
Forest Stewardship Workshop & Tour: *Klausner Lumber One, LLC*



March 31, 2015
9:00 am – 3:00 pm

Agenda:	9:00 am	Sign-in, meet & greet at <u>Suwannee River State Park</u>
	9:30 am	Welcome, Introduction , Brian Cobble, Florida Forest Service and Chris Demers, UF/IFAS School of Forest Resources and Conservation
	Team 1	
	9:45 am	Depart in vans/carpool to Klausner Lumber One Mill Tour
	Team 2	
	9:45 am	Break into 2 groups for presentations
	10:00 am	Presentation 1: Forest Management Considerations for Sawtimber Production , Brian Cobble; Suwannee County Forester
		Presentation 2: Why Seedlings and Genetics Matter on Growing Sawtimber , Wayne Bell, International Forest Company
	10:45	Break/ Rotate Teams (repeat above schedule)
	11:30	Team 2 Lunch
	12:00 pm	Team 1 Lunch
	1:00	Team 1 presentation rotation, Team 2 depart for mill tour
	3:00	Fill out evaluations, adjourn



KLAUSNER

UF IFAS
UNIVERSITY of FLORIDA

SFRC
SCHOOL OF FOREST RESOURCES
& CONSERVATION



Funding for Florida's Forest Stewardship Program is provided by the USDA Forest Service through the Florida Department of Agriculture and Consumer Service's Florida Forest Service and the Florida Sustainable Forestry Initiative Implementation Committee.

Table of Contents		Page
Assistance		
Tour Contacts		3
Florida Forest Stewardship Program Fact Sheet		5
Tree Farm Program Fact Sheet		6
Publications		
Thinning Southern Pines – A Key to Greater Returns		7
Selecting Planting Stock – A Decision that Lasts a Rotation		12
Improved Quality Pine Seedlings: What to Expect at Early Ages		14
Why Container Seedlings?		18
UF/IFAS Forest Stewardship Publications		20
Note space		21

Resource Contacts

Wayne Bell

International Forest Company
1265 GA Hwy 133 N
Moultrie, GA 31768
(229) 985-0321
wbell@internationalforest.co

Chris Demers

Forest Stewardship Coordinator
UF/IFAS School of Forest Resources and Conservation
PO Box 110410
Gainesville, FL 32611
(352) 846-2375
cdemers@ufl.edu

Brian Cobble

Suwannee County Forester
Florida Forest Service
7620 133rd Road
Live Oak, FL 32060
(386) 364-5314
Brian.Cobble@freshfromflorida.com

Elena Toro

Extension Agent II
UF/IFAS Suwannee County Extension
1302 11 St SW
Live Oak, FL 32064-3696
(386) 362-2771
etoro@ufl.edu

Questions about this or other Forest Stewardship Program activities can be directed to Chris Demers at (352) 846-2375 or by email at cdemers@ufl.edu. For more information and events see the UF Forest Stewardship web site at:

http://www.sfrc.ufl.edu/forest_stewardship

Klausner USA

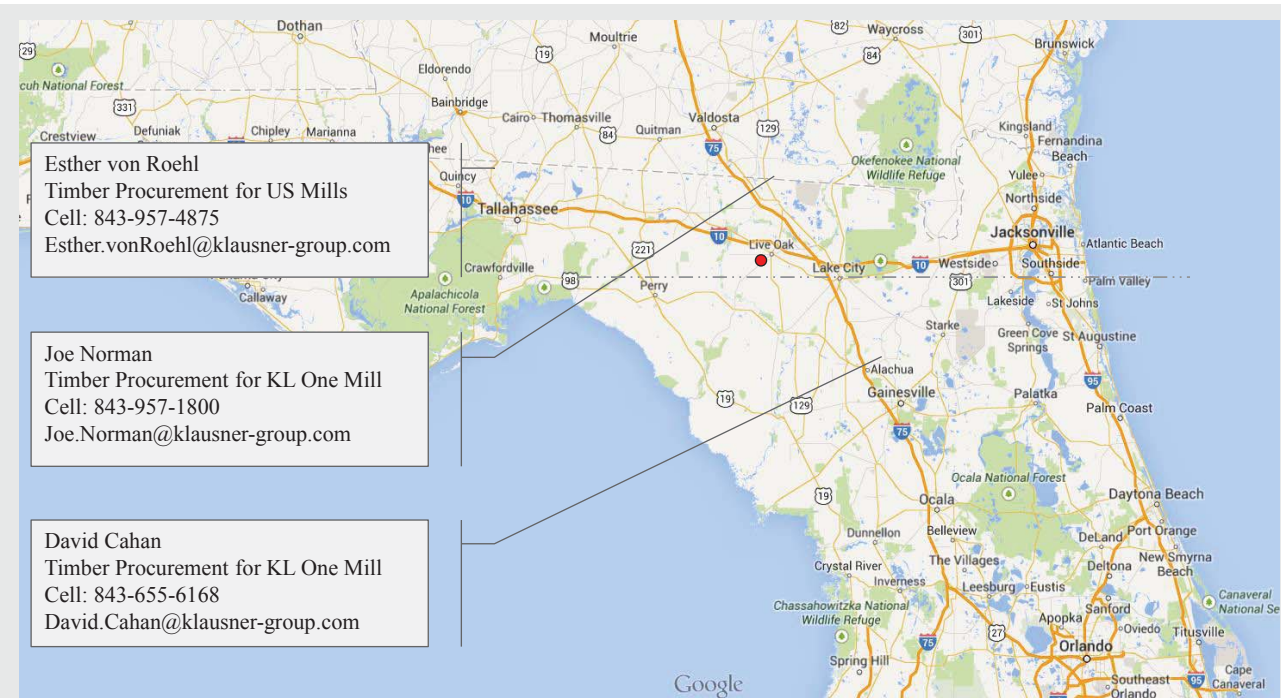


All information included in this presentation is absolutely confidential.

1



Timber Procurement KL One Mill



Esther von Roehl
Timber Procurement for US Mills
Cell: 843-957-4875
Esther.vonRoehl@klausner-group.com

Joe Norman
Timber Procurement for KL One Mill
Cell: 843-957-1800
Joe.Norman@klausner-group.com

David Cahan
Timber Procurement for KL One Mill
Cell: 843-655-6168
David.Cahan@klausner-group.com



Florida's Forest Stewardship Program

Forest Stewardship is active management of forests and related resources to keep these lands in a productive and healthy condition for present and future generations, and to increase the economic, environmental and social benefits of these lands. Forest Stewards are landowners who manage their forestlands on a long-term basis by following a multiple resource management plan.



