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To Cut or Not to Cut?

THAT IS THE QUESTION.

PART 2

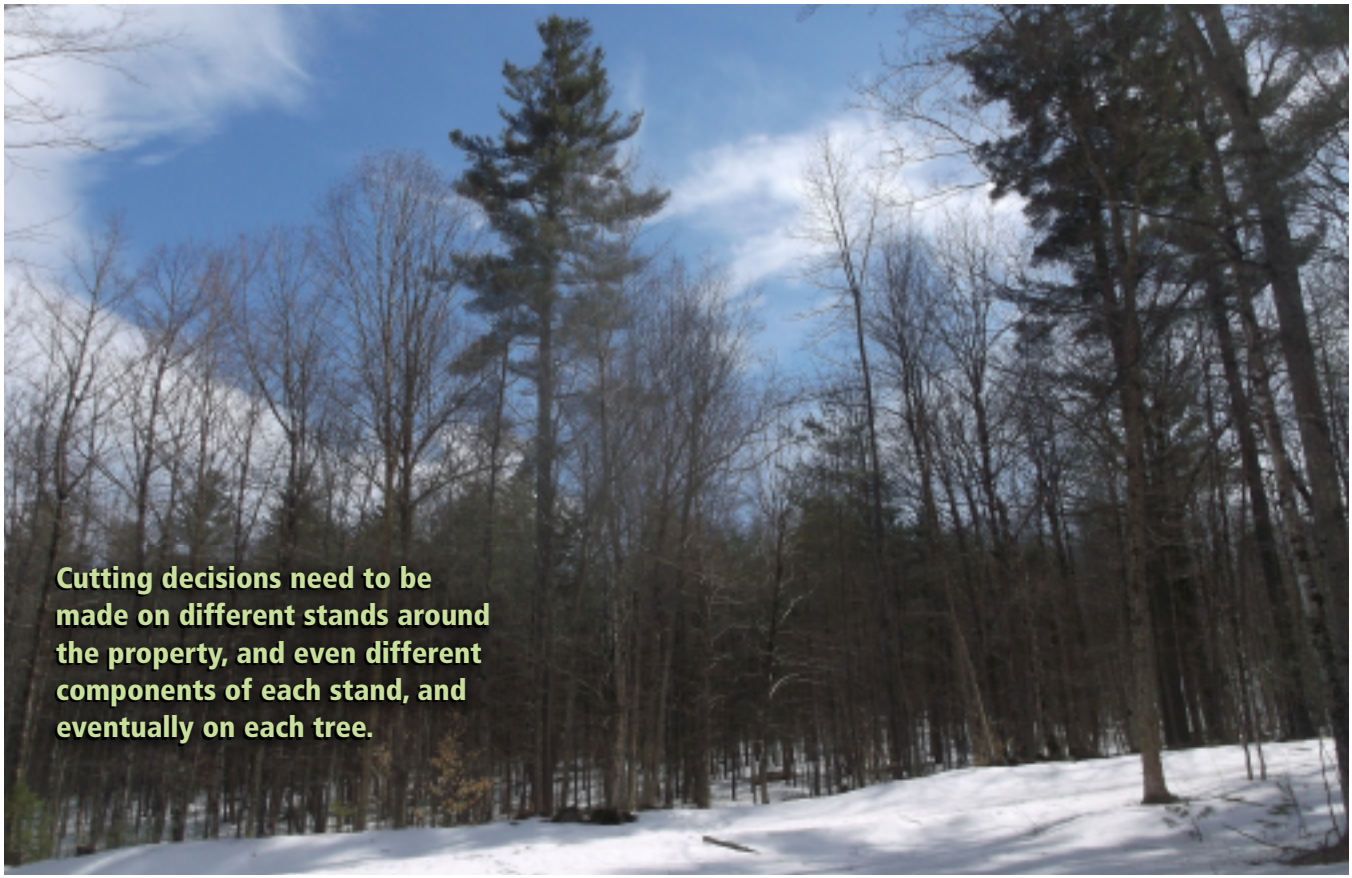
Whether 'tis nobler in the mind to suffer the slings and arrows of outrageous crowding, poor growing stock, and lack of young forest, or to take arms against a sea of troubles, and by opposing, perhaps to end them? Decision making in forestry is full of conundrums, risks, intended and unintended consequences. If you want something simple, stick to calculus where there is usually one correct answer.

