Southern Forest
Nursery Management Cooperative
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3301 Forestry and Wildlife Sciences Building
Auburn University, Alabama 36849-5418
phone 334.844.1012
fax 334.844.4873

Director's Report

With the growing season winding down and nursery personnel planning their next years' production plans, we hope that everyone's seedling crop is sold and ready for lifting. Unlike previous growing seasons with too much or too little, this has been a "normal" production year as we have not heard of any reports of temperature or precipitation concerns.

Membership

As we enter the 2015 Fiscal Year, I would like to welcome a new member to the Nursery Cooperative: The Westervelt Company. The company's history began in the late 1880s when Herbert Westervelt began a career in the paper industry, developing Prairie States Paper Corporation. With over half a million acres of timberlands, the company focuses on businesses which sustain natural resources for the future. Located in Tuscaloosa, AL, they operate a container seedling nursery with a capacity of 4 million seedlings. Tommy Conwell will serve as the Advisory Member to the Nursery Cooperative.

With the addition of The Westervelt Company, current membership within the Nursery Cooperative is 17 Full members; they include: ArborGen, Campbell Timberland Management, International Forest Company, Plum Creek Timber Company, Rayonier, Weyerhaeuser, Native Forest Nursery, the States of Arkansas, Georgia, Louisiana, North Carolina, South Carolina, Oklahoma, Tennessee and Virginia. The US Forest Service State and Private Forests is also a member.

2014 Advisory Meeting

The Advisory meeting is scheduled for Wednesday and Thursday, November 12 & 13, 2014 at the School of Forestry and Wildlife Sciences Building at 602 Duncan Drive. The Nursery Cooperative Staff will begin the process of updating our Accomplishments, Budget and next year's Work Plan. We will also have a couple of guest presentations, one from the National Science Foundation and one from Richard Hall from RMS. If you have any ideas or items that your organization would like addressed, please contact me or Tom. The Advisory meeting will begin after lunch on Wednesday and adjourn around noon on Thursday. We will set up the meeting using video conferencing for those who may not be able to travel to Auburn. If you would like to get access to the meeting please call Elizabeth Bowersock at 334.844.1012 and she will let you know what you need to access the meeting. Place those days on your calendar and more information will be available shortly.

2014 Contact Meeting

The 2014 Nursery Cooperative Contact meeting was held on July 21-24, 2013 in Williamsburg, VA in conjunction with the Southern Forest Nursery Association. The meeting was attended by 33 Nursery Cooperative members. Nursery Cooperative staff presented information to the entire group on new soil fumigant chemistries, weed control in native plant production systems, a rapid pitch canker identification tool and a new service that will report on seedling quality for member nurseries. The field trip at this meeting included a tour of the Virginia bareroot nursery and examination of two soil fumigation trials. To review any of the Nursery Cooperative presentations again, I encourage you to access them at http://nurserycoop.auburn.edu/membersonly/contact2014.html. Next year's Contact Meeting is scheduled to be held in southeastern Georgia with Plum Creek hosting the nursery tour We are currently working with Doug Sharp and Kyle Owens in preparation for the meeting. Watch the Spring 2015 Newsletter for more details on the Contact Meeting.

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Center for Advanced Forestry Systems (CAFS)

The Forest Health Dynamics Laboratory at Auburn's School of Forestry and Wildlife Sciences has been designated an official research center of the National Science Foundation, as part of the Center for Advanced Forestry Systems (CAFS). This designation, the result of a rigorous two and a half year selection process, comes with a $300,000 grant and five year membership, which can be extended twice in additional five-year increments. The Forest Health Dynamics Laboratory, led by faculty members Dr. Scott Enebak and Dr. Lori Eckhardt, joins existing centers to become the tenth site for the Center for Advanced Forestry Studies. The Auburn site is the only site that addresses forest health in the region. The designation brings other advantages, such as increased opportunities for collaboration across research sites, and the chance to propose projects to industry leaders for additional funding. The nature of CAFS, with its close ties to industry leaders to help drive applied research to solve pressing problems, is a natural fit for the Auburn site, which already works closely with industry through the Southern Forest Nursery Management Cooperative and the Forest Health Cooperative. -- **SE**

Pesticide News

Risk-Mitigation of Soil Fumigants – Phase II. EPA and the registrants continue to gather data on the second phase of risk mitigation. The Chloropicrin Manufacture Taskforce (CMTF) and the Methyl Bromide Industry Panel (MBIP) continue to monitor the effects of the 2012 labels. I would ask that if your organization is encountering any problems or concerns with the new soil fumigation labels and the implementation of the new rules, that you contact me so that we can compile these concerns for EPA. I want to thank everyone who responded to Barry Brooks' request for soil fumigation information that has been conducted so far. That information is being compiled and will be used to address EPA's concerns on bystander safety. -- **SE**

Herbicide Trial Updates

Hand-me-downs. I have a friend who used to give me big cardboard boxes of hand-me-down clothes for my 3 daughters when they were younger, and we'd have "trying-on" parties – if a piece of clothing didn't fit one girl, we knew it'd fit another one. Like those hand-me-down clothes, seedling producers sometimes get 'hand-me-down' herbicides that will not work on one weed but may work effectively on another.

An earlier attempt to control black willow was Dr. Paul Jackson's use of Sporatec® (a contact fungicide) in May 2011 at IFCO's Moultrie, GA facility. Although he found that Sporatec® did not control willow, he speculated that it might offer good control of moss and liverwort. This year, we planned a liverwort trial in containers, but found that no nursery had enough of a liverwort problem to warrant it. After making inquiries, we found nurseries with moss problems that could benefit. However, we found that production of Sporatec® was being discontinued, so we replaced it with a comparable fungicide, Ecotec® (also manufactured by Brandt Company). Initial establishment of this study was made at the North Carolina Forest Service's Linville River Nursery in mid-June. Applications of two rates of TerraCyte®PRO (fungicide manufactured by BioSafe Systems) and Ecotec® as a drench over Frasier fir were made, with additional applications made in late July. Moss control is being monitored and evaluated; fir seedling quality will be evaluated at the end of the growing season when we bring seedlings to the Cooperative lab for measurements. A Research Report on this herbicide's effectiveness on moss and liverwort will be finalized this winter. -- **NP**

