UNEVEN-AGED SILVICULTURE OF UPLAND HARDWOOD STANDS WORKSHOP NOTES

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Applying Group Selection in Upland Hardwoods

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Introduction

Interest in applying group selection in upland hardwoods has grown in recent years, primarily in response to public opposition to the aesthetic effects of clearcutting. Critics suggest that an uneven-aged silvicultural practice such as group selection might be a suitable compromise--drastically reducing negative visual effects of harvesting trees while continuing to utilize the timber resource.

It is important to realize, however, that not all uneven-aged practices provide suitable biological conditions to perpetuate valuable shade-intolerant hardwoods, a primary goal in clearcutting. Attention is focused on group selection because it involves making small openings which often satisfy aesthetic goals while providing suitable conditions for regeneration and development of desirable intolerant species. Compared to single-tree selection practices, group selection also offers these advantages (Smith 1986):

Less damage to residual growing stock during periodic cuts.

-- Trees have better form growing in dense groups in openings.

-- Wildlife habitat is more diverse within a stand.

-- Patches of low-quality trees are removed and regenerated with new reproduction in one periodic cut.

-- More economical sale preparation (marking, etc.) and logging.

-- Openings made at each cut are recognizable age classes.

Currently, group selection is not a widespread practice, primarily because application guidelines are not well documented. We present some suggestions for applying group selection in Appalachian hardwoods. Also, background information is provided to clarify terminology.

These suggestions are not the only means of applying group selection, yet they do conform to accepted definitions of the practice, and we think experienced foresters should find

these methods workable in the field. From the start, it is assumed the forest manager has weighed other alternatives and decided that the group selection method is best suited to silvicultural objectives. We then focus on *how to do it.*

Background

Group selection is certainly not new to forestry literature. In fact, this approach to stand management was described almost 90 years ago. Yet today there is considerable debate among forest managers about how to define group selection and how to apply it. To fully appreciate group selection, it is helpful to review related practices and how they can help meet various management goals for a particular hardwood stand.

Selection practices (group, single-tree, and so on) are cutting methods used to develop or maintain trees of different ages within a stand. By design, these practices maintain at least three distinct age classes in an individual stand. Eventually, for a particular stand, tree size (by species) indicates tree age. Group selection can be viewed as a variation of single-tree selection. They are similar in that periodic cuts establish and develop reproduction, improve stand structure, and control residual stocking for sustained yield. But they differ in how these periodic cuts are made and their effect on maintaining species composition and aesthetics.

The distinctive feature of group selection is that openings are created in the stand by periodically removing trees in groups. However, opening size could vary from single large tree crown to whatever maximum size meets acceptable aesthetic and management objectives. Periodic cuts also improve growing stock established previously and even control pest species such as grapevines. In fact, many silvicultural practices can be done in different parts of the stand during each periodic cut. As a result, guidelines for applying this practice are quite flexible.

Without question, group selection is an intensive stand management practice. But it is also a versatile means of dealing with multiple objectives. By applying the following procedures, and, of course, modifying them to meet your needs, group selection can be a viable alternative silvicultural tool.

Getting Started

Similar to single-tree approaches, the group selection method is determined by initial stand conditions. An inventory is needed to develop a stand table by 2-inch dbh classes. This information is used to plan the harvest and develop marking guidelines to locate potential openings in the stand and improve growing stock.

Also, it is very important to estimate volume in high-risk and undesirable trees (improvement cut) that must be removed in the current cut. In previously unmanaged stands, this volume can be significant. Volume in the improvement cut is subtracted from total initial volume to determine how much additional volume can be removed in openings without overcutting the stand. The improvement cut should include trees that are:

- Culls and near culls.
- Short-lived or undesirable species.
- Low-vigor, with dead upper crown branches, sparse foliage.
- Stricken with at least 40% butt-rot deduction.
- Not expected to attain butt-log grades 1, 2, or 3 (USDA Forest System, Rast et al. 1973).

-- Expected to die before the next harvest.

Determining the Cut

When planning to use the group selection practice, the ideal total cut volume should equal periodic stand growth, which depends on length of cutting cycle, stand size, and average volume growth per acre. Most foresters have reliable local estimates of average stand-volume growth per acre. For mature Appalachian hardwood sawtimber stands, the following estimates by northern red oak site-index class could be used:

SI 80: 400 bf/acre/yr
SI 70: 300 bf/acre/yr
SI 60: 200 bf/acre/yr

These figures are multiplied by stand acreage and cutting cycle length to get total cut volume for the stand. For example, in a mature, 30-acre sawtimber stand on site index 70, the total cut would be about 180,000 bf every 20 years.

Length of cutting cycle will depend on site productivity and volume needed for an operable cut in local markets. In roaded areas, harvests averaging 2,500 bf/acre usually are acceptable. So, in most managed stands, the minimum cutting cycle is 10-15 years, depending on site index. Of course, longer cutting cycles involve higher volumes per acre and fewer administrative problems such as attracting buyers. Short cutting cycles result in a more variable stand, with age classes closer together, so goals related to desired stand variability also will influence cutting cycle length.

As trees are marked for harvest, marking crews should keep a running tally of cut volume. Note that the improvement cut has priority over creating openings, particularly in previously unmanaged stands. Once total volume marked for harvest (volume from group openings plus volume between openings for the improvement cut) equals periodic growth, the mark is complete and no more openings are needed.

