UNEVEN-AGED SILVICULTURE
OF UPLAND HARDWOOD STANDS
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Deferment Cutting in Appalachian Hardwoods: The What, Whys, and Hows

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Deferment Cutting: What Is It?

Deferment cutting is a regeneration practice that resembles a seed-tree or shelterwood cutting. The difference is that residual trees are not cut when the reproduction becomes established. Instead, residual trees are left until new reproduction matures to sawtimber size, and another regeneration cut is the silvicultural objective. Hence, with *deferment cutting,* specific residual trees are left for a long period (Smith et al. 1989).

Because this practice can result in the establishment of a two-aged stand, deferment cutting is neither even-aged nor uneven-aged silviculture. However, an important goal of this practice is to establish and develop shade-intolerant species, so we lean toward including deferment cutting in the even-aged system.

Deferment cutting can be viewed as a shelterwood method in which overstory trees are left for varying lengths of time to meet specific objectives: provide seed, shelter reproduction, provide wildlife food and habitat, protect water quality, increase growth, improve diversity, and/or enhance visual quality. An even-aged or two-aged stand structure could be produced depending on how many years the residual trees are left.

More than 10 years ago, a USDA Forest Service employee (Bob Schirck, retired) returned from a visit to Europe with the idea of deferment cutting. Used in Europe to manage larch, pine, and oak-beech stands (Kostler 1956, Troup 1966), deferment cutting was developed primarily to improve the aesthetics of clearcutting. A similar practice called *insurance silviculture* was applied to Allegheny hardwoods by Texasgulf, Inc. (Bennett and Armstrong 1981). In that study, residual trees were primarily poles and small sawtimber. Marquis et al. (1984) also described a similar practice in which saplings and poles are left in the residual stand.

On the Monongahela National Forest and the Fernow Experimental Forest near Parsons, West Virginia, the deferment practice has been demonstrated for about 10 years. Residual deferment trees were of sawtimber size in all but one situation in which both pole and sawtimber trees were left. With defer-

ment cutting, saplings, poles, and/or sawtimber trees can be left in the residual stand depending on the objectives and longevity of the selected tree species.

Why Use Deferment Cutting in Appalachian Hardwoods?

Although a variety of regeneration practices can be used to reproduce Appalachian hardwoods, foresters generally prefer some form of clearcutting. And there are good reasons for this practice, as indicated by the variety of plant and wildlife species that can be attained within a stand or forest through periodic regeneration. In fact, most of the current, often highly desirable, second-growth hardwood stands in the region were established around 1900 as a result of logging following clearcutting and high-grading practices. However, though silviculturally acceptable and justified for regenerating desirable intolerant and some tolerant species, the fact remains that the clearcutting practice continues to face strong criticism by special interest groups and others who oppose any cutting method that removes the entire overstory crown canopy within a short time. This opposition relates mostly to aesthetics--the size and shape of the clearcuts and the short-term visibility of slash (dead and down trees and tops) and roads.

As an alternative to clearcutting, deferment cutting in the Appalachian hardwood stands provides another silvicultural regeneration method for establishing and developing desirable shade-intolerant and shade-tolerant species. Residual stand basal areas might range from 20 to 40 square feet per acre depending on the size and number of stems left in the residual stand. This is discussed in the section that follows. Although improving aesthetic values is the primary reason for using deferment practice, deferment trees can be selected according to other landowner objectives. The crop-tree management concept is a practical approach to selecting deferment trees.

How to Apply the Deferment Practice

A deferment practice can be used in a mature stand where the decision has been made to regenerate the stand. The next step of key importance both silviculturally and aesthetically is to decide the amount of basal area to leave in the residual stand and where it might be located in the stand structure, i.e., saplings, poles, and sawtimber or mixtures. At the same time, it is necessary to develop criteria for selecting residual trees that satisfy given objectives.

The following suggestions might be useful in developing guidelines for residual basal area. In mature stands, 60 square feet per acre in the overstory (none in the understory) is about the level where shade-intolerant species begin to become established. Thus, the upper level for residual overstory sawtimber-size trees could be about 40 square feet per acre. All other trees 2 inches dbh and larger should be removed. The minimum basal area is controlled by other factors such as aesthetics. Although the overstory may eventually influence reproduction development, it should not be of major concern. However, should the overstory be of concern, some or all of it can be removed at the discretion of the forester-landowner and this removal could be profitable.

When leaving only sapling and pole-size trees, leave a maximum of 10 to 15 square feet of basal area per acre. In most cases, all of these residual stems will be shade-tolerant species. However, when mixing residual overstory with understory trees, a maximum combination of about 20 to 30 square feet in the overstory and 10 square feet in the understory should result in the establishment and development of shade-intolerant species. Again, should problems with respect to reproduction develop-

ment arise after 15 to 20 years, measures could be taken to remove some of the existing overstory to liberate stems. While it is true that some individual stems will be influenced by the overstory, we only need to manage perhaps 100-125 pole-size stems or 50-75 sawtimber-size trees. And, competition for light, water, and nutrients will reduce the number of stems over time, especially when a new stand has 10,000-20,000 or more stems per acre.