The Pendulum® AquaCap™ Trials and the Missing Link. Not too catchy of a title for a mystery book, but it could be! On the Cooperative's web site, in past Research Reports, we follow the progress of PAC herbicide studies from the initial testing on spurge control in 2007 to the speculation of what was causing gall formation on pine seedlings. This included genotype, soil type, timing, rates and temperature as to why herbicide galls form. We've since concluded that the optimal time to spray is at the time of sowing and have recommended rates to use for fine and coarse textured soils. The most recent Research Reports (14-01, 14-02, 14-03) focused on operational tank mix applications, outplanting survival and growth of herbicide galled seedlings, and later 'safe' timing applications of PAC. The question of the effect either soil texture and temperature on herbicide gall formation still had not been investigated, so this study was established in the Cooperative greenhouse at Auburn in late May. Because temperature will be the same for these seedlings, we are growing loblolly seedlings in both fine and coarse textured soils and have applied two rates of PAC at 5 weeks post-sowing with the intent of inducing galls. We continue to monitor herbicide gall formation on seedlings grown in both soil types, and will take this test down in November to measure results. Watch for the updates in the Spring 2015 Newsletter. -- **NP**

An Old Problem with a Promising New Solution. In the 2012 Nursery Production Survey, 70% of container nurseries listed black willow as the #1 weed problem. For growers in agreement with this ranking, you know how difficult black willow is to control with herbicides once it is established in containers. In 2013, Ben Whitaker installed a research test using a new herbicide, Marengo® (indaziflam), at ArborGen's Supertree Nursery in Shellman, GA. This study evaluated bareroot loblolly pine seed and seedling

tolerance to Marengo® as well as its effectiveness on weed control.

After positive results (good weed control and loblolly pine tolerance) from that study, we established a trial at IFCO's Moultrie, GA facility in June to test the tolerance of four conifer species in containers (loblolly, longleaf, shortleaf and slash) to Marengo® and its effectiveness in controlling black willow in containerized loblolly. Three rates of the herbicide were used, and an additional application was made in mid-July. As monitoring and evaluation progresses, visual inspection shows promising results in willow control and minor stunting in pine growth in all four species. Loblolly, longleaf, slash and shortleaf pine seedling quality and RGP will be evaluated at the end of the growing season as well as evaluation of willow control.

Because this herbicide is providing positive results to date and we have seen other weeds controlled in addition to black willow, we plan to expand this trial next year to quantify its effectiveness on all weeds in containers sprayed, as well establishing several timing and rate studies of Marengo® in bareroot nurseries. -- **NP**

Research News

Mid-Season Results: SumaGrow™

A representative from Bio Soil Enhancers in Hattiesburg, MS contacted a Nursery Cooperative member in March 2014 to see if it was possible to test their product in a production system. Previous Bio Soil in-house research had shown positive results in loblolly pine outplanting trials and they wanted to test the material in a production system. The nursery contacted the Nursery Cooperative and we began discussions to develop an experimental design and protocol. Initially, Bio Soil requested an operational experiment where the nursery would reduce total fertilization by 50% since the company felt their product worked best under these conditions. Since we did not have any experience with the product, and it would be difficult to install in a nursery with appropriate replication, this request to reduce fertilization was declined. We explained that a nursery would be more willing to put in another study if some benefit was seen using the product at normal fertility levels.

Sumagrow™, according to the manufacture:

- SumaGrow™ is a synergistic consortium of native microbes selected for their abilities to increase plant health and growth through soil fertility.
- SumaGrow™'s microbial formulation improves and restores soil health and fertility.
- SumaGrow™'s microbial formulation unlocks bound soil nitrogen and absorbs nitrogen from the air for optimum plant growth and development. It promotes early root formation.
- The SumaGrow™ formulation inhibits plant pathogens and enhances the plant's natural defense mechanisms. This bio-control function is comprised predominately of Trichoderma strains.
- It is Super Concentrated - 1/2 gallon of Sumagrow™ mixes with 20-40 gallons of water and is applied to one acre at planting and 1/2 gal per 20-40 gallons is applied half way through the planting season. That is it, different crops required different applications.
- It is very low cost. An average of $40 to $50 USD per gallon / per acre.

Two applications of SumaGrow™ were made in a randomized block design. The first application of ½ gallon/acre was made shortly on May 2, 2104 and the second and final application of ½ gallon/acre June 2, 2014. The product was applied to loblolly pine on second year fumigated soil replicated seven times and on slash pine sown on third year fumigated soil. The slash pine trial was replicated three times. Each plot was 60' x 120' and applied with the nursery sprayer. The control plots did not receive SumaGrow™. All plots received normal nursery operations.

Our final data collection will be this fall when seedling biomass and seedling quality are determined. To date, we have done seedling counts four times, and collected seedlings in early July for biomass and quality. The seedlings quality and biomass results are listed in the table to the left.

As the data shows, at this time in the growing season there is no difference between the control and SumaGrow™ for either loblolly or slash pine seedling biomass, quality and numbers. However, since root biomass normally increases significantly over the fall/winter months, a final assessment will be conducted at the time of lifting to determine if the applications of SumaGrow™ in the spring will provide a larger root biomass at the time of lifting. -- **TS**

		RCD (mm)		Height (cm)		Dry Weight (gm)		Seedlings/sq. ft.
Species	Treatment	Mean	Std Error	Mean	Std Error	Root	Top	6/25/2014
Loblolly Pine	Control	1.4	0.02	10.1	0.11	0.04	0.27	27.0
Loblolly Pine	SumaGrow	1.4	0.01	10.1	0.01	0.04	0.28	27.6
Slash Pine	Control	1.7	0.01	10.9	0.14	0.07	0.37	26.5
Slash Pine	SumaGrow	1.8	0.02	10.9	0.02	0.07	0.39	26.9

