

TREELINES

The Quarterly Newsletter from ArborGen's US Nurseries and Seed Orchards • Spring 2009



SPECIAL ISSUE: MASS CONTROL POLLINATION

When Economic Benefits Matter

As the old saying goes, you reap what you sow.

LANDOWNERS today need real economic benefits and ways to get more volume of higher quality wood off less land. Well, think genetics. It's been estimated that net present values (NPV) of \$50 to over \$300 per acre can be realized across a range of productivity and silvicultural management regimes simply by planting the best genotypes available. Tree improvement has been a standard silviculture tool in advancing Southern pine regeneration for nearly 50 years, and today's superior genetics are the result of not only precise scientific methodology but also good old-fashioned insight from experienced forestry experts. No longer is a pine just a pine – tree pedigrees run from 1st to 3rd generation and elites, and the higher the pedigree, the greater the return on your investment.

Now, for the first time, the superior genetic benefits of mass control pollination (MCP) are available commercially in quantity. ArborGen is offering SuperTree Seedlings MCPs in both bare root and container for first-come first-serve buyers. Before you say "too costly", consider what you'll gain in planting fewer trees per acre and adapting your silviculture to wider rows and targeted trees that grow faster, have less disease and make the best sawtimber. You're going to make that initial extra expense back in maintenance costs, growth and yield – without a doubt.



Bags covering receptive flowers on trees in ArborGen orchard.

Control = Higher Genetic Certainty
MCPs are offspring where pollination is strictly controlled to two known parents, versus open pollinated (OP) trees where only one parent is known. (See page 5.) By controlling pollination, the resulting offspring are better than one or both parents. Even though both MCP and Elite OP seedlings come from second or

third-cycle selected parents, with MCP you are guaranteed to get the gains expected from both parents with minor to no dilution from orchard and wild pollen, which could range anywhere from 20-80 percent and introduce traits that may not be desirable. With MCPs those undesirable traits are excluded and that
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“The dramatic improvement of MCP and varietal trees over open-pollinated trees will result in higher returns and shorter timber rotations.”

— Brad Thompson, Thompson Forest Consultants, Inc., Greenwood, SC

When Economic Benefits Matter

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means significantly less fusiform rust, less forking, straight boles and smaller diameter limbs that self-prune faster and make smaller knots. Picture a row of trees where every tree is of virtually ideal quality, versus a row where only one out of every four or five trees is of the desired quality.

Measure the Value

To measure the true value of MCPs you need to consider the gains in yield, percent sawtimber (ST) and silvicultural adjustments due to greater genetic certainty that will save on establishment cost or will result in a stand that grows a higher amount of ST volume.

Yield: Fewer MCP trees per acre give the same or greater percentage of crop trees. Where traditionally you may have planted 550 seedlings to get 130 crop trees, with MCPs you'll plant only 400-450. That keeps your seedling cost increase to about \$30.00 per acre or less. MCPs also yield a 2- to 5-foot increase in site index (SI) – the average height of the dominant and co-dominant trees in a stand at a given base age, usually 25 years. Average would be from 78 to 82 feet.

Percent ST: MCP trees have proven to average 17 percent more volume, and give about 20 percent ST gains at clearcut than OP trees.

Silvicultural adjustments you can make:

- Mechanical Site Prep – 20 percent cost reduction due to increased row spacing from 12 feet to 18 feet
- Planting – Cost decrease of \$10.00 per acre, less trees per acre and less walking.
- Herbaceous Weed Control
 - » Broadcast – 0 percent change
 - » Strip/6-foot Band – 20 percent reduction/treatment
 - » Spot/6-foot Diameter – 25 percent reduction/treatment

Mixed Planting Options

MCPs also give you new options to increase the number of acres that MCP value is expressed across. Because less selection is needed from MCP than from an OP population, it is possible to consider mixed MCP/OP plantings. In these mixed plantings, MCP is planted at sawtimber spacing in the leave rows, and OP is planted at high density in the planned take-out row. If a fourth row removal is planned, not planting it with MCP allows 25 percent more acres to be planted with the same expenditure of dollars on MCP seedlings. Thus the gains determined in the chart below can be made on 25 percent more acres.