In Part 1, we looked at some philosophical considerations that should direct our decision-making process and objectives, and in Part 2, we will get into more specific objectives at the stand level and how to discern priorities. Objectives in forestland management often include recreation, wildlife, and financial considerations. There are often conflicts within these goals.

The crispest conflicts are in short-term cash flow vs. aesthetic appeal, and cash-flow vs. long-term value accretion. And conflicts often make a good story.

First let's look at the aesthetics. Harvesting trees is messy. Even with a neat crew, there are stumps, branches, scrap pieces, and soil disturbances. There are four basic choices: 1) Don't do it. If you just can't tolerate any change or disturbance, perhaps active management is not for you. 2) Get out your checkbook. For a fee, there are landscape forestry firms that will cut, chip, rake, and plant trees to mitigate any disturbances you might have. 3) Educate yourself about the costs and benefits. You can learn to appreciate stumps, branches, and other indications of active management in the context of your other forestry goals for income, tree growth, or wildlife habitat. 4) Minimize and conceal: By minimizing disturbances in visible areas, and reserving anything drastic for out-of-sight places, visual impacts can be minimized.

Short-term cash vs. long-term value is a main conundrum of forestry. The best trees to grow for the future may be the most valuable trees to cut today,



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especially in immature middle-aged stands. Harvesting the lower-value trees to improve the future value does not provide "quick cash," And, rarely, if you cut the most valuable trees, will the remaining trees be the best trees to grow for the future. Have you heard the expression: "We'll cut the big ones to let the little ones grow?" This is seldom a good idea. So this is where the important decisions are made. If that stand is mature, then the key will be to harvest in a way that maximizes the revenue and creates desired regeneration for the next forest. If the stand is immature, then the future value should be deemed more important and the stand tended toward its maximum future value. But most stands are more complex, with perhaps two or more age classes or species that mature at different times. Decisions need to be made on different stands around the property, and even different components of each stand, and eventually on each tree. Each tree will have its own growth rate, risk factors, and expected future value. We will look at individual tree decisions in Part 3.

Even a mere financial perspective should lead us to good stewardship. Traditionally, large tracts of forest land are a fairly low-yield, but a stable, investment. Timber harvests pay a dividend, but the land generally increases in value. The timber component is a main factor in land value for large tracts. So we are concerned about the overall condition of the land, with timber stocking, quality, and species composition. We would grow trees (or stands) to their peak of value, which implies healthy trees and optimum stocking levels for good growth rates. Final harvests would be done in favorable markets, but also to provide suitable regeneration to maintain productivity. Thinning and improvement cutting is done as an investment (or foregone income) toward future value. Treatments might be buffered by standards for enrollment in state tax stabilization programs to reduce annual property tax costs. Riparian buffers and other conservation requirements are included as particular stewardship practices. Smaller tracts are even more influenced by real estate value than their "timber component," so factors like overall aesthetics are more important.

In a silvicultural sense, we normally think of increasing the value of annual growth. We often compare the value of the growth of low-quality vs. high-quality forest products. In a general sense, low-quality products such as biomass might be worth a dollar or two per ton to the landowner. Veneer hardwoods are worth hundreds of dollars per ton. With a normal growth rate of a couple tons per acre per year, investing in growing quality timber makes sense. Maintaining a poor-quality forest might have other benefits, but not in terms of value growth. With an overall goal of healthy forests accumulating