The Forest Stewardship Program addresses the improvement and maintenance of timber, wildlife, soil and water, recreation, aesthetics, as well as forage resources.

Eligibility

Private forest landowners with at least 20 acres of forest land and have a desire to manage their ownerships according to Stewardship principles can participate in the Forest Stewardship Program. Also, adjacent landowners, with similar management objectives, may combine their holdings to meet this acreage limitation.

Benefits to Landowners

- A customized management plan that is based on the landowner's objectives. The plan will include forest stand characteristics, property maps, management recommendations, and a five-year time line for future planning. This plan also serves as documentation of active management on the property that may help reduce tax liability.
- An opportunity for future public recognition as a certified "Forest Steward".
- Educational workshops, tours and a quarterly Stewardship newsletter developed and distributed by the University of Florida, IFAS Cooperative Extension Service.

Getting into the Program

Contact your local Florida Forest Service County Forester and tell them that you would like to have a Forest Stewardship Plan prepared for your property. More information and application here:

<http://www.freshfromflorida.com/Divisions-Offices/Florida-Forest-Service/For-Landowners/Programs/Forest-Stewardship-Program>



Tree Farm Program

The American Tree Farm System® is a program of the American Forest Foundation and was founded in 1941 to promote the sustainable management of forests through education and outreach to family forest landowners. Nearly 26 million acres of privately owned forestland and 80,000 family forest landowners in 46 states are enrolled in this program and committed to excellence in forest stewardship. About half of all Tree Farms are located in the South.

Eligibility

Private forest landowners with at least 10 acres of forest land and have a desire to manage their ownerships according to sustainable forestry guidelines can participate in Tree Farm.

Benefits to Landowners

Tree Farmers are good stewards of their forestland committed to protecting watersheds and wildlife habitat and conserving soil. They manage their forestland for various reasons, including timber production, wildlife, recreation, aesthetics, and education/outreach. Tree Farmers receive many benefits:

- Representation on local, state, and federal issues affecting forestland owners.
- Exposure to a network of forestry professionals and landowners committed to sustainable forestry.
- Access to seminars, field days, and workshops to help manage their Tree Farm even better.
- Certification that meets international standards of sustainable forest management.
- Participation in local, state, regional, and national Outstanding Tree Farmer of the Year awards and recognition.

Getting into the Program

Contact your local Florida Forest Service County Forester and tell them that you would like to join the Tree Farm program. More information here:

http://www.floridaforest.org/tree_farm.php

Thinning Southern Pines - A Key to Greater Returns¹

Chris Demers, Michael Andreu, Babe McGowan, Alan Long, and Jarek Nowak²

Many landowners plant pines with the intention of harvesting them at some point in the future. When pulpwood markets are favorable, a complete stand harvest within 15 to 20 years is possible and may bring an acceptable return. However, longer rotations can bring higher financial returns on larger diameter trees if landowners are willing to begin thinning their pine stands when trees are 10 to 15 years old. Pine sawtimber, poles and/or plylogs are most often the forest products with the highest value and, if economic returns are a priority, the most desirable products to come out of a timber stand. Thinning is a partial tree harvest in an immature stand to maintain or accelerate diameter growth of the remaining trees. If it is done properly, thinning can bring substantially higher revenues when trees are harvested at 25 to 40 or more years of age. Trees will respond to thinning best if they are thinned before 16 or 17 years of age.

The increased diameter growth after thinning results from the greater availability of light, water, and nutrients to the remaining trees. Ideally, the best and biggest trees should be retained to assure the most rapid increase in timber value. For best results, thinning should favor the tallest, best-formed trees over those that are overtopped, crooked, forked, diseased or otherwise undesirable. Timberland owners who wish to harvest high-value sawtimber-, plylog- or pole-sized products at the end of the rotation should consider thinning a necessity.

For the landowner, thinning can bring

1. increased return on investment from the sale of higher-value forest products;
2. periodic income from the multiple harvests that lead to those higher-value forest products;
3. improved access for equipment, people and wildlife;
4. a healthy, vigorous forest with less risk of insect infestation, destructive fire, and wind damage; and
5. enhanced wildlife habitat with increased herbaceous ground cover

Before describing specific methods of thinning, we will review the underlying concepts of stand density, crown position and forest health. These will dictate if, when, and how to thin.

Stand Density

Stand density describes how much a site is being used by trees and how much the trees are competing with each other for the site's resources (water, light, nutrients, space). At high densities, the growth rates of individual trees slow down because there are more trees competing for the site's limited resources. Trees are usually thinned to achieve a particular density target.

Measures of Density

Trees per acre. In single-species, even-aged stands of known age, site quality, and history, the number of trees per

1. This document is SS FOR24, one of a series of the School of Forest Resources and Conservation, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. First Published: March 2005. Reviewed December 2006 and April 2010. Revised July 2013. Please visit the EDIS website at <http://edis.ifas.ufl.edu>.
2. Chris Demers, forest stewardship coordinator, School of Forest Resources and Conservation, Michael Andreu, associate professor, School of Forest Resources and Conservation, Babe McGowan, consulting forester, McGowan Forestry Services, Alan Long, former professor, School of Forest Resources and Conservation, and Jarek Nowak, Florida Forest Service, Tallahassee, FL.

acre is a useful measure of stand density. Typical densities in plantations range from 200 to 800 trees per acre.

Volume per acre. Because many management objectives relate to wood volume, it is often used as a measure of density. Stand volume is generally expressed as cubic feet (solid wood), board feet, or cords per acre. A cord is 128 cubic feet of stacked roundwood (whole or split, with or without bark) containing wood and airspace; an example of a cord is a stacked pile of firewood 4 ft high x 4 ft wide x 8 ft long. Tons per acre is a weight measure that is derived from volume. Tons is the unit of measure most commonly used to buy or sell wood.

