

Evaluating High-Graded Hardwood Stands



The majority of hardwood stands across the South have been high-graded, and hardwood forests in Mississippi are no different. A high-graded hardwood stand is one in which most or all of the high-valued, desirable trees that had quality stem form have been cut, leaving a stand of either poorly formed desirable trees or undesirable trees.

How and when did this happen? Is there anything that can be done with these stands, or are they the management nightmare they appear to be?

Most of the high-graded hardwood stands are the result of repeated cuttings, with little thought to future stands or regeneration. Almost all of these past harvest practices came under the heading of “diameter limit cuttings,” and many of the early harvests were done in the name of good forest management. Landowners thought the large trees were the older trees, so they removed them to give room for young trees to develop. This type of harvest has been practiced in Mississippi for at least 150 years.

We now know that small trees are not necessarily young trees, and that cutting only the biggest and best trees out of a stand results in an undesirable situation from a timber management standpoint.

In addition to poor harvesting practices of the past, diseases, insects, and, to a much lesser extent, fire have had negative impacts in these hardwood stands. What we generally find in these high-graded hardwood stands today is a combination of the remnants from previous cuttings, some regrowth of desirable species, and a large proportion of shade-tolerant species, most of which are undesirable for timber management. In some cases, large diameter desirable trees remain, but, on closer examination, these trees have serious defects, which is why they were left.

Management Options

Managing high-graded hardwoods is challenging and complex because of the number of species involved and their interrelationships. These interrelationships yield numerous management options that are often complicated and very rarely, if ever, conform to a textbook scenario.

Usually there are two major options—**rehabilitate** or **regenerate**. Rehabilitation includes two primary management operations:

- proper use of the currently existing stand to improve the growth and development of a better stand, and
- timber stand improvement activities that control undesirables and promote growth and development of the desirable trees.

To rehabilitate a stand, we must assume that a manageable stand of crop trees exists, which may or may not be true. If there is no manageable stand of desirable crop trees, the stand needs to be **regenerated**.

If regeneration is chosen, it can be accomplished through natural regeneration, artificial regeneration, or, as is quite often the case, a combination of the two. The most important factor that leads to stand regeneration is that the current situation is not viable for future and/or prolonged management. That may not be good news to many owners of these high-graded stands, but this is a situation that did not develop overnight. In many cases, the poor quality

of the currently existing stand has been developing for decades. Drastic measures are often required to get the stand back into good timber production.

Stand Evaluation

Before deciding whether regeneration or rehabilitation is the right choice, the landowner must first evaluate the current situation. This evaluation should be based on the following six criteria:

- Site Quality
- Manageable Trees
- Cull Trees
- Undesirable Species
- Advance Regeneration
- Age

Site Quality

Site quality is a principal determinant of stand quality with hardwood species. The potential for management of any hardwood stand is always directly tied to the quality of the site. Usually, a number of different species are involved in hardwood management, whereas only one pine species would typically be considered for a large geographic area.

Site quality becomes a species consideration as much as a characterization of the physical properties of the area. For example, what might be considered an average site for some oak species might actually be a relatively poor site for yellow poplar. It is important that the species be properly matched to the site to achieve optimal production.

In most site quality evaluations, a ranking of five classes is used. The terminology may vary, but the comparative evaluation remains the same. One example would be to have five classes or categories: 1) poor, 2) below average, 3) average, 4) above average, and 5) excellent.

The principal method for evaluating site quality has historically been the use of site index, which is a measure of site productivity. A major problem with using site index in high-graded stands is the tendency to underestimate the site's true productive potential. This is because past cutting practices have favored the existence of slower growing and lower quality trees, even of desirable species. If site index is used for evaluating site quality, it is very important that

you use the proper species curves (these vary by region for hardwoods). **To get a proper evaluation**, you must carefully select the trees to be used.

An alternative to using site index is to refer to the soil classification and description of the soil series appropriate to the site. These soil series descriptions give the site index for a number of appropriate species for that soil and can be used either independently or as an excellent cross-reference to check the on-site measurement for site index determination.

A third method for determining site quality is to use one of the site rating systems based on landforms. These systems have been completed for a number of physiographic and topographic combinations, and the results are dependable and well suited to managing these types of stands.

Overall, the intensity of forest management should increase as site quality increases, and the return on investment will decrease as site quality decreases. In a situation where the management could be expensive, as is the case with many high-graded stands, it is important to evaluate the expected return on investment before starting any management activities.

Desirable Trees

The desirable trees in high-graded hardwood stands represent the real key to the prescription process (**Figure 1**). Importance is placed on the species present, the total number present, and the distribution across the area. The minimum amount required for successful management really depends on the goals of the landowner. Depending on which technical reference you use, the minimum basal area per acre (a measure of stand density) typically ranges between 35 square feet and 50 square feet.

