North Central Forest Experiment Station 6.01

CENTRAL HARDWOOD NOTES

Principles Of Managing Stands

Forest stands are managed to achieve some combination of desired products or values. These products or values may include income and tangible benefits from timber production or fees for hunting rights and other recreational activities. The values may be intangible, such as the enjoyment of seeing wildlife or flowering plants, or the simple satisfaction of knowing that there is an area undisturbed by human activities.

Defining Your Objectives

With such a diversity of benefits possible, it is extremely important that you as a forest land owner or manager clearly define your objectives before you make any decisions on how to manage the land. For some objectives, management may be very intensive, with frequent cuttings and other procedures that substantially affect the forest character. For other objectives, proper management may involve doing nothing more than providing minimum protection against fire, insects, and diseases.

Once you define your objectives, an overall silvicultural (management) system can be selected. This system defines the combination of cutting methods and cultural practices to be used. It determines the amount of area regenerated each year and the size of the regeneration openings, which in turn establishes the distribution of tree sizes, ages, and species over the area. *This manipulation of the* vegetative cover is *the* primary tool of *the forester* ; it affects esthetics, visual and biological diversity, wildlife habitat, water yields, plant and animal species composition, tree growth, economic returns, and many other forest attributes. Associated cultural practices, such as the use of herbicides, fertilization, and site preparation, are tools that increase the effectiveness of cutting practices to obtain the desired vegetation.

The basic unit of management for regulating the forest vegetation is the stand. Stands are areas of relatively uniform site and forest conditions. They vary in size according to: management goals, the size of the overall forest, and the practical considerations of harvesting and applying silvicultural practices. Stand size usually ranges from 5 to 100 acres, but smaller and larger areas are sometimes used. The overall management plan is implemented by applying silvicultural practices in an ordered sequence to individual stands.

Developing Stand Prescriptions

The extreme variation found within the central hardwood forests calls for a systematic process to develop stand prescriptions. Your first step is to inventory site and vegetation. Then you should analyze these data to evaluate the stand's stage of maturity, potential for future growth, ability to regenerate, condition of

wildlife habitat, and similar factors. After you consider alternatives for the particular site and stand, you should develop a prescription to move this stand toward the overall goals for the property, taking into account the resources available to implement chosen actions.

Stand Management Goals

Some of the more important stand management goals are:

1. Establish regeneration. For long-term forest development, establishing desirable regeneration is one of the most critical management tasks. Harvested trees and trees with low potential value should be replaced with desirable species suited to the site and goals of the landowner.
2. *Control* species. Species composition determines the value produced, in terms of timber value, food and habitat value for wildlife, and scenic value. Species composition also determines growth potential since certain species grow faster than others.
3. *Control density.* Stand growth and yield and timing of yield are determined in large measure by stand density. In dense stands, individual trees grow slowly, harvests are delayed, economic returns are reduced, and trees with poor vigor are more susceptible to insect and disease damage. Such stands offer little vegetative cover or food for ground nesting birds or browsing animals. In stands that are too open, total yields may be reduced and individual tree quality is often poor because of bole branches and other defects. Mast and fruit production for wildlife may be very low in open stands.
4. Reduce losses to *insects, diseases, and* fire. The best way to reduce insect and disease losses is through timely application of silvicultural treatments. Providing adequate growing space, maintaining desirable species mixtures, and creating fire lanes are examples of management actions you can take to reduce losses.
5. *Enhance nontimber* value. The quality and quantity of nontimber benefits can be positively affected by stand management practices. Dead snags and den trees can be protected to increase the number of cavity-nesting birds and animals, minimum disturbance zones can be identified, and harvest cuts can be distributed in time and space to assure consistent wildlife habitat. Nontimber values can often be enhanced with little or no loss of timber production.

Achieving Stand Management Goals

You achieve goals through regeneration cuttings and intermediate stand management practices. The regeneration cuttings determine the potential stand production as well as the organization of the vegetative cover over the whole forest. Through the regeneration practices you establish the potential for the property to provide the long-term goals of the owner/manager.

