AUBURN UNIVERSITY- FOREST HEALTH COOPERATIVE

FY 2019 ACCOMPLISHMENTS

As presented to the Forest Health Cooperative Advisory Committee

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AUBURN UNIVERSITY - FOREST HEALTH COOPERATIVE

FY 2019 WORK PLAN

GOAL A: RESEARCH

Objective 1. Identify research projects

Quantifying the impact of pine decline in the southeastern United States – FHC and SFWS. *Year 5

- ***Accomplishments: Funded by FHC and SFWS***

Sudden Oak Death (*Phytophthora ramorum*) Detection Survey (Stream Sampling) in AL and MS – FHM, USFS for all travel, supplies and laboratory technician. *Year 8

- ***Accomplishments: Refunded by USFS Forest Health Monitoring grant.***

Wood chemistry and disease resistance – SFWS, Forest Products Development Center. *Year 7

- ***Accomplishments: Funded by Forest Products Development Center***

Pinus related diseases and molecular aspects - Collaboration between SFWS and FABI – University of Pretoria South Africa for travel and supplies and a graduate student stipend at UP. *Year 7

- ***Accomplishments: Funded by SFWS and FABI***

Identification and quantification of volatile chemicals emitted by *Amylostereum areolatum* and ophiostomatoid species to develop highly novel lures for monitoring and evaluating Sirex and bark beetle populations in the United States. *Year 1

- ***Accomplishments: Funded by AU-IGP, SFWS and University of Alberta***

Objective 2. Recruit graduate students

Currently there are no openings for a graduate students in the Coop.

Objective 3. Initiate research projects: Determine location, cooperators, and set up research plots dependent upon projects chosen by the membership.

Quantifying the impact of pine decline in the southeastern United States.

- ***Accomplishments:*** The growth performance of the inoculated and control trees with in the experimental plots have been monitored and data such as radial growth, height growth, leaf area index, foliar nutritional analysis and total phenolic content has been assessed. Insects were collected biweekly: year one and two collections have been completed). Microbial biomass (year one and two), soil cores (pre-treatment) and foliar samples (year one and two) have been taken and processed.
- ***Related Publications*:** Devkota, P., Mensah, J.K., Nadel, R.L., Matusick, G. and Eckhardt, L.G. 2018. *Pinus taeda* L. response to differential inoculum density of *Leptographium terebrantis* colonized toothpicks. For Path, https://doi.org/10.1111/efp.12474

Ecology of siricids and fungal associates in southeastern pine forests: potential for biological control and competition.

- ***Accomplishments:*** Research reports completed. One manuscript submitted and one in preparation.

Response of different loblolly pine families to *Leptographium terebrantis* and *Grosmannia huntii.*

- ***Accomplishments:*** Research reports completed. Published **-** Devkota, P. and Eckhardt, L.G. 2019. Intraspecific response of *Pinus taeda* L. to *Grosmannia huntii* and *Leptographium terebrantis.* For Path http://doi.org/10.1111/efp.12512. Devkota, P., Enebak, S.A., and Eckhardt, L.G. 2019. A performance comparison of bareroot and containerized *P. taeda* L. seedlings to the effect of ophiostomatoid fungi. Tree Planters Note (*In press*).

Virulence of *Leptographium terebrantis* and *Grosmannia huntii* on loblolly pine families under drought stress.

- ***Accomplishments:*** Research reports completed. Published **-** Devkota, P., Enebak, S.A. and Eckhardt, L.G. 2018. The impact of drought and vascular-inhabiting pathogen invasion in *Pinus taeda* health. Intl J For Res, https://doi.org/10.1155/2018/1249140

Mature root inoculation of families from seedling screening study to look at reliability of seedling screening.

- ***Accomplishments:*** Research reports completed. Published **-** Devkota, P., Nadel, R.L., and Eckhardt, L.G. 2018. Intra-species variation of mature *Pinus taeda* in response to ophiostomatoid fungi. For Path, https://onlinelibrary.wiley.com/doi/10.1111/efp.12415/full

Wood chemistry and disease resistance – SFWS, Forest Products Development Center.

- ***Accomplishments:*** Research reports being prepared. Manuscript "Applying discriminate analysis and acoustic tool to assign *Pinus taeda* families into pine decline susceptibility classes" submitted.

Identification of Climate Effects on Microbial Symbionts of Longleaf Pine - in collaboration with CERL personnel and University of Mississippi for all travel and supplies.

- ***Accomplishments:*** Manuscript submitted.

GOAL B: TECHNOLOGY TRANSFER

Objective 1. Serve as a clearinghouse of information related to forest health issues.

