

Survey of Root and Shoot Cultural Practices for Hardwood Seedlings

Harry L. Vanderveer

Harry L. Vanderveer is Manager, Nursery Operations, Texas Forest Service, PO Box 617, Alto, TX 75925-0617; telephone: 936.858.4204; e-mail: hvanderveer@tfs.tamu.edu

In: Dumroese, R. K.; Riley, L. E.; Landis, T. D., tech. coords. 2005. National proceedings: Forest and Conservation Nursery Associations—2004; 2004 July 12–15; Charleston, NC; and 2004 July 26–29; Medford, OR. Proc. RMRS-P-35. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Abstract: A telephone survey of selected forest seedling nursery managers was conducted in early 2004. About 2 dozen managers were contacted and asked to respond during a brief (15 to 30 minute) conversation about the current practices they employ to manage root and shoot growth of hardwood seedlings. The participants involved were evenly split between public agencies (government) and private agencies (forest industry or other corporate entities). To receive open and honest responses to all questions, individual nursery names, locations, and managers were kept confidential.

Keywords: root pruning, undercutting, top clipping, shoot pruning, root wrenching, shoot-to-root ratio

Introduction

The efficient production and culturing of forest tree seedlings for reforestation, or even afforestation, of land in the United States has attracted broader interest in recent years, with a stronger emphasis on the benefits these trees bring to wildlife, watersheds, and the esthetic values of the landscape. Large-scale efforts are ongoing for most of the major conifer species, which are usually managed for forest products uses, including lumber and paper production. In contrast, hardwood species are now being grown to meet different objectives. These are often smaller-sized planting sites with specifically intended outcomes, such as wildlife habitat improvement for hunting, viewing, or, in some cases, replenishing threatened or endangered species. This emerging interest in hardwood seedling production has stimulated the need to compile the current state of knowledge and practices for producing the wide variety of hardwoods grown in a more effective and efficient manner.

The objective of this survey was to determine what types of activities nursery managers use to manipulate the growth and development of plant roots and shoots. Other investigators at this conference gathered information on the current state of knowledge and practices for hardwood seedlings in the areas of soil fertility and plant nutrition, crop rotation, cover cropping, and weed management.

Methodology

In May 2004, a list of forest seedling nurseries was reviewed to find those that currently grow hardwood seedlings. An effort was made to contact a sampling of those nurseries across the southeastern and northeastern areas of the United States. Approximately 24 nursery managers from these regions were eventually contacted. Roughly half of these managers worked for public agencies (state nurseries), and half were employed by private sector enterprises. These private nurseries were again split between large forest industry corporate nurseries, small nursery companies, and family-operated businesses. Ultimately, nurseries in Alabama, Arkansas, Florida, Georgia, Indiana, Louisiana, Maryland, Missouri, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and Wisconsin were contacted.

After initial contact with these nurseries, it was determined that participants in the survey would speak most freely and frankly if their actual employer affiliation remained confidential.

Survey Questions and Discussions

The survey questions and discussions were categorized into these topic areas:

1. Why do you culture your hardwood seedlings?

2. Do you use any special equipment to accomplish the culturing procedures?
3. Are there any special considerations for culturing hardwood seedlings?
4. What pitfalls have you learned to avoid when culturing hardwoods?

Culturing Hardwood Seedlings

The most common response was “to meet customer specifications.” An alternative response was “to have more uniform seedlings.” Further questioning on this topic revealed that proper shoot-to-root ratio was deemed important. The need to facilitate seedling harvesting and packaging was also mentioned by several nursery managers as a reason to manipulate the shoots and roots of seedlings.



Figure 1—Stationary blade used to undercut root systems in bareroot seedling beds.



Figure 2—Reciprocating blade used to undercut root systems in bareroot seedling beds.

Special Equipment Used to Culture Hardwoods

The equipment question naturally divided between root culture and shoot culture. For root culturing, 3 types of devices were most often mentioned by nursery managers. A stationary, sharp blade that is drawn behind a tractor is commonly used to undercut root systems in the nursery seedbeds (Figure 1). Some nurseries like to use a more intricate and costly reciprocating undercutting blade implement (Figure 2). Each of these types of undercutters can accomplish acceptable manipulation of the depth of root development.

For managing the lateral roots of hardwood seedlings, either a series of rolling coulter blades positioned to run between the drills of growing seedlings (Figure 3), or a set of stationary knife-like blades drawn between the seedling drills is used. However, it should be stated that nursery managers did not universally do lateral root pruning of hardwoods. The reason for this was divided: (1) any disturbance to, or reduction in, the mass of lateral roots is detrimental to survival and growth of hardwood seedlings; and (2) some nurseries do not own lateral root pruning implements.

Management of seedling shoots requires a totally separate assortment of equipment. Most commonly employed for this purpose is a rotary mower or brush hog (Figure 4). Several of the nurseries contacted use sickle-bar clippers (Figure 5) to limit the height growth of hardwood seedlings. They cited the more surgical cutting action and better visibility as the reasons for choosing this tool. Finally, a few nurseries that only occasionally do top pruning of hardwoods said they tried gasoline powered hedge trimmers.

Special Considerations for Culturing Hardwood Seedlings

The nursery location and climate conditions were often mentioned as factors that determine when seedling cultural



Figure 3—Rolling coulter blades used to manage lateral roots in bareroot seedling beds.



Figure 4—Rotary mower used to manage seedling shoot growth in bareroot seedling beds.

activities can be performed. Soil and weather conditions are always part of the decisionmaking process around a seedling nursery. This seems to be where experience and knowledge of local conditions become very important in managing a seedling crop. Possibly this is when the science and art of nursery production part ways?

The next most frequently referenced consideration was the customer type—whether they are buying trees for reforestation use or liner stock for ornamental nursery production. The size and shape of seedlings going to the horticultural trade is far more demanding in terms of seedling height, caliper, and quality of the root systems. Generally, these plants are larger than reforestation grade plants. Of course, the pricing for seedlings entering this part of the market tends to be considerably higher than those sold for reforestation.



Figure 5—Sickle-bar clippers used to manage shoot growth in bareroot seedling beds.

Pitfalls to Avoid When Culturing Hardwoods

Pitfalls or practices to avoid in the culturing of hardwood seedlings probably came to light from a big problem that a nursery manager encountered in the past. The range of responses to this particular discussion question ran the gamut from “we never top-prune or root-prune” all the way to “we top-prune early and often.” Again, the customer usually determines which of these extremes is practiced. A few items that were mentioned by several survey contacts included: (1) don’t top-prune seedlings of opposite budded species, such as maple, ash, and dogwood; (2) top clip tender, green growth and avoid cutting into hardened, woody stems; and (3) produce a plant that does not require any additional field pruning of either shoots or roots.

Summary

Hardwood seedlings vary a great deal. Different species, different customer expectations, different soils, varying climate conditions, various availability of special nursery equipment, and the range of experiences and personalities of nursery managers make generalizations on the subjects of root and shoot pruning very difficult. The topics deserve a more thorough treatment in terms of fact-finding on the currently observed methods and scientifically based investigation. With the growing interest in producing hardwood seedlings, a forum should be convened to advance the accumulated knowledge and understanding on these important topics. This information could then become a basis for better plant production and education for the future generations of nursery practitioners.