

EXTENSION NOTES



CHOOSING A SILVICULTURE SYSTEM

If you're planning to harvest trees from your woodlot, a forest management plan can help you achieve the highest economic returns possible and ensure the long-term health of your forest. One of the most important steps in developing a plan is choosing a silviculture system. Silviculture systems are different approaches to harvesting, regenerating and growing forests. The three main silvicultural systems used in Ontario include: the selection system, the shelterwood system, and the clearcut system.

This Extension Note describes the silvicultural systems and some of the factors you should consider as you select a system that's right for you and your property.

THE SELECTION SYSTEM

HOW IT WORKS

Individual trees or groups of mature, unhealthy or other selected trees are harvested periodically. Most of the trees are left to regenerate the stand naturally. Before any harvesting is done, an inventory of the forest is completed. The inventory identifies the tree species, the different sizes of trees, the quality and health of the trees and the availability of habitat in the forest. Based on this information, a tree marking prescription is written and all trees to be cut are marked with yellow paint. Crop trees are usually marked with blue paint. Crop trees are the trees you want to grow for their future commercial value, for their value to wildlife or as sources of seed for regenerating desired tree species. Every eight to 15 years, the stand is thinned to give crop trees room to grow, and some unhealthy and mature crop trees are harvested. Care is taken during the thinning and harvesting operations to



avoid damaging the site and the crop trees. Damage to young and old trees can lower the future value of the wood.

Road access and a good network of skid trails are important. Good access will improve the efficiency of each thinning and also minimize the damage to crop trees.

The selection system can be adapted to encourage the growth of different species. Cutting individual, mature trees in the canopy encourages the growth of shade-tolerant species, such as maple, beech and hemlock, which are growing in the understorey. Cutting groups of trees, in an adaptation called the “group selection system,” encourages the growth of intolerant species, like poplar, and mid-tolerant species, like oak, basswood, cherry and white pine. The group selection system creates sunny gaps in the canopy where these species can grow.

THE RESULTS

This system maintains a diverse, all-aged forest with a wide range of species of different sizes and ages. These natural-looking forests provide continuous supplies of wood, fuelwood and other forest products, as well as habitat for wildlife and attractive areas for recreation.

WHERE IT WORKS BEST

The selection system is well-suited to the mixed hardwood forests of southern Ontario, where the small periodic cuts mimic the forest’s natural cycle of renewal. Mixed hardwood forests rely on small-scale natural disturbances, such as lightning, fire, wind, ice storms and disease, to kill individual trees or groups of trees and create the space that young trees need to grow.

BENEFITS

- preserves the genetic diversity of the forest
- full canopy protects site from erosion
- maintains natural-looking, diverse forest
- provides good wildlife habitat and areas for recreation
- generates long-term income and a steady supply of wood products

DISADVANTAGES

- requires investments in evaluating the forest, selecting and marking crop trees, thinning and harvesting
- assistance from forestry experts is recommended
- large areas are required to generate sufficient volumes of wood and income
- crop trees and regeneration can be damaged during harvest operations



The selection management system maintains a diverse, all-aged forest with a wide range of species of different sizes and ages.



The shelterwood system maintains a forest canopy to protect, shade and shelter a new crop of trees.

SHELTERWOOD SYSTEM

HOW IT WORKS

Mature trees are harvested in a series of two or more partial cuts. The cuts stimulate the germination and rapid growth of a new forest in the shelter and the shade of mature trees. The mature trees usually provide seed for regenerating the site, but sometimes regeneration is achieved by seeding, planting or stimulating coppice growth. You will need good roads and skid trails to access the site to complete each harvest. Care is taken at each harvest not to damage the site or the regeneration.

