HARDWOOD SEEDLING PRODUCTION'

Randy Rentz[2]

ABSTRACT-Columbia Nursery is a part of the Louisiana Department of Agriculture and Forestry. We grow between 5 and 6 million hardwood seedlings annually, along with 3 to 4 million loblolly pine. Growing hardwood seedlings can be quite challenging and is always interesting. For those lucky enough to be affiliated with an organization that makes the production of hardwood seedlings a priority, it can be quite fulfilling and sometimes quite a humbling job.

At Columbia Nursery the primary goal is to produce a seedling that meets the needs of the customer, be it in an urban forestry capacity, a reforestation effort or a wetlands restoration site. It is these many variable situations along with the number of different species that make it impossible to grow hardwood seedlings to one particular set of specifications. Impossible, meaning it would not be the proper way to handle these seedlings, not that it could not necessarily be done.

Hardwood seedling production has seen almost unbelievable growth over the past 8 years while research has lagged behind. Though research is a slow process under any circumstances it seems to be even slower in the area of hardwood seedling production. With the nurseries being pushed to their limits to supply the needs for programs such as WRP, CRP, and WHIP there seems to be a mind set to accept less quality as long as we can get the volume. This can be very harmful down the road in terms of survival and quality of our reforested hardwood stands. Why have we relived the same mistakes we made in reforesting our cut over upland forest and abandoned hill country farms years ago? Of course government programs are not going to wait on research to catch up and the economics of money in the hand now is not going to slam the brakes on hardwood reforestation. As long as the money is there it is going to be full steam ahead at all cost. It is therefore thrown back in the hands of the field foresters, planters, and nursery manager to provide the best quality with what resources are available.

THE IDEAL SEEDLING

Quality in the nurseries means producing a seedling that has the best chance at survival when out planted. This quality is essential to be genetically compatible with the area in which it is to be planted, and ultimately providing a quality product whether it be for wildlife, watershed, recreation, or wood product.

What is the ideal hardwood seedling? Nuttall oak needs to be 3/8" at root collar and 22" tall. Willow oak can be 1/4" at root collar and 18" tall. Pecan needs a 3/8" root collar, but it doesn't have to be but 12" tall. Of course, these are all minimum standards because I've got some Nuttall that's 36" tall and some sycamore that's ready for the chipper. "Old Joe" likes the big ones, so I'm saving them for him. While "Sam" over there would just as soon them to be smaller, so he gets these we didn't get in the ground until the end of May and just couldn't seem to get the growth out of them like the others.

The ideal hardwood seedling for all practical purposes is at the very least quite debatable. Outside of answering this question individually through trial and error; there are no true guidelines for growing hardwood seedlings. It may well be that there is no optimum standard for hardwood seedlings. When considering sites where 8" in elevation can mean the difference between planting one species or the other, we can't expect to grow seedlings that meet one particular group of standards and say this is the way they should all be grown. This is not a practical way to think.

This being said, it would not be practical for us to suggest the best way to grow hardwood seedlings. Instead we will concentrate on what works at Columbia Nursery and hopefully these practices can be of benefit to others.

NURSERY PRACTICES

Soils

Columbia Nursery has a very fertile silt loam soil. A pH of 5.4- 5.9 is maintained primarily by the addition of cotton gin trash and other organic amendments to the soil. Internal drainage is maintained through subsoiling in the fall preceding fumigation and planting deep-rooted cover crops such as winter wheat (every little bit helps). Just as important as internal drainage is external drainage. Fields are land planned prior to fumigation and subsoiling to eliminate any low areas which would tend to hold water. All ditches are maintained regularly to eliminate any areas that would restrict water flow. Maintaining proper internal and external drainage is very important not only during the growing season but for overall soil structure.

Probably the primary overall objective of a nursery is maintaining good soil structure. The best way to assure good soil structure is through proper rotation, and the addition of organic amendments. These amendments should be in the form of both cover crops and organic matter from outside sources. It is usually very easy to find a local source of organic matter. At Columbia Nursery we get clippings from the town, materials from a local horse farm, sawdust from a small local mill and gin trash from a nearby cotton gin. Without this added organic matter, it would be

[1]Rentz, Ft. 1999. Hardwood seedling production. In: Landis, T.D.; Barnett, J.P., tech. coords. National proceedings: forest and conservation nursery associations—1996. Gen. Tech. Rep. SRS-25. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station: 22-24.
[2]Nursery Superintendent, Louisiana Dept. of Agriculture and Forestry, PO Box 1366, Columbia, LA 71418; TEL: 318/649-7463.

impossible to maintain proper levels of soil organic matter and provide a good soil structure.

The cover crops used are primarily sudex, corn, and winter wheat. Sudex is planted in the spring, when it reaches a height of 4-5' it is cut down. This can usually be done three times before August. In August, it is cut and turned under in preparation for fall fumigation. Corn and winter wheat are used on ground which will lay out for two years and the spring before fall fumigation sudex is planted.

