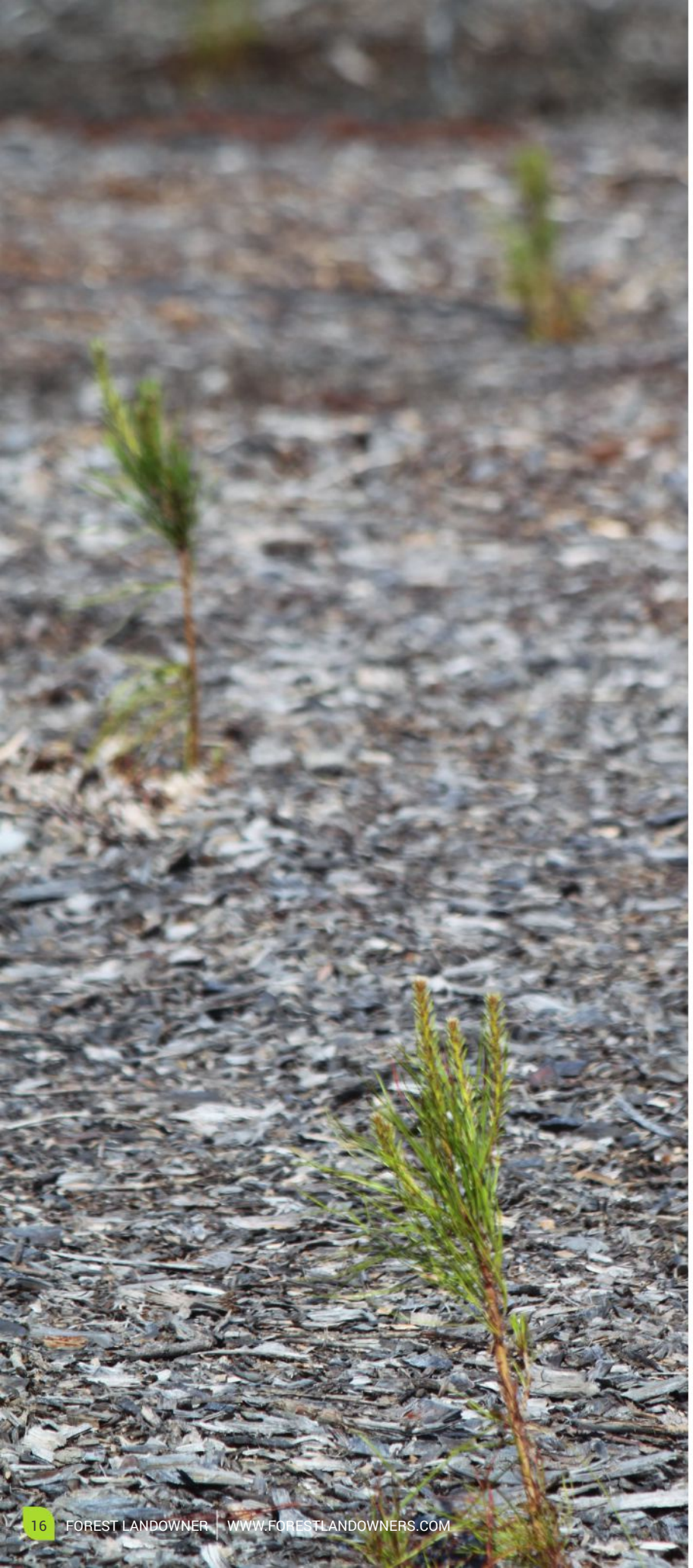
MAKING Sense of the GENETICS Market

Landowners have more choices for loblolly seedlings than ever before. How you decide depends on a number of factors.

By Steve McKeand



Landowners in the southern United States have more options today about what genetics to plant than ever before. Just as farmers select the best variety of corn, wheat, or soybeans to meet their objectives, forest landowners can choose to plant a wide variety of tree genetics.