Native Understory Plant Trials

I have recently completed my first year of graduate school. My research focuses on improving and developing cultural

practices that can be used in the commercial production of native plants that, collectively, make up a large portion of the native understory of longleaf ecosystems. This past year I have conducted herbicide evaluations on seedlings of native longleaf understory species (i.e. wiregrass, Indian grass, and little bluestem) and on established versions of these native plants that are grown for the purpose of collecting seed. The majority of this research took place at International Forest Company and Lolly Creek. In addition to the herbicide evaluations on native plants, I have also conducted an imazapyr bioassay study. Imazapyr is a common site preparation herbicide. However, longleaf pine seedlings are especially sensitive to imazapyr which can linger in the soil for 30-60 days. If an insufficient amount of time has passed before longleaf pine seedlings are planted, they could experience adverse effects such as stunting, chlorosis, and in some cases mortality. Longleaf pine already has a slow early growth stage, so anything that could increase that stage should be avoided. The purpose of this bioassay research is to develop a quick and easy field test that will determine if longleaf can be safely planted in soil that has been treated with imazapyr. Essentially, an indicator species, such as sorghum or radish, and the seed of that plant can be sown in imazapyr treated soil. Based on the results seen shortly after the seeds have been sown, it can be determined if longleaf can be planted or if more time is required for the imazapyr to degrade. Throughout the course of the next year I will replicate the bioassay, analyze the data that I have collected this past year for each project, and complete writing the thesis for my project. After the completion of this research we hope to improve upon the production of native plants and the successful planting of longleaf pine seedlings. -- **NB**

Planting Container Seedlings that also Contain a Willow Seedling

Not surprising to any container seedling producer, the number one weed in nearly all container nurseries, according to our 2012 survey, is black willow (*Salix nigra*). Even with intensive rouging of willow trees around a nursery, the small, wind-blown seed can still result in thousands of willow seedlings growing within the container sets. Difficult to control with herbicides, oftentimes they need to be hand weeded from the pad. In the Spring 2014 Newsletter, Nina Payne had a good article on some options to control willow trees around nurseries so I encourage you to go back and read it again.

At some point during the growing season or a time of extraction, if the root plug still has a willow seedling it must be removed. The options are to either rip the willow out, or clip the willow stem at the ground. Ripping the root plug apart generally is not in the best interest of the plug integrity. Thus, this trial examined the effects of clipping to determine if cutting the willow off at the root collar was an effective control option. Last November (2013) we extracted 30 container loblolly pine (7 months old) that also contained a black willow in the plug and brought them back to Auburn where we clipped the black willow at the root collar. One half of the loblolly pine seedling plugs were planted with the top of the container plug even with the soil line. The other half of the loblolly pine seedlings were planted with the plug 2" below the soil line. All seedlings were planted in the seedling stress facility and irrigated throughout the study period of 5 months. At the end of the trial period the number of plugs that re-sprouted black willow seedlings were counted. In 2014, we repeated the study but used seedlings that were 2 months old. The table below shows the results of both trials.

Percentage of plugs that re-sprouted willows:

Year	Plug Age	Planted Deep	Planted Shallow
2013	7 months	0%	60%
2014	2 months	0%	43%

It appears that cutting the willow out of the loblolly pine container plugs and planting the seedling at least 2" deep effectively stop re-sprouting of the black willow seedlings. This is another good argument for the plant deep approach to non-longleaf species. The lack of re-sprouting on the deep planted seedlings is most likely due to a lack of sunlight reaching the black willow stem. Several years ago I cut off a pine and willow in the same plug at the root collar and placed it in plastic cup near the window in my office with a little water in the cup. I forgot about it and was quite surprised to see after a couple weeks the willow sprouting and producing vigorous roots.

I have heard anecdotal reports that clipping the willow at the root collar and planting on a dry site reduced the incidence of re-sprouting. This seems plausible since willows are water loving plants and typically found on moist to wet sites. This October (and again next May) we will collect some more black willow seedlings and plant them in the seedling stress facility at ground level. After a couple weeks of irrigation to help get the seedlings established, we will cut off the willows and shut off all water to the boxes to determine re-sprouting in dry conditions.

Cutting willows off at the root collar and planting the seedling deep will not work with longleaf pine. Unfortunately we are still left with the question "how do we control willows in longleaf container?" The question still lingers and it is constantly a point of discussion among the Southern Forest Nursery Management Cooperative staff. -- **TS**

Rapid Screening of Seed and Plant Material for Pitch Canker

Pitch canker, caused by the fungal pathogen *Gibberella circinata* (anamorph *Fusarium circinatum*) is internationally one of the most detrimental diseases in terms of pine tree mortality. This pathogen is transmitted on both seed and seedlings and for this reason currently requires seed certification, indicating the absence of the pathogen, when pine seed is to be exported. Currently, the International Seed Testing Association's (ISTA) seed screening method is enforced by the USDA Forest Service Resistance Screening Center for pine seed certification.

The ISTA approved certification method relies on the culturing of *G. circinata* from pine seed on blotter paper infused with PCNB broth medium, where suspected colonies of the pathogen are morphologically identified. There are several drawbacks to this certification method including not only being a time consuming method but also relying on the unreliable species level identification of suspected fungal colonies. The current method thus often results in false negative outcomes, as numerous fungi may grow from the pine seed, covering *G. circinata* colonies on several seed. A faster and more accurate method has, however, been developed by us and relies on bulk DNA extraction and a polymerase chain reaction (PCR) procedure to screen numerous seeds for the presence of the fungal pathogen.

To date, in collaboration with Dr's Jason Smith and Tyler Dreaden at the University of Florida, specific primers have been developed and shown to give results only in the presence of *G. circinata* and *Fusarium subglutinans*. We have shown that these primers are effective in accurately identifying *G. circinata* on both seed and planting material. To date, 162 seed lots representing 8 of the most commonly planted pine species in the southeastern US, have been sourced from several companies and are being screened for the presence of *G.circinata* using the newly developed DNA extraction and PCR amplification protocols. All seed lots will also concurrently be screened using the current ISTA certified blotter paper method for comparison purposes. Through this project we aim to have the faster and more accurate DNA extraction method approved and adopted by ISTA for pine seed and plant material screening and certification. -- **RN**

20 Years Ago

In the Fall 1994 newsletter the new Southern Forest Nursery Management Cooperative director, Dr. Ken McNabb, discussed a forthcoming joint meeting at Auburn with the Silviculture Herbicide and Nursery Cooperatives. Several research articles were included that discussed soil fumigant alternatives for methyl bromide. Future studies looking at products to reduce frost damage, chemically pruning roots and a new herbicide, Reflex® were listed. Insect damage resulting in "bushy top" seedlings was identified in South Africa and its occurrence in the southern US discussed. Also included was expressed concern over the possible loss of many of the nursery pesticides due to the dual use of many of these pesticides for food and non-food uses and the new EPA requirements. A reminder was noted that the new Worker Protection Standards became effective January 1, 1995. Changes in staff at the Hauss nursery in Atmore, Alabama and International Forest Seed Company were reported. Finally, an interesting note on the importance of clean water when mixing root gels was discussed. This topic came up during some conversations at the SFNA Meeting in Williamsburg this past July. We have reproduced this article from the 1994 newsletter in its entirety below.