For additional information about mass control pollinated seedlings or to place your order, call 1-888-888-7158. Supplies are limited, so call today.



Cost for Genetics Easily Justified

A 2006 study of the North Carolina State University Tree Improvement Program to estimate genetic gains in yields determined that:

Using an 8 percent interest rate and calculating across the numerous intensities of management and SI values, landowners can easily justify spending up to an additional \$40–\$140 per acre on families that result in a 5-foot increase in site index (SI).

“The potential benefits of investing in the best genetic material for all sites are great, and the costs are minimal. It's a win-win situation for all involved. Landowners should demand the best genetic material and should be willing to pay more for it.”

— Steven E. McKeand, et al., 2006, “What are the Best Loblolly Pine Genotypes Worth to Landowners?”

MASS CONTROL POLLINATED GAINS VERSUS OPEN POLLINATED

GENETICS	THIN VOLUME @ 14-YEAR	CLEARCUT PULPWOOD	CLEARCUT CNS GTONS/AC	CLEARCUT ST GTONS/AC
OP: 535 tpa	46	40	83	20
MCP: 420 tpa	40	18.9	78.6	70.1

Customer Focus: Derek Dougherty, Dougherty & Dougherty Forestry Services

Derek Dougherty, a private landowner and President and CEO of Dougherty & Dougherty Forestry Services, Inc. in Athens, Ga., manages timber for private landowners in Alabama, Georgia, Virginia and the Carolinas. DDFS's unique selling position is focused on promoting "Progressive Forestry on Private Land." As far as Derek is concerned, if your focus is productivity and value, you have to manage the elements that most affect best-return plantation management: genetics, density, nutrient availability and water management.

"The success of your plantation management rests on the selection of the genetic material or seedlings," says Derek. "In the early-to-mid '90s, we planted 2nd generation open-pollinated mixes. In the late '90s we moved to Elite open pollinated (OP) seedlings. In 2004, we planted our first control pollinated seedlings and now plant a mix of MCP and varietal seedlings, using only a very few OP seedlings."

Derek's focus is on growing quality sawtimber and he sees MCP as a cost effective tool to increase the percentage of sawtimber potential trees in his young plantations. Derek's oldest MCP plantation is now in its sixth growing season and his oldest varietal plantation is in its third growing season. "We have planted hundreds of thousands of MCP and varietal seedlings and the results are clearly evident already. We've almost eliminated fusiform rust from our young plantations, and we have greatly increased the straightness and growth."

As a direct result of the quality of seedlings available from ArborGen, Derek has been able to adapt his silviculture in multiple ways. "With a commitment to quality herbaceous weed control after planting, we have always planted a lesser number of trees per acre than many landowners. Access to ArborGen's MCP and varietal seedlings has allowed us to lower this number even more. We now plant 400-450 seedlings per acre with the confidence that we will have a plantation in place capable of providing the 150 to 200 quality crop trees that we are looking for at final harvest. We improve that confidence by planting containerized seedlings to make sure survival less of an issue. The



Derek Dougherty with a stand of five-year-old MCP from ArborGen, Walton County, Georgia.

containerized seedlings that we get from ArborGen also allow us to fall plant – an important option for us that allows us to move up our site preparation schedule and access chemical and mechanical contractors when they are more available in May, June and July."

DDFSI often plants on a wider than conventional spacing as well. "As our seedling quality options get better, our options for management increase," says Derek. "The better form and branch control of the MCP and varietal seedlings has allowed us to increase our row spacing to as much as 18 to 20 feet between rows, without concerns of branches becoming

too large. Wider row spacing means fewer passes across the tract for all row-oriented activities including shearing, bedding, banded herbaceous weed control and even the planting labor itself. Fewer passes means less cost, and this savings is used to cover the additional cost of the better seedlings. In the end, we get a plantation composed of better quality seedlings at a conventional price, and with the wider rows, we have the ability to complete pure selection thinning versus row thinning where others lose a portion of the quality trees with each row removal."