This system can involve three different kinds of harvests:

1. Preparatory cut

The preparatory cut is a thinning operation that gives selected trees room to grow large crowns. Trees with

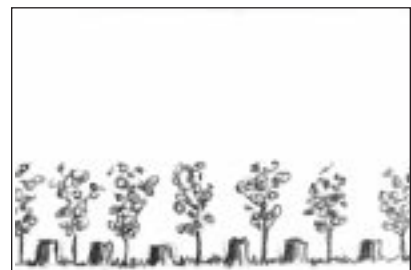
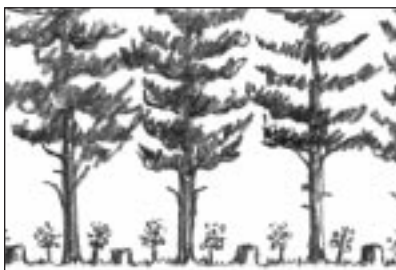
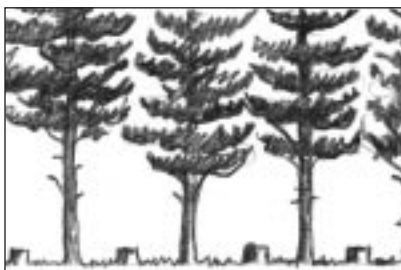
large crowns provide more seeds than trees with small crowns. A preparatory cut is only done if there is a shortage of trees with large crowns on the site. The first harvest is usually done when the trees are 60 to 80 years old.

2. Seed cut

The seed cut removes about half the mature trees in the stand. It opens up the stand, allowing sunlight to reach the forest floor, where it stimulates the germination and growth of seedlings. The second harvest is usually done when the trees are 80 to 100 years old.

3. Removal cut

The removal cut harvests all the mature trees. It can be done as a single harvest or as a series of partial harvests. The removal cut is conducted after a dense



The shelterwood system can involve three different kinds of harvests: the preparatory cut (left), the seed cut (centre) and the removal cut (right).

carpet of saplings (trees taller than 1.5 metres) is established in the shelter of the mature trees. By giving the saplings full sunlight, the removal cut encourages the rapid growth of a new forest. The final harvest is usually done when the trees are 100 to 120 years old.

THE RESULTS

The shelterwood system produces an even-aged, fast-growing forest. It favors mid-tolerant species, such as oak, white ash and white pine, which can germinate in shade but later require some sunshine to survive. This system can be adapted to quickly regenerate maple sugar bushes.

WHERE IT WORKS BEST

This system is well-suited to mixed hardwood and conifer forests in southern Ontario that lack sufficient natural regeneration to grow desired species. The shelterwood system mimics major disturbances, like wind, fire and

insects, that create large gaps in the forest canopy where mid-tolerant species can grow.

BENEFITS

- preserves the genetic diversity of the forest
- partial canopy protects site from erosion while new growth is getting established
- maintains some wildlife habitat
- can be used to regenerate oaks which provide food for wildlife

DISADVANTAGES

- requires investments in evaluating the forest, select-ing and marking crop trees, thinning and harvesting
- assistance from forestry experts is recommended
- can cause loss of habitat for animals that require a mature closed canopy, such as the red-shouldered hawk

CLEARCUT SYSTEM

HOW IT WORKS

All the trees are harvested in one cutting operation. In a modification of the clearcut system, called the “seed-tree method,” individual trees or groups of trees are left standing to provide seed for regeneration. The seed trees are large-crowned (capable of producing large quantities of seeds) and able to survive in windy, exposed conditions.

The clearcut area can be regenerated by:

- windborne seeds from nearby areas
- seeds from trees left on the site, singly, in strips or in groups
- coppice growth (the shoots that grow from the stumps of trees when they are cut or stressed)
- artificial seeding
- planting seedlings or trees

You may need to thin the regenerating forest and protect the young trees from competition with other vegetation and from small mammals.

THE RESULTS

Clearcutting produces an even-aged forest with trees that are about the same age. Although maple and other shade-tolerant species can become established in clearcut areas, clearcutting strongly favors the growth of shade-intolerant species, like jack pine, poplar, cedar and white birch. These species, which need full sunlight, grow fast and quickly dominate clearcut areas.

WHERE IT WORKS BEST

Clearcutting is a good choice for the Boreal forests of northern Ontario, where it mimics the natural

disturbances that perpetuate this kind of forest ecosystem. In Boreal forests, large catastrophic occurrences, like forest fires and insect infestations, kill extensive areas of forest, which regenerate naturally to even-aged growth.

