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To Cut or Not to Cut?

In previous articles, we looked at the underlying philosophies and objectives in forest ownership and the conundrums for individual tree or group selection. In this final installment, we will cruise through the range of silvicultural options. If you have a forest plan developed by a professional forester, this will help you understand the language. If you are developing a plan, this will explain the breadth of choices. Whether you have 50 acres or 50,000 acres, a management plan is like a blueprint for a building project. A good plan will describe your different forest stands and lay out the treatments and timing to achieve your specific goals.

A silvicultural system is a program for maintenance of a forest stand through the entire life cycle, from regeneration to maturity, and on to the next regeneration phase. For most landowners, we are brief tenants for a part of this cycle, but I have had the honor of working with some seasoned citizens who have harvested mature trees from areas they planted as kids, or remember as pasture, picking strawberries in the sun between small "bushes." These systems are usually named for the way in which the stand is regenerated, but include processes to culture young and middle-aged stands. Planting trees is expensive, and so we take effort to create conditions for natural regrowth where possible. The first division is normally between even-aged and uneven-aged options, but there are two-aged and various hybrid approaches. This overview applies to northern hardwoods, southern pines, and all kinds of forest.

Even-aged Options

Forests of one primary age class are simplest to describe and manage and are found all over the world. Even-aged forests originate from some event that allows a forest area to be re-stocked with trees over a short period of time, such as fire, pasture abandonment, heavy harvesting, or tree planting.

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These stands go through a fairly predictable process involving stages of development. The young stands are naturally crowded with as many as 10,000 stems per acre or more. Over the next decades, natural selection eliminates a huge percent of these, and we call this the "stem exclusion" phase. At some point, an understory may become established, starting a new phase. This may or may not be a desired replacement forest. Eventually, the overstory may be eliminated by fire, storm, or disease and a new forest takes its place. There are silvicultural practices to deal with each of these stages and to move the forest toward a desired condition. These desired conditions can include the success of preferred species, healthy growth rates, wood products, forest structure or wildlife habitat. In most cases, we work with these natural processes, guiding them, speeding them up, deriving products that benefit mankind, and creating stable conditions without the wild swings that nature provides, such as forest fires and widespread insect outbreaks.

Clear-cutting is the simplest system to describe. A mature forest is removed in one harvest, leaving a bright, sunny site for new tree growth. This will benefit certain shade-intolerant species, or it can be planted to new seedlings. Generally, the harvest is complete removal. Sometimes, commercial stems are removed and culls, understory saplings, or scattered trees are left which might impede successful regeneration. In these cases, a subsequent treatment might be needed to prepare the site for effective regeneration. This can include cutting or destroying vegetation and scarifying the soil surface to expose soil for new seedlings. Clear-cutting can result in new growth of sprouts from stumps and roots instead of seedlings, and we call this "coppice" regeneration. Poplar, beech, and black locust are trees that regenerate from sprouts.

Clear-cutting is a drastic change, and has a bad perception by the general public that is largely undeserved. Modern clear-cutting is highly protective of soil erosion, water quality, and wildlife habitat, and is a reliable way to regenerate sun-loving trees or create conditions for planting seedlings. In my experience, most of the clear-cutting we have done has been particularly to improve wildlife habitat by creating lush new growth. And there are numerous modifications to this system.

The Seed Tree system is similar to clear-cutting with a single, heavy removal cut. The difference is that scattered overstory trees are retained particularly for seed. Selected species are retained, such as pines, oaks, birch, etc., to provide the seed for the newly exposed site. Since a single mature tree can throw a million seeds, only a few trees per acre are needed. This is normally used for shade-intolerant species, though a wider range of species can be targeted with particular seed sources. The seed tree method can provide a visual alternative to clear-cutting, and the seed trees can be harvested or left as part of the next forest. There is risk that seed trees can blow over or die from exposure, but they usually provide their seed beforehand.

The Shelterwood system is commonly used in a wide range of forest types. The mature overstory is removed in a series of two or more harvests over a relatively short time, such as 5 to 20 years. The first cut, which might be 20% to 80% removal (quite variable from shaded to sunny), has the purpose of establishing the new seedlings. We call this the Establishment Cut, and the seedlings get started in partial shade with abundant seed. This is a versatile system which can regenerate shade-tolerant, intermediate, or intolerant species. Once the seedlings are established, the overstory can be removed in one or more subsequent harvests, which we call Overstory Removal Cuts. With a wide range of options for balance of shade and sun or variability in the establishment cut and also in the timing of overstory removal treatments, this is a widely used treatment. It can provide aesthetic benefits, additional growth on retained overstory trees, and structural diversity which is beneficial for wildlife, especially birds.

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Problems with the system include the risk of windthrow or exposure for retained trees. This seldom inhibits regeneration success, but can be disappointing if you retained good growing stock. Removal of the overstory causes damage to the understory, and minimizing this is critical to the success of the operation. However, reluctance to remove the overstory results in the slow death of your new seedlings in the shade as the overstory grows. The antidote to this is counter-intuitive. If the overstory is removed after only 3 to 4 years when the seedlings are just barely established, the small supple trees are easier to protect, and more ready to rebound. We have had good success with this, but you sacrifice the additional growth on the overstory trees.

