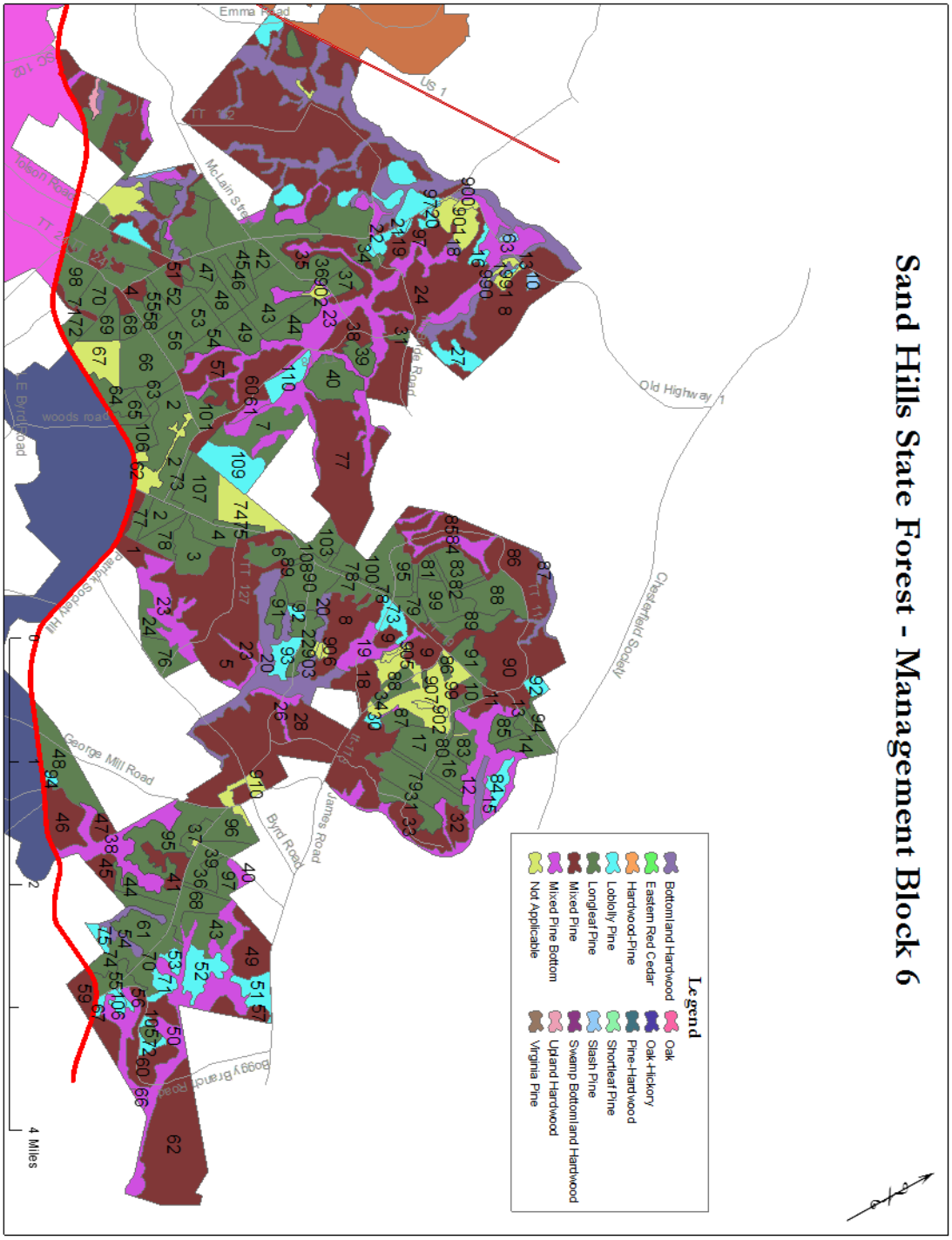


Figure 8. Sand Hills State Forest, Block 7 stand delineations.

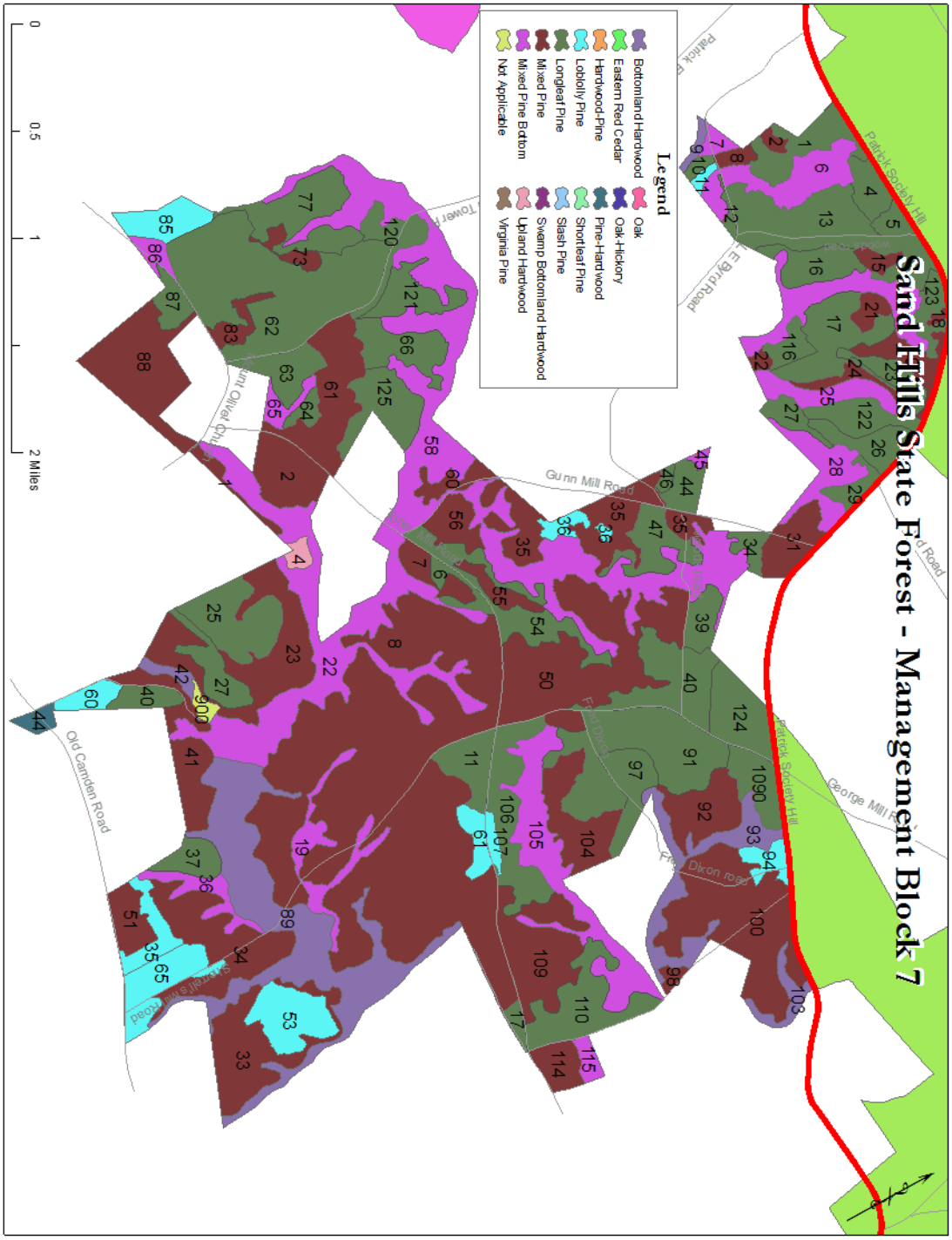
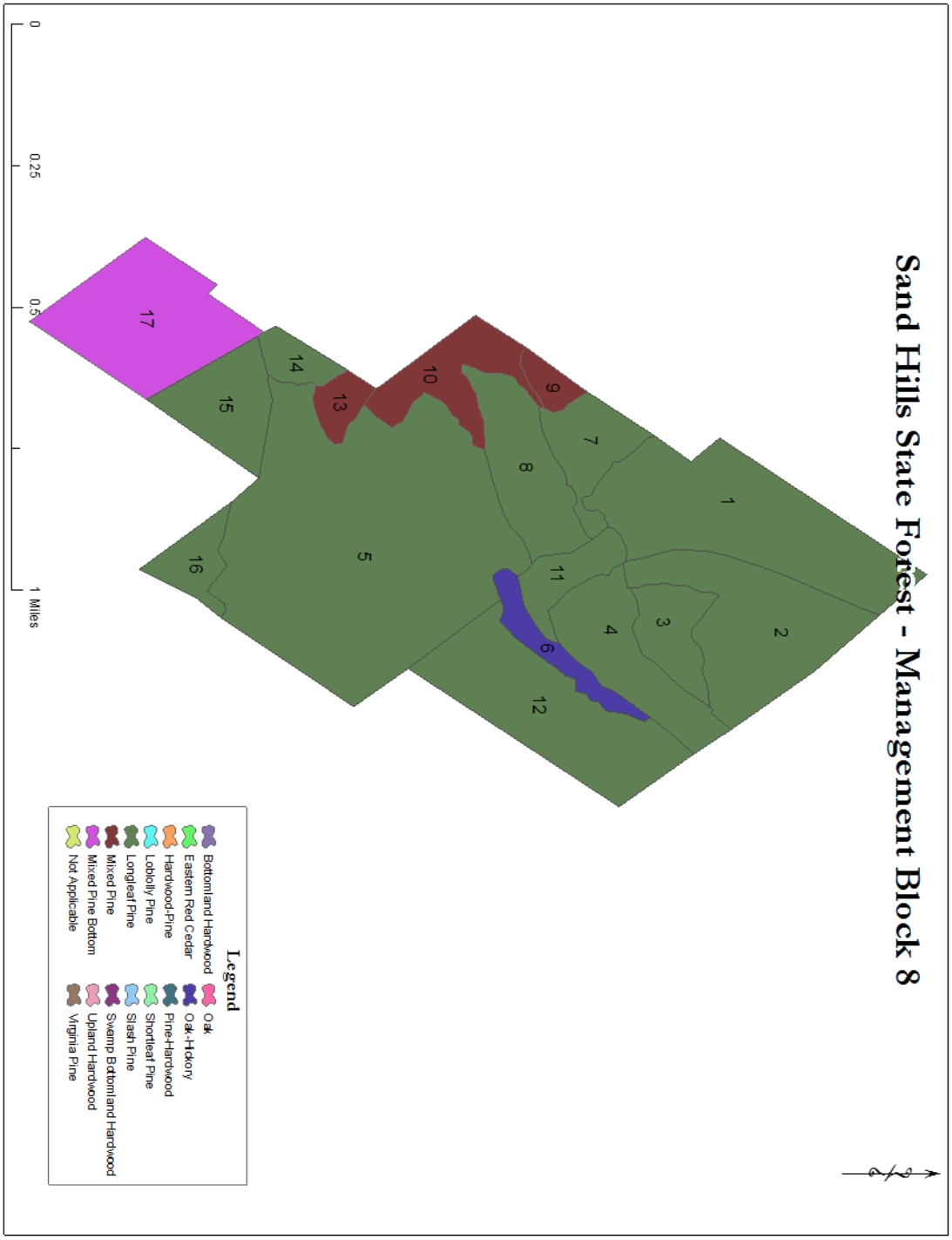


Figure 9. Sand Hills State Forest, Block 8 stand delineations.



Sand Hills State Forest SFI Commitments

A. Formal commitment to the SFI & ATFS Standard

The South Carolina Forestry Commission and Sand Hills State Forest in particular are committed to the SFI & ATFS Standard, and following the guidelines for the Standard as part of our State Forest Lands management program.

B. Formal commitment to comply with applicable social laws

The South Carolina Forestry Commission and Sand Hills State Forest in particular are committed to complying with all social laws, including but not limited to those covering civil rights, equal employment opportunities, anti-discrimination and anti-harassment measures, workers' compensation, indigenous peoples' rights, workers' compensation, indigenous people's rights, workers' and communities' right to know, prevailing wages, workers' right to organize and occupational health and safety.

Forest Land Management (SFI Objectives 1-15)

1. Forest Management Planning

A. Forest management plan(s)

Sustainability is and always should be a sine qua non of responsible forest management. In accordance with the Long Range Plan for the South Carolina Forestry Commission State Lands, Sand Hills State Forest will be managed to be a healthy, productive, forested ecosystem, while improving the quality of life of South Carolina's citizens through the environmental, educational, economic, and recreational benefits of active forest management. The individual management goals can be subdivided into the following four broad categories.

Environment

Sand Hills State Forest will serve as a leader in environmental protection by implementing science-based, multiple-use forest management practices.

Conservation of biological diversity will be a high priority. Protection of soil, water, and air resources will be an integral part of all forest management activities.

Education

Sand Hills State Forest will be utilized as an outdoor classroom, providing the necessary educational resources and opportunities to raise the awareness of the benefits of forest resource management. We will strengthen our association with colleges and universities to promote forestry-related research and outreach to forest landowners and forestry professionals. Our State Forest will be used as a training center for agency personnel to meet job demands.