Basal Area. Basal area is a measure of stand density developed by foresters. It is the total cross-sectional area of tree stems in a stand, at breast height (4.5 feet above the ground), measured in square feet per acre. Basal area (BA) of a single tree in square feet is calculated using the formula:

$$BA = 0.005454 \times d^2$$

Where: d = diameter (inches) of the tree at breast height (often abbreviated as “DBH”).

Tree Crown Position

Thinning reduces stand density by targeting trees belonging to different tree crown classes. (Tree crown is composed of all the live branches of the tree.) Each tree class is described by the vertical crown position of its members relative to trees of lower or higher classes. Most planted pine stands have an even-aged structure, which means there is little or no difference in the age of the trees. However, as an even-aged stand grows, the trees compete for site resources and begin to differentiate in height and diameter. As the level of tree competition increases over time, individual tree growth slows down. This growth deceleration happens at different rates for different trees due to genetic, microsite and other differences. In the absence of thinning, the weakest and slowest-growing trees die and provide more room for larger and healthier neighbors. The variation in tree growth results in four distinct tree crown classes:

1. Dominant trees:

- crowns extend above the main tree canopy layer
- crowns receive full sunlight from above and the sides
- crowns are large and well-developed
- characterized by large diameters and exceptional tree vigor

2. Codominant trees:

- crowns form the main canopy layer
- receive sunlight from above but are restricted at the sides
- have medium-sized crowns and diameters

3. Intermediate trees:

- crowns reach only to the lower part of the main canopy
- receive sunlight from above only partially, if at all
- have small, crowded crowns and small diameters

4. Overtopped (suppressed) trees:

- crowns are entirely below the main canopy
- receive no direct sunlight
- are usually the smallest trees with poorly developed crowns
- show very low vigor

Forest Health

Forest health is the focus of forest management and the purpose of thinning. The primary purpose of thinning is to remove poorly performing trees and leave a healthy, vigorous stand. A healthy forest produces more tons of valuable timber per acre resulting in more tons of higher quality wood available to sell. The various insects and diseases that affect pine stands in the South have evolved to exploit unhealthy, stagnated, or damaged trees that are stressed. Healthy pine stands resist damage from insects, disease and wind. If done early in the pines' development, thinning is an important tool to prevent problems with insects, diseases, or other stresses such as wildfire or strong winds.

Fusiform Rust

Fusiform rust is a native, fungus-caused disease that deforms and kills pines. Since the late 1950s, it has increased to epidemic proportions in slash and loblolly pine plantations throughout the South. This disease was first reported in the early 1900s and was neither widespread nor prevalent at that time. The spread of fusiform rust increased as the acreage of young, intensively managed pines increased across the South. The fungus causing fusiform rust is greatly favored in young, rapidly growing pine plantations of slash and loblolly pines, especially when established in high rust hazard areas and in close proximity to oaks, especially water oak, which are alternate hosts for the fungus. Oak abundance generally increases in areas where fire is absent. Most stems infected with fusiform rust disease should be removed in a thinning. Larger diameter stems with minor disease on branches can continue to have good growth rates and withstand high winds after thinning. If the stem infection rate of a stand exceeds 50%, the best option may be to clearcut and regenerate with genetically improved, rust-resistant pines. However, if there are at least 150–200 healthy, well-formed trees per acre, removing the diseased trees and retaining the healthy ones

is usually the best option. If there is an abundance of red oak species, especially water oak, in surrounding stands, they should be reduced if possible. A professional forester can help you make appropriate management decisions to minimize or deal with problems associated with fusiform rust. More information about this disease can be found at http://www.floridaforestservice.com/publications/fh_pdfs/fusiform_rust_of_pines.pdf.

Southern Pine Beetle

Southern pine beetles (SPB) are native, aggressive insects that live predominantly in the inner bark of pine trees. Trees attacked by SPB often have hundreds of light-colored, dime-sized resin masses (i.e., pitch tubes) on the outer tree bark. SPB feed on living bark tissues where they construct winding, S-shaped galleries on the inside of the bark, which can effectively girdle and kill a tree. In addition, SPB carry and introduce blue-stain fungi into trees. These fungi colonize the water-conducting tissue and can block water flow within the tree. Once SPB have successfully colonized a tree, the tree generally will not survive, regardless of control measures. An important way to prevent SPB infestations in pine stands is to maintain high tree vigor. This can be achieved by thinning dense stands to a basal area of 80 sq. ft. per acre or less to reinvigorate tree growth. More information about SPB and its control can be found at <http://edis.ifas.ufl.edu/IN333>.

Cost-share assistance for thinning pine stands, prescribed fire and other treatments is available through the Florida Forest Service's Southern Pine Beetle Assistance and Prevention Program: http://www.floridaforestservice.com/forest_management/fh_insects_spb_prevention_program.html

Annosum Root Rot

Loblolly and slash pine are particularly susceptible to this disease, which may be scattered through a stand or occur in pockets of dying or dead trees. Trees generally yellow and lose needles as they die from this disease, although they may just turn red in a short period of time. Dead trees gradually fall over from a loss of root support. Wind-blown fungus spores from nearby infection centers generally enter a stand by landing on freshly cut stumps or wounds during the colder months of the year. The stump and subsequent root infections spread to adjacent trees through root contact. The disease is most prevalent on well-drained sandy soils with higher pH, such as those found on old agricultural fields. Prevention measures include prescribed burning during winter months before thinning to eliminate the spore-producing conks, thinning in high hazard areas

during summer, and treating freshly cut stumps with borax immediately after thinning. More information about this disease is at: <http://www.freshfromflorida.com/pi/enpp/pathology/pathcirc/pp398.pdf>

When and How Much to Thin Timing

The first thinning should take place shortly after the crowns of the trees start to close (tree branches of neighboring trees begin to touch each other). This is when diameter growth will begin to decrease due to the trees' limited ability to capture sunlight, which is needed to produce the carbohydrates necessary for diameter and volume growth. An important indirect measure of a tree's ability to capture sunlight is *live crown ratio*. Live crown ratio is the percentage of a tree's height occupied by branches with green needles. In southern pines, optimum growth and vigor are maintained when the live crown makes up at least 40% of tree height (a live crown ratio of 40% or higher). Thinning is most beneficial for stand growth before the average live crown ratio falls below 40%.

