AUBURN UNIVERSITY- FOREST HEALTH COOPERATIVE

FY 2021 ACCOMPLISHMENTS

As presented to the Forest Health Cooperative Advisory Committee

Dr. Lori G Eckhardt - Director

11/10/2021

AUBURN UNIVERSITY - FOREST HEALTH COOPERATIVE

FY 2021 WORK PLAN

GOAL A: RESEARCH

Objective 1. Identify research projects

Isolation and identifying of fungi associated with loblolly pine needle damage in the southeastern US. *Year 3

- ***Accomplishments: Funded by SFWS, FABI, Stallworth and FHC***

Sudden Oak Death (*Phytophthora ramorum*) Detection Survey (Stream Sampling) in AL and MS – FHM, USFS for all travel, supplies and laboratory technician. *Year 9

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

Wood chemistry and disease resistance – SFWS, Forest Products Development Center. *Year 8

- ***Accomplishments: Refunded 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 8

- ***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 3

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

Objective 2. Recruit graduate students

No graduate students were hired in FY21.

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.

1. ***Accomplishments:*** Study completed. Completed 2 Master's theses and 1 Ph.D. dissertation. Research reports being finalized. Three manuscripts published, two submitted, and three others in preparation.
    - Shrijana Duwadii - Impact of tree inoculation by *Leptographium terebrantis* on soil microbial communities in commercial loblolly pinestand
    - Jessica Ahl - Ophiostomatoid fungal infection and insect diversity in amature loblolly pine stand
    - John Mensah - Influence of *Leptographium terebrantis* S.J. Barras and T.J. Perry on *Pinus taeda* L. physiology, growth and productivity

➢ ***Related Publications*:**

- Devkota, P., Mensah, J. K., Nadel, R. L., Matusick, G., & Eckhardt, L. G. (2019). *Pinus taeda* L. response to differential inoculum density of Leptographium terebrantis colonized toothpicks. *Forest Pathology*, 49 (1),e12474
- Mensah, J. K., Sayer, M. A. S., Nadel, R. L., Matusick, G., & Eckhardt, L.G. (2020). Physiological response of *Pinus taeda* L. trees to stem inoculation with *Leptographium terebrantis*. *Trees*, 34:869-880
- Mensah, J. K., Sayer, M. A. S., Nadel, R. L., Matusick, G., Fan, Z., Carter, E.A. & Eckhardt, L.G. (2021) *Leptographium terebrantis* inoculation and associated crown symptoms and tree mortality in *Pinus taeda.* Fungal Ecology 51:000-000. Available Online First: https://www.sciencedirect.com/science/article/pii/S1754504821000192?via%3Dihub
- Stephanie Siegel (2021) New sapwood challenges "Perfect Storm" of pine fungal infection. CompassLive https://www.srs.fs.usda.gov/compass/2021/09/16/new-sapwood-challenges-perfect-storm-of-pine-fungal-infection/
- Ahl, J.B., Eckhardt, L. G. (Submitted) Identifying fungal spores on the pine bark beetle with hyperspectral interferometry. Microscope Researchand Technique
- Mensah, J., Devkota, P., and Eckhardt, (Submitted) L. Sapwood growth and tolerance of *Pinus taeda* trees to *Leptographium* inoculation. Forest Pathology
- Mensah, J. K., Sayer, M. A. S., Nadel, R. L., Duwadi, S., Fan, Z., Carter, E.A., & Eckhardt, L.G. (In preparation) Effect of *Leptographium*

terebrantis and drought onfoliage, new root dynamics and stemwood growth in plantation *Pinus taeda* L.

- Mensah, J. K., Sayer, M. A. S., Nadel, R. L., Matusick, G., & Eckhardt, L.G. (In preparation) Foliar nutrients response of *Pinus taeda* L. to *Leptographium terebrantis* infection.
- Mensah, J. K., Sayer, M. A. S., Nadel, R. L., Matusick, G., & Eckhardt, L.G. (In preparation) Effect of *L. terebrantis* on the production of defensive chemical compounds.

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.

- ***Accomplishments:*** Volatile collection chambers have been put together to collect headspace volatiles from fungal cultures. A total of 320 samples have been collected from fungal cultures grown in the lab plus 63 different dilutions of chemical standards. Seedlings were inoculated with fungal species and later sampled for fungal volatiles. 150 samples have been collected. Samples have been analyzed with the Gas Chromatography-Mass Spectrometer and 13 and 6 volatile organic compounds have been identified to date respectively. Compounds are still being identified.

Isolation and identifying of fungi associated with loblolly pine needle damage in the southeastern US.

- ***Accomplishments:*** Total 25 infected stands across the southeastern united states have been surveyed to collect unhealthy loblolly pine needle samples from October 2020 through September 2021. To date, 643 branch tips were examined from 282 sampled trees. Sterilized needle samples were plated onto various growth media, incubated, monitored and transferred to fresh media. Fungi identifications were confirmed by a series of molecular steps such as DNA extractions, PCR, gel electrophoresis and ITS-rDNA sequencing. Needle pathogen impacts on loblolly pine foliage and foliar chemistry were also investigated. Climatic regression models were developed to predict loblolly pine defoliation severity in the following years.

