

FOREST STAND IMPROVEMENT

S. C. Practice Job Sheet 666

Prepared for: _____

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Farm: _____ Tract: _____ Date: _____



Periodic thinning provides room for tree crowns to expand, resulting in improved growth.

DEFINITION

The manipulation of species composition, stand structure, and stocking by cutting or killing selected trees and understory vegetation.

PURPOSES

- Increase the quantity and quality of forest products, e.g., sawtimber, veneer, wood fiber, poles, pilings, maple syrup, naval stores, nuts and fruits.
- Harvest forest products.
- Initiate forest stand regeneration.
- Restore natural plant communities.
- Improve wildlife habitat.
- Achieve a desired level of crop tree stocking and density.

CRITERIA

The harvest-regeneration strategy should be identified for all planned forest improvement harvesting:

- Uneven-aged management systems (single-tree selection, group selection, coppice selection)

- Even-aged management (clear-cut, seedtree, shelterwood, coppice)

The method, felling direction and timing of tree cutting for harvesting should facilitate efficient and safe tree removal and protect sensitive areas such as vernal pools, riparian zones, cultural resources and structures. Harvest within riparian zones must be directed away from the water so that equipment traffic is eliminated or minimized.

Soil erosion, displacement and compaction, rutting, and damage to remaining vegetation should be minimized.

Practices must comply with applicable federal, state, and local laws and regulations during installation, including South Carolina's Best Management Practices.

Conventional logging skidders and tractors can be used on most sites in the Piedmont and Coastal Plain. Special equipment such as logging mats will be used if needed on extremely wet sites to prevent soil compaction and rutting. Wetland sites should not be logged when the soil is saturated

Locate stream crossings where impacts to the stream are likely to be minimal

Identify and protect sensitive areas such as SMZs, ephemeral streams and erosive soils.

Pre-Commercial Thinning

Pre-commercial thinning is needed where the stand of desirable trees of unmerchantable size is overstocked and is applied to young stands, normally 2 to 4 inches in diameter. It is particularly needed in young, even-aged stands which have seeded thickly in old fields, burns, and cut-over areas.

Spacing and Number of Release Trees

Spacing of remaining crop trees should be wide enough to permit fast growth until they are of sufficient size in diameter and height to yield useable or sellable products and the stand is ready for a commercial thinning. Some room should be left for crown spread; however, the trees should be left close enough to fully utilize the growing space until the first commercial thinning is made.

The released trees should average no farther than 12 feet apart (304 trees per acre) if they are smaller than 4 inches in diameter. Trees 4 to 8 inches in diameter should be released at intervals of 12 to 15 feet (304 to 194 trees per acre).

Methods of Removal or Control

Unwanted trees, shrubs, vines, or weeds may be removed or controlled by any technique shown in Table 1.

- 1. Cutting: Cutting is the usual method for removal of undesirable elements of a stand such as competing trees, shrubs and vines.

- 2. Chemical Control of Hardwoods: When hardwoods are cut in pre-commercial thinning operations, sprouting may be reduced or eliminated by treating the stumps with an approved herbicide. However, where single trees of a sprout clump are left in thinning a hardwood stand, a poison or growth regulator (herbicide) cannot be applied to any part of the stump. To do so will result in killing or seriously damaging the single tree left for future harvest.

Species to be Favored

Trees to remain should be selected based on the most desirable species, form, vigor, and crown development. Usually, only dominant and co-dominant trees should be released.

Optimum Seasons for Thinning:

- 1. Pine Types: Pre-commercial thinnings should be made during the late fall and winter months (October through March) unless wet conditions limit equipment operation. This reduces the possibility of insect infestation, particularly the pine bark beetles.

TABLE 1 - Methods for Woody Plant Control

Hand Crew Methods	Effective Size of Target Stems	Equipment
directed foliar sprays	up to 6 feet tall	backpack sprayer
streamline basal sprays	up to 2 inches DBH	backpack sprayer with handgun
soil spots by grid 4/	up to 10 inches DBH	spotgun or gunjet with straight stream
basal soil spots 4/	all sizes	spotgun or gunjet with straight stream
injection	all sizes greater than 1 inch DBH	tubular tree injector, hypo-hatchet, axe or hatchet with spray bottle
stump sprays1/	all sizes	backpack sprayer
girdling2/	all	axe or mechanical girdler
Ground Machine Methods	Equipment	
foliar spray	crawler, skidder, farm tractor, all-terrain vehicle equipped with spray system	
pelleted or granular	crawler, skidder, farm tractor, all-terrain vehicle equipped with spreader with spinning disc or forced-air blower	
Aerial Method	Equipment	
foliar spray ^{3/}	helicopter	
granular or pelleted	helicopter	

^{1/} Stump spraying is used to reduce sprouting. Except for species such as red maple, ash, and chestnut oak, stumps large than 12" diameter are not likely to sprout.

^{2/} Girdling without a herbicide is only effective for easy-to-kill species or trees larger than 12" diameter.

^{3/} Aerial spraying is used for all sizes of major hardwood species. It is an appropriate method for larger tracts where brush is dense and terrain is difficult. Spray may drift and harm desirable plants downwind of the treated area.

