AUBURN UNIVERSITY
SOUTHERN FOREST NURSERY MANAGEMENT COOPERATIVE

FY 2018 ACCOMPLISHMENTS

As Presented to the Southern Forest Nursery Management Cooperative Advisory Committee
October 31 – November 1, 2018

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FY 2018 ACCOMPLISHMENTS

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 continue to monitor the 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 1-yr post fumigation. Data will be collected for the second growing season and treatment plots will be part of the 2018 Southern Forest Nursery Association's annual meeting to be hosted by Rayonier. Products tested included Etheyelenedinitril, Dominus, Vapam, Ally 33 and propylene oxide. (Nadel/Enebak)

- ✓ ***Accomplishment: Trial was successfully installed in fall 2016 with pre- and post-Trichoderma and nematode levels were measured in 2017 and 2018. Initial weed counts per treatment were undertaken with data indicating Propylene Oxide is not efficacious and will be phased out of further research trials. MBr alternative plots were used as a demonstration site for 2018 Southern Forest Nursery Association biennial meeting hosted by Rayonier. Final seedling characteristics were collected in November 2017 and October 2018 and will be submitted as a Research Report to members in 2019.***

Nursery Weed Control

Information will be gathered and appropriate trials developed and installed to examine methods of weed control by herbicide application, crop seed protection, and weed seed source containment. Several of these herbicide trials are continuations or expansions of trials currently in progress.

- *Weed seed source scouting for each nursery*: Participating nurseries will be scouted, using field visits, online maps or drones, to examine areas where weed seeds may be accumulating, in addition to identifying mechanical or cultural practices that may introduce or transport weed seeds. Any SFNMC member nursery may participate (Payne).

- ✓ ***Accomplishment: Conversations were conducted among those nurseries where we installed field studies on ways to reduce weed populations. Progress has been noted in nurseries' efforts to control weeds on riser lines, in ditches, roads, and other nonproduction areas. Special emphasis was made on the importance of weed-free bark/mulch in those nurseries using it as a soil amendment and/or bed covering after sowing.***

- *Herbicide safeners in hardwood*: The feasibility of using herbicide safeners as potential hardwood seed treatments will be explored. These safeners are chemical agents applied to seed or into herbicide tank mixes to reduce herbicide injury to desired plants without diminishing the herbicidal effectiveness in control of targeted weeds. Commercial safeners are currently used in corn, grain sorghum, rice, and wheat. If practicable, a trial using herbicide safeners on spring-sown hardwood species will be installed to determine tolerance of multiple hardwood species as well as effectiveness of weed control with safeners (Payne/Brooks).

- ✓ ***Accomplishments: This proposed trial was not conducted in FY 18 due to lack of cooperative interest.***

- *Pendulum®AquaCap™ High Rate in bareroot and container pine*: In response to concerns from nurseries about late summer weed problems, a follow-up study using the highest allowable labelled rate of PAC will be installed at sowing to measure seedling tolerance (herbicide gall formation) and longer-term (6 to 8 months) weed control. Bareroot loblolly and slash pine and container loblolly, longleaf, slash and shortleaf will be included. INSTALLATION OF THIS TRIAL IN EACH SPECIES IS DEPENDENT ON RESULTS OF 2017 TRIAL. (Payne/Enebak)

- ✓ ***Accomplishments: The determination was made to discontinue this study based on results of the 2017 trial. In that study, no significant differences in bareroot seedling characteristics were measured when comparing seedlings with no PAC applications to those receiving the highest labelled rate of PAC at sowing. However, the variation and inconsistency in container seedling characteristics in the 2017 trial confirmed results from two previous studies that the effect of PAC on pine seedlings grown in organic media is uncertain.***

- *Marengo® in bareroot eastern red cedar*: A third-year study applying Marengo over-the-top of eastern red cedar seedlings will be installed 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. INSTALLATION OF THIS TRIAL IS DEPENDENT ON RESULTS OF 2017 TRIAL. (Payne/Enebak)

- ✓ ***Accomplishments: Positive results of the 2015 and 2017 trials provided sufficient information for the nursery in which Marengo was tested to use it operationally in 2018. No further testing is planned.***

- *'New' Postemergent Herbicide Screening in bareroot pine*: A replicated screening study of several post-emergent herbicides for the control of sedges, grasses, and broadleaf weeds will be installed at member bareroot nurseries. Along with recommendations from AU College of Agriculture faculty, results of 2016 and 2017 trials will be used to determine inclusion of herbicides in the study. (Payne/Enebak)