Economy

Sand Hills State Forest will contribute to local and state economies through the sustainable production and sale of forest products. Comprehensive planning, using the latest technology, will be employed to determine sustainable harvest levels. Revenue will be utilized to further the mission of the agency.

Recreation

Sand Hills State Forest will provide outdoor recreation, compatible with forest management activities. Through statewide and local planning efforts and on-site monitoring, we will involve technical experts and user groups in determining the optimal levels of recreational opportunities at each State Forest.

B. Assessments and forest inventories supporting long term harvest planning

The South Carolina Forestry Commission began utilizing a harvest scheduling model for timber management in 2007. Designed under contract by Forsight Resources, development of the model and required updated inventory began in 2004, with initial implementation beginning in Fiscal Years 2007-8. In 2014 ForesTech International began contractual work with the Commission to provide harvest schedule modeling. We currently utilize the SIMS 2009 Growth Model.

Data collected to support long-term harvest planning is part of an on-going forest inventory plan. Subsequent to and in coordination with our development of a harvest schedule model, a five-year, complete forest inventory was conducted across all State Lands, including Sand Hills State Forest. This inventory was

finished in 2009, and then inventory began again, focusing more directly on areas that experienced recent harvesting activity or planting.

From 2008 through present, the South Carolina Forestry Commission, like many State agencies, has been experiencing a period of reduced budgetary capacity, and a loss of personnel across all components of the agency. This resulted in diminished capability to conduct forest inventory at our previous rate. Current efforts to increase inventory data collection have included the development of better use of onsite personnel, and our inventory methods and data collection are being updated to better meet the needs of our new harvest scheduling client.

Over-arching management of Sand Hills State Forest is supported by a robust GIS database. While areas for harvesting are recommended through spatial modeling, on-the-ground implementation of that harvesting as well as other management operations rely on a GIS database that includes information on roads, soils, hydrology, endangered species, elevation, and other data as needed. These data were obtained from many different State and Federal Agencies, or developed in-house where applicable.

C. Forest inventory updates, recent research results and recalculation of planned harvest levels

Updating of forest inventory has recently undergone a shift, as we have changed our harvest scheduling client. Data is collected using electronic field recorders, and then uploaded to ForesTech International. and stored in their off-site servers. This provides better long-term maintenance of data, and also allows for information to be served Agency-wide as needed. Data is re-grown annually using growth and yield modeling tools developed by ForesTech International.

D. Regional conservation planning

The South Carolina Forestry Commission and Sand Hills State Forest in particular are not actively involved in any regional conservation planning initiatives at this time.

Training

Due to the complexity of the modeling discussed above, the Commission used a professional client who provided expertise beyond that available within the Agency. However, periodic training on the use of GIS has been provided by the Forest Analyst through use of local college facilities, and additional support is provided on an individual basis, although the number of staff using GIS is limited. Further training of personnel however is limited to broad-based educational

programs associated with maintaining Registered Forester and in some cases Certified Forester certification as well as TOP Logger certification.

Monitoring

Owing to the development of our harvest schedule plan, our monitoring of our long-term harvesting has been in terms of annual completion of recommended harvest areas. Due to conflicts in timing, and other limitations, we expect to experience some variation from planned vs. completed activity.

The following describes the development of our harvest scheduling model, and the harvesting recommendations that are used for our planning.

Management Regimes

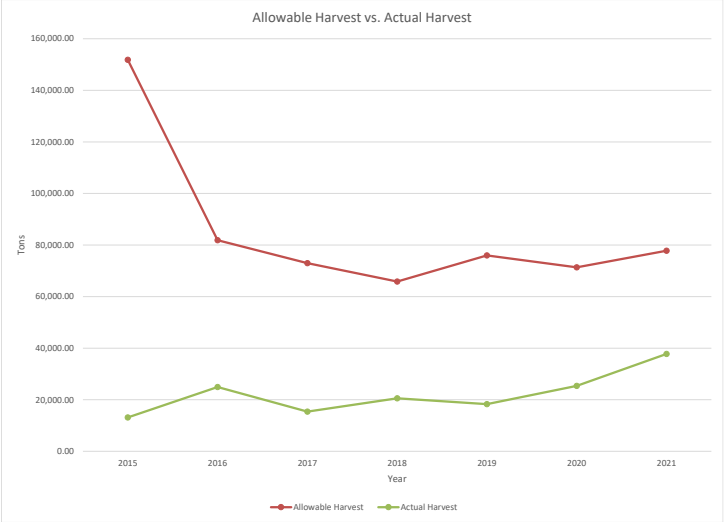
Due to the land transfer agreement and the quitclaim deed of 1991 between the U.S Fish and Wildlife Service and the S.C. Forestry Commission, Sand Hills State Forest is considered a Recovery Population for the Red-Cockaded Woodpecker and is to harvest timber under the same guidelines as if it were a USFWS property. For that reason all harvest scheduling must be approved by the USFWS. Sand Hills State Forest works closely with the USFWS and ForesTech International. to confirm that our harvest schedule model is in compliance with the guidelines set forth by the USFWS to protect as well as enhance the habitat of the Red-Cockaded Woodpecker on Sand Hills State Forest.

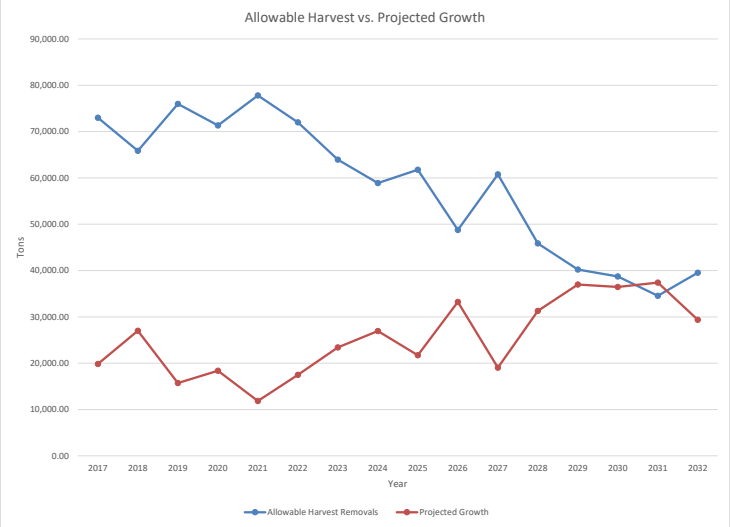
Harvest Regimes (*Longleaf Pine*):

- 1st Thin (Marked selection, ***basal area trigger active***):
  - Minimum harvest tons/ac: 25
  - BA thinning target ~110 ft^2/ac
  - BA residual post-harvest ~80 ft^2/ac
  - Products: All products available if specs met.

- Perpetual Thin (Marked selection, ***basal area trigger active***):
  - Minimum harvest tons/ac: 25
  - BA thinning target ~90 ft^2/ac
  - BA residual post-harvest ~ 50 ft^2/ac
  - Products: All products available if specs met.
  - Thinning Rule: No more than 40 ft^2/ac can be removed in one thinning

Clear-cuts will not exceed 100 acres in size. Green up requirements for adjacent stands shall be 3 years old or 5 feet in height.





	2017	2018	2019	2020	2021
Projected Growth	19,848.22	27,010.50	15,726.40	18,382.67	11,841.88
Actual Harvest	15,386.00	20,569.00	18,288.70	25,360.00	37,776.22

2. Forest Health and Productivity

A. Reforestation and long term forest management planning

Almost all of our acreage at Sand Hills State Forest is forested, however some property acquisitions have been made where acreage has been in agriculture or retired agricultural practices. Some acreage is still under ongoing afforestation, where Longleaf Pine has been planted, and replanted in subsequent years due to poor initial seedling survival. In some cases, where old-field sites failed in Longleaf restoration planting, we have planted Loblolly Pine for one rotation, to allow time for natural soil amelioration.

Slash pine stand conversions are now complete on SHSF. The last of the slash plantations have been harvested by clear-cutting and replanted to longleaf. The method that was utilized in planting these new grounds was mostly mechanical machine planters which planted containerized longleaf seedlings at 726 trees per acre. Now that these stands are converted, there will not be much need for machine planting on SHSF. SHSF is now dependent on natural regeneration to reforest areas that have been thinned. SHSF will also utilize the hand planting method to plant containerized seedlings from time to time. Hand planting has proven to be very successful when used on SHSF when a young plantation has low seedling survival and needs to have spots filled in. Hand planting may also be occasionally used to replant areas that have mortality due to insect, disease, or fire.

Our Agency-wide approach to forest management is to avoid pre-commercial thinning where possible. All other harvest activity, from initial thinning through final harvest is planned for, and the revenue included and accounted for, in our Harvest Schedule plan. Due to the size of the Forest and relative difficulty in

implementation, we do not use or plan to use any fertilization or pruning techniques with forest management.

B. Reforestation program

Artificial and natural regeneration schemes are dependent on current stand cover type and desired future cover type. The following provides a general overview of how we approach these stands, however some deviation may be expected on an individual basis, simply as a result of such a large management area.

In much of our pine forest, where we are either replacing a stand with the same species, or replacing to Longleaf Pine, our plan includes artificial planting, using available seed stock from the Arborgen/Taylor Nursery of Edgefield County, SC. However, in these areas where significant regeneration is evident and noticed by field personnel, we may refrain from planting and allow for natural regeneration, especially in stands of Longleaf Pine. Some of our pine stands are within the ½ mile partition of active Red Cockaded Woodpecker clusters, and in those stands as needed we may leave some standing relic trees or use a modified seed-tree harvest following recommendations as set forth in the RCW Recovery Guide.

In our hardwood forests, and particularly our bottomland hardwood forests, we allow for natural regeneration following a clear-cut rotational harvest. Site conditions following harvest, particularly increased light penetration to the forest floor, have been found to be conducive to development of a stand of desirable species composition. In hardwood stands or more commonly mixed hardwood stands with a significant pine component or site conditions favorable for pine, we may use artificial regeneration to convert the stand to a more desirable composition.

In stands where artificial regeneration is used, we monitor the success of our planting over the years following planting to ensure we have adequate survival. Our planting density has been variable, in part to meet grant requirements for particular plantings where stand density was designated to be beneficial to wildlife, however we generally plant from 500 (wildlife planting) to less than 726 trees per acre. Following evaluation of our seedling survival rate, we may either replant the stand or spot-plant the stand depending on its condition.

In stands where natural regeneration is allowed, very little monitoring has been conducted. Some spot sampling has been conducted during years 5-10, and results have shown a desirable stand component however follow-up assessments are generally not conducted.

C. Assessments supporting reforestation programs

Planting is conducted generally in the late fall through early winter, which is recommended for improved success rates, particularly containerized Longleaf Pine. Planting is to be conducted by contract work, through a bid proposal program as required by state law. Purchase, handling and storage of the seedlings is conducted by Sand Hills State Forest personnel to ensure proper techniques are adhered to. Monitoring of the planting operation is also conducted to ensure proper spacing and planting depth are maintained, as outline in clear language in the planting contract.

Seedling survival rates are determined through sampling of planting sites in early spring over the 2- to 5-year period following planting. Our experience at Sand Hills State Forest has found that early assessments (first and second-year post-planting) often under-estimate survival rates. For this purpose we give many stands more time to develop. By year five, if planting success is not evident then timing needs of adhering to long-term planning goals require that we replant the site.

D. Use of improved planting stock, varietal seedlings and exotic species

SHSF acquires seedlings from Arborgen's Taylor Nursery located in Edgefield County in South Carolina. Generally, we plant a cost-effective Longleaf or Loblolly variant, however in years where demand is low, we may acquire surplus stock of improved variants. We do not plant exotic species, and instead have an active Longleaf reforestation program to replace non-native stands of Slash Pine.

E. Afforestation

Since most of the Forest is in acceptable forest cover, only a few areas of the forest could be in consideration for afforestation work. Primarily, some of our retired wildlife food plots have been converted to full forest cover, and cover type selection is specific to that site and its associated conditions. While no plans are currently under way for such consideration, we may make such changes in the future as needs arise.

SHSF does not and will not afforest in locations which negatively impact ecologically important natural communities, threatened and endangered species, or native natural communities which could be at risk of becoming rare. SHSF staff are careful to survey all areas before any type of management work is to take place. Because SHSF is considered a recovery population for the Red-Cockaded Woodpecker, there are extensive protocols in place that dictate the types and timing of forest management activities across all of the State Forest. SHSF also keeps an extensive GIS system that designates ecologically important natural areas, threatened and endangered species, as well as native natural communities to assure that these areas remain protected.

Use of Chemicals

F. Forest chemical program

Our forest chemical program is limited to pre-planting/site preparation of sites following harvest. We time these backpack or aerial broadcast applications near the end of the growing season, to optimize our mortality while reducing other risks associated with heavier spraying. Spraying is usually conducted by a contractor, who is selected through a bid process as per State contract regulations.

Some in-row broadcast spraying has been conducted on Longleaf Pine stands. Future applications may be conducted as needed, though we have found with proper site preparation and maintaining a healthy burning plan, most sites do not need a second release application of chemical.

Use of Spill Response Plans and Chemical Spill Kits

The State Forest System has a protocol and a Spill Response Plan (SRP) that will be adhered to in the event of a chemical spill on Sand Hills State Forest. Sand Hills State Forest keeps a spill response kit that can and will be used in the event of a chemical spill.