The following article is reproduced from the 1994 Newsletter due to the recent discussions about the impact of hard water at nurseries at the SFNA Williamsburg, VA meeting.

"Clean Water Cuts Costs of Root Dip"

"At the Texas Contact meeting, Bill Isaacs showed us how important clean water is when making a gel root-dip. Distilled water may require only half the amount of crystals (half the expense) was water from a nursery well. There are three ways to treat water. Distilled water requires a lot of energy and would likely be too expensive for a 6,000 gallon/day output. Another alternative is a water softener followed by a reverse osmosis system. Such a system is currently being used at the Andrews Nursery. A system to treat 6,000 galls/24 hours could cost $16,000 or more. The system has cut gel cost in half. Untreated water requires 63 grams of crystals per bundle as opposed to 31 grams using treated water. The system paid for itself in less than two year." "…A third alternative (yet to be tested in forest nurseries), consist of an ion exchange system (deionization). Although this system removes sodium from the water, the cartridge filters would need to be periodically replaced. Although the initial cost would be less for a deionization system, the operating cost (frequency of cartridge replacement) will vary depending on water quality."

Nursery Soil Water Retention Curve

Soil water retention curves can help nursery managers make decisions about irrigating their seedlings during the growing season. However, according to our 2012 nursery practices survey (Technical Note 14-01) the majority of nursery managers use a "touch and feel" system to determine when the soil need irrigation, rather than a more objective method such as tensiometers or electronic soil moisture measuring devices. Those managers that do use a more objective soil moisture measuring devices believe they use their irrigation water more efficiently and that they develop a better seedling root system. One argument for tensiometers or electronic soil measuring devices is that they normally measure soil moisture levels in the root zone,

4-6 inches below the soil surface. Many nursery managers using the "touch and feel" system base their decisions to irrigate on the surface 2-3 inches.

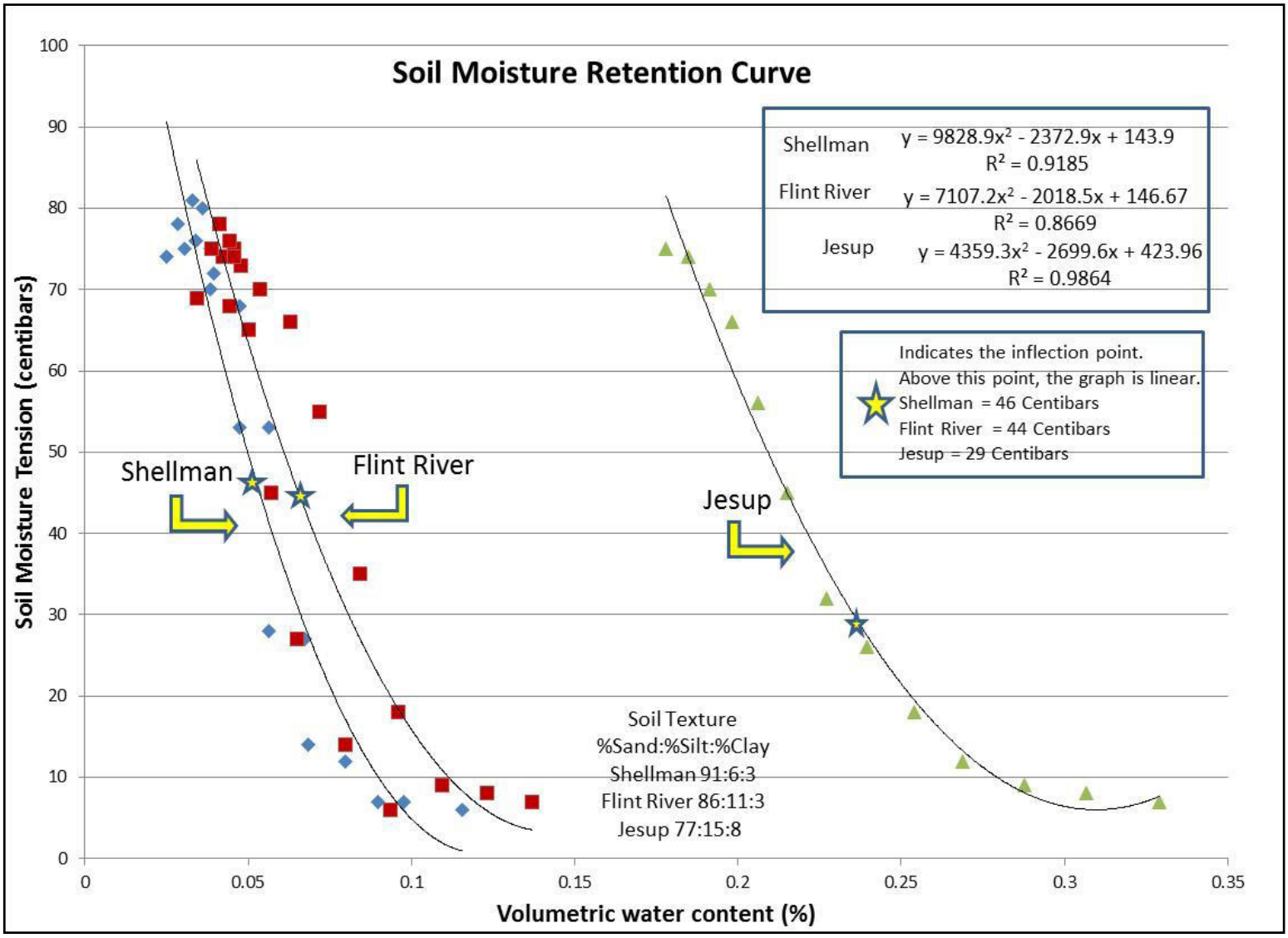
In the summer of 2013 we used a 6" x 12" PVC drain pipe with one end sharpened/honed to a sharp edge to facilitate collecting a soil core with relatively little soil disturbance. After the PVC tube was pushed down to the proper soil depth, the soil surrounding the PVC pipe was removed, the tube with the soil core slid onto plywood for transportation back to Auburn. With respect to measuring soil moisture within the soil core, we used the same methodology as described in Retzlaff & South, 1985 Tree Planters' Note "A simple method for determining a partial soil water retention curve". Each PVC cylinder with soil was saturated and allowed to reach field capacity. The tensiometers placed at approximately 6", where soil moisture tension was recorded each day at the same time along the total weight of the soil cylinder. The soils we used were from 3 nurseries with the following soil texture classifications:

Nursery	Texture	Classification
Shellman, GA	91:06:03	Sand
Flint River, GA	86:11:03	Loamy Sand
Jesup, GA	77:15:08	Sandy Loam

Developing a soil moisture curve should provide the nursery manager with a better understanding of water retention in the upper soil. This method is also a much more objective method for training new personnel at your nursery why and when to irrigate.

There are several points to make from the graph below:

1. Following irrigation or heavy rainfall you would expect the soil moisture tension to be less than 15 centibars. The lowest part of the curve reflects field capacity.
2. As the soils dry, the water tension increases and you move up on the graph, toward the inflection point.



3. The inflection point is the point where the soil tension begins to rise rapidly. For example, the inflection point for Flint River, GA is 44 centibars.
4. To promote seedling growth, the area of root growth (top 6 inches) needs to be maintained between field capacity and the inflection point.
5. Delaying irrigation as the soil moisture tension curve approaches the inflection point helps to stress the seedling and grow a better root system.
6. The water retention curve can also be used to calculate how much water is required to bring the soil tension back to field capacity, thus avoiding overwatering.

Developing these types of curves for your nursery can provide you with a better understanding of moisture relationships and improve your water management. -- **TS**

Leadership 101

You've made a mistake... Now what?

We all make mistakes, but do you think people will remember the mistake that was made or how you handled the mistake? Research has shown that people will more commonly remember how the mistake was handled. Just this week the Office of Information Technology (OIT) (the computer geeks) here at Auburn mistakenly sent out a blanket email that we needed to complete an online security training session or our email account would be frozen. After a flurry of emails and OIT was made aware of the problem someone from OIT promptly responded. A portion of that email said: "I am very sorry. I hit a button in the new system and sent a mass canned email out. The email should not have gone out and I apologize for making this mistake." .... "I hit a button that I thought was suspended. It was not and I have caused a mess. My sincerest apologies. So sorry." There were a couple of points that impressed me from their response. First, the person was sincerely sorry for the mistake. Four times an apology is offered. Secondly, the person explained how the mistake was made, accepted responsibility and didn't try to blame the system or others. Former UCLA Coach John Wooden said "You can make mistakes, but you're not a failure until you start blaming others for those mistakes."

Lisa Haneberg at Management Performance International (www.managementperformance.com) wrote an article a couple years ago on how to handle your mistakes. I have included her 10 points below:

1. Admit the error before anyone knows about the mistake. By being the first to notice and admit the mistake, you will diffuse peoples' reaction and turn their attention to helping you solve the problem.
2. Don't try to hide mistakes. It drives people crazy when we deny or try to cover up our mistakes. Mistakes can be corrected, but it is difficult to repair a spoiled reputation.
3. Apologize sincerely. Mistakes may cause inconvenience and create a waste of time, costs, or effort. Let people know that you sincerely regret the inconvenience your mistake has caused.
4. Ask questions that show you care. Unless we learn from our mistakes, history will likely repeat itself. Take the time to better understand how to prevent similar errors in the future.
5. Let team members help you to recover. Once you have admitted your error, your team members will want to help turn the situation around. Our team members are there for us, just like we will be there for them when they need it.
6. Move quickly into problem solving. The only thing that drives people crazier than someone denying a mistake is when he or she is slow to fix it. A quick recovery is particularly important when mistakes inconvenience others.
7. Reverse the mistake if possible. If you have made a bad decision, don't stick with it and suck the whole team down with you. Undo the decision if possible.
8. Treat yourself consistently. The ways in which you handle your mistakes should look and feel similar to the ways in which you handle mistakes made by others. We should neither be tougher nor more tolerant of ourselves. A mistake is just a preventable problem looking for a quick solution.
9. Clear your head if needed. It is in moments of great stress and frustration that we do stupid things, so don't compound the problem by sending an email you will likely regret later. If you need to, vent with a trusted friend.
10. Update others on the progress of the fix. Once a blunder is out in the open, follow up a couple of times so they know all is under control. This will instill confidence and create closure. -- **TS**

Nursery 101

What do pine seedlings and stone-washed blue jeans have in common?

The answer is that they both need Trichoderma fungi to be effective. For years, the Southern Forest Nursery Management Cooperative has monitored Trichoderma fungi in the soil following various soil fumigation treatments. Seedling quality is enhanced in the presence of Trichoderma and the fungus is a good indicator of soil fungal health. In the same light, most people are unaware that stone-washed blue jeans are made using Trichoderma.

Surprisingly, stones are not used in the manufacturing process of stone-washed blue jeans, although it is termed "bio-stoning." Rather, the manufacturer puts denim jeans into a large vat that contains hyphae of *Trichoderma reesii*. The fungus breaks down the cellulase enzymes in the denim to give the desired, faded, worn appearance so desired by teenage children.

What is Trichoderma? Trichoderma is a naturally occurring soil-borne fungus that helps to control soil-borne diseases and break down plant residues to make nutrients available. Although we in the seedling business welcome and encourage the presence of Trichoderma, it is a major pest in the mushroom industry where it is known as "green mold," causing a soft rot of the mushroom crop.