- ✓ ***Accomplishments: Eleven postemergent herbicides, selected for broadleaf weed, grass or sedge control, were applied in a replicated study at 8 weeks post-sowing over the top of bareroot loblolly pine in two nurseries and bareroot slash pine in one nursery. Each nursery provided 440 to 480 feet of bed space for each installation. Five of the herbicides used were included in 2017 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.***

- *Low rate glyphosate applications over the top of hardwood*: In an effort to identify safe herbicides for emerged weed control in hardwood nurseries, reviews of research of low rate applications of glyphosate in agricultural crops will be made. Sufficient positive results may lead to the design and installation of a study using low rate, over the top applications in multiple hardwood species in Coop member nurseries. (Payne/Brooks)

- ✓ ***Accomplishments: Reviews of literature and discussions with AU College of Agriculture faculty resulted in the decision to omit this study. There is evidence in the agriculture community of the development of herbicide resistance caused by repeated low-rate applications of herbicides.***

- *RonstarFlo® (oxadiazon)* in *bareroot and container pine*: As a result of increased incidence of annual sedge in member nurseries, a trial of pre-emergent applications of RonstarFlo® will be made in bareroot and container nurseries. Previous bareroot nursery trials in 1999, 2012, and 2013 showed no negative effect on loblolly pine seedling characteristics. INSTALLATION OF THIS TRIAL IS DEPENDENT ON RESULTS OF 2017 TRIAL. (Payne/Enebak)

- ✓ ***Accomplishments: This trial was installed in March and April of 2018 to 180 newly-sown trays of containerized loblolly and longleaf pine in one nursery. These two species were selected due to their sowing dates coinciding with willow seed dispersal. The 2017 trial results showed no negative effects to seedlings of either of these species while providing between 85% -100% willow control and 80% - 100% control of other weeds in treated trays. Field counts and seedling sample collections will be done in late fall 2018 with results of analyses of measurements included in a Research Report.***

- ➢ *RonstarFlo® (oxadiazon) over hardwood*: Interest in the use of RonstarG in postemergent applications in hardwood has been expressed following its past use. A trial using granular and liquid formulations of oxadiazon in applications after hand-weeding will be installed in one nursery. (Payne)

- ✓ ***Accomplishments: This study was not conducted in 2018 due to operational limitations; however, more interest has been shown during the year to include this herbicide and others into a granular postemergent herbicide study in hardwoods in 2019.***

Fusiform Rust Control

A seed treatment study on loblolly will be done testing new chemistries in conjunction with the US Forest Service Rust Testing Laboratory in Asheville, NC. Two new fungicide treatment chemistries will be assessed in this study. Conifer seed (loblolly and slash) will be sown at Auburn into USFS container systems until germination at which time the seedlings will be treated prior to being challenged with basidiospores of fusiform rust. (April - Nov 2018) (Nadel/Enebak)

- ✓ ***Accomplishments: Loblolly and Slash pine seedlings were treated with two potential new chemistries, standard Bayleton and water checks were used to determine the efficacy of the new chemistries to control fusiform rust. This study was a seedling treatment study. 6 weeks post sowing seedlings were treated and sent to the USFS Rust testing Laboratory where they were challenged with 30 000 basidiospores of Cronartium quercuum f.sp fusiforme. The final amount of infection will be recorded in November and determined by treatment.***

Nanocellulose/lignin impregnated with insecticides to control pine tip moth

Nanocellulose particles will be created and impregnated with imidacloprid, fipronil and/or emamectin benzoate. Particles will be dispersed over seedlings in a greenhouse (25 per treatment) with a sifter/spray. Seedlings (needles, stems, roots) will be sampled at various time points (weekly for 10 weeks). Tissues will be ground and analyzed to determine movement of pesticide through seedling tissues. (Persin/Eckhardt/Nadel)

- ✓ ***Accomplishments: Fipronil was delivered to loblolly seedlings through a nanocellulose system. Seedlings were then allowed to grow in the greenhouse for several months. Seedling foliage sampling has occurred, chemical analyses currently underway thus we await results to determine whether cellulose nanofibrils (1) improved the systemic adsorption of fipronil in the trees and/or (2) whether it will decrease the amount of the recommended rate of fipronil, with the same/ improved efficiency***

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 will continue to obtain approval 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. (Nadel/Enebak)

- ✓ ***Accomplishments: The molecular protocol developed to rapidly screen for the presence of Fusarium circinatum in pine seed and seedlings submitted to the ISTA for review and approval in 2016 and is still in ISTA conference. Dr. Nadel has met with the director of ISTA on two separate occasions to move the process along with little effect. However, pitch canker screening of seedlot and seedling samples is now a service available to members to determine 'yes' or 'no' on seed or seedling samples.***

Modeling container seedling development

This will be a collaborative project with the Plantation Management Research Cooperative, University of Georgia. We aim to model growth and carbohydrates in container grown pine seedlings over time. The model uses temperature and water availability to predict plant size, and plant carbohydrates levels (Nadel/ Montes).

