



Selling timber is a once in a lifetime activity for most landowners. No single activity has such power to improve- or degrade- the forest. Proper harvesting can provide income, improve wildlife habitat, and result in trails, better access, views, and a healthy and vigorous forest. Uncontrolled, exploitive cutting can reduce these values leading to environmental degradation, public resentment and legal entanglements.

To insure a successful timber sale, use sound principles: do your homework, understand your land and develop a set of goals and objectives, use a written contract, hire a licensed forester, work with a certified logger, and use silviculture to help guide your tree marking decisions.

Silviculture is the art and science of regenerating and tending trees and forests. Within the limits of nature, silvicultural principles and techniques can be used to grow the kind of forest you want. In practice, silviculture guides the way foresters mark stands of trees for cutting.

Choosing the Trees to Cut

Generally, there are four reasons foresters mark specific trees in any given timber sale. Usually, a timber sale involves more than one of these reasons:

1. Remove mature trees
2. Improve the vigor and value of the stand remaining after the cutting
3. Encourage regeneration (new seedlings) of desired species, and
4. Meet certain requirements for income for the landowner (now or later), for wildlife habitat, for scenic values or to improve the logging chance (to help make the logging more salable).

Stand- A group of trees similar in age, species, and structure, and growing on a sufficiently uniform site as to be a distinguishable unit

1. Removing Mature Trees

Mature trees are those that have reached their maximum product value, or the point where vigor, health, or growth are declining. Maturity doesn't relate very closely to tree diameter. For example, a diseased, rough or suppressed 12 inch oak may be mature while a healthy 20 inch oak that is still increasing rapidly in value and volume may not be mature. This is why the saying, "cut the big ones and leave the small ones", doesn't work well.

Mature trees are important wildlife habitat and foresters may leave some of them to benefit wildlife. Old forests with dead and dying trees provide habitat for pileated woodpeckers and other birds which carve out holes and hollows of dead and dying trees for feeding, nesting and denning. Species that use these tree cavities include flying squirrels, owls, bluebirds, kestrels, chickadees and raccoons.

Much of the economic value from a timber sale comes from cutting the mature trees.

2. Improving Vigor and Value

In any partial cutting, one objective is to remove the diseased, slow growing, and mature trees, leaving crop trees that are increasing rapidly in size and value. The volume and value of good stems increase at a faster rate as tree diameter increases.

Crop tree release is a valuable tool for improving wildlife habitat as well. Foresters will often release apple trees, oaks and other food producing species. Acorns are a staple for many of our forest wildlife (bear, deer, grouse, turkey, bluebirds, wood ducks, and squirrels). The reproductive success of some wildlife species rises and falls with years of abundant and sparse acorn production.

Young, immature trees grow much faster, sometimes twice as fast, when you remove the trees that interfere with them. But, if too many trees are removed, there aren't enough remaining trees to occupy the area, and growth per acre lessens. Also, open-grown trees may sprout branches along the stem or retain their lower live limbs so that tree quality declines. That is why foresters are careful to keep stand density above a certain minimum (which varies with stand age and species composition).

3. Regeneration

It's important to create stand conditions where desired species will seed and grow. There's some indication in New Hampshire that white pine, oak, and some other species are not regenerating well and this will eventually lead to a decline in their numbers.

The seedlings of some species, such as aspen and paper birch, need full sunlight to survive and grow. They are called intolerant. Tolerants can survive and grow in deep shade as well as in sunlight. Beech, sugar maple, hemlock, red spruce, and balsam fir are examples. Intermediates such as white pine and oak grow well in partial shade.

A variety of regeneration cutting methods encourage seedlings of tolerant, intermediate, or intolerant species. For example, clearcutting is used to favor regeneration of intolerants- paper birch, aspen, and pin cherry- along with a mixture of other species.

Some species have special seedbed needs for seed germination and early growth. For example, disturbed soil or exposed subsoil helps yellow birch and white pine survive. These conditions can be created by well-distributed logging or with special equipment. Other species do best when competing shrubs, seedlings, and saplings are removed.