The presence of Trichoderma in the rooting zone and soil has been linked to increased plant growth, increased seed germination, increased fertilizer efficiency and induced systemic resistance to plant diseases. Its use in controlling diseases has seen wide application in seedling nurseries. Trichoderma also acts a biological control agent due to their soil activities. This includes competition, parasitism, production of inhibitory compounds and enzymes or inactivation of the pathogens enzyme system.

Trichoderma protects seedlings by actively colonizing the root zone making it difficult for pathogens to compete for root space and nutrients. Trichoderma can also coil around the hyphae of pathogenic fungi and produce enzymes to dissolve the pathogen's cell walls. A similar type of fungal behavior is observed in mycorrhizae which also colonize seedling root systems and protect them from pathogens. However, Trichoderma is not a type of mycorrhizae. Mycorrhizal fungi are not parasitic like Trichoderma fungi. Trichoderma fungi also produce enzymes capable of dissolving crop residues and attacking soil-borne pathogens like *Pythium*, *Fusarium* and *Rhizoctonia*. Trichoderma produces two main types of enzymes: cellulase and chitinase. The enzyme cellulase breaks down cellulose found in crop residue and the chitinase breaks down the chitin found in fungal cell walls. Trichoderma is often used as a compost addition in conventional gardening systems to break down straw, sawdust and other fibrous materials.

Although both bareroot and container seedlings can benefit from Trichoderma, the fungus has been more widely used in container production systems than bareroot production systems. Recently, I received some product information on a Trichoderma product from Italy called Tenet™ or Bio-Tam™. The product's intended use is as either a broadcast or drench application in moist soils. I do not know of any trials being conducted in the southern bareroot forest seedling industry. However, in container nurseries the fungus has been used as a soil amendment at the time of sowing to simulate germination and protect developing roots from pathogenic fungi. The product is also sold as Root Shield™ or Plant Shield™. Since applications of Trichoderma have no curative effect, the fungus must be applied before there is a disease present. Therefore, incorporation in the growing medium at the time of sowing has been shown to be effective. Certain fungicides applied as a root drench, however, will adversely affect Trichoderma colonization.

The optimum temperature range for Trichoderma is approximately 77 to 86°F. Commercial products recommend one or more repeated applications. Trichoderma has a lifecycle of about 28 days. It is self-replicating but over time; the lifecycle rate increases with decreasing spore production. Repeated applications will ensure Trichoderma growth on new, expanding roots. Trichoderma does best in high organic matter content and at a pH range of 5.5 to 8.5.

The use of Trichoderma as a biocontrol agent has a long history in vegetable and ornamental crops and may be worth your consideration. Even if you don't try Trichoderma in your nursery, at least you now have a dinner table subject to talk about with your teenagers wearing those stone-washed blue jeans. -- **TS**

http://jhbiotech.com/docs/Understanding-and-Using-Trichoderma-Fungi.pdf

Other News

A New Nursery Cooperative Evaluation System: Bareroot and Container Seedling Quality Analysis

For years the Oregon Nursery Cooperative provided an evaluation of various seedling quality parameters to various members across North America, including those within the Southern Forest Nursery Management Cooperative. However, when the Oregon Cooperative disbanded a couple years ago, these assessments of seedling quality were no longer available. We have realized the need and value of this seedling quality information for your company and that it also falls within our goal to provide research toward increasing nursery productivity. Seedling quality information is important to all members within the Southern Forest Nursery Management Cooperative and we believe it will help you maintain your market share in the industry.

Over the past year we have been working with several nurseries to develop a standard operating procedure that will be workable for both your organization and the staff in Auburn as they evaluate seedlings. The results of the

A Helpful EPA Pesticide Web Site

It is not often to observe the words "helpful" and "EPA" in the same sentence but here is one example why this is true. The reason I like this EPA web site so much is that at the beginning of the growing season a nursery asked where they could find, in print, if the re-entry interval (REI) for Goal® 2XL had been reduced. We looked in all our usual websites and could neither locate nor confirm whether or not the REI had been reduced. In late July, we were notified by EPA about the improved web site for product labeling and within a few seconds we were able to confirm that the REI for Goal® 2XL (and GoalTender®) has been reduced from 3 days to 24 hours on April 25, 2013. Thus, the ease at locating this information from EPA was helpful.

Pesticide product labels provide critical information about how to safely handle and use pesticide products. A critical aspect of registering a pesticide product is the approval of the product label. The information on this web site is intended to help the pesticide registrant and the public better access, understand, and use information about pesticide labels.

The Pesticide Product Label System (PPLS) is a collection of over 170,000 historic and current labels. PPLS allows you to search for information by product name, company name, and EPA Registration Number. All labels are text-searchable PDFs. In addition, EPA has included information describing when a pesticide product has been transferred from one company to another.

The link to the PPLS site is: http://iaspub.epa.gov/apex/pesticides/f?p=PPLS:1 .

Once you are at this site you have three options to consider. The easiest is the first option; enter the Product Name of the chemical in question. For example, I decided to look up Goal® 2XL. You will notice as you start to type, all the products for the chemical you spelled will appear. Choose the product you are interested in and click on Search at the bottom of the page. A list of label approved dates will appear. I clicked on April 25, 2013 for the most recent label changes and the most current label. The initial pages, before the actual label describe the changes for that date. Changes in the REI were part of the most recent label changes. In addition, if you scroll on down the label to the section on Conifer Seedbeds on pages 25-30 you will note the statement: "Agricultural Use Requirements: Do not enter or allow worker entry into treated areas during the restricted entry interval (REI) of 24 hours."

We encourage you to print out this information for your records. There is many times a long delay before changes such as noted above actually appear on your printed label. This information will satisfy all Agricultural Chemical Inspectors and in the case of Goal®, allows you to enter the fields after 24 hours without fear of non-compliance with label usage. -- **TS**

seedling quality analysis will be sent back to you and any other company representative in a PDF document. An example of the seedling quality output is included at the end of this newsletter. If some seedling quality data is missing from the sample report, let us know. **As with other organizational information, your individual seedling quality results will remain confidential**.