Most recently, DDFSI has moved to
(Continued on page 4.)

Varietal Forestry: The Next Giant Step for Forestry

Over the last five decades, tree improvement programs in the southeastern U.S. have identified the best sets of parent trees from which to produce quality seedlings. Mass control pollination is one way to protect these superior genetics, but although the offspring are from the chosen mothers and fathers, they can still exhibit different traits, just like brothers and sisters in the same family of humans will. Varietal forestry will take the protection of these superior genetics to the next level.

How does varietal forestry work?

Special tissue samples from the seeds that produced the “best” individuals are stored in a freezer (cryostored). After the best varieties have been identified in field trials, such as those of the ArborGen Testing Service, some of the frozen tissue of selected varieties is pulled out of the freezer to make millions of embryos (seeds). These embryos are germinated and grown into container or bare root seedlings that look identical to those being planted today. These seedlings, however, are far from being the same as today’s seedling lots. Each lot of varietal seedlings has the same set of superior genes, thus, every seedling has the potential to produce a high quality, rust-free, sawtimber tree if cultured correctly. In the near future, MCP and varietal stands will be the norm instead of OP stands that face disease risk and inferior growth.

Making the forest investment worthwhile.

Early yield trials indicate that with varietal forestry, it will be possible to attain the production levels needed to practice forestry on land that costs between \$1,500 and \$3,000 per acre. This may actually make forestry investments more attractive because an investor can expect to earn a higher return from his forest investment and also gain from any unique appreciation in the land on which his forests are planted. Keeping forestry an attractive investment proposition is as important for the environment as it is for the individual investors. Without economic incentive, landowners may well succumb to the temptation of high land prices for development purposes. Although foresters may not yet have seen the accomplishments of corn growers – who went from producing 40 bushels an acre to more than 200 bushels an acre, varietal forestry is quickly moving yield, quality and value in that direction.

The ArborGen Testing Service has now tested more than 9,000 varieties produced from the best-of-the-best parents. Testing for varieties with improved wood properties, as well as increased growth, stem quality and disease resistance is expected to continue into the future.

Start improving your returns today. SuperTree Seedlings has a limited amount of varietal seedlings available for this planting season. Call 1-888-888-7158 today to get more information or order yours.



Customer Focus

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some more advanced wide row spacing systems with multiple levels of genetics deployed on each site. “To further control cost and focus on the crop trees, we now establish plantations with two levels of genetic improvement present. Planting in rows 20 feet apart, we first plant containerized varietal or MCP seedlings on a 15- to 20-foot spacing within the row and then plant two less expensive, but quality, OP material seedlings between the best seedlings. This allows us to further focus our investment dollars on the crop trees by going back and completing advanced

treatments such as tip-moth control or single tree fertilization on only the best seedlings.”

Derek has been buying SuperTree Seedlings since 1993, and he likes the fact that he can benefit from the insight that has gone into getting the genetics right. “I purchase trees from ArborGen because they understand the traits that I am interested in and have the insight in their genetics to provide those seedlings. I like the fact that I can get containerized seedlings from them that are ready in the fall, and I work over many states and like the fact that they have seedlings specifi-

cally chosen for each planting zone that I work in.” Derek believes that building on the chosen genetics and combining them with quality, focused silviculture gives his clients a competitive and progressive edge.

Derek received his degree in forest resources from the University of Georgia. His firm offers timber sale management, inventory and appraisal services, and plantation establishment and maintenance services. He has published many articles and completed presentations on genetic options, including MCPs and varietals. He can be reached at 1-888-285-0947.

The MCP Process: Don't Try This at Home!