Pine Straw Enhancement

In 1999, SHSF implemented a pine straw enhancement program on the forest. Under this program, an individual from the general public can enter into a one to six year contract with SHSF to clear up land for pine straw production. The individual agrees to eradicate at least 90 % of all hardwoods on their tract using the cut and pile method along with the application of herbicides. Herbicide applicators either directly spray stumps after cutting the tree or spray the foliage of trees before cutting and piling. Some cases require follow-up sprays that require the applicators to spray new growth on previously cut stumps. SHSF requires that the use of herbicides be overseen by a state certified applicator. SHSF agrees to burn these sites at least once during the enhancement contract period in order to rid the stands of slash piles accumulated by the cut and pile technique. In exchange, that person is entitled to all of the pine straw on his/her tract during the contract period. The removal of the hardwood understory enhances the straw production, as well as greatly improves the habitat for the RCW. Upon expiration of enhancement contracts the clean tracts revert back to SHSF to be sold as negotiated sales or bid sales on a two year rotation.

SHSF currently has 21,000 acres that have been positively affected by the pine straw enhancement program. The majority of the enhancement tracts are in

longleaf plantations that are at least 15 years in age. There are only about 3000 acres in natural pine that have been enhanced.

Staff Certification

To better manage our herbicide program, and to provide trained oversite for on-site operations, Sand Hills State Forest does maintain on-staff personnel who are licensed Applicator with the state of South Carolina.

G. Best management practices

The South Carolina Forestry Commission is the lead agency in South Carolina in designing, interpreting, monitoring, and updating forestry best management practices (BMPs) that protect water quality/quantity and conserve site productivity. Best Management Practices are science-based forest management practices, developed pursuant to federal water quality legislation, that minimize or prevent nonpoint source water pollution from forestry operations and give forest landowners and the forestry community guidelines to follow in practicing good stewardship on our valuable forestland. BMP implementation protects the quality of our drinking water and helps sustain the productivity of our forests for future use.

As part of the South Carolina Forestry Commission, the state forests lands, including Sand Hills State Forest, will serve as models for BMP implementation. They should meet or exceed all established BMPs, all applicable state water quality laws, and the requirements of the Clean Water Act for forestland. State forests will make all efforts necessary to ensure that there are no negative impacts to water quality/quantity or site productivity from forestry operations (i.e., forest road construction, timber harvesting, site preparation, reforestation, prescribed burning, pesticide application, fertilization, or minor drainage) on their lands.

BMP Training

In addition, All state forest employees involved in the supervision of forestry operations will be required to have appropriate BMP training (i.e. Timber Operations Professional or equivalent), and all timber harvesting contractors operating on state forests will be required to have appropriate BMP training (i.e. Timber Operations Professional or equivalent) and will be responsible for BMP compliance on their work site. State forests will include this requirement in all bid invitations and contracts.

Operational measures for maintaining site productivity

H. Stand level practices

Sand Hills State Forest is mostly situated on soils of poor productivity, and indeed this characteristic partially is responsible for the state to acquire the property. From a harvesting approach, the condition of most of the soils, being primarily sandy, requires less concern to damage by harvesting activity. Still, we outline in all contracted harvesting operations that BMPs be adhered to, skid rows and decks be minimized in size and impact to the site, and field personnel monitoring the harvest address any violations of areas of concerns as they occur. We use a performance bond as part of the contract to ensure all post-harvest clean-up work is conducted. All contractors on SHSF are required to carry Workmen's Comp. as well as insurance.

In some portions of the forest, particularly our bottomland forest, we also work with timber contractors to allow for seasonal access to timber to mitigate any problems associated with regular and/or infrequent flooding. In some cases, we may provide for extensions to our harvest contracts in an effort to minimize this impact.

We require that the site be left to specific conditions that are beneficial to subsequent harvesting, but since we use hand crews to artificially plant, we allow for retention of large woody debris and tops. Site preparation may include prescribed fire application to minimize the obstruction this harvesting debris may pose.

Previous harvest operations may have allowed for traditional biomass removal, however no current plan is in place to continue this practice. While we found that biomass harvesting did increase the ease of timber harvesting and may have impacted revenues for that timber, it is hard to calculate the total impact of biomass removal from a revenue vs. site productivity approach, and the revenue stream attributed to the biomass itself is so minimal it has prevented us from any recent applications. Our enhancement program, as described previously, in some ways may resemble a biomass harvest, however the woody material cut is left on-site, which not only improves the habitat for our species of concern but keeps associated nutrients on site.

Pine Straw Harvests

Sand Hills State Forest is actively involved in the business of selling and managing for commercial pine straw, which may be considered a non-traditional biomass harvesting operation. There has been much discussion in the scientific community on the results of this practice on site productivity, and while there may be evidence to suggest it has a deleterious effect on productive sites, the effect on

poor sites, such as the predominant sand ridge habitat at Sand Hills, are less known.

As discussed previously in our section on timber stand improvements, the marketability of pine straw has allowed for much stand improvement work, geared toward habitat improvement for the RCW. These contracts are designed to improve the stands to a condition where they are commercially viable. Given that Sand Hills is required to both be independently supported, and managed specifically for RCW recovery, we are limited in available revenue streams, and thus have found pine straw an option that dovetails nicely with these restrictions.

The two methods of selling pine straw on SHSF are by negotiated sales or bid sales. Negotiated sales are sold on a first come first serve basis. Negotiated sales usually consist of tracts that are five to fifty acres. Buyers are given thirty days from date of purchase to rake the tract. Bid sales are made up of bigger tracts or multiple tracts. Bidders are given two weeks to make site visits before bid opening day. Once the successful bidder has been awarded the contract they will be given ninety days to rake the tracts. Pine straw will not be harvested within an active RCW cluster on SHSF during the RCW nesting season.

SHSF is planning to put all future pine straw harvesting on a two year rotation, meaning that each stand will be raked only once during a two year period. A two-year rotation will allow that beneficial litter layer to decompose and release nutrients into the soil that aid in tree growth. There will be neither pine straw harvesting nor any pine straw enhancement work allowed within active RCW areas on SHSF during the RCW nesting season (April1-August 1).

I. Landscape level practices

SHSF maintains an active forest-wide road maintenance program. Following harvest activity and road impacts, Forest personnel work to reclaim the road to its previous condition (or better), and reduce any short-term erosion concerns from timber haulage. The following more completely describes our landscape level roads program.

State forest roads are maintained year-round through the use of SHSF motor-grader. All roads and truck trails are continually monitored specifically by the Forest Director and the crew foreman as well as with help by all SHSF personnel. This ongoing monitoring program targets erosion problems, improper location, BMP non-compliance, and addresses the need for surfacing material, entrenchment, general maintenance, and requirements for the installation of structures or technology to minimize traffic impact. The monitoring process may result in a determination to limit or restrict forest traffic to control recurring maintenance problems.

Documentation of projects such as the installation or replacement of culverts, fords, etc. will be held on file at each state forest office. Documentation will include, at a minimum, dated maps with identified road problem areas highlighted and the prescribed corrective actions indicated. New road construction or major roadwork will be recommended by the forest director. New road design should comply with all applicable BMPs and should consider location, width, slope, purpose, adaptability to alternate use, and functional life. Cost, urgency, and complexity of construction will be determining factors in a decision to solicit contractors.

Installation of structures such as bridges, culverts, water bars, ditches, etc. will be in compliance with current BMPs and regulations as may be mandated by other agencies.

Forest Health

J. Forest health programs

We consider forest health as many-faceted. Impacts to forest health are many, and this sections addresses first our approach to natural disasters and forest management, the subsequent risks from more common health issues, such as insect and disease outbreaks.

Effects of Natural Disaster

There are several natural disasters that may affect our State Forest lands, though primarily wildfires, flooding events and hurricanes/wind storms are considered the most likely. Indeed, the impacts of these types of events have been recurring and constitute a significant factor in how many of our management operations can take place.

Wildfire

Fire is a natural part of the forest ecosystem across much of the State Forest system. We maintain a program of prescribed fire management, both to enhance the condition of the forest stands while also serving to mitigate wildfire risk through forest fuels reduction. Severity of wildfires on SHSF or also somewhat mitigated through our pine straw enhancement program and the removal of pine straw. However, periods of time exist where the risk of uncontrolled wildfire on State Lands is high. In such cases, the South Carolina Forestry Commission, being recognized as the Agency with authority over containing and suppressing all wildfire on both State and private lands, is readily equipped to address fires on Sand Hills State Forest by trained personnel.

Flooding

With bottomland forest comprising several thousand acres of our Forestland, minor flooding is frequent and primarily impacts access to affected lands. On a less frequent return interval, large-scale flooding events have been known to inundate almost all of our bottomland hardwoods at Sand Hills State Forest. Long duration flooding has been known to increase tree mortality in susceptible species, and thus we consider flooding as a primary driver of species composition in these riparian forests. Access during these events is extremely limited, and often considerable road improvements are required post-flooding. Timber harvest activities in our bottomland hardwood forests are generally limited to regeneration harvests potentially up to 100 acres in size, however size is usually limited to 50 acres or less. Adjacency restrictions are adhered to as described in our management section, and the stand is allowed to naturally regenerate. When needed, buffer strips are used to protect our riparian zone forest, and some thinning may be conducted in these stands as needed. These thinnings are done in accordance to BMPs, and help to maintain a healthy forest while providing some addition revenue.

Hurricanes

While small-scale wind events occur fairly frequently across the forest, we consider the damages and management implications to be generally small and can be addressed on an individual basis. Large-scale wind events, primarily hurricanes, are an inevitability in the Southeastern Coastal United States. Sand Hills State Forest was in the direct path of Hurricane Hugo in 1989, and wind damage was wide-spread across the forest at that time. Emergency harvest activities were conducted as possible, but a large amount of timber was unsalvageable. Since then, no major hurricane activity has occurred on the forest and historical return intervals suggest we may be overdue another such storm. We address this concern in two ways. From a management perspective, we have over time converted much of our forest to its previous natural stand composition of Longleaf Pine, the most resistant of the pine species to the impacts of hurricanes. Through thinning operations, we also maintain stands with adequate spacing which reduces windthrow susceptibility. Secondly, as a part of the States' Incident Management System, we have an enhanced ability to address the immediate effects of a hurricane event. Through training, maintenance, and readiness planning, we can open roads, provide access, and generally address user safety immediately after an incident.

Ice Storms

The risk of severe ice storms in the central region of South Carolina is slight, but does occur on an irregular cycle. The last ice storm of significance occurred

within the last decade, and caused a large amount of damage to some of the standing timber on Sand Hills State Forest. Slash pine (*Pinus elliottii*) is a species known to be susceptible to ice damage, and further is outside its accepted natural range. Large areas of the Forest were planted in Slash Pine from the time of acquisition until the 1950s, when it was supplanted by Loblolly Pine. These stands experienced ice damage, and while some salvage logging was performed a large portion of timber was lost. These Slash Pine stands have been harvested and converted to the historically and ecologically more appropriate Longleaf Pine, which is much less susceptible to ice damage.

Insects and Disease Risks

We consider active forest management, and maintenance of stands in a healthy and vigorous growing condition, as the most important approach to reducing impacts from insects and disease. Additionally, regular prescribed fire is used to promote forest health. Our location in central South Carolina is also favorable for reduced planting risks from several species of insects. Still, we try to monitor our Forest and address these risks on an as-needed basis.

Some monitoring of the Forest is conducted as part of State-wide initiatives, but we generally address areas of concern as they develop. Where possible, we minimize the impact or spread of the outbreak through harvesting, a successful and recommended approach to some insect control. All such activities are incorporated into the planned harvest activity, and subsequent runs of our harvest schedule model will account for the experienced changes to the stand condition and associated inventory levels.

Emergency Salvage Measures

In situations where salvage of standing timber is necessary due to wildfires, insect damage, or natural disaster, an avenue needs to be established to allow for the sale of timber before the integrity of the wood is compromised. All salvage operations will be informally consulted on with the USFWS on a case-by-case basis, regardless of the number of acres involved. However in an effort to minimize loss of valuable timber, SHSF will notify the USFWS as soon as possible, but no less than 5 days prior to implementation of the emergency timber harvest and shall provide the USFWS an opportunity of no less than 5 days to informally consult on a salvage operation plan. If SHSF receives no reply from the USFWS within 5 days, salvage of only dead and dying trees may proceed without USFWS concurrence. However, no harvest in RCW clusters during the nesting season is permitted without USFWS concurrence. Typically, in emergency salvage harvests, only dead and dying trees may be removed depending on, for example, current stand density. Similarly, some damaged trees may be retained, again, for example, depending on stand density and amount of residual foraging habitat remaining for the RCW group(s) impacted. All of these decisions will be made during the abbreviated, informal consultation period.

In the case of southern pine beetle or similar infestation, a sufficient barrier zone of healthy trees would be removed to prevent the spread of the infestation. The cut and leave guidelines (as prescribed by the SCFC forest pest entomologist) would be followed to control an outbreak of SPB. Actively infested trees within the spot would be felled, and a horseshoe-shaped buffer of green, uninfested trees around the active spot, no wider than the average tree height, would be felled as well. The buffer will ensure that no freshly attacked trees are left standing. Dead trees without bark beetles would be left standing for wildlife habitat.

