AUBURN UNIVERSITY
SOUTHERN FOREST NURSERY MANAGEMENT COOPERATIVE

FY 2017 ACCOMPLISHMENTS

As Presented to the Southern Forest Nursery Management Cooperative Advisory Committee
November 8-9 2017

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GOAL A: RESEARCH

Objective 1. Identify, test, evaluate, and promote the registration of cost effective pesticides for use in forest tree nurseries.

Methyl Bromide Substitution

We will establish a replicated Methyl Bromide substitution trial at Rayonier Elberta Nursery, AL. The data collected will include seedling quality, nematodes, weeds and Trichoderma levels prior to and post fumigation. Data will be collected for two growing seasons and treatment plots will be part of the 2018 Southern Forest Nursery Association's annual meeting to be hosted by Rayonier. Products to be tested include Etheyelenedinitril, Dominus, Vapam, Ally 33 and propylene oxide. (Nadel/Enebak)

✓***Accomplishment: Trial was successfully installed. Pre and post Trichoderma and nematode levels were measured. Initial weed counts per treatment were undertaken. Weed data was collected and final seedling characteristics will be taken in November 2017.***

Herbicide Trials

Herbicide trials will be developed and installed to examine the effects of herbicides on seedling quality and on targeted weeds as reflected in our recent problem weed survey. Several of these are further developments of herbicide studies installed in in previous years.

- Pendulum®AquaCap™ on containerized pine: To gain additional seedling tolerance and targeted weed control information, a third-year container trial will be installed to test the tolerance of 4 pine species in container media to applications of PAC and the effectiveness of PAC on black willow and other weeds. Applications will be made weekly during the sowing period to coincide with willow seed dispersal. (Payne/Enebak)

✓***Accomplishment: This trial was installed in March and April 2017 in loblolly, longleaf, shortleaf and slash pine at one container nursery. This is the third year of study on loblolly and slash pine, and second year of study on longleaf and shortleaf pine. Newly-sown trays were sprayed over a five-week period in order to coordinate spray applications with sowing dates, species availability, and black willow seed dispersal. In addition to the two rates of PAC used in 2015 and 2016 studies, an additional higher rate (highest labelled rate) was added to determine seedling tolerance and its effectiveness in providing longer-term (6 to 8 months) weed control at this rate. The nursery provided 360 trays of seedlings for use in this study. Field counts of seedlings and weeds and collection of sample seedlings are scheduled for late November. Results of this trial will be included in a Research Report.***

- Pendulum®AquaCap™ and Marengo® outplanting studies: The four outplanting studies currently in place at Westervelt (AL) and IFCO (LA) nurseries will be continued for one additional growing season to gain additional data. Measurements from these studies will be used to compare survivability and growth of treated to non-treated container loblolly pine seedlings. Outplanting test maintenance is provided by cooperating nursery staff; measurements will be made by either nursery or SFNMC staff. (Payne/Enebak)

✓***Accomplishment: Because 2016 measurements of the outplanting studies showed no differences in survival and growth between treated and non-treated container loblolly pine seedlings sprayed with either Pendulum®AquaCap™ or Marengo®, utilization of these outplanting studies is discontinued.***

- Marengo® in bareroot eastern red cedar: A follow-up trial applying Marengo over-the-top of eastern red cedar seedlings will be established at the Georgia Forestry Commission's Flint River Nursery. This trial will be used to confirm results of a 2015 study installed at this nursery in which cedar seedlings treated with Marengo® exhibited increased growth characteristics when compared to untreated seedlings. (Payne/Enebak)

✓***Accomplishment: A follow-up trial of Marengo® sprayed at three rates over the top of bareroot eastern red cedar was installed in one nursery in June 2017. The nursery provided 160 feet of bed space for use in this study. Seedling sample collections are scheduled for mid-November 2017, with results of analyses of measurements to be included in a Research Report.***

- Pendulum®AquaCap™ second application timing trial: In response to concerns from multiple bareroot nurseries over reoccurrence of spurge in late summer (after PAC application was made at sowing), a timing trial of PAC will be installed at several nurseries of varying soil types. This study will be used to determine if PAC applications made at sowing and again at 8, 10, or 12 weeks post-sowing will result in herbicide gall formation or have other effects on seedling quality. A similar timing trial with PAC was made in 2013 without an at-sowing PAC application. (Payne/Enebak)