Another factor that influences thinning decisions is the marketability of the removed trees. The first commercial thinning should remove pulpwood-size trees and perhaps some chip-and-saw-size trees, if they are poorly formed or diseased. Pulpwood logs must be at least 10.5 feet long and 2–3 inches in diameter at the small end; some local markets require larger log sizes. To meet these minimum specifications, trees must be about 16 feet tall and have an average DBH of at least 5 inches before they are cut. It may be necessary to thin smaller trees if the average live crown ratio of the stand is below 40% and trees do not grow at least 5% in diameter per year. With the demand for woody biomass on the rise in some regions for energy production, these trees may have a market. Otherwise, "pre-commercially" thinned trees are usually left on the ground to decompose. In this case, thinning should be regarded as an investment in the quality of the stand for the future, when final harvest returns may justify the operation. See <http://edis.ifas.ufl.edu/fr243> for information on pre-commercial thinning loblolly pine.

Thinning Intensity

The number of trees to remove depends on the initial stand density, site quality, and management objectives. For timber objectives, a thinning should reduce stand density to a level that maximizes individual tree growth without sacrificing full utility of the site. Density and stocking should be approached from the quality of the residual stand first; and

second, the density of the residual stand. Depending on the site, the density and quality of the trees in the stand you are working with, and your management objectives, the residual basal area after the first thinning will usually fall between 45 to 85 square feet per acre of the very best trees capable of producing a higher-value product. These will be the healthiest, best-formed trees in the dominant and co-dominant crown classes. A suggested rule of thumb is to use basal area as a result, not a target. Basal area does not take into account the age of the stand, site productivity, and tree health and quality. Focus growth on the best trees in the stand and the basal area will follow.

Thinning, especially when followed by prescribed fire, can be great for wildlife habitat. Thinning allows more sunlight to reach the forest floor, encouraging the growth of herbaceous plants and shrubs, which provide food and cover for many upland wildlife species in the southeast. Subsequent thinnings and a prescribed fire regime during the rotation will promote an open tree canopy, diverse groundcover, and productive wildlife habitat. See <http://edis.ifas.ufl.edu/uw132> for more information on the effects of fire on wildlife habitat.

How to Thin

Most producers use a combination of thinning methods to reach economic and/or wildlife habitat objectives. No matter which thinning method you choose, avoid thinning during times of drought or extreme wet weather to prevent damage to the site, and take care not to damage residual trees during logging. When trees do become damaged (frequently, for instance, the “bumper” or “turning” trees at the ends of thinned rows suffer some damage), they should be removed at the end of the logging operation. Landowners are encouraged to consult with or hire a professional forester to assist with thinning and other forest management activities. See <http://edis.ifas.ufl.edu/fr125> for tips on selecting a consulting forester.

Combine Row and Selection Thinning

Although most discussions about thinning southern pines are about which rows to thin, the focus should be on what comes out of the remaining rows. Modern equipment, though large, is capable of taking out trees in the rows between cut rows, as in a 5th or 7th row thinning. Generally, the further apart the cut rows, the better. Think of the cut rows as access for the harvester to cut selected trees out of the remaining rows. It is best to remove trees based on selection thinning from fewer cut rows rather than taking

out every 3rd or 4th row. The first thinning is the most important thinning and sets the growth rate for the rest of the rotation. Properly executed thinnings consistently produce higher valued products, and thus more revenue. In addition to revenue goals, thinning greatly enhances wildlife habitat by providing light needed for important food plants to grow. Removing every 3rd or 4th row is essentially clearcutting 33% or 25% of the stand without regard to quality, and leaves only 66% or 75% of the stand to select from. Unless there is excessive disease or extreme variability in density (see fusiform rust guidelines above), this should be avoided. Leaving the trees distributed over a larger portion of the stand can be much more profitable in the long term because you can select your best trees to grow into larger, more valuable products.

The premise for thinning is simply to take out the poor trees and leave the healthy crop trees for potential future harvest. Trees that are diseased, crooked, forked, suppressed or otherwise of poor quality or health should be removed in the first thinning. For best results, hire a professional forester to mark every thinning. If marking is not feasible for some reason, closely supervise each thinning, but especially the first, to ensure contractual guidelines are followed. Do not assume the logger or harvester operator will leave the trees most appropriate for the long-term health and productivity of the stand.

Conclusion

Thinning is an important silvicultural practice that redistributes the growth potential of the site to the best trees. Diameter growth rates are maintained or increased on residual trees after thinning, which increases the return on investment from higher-value trees. Biologically, thinning accelerates stand development by favoring the tallest, best-formed trees over those that are diseased, overtopped, crooked, forked, or otherwise undesirable and likely to die on their own if left in the stand long enough. In addition, thinning provides periodic income, improves access for equipment, recreation and hunting, and creates a generally healthier stand. Thinning is also beneficial for wildlife, especially when combined with prescribed fire or herbicide use to control competing vegetation. By allowing more light to reach the forest floor, thinning promotes growth of plants important as food and/or cover for wildlife species. Landowners are encouraged to consult with or hire a professional forester to assist with thinning and other forest management activities.

References

Davis, L.S. and K. N. Johnson. 1987. *Forest Management*. McGraw-Hill Publishing Co., NY. 790 pp.

Harrington, T. B. 2001. *Silvicultural approaches for thinning southern pines: method, intensity, and timing*. Georgia Forestry Commission, Publication #FSP002. 17 p.

Harrington, T. B. 2001. *Silvicultural basis for thinning southern pines: concepts and expected responses*. Georgia Forestry Commission, Report #FSP001. 13 p.

Meeker, J. R., W. N. Dixon, J. L. Foltz, and T. R. Fasulo. 2004. *Southern Pine Beetle, Dendroctonus frontalis Zimmerman (Insecta: Coleoptera: Scolytidae)*. EENY-176 Entomology and Nematology Department, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. 6 pp.

Smith, D. M., B. C. Larson, M. J. Kelty, and P. M. Ashton. 1996. *The Practice of Silviculture: Applied Forest Ecology*, 9th ed. John Wiley and Sons, Inc. New York. 560 pp.

Schmidt, R. A. 1998. *Rust Disease of Southern Pines: Biology, Ecology and Management*. Bul. 903. School of Forest Resources and Conservation, University of Florida, Institute of Food and Agricultural Sciences, Gainesville. 8 pp.