Perhaps more important is the number of larger trees of desirable species on the property. Here is a rule of thumb that might be helpful: *The minimum number of small sawlog-size trees that represents a manageable stand is 50 trees per acre*. This rule assumes that longer-term management is desirable and that proper rehabilitation processes will be followed, and it has been used successfully in the past.

One last consideration on desirable trees is that they must have the ability to respond. During the evaluation, do not choose these trees only by species and form. You



Figure 1. Desirable trees such as this oak are necessary for continued management of high-graded stands.

should also consider the age of the tree. Remember that the lack of age determination is the reason many of these stands got into this high-graded condition.

Cull Trees

Inventory trees on the area, both by the number of stems and by the basal area per acre. For years, land managers did not evaluate cull trees because they thought they were worthless. Actually, cull trees represent a totally different perspective from undesirable species, and they do have some positive potential. In this discussion, cull trees are considered to be poor-quality stems of desirable species (**Figure 2**).

Hollow trees would obviously be considered cull, and they should be identified and their location noted as den trees if wildlife habitat is a management consideration.



Figure 2. This low-quality oak is a cull stem, but it could produce desirable sprouts for regeneration.



Figure 3. This beech tree is undesirable for most timber management plans.

Cull trees represent fewer problems for future management than undesirable species, primarily because these trees have at least the potential for good sprouts if they are cut. Even if cutting these trees does not result in desirable sprouts, they do at least have the potential, so at this time they are a desirable species for the area. In addition, cull trees of a desirable species could also add to advanced regeneration stock. Remember, a cull tree of a desirable species may be due to a mechanical factor and not a genetic factor.

Undesirable Species

The prolonged use of high-grading management and diameter limit cuts has led to a large number of stems per acre of undesirable species (**Figure 3**). Typically, these

undesirable species are shade tolerant and have resulted from the removal of stems across the area, which created very small regeneration openings.

Unfortunately, most of the commercially important hardwood species in the South are not considered to be shade tolerant. At best, a few of these desirable species might be moderately shade tolerant. Often in these high-graded hardwood stands, there are large numbers of eastern hophornbeam, American hornbeam, American beech, red maple, flowering dogwood, assorted hickories, and others. Depending on the length of past poor management, these undesirable species may now occupy all levels of the canopy, ranging from the overstory down to the understory. This is obviously not a desirable situation and gives few choices for management.



Figure 4. This oak seedling represents a desirable stem for the regeneration of this stand.

Advanced Regeneration

Inventory of the advanced regeneration allows an evaluation of the future stand (**Figure 4**). During this inventory, take note of both the number of stems and the distribution of these stems across the area, with all data recorded by species. It is very important to note the “clumps” of this regeneration in the inventory. Otherwise, biased and totally misleading data may result.

You must consider the timing of the stand evaluation. There may be a large number of desirable species stems in a recently cut stand, but these stems usually will lose their vigor when the canopy closes if proper management is not begun. Therefore, it is helpful to know the time of harvests or the age of some of the advanced regeneration stems on the site.

There are a number of different systems you can use for evaluating the advanced regeneration, depending on whether the stand is on a bottomland or an upland site. These systems all include provisions for what might be considered new regeneration or advanced regeneration, and typically they employ a point system to give a final rating on the stand in terms of management options.

Age

As stated before, much of the high grading occurred because age was not evaluated. Age should be determined for the “manageable trees” only. Once again, the age is

directly related to the potential of these stems for response and is needed for the site index determination. The interpretation or use of the age data depends entirely on the species-site relationship for a given stand.

Age can be determined in three different ways. You can estimate the age. (Some published reports indicate that with training and practice, reliable estimates can be obtained.)

A second option is to get an increment core from selected trees and count the rings. Most land managers do not want to take an increment core from a manageable or potential crop tree because of possible damage that could result. If you want to core a tree, remove the increment core from the stem within 6 to 8 inches of the ground. That area will probably be left as a stump, and you can more accurately estimate stem age by taking the core from this lower position. The negative aspect of coring a tree at that height is the increased potential for disease or insect attack. Many managers have stated that reinserting the core in the hole and sealing over the exterior wound has resulted in very little or no problems on cored stems.

A third option for determining age on manageable trees is to count the rings on similar nearby harvested stems. This is an option when stems of a desirable species need to be removed because of damage from past logging practices or when other types of physical or biological damage have occurred to the stem. The underlying assumption from this type of evaluation is that the

harvested stem and the remaining stem are about the same age. There is some credibility to that assumption, since most of our commercially desirable species tend to develop in even-aged groups.

Collecting Information

A systematic approach is best when evaluating high-graded stands. Many of the criteria discussed cannot be fully evaluated without data from sample plots. A wide variety of inventory systems are available, but simplicity and utility are the essential components in evaluating these stands.