Intermediate management practices, (sometimes called forest improvement practices), are applied to ensure the survival and increase the growth of desired species, to reduce the time to harvest, to improve the quality of future harvests, to improve tree vigor, to enhance wildlife food or cover, etc. In the managed forest,

the extent of these practices determines how much of the potential established by regeneration practices will be realized. Previously mismanaged forests can be made more productive through timely application of intermediate management practices.

Regeneration Considerations

It is usually not difficult to obtain natural regeneration in central hardwood forests. New tree seedlings will usually become established after any type of harvesting or natural stand disturbance, except where dense understories of undesirable trees, shrubs, and herbaceous species are present. On the other hand, establishing a particular species can be difficult.

Dense understories of undesirable vegetation will prevent establishment of desirable tree species. Newly germinated tree seedlings cannot compete with established vegetation for light, soil moisture, and nutrients. If undesirable understory vegetation is too dense, control measures may be needed. Herbicides provide the most efficient and effective means of control, but uprooting of woody vegetation with the blade of a tractor or during logging may also be effective.

The cutting method selected for regeneration has a major impact on the species regenerated. A key silvical characteristic is shade tolerance, the capacity of a species to survive and grow in shade. Very tolerant species will survive in deep shade, whereas very intolerant species require full sunlight. There are many species with intermediate shade tolerance. Generally, the more shade-tolerant species can become established beneath the canopies of the intolerant species and will replace them in undisturbed stands. But the most intolerant species will not develop in the shade of other trees.

There are five commonly-used regeneration cutting methods: individual tree selection, group selection, shelterwood, seed tree, and clearcut. Each is an orderly procedure to harvest mature stands and to create microclimates favorable to the desired species or, conversely, unfavorable to unwanted species. The methods differ in the amount of canopy removed and the resulting degree of exposure of the forest floor to sunlight. Essentially, each method simulates various kinds of natural disturbances. All regeneration methods can be used in central hardwood forests.

With the individual tree selection method, relatively few trees are harvested at one time, resulting in continuous shade on the forest floor. So it is useful only for tolerant and very tolerant tree species such as sugar maple and beech. Since very valuable, less tolerant species such as red and white oak, black walnut, black cherry, and others cannot be regenerated by this method, it is seldom recommended for timber production. However, selection forests appear natural and relatively undisturbed and often are preferred where esthetic and recreation values are highest. Their interspersed crown levels also provide excellent habitat

for nongame birds. On the other hand, they generally provide poor habitat for ground dwelling birds and animals because plants in this stratum are not very diverse.

Methods other than single-tree selection are necessary to regenerate less tolerant species. Group selection cutting, with openings ranging from 1/3 to 2 acres in size, can be used to secure reproduction of desired, less tolerant species such as red oaks, white ash, green ash, black cherry, cucumbertree, red maple, and-to some extent-yellow-poplar. The proportions of valuable species may be less with group selection than obtained with shelterwood and clearcutting, but they are substantially higher than with single-tree selection. The mosaics of various size trees and variety of shrub and herbaceous species also provide excellent habitat for a wide variety of wildlife.

Epicormic branching on border trees with poor crowns may cause quality defects in group selection forests. Group and patch selection are seldom used for managing large properties because yield regulation and cultural practice applications are inefficient compared to other methods. However, group selection provides a useful compromise for landowners who want vegetative and wildlife diversity, but object to larger clearings.

Shelterwood and clearcutting methods are well suited to central hardwood forest types, where the most valuable species tend to be shade intolerant. The choice between the two cutting methods is based primarily on presence of advance regeneration of appropriate size, and wildlife, water, and esthetic objectives for each particular tract. Shelterwood cutting is useful in the oak-hickory type when oak advance regeneration is not adequate in size or numbers. Clearcutting requires fewer returns to the stand for cutting (“entries”) and is less costly to administer than the shelterwood cuttings, so it is the preferred method when advance seedling regeneration is adequate. When shelterwood cutting is used, the number, intensity and sequence of cuts, intervals between cuts, and supplementary treatments applied must be carefully tailored to stand conditions and species present.