Williston, H. L., W. E. Balmer, and D. Tomczak. 1998. *Managing the Family Forest in the South*. Management Bulletin R8-MB 1, USDA Forest Service. Atlanta. 92 p.



International Forest Company, Inc.
1265 Ga. Hwy. 133 N.
Moultrie, GA 31768-7165
800-633-4506/www.internationalforest.co

Selecting pine planting stock – a decision that lasts a rotation

Availability of pine seedlings for reforestation has moved from a low cost, low genetic gain model to one where genetic gain is recognized as a key driver of value. There are many different options on where to secure planting stock. Landowners are urged to make informed decisions on planting stock selection. Their choices will influence the productivity and profitability of their land over the next rotation.

A key change in seedling markets today, is that the majority of seedlings are produced and marketed by stand-alone nurseries or biotech companies rather than as part of large vertically integrated forest product corporations. One result of this change is the highest gain genetics can now be made available for sale to independent landowners as well as large forest land management organizations.

Tree improvement of loblolly pine commenced just over 60 years ago. Through working with regional germplasm of loblolly pine significant improvement has been made in the growth and form of pine plantations as well as a reduction in the incidence of fusiform stem rust through the selection of trees with desirable characteristics. The first significant product that the tree improvement programs brought to the forest industry was a reliable source of improved pine seed produced in seed orchards. Naturally produced orchard seed is referred to as Open Pollinated (OP) because although we know the identity of the mother tree, the pollen source is unknown.

As recently as ten years ago it was very common to purchase seedlings of “Seed Orchard Mix” but as landowners began to recognize the value of enhancing the uniformity of plantations, most seed is now available as a family (that is seed with a single female parent). Unfortunately the exact genetic identity, and performance, of many seedlings is never fully disclosed to the landowner.

Each pine seedling produced from a family has a unique assortment of genes that will drive the expression of its physical appearance. Any stand of pine trees produced from open pollinated seed orchard seed will show diversity in the size, growth and appearance of the trees. Trees are like agricultural crops, when we have greater uniformity within a plantation, we can achieve greater productivity and harvesting efficiency. To illustrate this you can think of a stand of trees with a range of heights, as the plantation matures the larger trees shade the smaller ones eventually leading to suppressed growth or death. The dominant trees develop heavier branches and greater taper resulting in a broad range of stem sizes at harvest. Plantations that lack uniformity (due to inferior genetics or poor silviculture) will have reduced harvest value due to the competition induced mortality of suppressed trees. The uniformity of pine plantations can be enhanced by planting Controlled Mass Pollinated (CMP) seedlings and using the best possible silviculture before and after planting. CMP seedlings are produced by the controlled crossing of superior parents from the genetic improvement program. Parents of complementary traits are bred together so that these attributes can be expressed in the offspring. Because CMP seedlots are comprised of a single female and a single male parent the seedlings are full siblings and express greater uniformity in field growth. CMP crosses are specifically selected to provide faster growth, enhanced disease resistance, straighter stems and desirable branching characteristics that assure higher sawtimber value. CMP seed can reliably be generated in large quantities to supply seedlings that attend to the unique site and product needs of clients.

When selecting planting stock we have two major decision points:

- ☒ Bareroot or Containerized Planting Stock
- ☒ Open Pollinated or CMP Genetics

Planting Stock Selection

Despite the loss of root mass, under ideal planting and growing conditions, very good survival can be achieved with bareroot seedlings. However, in drought years and in certain soil types survival of bareroot seedlings is typically lower than desirable. The most expensive activity in plantation forestry is replanting after establishment failure!

Containerized seedlings can now be cost effectively protected against the attack of tip moth through the use of PTM pesticide. Most foresters would agree that the incremental cost of containerized planting stock is a worthwhile investment that yields significant benefits in plantation uniformity, survival and early growth. Containerized seedlings are recommended for most reforestations but especially for small landowners and where margins for error are small.

Level of Genetic Gain

Genetically improved planting stock will significantly increase the productivity of the plantation. In the case of CMP seedlings the landowner is planting a cross developed under rigorous field testing. CMP crosses allow us to capture the highest level genetic gain from elite parent trees, and to deploy this gain directly into stands with superior and more uniform growth rates. It is recommended that landowners establish genetically improved seedlings in order to maximize financial returns from their forest plantation. Planting high genetic gain containerized seedlings allows landowners to reduce the initial number of seedlings planted per acre, while enhancing productivity and profitability of the forest plantation through increased sawtimber harvest.

Site prep

Successful pine plantations start long before planting with excellent vegetation control and site preparation. Mechanical site prep can reduce the impact of negative factors in the site, such as the use of bedding for poor drainage and ripping of compacted soils. Genetically improved seedlings need the best possible silvicultural practices in order to deliver on their productive potential.

Planting

The best laid plans can be derailed if problems occur in delivery and planting of seedlings. It is vitally important that seedlings are stored adequately in a cool place prior to planting. Do not allow stored seedlings to freeze as this can cause severe root damage. Allowing the boxes to overheat can rapidly result in seedling death. Every year thousands of pine seedlings are planted, already dead, because of preplant mishandling of planting stock. Follow the instructions provided by your seedling grower and insure that machine planters or hand planters are scheduled and ready to work, as soon as the seedlings are delivered.

Careful professional supervision of planting quality will avoid common problems that include J-rooting of bareroot seedlings and trees that are not planted deeply enough. After successful planting an appropriate spring release herbicide should be applied to control the growth of herbaceous weeds during the first growing season.

Investment in planting stock is often mistakenly seen as a place where cost savings can be made. In reality the investment in quality planting stock will allow the site to express its full productive potential. The selection of containerized high genetic gain planting stock has been shown to significantly increase the Net Present Value of the pine plantation.

Improved Quality Pine Seedlings: What To Expect at Early Ages

Genetically improved seedlings have helped increase growth rates of forest tree species around the world. Some of the most sophisticated pine tree improvement programs are in the southeastern United States. Covering this region are three tree improvement cooperatives that have been working on genetically improving pine for over 50 years. About 14 million dollars are spent annually to breed, test, select, and produce improved loblolly and slash pine. The results have been impressive: every analysis shows that the returns on the investment of planting genetically improved loblolly and slash pine are very good (McKeand et al. 2007)

Today, more than 75 percent of the United States tree planting occurs in the southeastern United States, and more than 95 percent of the loblolly and slash pine seedlings planted are genetically improved. By 2000, 59 percent of all the loblolly pine plantations in the South were being planted with open-pollinated (OP) seedlings in single-family blocks (McKeand et al. 2006).