Selecting Leave Trees

Criteria for selecting trees to leave in the residual stand should be developed by the landowner and forest manager. Objectives might relate to timber, wildlife, aesthetics, water, and/or recreation. Currently, timber and wildlife in combination seem to be the most popular objectives. The following are criteria for selecting residual sawtimber-size trees to meet both timber and wildlife objectives.

For Timber--

Select:

-- Trees in the dominant and codominant crown classes.

Species that will live for at least another 50-75 years.

High-quality trees with a potential butt-log grade of 1 or 2 (no epicormic branches living or dead on the bottom 25 feet of the bole).

Major commercial species when possible (white ash, red oaks, yellow-poplar, whiteoak, or sugar maple. Black cherry is questionable based on longevity).

Do Not Select:

-- Trees with dead upper crown branches.

High-risk trees--leaners or those that are highly susceptible to insects and diseases.

Trees with holes in the main bole at the base of the stem.

For Wildlife--

Select:

-- Mast-producing tree species (favor hard mast species over soft mast).

-- Dominant and codominant trees.

Species that will live for at least another 50-75 years.

Wildlife trees over timber.

Trees with no dead upper crown branches.

When Selecting Cavity Trees--

-- Any crown class is acceptable.

Longevity is not a consideration.

Risk is not a factor.

Tree quality is not a factor.

Dead upper crown branches are acceptable.

-- Holes in main bole or crown are acceptable.

With these criteria as a start and knowing the objectives for residual basal area, a forester can begin to do a *leave tree* mark to attain the residual stand. Also, when defining criteria to meet timber, wildlife, and/or other objectives, we suggest adopting the crop-tree management concept for selecting residual trees.

How Do Deferment Trees Respond?

At this point, our preliminary information indicates that, for most sawtimber-size trees, loss in butt-log quality is not a major concern, especially for yellow-poplar, red oak, and

black cherry. Commonly, when the boles of dominant and codominant trees have no epicormic branches before release, there will be no reductions in butt-log quality due to epicormic branching after release. Also, the height growth of surrounding reproduction is rapid, so concerns about epicormic branches on the butt log are minor. Loss of trees to windthrow depends on location (exposure to wind, ice) and soil characteristics (soil depth, hardpan), and/or the presence of insects or diseases such as gypsy moth or root rot. Logging damage (exposed sapwood) to the residual trees can be of major concern. Although we are currently measuring damage after 10 years, many of the wounds less than 100 square inches in size in yellow-poplar sawtimber deferment trees have calloused over or are nearly closed. When complete, our damage survey also will include species such as red oak, white oak, and perhaps black cherry. To minimize the development of such wounds, avoid spring logging when bark slips easily.

Depending on the amount of residual basal area, we expect growth response for mature sawtimber-size tree species to be surprisingly good (dbh growth of 2.5 to 3.5 inches in 10 years).

Summary

Deferment cutting is an alternative regeneration method to consider when the establishment and development of shade-intolerant and shade-tolerant species is the silvicultural objective. Experience indicates that desirable reproduction can be established and will develop into an acceptable stand for future management. When considering the deferment of two-aged silviculture practice and depending on the length of the rotation, a forester could recommend a regeneration cut every 40-100 years. This means deferment trees could be grown on an 80- to 200-year rotation. At present, loss of tree quality is not a concern, and the growth response of the residual trees is acceptable.

Deferment cutting can be useful in Appalachian hardwoods to provide many of the silvicultural benefits from clearcutting, while satisfying landowner objectives in selecting leave trees. Leaving some trees in a cutting area seems a necessary condition for public acceptance of even-aged silvicultural practices. Shade-intolerant species can be established and will develop with some overstory trees present. The concern is how many trees and what kinds (saplings, poles, sawtimber, or mixture) of trees to leave. Also, species is a factor. For example, the crown width of a codominant yellow-poplar is much smaller than a red oak for the same dbh.

If confronted with a decision that clearcutting is unacceptable for a given stand situation, consider the deferment or two-aged practice. This is a form of seed tree or shelterwood except that the residual trees are not removed for many years. Thus, a deferment practice may be acceptable as an alternative to clearcutting in satisfying silviculture objectives to reproduce a variety of shade-intolerant trees and providing a "non-clearcutting" appearance to the landowner. Although it represents a compromise for both the forest manager and the landowner, deferment cutting may be one silvicultural tool that will allow more landowner control through selection of specific residual trees.

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Notes

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