Prior to fumigation, any additional organic matter should be incorporated along with the cover crop to assure proper decomposition and control of any outside sources of weeds. Rotation in the hardwood seedlings have normally been one year in seedlings and one year in cover crops followed by fall fumigation, This rotation has been interrupted somewhat in that we are now planting about 20 acres on a 2-1 rotation (2 years in seedlings and 1 year in a cover crop). The ground this has been practiced on seems to be holding up very well at this point with no loss of seedling quality the second year. The remaining ground is on a 2-2 rotation.

Weed Control

Weed control is another very important area in hardwood production. There has not been enough research in hardwood nurseries. Much of the work has been trial and error, but a fairly effective weed control program has been established. This program is primarily a zero tolerance weed control program, which consists of a combination of pre-emergence herbicides, post emergence drill spraying, hand weeding, and spot spraying. While it is impossible to maintain 100 percent weed control, it is very important to at least try.

It is just as critical to carry a weed control program over into the cover crop rotation. There are times when it is better, and will save money down the road to cut under a cover crop and replant, rather than carry one through with poor weed control.

Planting

After fall fumigation, all the ground, both fumigated and non-fumigated, which is to be planted is hipped up. Since this is a silt-loam soil, hipping allows quicker field access after a period of wet weather. Before planting, fertilize is added and it is then harrowed in preparation to pulling beds. Once the beds have been pulled, it is ready to plant.

Careful consideration should be given to species placement in the field. Growth patterns of individual species should be taken into consideration when determining placement in the nursery. Species such as green ash, sycamore, Nuttall, etcetera, that exhibit extremely fast initial growth patterns should not be placed adjacent to slower growing species such as water oak and pecan.

Timing of planting is also a factor. Fall planting is done as much as possible. All our white oak species, along with black walnut, water oak , and a couple of others are fall planted.

The majority of our crop, however, is planted in the spring from the middle of March through the end of May. We plant the slower germinating species such as pecan and water oak first and the faster species such green ash and sycamore last. This allows for a more uniform stand during the growing season.

Planting is done on a four foot wide bed with four drills per bed. Most species are planted at 6 to 8 seedlings per square foot. There are a few species which can withstand higher bed densities and still produce quality seedlings. Planting depth is determined by species, ranging from 1/4" for green ash to 1 ½ to 2" for pecan.

Immediately following planting, the beds are rolled and a soil stabilizer along with pre-emergence herbicide, and fungicide is applied. Once the soil stabilizer has cured , it is watered throughly and kept moist to assure uniform germination. The fall planted crop is handled somewhat differently, in that rye grass is broadcast over the beds following planting. In late winter the rye grass is killed and lays downs to provide mulch.

Growing Season

Germination can be erratic in most hardwood species. Sufficient moisture during germination must be maintained or germination will be extended or shut down all together. Again the germination characteristics of species must be taken into consideration. Species such as green ash, cypress, and pecan must be kept relatively moist during the entire germination process, while species such as cherrybark oak and Shumard oak, tend to germinate more readily with minimal moisture.

Once the seedlings have germinated and reached a height of 8-10" a shielded sprayer may be used to control any emerging weeds. This, used in conjunction with 2 or 3 hand weeders, can keep the crop relatively free of weeds.

After germination is complete 15 units of nitrogen along with 2.5 gallons of crop boaster is sprayed and watered in every 2 weeks until seedlings reach a height of 12-14". This usually takes 4 to 6 weeks depending on species. When the seedlings reach a height of 18 to 20" they are pruned back to 12 to 14". This is done to release the slower germinating seedlings and provide a more uniform stand.

Though it is not quite as critical to produce a uniform stand in hardwood it does make them easier to pack and ship. This can be accomplished in a number of ways, through top-pruning, regulating irrigation, fertilization, and undercutting or root pruning.

At Columbia Nursery top-pruning is used more that any other method of height control. As mentioned earlier when seedlings reach a height of 18-20" they are pruned back to 12-14". They are then top-pruned again when they reach a height of around 22" to about 18-20". If another top-pruning is needed they are pruned to 22-24". This will be the last top-pruning and usually occurs toward the end of August. Horizontal root pruning serves two purposes; it stimulates lateral root growth and shuts down top growth.

This method is used primarily on green ash and black walnut. Water and fertilize, when used properly can stimulate or inhibit seedling growth. Care must be taken when using this method not to shut the seedlings down completely. There is a fine line between just enough moisture and not enough moisture. This method when used properly works quite well.

CONCLUSION

Hardwood seedling production must not be categorized into one group. Just as we distinguish between upland hardwoods and bottomland hardwoods we must also distinguish between individual hardwoods. Anyone growing hardwood seedlings knows they each exhibit individual characteristics in the nursery bed just as they do in the field. There should be some form of criteria for hardwood seedling production, but it needs to be backed by research.

Good solid research in the area needs to be expanded and the genetics work which has begun again, needs to continue on past the point where economics may say it is feasible. The nurseries need to be more involved in the seedlings from the seedbed to the field. It is not enough to just grow a quality seedling and say that's where our job ends. Everyone knows that when a planting job fails it is not that the seedlings were planted off site, that they were mishandled, there was drought, flood, or any other act of God; it is because they weren't any good when they got them from the nursery.