MCP has its roots in the control pollination process that has been used in pine tree improvement for over 50 years, which began with the selection of trees found in natural stands that were straight, disease resistant and fast growing. Liz Bupp, ArborGen Orchard Supervisor, explains, "The trees that were selected *looked* good, but because good looks don't guarantee superior genetic quality, they had to be 'tested' and that begins with control pollination."

With the aid of aerial lifts to get to the tops of the trees where most of the flowers are found, control pollinations (crosses) are done by placing a bag over the flowers (female parent) of one tree and injecting pollen (male parent) collected from another tree into the bag. This is labor intensive and done carefully to ensure the exact mother and father of each seed in the cross is known. The seeds are then grown into seedlings and tested to see if the desirable traits indicated by the good looks are, in fact, passed along to the offspring. Trees that test the best are then grafted into seed orchards.

"MCP is a large-scale adaptation of the control pollination process," says Liz. "This allows us to collect pollen from specific trees that have the superior traits to create crosses of the highest genetic quality. Typically, we put up over 100,000 bags and collect over 100 gallons of pollen per season using dozens of lifts. Weather is always tricky. High winds, heavy rains and freezes keep it interesting and can aggravate you to no end during pollination season." Besides the logistical challenges, MCP also requires a thorough knowledge of flowering and pollen ripening characteristics of the trees, pollen collection and

an understanding of how to dry, process and store all that pollen.

ArborGen has five orchards across the south where MCP operations are conducted, which spreads the risk from natural disasters and ensures the best genetics for every planting zone.

standard traits like growth and rust resistance, but also in branch size, branch angle and stem growth stability. The data behind the progeny tests helps to determine how much gain you get from specific crosses.

"It takes two years to get a seed and another year to get a seedling from each

"All these years of selecting, planting, testing, documenting and doing it all over again, has resulted in the excellent quality MCPs you can buy today."

— Phil Dougherty, ArborGen Pine Development Project Leader

We take it one step further

SuperTree Seedlings' MCPs are the culmination of crosses that began with MeadWestvaco in the '90s, which used a G&Y (growth and yield) model to make timber yield estimates and showed that controlled pollination gave increased growth rate with the same amount of sawtimber for a shorter rotation.

Phil Dougherty, ArborGen Pine Development Project Leader, explains, "In general terms, MCP means that even if you just did crosses between elite parents without any other considerations, the expected gains would be large; i.e. you have much higher genetic certainty in the population of seedlings you plant. But our crosses are not just based on elite parent breeding value (BV). We've spent nearly 16 years rating each parent's genetic strengths and weaknesses and then recommending breeding schemes so that the parents complement each other and produce the best progeny for outplanting."

This complementary breeding approach leads not only to improvement in

cross. All these years of this selecting, planting, testing, documenting and doing it all over again has resulted in the excellent quality MCPs you can buy today. When you've got these great genetics, it just makes sense to protect that family from being diluted with outside pollination. Even in a top quality seed orchard, some of the flowers would be pollinated with pollen of unknown genetic quality from outside the orchard, with dilution ranging anywhere from 20-80 percent. You need to capitalize on the good genes we've developed in the mother and the father. We go to the trouble to mass pollinate to keep the genetics pure," says Phil. "In the end your value comes from increasing growth yield through putting a greater percentage of that yield on the high-value products of timber. The wood that you're growing from those MCPs is good for solid wood products like 2x4s."

Reap the rewards of ArborGen's hard work by calling SuperTree Seedlings and ordering your MCPs today. Supplies are limited, so call 1-888-888-7158 today.



The MCP Process (from left): Receptive flowers, male pollen cluster, cable ties on bags, pollinating the bags.



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Inside:

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Pine and Hardwood Seedlings Available

Our Nurseries and Sales Offices

By reforesting with pine and hardwood SuperTree Seedlings, you will enhance your land's value, promote wildlife, protect soil and water and ensure our future generations have abundant raw materials and a healthy environment. Call the toll-free number of the nursery or sales office nearest you or call toll-free 888-888-7158.

Alabama SuperTree Nursery 800-222-1280	Selma, AL
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