✓***Accomplishment: While maintaining the intent of this study, a modification was made to eliminate later-season (at 8, 10 or 12 weeks post-sowing) sprays and substitute a higher rate application of PAC at sowing. Because a later-season application of PAC would require weed-free seedling beds for optimal herbicidal effectiveness, hand-weeding of the test beds would be required, defeating the purpose of this study. This rate is the highest allowable labelled rate of PAC, has not been tested by the SFNMC, and is recommended for longer-term (6 to 8 months) weed control. At-sowing applications of PAC at three rates (two previously studied rates and one new high rate) were made in loblolly pine in four bareroot nurseries in April 2017. Each nursery provided between 100 and 150 feet of bed space for this trial. (This higher rate of PAC was also included in the PAC container study listed in the first item.) Field counts of weed populations and collections of sample seedlings are scheduled for October, with results of analyses of measurements included in a Research Report.***

- 'New' herbicides screening study: A replicated screening study of multiple (up to 20) pre- and post-emergent herbicides for the control of sedges, grasses, and broadleaf weeds will be installed at member nurseries of various soil types to target specific weed problems. Using our recent problem weed survey, faculty of AU Department of Crop, Soil and Environmental Sciences will identify herbicides to include. These herbicides have not yet been tested by the SFNMC but are presently used in either turf or agricultural settings. Pine seedling tolerance and herbicidal effectiveness will be measured. In addition, second-year trials of any of the 4 herbicides tested in 2016 may be installed after seedling quality data are analyzed to quantify seedling tolerance. One of these 4 new herbicides (sulfentrazone) may be used in an additional trial targeting annual sedge. (Payne/Enebak)

✓***Accomplishment: This study was modified to screen only post-emergent herbicides due to logistical limitations of including both pre- and post-emergent products. Nine herbicides, selected for broadleaf weed, grass or sedge control, were applied at 9 weeks post-sowing over the top of loblolly pine in four nurseries and slash pine in one nursery. Each nursery provided from 400 to 650 feet of bed space for this trial. Four of the herbicides used were studied in 2016 trials with no negative effects on seedling characteristics when applied at least 8 weeks after sowing. Field observations over the summer show that at least two of the new herbicides have negative effects on seedling growth and development. Collections of sample seedlings are scheduled for October and results of analyses of measurements will be included in a Research Report.***

- RonstarFlo® (oxadiazon) study targeting annual sedge (*Cyperus compressus*): As a result of increased incidence of annual sedge in both bareroot and container nurseries, a trial of pre-and post-emergent applications of RonstarFlo®, alone and in combination with other preemergent herbicides, will be made. In 2012 and 2013 trials using RonstarFlo®, bareroot pine seedlings exhibited tolerance to the herbicide with good sedge control. (Payne/Enebak)

✓***Accomplishment: To continue work begun in 2012, this trial was installed in four bareroot nurseries in loblolly pine. Pre-emergent applications of three rates of RonstarFlo® (two previously studied rates and the highest labelled rate not yet studied) were made at the time of sowing. Conifer nurseries are listed on the RFlo label as acceptable use locations but the four major pine species produced by our nurseries are not listed as tolerant in over-the-top applications of the herbicide. Because annual sedge can be a problem weed in container nurseries, this study was expanded to include applications of RFlo at three rates to newly-sown trays of loblolly, longleaf, shortleaf and slash pine in one nursery. Bareroot nurseries each provided 200 feet of bed space, and 360 container seedling trays were provided by one nursery. Field counts of seedlings and weeds and collection of seedling samples are scheduled for October and November, with results of analyses of measurements included in a Research Report.***

- A survey of member nurseries will be made to document historical and current use of Goal® (oxyfluorfen) products in weed control regimens. This survey is relevant due to the presence of weeds that appear to be more resistant to Goal® in a limited number of our member nurseries.