Some forest managers are accustomed to using basal area guidelines to apply partial harvest practices. For applying group selection in Appalachian hardwoods, residual stand basal-area goals for sawtimber-size trees (11.0 inches dbh and larger) by northern red oak site classes are as follows:

SI 80: 70-85 square feet/acre
SI 70: 55-70 square feet/acre
SI 60: 40-55 square feet/acre

As with volume-based guidelines, marking crews should keep a running tally of cut basal area as trees are marked in group openings and between openings. Based on the initial cruise data, marking is complete when enough cut basal area has been marked to achieve the desired residual stocking.

Placement of Openings

A good rule of thumb for locating group openings is *worst first,* meaning cut parts of the stand where potential rates of return are low compared to other parts of the stand. For instance, large, mature trees (even those of good quality) continue to grow but earn lower rates of return than smaller trees with the potential to become good-quality trees (Trimble et al. 1974). Clumps of trees over 20 inches dbh are candidates for removal due to their declining power. Cut the large trees and surrounding trees, being careful to make the opening within desired size limits.

Parts of the stand occupied by undesirable species of poor-quality trees also have lower potential earning power. Place group openings such that poor-quality trees are removed and the space is given over to new, more desirable reproduction. Again, the size of the

opening depends on existing stand conditions and goals of the landowner.

Try to place current openings so that minimum-size openings can be placed between them in future harvests. For example, if 0.5-acre openings are the desired minimum, place current openings at least 170 feet apart (diameter of a 0.5-acre opening). Distributing openings throughout the stand is also a concern. As the marking crew becomes more familiar with the stand, potential openings are more easily recognized.

The initial inventory will provide information which can be used to define marking guidelines for individual trees. For example, the initial stand structure will indicate dbh classes which should be favored for harvest. Some dbh classes may have surplus trees, more than needed according to residual number-of-tree goals for selection stands (Smith and Lamson 1982). Removing surplus trees, particularly those growing in clumps where it is convenient to make an opening, improves the residual stand structure for sustained yield.

Adhering to a number-of-trees goal is not a primary concern when marking a group selection harvest. It is just a useful check to make certain the stand will continue to produce regular timber yields. Removing all surplus trees can result in overcutting, especially when the improvement cut is heavy. The key is to cut surplus trees when possible, but first concentrate more on improving the residual stand, harvesting mature trees, and regenerating undesirable portions of the stand. With an increase in number of periodic cuts, removal of surplus trees will become more of a factor when marking between group openings.

Size of Openings

The area of a group selection opening varies according to management and silvicultural objectives and biological requirements of desired reproduction. Note that openings can be as small as the crown of a single tree or as large as aesthetic goals allow. For intolerant species to regenerate and develop in Appalachian hardwoods, openings must be about 0.5 acre or more. A more general rule of thumb is to make openings whose diameters are at least 1.5 to 2.0 times the total height of surrounding mature, codominant trees. In addition, it is important to clean the small openings, cutting all trees 1.0 inches dbh and larger.

Maximum opening size is related more to objectives than biology, and an aesthetic goal for a particular stand is usually the reason size limits are imposed. In some cases, openings can be as large as 2 acres, particularly in the western United States. In the Appalachians perhaps openings should not exceed 1 acre.

Keep in mind that not all openings need to be large enough to favor intolerant reproduction. The key is to define clearly the stand goals for species composition and aesthetics, and then decide how many openings must exceed the minimum size in order to achieve your goals. If the improvement cut between openings requires a relatively high-volume removal, it is better to reduce the number of openings in the current cut. Once residual stand quality is improved, later cuts can focus on regenerating the desired number of intolerants. And once several periodic cuts are made, creating group openings can be given higher priority.

Other Practices

During periodic group selection cuts, other practices may be considered. Grapevines can be a problem on better growing sites. Be careful that periodic cuts do not encourage the vines to spread and create destructive arbors that choke out desirable tree species. Where vines are already a problem, cut exist-

ing vines and keep the canopy closed, since shading prevents sprout development and vines will die in a few years (Smith 1984).

Precommercial crop-tree release is also an option for saplings growing in openings created previously. Apply a full crown release so that selected crop trees are left free to grow. Crop trees should be codominant, well-formed trees with potential to become high-value sawtimber to satisfy stand objectives. Release 50-75 crop trees per acre if they are available (Smith and Lamson 1986).

Most cultural treatments that might be considered during group selection cuts are also applied in even-aged stands. In even-aged stands, however, treatments are made at different times throughout the rotation. In group selection practices, each periodic cut can involve many cultural treatments at the same time in different parts of the stand.

Summary

Some suggestions for applying group selection harvests can be summarized as follows:

-- Use volume, basal area, or both, to regulate the stand.

-- Estimate initial volume and improvement-cut volume.

-- Set cutting cycle based on growth and local markets.

-- Harvest only periodic-stand volume growth.

-- Keep a running tally of cut volume when marking.

-- Give priority to the improvement cut.

-- Mark openings until the total cut is achieved.

-- Let opening size vary, single-tree up to aesthetic limit.

-- Set opening size based on local aesthetic goals.

-- Make openings at least 1/2-acre where intolerants are desired.

-- Select openings using the *worst-first* approach.

-- Define *mature/large* trees using cruise data in each stand.

-- Regenerate patches of undesirable trees with openings.

-- Cut single trees based on maturity, potential quality, and risk.

-- Reduce surplus dbh classes if volume limits allow.

-- Control vines and pest species with each harvest.

-- Release desired crop trees within established openings.

-- Follow environmental safeguards as with any harvest practice.

Group selection should be viewed as a relatively intensive stand management practice with several silvicultural practices applied at the same time in different parts of the stand. Currently, there is growing opposition to clearcutting. When desirable, group selection or other regeneration methods where openings are established may satisfy aesthetic and silvicultural objectives while providing the opportunity to grow mature Appalachian hardwoods for monetary returns.

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Notes

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