K. Assessments supporting forest health programs

Our most important data collected for forest health is our forest inventory data, used to determine the timing of harvest operations. This data focuses on standard metrics needed to develop growth and yield models, including trees per acre, basal area, species, individual trees measurements of diameter at breast height, stopper height (height to first defect), and total height. If no defect is found, we use total tree height to develop volume estimates.

Other types of assessments that may apply include regional studies conducted by our Agencies Insect and Disease laboratory, which monitors for outbreaks and insect population measures, and general day-to-day assessments by on-site field personnel.

L. Fire prevention and control

As previously discussed, the Forestry Commission, and thus Sand Hills State Forest is the lead Agency used to address wildfire suppression in the state. This designation provides us with ample resources and training to maintain an active prescribed fire management program.

Through the use of fire to reduce fuels, we have seen improved site conditions for planting, and improve stand conditions through reduction of hardwood competition. Decreases in personnel in recent years have resulted in fewer acres burned, but overall forest condition is still healthy, and as we return to full staffing we anticipate increasing the acreage of our burning program.

Training

As Registered Foresters, our management staff is well trained in many aspects of forest management. As part of the Forestry Commission, we also participate in frequent workshops/ continuing education addressing many aspects of forest management and health such as GIS, Insect & Disease, Wildland Fire, etc.

Our staff also includes many technicians and other employees who are provided the opportunity to complete a forest technician training program geared at improving their ability to assist management, including identification of forest health issues. All staff are required to maintain forest firefighter fireline certification status, which includes an annual refresher course in fireline safety, and completion of a physical fitness examination.

Finally, Sand Hills State Forest employs a forestry technician, Allen Rabon who holds a certified pesticide applicator license, and maintains the safety and integrity of our chemical applications for those plantings. Field application and recommendations are developed cooperatively with our product support agency.

Monitoring

Our monitoring program for assuring that stands are replanted adequately and that forest disturbance is minimal, and still being developed into a more robust, formal system. We maintain review on a yearly basis, and supervisor approval of sites as needed. An annual report of our activities is provided as part of the review of the Forestry Commission in its entirety.

Indicator	Measurement Method	Target	Measurement Frequency and Timing	Measurement Responsibility
Site Preparation within 1st year	Site burned or chem. Treated as needed	100%	Annual review	Harvest Supervisor
Sites planted within 2yrs	Trees planted correctly, and at correct spacing	100%	Annual review	Harvest Supervisor
Seedling establishment	Seedling survival checks	75-95%	2-3 yr. post-planting	Harvest Supervisor

Records

Our planting plans are available on an annual basis, as part of our bid proposal process. These data are then added as updates to our forest inventory. Chemical records and application plans may be available as part of the forestry technician's planning report. Certification of personnel as fireline qualified is documented through our agency training manager.

A. Key water quality and riparian constraints impacting forest management planning

Our active harvest schedule plan included stands that contained riparian boundaries, due to the complexities and site-specific details that could not be included in the model. Instead, we address the management of these areas at the implementation of the harvest activity, and thus expect a reduction of harvest acreage in areas that have water quality or riparian concerns. All areas are managed in complete accordance with BMP recommendations, and frequently exceed the minimal distance requirements as we consider other factors, such as aesthetics or wildlife.

The State Forest System has a program as well as utilizes the Water Plan of The SCDNR that addresses the Pee Dee Basin/watershed where SHSF is located to address and protect water quantity and quality during all phases of management. Exercising sound forest management practices lead to the protection of water quantity and quality. Sand Hills State Forest adheres to all Best Management Practices.

B. Water quality and riparian protection programs

As previously mentioned, our agency is the lead in BMP monitoring for the state, and as such we include guidelines for maintaining their use in our timber sale contracts. Site conditions over much of the Forest reduce the need for extensive road and landing design, however in areas where the concern exists our staff works closely with harvest operators to best locate their decks and skid trails. Only our bottomland hardwood forest requires regular monitoring and access control, and we do so through regulation of forest gates that can prevent access during wet weather conditions, and through personal communication with the contractor.

Our GIS contains several hydrology layers, including streams and other water bodies, and these layers are used to identify areas of concern in stands before harvesting is conducted. Field foresters make on-the-ground assessments for BMP use, and design stand boundaries in accordance.

In cases where there is concern with BMP adherence or rules, we use our Agency personnel in charge of BMP monitoring to assist in making management decisions.

C. Contract provisions

Our harvest contract requires compliance with BMP use as well as using TOP Logger certified contractors, and also the inclusion of a performance bond to promote BMP use or pay for remediation work, as needed.

Training

The Forestry Commission provides for BMP training through administration of the TOP Logger program, and all Agency staff may attend the training free of cost.

Monitoring

We monitor indicators key to water quality/quantity as part of our harvest operations review. The following table may be used to illustrate the compliance rate we require of harvest operations. All approval of post-harvest site conditions is through the field forester with supervisory approval.

Indicator	Measurement Method	Target	Measurement Frequency and Timing	Measurement Responsibility
Proportion of stream crossings installed with a quality score of 95% or more.	Post-installation inspection	100%	In conjunction with each installation	Technician/Road construction supervisor
Proportion of blocks that comply with riparian BMPs	Post-harvest inspection	100%	Annual following compilation of all final harvest inspection results	Harvesting supervisor

Records

The key supporting documents for BMPS and their implementation are our BMP guidelines produced as part of our Agency, our GIS layers, harvest maps where required, monitoring and inspection forms, and example contracts, upon request.

4. Conservation of Biological Diversity including Forests with Exceptional Conservation Value

Landscape Level Management Programs and Practices

A. Key biological diversity and wildlife issues impacting forest management planning

As described previously, and in much greater detail in Appendix B, Sand Hills State Forest manages explicitly for the recovery of the Red-Cockaded Woodpecker. Our Harvest Schedule Plan addressed wildlife constraints directly in terms of habitat considerations for the RCW, which requires meeting a fairly complex set of regulations (see the USFWS RCW Recovery Guide for a more complete description of the habitat goals we manage for).We also work in coordination with a State Department of Natural Resources biologist, who monitors our RCW population, as provides on-site technical expertise on how to address any management issues as they may arise.

Other considerations are taking into account during the implementation stage, such as timing of the harvest for breeding season of certain species, and protection of any known threatened and endangered species as encountered, and these considerations are discussed in greater detail in subsequent sections.

B. Landscape level programs

Being an RCW recovery site, we address our landscape level concerns as forest-wide issues within this context. Given the relatively large size of our forest, over 46,000 acres, we have identified several limitations with regard to RCW habitat at the landscape level. Limiting factors include isolation of clusters due to fragmentation of habitat, limited distribution of mature pine habitat suitable for foraging, and a shortage of trees suitable for cavity construction. Fragmentation of habitat is due to many factors. SHSF is heavily interspersed with private land holdings, most of which are in agricultural or other non-forested conditions.

Private forestlands adjacent to SHSF are routinely harvested and are not considered suitable for RCWs. The boundary of SHSF is highly irregular and some portions of SHSF are partially or completely surrounded by incompatible land uses. RCW clusters may be isolated for this reason, due to natural breaks in the habitat such as bottomland or hardwood forests, or due to past land uses on the forest itself.

Existing mature pine habitat on SHSF is further fragmented due to past land uses on lands within the forest boundaries. At the time of acquisition, the Forest was sparsely forested, with many acres in abandoned cropland. During the period from 1945 through the 1960's slash pine was extensively planted on the Forest. This species is not native to the area, and performed poorly, often reaching no more than 7 inches in diameter and 40 feet in height after 40-50 years of growth. This off-site species fragmented the existing mature forest and, for this reason, has been extensively harvested and converted back to longleaf pine. Much of the property currently is planted in young longleaf pine (<30 years) or immature pine that is between 30 and 60 years old due to the emphasis on timber harvesting and due to the large-scale conversion of slash pine back to longleaf pine (Figure 1, Table 2). The lack of mature pines has fragmented the foraging habitat and isolated clusters within the forest boundaries. Additionally, suitable trees for cavity excavation are not present in many areas of the forest. During past timber harvesting activities, only the low quality trees were left. These relict trees are often the only trees in some stands that are old enough and large enough to facilitate cavity construction by the RCW. Prior to the initiation of artificial cavity creation, this lack of suitable trees was a limiting factor for the RCW population on the Forest. Currently lack of trees old and large enough for either creation of artificial cavities (DBH ≥ 15 inches) or natural cavity excavation (typically 70+ years for longleaf pine and 60+ years for loblolly) continues to limit the growth of the population. Due to the RCW population and the fact that SHSF is considered a recovery population, the Forest is considered to be a Forest of Recognized Importance (FORI).

Maintaining Forest Cover Types

SHSF will maintain native forest cover types and ecological function through proper forest management such as prescribed burning and thinning regimes. Prescribe fire will promote the retention and productivity of the native ground cover and plants that thrive in the longleaf pine ecosystem. Prescribed fire will mimic the natural lightning fires that were allowed to burn across the landscape hundreds of years ago that created the open-park like appearance throughout the sandhills. These fires eliminated many of the scrub oaks/ hardwoods that then allowed the wire grass and understory to flourish throughout these ecosystems. Proper thinning techniques will also allow for the management of native forest cover types through the removal of the mid story component as well as the thinning of trees to open up the forest ceiling to allow sunlight to hit the forest floor.

Fish and Wildlife

Sand Hills State Forest contains a wide range of habitats including diversity within stands and across the landscape. This mix of forest types provides excellent habitat for many wildlife species, both game and non-game.

Many forest management activities are beneficial to game species of wildlife. Practices such as thinning, prescribed burning, planting beneficial tree species, and supplemental wildlife food plots encourage a variety of game species. White-tailed deer, bobwhite quail, mourning dove, and eastern wild turkey are the most prevalent game species in our forests. Other species, including rabbit, gray squirrel, fox squirrel, and waterfowl are also present. The streams and managed ponds on state forests contain fishing opportunities for sunfish, catfish, and largemouth bass.

Since hunting is one of the multiple-use goals of state forest lands, game management should be aggressively pursued. Most state forest lands are enrolled in the South Carolina Department of Natural Resources Wildlife Management Area program, which allows public hunting opportunities. Through this cooperative agreement, DNR monitors the health of game species and provides recommendations and funding to maintain and increase populations. Forest management activities should be planned to maximize the benefits to game species by considering appropriate timing of an activity, size of the affected area, and spatial arrangement.

Non-game wildlife species play an important role in management planning and prescriptions on state forests. Threatened and endangered wildlife species and species of concern, including the red-cockaded woodpecker, Pine Barrens treefrog, green salamander, and neo-tropical migratory birds should be considered when forest management activities take place. Endangered species populations should be managed with input from DNR and the US Fish & Wildlife Service, utilizing appropriate habitat management measures to increase and maintain populations. Where sensitive species are known to occur, particular concern should be given to reducing fragmentation of habitat, maintaining and creating additional high-quality habitat, and complying with the Endangered Species Act.

In addition to these general guidelines and in congruence with our RCW objectives, Sand Hills State Forest has also identified other specific wildlife species, and relative efforts that can be made for their benefit, as following.

Pine Barrens Treefrog (G4 species)

The Pine Barrens Treefrog typically occurs in shrub or herb bogs associated with seepage areas in the Carolina sand hills (Cely & Sorrow, 1982). This species has a limited range in South Carolina, confined to only a few counties in the northern South Carolina portion of the sand hills physiographic region.

The typical habitat consist of herb and shrub bogs associated with upland areas of sandy soils that act as reservoirs to supply the seeps with water. In general, these areas have low basal area with a thick, shrubby evergreen understory, often with an herbaceous zone nearby. This type of habitat is found in low areas throughout the sand hills, but the size and distribution of these areas is highly variable. PBTF habitat was historically maintained by periodic fire that retards succession and keeps these bogs relatively open. Some studies suggest that fire frequencies of 10 years or less would be sufficient to keep an herb bog free of woody vegetation (Wharton et al. 1976).

The current prescribed burning regimen at SHSF should be sufficient to maintain existing PBTF habitat, particularly if landscape-level burns are utilized. In the absence of prescribed fire, logging and manual clearing may be utilized. Care should be taken when using herbicides in areas of potential PBTF habitat.

Bachman's Sparrow (Non-listed species)

The Bachman's sparrow typically lives in the mature pine forests and open habitats of the southeastern United States. The species was historically most common in mature, open pine forests like the RCW. The species was also negatively affected by the logging of most of this forest and populations have declined across the species' range. Bachman's sparrow has varied greatly in range and population size over the past century, and is now rare in most places it was once a common resident (Dunning 1993).

The typical habitat of the Bachman's sparrow is pine woodlands or open habitats with a dense ground layer of grasses and forbs, and an open understory free from dense shrubs (Hardin *et al.* 1982, Wan A. Kadir 1987, Dunning and Watts 1990). The species is often associated with mature pine stands where wiregrass (*Aristida* sp.) or broomsedge (*Andropogon* sp.) is prevalent in the ground cover. Bachman's sparrows tend to be especially common in areas maintained for RCWs. Prescribed burning isemployed as a habitat management technique for RCWs maintains habitat suitability for Bachman's sparrows as well by maintaining the open grassy habitat and suppressing growth of dense shrubs. Bachman's sparrows are also found in open habitats such as road cuts, utility rights of way, and especially clearcuts. Habitat in clearcuts remains suitable for 1-7 years after replanting (Dunning and Watts 1990). Suitability of habitat in these clearcuts is short-lived and sparrow densities drop rapidly with stand age.