Intermediate Treatments

Once your new stand has been established by whatever means, there are a number of ways to culture these young forests. The very young groves with no commercial products are sometimes thinned as an investment in improved growth, giving the preferred trees the room they need to grow. We call this Pre-commercial Thinning. Weeding and Cleaning are generally applied to seedlings and sapling stands respectively, where undesired trees are selected mostly by species. Liberation Cutting generally releases saplings from

older trees retained from the previous stands. Crop Tree Release is where individual premium trees are selected and competing adjacent trees are removed. This process can be applied as a commercial thinning in middle-aged stands.

Commercial Thinning is done in stands of medium-sized, immature trees by several methods, with the products such as firewood, pulp, or small sawlogs covering the cost of the efforts. The basic goal is to concentrate the growth onto the best trees for both quality and species. Thinning treatments are often described as to the crown condition of the removed trees: Crown, Low, and Free thinning. Crown thinning removes the taller trees in the main canopy, and is often done on younger stands, removing faster-growing trees like poplar or birch. Low thinning is used on older stands, nearly mature, to harvest shorter trees that are under the main canopy before they perish. Free thinning is used in many types of immature stands, removing some of the tallest trees, along with shorter trees depending on all your criterion. This is the typical method of thinning.

Mechanical or Row Thinning is done without consideration of the crown positions, such as removing every third row in a plantation. Thinning can be done until the stand is mature, when the preferred regeneration method is implemented.

Uneven-aged Management

Uneven-aged aged management is much more complex, with stands that include several age classes either mixed on the same acre, or arranged in groups. Many landowners prefer an uneven-aged approach from a philosophical perspective. They might desire the idea of occasional harvest of groups of trees as they mature, or they oppose the idea of harvesting a whole stand with even-aged methods as mentioned above. In many cases, we are actually working with an even-aged stand and working toward multiple-aged conditions over the next many decades. All the aspects of even-aged management apply to these groups, and the group might be quite small or as large as several acres. We call this the Selection System where single trees or groups of trees are harvested for a mix of results: harvesting mature trees, establishing or releasing regeneration, thinning to promote growth on desired trees, and removal of poor quality trees and undesired species. Single tree and small group selection will generally give shade-tolerant regeneration with a few intermediates. Large group selection (up to 2+ acres) provides conditions for intolerant regeneration with some intermediates or shade tolerant species at the edges. So, there is a wide range of ways to implement this, and the truly uneven-aged forest is complex, interesting, sustainable, and provides great wildlife habitat.

On the negative side, uneven-aged management is complex to control and expensive to manage. We try to create a balance of age classes and conditions for regeneration of new age classes at nearly every entry. We also need to cover the entire stand to find the 20% to 30% of scattered mature trees and also do the careful thinning and crop tree release throughout the area. So, each entry has expensive logging and high administrative costs, with a low percentage of mature and valuable timber.

Hybrid Approaches

There are also Hybrid Approaches to silviculture that incorporate aspects of even-aged and uneven-aged techniques, and some that are clearly two-aged. Improvement Cutting is sometimes conducted that does not conform to normal residual stocking requirements and is best considered as a hybrid. One example has been described as Forest Rehabilitation, which starts with highly irregular stands.

An important variation on the shelterwood system is Deferred Shelterwood. This retains the overstory for longer periods, essentially maintaining two distinct age classes. This result is often created when a landowner decides not to do the final removal cut. You can picture a lovely young forest with a scattering of mature overstory trees. The problem is that the overstory trees can eventually shade out the desired understory until it loses its vigor and becomes ineffective. Proper application requires low initial stocking of the overstory to allow for decades of growth as a two-aged forest. Other variations include uneven spacing of reserved trees, called Group or Expanding Gap Shelterwood, or variations in timing of removal cuts, which create multiple-aged stands and are referred to as Continuous Cover Shelterwood.

Another variation on even-aged regeneration harvesting is called “Variable Retention.” Portions may resemble a clear-cut or shelterwood harvest, but also include groups of retained trees. These might be habitat areas, groups of desired species, or immature stems. It is an overall heavy regeneration harvest with about 10% to 40% of the overstory retained as groups or individual trees and results in two-aged or multiple-aged stands over time which do not conform to normal uneven-aged systems.

Each stand has its own history, problems, and potential solutions, and there are many options for management. Having this language helps us communicate. Understanding the basic ecological functions, regeneration, and wildlife aspects of these options helps steer us toward better choices and implementation. ■

Robbo Holleran *is a private consulting forester helping landowners meet their goals in Vermont and adjacent areas. His work has him outdoors about 150 days each year, plus play time. He is one of the authors of the most recent* Silvicultural Guide for Northern Hardwoods in the Northeast.