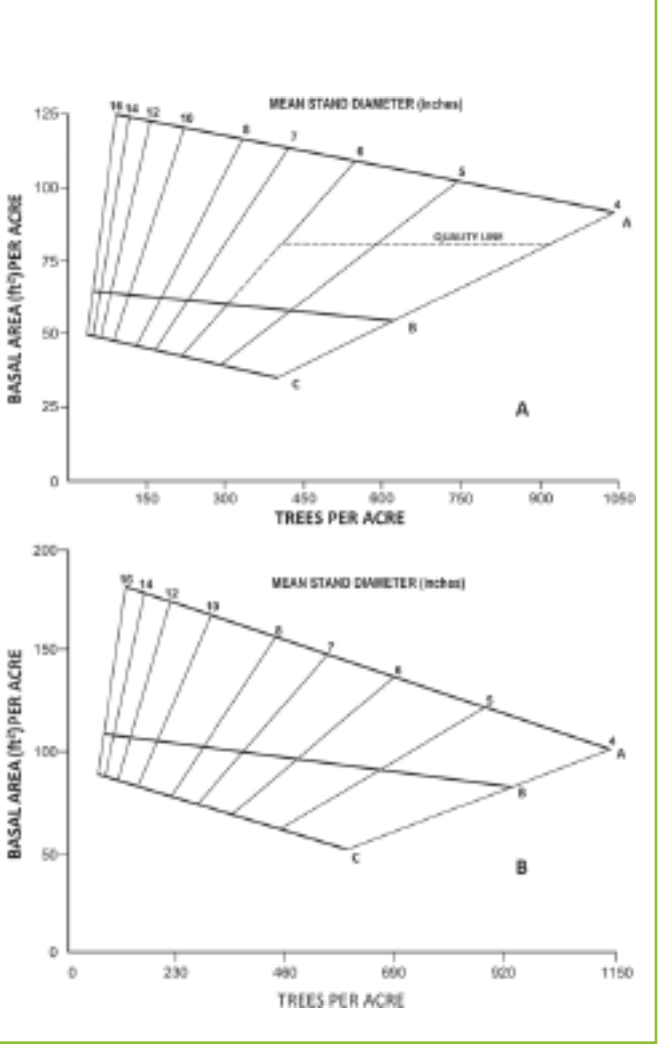
value in tree growth, we have to consider the optimal stocking level.

The diameter growth rate of forest trees is largely controlled by the crowding of adjacent trees. The tree rings seldom show weather effects, except in dry areas, where water is the limiting factor to tree growth. Trees function as giant solar collectors, making sugar from sunlight energy with water and CO2. They burn sugar to live, and the excess sugar is converted to the new layer of wood just under the bark. So trees with plenty of sun on their green crown are healthy and growing, whereas trees shaded or crowded on all sides are less vigorous and growing slowly. This is why the stocking level is important for tree growth and forest health.

What Is Optimum Stocking?

Each forest type has a "silvicultural guide" with the nuts and bolts of the forest type. I am most familiar with the northern hardwoods and their mixed woods (25%–65% softwoods included with typical northern hardwoods: maples, beech, and birches.) This guide applies to the vast majority of the lands I manage, and I was honored to be asked to assist with preparing the recent revision of the Silvicultural Guide for Northern Hardwoods in the Northeast. The guides provide a framework for a professional and will be helpful to an educated layperson. Each guide has a stocking chart with A, B, and C lines. The A-line is the total stocking in a natural, unmanaged stand, relating basal area, number of trees per acre and average diameter. So the line follows a curve based on diameter and total stocking. The A line is a "normal maximum" though some stands are denser. Mortality approaches the growth rate at the A line. The B line is the minimum number of trees (at that diameter) to fully occupy the site. Mortality from crowding should be zero, and net growth should be about maximum. Individual tree growth should be high, but not quite maximum. At the B line, there will be enough sunlight for some understory accumulation, but not enough for effective regeneration unless additional cutting is done sooner rather than later. And the C line is defined as the stocking level that should grow to the B line within 10 years. This is important, as this is considered the minimal stocking for effective management of the overstory; or that below this level, regeneration of a new age class or replacing the overstory becomes an important consideration.

Your optimum stocking depends somewhat on your applied philosophy. For immature or multi-age stands, somewhere between the A and B lines is a normal range, and halfway is a reasonable option. You might desire a lower stocking for higher growth and lower mortality, or higher stocking for the aesthetic appeal or future market value. One problem is if you ever have the actual optimum for your goals, the next year the trees will be a little larger and the stand will be more crowded than optimal. Most of us do not have the luxury of cutting exactly equal to the growth rate each year on every acre. We need to consider how far below and above optimum we can tolerate, what the costs and benefits are to frequent or infrequent harvests, and how much volume and value are appropriate to remove in each entry. A practical application is to harvest to the B line and allow it to grow to just below the A line. This creates a cutting cycle (time between entries) of about 20 years in most cases in northern hardwoods. (Softwoods and southern types can have faster growth and shorter cutting cycles.) Variations depend on your specific goals, soils, growing season and forest type, but these principles apply. If you are interested in maximizing net growth and minimizing mortality and want to maintain a more open forest, then you might harvest to the B line or just below, and then grow the stand to about halfway to the A line on perhaps a 15-year cycle. To maintain a more crowded forest with higher stocking, another option is to cut to about halfway between the A and B line, and grow the stand to near the A line. These will be lighter cut and some growth will be sacrificed, but a 15-year cycle is about right for that too. If you have easier access and terrain, and a low per-job cost (such as marking trees, moving equipment, etc.), then more frequent entries



Stocking chart for northern hardwoods (top) and northern hardwood-mixedwoods (bottom). *NRS 132*

and lighter cuts may be warranted even every 5 years. We have properties with very difficult per-job costs and slow growth that are realistically on a 30-plus-year cutting cycle. These thought processes lead us to the optimal stocking range for each stand.