A basic approach could be used to locate a series of plots spaced evenly across the area (Figure 5). The number of plots depends on the number necessary to obtain an accurate estimate of the stand. Usually, enough plots are measured to give a 5–10 percent sample of the area.

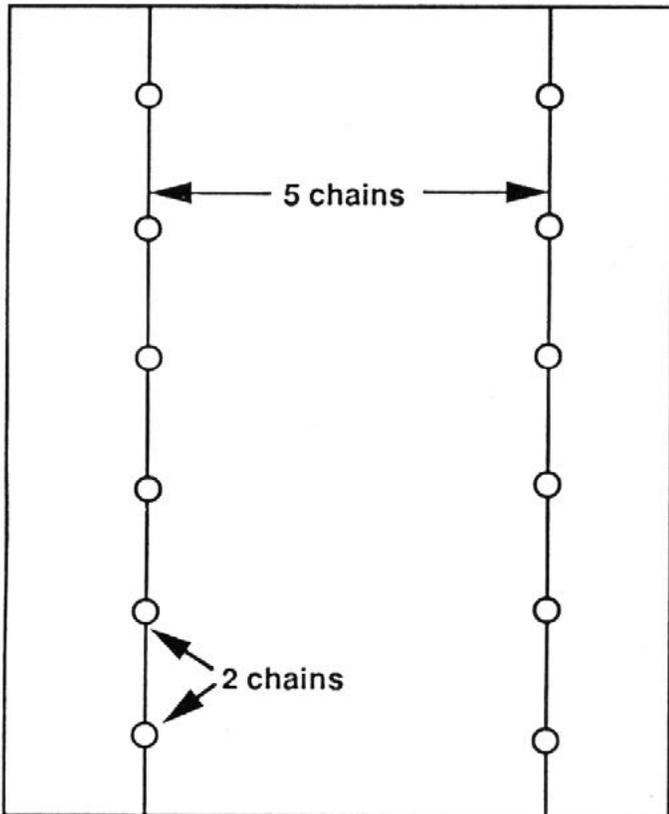


Figure 5. Example of plot layout for 10 percent sampling using 0.1-acre plots.

At each sample location, evaluate two plots using the same point as plot center (Figure 6). The smaller plot is used to evaluate advanced regeneration, and either 0.001-acre (radius of 3.72 feet) or 0.01-acre (radius of 11.78 feet) size is used, depending on the size of the stems. If the regeneration is mostly 3 feet or less in height, the smaller plot is used.

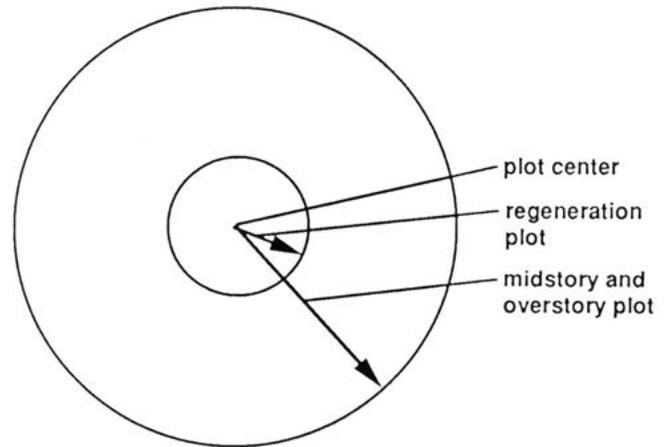


Figure 6. Examples of concentric circle plots for evaluating different layers of vegetation.

Larger stems with wider spacing are better evaluated using the larger plot radius. In either case, record the number of stems by species and size class (for example: less than 1 foot tall, 1–3 feet tall, more than 3 feet tall). If you intend to use a point rating system discussed earlier, collect the information required by that system.

Evaluate the **midstory** and **overstory** using 0.1-acre (radius of 37.2 feet) or 0.2-acre (radius of 52.7 ft.) circular plots. If the upper canopy levels have numerous, smaller-diameter trees, use the smaller plot. Fewer, large-diameter trees are best evaluated using the larger plot. Record stems from these plots by size and classify them as desirable, undesirable, or cull.

Record the data from each plot separately, as inspection of the results can indicate if stratification or “zones” exist across the area. The data from the plots can be analyzed in the same way as most timber inventory data to give a clear picture of the existing stand.

Summary

Before you begin what may be a very long and challenging task of managing a high-graded stand, it is absolutely essential that you spend some time in evaluating the current situation. These are complex species associations, and the complexities of the management required to return these stands to optimal production is often extensive and can be expensive.

The most important point to remember is that if you do nothing, these high-graded stands most likely will not correct themselves. Just as active mismanagement caused the current undesirable state, it will take active management to return them to their productive potential.

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Revised by **Randall J. Rousseau**, PhD, Extension/Research Professor, Forestry. Written by Andrew W. Ezell, PhD, retired Professor and Head, Forestry.



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