For loblolly pine, there are hundreds of seedling varieties available with a range of values for traits such as growth rate, stem form, fusiform rust resistance, and wood quality. Most seedlings are open-pollinated (OP) families where seed has been collected from genetically superior parent trees in seed orchards (Figure 1).

Most of the pollen (the male side of the family) comes from the other superior parents in the seed orchard, but we estimate about 30 percent of the pollen comes from non-improved inferior trees from outside of the orchard. About 80 percent of the loblolly pine seedlings available from nursery vendors are OP families, but about 15 percent of the seedlings are specific crosses where a mother tree is pollinated by one other superior parent tree to produce a full-sibling (full-sib or FS) family (Figure 2).

Pine trees produce both female "flowers" (female strobili to be botanically correct) and male "catkins" (male strobili), so full-sib families can be produced between essentially any two mature pines – more on the difference between OP and FS families later.

The availability of so many different families to all landowners is a relatively new phenomenon. Until about 10 years ago, most of the loblolly pine seedling production was from nurseries owned by large forest products companies.

With the shift of land ownership from these large vertically integrated forest products companies to

more forest investment and land management companies, there has been a fundamental shift in the availability of genetically improved seedlings to landowners. When the large forest products companies controlled much of the production of improved seedlings, the best genotypes typically went to their own lands. Companies had long-term investments in developing the genetic resource and recognized the value of genetics for increasing productivity and value of their plantations. They wanted to benefit from growing and harvesting the highest value trees on their own land. While genetically improved trees were sold on the open market, the best genetics were not typically available to other landowners. State agencies also had the best genetics available in their seed orchards, but seedlings were sold as mixtures of families to maintain diversity. This increased diversity came at a cost of reduced genetic gain in the seedlings sold.

Today, essentially all genetically improved pine families are available to all southern landowners, and over the last decade, a true seedling market has evolved. While large forestry companies still grow seedlings for their own use, there are many nursery vendors who sell a full range of genetics to all landowners (Table 1). No nurseries sell poor-quality genetics, but no nursery produces only the top-ranked family for all traits; there is no such family.

First- vs. second- vs. third-generation seedlings

One misconception landowners have is that first-generation seedlings are inferior to second-generation seedlings that are in turn inferior to third-generation seedlings. While it is true the objective of a breeding program is to improve the population from one generation to the next, there is always a range in performance among families within each breeding cycle. There also is substantial overlap among families from one generation to the next. For example, in the NC State University Cooperative Tree Improvement Program Coastal Plain population, we have performance data for first-, second-, and third-generation families. For the 100 top-ranking OP families for stem volume, there were more third-generation families (42) than any others, but there were also 19 second-generation families, and 39 first-generation families. Each of these groups has families that are fast growing with a range of performance for other traits described below.

Rather than choosing families to plant based on the generation

These are the nursery vendors who are members of the NC State University Cooperative Tree Improvement Program. Each one advertises the value of genetically improved loblolly pine to one degree or another. This list is not meant to be comprehensive, but it does illustrate how members of our Cooperative value and market genetics.

ArborGen, Inc.
http://supertreeseedlings.com

Blanton's Longleaf Container Nursery

Georgia Forestry Commission
http://www.gfc.state.ga.us/seedlings/seedlingprices.cfm

International Forest Co.
http://www.internationalforest.co/seedlings.php

Meeks Farms & Nursery, Inc.
http://meeksfarms-nurserys.com/

North Carolina Forest Service
http://store.yahoo.net/nc-forestry/pineseedlings.html

Rayonier, Inc.
http://rayonierseedlings.com/

South Carolina Forestry Commission
http://www.state.sc.us/forest/nur.htm

Virginia Department of Forestry
http://dof.virginia.gov/nursery/index.htm

The Westervelt Company
http://www.westerveltnatresources.com/timber/nursery.cfm

Weyerhaeuser Co.
http://www.weyerhaeuser.com/Businesses/SouthernSeedlingSales

White City Nursery, LLC
https://sites.google.com/summithelicopters.com/whitecitynursery