✓***Accomplishment: A request for current and historical use of oxyfluorfen products was emailed to all nurseries in September. Information received will be complied and saved for use should the need arise to investigate herbicide resistance to Goal® products.***

Fusiform Rust Control

A seed treatment study on loblolly will be done testing new chemistries in addition to using various rates of Proline® in conjunction with the US Forest Service Rust Testing Laboratory in Asheville, NC. Current label rates for Proline® as a seed treatment on conifer seed were based on the use of tridimefon activity. Label rates for others agronomic seeds are 10-100 x less ai per unit of treated seed. The ability to identify the lowest effective rate for Proline® use on conifer seed will decrease pesticide usage. Any potentially new fungicide seed treatment chemistries will also be assessed in this study. Conifer seed (longleaf, loblolly and slash) will be treated in Auburn and then sown into USFS container systems until germination at which time the seedlings will be challenged with basidiospores of fusiform rust. (April - Nov 2017) (Nadel/Enebak)

✓***Accomplishment: Loblolly and slash pine seedlings were treated 5 rates of Proline, standard Bayleton and water check to determine the lowest effective rate to control fusiform rust when used as a seed treatment prior to sowing. Bayleton and non-treated seed were included as a positive and negative control. Treated seed were sown at the USFS Rust Testing Laboratory and 6 weeks post sowing were challenged with 30,000 basidiospores of Cronartium quercuum f.sp fusiforme. Seedlings were then cared for by USFS staff and the amount of infection determined by treatment recorded in October. Effects of reduced seed-treatment rates on infection will be compiled into a Research Report.***

Objective 2. Identify and develop economically feasible nursery cultural practices that enhance seedling quality.

Development of a rapid screening test for the presence of *Fusarium circinatum*

We continue testing this new method on conifer seed and seedlings for the presence of the pitch canker fungus and aim to have this new technology adopted and approved by the International Seed Testing Association (ISTA) as a seed screening method that can then be enforced as an alternative to the current blotter paper method used by seed certification companies, disease diagnostic laboratories and plant inspection agencies. SFWS staff will focus on equipment grants that would allow the purchase of a qPCR such that the system could be used to quantify seed infestation. (Nadel/Enebak)

✓***Accomplishment: The molecular protocol developed to rapidly screen for the presence of Fusarium circinatum in pine seed and seedlings has been submitted to the ISTA for review and approval. Pitch canker screening of seedlot and seedling samples is now a service available to members. In collaboration with SFWS staff we have been able to recently acquire a real time PCR machine that will enable us to now work on quantifying the actual seed infestation using molecular method.***

Using Near Infrared (NIR) to Detect Freeze Injury in Loblolly Pine

Near-infrared Spectroscopy (NIR) was originally developed for use in the pharmaceutical industry and is now used in agriculture, and chemical manufacturing. Recently this technique has found a use in identifying different species of Eucalyptus. Initial testing in both bareroot and container loblolly pine that represents a base line for freeze tolerance (e.g. 7-56, Atlantic Coast, Marion County) will be done with a laboratory NIR machine to develop a baseline for non-injured tissue. Two years of funding has been secured from SFWS to bring on a PhD student, who has been identified and is starting on the project in January 2017. Seedlings will then be subjected to various levels of exposure to freezing temperatures to determine if freeze injury can be detected. If successful, we will try to obtain a portable NIR instrument which has been successfully used in forestry. (Jan – Dec 2017) (Enebak/Via)

✓***Accomplishment: A second student was identified and application was approved by AU Graduate School to begin on this project in January 2017. However, the student was not granted a student visa and was denied entry in the US. This, and long duration in locating a student resulted in the matching-SFWS to be rescinded. This project will be tabled until funding and qualified student can be located.***

Controlled Release Fertilizers in Container Seedlings & Nutrient Status

This study will be repeated for a third year using the same protocol as this last year, but focussed on application rates. The use of long-term controlled release fertilizers (CRF) (> 14-18 months) at different rates will be examined in the production and nutrient status of container seedlings over time. An example of a CRF would be #2 Polyon 16-5-11. Container sets of participating nurseries will be seeded with different numbers of prills by incorporating a sample of the fertilizer, at different rates, in a small portion of their media by hand. Nutrient status will be measured on seedlings treated with various fertilizer rates and examined for foliar nutrients after outplanting. Nurseries interested in participating in the experiment include IFCO, Bellville, River Bend, North Carolina Forestry Commission and Westervelt. (Nadel/Enebak)

✓***Accomplishment: Cooperators for this particular CRF study could not be identified and this trail was not installed in FY17. We continue to monitor the growth and survival of the previous rate trial that was out-planted in December 2016***

Literature search on bareroot seedling nutrient loading

A literature search will be undertaken to determine whether any research has been undertaken on nutrient loading of bareroot seedlings, without the resulting excess foliage flushing. (Nadel/ Enebak)

✓***Accomplishment: No progress was made with this project in 2017.***

Objective 3. Develop methodologies to minimize the environmental impact of nursery cultural practices while maximizing their effectiveness including the development of integrated pest management programs.