- ✓ ***Accomplishments: Project ongoing. Loblolly seed sown in May with seedling growth, soil moisture and temperature measured throughout the growing season. Seedlings growth measured every 2 weeks.***

Soil stabilizer trials

Three soil stabilizers (H.B Fuller, Tailored Chemical Systems, Soil Tech) will be tested at both Jesup and Elberta Nurseries. The application rates to be tested are 4:1, 7:1, 10:1. (Nadel/Payne)

- ✓ ***Accomplishments: One replicated study comparing three soil stabilizer products (DuraPro P-1490, SoilTac, and Tailored Permaflex 325) at a single rate was installed in one nursery. Products were supplied by the manufacturers and applications were made operationally with nursery equipment over 1.4 acres of bed space. Visual inspections over the summer showed no evidence of seedling intolerance to the products. Seedling counts by drill will be made and sample seedlings will be processed at the SFNMC laboratory to determine effects of these products on seedling characteristics.***

Seedling growth/root vigor trials.

Two products reported to increase seedling growth and vigor will be examined for their reported efficacy. These include Radiate and Megafol and will be tested at the Jesup nursery in Georgia. (Nadel/Payne)

- ✓ ***Accomplishment: Three foliar 'plant vigor' products (Axilo, FoliarBlend, and Megafol) were applied in three bareroot loblolly pine installations and one slash pine installation. Four applications, as recommended by producers, were made at approximately 8, 10, 13 and 15 weeks post-sowing at each location. Collections of sample seedlings are scheduled for October and results of analyses of measurements will be included in a Research Report.***

- ✓ ***Additional Accomplishment: A replicated study to determine the tolerance of bareroot loblolly pine seedlings to mid-season, high-dose applications of liquid copper was installed at two nurseries.. The liquid copper product was supplied by the manufacturer and applied over-the-top at approximately 8 weeks post-sowing. Field counts and seedling sample collections will be done in Fall 2018 with results of analyses of measurements included in a Research Report.***

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.

Hardening off practice of reducing water availability and its impact on root heath

Root heath and root hydraulic conductivity is of importance to outplanting success. With this study we aim to determine whether the hardening off practice of reducing water availability, prior to the lifting of seedlings, may inadvertently (in warmer winters) increase the vulnerability of seedlings to develop embolisms. As roots play a significant role on whole plant water transport, embolized roots will increase drought vulnerability for outplanted seedlings. Some southern pine species have moderate embolism resistance, however, the majority of studies were undertaken on mature trees. Little is known about root vulnerability to cavitation for loblolly seedlings undergoing water stress. As there is no direct comparisons at the seedling stage at a particular site we aim to determine whether there is any potential genetic variation to embolism resistance within loblolly. Nutrient levels of the seedlings will also be monitored overtime. (Nadel/ Samuelson).

- ✓ ***Accomplishments: Crucial for the success of this project; we ensured that all requirements for the SFNM coop outdoor stress facility (where we can control soil moisture) were met, so as to undertake this physiological study. In addition new sampling and physiological measurement techniques were practiced so ensure optimal sampling of both tree and root physiological measurements.***

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). 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 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)

- ✓ ***Accomplishments: Following the results obtained from the first year of study in which 1 MCP was shown to improve tree survival, resulted in the implementation of a second study to determine repeatability for a "normal" lifting period. This years study was undertaken on a single seedlot of loblolly pine. At two week intervals seedlings were removed from the stored seedlings for measurement and outplanting. Outplanted seedling growth and survival continues to be measured.***

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)

- ✓ ***Accomplishments: Nursery Cooperative staff participated in 2 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. These data are reported to Advisory and Contact members as a point of reference and use over time.***

Drone use for seedling quantification

There is a need to develop software that will be capable of counting the number of seedlings in a nursery once images have successfully been captured by a drone that has flown the nursery.