A “single family” is a group of seedlings produced from the seed of one specific, select individual (genotype) within a seed orchard. Family seed is sown separately in the nursery and planted separately in the field. In contrast, a seed orchard mix is a collection of cones from a number of individuals in a seed orchard. A seed orchard mix includes many OP families and so contains a greater degree of genetic variability than a single OP family does.

Although reduced genetic variation is of some concern for OP family plantings, there have been no reported problems associated with single-family plantings, as long as the seedlings are planted in the correct climatic zones (Schmidting 2001). Stands established from an OP single family tend to be more uniform than stands from a seed orchard mix.

Today, about 800 million loblolly pine seedlings are planted every year in the southern United States, and most of those seedlings are open-pollinated. The genetic improvement level of loblolly pine has risen considerably, with the standard being either 1.5 generation (i.e. first-generation orchard thinned down to only the best genetically superior stock) or second-generation seedlings (Rousseau 2010). However, we have begun to see more third-generation or third-cycle seedlings being offered. In addition to the typical open-pollinated seedlings, we have also begun to see the emergence of full-sib and varietal pine seedlings.

Full-sib seedlings are the result of crossing two highly select individuals, which takes advantage of the known genetic quality of both parents. Full-sib seedlings were previously used only for research, as they were too expensive and time-consuming to produce in great quantities. However, today full-sib seedlings are being produced through an operational scale process known as mass control pollination (MCP) (Figure 1). MCP production is still expensive, so seedlings cost about \$120 to \$140 per 1,000; OP seedlings cost about \$50 to \$75 per 1,000.



MISSISSIPPI STATE
UNIVERSITY
EXTENSION SERVICE



Figure 1. Mass control pollinations taking place in a seed orchard (left). Here a worker applies pollen from a single selection inside the bag to a selected female, making a full-sib cross.



Figure 2. Seed orchard photo showing bags that exclude outside pollen sources (right). Eventually the bags will decompose, allowing the mass control pollinated cones to mature. Photos by MeadWestvaco.

Varietal pine is the top genetic level of pine tree improvement today. The term varietal was given to the development of pine clones (Rousseau 2010). Varietal pine seedlings are produced through either hedging or somatic embryogenesis. Hedging is a simple technique where young seedlings are cut back to produce numerous growing tips that are harvested and propagated into seedlings. Somatic embryogenesis is a technique where an embryo is removed from the seed and placed into a system that allows it to multiply. These embryos are grown on a specialized media to form seedlings that are identical copies of the original. In this process it is possible to place the resulting embryos in liquid nitrogen (cryopreservation) until the genetic testing is complete. Although these techniques are expensive, they do provide the grower with the highest quality genetic material available. Seedlings produced with this method cost about \$435 per thousand.

No matter what type of improved pine you use, you should understand how that pine will perform on the planting site. At first, seed orchard mixtures were used to provide a sort of genetic buffer to the variety of sites being planted across the South. Later, with more information about how seedlings perform on different types of sites, single-family plantings became the norm. However, each year more acreage is planted to MCP and varietal seedlings. Before planting, landowners should be fully aware of how these advanced genetic seedlings perform in their general area in order to realize the genetic potential.

With this understanding Mississippi State University Department of Forestry examined differences among selected open-pollinated second-generation seedlings, a selected MCP family, and varietal loblolly pine seedlings.

Comparison of Loblolly Pine Genetic Types

Test Establishment

The test site is located on the Mississippi Agriculture and Forestry Experiment Station located in north Mississippi near Holly Springs. The soil is a combination of a Loring silt loam and a Cahaba-Providence complex. The test site was primarily in bermudagrass, as it was previously used for cattle grazing and hay production. Site preparation included a sub-soiling in March of 2007 to a depth of 14 inches on 12-foot intervals and a March 2007 glyphosate banded treatment directly over the sub-soiled rows. The test was hand-planted in April 2007 at a spacing of 12 by 9 feet (i.e. 403 trees per acre). At the time of planting a single 20mg SilvaShield tablet was placed directly into the planting hole to control pine tip moth. In May 2008 the test received a broadcast application of Oustar.

The three types of planting stock included a single MeadWestvaco select second-generation OP family, a single MeadWestvaco select MCP family, and ArborGen Varietals. The seedlings of both the open-pollinated and MCP families were 1-0 bareroot stock, while the varietals were containerized stock. The MeadWestvaco second-generation OP and MCP families were selected based on their known performance in southwest Tennessee. The varietal plots were a mixture of 57 different varieties, making it difficult to directly compare the performance of any single variety to the second-generation OP and MCP plots. The field design is a randomized complete block where the seedlings of the 3 genetic types were planted in 100 tree blocks across the site and replicated 6 times. Thus, 600 trees of each type of planting stock were measured and evaluated through the 2010 growing season.

Table 1. Average total height and dbh of the three genetic types from age 1 to age 4 tested on the MAFES site near Holly Springs, MS

Genetic Type	Total Height (ft)				DBH (in)	
	Age 1	Age 2	Age 3	Age 4	Age 3	Age 4
Single 2nd-Gen. OP	1.9	5.0	9.6	14.7	1.7	3.1
MCP	2.0	5.4	10.4	15.8	2.0	3.5
Varietal	1.9	4.9	9.6	14.2	1.5	2.7

Early Results of the Three Genetic Types

Test survival was 93 percent at the end of the first growing season. Survival was certainly good, but the heavy bermudagrass competition and the drought played a major role in seedling mortality. The varietal seedlings had the lowest age-one survival, at 87 percent. This was probably because at planting, they had smaller root systems than stock of the second-generation and MCP seedlings. By age four, test survival was 92 percent. There were no major trends in survival differences among the three genetic types at age four. The slight change in test survival between age one and four suggests that proper site preparation and weed control is critical to plantation success.