The use of drones: Unmanned Aerial Vehicles (UVAs) in seedling production

Working with the Department of Bioscience in the College of Agriculture, UVAs will be flown over the growing season and the data analyzed to examine the effects of nursery practices on seedling productivity in a continuation and confirmation of the 2016 data collection. The ability to count the number of seedlings in a container nursery is imperative. This study will focus on determining the correct software to be used to count individual seedlings from the images obtained from UVAs (McDonald/Enebak/Nadel)

✓***Accomplishment: Imagery of both bareroot and container seedlings were obtained and submitted to AU Biosystems Engineering department to assess the ability of specific software to assist in seedling inventory. Using currently available software, Dr. Tim McDonald was able to "count" seedlings in images provided. Thus, the system is possible, but would need to be tied to individual seedling systems.***

Test alternative fipronil chemistries for use in seedling production

Nursery Cooperative staff will test alternative fipronil chemistries as an alternative to PTM. (Enebak)

✓***Accomplishment: Two a.i. sources of fipronil were identified and a trial installed in March 2017. Growth and survival of the trial will be measured in early 2018.***

Objective 4. Further define the "optimal seedling" so as to maximize the cost effectiveness of artificial regeneration forestry systems.

Chilling Hours and Seedling Storability

Determine the impact of ethylene management on increasing seedling storability and its impact on chilling hours through a one molecule inhibitor of ethylene (1-MCP). Several types of stresses (such as temperature, moisture and nutrient stress) induce ethylene production. Increased Ethylene production has been shown to reduce the growth and survival of several agricultural crops. The AgroFresh Inc. 1-MCP product inhibits the production of ethylene (due to the blocking nature of the molecule) and successfully used in fruit production and storage increasing yields and survivability of such crops. There are potential opportunities for the forestry industry to use such a product (during lifting and storage of seedlings) to increase survivability. This study we aim to determine what impact the 1-MCP molecule will have of ethylene production of seedlings and whether such a product could aid in increasing seedling storability and out planting success. (Nadel/ Enebak)

✓***Accomplishment: Study was undertaken using a single seedlot of slash pine. Seedling were pulled from the nursery for each treatment and placed in a cooler. At two week intervals seedlings were removed from the stored seedlings for measurement and outplanting. Outplanted seedlings growth and survival continues to be measured. Provisional results indicate an impact of 1-MCP on seedling survival. Further studies on the use of 1-MCP are required to determine the reproducibility of the results over a "normal" lifting period***

A meta-data analysis (statistical analysis of data across multiple studies) will be attempted to determine if there is a link to the number of chilling hours seedlings are exposed to and their ability to survive storage after outplanting. (Enebak/Loewenstein)

✓***Accomplishment: No progress was made with this project this growing season.***

GOAL B: TECHNOLOGY TRANSFER

Objective 1. Serve as a clearinghouse of information related to nursery production and tree planting.

Methyl Bromide

In collaboration with MBr manufacturers, the Methyl Bromide Industry Panel (MBIP), the Chloropicrin Manufactures Task Force (CMTF) and applicators, the Nursery Cooperative staff will continue to keep abreast of EPA actions and/or possible legislative initiatives that may affect the future availability of soil fumigants. We will continue to inform the membership through the Advisory Committee to keep the membership knowledgeable of these activities

The Nursery Cooperative staff will continue to keep abreast of activities related to the Quarantine pre-shipment (QPS) process. We will inform the membership of any EPA initiatives and continue to work with the AF&PA, the Crop Protection Council, USDA and APHIS to provide input and influence the QPS process if necessary.

The Nursery Cooperative staff will continue to work with the AF&PA, and USDA to inform and influence the EPA deliberations regarding pesticide regulation as it pertains to the soil fumigation re-registration decisions that were released in spring 2013. (Nadel/Enebak)

✓***Accomplishment: Accomplishments: Nursery Cooperative staff participated in 1 conference calls with the MBIP and the CMTF on soil fumigation rules. Nursery Cooperative staff continue to survey members each fall and spring as to their soil fumigation operations. Soil fumigation use, rates, compounds and issues are being compiled for inclusion on the soil fumigation REDs including Telone, which appears to have a lower toxicity ranking than previously reported. These, and other changes, will be part of the new labels, scheduled to appear in 2020.***