We try to regenerate species that are suited to the site, since certain species grow better in certain soils. We also try to grow species that will be valuable for timber and wildlife. The current stand condition influences what we try to regenerate. For example, we might not want to use a technique to regenerate white pine if the stand has only a small proportion of mature trees that might not provide enough seed to regenerate white pine. Also, most trees produce abundant seed only periodically and harvests are best timed to occur in a good seed year.

4. Special Considerations

Trees are marked for timber, wildlife, scenic values, income, and to facilitate logging.

You can regard your woodlot as a bank account and repeatedly harvest the interest (growth) and not touch the principal. When your income requirements are low, you can accumulate growth. In this case, the marking may be light, removing only the low vigor trees. Leaving a woodlot untouched for long periods, however, will gradually lead to slower growth and too much low

Crop tree- Any tree designated to be left to grow and be part of the final stand, usually selected when the stand is young. Crop tree release refers to removing trees whose tops are touching the tops of the crop tree, thereby giving more sunlight to the crown of the crop tree.

Mast- Fruits or nuts used as food by wildlife. Soft mast includes fruits such as black cherry. Hard mast refers to nuts such as acorns and beechnuts.

Tolerance- the capacity of trees to develop and grow in the shade of surrounding trees.

Intolerant- Trees relatively incapable of developing and growing in the shade of, and in competition with, other trees.

Tolerant- Trees with the ability to grow in the shade of another.

quality. On the other hand, when your income needs are high, you may wish to have your woodlot marked a little heavier (digging into the principal). This helps meet current income needs, but could delay the next harvest.

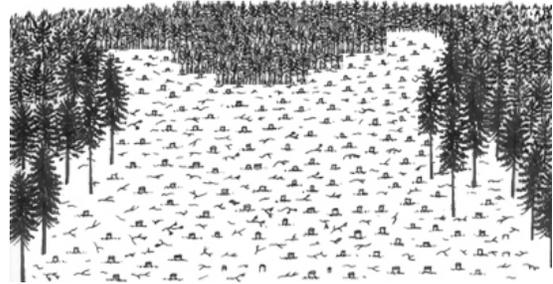
Some trees are marked by foresters to facilitate the logging chance, for example to clear landings and roads or trails, to remove trees that will be damaged by felling or skidding other trees, to provide sufficient volume to make the logging worthwhile. Loggers and foresters working together can make this happen.

Silvicultural Systems

Foresters use several silvicultural systems for regenerating, growing, and harvesting trees.

1. Clearcutting System

Clearcutting is best applied to stands where most of the trees are mature or defective and ready to be removed. It regenerates intolerant and intermediate species with some tolerants. As the new stand grows, you need to thin it to improve species, quality, and growth. The later thinnings remove products that can be sold. When the stand is mature (at the end of the rotation period), it may be clearcut again.



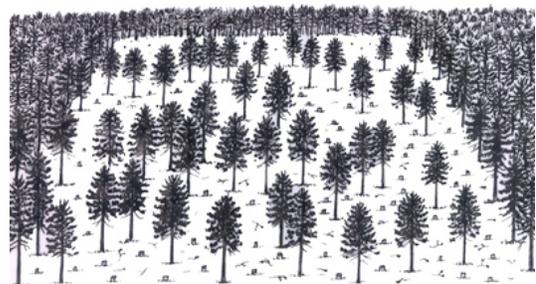
Rotation- The life of the stand. The period of years between establishment of a stand and the time when it is considered ready for final harvest and regeneration.

Thinning- Cuttings made in immature stands to provide growing space around the crowns of the remaining trees in order to stimulate the growth of those trees to increase the total yield of useful material from the stand.

Clearcuts create habitat for a variety of wildlife not found in mature forests. Swallows, bluebirds and indigo buntings will quickly occupy a clearcut, particularly where snags or live trees with cavities and perches are left throughout. Raspberries, pin cherry, aspen, and paper birch sprout soon after cutting, providing valuable sources of berries and seeds (mast), browse, and cover for many species of wildlife. Black bear will forage throughout the summer on the edges of these cuts.