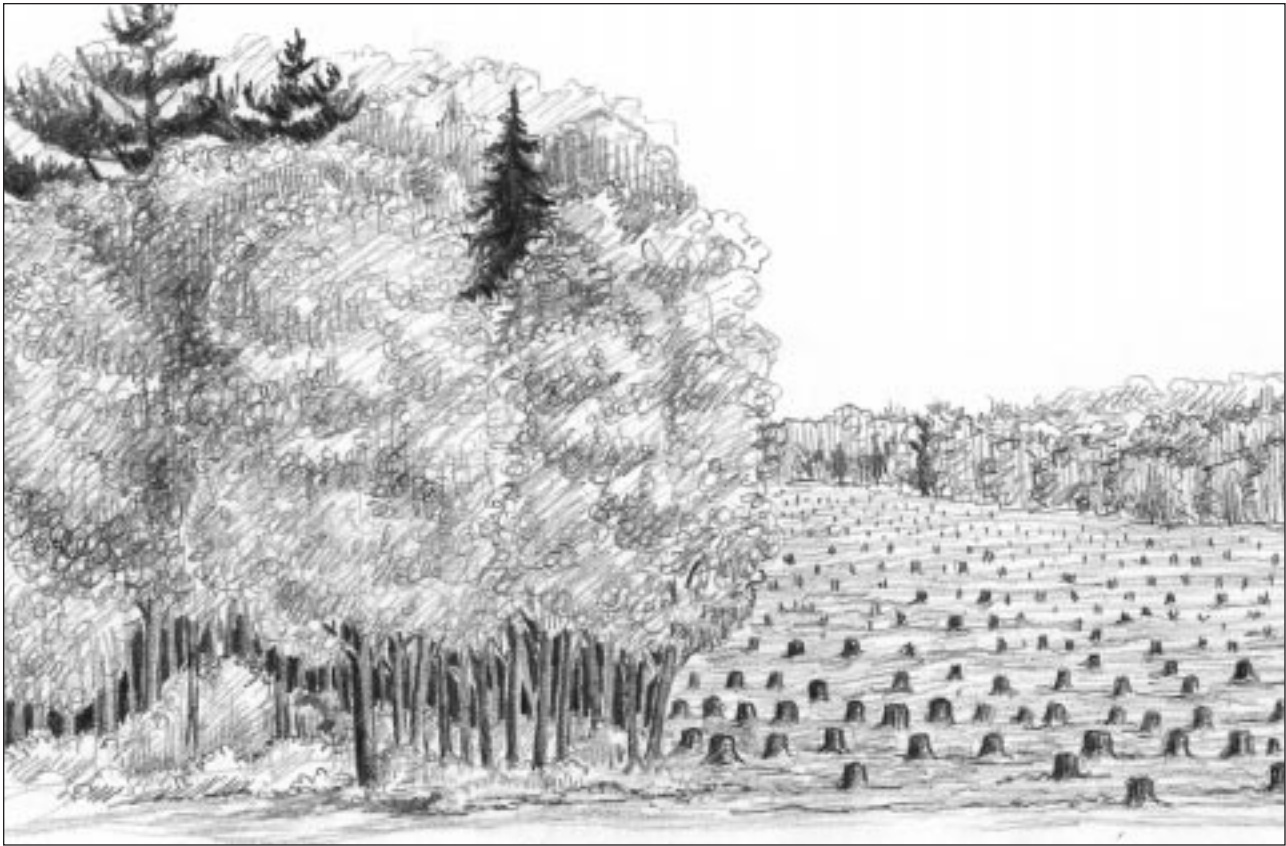
Clearcutting is not recommended for general use in the mixed hardwood forests of southern Ontario.

BENEFITS

- simplest harvest method with no need to protect remaining seed-trees from damage
- generates highest immediate financial returns
- favors intolerant species, which do not grow well in shade

DISADVANTAGES

- makes land more vulnerable to erosion from wind and rain
- erosion can carry silt into streams and rivers, reducing water quality and damaging aquatic habitats
- regeneration in hot, exposed areas can be difficult and may require investments in preparing the site for seeding or planting, thinning, controlling competition and protecting young trees from small mammals
- can reduce the genetic diversity of the tree species in the new forest if the seed came from a few seed trees
- unpleasant to look at and of little value for recreation



The clearcut system mimics natural disturbances, like forest fires, that kill extensive areas of forest which regenerate naturally.

FACTORS TO CONSIDER WHEN CHOOSING A SILVICULTURE SYSTEM

Choosing a silviculture system isn't easy. There are many factors to consider and many decisions to make. The most important ones are your personal goals, the condition of the stand today and your property's potential. The following considerations and questions will help you choose a system.