Update of Nursery Label Book

The Nursery Pesticide Label Book on the Nursery Cooperative's website will be updated to include recent additions of herbicide, insecticide and fungicide labels. (Brooks/Enebak)

✓***Accomplishment: The collection and listing of herbicides, insecticides and fungicide labels continues. Labels for herbicides, Insecticides and Fungicides were linked to an Excel Spreadsheet that is available on the Nursery Cooperative Web Page.***

Revision of Ag Handbook 473, Hardwood Nursery Guide (Hardwood Manual)

In collaboration with the US Forest Service and with input from Nursery Cooperative membership, Dr. McNabb and Nursery Cooperative staff and Carolyn Pike, of the USFS, Purdue will complete the missing chapters of the Hardwood Manual. (McNabb/Starkey/Bowersock)

✓***Accomplishment: Ken McNabb has completed the missing chapters of the Hardwood Nursery Guide and is in the final editing process for submission to printers with a deadline of October 31, 2017. Plans are to have the guide printed in and distributed to membership in 2018.***

Re-registration of Nursery Pesticides

The Nursery Cooperative staff will continue to follow the re-registration process for pesticides currently under review under the Food Quality and Protection Act (FQPA) used in seedling production and will provide information to the necessary regulatory agencies (USDA, APHIS, EPA, etc) when necessary. (Enebak/Nadel)

✓***Accomplishment: In early July 2017, a request came from EPA/USDA ARS on the use of phosmet, an insecticide labeled for use in nurseries and seed orchards on conifers. I queried the southern seedling producers about their usage, if any of phosmet, and received no comments from the 18 or so state, federal or private nurseries. I also could find no record in the Nursery Practices Survey Reports or data sheets conducted in 2012 of any organization using any of these materials.***

Maintain and Update Nursery Cooperative Web Site

The Nursery Cooperative staff will continue to update the Nursery Cooperative website for use by Nursery Cooperative Members and increase the "searchable" status of the Cooperative's data and reports. (Bowersock)

✓***Accomplishment: A compilation of herbicide Research Reports based on active ingredient from 1979 to 2017 was developed and distributed to nursery members in paper format at the 2017 Contact Meeting, and also made available as a searchable Excel spreadsheet to interested nursery personnel. This list allows for searches by herbicide common and trade name, weed type, and species tested. (Payne)***

Leveraging Nursery Cooperative Data

The Nursery Cooperative staff will continue to stress the importance of Cooperative membership and when possible, leverage Cooperative information for grant proposals and data cite license for the seedling production survey. (Staff)

✓***Accomplishment: Accomplishments: The Nursery Cooperative had an additional year added to the 5-yr agreement to share seedling production data under a Cite License. For an annual fee of $10,000, seedling production data will be given to USFS Washington Office for them to use in their planning and reporting programs. Funds are used towards Elizabeth Bowersock's salary to compensate for her time.***

✓***Accomplishment: A proposal that used Nursery Cooperative funds as a match/leverage for Center for Advanced Forestry Systems (CAFS) was approved in July 2017. The Nursery Cooperative will share $60,000 annually with the Forest Health Cooperative in FY 18 that will go towards Dr. Ryan Nadel's salary. This is the last year of this grant proposal.***

Objective 2. Efficiently and regularly transfer the results of cooperative research to the membership.

Contact Meeting

The Nursery Cooperative Contact meeting will be conducted as a 2-3 day program will be held in in South Carolina. ArborGen's SuperTree Nursery in Blenheim, SC will serve as the host and conduct the nursery tour. Working with Gary Nelson, cooperative trials will be install as part of the outreach component of Nursery Cooperative research. The agenda will cover presentations by Nursery Cooperative staff on current research activities and results during the week of July 10, 2017. Details will be worked out with Gary Nelson with meeting information outlined in the Spring 2017 Newsletter. (Enebak/Bowersock)

✓***Accomplishment: The 2017 Nursery Cooperative Contact meeting was held on July10-13, 2017 in Myrtle Beach with ArborGen's SuperTree Nursery in Blenheim, SC serving as the host and conducting the nursery tour. The meeting was attended by 38 Nursery Cooperative members. Nursery Cooperative staff presented information to the entire group on soil fumigant usage rates over time, weed control, new technologies and mobile apps and a rapid***

pitch canker identification tool that is ready for members to participate. In addition, guest speakers included Tim McDonald, Biosystems Engineering from Auburn discussing the possibility of seedling inventory and camera systems, Lisa Samuelson from SFWS reporting on seedling physiology and Barbara Crane, US Forest Service on the status shortleaf and longleaf pine seed orchards. The field trip at this meeting included a tour of the Blenheim Nursery and SFNMC herbicide trials. Special thanks to Gary Nelson, his staff and ArborGen for their efforts to host the group.