Bachman's sparrows are negatively affected by timber rotations that leave the majority of forest stands in unsuitable age classes (i.e. 15-70 yr. old) (Dunning 1993). However, prescribed burning, longer timber rotations, and harvest schedules adopted for RCW management should benefit the species by providing mature open forests for nesting habitat.

Continued management for RCWs on the SHSF is likely to positively impact the Bachman's sparrow population. Maintenance of habitat for RCWs through prescribed burning will provide ideal habitat for Bachman's sparrows. However, care should be taken to ensure that activities on the forest are not impacting the nesting habitat. Nest sites for Bachman's sparrows are especially found on the ground in clumps of broomsedge or wiregrass (Dunning 1993). Certain areas of the forest currently support dense areas of broomsedge and wiregrass, while others do not. The areas that do not have a dense layer of forbaceous or grassy cover are typically those that have not been burned as frequently, or are burned in the non-growing season, and those that are being intensively managed and raked for pine straw, though not all areas being raked are devoid of grasses and forbs. In order to protect habitat for the Bachman's sparrow and to ensure that Good Quality Foraging Habitat (native bunchgrasses and/or other native, fire-tolerant, fire dependent herbs should total 40% or more of the ground cover, USFWS 2003) is provided for RCWs, measures will need to be taken to ensure that various activities on the forest, including pine straw raking, are not negatively affecting the native ground cover.

Henslow's Sparrow (Non-listed Species)

The Henslow's sparrow is a species that was once common in wet grasslands of eastern North America and the tallgrass prairies of the Midwest (Herkert *et al.* 2002). However, populations have declined over the last century, and the species was recently identified as the highest priority for grassland bird conservation in eastern and mid-western North America (Herkert *et al.* 1996, Pashley 1996). The breeding range of the Henslow's sparrow ranges from Minnesota east to western New York State, south to northern Maryland and northern West Virginia then west to extreme northeastern Oklahoma (Herkert *et al.* 2002). Because of the secretive habits of the Henslow's sparrow, the winter range is not precisely known, but appears to be largely the southeastern United States.

The winter habitat of Henslow's sparrows is similar to breeding habitats with a preference for open, boggy pine flats (Porter 2001), grassy pine flats (Lowery 1974), or low moist areas (Stevenson and Anderson 1994). More recent studies have revealed high densities of wintering Henslow's sparrows in recently burned (6 mo-3 yr) longleaf pine savannahs with extensive wiregrass understory (Herkert *et al.* 2002). While the SHSF appears to be on the edge of the species wintering range (Herkert *et al.* 2002), the availability of recently burned longleaf pine savannahs leave the possibility that Henslow's sparrows currently winter on the

SHSF. The secretive nature of the species probably leads to under detection on the SHSF. However, continued prescribed burning for RCWs should create and maintain winter habitat for Henslow's sparrows across the SHSF.

American Kestrel (Non-listed Species)

The American Kestrel is the smallest, most numerous, and most widespread of North American falcons (Smallwood and Bird 2002). American kestrels use a wide variety of habitats during the breeding season, from open to semi-open habitats, including meadows, grasslands, deserts, early old-field successional communities, open parkland, agricultural fields, and both urban and suburban areas (Smallwood and Bird 2002). Breeding territories are typically characterized by either large or small patches covered by short ground vegetation, with some higher woody vegetation sparsely distributed or entirely lacking (Bird and Palmer 1988). American kestrels are secondary cavity nesters, using woodpecker excavated or natural cavities in large trees, crevices in rocks, and nooks in human made structures (Smallwood and Bird 2002). Kestrels will also use nest boxes placed in appropriate habitats. Winter habitats are similar to breeding habitats, except for the presence of more woody vegetation, and suitable nest trees may or may not be present (Smallwood 1987, 1988).

Though the species in the most numerous and widespread of the North American falcons, the southeastern subspecies (*F. s. paulus*) appears to be in decline. This is likely due to the lack of suitable old trees for cavities. Nest box efforts have stabilized populations in certain areas, but there is much concern over widespread decline of breeding American kestrels in the southeastern United States. The subspecies was formerly designated Category II (candidate for listing, but insufficient evidence; not protected under the federal Endangered Species Act) until Category II designations were eliminated in 1996 (Smallwood and Bird 2002). Kestrels have been actively managed for on sites of fire-dependent longleaf pine-turkey oak Sandhills by leaving snags standing that could serve as natural nesting cavities for American kestrels. Additionally, the burning regime and forest management for RCWs often leave open areas in which kestrels can forage. RCW management often results in the creation of both foraging and nesting habitat for American Kestrels.

Given the landscape at SHSF the southeastern subspecies of the American kestrel is likely to remain stable, or increase with increased management. Specific activities that may benefit breeding American kestrels are the removal of restrictor plates from RCW cavity trees when they cease to be functional and the placement of nest boxes for kestrels in appropriate places. The removal of restrictor plates from cavity trees that are beyond use by red-cockaded woodpeckers may provide cavities with entrances large enough for use by nesting kestrels. On Eglin Air Force Base, Florida, American kestrels are one of the primary secondary users of RCW cavities with enlarged entrances in both dead

and living trees (Gault pers. Comm.). Additionally, the placement of nest boxes adjacent to open mature pine stands and open fields or rights of way has been highly successful for American kestrels. There are currently several kestrel boxes in use on the SHSF. The nest box effort along with proper habitat management for RCWs should help to stabilize and possibly increase the breeding population of kestrels on SHSF.

Brown-headed Nuthatch (Non-listed species)

The brown-headed nuthatch, like the RCW, is endemic to the pine forests of the southeastern United States. Also like the RCW, the brown-headed nuthatch is unusual in being a cooperative breeder. Along with the RCW, the brown-headed nuthatch is thought to be an indicator species for the health of the southeastern pine forests. Failure to recolonize areas where the species has been extirpated highlight the sensitivity of this species to habitat alteration by humans (Withgott and Smith 1998). Brown-headed nuthatch distribution generally coincides with the geographic range of southeastern pine forests (Sauer *et al*. 2002).

The breeding habitat of brown-headed nuthatches is almost exclusively associated with pine trees in a variety of southeastern pine forest habitats (Withgott and Smith 1998). The most common habitat types are the loblolly-shortleaf pine associations of the Upper Coastal Plain and the longleaf-slash pine associations of the Lower Coastal Plain, with the highest abundances in open, mature, old-growth pine forests where natural fire patterns have been maintained (Hamel 1992). Brown-headed nuthatches are also found, but less frequently, in stands of young to medium-aged pine, in mixed pine-hardwood stands, in mature pine stands with heavy undergrowth, and in open residential areas with large pines (Hamel 1992).

Brown-headed nuthatches use snags for nesting and roosting, but foraging centers on live pines. The combination of the foraging and nesting requirements of the species is most often found in mature forests in which fire has created snags and kept the understory open, small clearings within mature forest that have been created naturally (e.g. by hurricanes, disease, or bark beetles) or artificially in which snags have been left standing, or in forest wetland borders where water incursion has created snags (Withgott and Smith 1998). Most of the habitats are pine dominated (Wright and Bailey 1982). Winter habitat is similar to breeding habitat.

Several activities have been shown to negatively affect brown-headed nuthatch populations. Clear-cutting has been shown to severely impact populations (Rowse and Marion 1981, Kerpez and Stauffer 1989, Burleigh 1958, Smith and Smith 1994). After clear-cutting it may take 12-25 years before the habitat again becomes suitable for brown-headed nuthatches (Conner et al. 1983). Fire suppression has also negatively impacted the habitat by allowing the thick hardwood component to flourish in formerly open pine forests (Engstrom et al.

1984, Hirth et al. 1991). Fire suppression can also slow the creation of snags, which brown-headed nuthatches use for nesting (Withgott and Smith 1998).

Populations of brown-headed nuthatches are declining throughout the species' range. However, the species remains common and widespread in open stands of mature forest in the southeastern United States (Withgott and Smith 1998). Brown-headed nuthatches are currently common on many areas of SHSF. It is likely however that populations were severely impacted by the recent clearcutting of thousands of acres of slash pine to convert back to longleaf pine. Most of the slash pine conversion has been completed and harvesting rotations employed for RCW management on SHSF should result in more suitable habitat for brown-headed nuthatches in the future. Additionally, the introduction of an aggressive prescribed burning program to manage RCW habitat should produce more snags for nesting and open habitat preferred by the brown-headed nuthatch. Given the long-term management goals of the SHSF, it is likely that brown-headed nuthatch populations will increase in the future.

Prairie Warbler (Non-listed species)

The prairie warbler is found throughout most of the eastern United States (Nolan *et al.* 1999). Prior to European settlement the prairie warbler was rare or absent over much of its current range. However, after the widespread deforestation in the eastern United States the species became more widespread. In recent decades the species has been on the decline again, at least in some regions, and is a species of concern (Nolan *et al.* 1999). Prairie warblers breed in various shrubby habitats that lack a closed canopy. Typical habitats are southern pine forests with scattered trees and a shrub layer and abandoned fields or pastures with shrubby growth (Nolan 1978).

The present range of the prairie warbler became occupied as forests were cleared. The species breeds in early successional habitats, which are short lived, and therefore breeding locations naturally change through time. Prairie warblers are often cited as an example of severe declines among Neotropical migrants, yet estimates of local populations are complicated by the ephemeral nature of the breeding habitats (Nolan *et al.* 1999). Lowland populations appear to be stable and many even increased (James *et al.* 1992). There do appear to be overall declines on at least some of the winter range (Arendt 1992, Faaborg and Arendt 1992), but the causes of these declines are undetermined. Despite the apparent decline of prairie warblers, they are not considered to be a threatened species (Reed 1992). The status of the species at this point needs further study.

Prairie warblers are likely to be present on some areas of SHSF. As fire suppression reduces the amount of shrubby habitat within pine forests, and recently replanted stands age, it is likely that the habitat available for prairie warblers on SHSF will decrease. Because of the uncertainty of the status of the

species at this time it is uncertain whether management strategies should be changed to create more habitat, especially since such management actions could be in conflict with requirements of RCWs and other species of concern on the forest. Surveys should be conducted to determine the distribution on SHSF.

Northern Bobwhite (Non-listed species)

The northern bobwhite is a resident species throughout much of North America (Brennan 1999). The present distribution of the species throughout its geographic range has become highly fragmented due to habitat loss. Extensive modern clean farming, high-density pine silviculture, and lack of prescribed fire have rendered much of the habitat unsuitable for occupation by bobwhites (Brennan 1991). Northern bobwhites require early successional habitats in a wide variety of vegetation types (Brennan 1999). Agricultural fields and grasslands, open pine forests and pine-hardwood forests can all provide high-quality habitat depending on the frequency and intensity of disturbance and the size of disturbance patches. Disturbance may result from fire, agriculture, or timber harvesting. However, clean farming with increased field size, removal of hedgerows and fence lines, and applications of pesticides has limited the suitability of agricultural lands as habitat in recent decades. Additionally, fire suppression in southern pine forests has limited the amount of habitat available to northern bobwhites (Brennan 1999).

The northern bobwhite is declining over most of its geographical range (Brennan 1991, Church *et al*. 1993). Declines have been greatest in the Southeast, with many local extinctions. Bobwhites rely on frequent vegetation disturbance (every 1-5 years) from prescribed fire and/or mechanical disturbances to maintain suitable habitat (Brennan 1999). The integration of bobwhite management with management for RCWs on upland pine sites will likely result in population increases for both species. It is likely that mechanical clearing and prescribed burning for RCW management on SHSF will create and maintain high quality habitat for bobwhites.

C. Assessments and inventories supporting wildlife programs

As part of the WMA program, key assessments of wildlife are taken by the South Carolina DNR, although Forest staff frequently assist in population monitoring for the DNR upon request. Subsequent hunting regulations, dates and times, and seasonal availability are determined in cooperation with DNR to maintain a healthy forest wildlife community. In terms of RCW management, Sand Hills relies on an on-site DNR biologist, as discussed elsewhere.

D. Forests with Exceptional Conservation Value

Our primary mission at Sand Hills State Forest is the recovery of the RCW, which is promoted primarily through the establishment of healthy, mature Longleaf

Forest communities. However, as discussed following under the endangered species section, there are unique areas at Sand Hills where we manage for those species and their associated habitats.

Other than the South Carolina DNR, who is our primary contact and advisor for management of critical species and habitats on the Forest, we do not maintain any current associations with other agencies or groups. Also, we maintain any GIS data related to these critical on a request-only basis, so as to discourage site degradation from public access.

E. Landscape considerations in threatened and endangered species programs

As previously described under the landscape level management considerations, our landscape level concerns are toward the improvement of habitat and habitat connectivity for the improvement of the RCW population. We work strongly with promoting the health of our Longleaf Pine communities in and around nesting sites of Red Cockaded Woodpeckers. We also work in conjunction with wildlife personnel at the adjacent Sand Hills National Wildlife Refuge to better manage for this recovering species. Harvest activity is limited in areas, or partitions, in and around these sites, and we have actively converted acreage forest-wide from Slash Pine to Longleaf Pine, which also may increase the potential habitat for this species.