FIGURE 1

Figure 1: *Seed orchards are collections of parent trees or selections that have been chosen for superior performance for traits such as volume growth, stem straightness, fusiform rust resistance, and wood quality. A typical seed orchard would have 15 to 25 parent trees each with multiple copies (often color coded as shown above in right photo) randomly spaced 30 to 50 feet apart. Parent trees are clonally propagated by taking stem cuttings and grafting them onto seedling rootstocks (left) so that multiple copies (called ramets) can be scattered throughout the orchard. The grafted trees are managed to produce large open crowns to maximize seed production.*

from which they came, landowners should select families based on the performance for specific traits. In the NC State Cooperative, we developed the Performance Rating System (PRS™) about 15 years ago as a user-friendly tool to assist landowners and foresters in making the appropriate choice of genetics to plant to meet their management objectives.

For example, if land is being planted in the Upper Coastal Plain of Georgia, resistance to fusiform rust should be of paramount importance since this is a very high-risk region for rust infection. In contrast, if a plantation is being established in northern Alabama where the risk of rust infection is low, less emphasis can be placed on rust resistance compared to other traits such as volume production and stem quality. Nursery vendors and other members of the Cooperative can provide PRS™ Spec Sheets for families that could be planted in these two different regions (see box for examples).

A True Seedling Market has Evolved in the South

With the increased availability of all loblolly pine genetics to southern landowners, a true seedling market has emerged over the past decade. When a limited number of seedlings of the best families were available to all landowners, there was little price differentiation among families. As is typical in open markets where there is a supply of a valuable product and there is reliable information about those products, a significant price differential for the best seedlings also emerged.

Landowners can pick and choose seedling families that perform at desired levels and are priced at an acceptable amount. Prices per thousand seedlings range from about $50 for average or “run of the mill” open-pollinated families to $229 for the best full-sib families. While there are no poor quality loblolly pine seedlings sold to landowners, not every seedling family can be the best.

The best families often will have volume production values that are twice as high as “run of the mill” OP families, and they will have very straight stems with very low forking and excellent rust resistance. In the Cooperative’s Coastal population, when both the open-pollinated and full-sib families are compared together, 95 of the top 100 families for volume are full-sibs. This is to

FIGURE 2

Figure 2: *Seeds are collected from different ramets of a parent and kept separate to produce a family. Most seed comes from open pollination from other trees in the orchard. If the female flowers were protected from outside pollen with pollination bags (left) and pollinated with specific pollen collected from another parent tree (right), it is a full-sib family. In 2016, over 116 million or 15% of the loblolly pine seedlings produced in the South were full-sib families. (Right photo courtesy of Don Chastain, Timberland Investment Resources, LLC, Charlotte, N.C.).*

be expected since tree improvement foresters only make production crosses among the very best parent trees, and the inferior pollen found in OP families is eliminated.

In addition to excellent volume production, the best full-sib families have much straighter stems and better fusiform rust resistance than the best OP families. For stem straightness, there are 503 full-sib families that rank higher than the best OP family. For rust resistance, there are 293 full-sib families that are superior to the best OP family, and for stem forking, there are 194 full-sib families that rank better than the best OP family.

Tree improvement and nursery programs in the southern United States have changed dramatically over the past few years, mainly to the advantage of all landowners. Land managers have many more options today to pick and choose seedling families with desired performance at prices acceptable to them. My recommendation to landowners is to become as familiar as possible with the genetic options available. Working with a consulting forester, regeneration advisor, or nursery vendor who is a member of one of the tree improvement cooperatives in your region is the best way to assure that the best planting decisions are made for your land.

Landowners have one opportunity to influence the genetic quality of the seedlings planted in a stand. If the wrong choices are made, the landowner will suffer the consequences of those decisions for 25 years or longer. For example, if a fast-growing family is selected, but it has poor stem quality, the plantation may be very acceptable for biomass or pulpwood. If markets or objectives change, then the options are limited when the stand is harvested. A stand with crooked stems or a high frequency of forking will have fewer stems that are suitable for saw timber. As with all forest management, the first rule of forestry is to know your objectives and make decisions that optimize those management objectives.

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