AUBURN UNIVERSITY- FOREST HEALTH COOPERATIVE

FY 2022 ACCOMPLISHMENTS

As presented to the Forest Health Cooperative Advisory Committee

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AUBURN UNIVERSITY - FOREST HEALTH COOPERATIVE

FY 2022 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 4

- ***Accomplishments: Funded by CFWE, 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 10

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

Wood chemistry and disease resistance – CFWE, Forest Products Development Center. *Year 9

- ***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 9

- ***Accomplishments: Funded by CFWE 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 4 (no cost extension)

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

Objective 2. Recruit graduate students

No graduate students were hired in FY22.

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 finalized. Five manuscripts published, one submitted, and two 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, (2022) 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. (Submitted) Effect of *Leptographium terebrantis*

and drought on foliage, 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:*** Study completed. Completed one Master's theses. Research reports finalized. Manuscripts in preparation.
  - Sylvester Menanyih – Survey of volatile organic chemicals emitted by ophiostomatoid fungi for monitoring and evaluating bark beetles in the southeastern United States
- ***Related Publications*:**
  - Menanyih, S., Cale, J., Calderon, A., and Eckhardt, L.G. (In preparation) Production of volatile organic compounds from ophiostomatoid fungi
  - Menanyih, S., Cale, J., Calderon, A., and Eckhardt, L.G. (In preparation) The influence of different fungal interaction on the production of fungal metabolites *in vitro* and *in situ*

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

- ***Accomplishments:*** Study completed. Completed one Master's theses. Research reports finalized. Manuscripts in preparation.
  - Debit Datta – Identification and distribution of fungal pathogens associated with loblolly pine defoliation and tree mortality in the southeastern United States
- ***Related Publications*:**
  - Datta, D., Coleman, J., Enebak, S., and Eckhardt, L.G. (In preparation) Survey of fungal pathogens associated with loblolly pine defoliation and mortality in the southeastern United States
  - Datta, D., Erramuspe, I.V., Enebak, S., and Eckhardt, L.G. (In preparation) *Lecanosticta acicola* impacts foliar nutrient content and total phenolics of *Pinus taeda* needles

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 agendas 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 produced 7 Research Reports in FY22

1. Menanyih, S. and Eckhardt, L.G. 2022. Allelochemicals production from loblolly seedlings inoculated with ophiostomatoid fungi. Research Report 2022-03. Forest Health Cooperative, School of Forestry and Wildlife Sciences, Auburn University
2. Menanyih, S. and Eckhardt, L.G. 2022. The influence of different fungal interaction on the production of fungal metabolites. Research Report 2022-02. Forest Health Cooperative, School of Forestry and Wildlife Sciences, Auburn University
3. Menanyih, S. and Eckhardt, L.G. 2022. Production of volatile organic compounds from ophiostomatoid fungi: single and combination. Research Report 2022-01. Forest Health Cooperative, School of Forestry and Wildlife Sciences, Auburn University
4. Datta*, D. and Eckhardt, L.G. 2021. Prediction of loblolly pine defoliation severity associated with changes in pathogen pressure in response to climate change in Alabama. Research Report 2021-04. Forest Health Cooperative, School of Forestry and Wildlife Sciences, Auburn University
5. Datta*, D. and Eckhardt, L.G. 2021. *Lecanosticta acicola* impacts foliar nutrient contents and total phenolics in *Pinus taeda* needles. Research Report 2021-03. Forest Health Cooperative, School of Forestry and Wildlife Sciences, Auburn University
6. Datta*, D. and Eckhardt, L.G. 2021. Needle pathogen, *Lecanosticta acicola*, effects on *Pinus taeda* shoot and needle lengths. Research Report 2021-02. Forest Health Cooperative, School of Forestry and Wildlife Sciences, Auburn University
7. Datta*, D. and Eckhardt, L.G. 2021. Isolation and identification of fungi associated with loblolly pine defoliation and mortality in the southeastern United States. Research Report

2021-01. Forest Health Cooperative, School of Forestry and Wildlife Sciences, Auburn University

Newsletters (Staff)

Newsletter distribution is planned for Fall 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	Baldwin
Phone calls	**32**	**2**
Letters	**2**	**20**
Emails	**59**	**29**
Site Visits	**8**	**2**
Diagnosis	**41**	**47**

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 July 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 FY23 being held*** **July 26-27, 2022**
- ***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. (Baldwin/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 6 articles on the subject of Forest Health**.**

Eckhardt, L.G. and Debit, D. 2022. Loblolly pine needle damage and mortality: symptoms, causal agents, and tree responses. Loggers Training Day, Chattahoochee Valley Community College, Phenix City, AL

Debit, D. and Eckhardt, L.G. 2022. Rayonier Annual Forest Health Meeting (*Virtual*)

Eckhardt, L.G. 2022. Brown spot needle blight: symptoms and mitigation. Society of American Foresters War Eagle Chapter Meeting, Auburn University

Eckhardt, L.G. and Datta, D. 2021. Brown Spot Needle Blight of Loblolly Pine. Natural Resources Webinar Series, AECS, Auburn University

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)

Publications

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

- Mensah, J., Devkota*, P. and Eckhardt, L.G. 2022. Sapwood growth and tolerance of *Pinus taeda* trees to *Leptographium terebrantis* inoculation. Forest Pathology 00:000-000

- Eckhardt, L.G. 2021. Loblolly pine decline. Tree Talk.

- Eckhardt, L.G. 2021. Loblolly pine decline. Forest Landowners Association.

- Eckhardt, L.G. 2021. Loblolly pine decline. Mississippi State University Extension Forestry Newsletter.

- 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., 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 $1,063,066.58**.**

- Sudden Oak Death (*Phytophthora ramorum*) Detection Survey (Stream Sampling) in AL and MS – FHM, USFS for all travel, supplies and laboratory technician $37,000
- 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 2022-2025*)
- Wood chemistry and disease resistance – SFWS and Forest Products Development Center (to get additional preliminary data for larger grant) $5,000
- Mitigating Needle Blight: A growing economic threat to pine forests – USFS (through Senate Appropriations from Senator Shelby) for travel, supplies, graduate students and technicians $2,400,000 (Y1 – $1,016,066.58; Y2 – $840,738.80; Y3 $483,151.46; Y4 - $60,000)