F. Support for old growth conservation

Our active forest management does not identify old growth conservation as a primary objective. However, in areas of limited access, within riparian areas, swamps, and other sites, we may allow for old growth conditions to remain or develop. While the habitat requirements of the RCW are not for stands explicitly considered old-age, there does exist a rotation-age limit of 100 years, as conditions of Longleaf Pine stems, in terms of cavity-site suitability, do not develop until ~ 70 years of age. Given this age rotation, many sites will develop conditions that start to mimic old growth, including a reverse-J shaped diameter distribution, areas of natural regeneration, and large diameter stems present. As a self-supporting Agency, we often are not able to increase the rotation age of stands to that which more closely resemble old growth conditions due to revenue needs.

G. Programs to address invasive exotic plants and animals

The Sand Hills State Forest has been involved in several programs over the years to mitigate effects of impacts of invasive plants and animals. Generally, the Forest has not been largely impacted by exotic plants and or animals, and we shall continue to address these problems on a case-by-case basis.

H. Prescribed fire

The use of prescribed fire has been mentioned in several instances in this document. Forest personnel use prescribed fire in many instances: site preparation, fuels reductions, timber stand improvement, aesthetics, and improved habitat through species management. Our personnel are trained and licensed through the Agency, and we maintain a high level of fire preparedness.

Stand Level Management Programs and Practices

I. Stand level programs

Within stand management allows for increased biological diversity through many factors. Retention of snags, allowance of coarse woody debris, and the robustness of our BMP riparian zone interpretation all increase the variability of habitat and diversity within stands. Our adjacency constraints on harvesting and are limits of harvest size (green-up constraints based on age and tree height, and rotational harvest limited to 100 acres maximum size, with even smaller applications in areas of RCW concern), also provide for a shifting mosaic of stand conditions at the tract level.

J. Threatened and endangered species

In stands where threatened or endangered species are known, we make management decisions as described elsewhere in this document. As we implement our harvest schedule model and develop site-specific plans for product removal, particularly adjacent to areas of concern, we inspect for presence of species and make changes to our long-term plans accordingly. Additionally, we request in our harvest contract that operators also monitor for presence of species, and notify us if any species of concern are located. Some threatened and endangered species have been identified, and a more specific management approach developed. Management considerations for recognized wildlife populations of concern were discussed previously. The following describe our considerations to plant communities of concern.

Pixie Moss (G4 species)

Pixie Moss, a low creeping woody plant, is found on the slopes or summits of xeric pine sand hills with thin soils and low overstory basal area. This species flowers in early spring, and requires periodic fire to maintain the open habitat it favors. Current fire regimes on SHSF should be sufficient to maintain pixie moss habitat. Care should be taken to identify occurrences of this species when pine

straw harvests, timber harvests, or other activities that may cause soil disturbance are conducted.

Sandhills Lily (G2 species)

Sandhills Lily is a sand hills endemic that occurs in the ecotone between longleaf pine/wiregrass communities and sand hills streamhead pocosins. Fire is essential to remove competition from this species where it occurs, and flowering may not occur in the absence of fire or other periodic disturbance. SHSF currently has two documented occurrences of this species. The current prescribed burning regime at SHSF should be sufficient to maintain the existing populations of this species. Areas with potential habitat should be surveyed in the growing season after prescribed burning to document new occurrences of this species. Due to the past documented occurrences of the Sandhills Lily, the Forest is considered to be a Forest with Exceptional Conservation Value (FECV).

Training

For prescribed fire applications, staff are certified through the Prescribed Fire Manager Program, as well as provided training through the status of wildland firefighter. Additional training may be obtained through additional workshops, most frequently as part of the continuing education requirements to maintain registered Forester Status. Most recently, several Forest staff attended a training exercise in adopting harvest plans to benefit forest bird populations.

Monitoring

The key indicators to monitored landscape and stand level biodiversity management programs can be identified in the following table.

Indicator	Measurement Method	Target	Measurement Frequency and Timing	Measurement Responsibility

Proportion of old growth forest by management unit/ecological grouping	Inventory updates	Based on accepted science	Annual	Planning forester
In-block retention levels	Post –harvest inspection (part of post harvest inspection checklist)	Average 7%	Following completion of logging activities on a block specific basis.	Harvest supervisors

Records

Forest management planning assumptions and considerations for wildlife are included in Appendix B. Inventory data would also support the implementation of harvest areas in accordance with these, and green-up constraints, and the presence of robust riparian habitat. Training records of those employees who have attended the Prescribed Fire Manager training are available through our Agency training manager.

5. Management of Visual Quality and Recreational Benefits

Visual Quality Practices and Programs

A. Key visual quality issues impacting forest management planning

Our visual constraints/forest aesthetics in harvesting are many. Primarily, we leave forest buffers along travel corridors, and recreational water bodies that exceed BMP standards. We also limit harvest size, and manage for timing of harvest activity, to prevent large non-forested openings. We may leave aesthetic buffers along trail systems, or in areas heavily frequented by recreational users. However, in all of these areas we may violate our constraints during harvesting operations where we are converting from an undesirable species to a more desirable species. Primarily, this occurs in stands of Slash Pine being replaced by Longleaf Pine, and we have observed that in areas where aesthetic buffers are left, we often have difficulties later with seeding in of residual Slash Pine from the buffers. These decisions are made on a stand by stand basis.

B. Visual quality management program

We do not have an active management program in our road design, and frequently we work with our timber contractors and operators to allow them to install decks and skid rows where best meets their needs. Due to the remoteness of most of our forest lands, we do not generally consider the location of the deck a critical aesthetic concern, however we do work closely to minimize the size of the deck, any debris piles that may be left behind, and ensure that no litter or waste associated with the contractor are left on site. Enforcement of these rules is in compliance with the performance bond inclusion on the timber contract.

C. Assessments and inventories supporting visual quality programs

We do not currently use any visual quality analysis or digital terrain models to inventory our viewsheds or to make management decisions. While no plans are in place for that incorporation, the Agency and Sand Hills State Forest are committed to improving our ability to better manage our State Land, and may incorporate those programs in the future. Our primary inventory approach to maintain a healthy viewshed is through the use of green-up constraints and adjacency constraints, as discussed in more detail in Appendix A.

D. Clearcut harvest provisions

As previously mentioned these constraints are discussed in detail in Appendix A. Our green-up constraints require a height of 5 feet or 3 years of age to be reached before an adjacent stand can be harvested. Our rotational harvest areas are limited

to 100 acres in size, with the only exception being bottomland hardwoods, which may be larger due to the relative increase of direct sunlight on the development of the residual stand. In Longleaf Pine, our clearcuts are often much smaller, in accordance with the Recovery Guide, and also we are required to leave a minimum of 8-10 stems an acre, which we have increased to almost a 30 basal area. This change makes our rotational harvests in these stands appear more like a thinning, and indeed thinning to a 40 basal area is encouraged by the Recovery Guide. We have not used a shape index directly, however current work to install openings for wildlife habitat, primarily duck habitat, is addressing shape and shape index as part of the design.

Public Recreational Opportunities

E. Recreation

The goal of the South Carolina Forestry Commission is to provide outdoor recreational opportunities on the state forests that are compatible with forest management activities. The SCFC will strive to accommodate the needs of the various recreational user groups that enjoy the state forests. However, as is the case for forest management activities, management of recreational activities will not take precedence over the protection and enhancement of the environment. In addition, management for the recovery of the Red-Cockaded Woodpecker will always take priority over recreation and other forest management activities.

There are a variety of recreational opportunities in South Carolina's state forests. In fact, the opportunities are as diverse as the forests themselves. There are equestrian, mountain biking, and hiking trails. Other activities include picnicking, bird watching, and canoeing to name a few. Sand Hills State Forest has historically been enrolled in the Wildlife Management Area (WMA) program, which is regulated by the Department of Natural Resources. Therefore, hunting and fishing on this State Forest require applicable licenses and a WMA permit and is allowed only in designated areas during the appropriate seasons. For more detailed information on hunting and fishing activities, refer to the annual DNR Hunting and Fishing Regulations. Sand Hills State Forest has developed a management approach to some of our most significant recreational opportunities, which are discussed here in more detail.

Sugarloaf Mountain

Sugarloaf Mountain Recreation Area encompasses approximately 400 acres in compartment 14 of SHSF. A 100-foot high mountain composed of ferrous sandstone is a popular attraction to many visitors. The recreation area also offers 7

primitive campsites for regular camping and 8 campsites for equestrian camping. All sites are primitive but portable toilets are provided. All sites are equipped with picnic tables and 6 sites have picnic shelters for day use and campers. A 10-acre fishing pond separates the regular campsites from the horse sites. A day use parking area is provided for daily riders. Approximately 50 miles of horse trails and roads used by horse riders can be accessed at Sugarloaf Mountain. A hiking trail offers a ½ mile and a 1-mile loop for walkers. There is currently one RCW recruitment cluster within the Sugarloaf Mountain Area. Campers and locals use the mountain area year-round. The recruitment cluster is not located near the campsites or trails, therefore the RCW will not be adversely affected.

Horse Trails

To meet the need for equestrian enthusiasts, the State Forest has established over 50 miles of horse trail. In addition, the numerous dirt roads on the forest also serve as riding trails. A horse-riding permit is required for all riders 16 years of age and older riding horses on Sand Hills State Forest. All equestrian riders are required to have, in the possession of the rider, a current Coggins test for each horse. There are 8 sites available at Sugarloaf Mountain for overnight camping and a day use parking area available for daytime riders. H. Cooper Black Recreation Area offers 68 campsites that are open to horseback riders. This facility has 24 horse stalls, 28 corrals and a horse arena available to the public for a small fee. Several stretches of tether lines provide hitching for horses while camping or day riding. There are some areas of horse trail that pass within the ½ mile boundary of the RCW clusters. While year-round use occurs, the minimal amount of horse traffic along the trails was determined not likely to adversely affect the RCW.

Fishing

Sand Hills State Forest has 14 fishing ponds that are open to the public for fishing. The forest requires no permit but persons must have a valid SC fishing license. Three of these ponds are in the H. Cooper Black Recreation Area and are closed during a scheduled field trial event or if someone has reserved the pond for retriever training. The ponds are stocked with brim and bass. Trolling motors are allowed in all ponds. Outboard motors are prohibited in all ponds with the exception of Sexton Pond, which does allow a gasoline type engine but not to exceed a 10-horse power motor. No RCW clusters are found within the boundaries of the ponds or their surrounding areas.

Hunting

Sand Hills State Forest provides many hunting opportunities for the hunting enthusiast. The state forest is considered a Wildlife Management Area land and all WMA regulations apply. WMA land is land leased by the S.C. Department of Natural Resources and opened for hunting to any member of the public who has purchased a WMA permit. The State Forest falls in game zone 5 and we provide a season for deer and small game as well as turkey. Numerous wildlife food plots are maintained annually on the forest. Two dove fields consisting of 84 acres are maintained for public hunting. No hunting is allowed in the H. Cooper Black Recreation Area during scheduled field trial events. Hunting within the regulations provided is not likely to adversely affect the RCW.

Road Rally

For several years, SHSF has been the site for the Annual Sand Hills Road Rally. This rally consists of several legs where cars compete against the clock. The rally takes place on designated dirt roads that are closed to the public during racing. The Road Rally takes place on major dirt roads around the forest. Cars are on a timed circuit and are allowed to race one at a time. This keeps any buildup of cars from forming within the racing areas. The Road Rally event does not take place during the RCW nesting season and is not likely to adversely affect the RCW.

Cooper Black Recreation Area

Approximately 7,000 acres on Sand Hills has been designated as the H Cooper Black Recreation Area. This multi-use area was designed for sporting dog field trials, horseback riding, mule and wagon rides and camping. Approximately 20 miles of marked horse trail with planted food plots along its corridors is provided for field trial use. In addition, 30 miles of dirt roads within the HCB area can be used for horseback riding. Three ponds designed with earthen piers and several fields planted with Bahia grass are available for retriever training and trials. The area offers a clubhouse with kitchen, a 24-stall horse barn, 28 corrals, 27 campsites with utility hookups and water, and 41 primitive campsites, all of which are for rent. A newly added horse arena is available for training and rodeos. Several stretches of tether lines are provided for riders to tie their horses. There are two comfort stations complete with toilets and hot showers and a dump station is available on site. There is a dog kennel that can house approximately 500 dogs available to dog owners.

We have three pond sites and several ground sites that are suitable for retriever training and trials. A picnic shelter at Wood Duck Pond is available for rent.

Fishing is allowed at the three ponds unless a field trial or retriever trial is scheduled or the pond is reserved for training. A valid SC fishing license is required. Hunting is allowed within the HCB boundary unless there is a scheduled field trial event. All WMA regulations apply while hunting the HCB area. All horse riders must have in their possession a current Coggins paper for each horse and a trail use permit.

There are four field trial courses on SHSF. All of the courses are located in compartment 18 of SHSF in the Cooper Black Field Trial Recreation Area. Field trial season runs from August to March, so these events will not affect the RCW nesting season. However, if field trials are scheduled in the future during the nesting season they will not be allowed within a ½ mile of any active RCW cluster. It was determined that while following guidelines set forth by the US Fish & Wildlife Service that activities at HCB will not adversely affect the RCW.

