



## SELECTING TIMBER HARVESTING SYSTEMS

### FOREST STEWARDSHIP MANAGEMENT NOTE #17

#### INTRODUCTION

Alpena-Montmorency  
CONSERVATION DISTRICT

Silviculture is the science and art of growing stands of forest trees. Silviculture includes the establishment of new stands and their protection while growing, but silvicultural systems are named after the methods of timber harvesting used when the trees are mature. This is because the type of timber harvesting has the greatest influence on the nature of the vegetation that is created and, consequently, the benefits that can be expected from the forest.

This Note outlines the major factors landowners should consider when selecting timber harvesting methods. It briefly describes conventional timber harvesting methods along with some unconventional methods, old and new. The most suitable harvest methods for the major forest types in Michigan are listed, and source of further information are given.

#### CONSIDERATIONS FOR SELECTING TIMBER HARVESTING METHODS

1. **LANDOWNER GOALS** - Different timber harvesting methods vary greatly in their impact on income, wildlife (FSMN #40,42), recreation, aesthetics (FSMN #33), and other considerations. Thus, in order to choose the best method, it is essential that the landowners' goals be well defined and prioritized (FSMN #34). Landowners should ask the foresters they work with to compare the effects of alternative harvesting methods on short- and long-term timber income, wildlife habitat, aesthetics, and any other issues with which they are concerned (FSMN #18). Although there is a very limited choice of suitable harvest methods for some forest types, clear landowner goals are still needed to best determine the details of how the chosen methods are implemented.

2. **STEWARDSHIP CONSIDERATIONS** - The effects of a timber harvest depend not only on the type of vegetation it creates (FSMN #40,41) but also the size of the harvest and the nature of the vegetation in the surrounding area (FSMN #37,39). For example, a small, aspen clearcut in a large area of relatively mature forest would add visual and wildlife diversity. On the other hand, a large, aspen clearcut adjacent to an existing clearcut would more likely reduce wildlife and visual benefits.

In terms of impacts on soil and water resources, the biggest problems result from poor road design and construction. Heavier levels of cutting, cause somewhat greater erosion, but if "best management practices" are used, erosion can be kept at acceptable levels for any type of harvest (#12,13, FSMN #5,6).

#### TIMBER HARVESTING METHODS IN BRIEF

The following paragraphs describe six distinct timber harvesting methods, arranged by the size of the openings created, from largest to smallest. In practice, however, timber harvests can create an infinite variety of vegetation structures by gradually varying the cutting method in different parts of a stand to accommodate variations in the existing vegetation or to customize the results in accordance with landowner objectives (#4,16). With greater emphasis being placed on non-timber values, many variations of the conventional timber harvesting methods need to be explored. Know what you are doing, but do not be limited by textbook dogma.

1. **EVEN-AGE METHODS** - With even-age methods, most of the trees in the stand are cut at the same time, so the trees in the new stand are all about the same age (although sizes may vary). Even-age methods are appropriate, within certain acreage limits, where it is desirable to encourage tree species that have high requirements for sunlight. Even-age methods can also be justified for producing brushy habitats favored by many species of wildlife (#4,24).

**CLEARCUTTING** - Clearcutting is the removal of all trees, down to a certain size limit, at the same time. Often, saplings are left to form the new stand. However, this should only be allowed if the saplings are of good quality. Clearcutting is used to regenerate tree species that need full sunlight to prosper and to prepare areas for plantation establishment. Where wildlife is a goal, clearcuts may be modified by leaving snags and cavity trees (FSMN #28), or by leaving scattered clumps of live trees for grouse and other wildlife (#6). Scattered individual trees may also be left for aesthetic or other reasons (#23).

Many of the adverse effects of clearcuts can be minimized by prohibiting them on steep slopes, by limiting their size to 25 acres or less, and by shaping them to fit into the natural curves of the landscape rather than carving out rectangular blocks (#11).

**SEED TREE METHOD** - The seed tree method is the same as clearcutting except a few, large, high-quality trees are left per acre to produce seed for regenerating a new stand. This method is used where adequate seedling do not exist at the time of the cut. After an adequate supply of young trees is established the seed trees are harvested.

**SHELTERWOOD METHOD** - The shelterwood method uses two or more partial cuts spaced a few years apart. The system is designed to promote the regeneration of tree species that need a lot of light but that benefit from a partial canopy. When adequate regeneration is established the remaining large trees are removed.

**2. UNEVEN-AGE METHODS** - With uneven-age methods, the stand always contains significant numbers of trees in various age and classes.

**COPPICE-WITH-STANDARDS METHOD** - A coppice is a woods that consists mainly of small trees derived from stump sprouts. Standards are large trees derived from seeds, rather than sprouts. A coppice with standards is a woodland consisting of about two-thirds coppice and one-third standards. By cutting the coppice component for fuel or pulpwood about every 20 years and leaving most of the standards for large timber production, a very diverse vegetation structure can be created. Although the coppice-with-standards method is ancient and little known in North America, it should be considered where diverse vegetation, wood products, and wildlife are landowner objectives (#8,18).