Maintain and Update Forest Health Cooperative Web Site

The Forest Health Cooperative Staff will continue to update the Forest Health Cooperative website for use by Forest Health Cooperative Members. (Mendez/Baker)

- ***Accomplishments:*** The website is currently being updated. Advisory Agenda's with each speaker's presentation available for Forest Health Cooperative Members. Research Reports and Technical Notes are updated. Changes in Forest Health Cooperative staff updated and current.

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

Research Reports (Staff)

We plan on producing Research Reports and Technical Notes in FY21 now that research projects are underway.

- ***Accomplishments:*** Research Report 2018-1 to 1018-4 and several currently being written which will be online before the end of the year.

- Wahl, A.C. and Eckhardt, L.G. 2017. Flight phenology of *Sirex nigricornis* (Hymenoptera:Siricidae) and other woodwasps in Alabama. Research Report 2017-01. Forest Health Cooperative, School of Forestry and Wildlife Sciences, Auburn University.
- Wahl, A.C. and Eckhardt, L.G. 2017. *Deladenus* species associated with native siricid woodwasps in Alabama. Research Report 2017-02. Forest Health Cooperative, School of Forestry and Wildlife Sciences, Auburn University.
- Wahl, A.C. and Eckhardt, L.G. 2017. Effects of growth rate on *Amylostereum* spp. Fungus by terpenes. Research Report 2017-03. Forest Health Cooperative, School of Forestry and Wildlife Sciences, Auburn University.
- Wahl, A.C. and Eckhardt, L.G. 2017. Competitiveness of *Amylostereum* spp. fungi against *Leptographium* spp. fungi. Research Report 2017-04. Forest Health Cooperative, School of Forestry and Wildlife Sciences, Auburn University.

Newletters (Staff)

Newsletter distribution is planned for November 2019 and Spring 2020. Members are encouraged to submit articles.

- ***Accomplishments:*** A February 2019 Newsletter was sent to all Forest Health Cooperative Members, approximately 20 on the mailing list.

Objective 3. Provide a limited consultancy function to the membership in the area of forest health.

Individual and Organized Contacts

An on-going activity and is handled as individual situations and cases arise. (Staff)

	Eckhardt	Mendez	Nadel
Phone calls	**30**	**6**	**1**
Letters	**1**	**0**	**0**
Emails	**55**	**23**	**1**
Site Visits	**6**	**3**	**0**
Diagnosis	**25**	**8**	**1**

Short Courses

Forest Health Short Course will be offered in odd years starting with FY2009. A Short Course in Forest Health will be planned for August 2021. (Staff)

- ***Accomplishments: A short course was held August 15-16 at the request of membership with 45 participants. The next short course will be planned for summer 2021 if there is interest.***

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 FY21 Advisory Committee Meeting will be held the last week in June 2020. A 2 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. (Eckhardt/Bowersock).

- ***Forest Health Advisory Meeting was held in Auburn on June 27-28, 2018.***

Forest Health Cooperative Membership

The Forest Health Cooperative staff should make an effort to recruit new members. (Staff)

- ***Looking for new members.***

Update the Cooperative Membership Directory

An on-going activity. (Bowersock/Eckhardt)

- ***Accomplishments: Membership directory updated and loaded onto website.***

Objective 2. Increase the visibility and effectiveness of the Cooperative as a source of information on issues related to forest health.

Presentations at Meetings

Forest Health Cooperative staff will continue to be encouraged to participate as a speaker or attendee in regional and national meetings. (Staff)

- ***Accomplishments:*** Forest Health Cooperative Staff gave 21 presentations and published 8 article on the subject of Forest Health**.**

Eckhardt, L.G. 2019. An overview of forest health research at the forest health dynamics laboratory Auburn University. Great Lakes Forestry Centre, Canadian Forest Service, Natural Resources Canada, Sault Ste Marie, Ontario, Canada (**Invited**)

Ahl*, J.B., Eckhardt, L.G. and Beach, J.M. 2019. Can you identify spores of fungal species on coleopteran with hyperspectral interferometry? Sigma Xi Student Research Showcase (*Virtual-Poster/Video*)

Duwadi*, S., Nadel, R., Carter, E.A., Feng, Y., and Eckhardt, L.G. 2019. Effect of soil moisture on soil microbial biomass in loblolly pine (*Pinus taeda*) stand. Sigma Xi Student Research Showcase (*Virtual-Poster/Video*)