It is through sound multiple-use forest management that the Forestry Commission plans to maintain the integrity of and enhance of the state forest environment while providing for future natural resource uses, including recreation.

Training

The complexity required to implement a long-term large-scale harvest schedule model exceeds the abilities of staff personnel, and thus required solicitation of outside contractors. Their training in modeling allowed for the incorporation of complex constraints on harvest activity.

Monitoring

We can identify much of the success of our recreational programs through the collection and monitoring of fees associated with their use. We also provide users feedback opportunities through many different venues; through our website, through a personnel-maintained Facebook page, and through personal communications.

From a stand perspective, our use of GIS, and specifically a harvest scheduling model, reduces the potential or requirement for monitoring to ensure that our size limits are not exceeded. However, annual review of planned harvest areas allows for verification, as shown following.

Indicator	Measurement Method	Target	Measurement Frequency and Timing	Measurement Responsibility
Clearcut size does not exceed constraints	Inventory updates	100%	Periodic	Harvest Supervisor and Forest Analyst
Providing needed recreational opportunities	Permit sales	Maintain or increase permit sale numbers	Annual	Forest Director

Records

Key items supporting the above programs that are available for verification include our inventory data, and maps of our recreational sites and OHV areas.

6. Protection of Special Sites

A. Key special sites issues impacting forest management planning

The South Carolina Forestry Commission is aware of many special sites existing across our State Forest system lands, and continues to maintain, preserve, and enhance these sites on an individual basis. Our general guidelines for all State Forest lands expressly forbid metal detecting, collection of artifacts of any kind, digging on or damaging forest lands, or collection of any vegetative material without the express consent of the Agency.

The location of some of these sites, specifically existing structures and cemeteries, are made available to the public with varying levels of access (some of the buildings are still in use by the Agency, and thus access to their interior is limited). However, many of the historical sites are considered sensitive, and information regarding their location is kept within the Agency and made available on an individual basis.

B. Special Sites program

Historical Value

Historical sites are denoted by their cultural, historical, and/or archeological significance and include existing structures, old home sites, grave sites or cemeteries, Native American mounds and middens, historical trails, and others. In most cases, our management approach is to leave these sites as undisturbed as possible, with the location information made available to the public upon special request only. This strategy has helped to protect these sites from the potential damages of collection and looting common at widely known historical sites. The following subsections address each significant category in more detail.

Site of archeological value are present on many locations across the State Forest System. While the location of these sites is known to much of the general public, and particularly evident to visitors, we still maintain the location details of these sites in-house to avoid site degradation. In some cases, sites of high archeological value have been discovered, and the Agency has worked closely with State and/or University archeologists to allow research on the Forest as well as to better understand how to preserve and maintain the site for future generations to enjoy.

Numerous grave sites and cemeteries are present across Sand Hills State Forest. Access is provided upon request or through existing easements for families who still actively use cemeteries, however maintenance of these access routes is only improved by the Agency upon request. Harvesting activity is generally excluded from these sites where timber is present, although infrequent harvest may take place as needed to maintain or preserve the site.

Biological Value

Many sites exist across the State Forest system that may be considered to have high biological value, based on species diversity and composition. For much of the Forest, we consider this intrinsic value to be inherent in our current management objectives, which is managed for through species selection, harvest type, and fire regime. These factors may improve or maintain desirable forest conditions. Unless specific action is required on a stand by stand basis, additional management concerns are not incurred on forest-wide stands. However, in locations where endangered species are known or suspected to be present, or where the habitat is considered critical, then the Agency adopts stricter management policies as needed.

Aesthetic Value

The South Carolina Forestry Commission recognizes that in some instances, the aesthetic value inherent to some sites is sufficient to merit additional consideration under our management regimes. Several strategies are in place to protect and enhance these sites. Most commonly, we protect this sites by minimizing occurrence of management activity. The activities that may still continue include applications of prescribed fire, and harvest activity as required to maintain site conditions. Another strategy we use is the extended applications of our standard Best Management Practices, where we exceed recommended or minimum buffer distances around harvest areas to improve the Visual Quality Zones (VQZs) of adjacent areas. This approach not only reduces the visual impact of harvesting to the recreational community, but also improves the intended performance of the buffer strip while providing enhanced habitat and habitat corridors for wildlife.

In some instances, where retaining a buffer may cause conflict with our conversion of forest type from a previous non-desirable species to species more appropriate from both a historical and physiological perspective, we consider the overall benefit of the public in removing the buffer greater than the short-term visual improvement of retention.

Other

Sites with unusual, rare, or unique geologic formations, evidence of past land uses desirable for preservation, or other considerations as they are discovered, will be

managed as special sites on State Forest lands. At Sand Hills we manage Sugarloaf Mountain, and a smaller, secondary monadnock as both unique geologic formations as well as rare habitat areas for the unusual species present at both sites.

C. Assessments supporting special sites programs

Sand Hills State Forest has developed a GIS layer that includes special sites that exist on the Forest. As sites are discovered, they are included in the GIS, however we maintain the spatial data in-house. Examples of special sites would include cemeteries, old home sites, etc.

Monitoring

Key indicators to be monitored in relation to special sites programs are listed as following:

Indicator	Measurement Method	Target	Measurement Frequency and Timing	Measurement Responsibility
Proportion of identified special sites protected during operations	Post harvest inspections	100%	Ongoing at the completion of each unit	Harvest supervisors

Records

Key items supporting the above programs that are available for verification are listed as:

- Maps / catalogues of special sites (by request only for sensitive areas)
- Website information for visitor sites
- Plans developed for special sites
- Training records held by Agency training supervisor

7. Efficient Use of Forest Resources

A. Key Utilization issues impacting forest management planning

Our overall harvest level constraints vary from Forest to Forest, but generally follow the most significant objectives as listed in Section 1. However, certain considerations are taken in developing how our harvest operations will take place, which is applicable across all stands. In cases of low quality timber, or stands with poor species composition, we try to employ improvement cuts, as possible. These harvests aim to remove undesirable stems and improve the existing stand or the condition of the stand for the development of the next stand if a seed-tree cut is employed. In stands where timber is of low-quality and not desirable for harvest, we still require they be cut (and all other timber to a minimum DBH, usually 5”), and left on the ground to better prepare the site for planting. Since harvest values are ultimately derived through an open-bid process as required by law, we have limited ability to force the buyer to utilize some of the lesser quality timber on-site. Instead, we hope that through the bid process our winning bid estimated profit margins based on the greatest utilization of the timber present.

B. Utilization programs adopted

Post-harvest, we inspect our harvest areas to ensure that site conditions outlined in each harvest contract are met. This includes the treatment of slash and debris, reductions in piles, and that all stems above given diameter are removed. This ensure the site is better prepared for harvesting, burning, and/or receptive to seed dispersal from leave trees.

The Commission and State Forest lands base our volume estimates, used in developing our bid sales, based on common diameter and height specifications. However, we do not translate these measurements into required log utilization specifications, we mentioned above. Traditionally, we have allowed the harvest contractor to determine the optimal specifications for merchandizing. Similarly, as our timber harvesting is done under contract, we have not tried to impose restrictions on how that timber is merchandized, or developed any incentives for the better utilization of off-grade wood.

C. Assessments and inventories supporting utilization programs

Harvest operation sites are only monitored in relation to conditions as outlined in each harvest contract, which includes site conditions post-harvest, relative to slash, debris, and related factors. Our performance bond, included in each contract

as described elsewhere, is used to ensure these conditions are met. However, since product utilization has not become a component of our stumpage marketing, we do not have any current assessments in place for that over site.

Training

Training in this section is only applicable to site inspections, and in regard to post-harvest conditions. Our training is provided by supervisory personnel, onsite, and under the general orientation period. This training is provided through Top Logger.

Monitoring

Key indicators monitored in relation to utilization programs are summarize as following:

Indicator	Measurement Method	Target	Measurement Frequency and Timing	Measurement Responsibility
Inspections with adequate post-harvest conditions	Harvest inspections	100%	Following completion of logging activities on a block specific basis.	Harvest supervisors
Average waste wood levels per sale (potential)	Waste/Site surveys	Company/ forest type specific	Following completion of logging activities on a block specific basis.	Harvest supervisors

Records

The key items supporting the above programs may be available in the following:

- Harvest inspections
- Training records (maintained by Agency Training Supervisory)

8. Recognize and Respect Indigenous Peoples' Rights

A. SCFC shall recognize and respect Indigenous Peoples' rights as required by state and federal law.

The state forest system has a written policy acknowledging a commitment to recognize and respect the rights of Indigenous people. Currently there are no state or federal tribes active within the footprint of Sand Hills State Forest. The state forest system will appropriately train personnel and contractors so that the state forest system is competent to fulfill our responsibilities under objective 8 of the Forest Management Standard. This policy is publicly available. The State Forest System will also reference and reflect the standards referenced in UNDRIP.

As inventories and management activities are conducted should possible sites be discovered State Forest Manager and State Lands Coordinator are to be made aware. State Historic Preservation Office (SHPO), State Commission of Minority affairs, and state archeologist will be consulted. In the event where rights of indigenous people may be affected by the forest management practices that take place on Sand Hills State Forest; Sand Hills will communicate with the indigenous group using appropriate protocols. Sand Hills will also provide the group with opportunities to review forest management plans and practices. Sand Hills will always respond to any inquiries and concerns that it receives.

B. When Indigenous Peoples' make claims.

SCFC State Forest Manager and State Lands Coordinator shall confer with affected *Indigenous Peoples* with respect to sustainable forest management practices

1. State Forest Manager and State Lands Coordinator shall confer with affected *Indigenous Peoples* seeking to:
   a. understand and respect *traditional forest-related knowledge*;
   b. identify and protect spiritually, historically, or *culturally important* sites;
   c. address the use of *non-timber forest products* of value to *Indigenous Peoples*
   d. respond to *Indigenous Peoples'* inquiries and concerns received.

If something is identified it will be incorporated into a GIS data layer and managed appropriately.

9. Legal and Regulatory Compliance

A. Access to applicable laws and regulations

Several components are involved to ensure staff and contractors have access to relevant laws and regulations. Our Forest personnel are provided with training in BMPS, and work closely with contractors through evaluation of contract obligations. Our contractors themselves are required to be TOP Logger certified in the case of timber operations, and a Certified Tree Planter with the S.C. Forestry Commission when hired for planting operations. Adherence to BMPS and other provisions is required within the contract, with performance bond limits to ensure operators remain within those limitations. BMP guidelines and other relevant information is available through many venues, including headquarters of the Forest operations.

B. Compliance management program

Forest personnel conduct post-harvest inspection, as well as site monitoring during harvesting as feasible, and address any issues as they arise. Site inspection includes BMP considerations as well as general site conditions following operator egress. In addition, we maintain an open line of communication with our contractors to allow them the opportunity to contact us as they encounter situations that may conflict with BMP guidelines, their contractual obligations, or other issues. Further opportunity is provided during post-harvest evaluation and any required mitigation work, which is terminated with the release of the aforementioned performance bond.

C. Compliance with social laws

Our Agency personnel are made aware of all social laws, and rights of workers at time of hiring. In addition, our Agency has a defined Grievance Policy for redress of conflicts as they may arise. All information required relevant to worker's rights is posted in a public area.

For our contractors, we include language in our contracts that requires the following is ensured for their employees:

- Workers compensation is provided to all employees

- Workers are provided with liability insurance
- Contractor will only employee legally allowed workers

Training

For logging contractors, the TOP logger program and BMP training is required by contractual agreement. Other regulatory requirements may be addressed in the contract itself, and this outside the scope of a training regimen.

Forest personnel are also provided with training through TOP Logger, BMP training, and other training opportunities that may address legal and regulatory compliance as they become available and as part of personnel's continuing education.

Monitoring

Key indicators monitored in relation to compliance programs are derived implicitly from those references made in Section B, and are highlighted in the following table.

Indicator	Measurement Method	Target	Measurement Frequency and Timing	Measurement Responsibility
BMP Awareness	Signage of sales document	100%	Individual sales contract	Harvest supervisor
BMP and tree planting awareness	Approval to bid on contracts	100%	Annual review	Management section

BMP compliance	Post-harvest site inspection	100%	Individual sales contract	Harvest supervisor/BMP Forester

Records

The following is a list key items supporting the above programs that may be available for verification:

- BMP guidelines
- Timber sale contract
- Tree planting contract
- Training records if staff (available through Agency Training Coordinator)
- Training records of contractors (available through Management Section)
- On-site inspection forms
- Prescribed- burn plan
- Pesticide application plan

10. Forestry Research, Science and Technology

A. Research program

While research is not a significant activity at any of our Forests, as part of the South Carolina Forestry Commission we are associated with many research Opportunities, with the Forest providing sites and data as and when requested. This following sections describes the most prominent research activities currently underway.

The Agency has an Insects and Disease lab, which monitors for different activity across the state, as well as frequently on the Forest. This data is used both in-house and cooperatively with other state and federal agencies. The work conducted by this lab helps to identify threats and concerns associated with insect and disease outbreaks, and better prepares us to address these events as they occur.