**GROUP SELECTION** - In the group selection method, groups of trees from about 1/10 to 1/2 acre in size and scattered throughout the stand are selected for removal. The object is to favor tree species of intermediate shade tolerance that need more light than is available in the selection system (below) but that tend not to prosper in larger openings. Variable-retention harvesting (VRH) is an adaptation of this.

**SINGLE-TREE SELECTION** - In the single-tree selection method (selection method, for short), individual trees are selected for cutting because they have reached the desired size for harvest or because their removal will improve the growth of the remaining trees. Harvests are made every 15 years or so when the canopy gaps created by the last harvest have closed up. Because the forest canopy remains largely intact with this method, the selection method only works with species that are quite shade tolerant.

Criteria for selecting the trees to be removed can be complex, but a type of single-tree selection, called crop tree management, has been devised to make the process more understandable to landowners and more responsive to their interests (#19). "Diameter-limit cuts", in which all trees above a certain size are harvested, are only acceptable if low-quality fiber production (i.e., pulpwood and fuelwood) is the sole objective. Continually taking the biggest trees leads to a deterioration in the overall quality of the stand (#9).

## **TIMBER HARVESTING METHODS FOR MICHIGAN FOREST TYPES**

The following recommendations are largely those given in Reference #11. Landowners are encouraged to obtain and study a copy of this publication before deciding on harvesting methods. Recommendations for some of the less common species can be found in Reference #3. Good introductions to harvesting methods and other silvicultural practices can be found in References #2 and #5.

1. NORTHERN HARDWOODS – Older studies showed the single-tree selection system to be the preferred method of managing northern hardwoods (#3,9,14), but over time this approach tends to exclude some species from a stand and simplify species composition. Most other methods can also be successful, but it is essential with any system that regeneration be established (i.e., seedling 2-4 feet high) by thinnings before the main canopy is removed (#9). Group selection can be used to promote less shade tolerant species such as cherry, ash, and oak. Cutting in narrow strips (1-2 chains wide) is not recommended (#9). When northern hardwoods are mixed with aspen, the proper way to encourage the hardwoods depends on the relative size of the aspen and the hardwoods (#9).

2. LOWLAND HARDWOODS - Where stand quality is low, clearcutting to regenerate the whole stand may be the only economical alternative. Where higher quality trees are common, the single-tree or group selection methods are recommended.

3. MIXED OAK - There is much uncertainty about regenerating oak even among experts. In general, however, oak should be harvested as small clearcuts where regeneration is well established or where the scrub oaks will be managed as stump sprouts. Otherwise, the shelterwood method or group selection methods should be used to develop regeneration before the canopy is removed (#1).

4. ASPEN-BIRCH AND ASPEN-CONIFER - Clearcutting is generally recommended for aspen (#10), but a shelterwood system has also been recommended that appears holds promise for improving timber yield, wildlife habitat, and visual quality (#21). To enhance biodiversity goals and reduce pest outbreaks, a combination of the group selection and seed tree methods has also been proposed for aspen stands (#15).

5. PAPER (WHITE) BIRCH - Although clearcutting is successful for regenerating paper birch in other regions it has failed miserably in the northern Lake States. The seed tree method is sometimes used and some success has been achieved with the shelterwood method (#17).

5. UPLAND SPRUCE-FIR - This type may be managed by the single-tree selection method or by clearcutting if seedlings are already well established.

6. SWAMP CONIFERS - Harvesting in coniferous swamps is usually accomplished by clearcutting narrow strips or small patches and leaving adjacent areas unharvested until regeneration is established in the cut areas. Due to heavy browsing by deer and other problems, little success has been achieved regenerating white cedar in recent years, so harvesting this type should be delayed if possible.

7. JACK PINE - On very dry soils where jack pine occurs in pure stands, clearcutting followed by planting is the most commonly recommended method. On somewhat moister soils where jack pine is mixed with red pine, white pine, and hardwoods, the single-tree selection method can be used to favor red pine and white pine as these species are better adapted to such sites.

8. RED PINE (PLANTATIONS) - Red pine requires abundant sunlight to prosper, and most plantations of this species are designed to be thinned two or three times and then harvested by clearcutting (#22), but shelterwood management is also possible (#7).

9. WHITE PINE - White pine is more tolerant of shade than red pine and it may be harvested and regenerated by the shelterwood or group selection methods (#20). Clearcutting is not recommended in areas where the white pine weevil is a problem because this destructive insect prefers sunny locations (consult local foresters).

## REFERENCES

FSMN #'s refer to other Forest Stewardship Management Notes in this series.

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