1. GOALS

Assessing your priorities will help you establish short- and long-term goals for your property. Begin by ranking the following possibilities in terms of importance to you:

- Immediate revenue from wood products or fuelwood
- Long-term revenue from wood products or fuelwood
- Wood products for personal use
- Fuelwood for personal use
- Wildlife habitat
- Natural-looking forest for recreation
- Revenue from maple syrup production
- Maple syrup for personal consumption

2. CLIMATE AND SITE CONDITIONS

Many tree species can grow in a range of conditions. However, their growth and survival rates vary greatly

with climate, bedrock type and soil type. Assess your site to determine the tree species that are best suited to it.

- What forest region is your stand located in?
 - Great Lakes-St. Lawrence
 - Deciduous
 - Boreal
- What type of bedrock lies under the stand?
 - Canadian Shield
 - limestone
- How deep is the soil?
 - 0–50 centimetres
 - 50–120 centimetres
 - greater than 120 centimetres
- What kind of soil is it?
 - sandy
 - silty
 - clay
- How much rain and snow falls on the site?
- How hot does the site get in summer?
- How long is the growing season?
- What native species grow best in your area?
- Is the site so steep that cutting the forest will make it vulnerable to erosion that could damage the site and the nearby streams and rivers?

3. STAND AND SPECIES CHARACTERISTICS

Assessing the tree density, health and species composition of your forest will help you determine the volume and value of the trees in your forest and how much work you need to do to realize your goals.

- How big is the area that your stand covers?
- How many trees are in the stand?
- What species are present in the stand?
- How old and how big are the trees of each species?
- How many of the trees in your stand are mast species, which provide fruit and nuts for wildlife?
- How many cavity trees and snags are there in your stand to provide nesting, denning, escaping and feeding holes for birds and mammals?
- Is there a carpet of organic matter and decaying wood on the ground to enrich the forest soil and provide habitat?
- Are there any tall pines poking through the canopy that should be preserved for their value as nesting and roosting sites for birds?

4. DESIRED SPECIES

The three silviculture systems favor different species. Identifying the species you want to regenerate or grow will help you choose a system. If you want to regenerate shade-intolerant species like poplars or cedar, choose the clearcutting system which provides the sunlight these species need. If you want to regenerate mid-tolerant species like red oak or white pine, choose the shelterwood system. If you want to regenerate tolerant species, like maples, beech or hemlock, or to maintain a forest with many different species, choose the selection system.

You also need to consider the amount of labor and the costs involved in regeneration. Here's some questions to consider:

- What species do you need to regenerate to achieve your goals?
- What methods work best for regenerating your desired species?
- Are there sources of seed for natural regeneration in the present forest?
- Are there sources of seed for natural regeneration nearby?
- Can you regenerate desired species by stimulating coppice growth?

- Can you afford the time and costs of artificially regenerating the site by seeding or planting?
- Are you willing to weed or use mulches, fire or herbicides to hold back grasses and other plants that might compete with the regeneration?

MAKING A CHOICE

Are your goals compatible? Here are some points to review as you consider your options and possible compromises:

- If you want a natural-looking forest that provides wildlife habitat, as well as continuous supplies of timber, fuelwood, maple syrup or other forest products, the selection system may be right for you and your land. While the costs of regeneration are low, the costs of tree marking and thinning can be significant.
- If you want to regenerate mid-tolerant species like oaks or quickly establish a new sugar bush, the shelterwood system may be the best choice. By keeping a partial forest-canopy until regeneration is established, this system maintains wildlife habitat and does not increase the potential of erosion or fire. However, the costs of selecting and marking crop trees, tending and harvesting can be significant.
- If you want the fastest returns and/or to regenerate intolerant species like poplar, clearcutting may be the system you need. However, regenerating a clearcut takes a long time and can be difficult and costly. Clearcutting also removes the forest canopy which, in turn, reduces the diversity of habitat available to wildlife and makes the site more vulnerable to forest fires and erosion.

For more information on silviculture systems or arrange for assistance preparing a forest management plan for your property, contact your nearest office of the Ontario Ministry of Natural Resources or a local forestry consultant.

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