Clearcutting also produces more browse and forage for wildlife species such as deer than shelterwood cutting. However, browse is available over a longer period of time under a shelterwood. Clearcutting is the only cutting method that will produce a water increase large enough to justify cutting for this purpose. This is likely to be a serious consideration only on municipal watersheds.

Many forest users object to clearcuts and shelterwoods because of their appearance during the years immediately after cutting. Attempts to minimize slash and soil disturbance and limits on size of openings and their proximity to older ones help reduce visual impacts; even so, these cuts remain unsightly to many people As a consequence, clearcutting and shelterwood cutting are the least suitable in areas where recreation or visual goals are primary.

There is no universal "best" regeneration method. Each method meets specific requirements and owners will have different objectives and different levels of resources available to meet those objectives. Since most landowners have varying objectives, several or *all* methods are off en appropriate for the same property.

Intermediate Stand Management

Intermediate cuttings may be necessary to enhance the development of existing stands to meet the overall goals for the property. Some trees are cut or killed to ensure survival and growth of more desirable trees. Intermediate harvests may be commercial but often an investment is required because of tree size or value, or local market constraints. More specific information on intermediate management practices is found in the Notes that follow.

In central hardwood forests, stands are often harvested through some form of "high grading" or cutting only the most valuable trees. When timber production is a management goal, intermediate cuttings must be considered for high graded stands. In these stands high value species and large diameter trees have been cut, leaving low value species and poor quality trees to occupy growing space, and to regenerate the next stand. This is still the most prevalent harvesting method on nonindustrial private forest lands.

Abundant reproduction usually develops beneath relatively open canopies of high graded stands, followed by suppression of the reproduction as the overstory expands. As a result of the suppression, the reproduction slows in growth and begins dying. The less tolerant species die first and many remaining stems develop poor form from bending toward crown openings. Ideally, the undesirable overstory should be cut or killed before it begins to suppress the desirable reproduction. Such release cuttings are effective if applied within 5 to 15 years, depending on overstory density. Usually all overstory trees should be cut or killed in one operation, but some trees might be left for longer periods. For example, trees that are undesirable for timber production may be highly desirable for wildlife habitat if they contain nesting cavities, perch sites, and produce mast or fruit.

There are millions of acres of older high graded stands in the eastern United States that have not had release cuttings. Invariably, undesirable growing stock greatly outnumbers desirable growing stock. But there are sufficient good growing stock trees in most of these stands to provide the base for a productive future harvest. You can start rehabilitation of such stands by an improvement cut. Cut or kill undesirable trees to favor better ones. Always encourage the development of the best trees. You want to accelerate the growth of the best trees, not merely harvest or kill the poor ones.

There is considerable confusion outside of the forestry profession about selection silviculture. To many, the removal of scattered large diameter trees is an effective application of the selection method. However, without improvement cuttings throughout all diameter classes to regulate diameter distribution and release good growing stock, such cuttings are high grade harvests which lead to quality and value decline.

Intermediate cuttings can have both adverse and beneficial effects on nontimber values, so take care to enhance and protect all values. For example, you can improve scenic values by releasing understory flowering trees and shrubs. You can reduce safety hazards in recreation areas by felling live and dead trees, pruning branches, and thinning to maintain vigorous, healthy trees. Thinning and improvement cuts in young even-aged stands can be used to improve vertical diversity and ground vegetation for many animal and bird species.

Summary

Forests should be managed to meet specific landowner goals-usually a combination of goals. The goals are reached by applying silvicultural practices in an ordered sequence to individual stands. Prescriptions are developed to move each particular stand toward the overall goal for the property. Stand management practices are aimed at establishing regeneration; controlling species composition and density; reducing losses to insects, diseases, and fires; and enhancing nontimber values. These goals are achieved by applying regeneration and intermediate cutting methods.

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