- ✓ ***Accomplishments: While imagery of both bareroot and container seedlings were obtained by Dr. Tim McDonald, AU Biosystems Enginering did not put any effort into identifying or coding software that would be able to "count" seedlings in images provided.***

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)

- ✓ ***Accomplishments: 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 Hardwood Manual in FY18. (McNabb/Starkey/Bowersock)

- ✓ ***Accomplishments: With the help of Carrie Pike, USDA Forest Service and Ken McNabb, the Hardwood Nursery Guide is in the printing process. Plans are to have the guide distributed to membership in early 2019.***

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) when necessary. (Enebak/Nadel)

- ✓ ***Accomplishments: In March 2018, USDA, OP/MP requested information concerning a request from EPA seeking information regarding the use of acetamiprid for basal bark treatments in forestry and non-bearing nursery stock/ornamental trees. A survey to all our members and potential orchard use resulted in no reported use in the southern US. Data was forwarded to EPA for their risk assessment.***

- ✓ ***In July, EPA received a voluntary request from Bayer Crop Science to remove Bayleton (tridimfon) from the market. Reaching out to Bayer Crop Science we were informed that the current decision is for Bayer Environmental Science to completely step away from TDF, and all Bayer ES products containing TDF will enter into state discontinuance over the next few years. One may try to purchase all the available Bayer Crop Science TDF that one can find. In addition, Amvac has Bayleton 50% (straight triadimefon and only labeled in a few states) and OHP has Strike Plus 50 WDG (triadimefon + trifloxystrobin). There is a comment period that any comments submitted would require Bayer Crop Science to address the concerns of the nursery industry. Comments must be received on or before January 7, 2019.***

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)

- ✓ ***Accomplishments: The Southern Forest Nursery Management Cooperative web site was updated to be more compliant with state and federal guidelines under the American's with Disability Act (ADA).***

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)

- ✓ ***Accomplishments: The Nursery Cooperative had a second 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.***

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 ½ day program will be held in conjunction with the Southern Forest Nursery Association's biennial meeting in Pensacola, FL on Monday July 16, 2018. The SFNA meeting will kick off on Monday evening, and run through Thursday July 19, 2018. Rayonier's Nursery in Elberta, AL will serve as the host and conduct the nursery tour as part of the SNFA meeting. Working with Mark Davis, 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. Details will be worked out with Mark Davis and the SFNA Planning Committee with meeting information outlined in the Spring 2018 Newsletter. (Enebak/Bowersock)

- ✓ ***Accomplishments: The 2017 Nursery Cooperative Contact meeting was held on July 16, 2018 as a ½ day program in conjunction with the Southern Forest Nursery Association's biennial meeting in Pensacola, FL. There were 34 members attending the Contact Meeting with 78 attending the SFNA portion of the meeting that ran through Thursday July 19, 2018. Special thanks to Mark Davis and his staff at Rayonier's Nursery in Elberta, AL that did the lion's share of the meeting organization, hosted the nursery tour and sponsored lunch.***

Research Reports (Staff)

We plan on producing Research Reports and Technical Notes in FY18.

- ✓ ***Accomplishments: Nursery Cooperative staff produced 6 Research Reports, 1 Technical Note and 1 Management Alert that covered the following topics.***

- ***RR 2018-01. Ronstar Flo (oxadiazon) on Loblolly, Longleaf, Shortleaf and Slash pine in Container-Grown and Bareroot Nurseries. Payne, Nadel and Enebak.***

- ***RR 2018-02. Black willow and weed control using Pendulum Aquacap (pendimethalin) on loblolly, longleaf, shortleaf and slash pine in container-grown and bareroot nurseries. Payne, Nadel and Enebak.***

- ***RR 2018-03. Over-the-top applications of Marengo on bareroot eastern red cedar (Juniperous virginiana). Payne, Nadel and Enebak.***

- ***RR 2018-04. Post emergent herbicide screening trials on loblolly and slash pine seedlings. Payne, Nadel and Enebak***

- ***RR 2018-05. Testing fungicides for the control of fusiform rust. Nadel and Enebak***

- ***RR 2018-06. Testing alternative fipronil products for the protection of seedlings against pine tip moth. Nadel and Enebak***

- ***TN 2018-01. Forest tree seedling production in the southern United States for the 2017-2018 planting season. Enebak.***

Newsletters

Newsletter distribution are planned for March and September 2018. Members are encouraged to submit articles and organizational updates. (Staff)

- ✓ ***Accomplishments: Newsletters were produced. mailed via the US Post Office and emailed to 90 contacts within the Nursery Cooperative membership in March and September 2018.***

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. (Nadel/Enebak)

- ✓ ***Accomplishments: Staff participated in the following contacts:***

	Payne	Enebak	Nadel	Harges
Phone calls	**16**	**16**	**10**	**Na**
Letters	**0**	**1**	**0**	**Na**
Emails	**163**	**43**	**44**	**Na**
Site Visits	**41**	**0**	**0**	**Na**
Diagnosis	**2**	**5**	**31**	**Na**

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 2017 to 2018 planting season. The survey will be sent out in June 2018. (Enebak/Bowersock)

- ✓ ***Accomplishments: A mailing list that 56 nurseries was sent in May 2018 throughout the southern US to gauge seedling production for the 2017-2018 planting season. Data was compiled and put into Technical Note 18-01 that will be distributed 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.