Total height was measured each winter to determine early-age performance and later correlate that to more mature performance. Following the first growing season, there was very little difference among the three genetic types (Table 1). This lack of differences may have been because the trees struggled to compete for water during a very dry growing season. By age two, the MCP seedlings were the tallest, at 5.4 feet, followed by the second-generation open-pollinated seedlings and the varietal seedlings. At age three the MCP seedlings were still the tallest, at 10.4 feet, followed by the second-generation open-pollinated seedlings and the varietal seedlings, at 9.6 feet. The MCP seedlings remain the tallest at age four at 15.8 feet. The second-generation open-pollinated seedlings were 1.1 feet shorter at 14.7 feet, and the varietal

seedlings were 1.6 feet shorter at 14.2 feet. Diameter at breast height (DBH) also followed the same trend as seen in total height, where the MCP seedlings were the largest at ages three (2 inches) and four (3.5 inches) (Table 1).

On average, trees grew about 3 feet between age one and two, about 4.5 feet between age two and three, and more than 5 feet between age three and four. As expected, height growth followed the same pattern as total height. MCP seedlings grew most rapidly.

As expected, MCP seedlings performed better than second-generation OP seedlings. The MCP material was genetically better, and the results show its superiority at least through age four. The test did not include a single highly selected variety, which would have made a more valid comparison to the other two genetic types. However, 57 individual varietals were used because it would be difficult to impossible to select the one varietal best for northern Mississippi sites.

The varietal seedlings ranged from 11 to 17 ft. tall. This variation was expected. Varietal 329 was one of the three tallest varieties from age two to age four. Although varietal 228 was not among the tallest varietal at age two, it was the tallest varietal at ages three and four (Table 3). Varietal 228 was 1.2 ft. taller than the MCP seedlings. However, the DBH of 228 averaged 3.1, making it smaller than the average DBH of the MCP seedlings, which was 3.5 inches (Table 2).

Table 2. Comparison of total height between the MCP type and selected varietal types from age two to age four on the MAFES site near Holly Springs, MS

Genetic Type	Total Height (ft)		
	Age 2	Age 3	Age 4
MCP	5.4	10.4	15.8
Top 3 Varietal	6.2	11.2	16.4
Best Varietal	6.3 (329) ¹	11.6 (228)	17.0 (228)

¹ Number within the parentheses represents the specific varietal number of the top performer

Conclusion and Management Implications

This specific MCP family easily outperformed the second-generation OP family, with faster growth through age four. The MCP family performed as well as the top-performing varieties. However, landowners must recognize the fact that this is only one test and that it may not apply to their property. In addition, form and wood characteristic traits are extremely important to the sawtimber market. To date, these traits have yet to be adequately measured but will be included as the test ages.

References

- McKeand, S.E., B.J. Zobel, T.D. Byram, and D.A. Huber. 2007. Southern pine tree improvement – a living success story. Proceedings of the 29th SFTIC. Galveston, TX. June 19-22, 2007. 3-6.
- McKeand, S.E., R.C. Abt, H.L. Allen, B. Li, and G.P. Catts. 2006. What are the best genotypes worth to landowners. *Journal of Forestry*. 352-358.
- Rousseau, R.J. 2010. Choose your planting stock carefully. Mississippi State University Extension Service. Publication No. 2589. 7pp.
- Schmidtling, R.C. 2001. Southern pine seed sources. USDA For. Serv. Gen. Tech. Rep. SRS-44, Southern Research Station, Asheville, NC. 25pp.



MISSISSIPPI STATE
UNIVERSITY
EXTENSION SERVICE
msucares.com

Copyright 2011 by Mississippi State University. All rights reserved. This publication may be copied and distributed without alteration for nonprofit educational purposes provided that credit is given to the Mississippi State University Extension Service.

By **Dr. Randall Rousseau**, Associate Extension and Research Professor, Department of Forestry.

Discrimination based upon race, color, religion, sex, national origin, age, disability, or veteran's status is a violation of federal and state law and MSU policy and will not be tolerated. Discrimination based upon sexual orientation or group affiliation is a violation of MSU policy and will not be tolerated.

Publication 2708

Extension Service of Mississippi State University, cooperating with U.S. Department of Agriculture.
Published in furtherance of Acts of Congress, May 8 and June 30, 1914. DR. GARY JACKSON, Director
(POD 08-11)



International Forest Company, Inc.
1265 Ga. Hwy. 133 N.
Moultrie, GA 31768-7165
800-633-4506/www.internationalforest.co

Why Container Seedlings?

Container grown pine seedlings first came into commercial use in the Southeastern USA in the 1980's, primarily focusing on longleaf pine. Today **95%** of all longleaf pine, over **190** million are planted yearly as container stock, as well as **66** million loblolly, **4** million slash, and **2** million shortleaf pines.

Containerized seedlings are increasing in use for a number of reasons:

- ✱ Container seedlings provide high survival over a wide range of planting conditions
- ✱ Fall planting with containers is leading to substantial increases in growth.
- ✱ Changes in climate are increasing the frequency and intensity of droughts
- ✱ High survival is needed to effectively deploy high-valued genetic selections

Container nurseries permit efficient use of high-value genetics through high seed conversion and more certain survival of deployed elite genetic selections. As genetics get more valuable and the number of trees planted per acre is reduced to maximize sawtimber production, uniform survival becomes highly important to foresters and landowners.

Container seedlings do cost more to produce than bareroot seedlings. Longleaf container costs are two times more expensive than bareroot. Prices will vary with genetic quality. Container seedlings are also more bulky than bareroot and usually cost more for transporting. However, additional cost considerations become small when less trees per acre are planted with container seedlings due to the high assurance of survival. As recently reported in Forest Landowner Magazine's cost report, with the appropriate adjustments in initial trees per acre planted, regenerating with container seedlings can cost less per acre to plant than bareroot.

All container seedlings are currently either grown in plastic or Styrofoam containers. Seedlings are extracted from containers with their root system intact and packaged in wax coated boxes.

Depth of containers or root plug length is often discussed and some preference is shown. Although, there has never been any scientific study that has shown root plug length affects survival as long as the volume of the root plug is 5.5 cubic inches or greater. Typically root volumes range from 5.5 to 7.44 cubic inches. Root lengths are typically from 3.5 inches to 6 inches in length. Longleaf pine is particularly sensitive to planting depth and the plug should be at ground level to 1 inch above ground in soft soils

to prevent survival issues. Shortleaf should be planted at ground level due to the ability to re-sprout. Loblolly and slash can be planted as deep as needed.