In April 2018, the South Carolina Forestry Commission entered into a partnership with commercial forestry seedling provider ArborGen, which will provide management services to operate the agency's Taylor Nursery in Trenton, S.C.. Through association with our nurseries, we provide areas for research plantings, actively use nursery stock within our own operations, and serve as a benchmark for tree improvement performance over time.

In some cases, our collective State Forest system has provided land and data as outside support for other research requests, including chemical applications, tree improvement studies, biomass plantations and more.

Our Agency also serves as the liaison for the conductance of Forest Inventory and Analysis (FIA) for the state of South Carolina. Our Agency employees conduct all plot sampling, with coordinated reporting of results which is used both internally and by the United States Forest Service.

Lastly, through our association with ForSight Resources and our development of a Harvest Schedule model, our forest inventory data has been used in the development of forest growth and yield models. This data is then used to better adapt our own forest growth to planned harvest levels.

B. Internal research

As mentioned previously, our Agency conducts Insect and Disease studies and Tree Improvement through our Nursery operations. Through our association with the South Carolina DNR, and through our direct participation of most of our State Forests as a Wildlife Management Area (Harbison State Forest being the sole non-participant due to hunting restrictions associated with the property), much of the work performed on biological diversity and wildlife management has fallen under their purview. Still, Forest personnel frequently assist in data collection as needed.

C. Funding of external research

The State Forest system is an active and voting member of SIC.

As a State Forest we also provide access and land for research plots, where possible, as another method of supporting forest research.

D. Regional analyses

As previously mentioned, Agency personnel collect and report FIA data, which is used internally for economic development research, as well as general forest research and reporting at the State Level.

Our Agency has also been the state compliance monitor for BMPS, and have generated annual reports of compliance for many years, and multi-year analysis of compliance in white papers and peer-reviewed journal publications.

Lastly, The Commission, and State Forest personnel, served as lead reporters and committee researchers in a comprehensive analysis of the state, finalized in the South Carolina State Forest Resource Assessment.

E. Climate change

The State Forest system and Our Agency collectively is not associated with any climate chance research, but do monitor existing information and research. There are properties within the State Forest System that participate in and sell carbon credits on the open market.

The State Forest System is aware of and familiar with The Southeast Regional Climate Hub Assessment of Climate Change Vulnerability and Adaptation and Mitigation Strategies. By practicing sound and proper forest management activities, the State Forest System will meet the objectives of the aforementioned strategies.

Training

Adequate training for Forest Research, Science and Technology is difficult to identify. Due to the specificity of the research topics discussed, Agency personnel receive training and educational opportunities related to their unique areas of study.

Monitoring

We identify the key indicators monitored in relation to research programs in the following table.

Indicator	Measurement Method	Target	Measurement Frequency and Timing	Measurement Responsibility
FIA data reporting	Accuracy of data collected	95%	Throughout year	FIA supervisor
Continued contributions of nursery[1]	Realized tree improvement	Increased awareness and sales	Annual review	Nursery Manager

Continued contributions of nursery[2]	Increased supporter of a-/reforestation	Increases in seedling sales	Annual review	Nursery Manager

Records

The following items document the above programs, and are available for verification:

- South Carolina Forestry Commission Yearly Accountability Report
- South Carolina Forestry Commission Annual Report
- Nursery sales reports and white papers
- Insect and Disease white papers
- Annual BMP Compliance report and Journal Publications
- South Carolina State Forest Resource Assessment

11. Training and Education

Internal Training and Education

A. Communication of commitment to the SFI Standard & ATFS

Our plans to communicate our commitment to the SFI Standard are ongoing. We will continue to educate our personnel on the SFI program, our role in the program, and how our participation may improve our State Forest, its operation, and their contributions to the State Forest.

B. Roles and responsibilities for achieving certification objectives

The monitoring of our SFI performance and our maintenance of the Standard will be conducted by the State Lands Coordinator. The State Lands Coordinator will conduct an annual review of all Forest Directors and Managers, evaluating how the SFI Standard has been communicated, acknowledged or recognized by outside parties, and how its use internally has impacted our daily operations.

C. Staff and contractor training and education

Overall training of Forest personnel is reviewed in the following table.

	Forest Directors	Foresters	Forest Technicians	Management Support	Other Agency Personnel
General awareness of SFI commitments	✓	✓	✓	✓	✓
Detailed knowledge of Company objectives and programs	✓	✓		✓	
BMP training	✓			✓	
Wildlife habitat recognition	✓	✓	✓	✓	✓
Chemical usage requirements			✓		✓
Forest health factor recognition	✓	✓	✓	✓	✓
Utilization standards	✓	✓		✓	✓

External Training and Education

D. SFI Implementation Committee participation

The South Carolina Forestry Commission currently participates in outside training. The Commission attends SIC meetings and participates as a voting member.

E. SFI Implementation Committee training criteria and delivery mechanisms

The South Carolina Forestry Commission currently participates in SFI Implementation Committee training.

Monitoring

Our monitoring approach to internal training and education is two-fold. First, we developed a new training scheme for State Forest land employees, to address short-comings that have been found during this SFI process. Most significantly, much of our training has become on-the-job experience, and during the orientation of our new personnel. While we have not experienced any negative results from using this approach, it does not allow us to monitor or address areas of training that might be beneficial to our personnel, or that might require retraining at some point in the future. Second, as a participant in the SFI program, we are in the process of educating our personnel of our involvement, and benefit of participation. The following table outlines our initial approach at assessing our own training levels, while additionally assessing how our participation in SFI is being acknowledged by Forest personnel.

Indicator	Measurement Method	Target	Measurement Frequency and Timing	Measurement Responsibility
Employee Training	Adequately trained in recognized areas	100%	Annual Review	Forest Directors and/or Stand Land Coordinator
Employee's SFI Application	Can express knowledge of and use of SFI and assoc. docs.	100%	Annual Review	Forest Directors and/or Stand Land Coordinator

12. Community Involvement in the Practice of Sustainable Forestry

Support for Sustainable Forest Management

A. Support for SICs

The Agency, and Forest personnel, provide partial support, mostly in the terms of personnel time, for the following SIC programs.

- Project Learning Tree
- Wood Magic Forest Fair
- Teachers Tour

These different programs require different assistance. In previous years, the State Forest system at large has served as the location and facility support for all of these events. Personnel have provided event support, and will continue do to so. Lastly, some personnel work with these programs as part of their day to day functions, providing, at least indirectly, some financial support in terms of staffing.

B. Educational materials

The development and distribution of educational material to forest landowners has, in years past, fallen under the supervision and direction of other entities within the Agency. Still we provide educational materials on site at each State Forest, and also participate in a leadership role in landowner and educational tours on our lands.

C. Conservation of managed forests

From an Agency perspective, conservation of managed forests has been addressed through cost-share programs. Under our State Forest system specifically, we have provided facilities and program support, although generally on an as-needed basis.

D. Regional conservation planning

Generally, our forests are not part of any regional conservation planning efforts at this time. Sand Hills State Forest, in particular, may be described as participating in a regional conservation effort as part of the RCW recovery effort. However, we address this effort as a forest-wide issue, with implications to management at the tract and stand levels.

Public Outreach and Education

E. SICs and other outreach organizations

Our outreach participation, as previously described elsewhere, is through leadership and participation in the Wood Magic Forest Fair, Teacher's Tour, Project Learning Tree programs, and SIC.

F. Public educational opportunities

Our public educational opportunities are many. Across the State Forest system, we participate in Future Farmers of America events, conduct field tours, provide training and educational opportunities to local schools, provide volunteer opportunities to various groups, and have developed or are in the process of developing self-guided tours, respectively. In addition, personnel frequently provide their services, through speaking engagements and teaching opportunities, to many schools, groups, conferences, and other users on an annual or by request basis.

Stakeholder Concerns

G. Company processes for receiving and responding to public inquiries and concerns

There are many avenues through which public inquiries can be made and subsequent response actions taken. The Agency, and Forests alike, use interpersonal communications, social media, regular postal and email, and other avenues as they arise to take concerns and inquiries for our actions. These inquiries are then directed to the appropriate parties, researched, and then responded to in a timely fashion.

H. Nonconforming practices

The Agency and State Forest system will address stakeholder concerns regarding apparent nonconforming practices on an individual basis.

Training

Other than participation in the aforementioned programs we are involved in, no specific training relevant to community involvement has been identified or provided for. Specific training operations for the operations mentioned is available however, and we have found that personnel who seek to participate in these programs, have also participated in training events and workshops, such as PLT training.

Monitoring

Monitoring of our response to community involvement will be internal, and on an individual basis as needs arise.

Records

The key items supporting the above programs and available for verification are as follows:

- Educational records (Training Coordinator)
- Records of educational opportunities provided, as available
- Review documentation and event advertising for listed SIC programs
- Records of FOIA requests (SCFC Public Information Officer)

13. Public Land Management Responsibilities

A. Public land planning and management processes

The State Forest system is involved in land management planning in many venues. Overarching guidance is provided through a Long-Range Plan, which serves as a working document for setting long-term goals and objectives. Following these guidelines, we continue to update and adapt a management plan specific for each State Forest, which more closely addresses their respective objectives and relative concerns. Finally, and in concert with our management plans, a harvest schedule model has been developed, and is in the process of being updated, which supplies ancillary data for our Forest system to better meet its needs.

B. Stakeholder engagement

Contact with local stakeholders over forest management issues is provided through many relationships, associations, and previously mentioned venues, as described elsewhere. Various trail groups, riding associations, and other organizations have, over time, developed lines of communication with our Forest personnel, from interpersonal to regular meetings, where concerns over respected issues can be brought forward, or addressed collectively. However, the State Forest position has, to this point, been to address concerns or requests on an as-needed basis, rather than seek out the inputs of any given group.

C. Indigenous peoples

We address issues or events as if and when they arise, making appropriate contact with tribal leaders when necessary, and taken any corrective actions, as deemed appropriate

Training

Training for public land management responsibilities has been determined to be non-specific, however Forest personnel have attended leadership programs and other team-building workshops, which help to provide them with training for many relevant situations.

Monitoring

Our key indicators for monitoring programs for involvement in sustainable forestry are limited to the planning records and the implementation of the monitoring process still in development. We identify our preliminary indicators as described here:

Indicator	Measurement Method	Target	Measurement Frequency and Timing	Measurement Responsibility
Long Range Plan usage	Forest system in compliance	100%	Annual review	Forest Analyst
Management Plan	Current to State Forest Need	100%	Annual review	Forest Director
Harvest Schedule Model	Current to State Forest Need	100%	2-3 yr. review	Forest Analyst

Records

The key items supporting the above programs that are available for verification are as follows:

- Records of FOIA requests
- Records of meetings with groups and associations
- Long Range Plan
- Management Plans
- Personnel Training records (Agency Training Coordinator)

14. Communications and Public Reporting

A. Summary audit report

Upon completion of this draft version of our current existing management plans tailored to the SFI standard, we shall submit our documents to the certification body for auditing. These documents will be assessed for content, and congruence to the SFI Standard, and the results with be submitted to SFI Inc. for posting to an external website. We shall also maintain all records of our audits for certification or recertification on hand at our Forestry Commission Headquarters in Columbia, SC, as well as each respective State Forest. We shall also work towards developing a documentation library, to better facilitate the auditing process.

B. Annual progress reports

As described previously, the State Lands Manager is responsible for SFI Standard adherence, and for collating data and preparing and submitting annual progress reports to SFI Inc. The method of review was described in detail in Section 16 (B). Reporting will be conducted in congruence with the SFI program.

Records

- Third party (BVC) Annual Audit Report
- Annual Progress Report

15. Management Review and Continual Improvement

A. SFI program effectiveness assessment

The Agency and State Forests in particular will use the following categories and associated criteria in the evaluation of the effectiveness of SFI programs and achieving continuous improvement in performance:

- Improved effectiveness of management process
    - i. Operational improvements
    - ii. Streamlined management
    - iii. Improved review process to meet Standard
- Realized increases in SFI certified wood and wood products
    - i. Enhanced revenue stream
    - ii. Increased participation of contractors
- Improved recognition of our leadership or exemplary status in sustainable forest management
    - i. Increased request for SFI literature or information
    - ii. Increased appearance of Agency in relevant publications and literature
    - iii. Increased request for our participation in events or literature related to forest sustainability

B. Monitoring of progress in achieving the SFI objectives and performance measures

The development of useful metrics to monitor progress against the SFI objectives and performance measures is challenging. While some of the expectations are noted previously, other measures have been identified that may support our progress

Describe the basic process used by the Company to monitor progress against the SFI objectives and performance measures. Note: The key data collected to support continual improvement should be captured in the *Monitoring* sections of this document.

C. Annual management review

Describe the timing, participants and content requirements of the annual review of progress including at least:

- Review of overall performance against the SFI objectives and performance measures
- Stakeholder concerns

- An assessment of the effectiveness of current programs
- Areas requiring improvement, related actions to be taken, timelines and responsibilities
- Proposed changes to programs
- External audit findings and any required corrective/preventive actions
- A management conclusion regarding the ongoing adequacy of the Company's SFI program

Records

The key items identified that may support the continual improvement of our Agency association with SFI and the SFI Standards, and that may be available for verification are as follows:

- Annual Report of Audit
- South Carolina Forestry Commission Annual Report
- South Carolina Forestry Commission Accountability Report

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