Research Reports (Staff)

We plan on producing Research Reports and Technical Notes in FY17.

✓***Accomplishment: Nursery Cooperative staff produced 3 Research Reports, 1 Technical Note and 1 Management Alert that covered the following topics.***

- ***RR 2017-01. Effect of Rate of Over-the-Top applications of Marengo (indaziflam) on seedling tolerance and control of black willow and other weeds in container-grown pine seedlings. Payne, Enebak and Brooks.***

- ***RR 2017-02. Herbicide trials with florasulum, penoxsulam, trifloxysulfuron and sulfentrazone in loblolly and slash pine seedlings. Payne and Enebak.***

- ***RR 2017-03. Pendaulum Aquacap (pendimethalin) applications on tolerance of container-grown loblolly, longleaf, shortleaf and slash pine and on black willow and weed populations in containerized growing systems. Payne and Enebak.***

- ***MA 2017-01. Record heat and drought impact on seedling outplanting growth and survival. Nadel.***

- ***TN 2017-01. Forest tree seedling production in the southern United States for the 2016-2017 planting season. Enebak.***

Newsletters

Newsletter distribution will be planned for March and September 2017. Members are encouraged to submit articles and organizational updates. (Staff)

✓***Accomplishment: Newsletters were produced and mailed to 90 contacts within the Nursery Cooperative membership in March and September 2017. Topics within those Newsletters included:***

2017 Contact Meeting
2018 Advisory Meeting
Nursery Production Survey
Pesticide News and QPS Updates
Herbicide Trial Updates
International Forest Research
Chilling Hours
Status of the World's Forests
Know Weeds – Green Kyllinga

Objective 3. Provide a limited consultancy function to the membership in the area of nursery seedling production and outplanting.

Individual and Organization Contacts

An on-going activity and is handled as individual situations within each organization within the Nursery Cooperative as cases arise during the growing and planting season. (Payne/Nadel/Enebak)

✓***Accomplishment: Staff participated in the following contacts***

	Payne	Enebak	Nadel
Phone calls	**53**	**34**	**10**
Letters	**0**	**2**	**0**
Emails	**231**	**43**	**33**
Site Visits	**43**	**1**	**1**
Diagnosis	**6**	**8**	**23**

Seedling Production Survey

The Nursery Cooperative staff will continue the seedling production survey initiated in FY 03. The same questionnaire will be used to obtain production figures for the 2016 to 2017 planting season. The survey will be sent out in June 2017. (Enebak/Bowersock)

✓***Accomplishment: A mailing list that 56 nurseries was mailed in May 2017 throughout the southern US to gauge seedling production for the 2015-2016 planting season. Data was compiled and put into Technical Note 17-01 which will be mailed to all participating nurseries.***

Nursery Customer Meeting Presentations

Over the past several years as schedules and travel permits, Nursery Cooperative personnel have participated customer (internal and external) meetings at nurseries in an effort to encourage and improve customer relations and educate nursery customers on seedling planting and successful plantation establishment. 30-minute presentations such as "*Why Did My Seedlings Die*?" and "*The Ten Commandments of Seedling Survival*" are presentation the staff have made.

✓***Accomplishment: There were no requests for special one-on-one meetings or presentations with member organizations in FY17.***

Short Course

With the Nursery Cooperative's short course in Auburn in September 2015, we will hold off for a year or two and revisit the course again in January 2017. The Short course would be in September 2017. (Staff)

✓***Accomplishment: In early February 2017, 6 people had expressed an interest in a Short Course. However, once the dust settled on the Plum Creek/Weyerhaeuser/IFCO nursery transfers in June, it became apparent that 25+ members could use a Short Course. AU staff was simply not ready to pull Short Course together in that time frame. We will begin planning and organizing in early 2018 for a Short Course in September 2018.***

GOAL C: COOP DEVELOPMENT

Objective 1. Provide for the continual relevancy and efficiency of the Cooperative research and technology transfer programs.