Mensah*, J.K., Nadel, R.L., Matusick, G., Sword, M.A., Fan, Z., and Eckhardt, L.G. 2019. Resins and phenolic response of loblolly pine (*Pinus taeda* L) to *Leptographium terebrantis* inoculation. Sigma Xi Student Research Showcase (*Virtual-Poster/Video*)

Eckhardt, L.G. 2019 Sudden oak death in the southeastern U.S. NCASI Eastern Regional Meeting, Atlanta, GA (**Invited**)

Eckhardt, L.G. 2019. Common disease, insect & cultural problems of Alabama's urban forest trees. 77th Annual International Society of Arborculture (ISA) Southern Chapter Conference and Trade Show, Mobile, AL (**Invited**)

Eckhardt, L.G. 2019. Pine Decline. Auburn Rotary Club, Auburn, AL. (**Invited**)

Mensah*, J.K., Nadel, R.L, Matusick, G., Sword Sayer, M. A., Fan, Z., and Lori G. Eckhardt, L.G. 2019. Chemical response of loblolly pine (Pinus taeda L) to Leptographium terebrantis. 96th Alabama Academy of Sciences, Tuskegee, AL (Poster)

Ahl*, J., Beach, J., and Eckhardt, L.G. 2019. Is it possible to differentiate fungal spores on bark beetles of concern with hyperspectral interferometry? Southeastern Society of American Foresters, Mobile, AL (Poster)

Mensah*, J.K., Nadel, R.L, Matusick, G., Sword Sayer, M. A., Fan, Z., and Lori G. Eckhardt, L.G. 2019. Loblolly tolerance to a root pathogen associated with pine decline. Southeastern Society of American Foresters, Mobile, AL (Poster)

Duwadi*, S., Nadel, R., Carter, E.A., and Eckhardt, L.G. 2019. Foliar nutrient concentration in response to Leptographium terebrantis inoculation of loblolly pine (Pinus taeda) trees. Southeastern Society of American Foresters, Mobile, AL (Poster)

Eckhardt, L.G. 2018. Forest health research at the Forest Health Dynamics Laboratory at Auburn University. 129th Sigma Xi Annual Meeting & Student Research Conference. San Francisco, CA (*Poster*) (**Invited**)

Mensah*, J., Nadel, R.L., Matusick, G., Sayer, M.A.S., Carter, E.A., and Eckhardt, L.G. 2018. Quantifying the impact of pine decline in the southeastern United States. Center for Advanced Forestry Systems Industrial Advisory Board Meeting, Burlington, VT (**Invited**)

Eckhardt, L.G. 2018. The impact of bark and ambrosia beetles: an international perspective. Shothole Borer (SHB) Workshop, Forest and Agricultural Biotechnology (FABI) facilities & library, University of Pretoria, Pretoria, South Africa (**Invited**)

Eckhardt, L.G. 2018. Pine decline in the southeast: An overview of research at the forest health dynamics laboratory. University of Alberta, Edmonton, Canada. (**Invited**)

Eckhardt, L.G. 2018. What is the story: needle rust, needle cast, needle blight or something else? Needle Blight Workshop, Alabama Cooperative Extension Service, Chatom, AL (Invited)

Mensah*, J.K., Sword Sayer, M. A., Nadel, R. L, Matusick, G., Fan, Z., and Lori G. Eckhardt, L.G. 2018. Can a root pathogen influence the growth of mature loblolly pine? Weaver Lecture Series and Graduate Symposium, School of Forestry and Wildlife Sciences, Auburn University, Auburn, AL (*Poster*)

Duwadi*, S., Nadel, R., Sword-Sayer, M.A., Carter, E.A., Eckhardt, L.G. 2018. Fine root dynamics in response to inoculation of *Leptographium terebrantis* in loblolly pine stand. Weaver Lecture Series and Graduate Symposium, School of Forestry and Wildlife Sciences, Auburn University, Auburn, AL (*Poster*)

Ahl*, J., Beach, J. and L. Eckhardt. Oct 17, 2018. Is it possible to differentiate fungal spores on bark beetles of concern with hyperspectral interferometry? Weaver Lecture Series and Graduate Research Symposium, School of Forestry and Wildlife Sciences, Auburn University, Auburn, AL (*Poster*)

Eckhardt, L.G. 2018. An overview of forest insect and disease research at the forest health daynamics laboratory at Auburn University. Auburn University Entomology Club, Auburn AL (**Invited**)

Devkota, P., and Eckhardt, L.G. 2018. The response of loblolly pine families to root-feeding bark beetle vectored fungi. Southern Forest Nursery Association Meeting, Pensacola, FL (**Invited**)

Publications

Forest Health Cooperative staff are encouraged to publish research results in scientific journals. (Staff)

Devkota*, P., Enebak, S.A., and Eckhardt, L.G. 2019. A performance comparison of bareroot and containerized *P. taeda* L. seedlings to the effect of ophiostomatoid fungi. Tree Planters Note (*In press*).