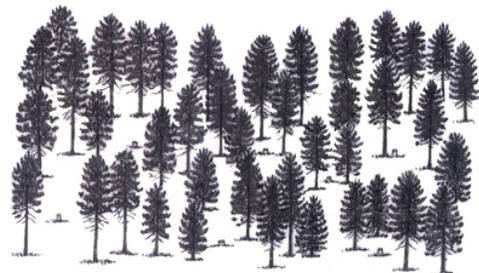
2. Shelterwood System

This system is applied in stands of mostly mature trees. The smaller trees are cut leaving an overstory of larger trees to provide seed and shade for the new seedlings. If many overstory trees are left, the shady conditions are good for tolerant species such as red spruce or hemlock. Fewer overstory trees provide partial shade for oak or white pine. When an understory of desirable seedlings develops, the overstory trees are carefully cut to prevent damage to the regeneration. The stand is thinned as needed over the rotation.



3. Single Tree Selection System

Mature and low-quality trees are removed at each harvest. The system is best applied in stands that have a range in tree sizes, and where the objective is to regenerate and grow tolerant species. After each cutting, new tolerant seedlings develop, and the stand always has



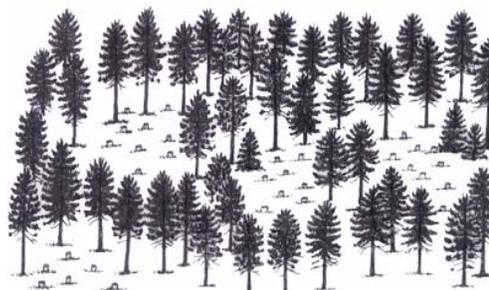
the appearance of a well-stocked stand with a full range of tree sizes. As in any partial cutting, care is needed to avoid logging damage to the remaining trees and regeneration. Diameter limit cutting is a type of single tree selection, but is normally ill-advised since it ignores the vigor and value potential of individual trees, regeneration needs, and growing conditions around the remaining trees.

Diameter limit- The use of diameter as the primary factor to choose which trees to cut. All trees greater than a certain diameter are cut.

Single tree selection maintains a closed-canopy mature forest characterized by a diversity of vegetation layers; grasses, flowers and ferns on the forest floor, shrubs and small to medium-sized trees, and mature trees. The more layers you have in a mature forest, the more places wildlife can live and forage for food. Snags and fallen logs add to the layering. Several species of birds require mature forests including scarlet tanager, ovenbird, wood thrush, red-eyed vireo and black-throated blue warbler.

4. Group Selection System

This is a variety of single tree selection in which groups of trees about $\frac{1}{4}$ to $\frac{1}{2}$ acre and larger are cut and single trees are removed between the groups. The system works best where the mature trees occur in clumps and where some mixture of intolerant or intermediate species is desired in the regeneration.



Group selection cuts maintain many of the bird species found in the mature forest. These cuts also create new habitat for some species that use clearings or regenerated stands (early successional habitat). Although not found in the mature forest, chestnut sided warblers, common yellow throats and white-throated sparrows will move into these small clearings, feeding on the abundance of insects. The buds, shoots, twigs, and leaves of new woody growth in these group cuts provide winter food for white-tailed deer, snowshoe hare, cottontails and beaver.

Early successional habitat- Land in an early stage of growth after a disturbance usually dominated by shrubs and fast growing, shade intolerant trees. Can be found at the edges between fields and forests, in abandoned pasture or crop land, and in recent clearcuts. A habitat in decline in New Hampshire.

Summary Thoughts

Not all timber sales fall neatly within these silvicultural systems. Sometimes a general improvement cut is made which upgrades the quality and species mix of a stand. However, all sales should involve one or more of the four reasons for choosing trees to cut.

One of these systems of cutting isn't necessarily better than the others for producing wildlife habitat. All systems maintain or create different habitat features that will benefit some species of wildlife while perhaps adversely affecting others. The best approach for wildlife will depend on current conditions, other land use activities in the area, and overall management objectives.

*Adapted by Karen Bennett, Extension Professor and Specialist, Forestry. UNH Cooperative Extension. 2007. From **Silvicultural Principles for New England Forest Types** by Bill Leak, US Forest Service, Northern Research Station, Durham, NH, August 1994, with wildlife management text by Ellen Snyder, UNH Cooperative Extension. Illustrations from the North Central Region Management Guides, US Forest Service, Northern Research Station.*

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