The staff at Auburn can begin bareroot seedling quality evaluations in January 2015. Please contact me before sending in your samples as we want to be sure we can process your seedlings in an expedient manner. We can evaluate container seedlings beginning this fall (after October 1st). We moved the evaluation of container seedlings up since container seedlings normally ship before bareroot seedlings. **VERY IMPORTANT:** Contact me before sending container seedlings since we are squeezing them in between our normal processing on Nursery Cooperative studies. I've listed some bullet points below that cover most of the information you need to know.

- One sample = 30 seedlings. Be sure we have at least 30 seedlings.
- Cost - $35 for one bareroot sample; $40 for one container sample.
- We will send you an invoice at the end of the season.
- Multiple samples can be shipped together as long as the seedling samples are clearly identified.
- A "Sample Submission Form" must accompany each sample. This form can be found on the "Members Only" section of the Nursery Cooperative web site under the "Seedling Quality" link.
- Ship seedlings dry – no ice. Ship so they arrive in 2 days. Do not ship so seedlings are in transit over the weekend.

Communication between your organization and the Nursery Cooperative is key to the success of this project. Call me about any questions, concerns or suggestions at any time. Call me about how to collect each sample if needed. For further information, you can review the presentation I made at the Williamsburg Contact Meeting which is on the "Members Only" section of the Nursery Cooperative web site under the "Meetings" link. -- **TS**

Know Weeds

Coffee senna (*Senna occidentalis*) - In reviewing weeds that can cause problems in forest tree nurseries, I found several that may be confusing to seedling producers. Their names and physical characteristics are similar, and literature often uses the same common name with different species – confusing, right?

These weeds are sicklepod (often called coffeeweed or coffeebean), coffee senna (also called coffee weed), and hemp sesbania (also called coffeeweed). Dr. Paul Jackson wrote about sicklepod in the Fall 2011 Newsletter, hemp sesbania is not commonly found in nurseries (but looks similar to the others), so this space will be dedicated to coffee senna. This plant can be seen on page 142 in Weeds of the South (http://www.ugapress.org/index.php/books/weeds_of_south/), sicklepod (*Senna obtusifolia*) on page 141, and hemp sesbania (*Sesbania exaltata*) on page 207.

As its name implies, the seeds of coffee senna are used as a coffee substitute in other countries although they contain no caffeine. From The Economic Botany of the Kiowa Indians, published in 1939, this plant 'set-tdawdl-ton-a' was interpreted as 'coffeeweed'! The plant's various parts are used in folk and herbal medicines for treatment of ailments ranging from typhoid to skin diseases and liver problems. However, the seeds contain compounds that are poisonous when ingested in large amounts by livestock.

Coffee senna (*Senna occidentalis*) can grow up to 6½ feet tall, with few branches and compound alternate leaves. These leaves can have from 8 to 12 opposite leaflets on each leaf; leaflets are longer than wide and are pointed at the tip, which is the distinguishing characteristic of this plant from sicklepod, as seen in these photos.

Coffee senna
(www.mississippi-crops.com)

Sicklepod
(www.ag.auburn.edu)

Coffee senna seedling
(www.oak.ppws.vt.edu)

Sicklepod seedling
(www.oak.ppws.vt.edu)

The seedlings of coffee senna and sicklepod look similar, as seen in these photos. One distinguishing characteristic of coffee senna seedlings is the presence of white hairs underneath the leaves.

Both sicklepod and coffee senna have been problematic in crops of peanuts, corn, cotton and soybeans for years, so multiple herbicides are available for their control in these crops. Biological controls are also being developed. Our list of available herbicides for control in forest tree nurseries is much shorter, however. Stinger® (clopyralid) has a supplemental label for forest tree nurseries for 10 southern states (excluding Florida) for use in southern pine seedbeds of nurseries. Sicklepod and 'other susceptible broadleaf weeds' are listed on this label. Needle curling may occur with applications of Stinger® during active conifer growth, so testing the product on a small area is advised for determination of applicability of use on a larger scale if controlling coffee senna (*Senna occidentalis*). When reviewing herbicide labels, you may see references to genus names of Cassia or Senna for these two species, as they were originally in the genus Cassia with over 600 species and transferred to the subgenus Senna in 1999.

For a more detailed image, this link directs you to the University of South Florida Herbarium's Specimen Image Viewer for an actual coffee senna plant with its leaves, flower and seedpods: http://www.florida.plantatlas.usf.edu/specimenimage.aspx?ID=262220 -- **NP**

Contact Us!

Scott Enebak	enebasa@auburn.edu / 334.844.1028
Tom Starkey	tom.starkey@auburn.edu / 334.844.8069
Nina Payne	nina.payne@auburn.edu / 334.844.4917
Barry Brooks	jbb0005@auburn.edu / 334.844.4998
Ryan Nadel	ryan.nadel@auburn.edu/334.844.1538
Elizabeth Bowersock	bowerep@auburn.edu / 334.844.1012
Nick Barnwell	nab0006@auburn.edu/ 334.844.8116

Auburn University
Southern Forest Nursery
Management Cooperative
Seedling Evaluation Report