Advisory Committee Meeting

The FY18 Advisory Committee Meeting will be held on November 8-9, 2017. A 2, half-day meeting will be planned. If there are any meetings that conflict with this time frame, let us know and we can try and accommodate Advisory Members. (Enebak/Bowersock)

✓***Accomplishment: Nursery Cooperative Advisory Meeting was conducted in Auburn on November 8-9, 2017, Workplan, Accomplishments and Budget was shared with membership.***

Nursery Cooperative Membership

The Nursery Cooperative staff will make an effort to recruit new members among those nurseries that will benefit from activities of the Nursery Cooperative. (Staff)

✓***Accomplishment: We have made a couple of contacts with PRT located in Atmore, AL. They have indicated that they would join the Cooperative after their first crop is complete in FY18. No new members joined the Nursery Cooperative in FY17.***

Update the Coop Membership and Nursery Directories

An on-going activity with an updated directory distributed annually to each member. (Bowersock)

✓***Accomplishment: Nursery Cooperative Membership Directories were updated and sent to Cooperative Members in November 2016 and again in June 2017.***

Objective 2. Increase the visibility and effectiveness of the Cooperative as a source of information on issues related to seedling production and plantation establishment.

Presentations at Meetings

Nursery Cooperative staff will continue to be encouraged to participate as a speaker or attendee in regional and national meetings related to artificial regeneration. (Staff)

✓***Accomplishment: Nursery Cooperative staff at Auburn University presented 3 talks on nursery related topics to regional and local groups. Topics and Titles are listed below:***

- ✓ ***Tri-State Forest Herbicide Workshop (Payne), Association of Consulting Foresters State Chapter Meetings (Payne),***
- ✓ ***Nadel, RL. The ten commandments for better seedling survival. Alabama Division, Society of American Foresters, Montgomery, Alabama. 29 August 2017.***
- ✓ ***Nadel, RL. and Enebak S. Root development and morphological comparisons of container-grown pine and subsequent productivity after establishment. Centre for Advanced Forestry Systems 2017 Industrial Advisory Board Meeting, Portland, Oregon. 2 – 4 May 2017.***

Publications

Nursery Cooperative staff is encouraged to publish research results in scientific journals. (Staff)

✓***Accomplishment: Nursery Cooperative staff at Auburn University published 4 manuscripts on nursery related topics in national and international journals. Titles and journals are listed below:***

- ✓ ***South D.B., Nadel R.L., Enebak S.A. and Bickerstaff G. (submitted) The nutrition of loblolly pine seedlings exhibits both positive (soil) and negative (foliage) correlations with seedling mass. Tree Planters Notes XXX (submitted), pg. 1 – 17***

- ✓ ***South D.B., Nadel R.L., Enebak S.A. and Bickerstaff G. (submitted) Effect of sulfur and lime on soil pH and nutrients in a sandy Pinus taeda nursery. New Forests XXX (submitted), pg. 1 – 17***

- ✓ ***Devkota P., Nadel R.L. and Eckhardt L.G. (submitted) Intra-species variation of mature Pinus taeda L. in response to root-infecting Ophiostomatoid fungi. Forest Pathology XXX (submitted), pg. 1 – 35***

- ✓ ***Zhao X., Hui B., Hu L., Cheng Q., Via B.K., Nadel R., Starkey T. and Enebak S. (2017) Potential of near infrared spectroscopy to monitor variations insoluble sugars in Loblolly pine seedlings after cold acclimation. Agricultural and Forest Meteorology 232 (2017), pg. 536 – 542 DOI 10.1016/j.agrformet.2016.10.0120168-1923/***

Extramural Funding of Nursery Cooperative Projects

Nursery Cooperative staff will continue to be encouraged to locate and generate extramural funding opportunities directly related to artificial regeneration. (Staff)

✓***Accomplishment: The Southern Forest Nursery Cooperative and the Forest Health Cooperative jointly was awarded a 4th year of a 5-yr proposal period of which $60,000/year that will be used to direct Nursery Cooperative and Forest Health Cooperative research.***

Interaction with other Research Cooperatives

The Nursery Cooperative staff will make efforts to interact, attend, work with other regional and national forest research Cooperatives in an attempt to broaden and strengthen research ties that can benefit seedling production. (Staff)

✓***Accomplishment: Attended and presented Nursery Cooperative information at the 2017 Annual CAFS meeting in Portland, Oregon, May 2-4, 2017***