- ✓ ***Accomplishments: Nursery Cooperative staff at Auburn University presented 1 talk on nursery related topics to member groups. Topics and Titles are listed below:***
    - o ***Nina Payne presented "Weed Control Strategies for Forest Seedling Nurseries" at the joint North Carolina/Virginia Forest Nursery Pests Workshop in Goldsboro, NC.***

Short Course

With the Nursery Cooperative's short course in Auburn in September 2015, and a large demand that could not be conducted in September 2017, we will begin organizing a Short Course to be offered in September 2018. (Staff)

- ✓ ***Accomplishments: A 3- day short course was conducted from September 11-14, 2018 in Auburn, Alabama. Thirty-five members attended the short course that covered 20+ topics presented by Nursery Cooperative Staff and 5 invited speakers. A biased selection of attendee's comments: "Very informative. Staff and speakers helpful and very knowledgeable" . " Excellent Course! Extremely helpful and approachable with awesome information!" "I thoroughly enjoyed my time here at the Auburn Short Course. I appreciate the work that y'all put into providing us with the course and the course materials." "Dr. Foshee and Dr. Nadel were both by far my favorite speakers. Also Nina's hospitality in Auburn was second to none. Enjoyed it."***

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 FY19 Advisory Committee Meeting will be held on 30 October – 1 November 2018. 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)

- ✓ ***Accomplishments: Nursery Cooperative Advisory Meeting will be conducted in Auburn on October 31 – November 1, 2018. FY19 Workplan, FY18 Accomplishments and FY18-19 Budget will be 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)

- ✓ ***Accomplishments: We continue to reach out PRT located in Atmore, AL. They have indicated that they would join the Cooperative after their first crop is complete in FY18. In addition, we've reached out Meeks as well as the Florida Division of Forestry. No new members joined the Nursery Cooperative in FY18, and with the ArborGen / South Carolina Forestry Commission's agreement, the SFNMC actually lost a full-member.***

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 2017 and again in June 2018.***

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)

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

    - ***Current Status of Seedling Producers in the Southern US. (Enebak) Georgia SAF Meeting, Warm Springs, GA. May 2018.***

    - ***Seedling Storage and Survival. (Nadel) Joint annual meeting of the Southern Forest and Conservation Nursery Association and the Northeastern Forest and Conservation Nursery Association. Pensacola, Florida. 16 -19 July 2018***

    - ***Root development and morphological comparisons of container-grown pine and subsequent productivity after establishment. (Nadel) Centre for Advanced Forestry Systems 2018 Industrial Advisory Board Meeting Burlington, Vermont. 12 June – 13 June 2018***

Publications

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

- ✓ ***Accomplishments: Nursery Cooperative staff at Auburn University published 5 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) correlation with seedling mass. Tree Planters Notes XXX, pg. 1-17***

    - ***Devkota, P., Mensah, J., Nadel, R. L., Matusick G. and Eckhardt, L. G. (In press) Pinus taeda L. response to differential inoculum density of Leptographium terebrantis colonized toothpicks Forest Pathology: e12474-n/a.***

    - ***Dlamini, L. S., Little, K. M., Sivparsad, B. and Nadel, R. (In press). Quantifying the impact of foliar insects on two Eucalyptus hybrids in Zululand, northern KwaZulu-Natal, South Africa. South African Journal of Plant and Soil: 1-7.***

- ***Devkota, P., Nadel, R. L. and Eckhardt, L. G. (In press) Intraspecies variation of mature Pinus taeda in response to root-infecting ophiostomatoid fungi. Forest Pathology: e12415-n/a.***

- ***South, D. B., Nadel, R. L., Enebak, S. A. and Bickerstaff, G. (2017). Sulfur and lime affect soil pH and nutrients in a sandy Pinus taeda nursery. REFORESTA: 12-20.***

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)

- ✓ ***Accomplishments: There were no new extra-mural funding grants secured for FY18. However, Nursery Cooperative received $21,000 from companies willing to test materials.***

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)

- ✓ ***Accomplishments: Nursery Cooperative staff at Auburn University participated with other Research Cooperatives in the United States. Topics and meetings are listed below:***
  - ***Attended and presented Nursery Cooperative information at the 2018 Annual CAFS meeting in Burlington, Vermont. 12 June – 13 June 2018***

  - ***Undertaking a collaborative project with the Plantation Management Research Cooperative, University of Georgia.***