1/15/2015

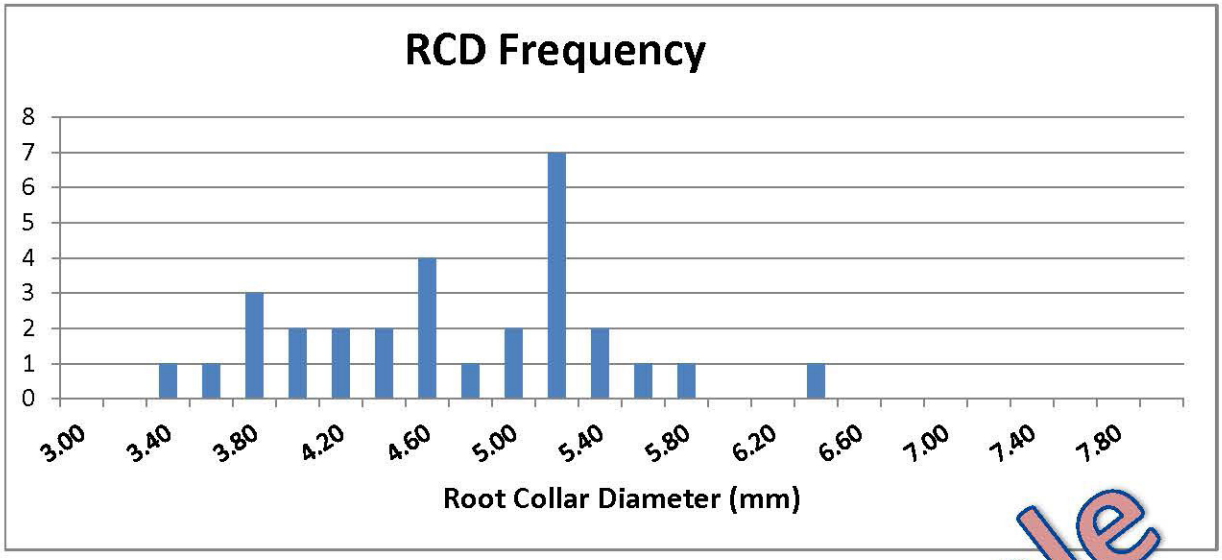
AR-G334S

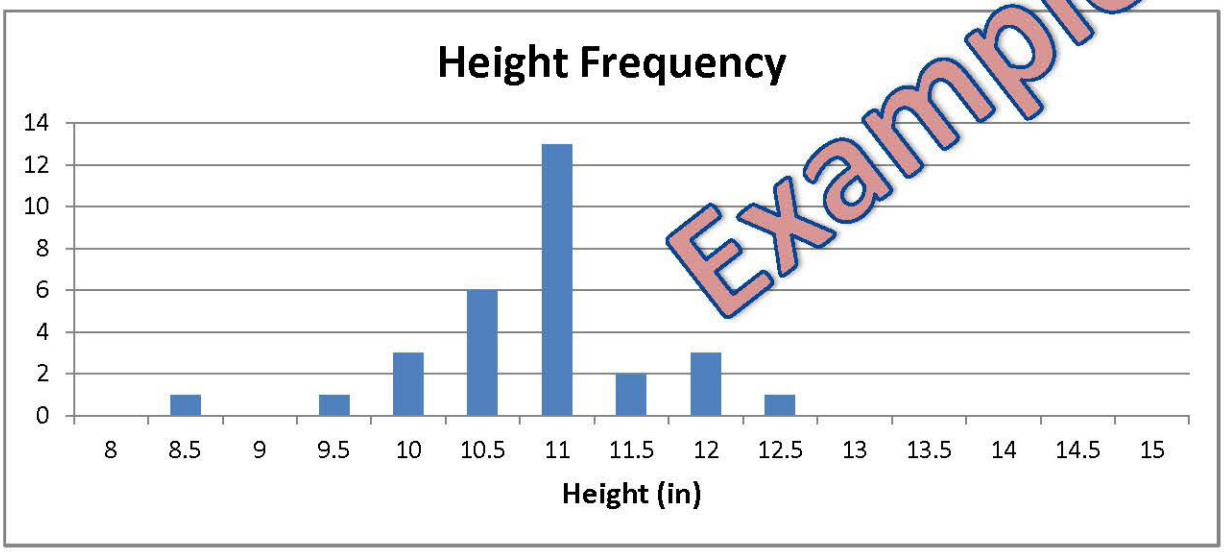
Company:	**Forest Tree Nursery**
Contact:	**Jim Simpson**
Nursery/State:	**Arkansas**
Species:	**Loblolly**
Stock:	**Bareroot**
Source:	**Piedmont**
Genotype:	**Adv**
Hand or Machine Lifted:	**Hand**

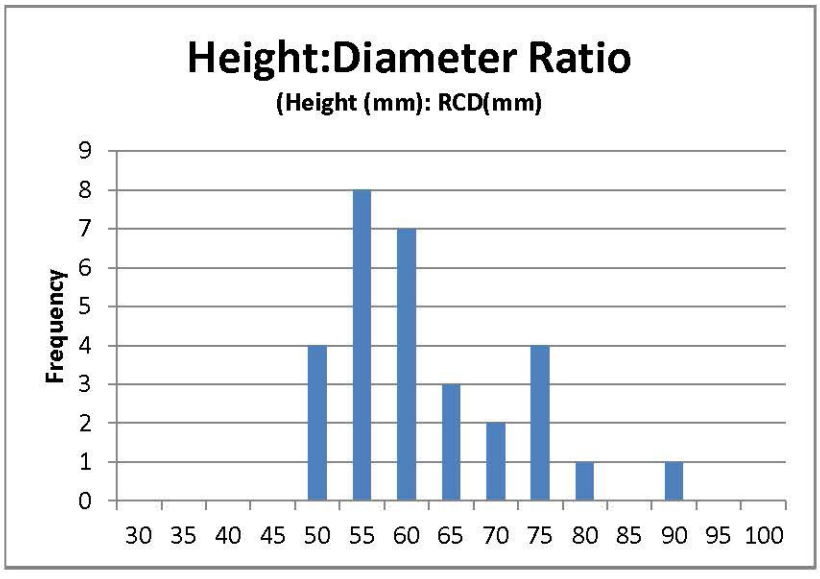
Measure of Central Tendency	
Average Height (in)	10.64
Average RCD (mm)	4.63
Median Height (in)	10.63
Median RCD (mm)	4.69

Measure of Spread (Dispersion)			
95% Confidence Interaval for RCD	4.63	±	0.25
98% Confidence Internval for RCD	4.63	±	0.30
Standard Deviation of Height		2.03	
Standard Deviation of RCD		0.70	
Coefficient of Variation of Height		8%	
Coefficient of Variation of RCD		15%	
Range (maximum - minimum) of Height (in)		3.90	
Range (maximum - minimum) of RCD (mm)		3.02	

Ratio	
Root Weight Ratio	19.6%
Height:Diameter Ratio	60
Top Dry Weight (g)	3.86
Root Dry Weight (g)	0.94







H:D is a ratio of sturdiness
Height (mm):RCD (mm)
A high ratio = "spindly"
A low ratio = "stouter"

Example

RCD (mm)	Ht (in)	H:D Ratio
4.5	10	56
5	10	51
4.5	12	68
5	12	61
4.5	14	79
5	14	71