Devkota*, P., and Eckhardt, L.G. 2019. Intraspecific response of *Pinus taeda* L. to *Grosmannia huntii* and *Leptographium terebrantis.* For Path http://doi.org/10.1111/efp.12512

Eckhardt, L.G. 2019. Getting to the root of pine decline. Futurum: Know what you want to be. https://doi.org/10.33424/FUTURUM10 (*Includes an article in their online magazine as well as a printable brochure and activity sheet to be used in middle and high schools around the world associated with the program*)

Devkota*, P., Mensah*, J.K., Nadel, R.L., Matusick, G. and Eckhardt, L.G. 2018. *Pinus taeda* L. response to differential inoculum density of *Leptographium terebrantis* colonized toothpicks. For Path, https://doi.org/10.1111/efp.12474

Devkota*, P. and Eckhardt, L.G. 2018. Variation in pathogenicity of different *Leptographium terebrantis* isolates to *Pinus taeda* L. For Path, https://doi.org/10.1111/efp.12469

Piculell*, B.J. Nelson, C.D., Roberds, J., Eckhardt, L.G., and Hoeksema, J.D. 2018. Genetically determined fungal pathogen tolerance and soil variation influences ectomycorrhizal traits of loblolly pine. Ecol Evol. 8:9646-9656

Essen*, C., Via, B.K., Cheng, Q., Gallagher, T., McDonald, T., and Eckhardt, L.G. 2018. Determining the predictive accuracy of whole tree modulus of elasticity (MOE) of 14-year old loblolly pine using density and dynamics MOEs estimated by three different acoustic tools. Eur J Wood Prod, https://doi.org/10.1007/s00107-018-1317-9

Acquah*, G., Via, B.K., Billor, N., Fasina, O.O., and Eckhardt L. 2018. High throughput screening of elite loblolly pine families for chemical and bioenergy traits with near infrared spectroscopy. Forests 9:418, https://doi.org/10.3390/19070418

Extramural Funding of Forest Health Cooperative Projects

Forest Health Cooperative staff will continue to be encouraged to locate and generate extramural funding opportunities directly related to forest health. (Staff)

- ***Accomplishments*:** Forest Health Cooperative Staff were awarded the following grants totaling $215,000**.**

- Sudden Oak Death (*Phytophthora ramorum*) Detection Survey (Stream Sampling) in AL and MS – FHM, USFS for all travel, supplies and laboratory technician $36,000
- Identification and quantification of volatile chemicals emitted by *Amylostereum areolatum* and ophiostomatoid species to develop highly novel lures for monitoring and evaluating Sirex populations in the United States - AU-IGP and SFWS in collaboration with University of Alberta (Edmonton) $30,000

- Collaboration between SFWS and FABI – University of Pretoria South Africa to work on *Pinus* related diseases and molecular aspects. $5,000 per participant (*extend 3 more years 2019-2021*)
- Pine needle mortality – SFWS for travel, supplies and stipend ($25,000); Regions for stipend ($10,000) *Still looking for 1.5 years stipend and molecular costs ($40,000)*
- Two Undergraduate Research Fellowships, Jace McCauley (sawflies) $10,000 and Alec Welham (continuation of wild pig project in conjunction with wildlife) $15,000, SFWS and AU Undergraduate Research Office. REU summer student, Diana Zurillo $30,000. (*These grants were submitted directly and won by the students. This covers their cost and labor on their projects. Both Jace and Alec have been undergraduate workers for the coop for 2+ years. Diana is from Puerto Rico and found out about our work via the REU program here at Auburn.*)
- Fungal host resistance in loblolly pine – SFWS and University of Alberta (Edmonton) $30,000
- Ecology of siricids and fungal associates in southeastern pine forests: potential for biological control and competition – SFWS and FABI $30,000
- Sudden Oak Death (*Phytophthora ramorum*) Detection Survey (Stream Sampling) in AL and MS – FHM, USFS for all travel, supplies and laboratory technician $34,000.
- Collaboration between SFWS and FABI – University of Pretoria South Africa to work on *Pinus* related diseases and molecular aspects. $5,000 per participant
- Wood chemistry and disease resistance – SFWS and Forest Products Development Center (to get additional preliminary data for larger grant) $5,000