Container seedlings can be hand planted or machine planted. The uniform shape of container seedlings root systems makes planting much more simple and the chance of **J-rooting** is virtually eliminated. Container seedlings can be planted with standard planting tools such as dibbles and hoedads or with special designed tools that match the root system for the container plug size.

Container seedlings can be planted 9-10 months of the year as long as there is adequate ground moisture. In recent years due to extreme drought conditions, container stock has been used as fall interplant stock to bring stocking up to acceptable levels in marginal stocked bareroot plantings. Typically, most planting occurs from mid-September through late April. Container seedlings planted in the September through November period usually exhibit increased growth and maximum survival over bareroot dormant season plantings.

In recent planting seasons, container seedlings have shown marked improvements in survival over bareroot seedling on several tracts in various states. Container seedlings carry **100%** of their roots to the field and transplant shock is minimized under difficult weather conditions like has been experienced in recent years. Recent climate change predictions suggests the trend in more frequent extremes in weather conditions will continue and may even become more challenging.

Information provided by:
International Forest Co.
1265 Ga. Hwy. 133 N,
Moultrie, GA 31768-7165
800-633-4506
www.internationalforest.co



UF/IFAS Forest Management and Stewardship Extension Publications on EDIS:

http://edis.ifas.ufl.edu/TOPIC_Forest_Management_and_Stewardship

- [Assessing the Economic Feasibility of Short-Rotation Woody Crops in Florida](#)
- [Assessment and Management of Hurricane Damaged Timberland](#)
- [Beyond the Trees: A Systems Approach to Understanding Forest Health in the Southeastern United States](#)
- [Cooperation and Communication: Benefits for Non-Industrial Private Forest Landowners](#)
- [Dead Wood: Key to Enhancing Wildlife Diversity in Forests](#)
- [Florida Forest Landowner Preferences for Carbon Offset Program Characteristics](#)
- [Forest Management in the Interface: Forest Health](#)
- [Forest Management in the Interface: Practicing Visible Stewardship](#)
- [Forest Resource Information on the Internet: Connecting to Today's Online Resources](#)
- [Improving, Restoring, and Managing Natural Resources on Rural Properties in Florida: Sources of Financial Assistance](#)
- [Improving, Restoring, and Managing Wildlife Habitat in Florida: Sources of Technical Assistance for Rural Landowners](#)
- [Longleaf Pine Regeneration](#)
- [Making the Most of Your Mast](#)
- [Management Practices to Support Increased Biodiversity in Managed Loblolly Pine Plantations](#)
- [Opportunities for Uneven-Aged Management in Second Growth Longleaf Pine Stands in Florida](#)
- [An Overview of Carbon Markets for Florida Forest Landowners](#)
- [Ownership Succession: Plan Now for the Future of Your Land](#)
- [Selecting a Consulting Forester](#)
- [Steps to Marketing Timber](#)
- [Stewardship Ecosystem Services Study Series: Assessing Forest Water Yield and Purification Ecosystem Services in the Lower Suwannee River Watershed, Florida](#)
- [Stewardship Ecosystem Services Study: Carbon Stores on Florida Forest Stewardship Program Lands](#)
- [Ten Tips for Encouraging the Use of Your Pine Plantations By Game Species](#)
- [Ten Tips for Increasing Wildlife Biodiversity in Your Pine Plantations](#)
- [Thinning Southern Pines - A Key to Greater Returns](#)
- [Tips for Integrating Land and Wildlife Management: Deer in Forests](#)
- [Tips for Integrating Land and Wildlife Management: Quail and Timber](#)
- [Using Soils to Guide Fertilizer Recommendations for Southern Pines](#)
- [What is in a Natural Resource Management Plan?](#)
- [What to Expect in a Forest Inventory](#)

NOTES

A series of horizontal lines for writing notes.

THANKS to our SPONSORS for their support of
2015 Florida Forest Stewardship Program Events

**Blanton's Longleaf
Container Nursery**

Jason Blanton
(850) 973-2967

blantonsnursery@earthlink.net



Frankie Hall
(352) 374-1542



**National Wild
Turkey
Federation**

www.floridanwtf.org
www.nwtf.org



**FLORIDA
FORESTRY
ASSOCIATION**

(850) 222-5646
info@forestfla.org



FARM CREDIT

Florida's largest agricultural lender.

Leasing • Loans • Financing • Crop Insurance

866.824.5626
www.FarmCreditFlorida.com



**INTERNATIONAL
FOREST COMPANY**

Wayne Bell
(229) 985-0321
(800) 633-4506
Mobile: (229) 873-4316
wbell@interforestry.com

**FORESTRY SOLUTIONS
THAT MEET YOUR OBJECTIVES.**



Fifty Years and Growing

DENSON HELMS
Marianna, FL
850.482.6573

RUSS WEBER, ACF, CF, RF
Gainesville, FL
352.377.2924

www.fwforestry.com



**Forest
Environmental
Solutions, LLC**

Joseph Gocsik
(352) 206-8776
JOE@FESFL.com



**Southern
Forestry
Consultants**

Monticello, FL office: (850)-997-6254
Quincy, FL office: (229) 246-5785
Northwest FL office: (334) 393-7868

**Forestland
Management**

Ray Horne
(352) 485-1924

rhorne1964@earthlink.net



Alan Jaye
(334) 830-1677

ajaye@greencirclebio.com

McGowan Forestry

Babe McGowan
(229) 376-0581

babemcgowan@gmail.com

**American
Forest
Management, Inc.**



Alachua Office: (386) 518-6344
13570 NW 101st Drive, Suite 500
Alachua, FL 32615

Marianna Office: (850) 526-5110
4962 Old Spanish Trail
Marianna, FL 32448

Americanforestmanagement.com



Wildlife Habitat Management
Prescribed Burning
Forestry Management & Consulting
Equipment Services

Brannen Willis
PromiseHabitatServices.com
352.408.1193
39711 Crest Haven Ct.
Umatilla, FL 32784



352.375.1473
800.344.1473 toll free
www.ColumbiaTimber.com
info@ColumbiaTimber.com

4424 NW 13th Street, Suite C-2, Gainesville Florida 32609



No One Knows The Country Like We Do!

352.225.3668
877.632.3668 toll free
www.UCLandAndLifestyle.com
info@UCLandAndLifestyle.com