Markets are a major driver in implementing a philosophy or details for a management plan. So, we have to consider present value along with expected future value for the whole range of forest products. It helps to consider historic changes in value compared to inflation. Low-value products like firewood, pulp, and biomass tend to vary within a narrow range. They have their ups and downs based on supply and demand, but do not keep up with inflation over the long timeframe. The highest-quality woods do increase in value over time, but can swing wildly based on consumer preferences and other factors. Thirty years ago, oak was worth a lot more than sugar maple, but recent preferences for "white wood" have reversed that. Oak is grown in a very wide range to fill the demand, with sugar maple coming from a smaller region. Still, high-quality oak is worth more than mid-quality maple. White pine provides another example. As a wood with wide usefulness, but high supply, it has always been mid-value. With fast growth rates and high stocking levels, it has always been a good timber investment. But other wood can be substituted, and various pines are grown all around the world. With less demand for lower-grade pine for miscellaneous uses like barn siding or crating, only the higher grades can reliably be sold for lumber in today's market. So those who have grown quality pine are rewarded. We cannot predict the species demands of future generations, so a good approach is to grow the best quality you can in the species best suited to your land, and to maintain some species diversity for future market swings.

Once you have a coherent management philosophy, you can begin to contemplate a more detailed forest plan. Most landowners will do this with the aid of a professional forester who can explain the options and make recommendations. The first step is to collect a good understanding of your forest resource. Whether it is 50 acres or 50,000 acres, some areas will have more value, high-risk trees, better access or terrain, different species compositions, wildlife features, opportunities for improvement, or other priorities that fit your goals. Therefore, a map and forest inventory are the starting points for good decisions. We do the mapping in several stages. Often there is a tax map, previous forest map, or boundary survey to start with. We review several types of air photos plus topographic and boundary maps for various features to develop a base map. Our field review gathers specific data at sample points, but we are always ground-testing our base map for stand changes and other features like trails, streams, and boundaries.

Each stand is an area with enough similarity that it would receive a similar treatment throughout. There is considerable judgment involved in deciding how to delineate stands. Smaller tracts might have small stands of just a few acres, whereas on larger holdings, larger stands will have more internal variation. For one example, a parcel may have had a 60-acre heavy cut a few decades ago, leaving a young stand of regenerated trees, not yet with any commercial value, and a scattering of retained overstory trees. The new stand might be mostly hardwood on one end, mostly softwoods on the other end, and mixed in the middle. If this is your 60-acre lot, it might be three different stands to you, and might be divided further based on other criteria. On a 500-acre tract, this could all be one stand.

The goal of gathering data within each stand is to determine the best choice for treatment, or if any treatment is warranted. If you know that you have 60 acres of immature saplings with no commercial value, and you do not intend to do precommercial thinning, very little additional information is needed. Most states have a beneficial tax category for forestland, and may require specific information for plans to comply, so you may be working within a particular framework. In general, we want to know the species composition and soil qualities for that stand, along with the age, or ages, of the main canopy trees. Total stocking is critical, along with tree sizes, acceptable versus unacceptable growing stock, and mature versus immature components. We also need to know of any health problems like insects, diseases, or other risk factors. Timber volume by species and diameter gives an indication of value, which is helpful. Many other factors can be reviewed including wildlife habitat and potential, aesthetic and historic resources, along with any rare, threatened, or endangered species or unusual habitats. Cost of the plan is often a factor, so sometimes we are merely meeting some minimum requirements.

With this data, we can begin to review a range of options, and the choices will be buffered by the underlying philosophies and overall goals. Once the treatment for each stand is selected, they can be ordered in terms of priority to create a schedule. This is what we call a management plan.

In Part 3, we will look at discerning priorities for each stand, matching them to your objectives and the conundrums for individual tree selection. ■

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