^{4/} Soil applications are especially effective on sandy soils.

Summer thinning (May-August) is preferable where Fomes annosus is the primary threat.

2. Hardwood Trees: Generally, it is best to make pre-commercial thinnings in hardwood types during mid-summer to reduce sprouting.
3. Pine - Hardwood Types: In stands where hardwoods are mixed with pines, and are cut in thinning, cutting should be done in the late fall and winter months.

Slash Disposal

Generally, disposal of the boles, limbs and tops of trees cut in pre-commercial thinnings is not a problem. The severed trees may be left in the stand where felled. In pine stands where they fall against the bases of selected "leave" trees, severed trees should be pulled away to reduce the possibility of fire losses and, in case of mid-summer droughts, to help avoid insect damage.

Intermediate Cutting (Removal of trees from a stand between the time of establishment and the final harvest cutting)

1. When to Start: Start at the earliest age that the cutting will provide sufficient wood products to make a profitable operation.
2. Species to Favor: Those best suited to the soil and site and which will yield the greatest return and benefit in the shortest time.
3. Trees to Leave: Select trees based on management objectives, the form, condition, and vigor of individual trees.
4. Spacing: Intermediate harvests must provide space for growth of the better trees. Recommended spacing for your stand is shown on this job sheet.

Always select trees of the poorest quality and the least desirable species for cutting.

Hardwood Stands - Several factors affect the management of hardwood stands.

These factors include (1) variety of species within a stand, (2) varying growth rates of each species, (3) relative vigor, and (4) tolerance of each species to shade.

Northern red oak, can only be successfully regenerated when large advance reproduction is present on the forest floor at the time of final harvest. Then any method of harvest is acceptable except single tree removal. A "shelterwood" thinning, including removal of mid-story and understory species allows for advanced oak reproduction requisite to establishing a stand after final harvest.

Harvest Cutting

Harvest cutting is the final major harvest cutting(s) made in a stand at or near the end of a selected rotation age to insure regeneration of a new stand of trees.

Apply harvest cut after the majority of the trees in the stand have reached harvest tree size - one which has reached economic and biological maturity. For example, a loblolly pine harvest tree may be approximately 16" to 18" DBH and 45 to 55 years of age, depending on site.

1. Types of Harvest Cutting — Even-aged Systems:

Clearcutting - Removal of the entire stand in one cutting.

Clearcutting is acceptable where adequate advance reproduction is established or tree planting, sprouting (coppice), or direct seeding is planned to establish a new stand.

Clearcutting can be accomplished in patches, blocks, or strips. This is a regeneration cutting applicable to both pine and hardwood stands. Size of clearcuts should consider economics, aesthetics, and needs of wildlife. At the time of harvest, all hardwood trees larger than 2 inches DBH (or 25 feet tall) should be cut, girdled, or chemically killed. If these trees are left standing, they develop into "wolf" trees

of low quality and shade the surrounding reproduction.

For adequate reproduction of hardwoods, the harvested area should be at least 2 acres in size. Larger areas are preferred to reduce the side shade effect in relation to the size of the clear-cut area, to reduce logging costs, and to create economical management units.

Seed Tree - Removal of the old stand in one cut except for a small number of trees left singly, in small groups, or narrow strips, as a source of seed for natural regeneration. After seedlings are established, seed trees should be removed within 3 years while the young seedlings are still flexible and logging damage will be negligible.

Shelterwood - Removal of the mature timber in a series of cuttings, which extend over a period of years usually equal to not more than one-quarter and often not more than one-tenth of the time required to grow the crop. The establishment of natural reproduction under the partial shelter of seed trees is enhanced. Harvest the seed trees within 3 years after adequate seedlings are established to prevent excess damage from logging.

2. Types of Harvest Cutting — Uneven-aged Systems:

Group Selection - Removal of mature timber in groups or strips, to create openings large enough for natural reproduction to become established and develop normally. Openings created by cutting are usually 1/10 acre or less in size for species tolerant to shade. For species that are moderately tolerant or intolerant to shade, a good opening size is 1.5 to 2 times the height of surrounding trees.

Openings should not exceed five times the height of surrounding trees.

Single Tree Selection - Removal of large individuals within the stand.

Improving Wildlife Habitat

Where an open understory is desired (especially for bobwhite quail), reduce pine stocking to no more than 300 trees per acre during the first thinning to allow for wildlife openings. Wider spacing (for hardwoods) is permissible where mast or fruit production is desired.

Mowing, other mechanical disturbance, or treatment with chemicals that may have a detrimental effect on nesting wildlife should not be conducted during the nesting season (April 15 - September 15).

Specifications (as applicable)

Species to Favor	Desired Spacing
Length of time (cutting cycle) between intermediate harvests (years)	
Number of crop trees per acre	Size of area to be harvested
Method of regeneration	Protective measures for seedling development
Related measures	Other

OPERATION AND MAINTENANCE

Operation and maintenance requirements are not applicable for this practice.

This job sheet was prepared in cooperation with local Soil and Water Conservation Districts and the South Carolina Forestry Commission.