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. (Baldwin)

- ***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 FY22 now that research projects are underway.

Newsletters (Staff)

Newsletter distribution is planned for Spring 2022. Members are encouraged to submit articles.

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	Ciarmitaro	Baldwin
Phone calls	**32**	**2**	**0**
Letters	**2**	**0**	**0**
Emails	**59**	**3**	**0**
Site Visits	**8**	**2**	**2**
Diagnosis	**41**	**4**	**0**

Short Courses

Forest Health Short Course will be offered in odd years. A Short Course in Forest Health will be planned for August 2023. (Staff)

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 FY23 Advisory Committee Meeting will be held in the last week of June 2022. 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/Baldwin/Bowersock).

- ***Forest Health Advisory Meeting FY22 being held*** **November 10-11, 2021**
- ***Forest Health Science Meeting FY21 was held*** **June 23, 2021 (Virtual)**
- ***Forest Health Advisory Meeting FY21 was held*** **November 10, 2020 (Virtual)**

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 10 presentations and published 5 articles on the subject of Forest Health.

Datta, D., and Eckhardt, L.G. 2021. Identification and characterization of fungal pathogens associated with loblolly pine needle defoliation (LPND) in the southeastern USA. Plant Health 2021, American Phytopathological Society (APS)

Eckhardt, L.G. and Datta, D. 2021. What is the story: needle rust, needle cast, needle blight, or something else? Landowner Pine Needle Blight Meeting Washington County AL (AFC)

Datta, D., Coleman, J.J., Enebak, S.A. and Eckhardt, L.G. 2021. Brown-spot needle blight: An emerging threat causing loblolly pine defoliation in Alabama, USA. International Conference on Forest Mycology and Applied Mycology 2021, Boston, MA

Datta, D., Coleman, J.J., Enebak, S.A. and Eckhardt, L.G. 2021. Brown-spot needle blight is emerging in Alabama: A serious threat to loblolly pine plantations. Sigma Xi Student Research Showcase

Menanyih, S.A., Cale, J., Calderone, A. and Eckhardt, L.G. 2021. Fungal volatile organic compounds can mediate between bark beetles and ophiostomatoid fungi. Entomological Society of America – Southeastern Branch (Virtual-Poster)

Menanyih, S.A., Cale, J., Calderone, A. and Eckhardt, L.G. 2021. Fungal volatile organic compounds can mediate between bark beetles and ophiostomatoid fungi. Alabama Academy of Sciences (Virtual-Poster)

Datta, D., Coleman, J.J., Enebak, S.A. and Eckhardt, L.G. 2020. Loblolly pine and brown-spot needle blight: An emerging relationship threatens timber industry. The Alabama Academy of Science

Datta, D., Coleman, J.J., Enebak, S.A. and Eckhardt, L.G. 2020. Loblolly pine is dying due to defoliation: who is the culprit? 98th APS Southern Division Annual Meeting

Datta, D. Coleman, J.J., Enebak, S.A. and Eckhardt, L.G. 2020. An emergence of *Pinus taeda* needle defoliation and tree mortality in Alabama, USA. ICMM 2020: 22th International Conference on Mycology and Mushrooms, Paris, France (e*Poster*)

Publications

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

- Datta, D., Brodbeck, A.B. and Eckhardt, L.G. (2021). Forest Health Highlight: Brown Spot Needle Blight of Loblolly Pine. *The Alabama Cooperative Extension System*, FOR-2105, 1-3. https://www.aces.edu/blog/topics/forestry/brown-spot-needle-blight-of-loblolly-pine/
- Mensah, J. K., Sayer, M. A. S., Nadel, R. L., Matusick, G., & Eckhardt, L.G. (2020). Physiological response of *Pinus taeda* L. trees to steminoculation with *Leptographium*

terebrantis. *Trees*, 34:869-880

- Mensah, J. K., Sayer, M. A. S., Nadel, R. L., Matusick, G., Fan, Z., Carter, E.A. & Eckhardt, L.G. (2021) *Leptographium terebrantis* inoculation and associated crown symptoms and tree mortality in *Pinus taeda.* Fungal Ecology 51:000-000. Available Online First: https://www.sciencedirect.com/science/article/pii/S1754504821000192?via%3Dihub

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 $218,000**.**

- Sudden Oak Death (*Phytophthora ramorum*) Detection Survey (Stream Sampling) in AL and MS – FHM, USFS for all travel, supplies and laboratory technician $42,000
- 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)
- Sudden Oak Death (*Phytophthora ramorum*) Detection Survey (Stream Sampling) in AL and MS – FHM, USFS for all travel, supplies and laboratory technician $36,000.
- Wood chemistry and disease resistance – SFWS and Forest Products Development Center (to get additional preliminary data for larger grant) $5,000