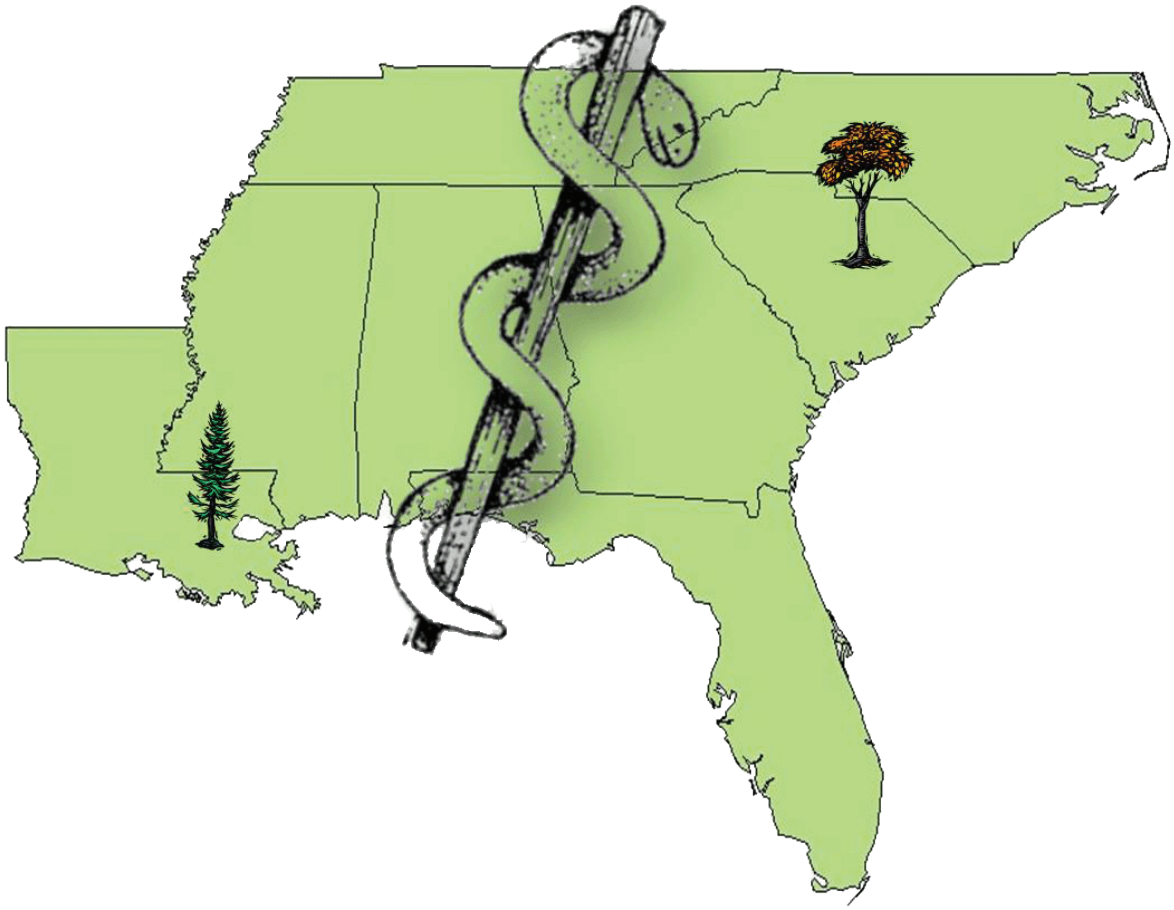
Auburn University
Forest Health Cooperative



FY 2017 Annual Report

AUBURN UNIVERSITY
FOREST HEALTH COOPERATIVE

ANNUAL REPORT
FY 2017

(October 1, 2016 - September 30, 2017)

Contents:

AUBURN UNIVERSITY – FOREST HEALTH COOPERATIVE

MEMBERSHIP LIST

(FY 2017)

Full Members:

Federal

United States Forest Service – NFS
United States Forest Service - SRS

Forest Industry

Hancock Forest Management
Plum Creek Timber Company
Rayonier
Westervelt
Weyerhaeuser

Associate Members:

Forest Industry

Delaney Development
Molpus Timber Management
Scotch Lumber Company

Non-Industrial – Private

ArborGen, LLC

Consulting Foresters

F & W Forestry

Sustaining Members:

Non-Industrial – Private

Alabama Farmers Federation
Burgin Land
International Paper
Forestry & Land Resource Consultants

Individual Foresters

Beth Richardson

State

Alabama Forestry Commission

AUBURN UNIVERSITY – FOREST HEALTH COOPERATIVE

Advisory Board Chairman

Service Rotation‡

(November 2017)

FISCAL YEAR†	**Chairman***
2011	Westervelt
2012	Weyerhaeuser
2013	US Forest Service
2014	Hancock Forestry
2015	Plum Creek
2016	Rayonier
2017	**Westervelt**
2018	Weyerhaeuser
2019	US Forest Service
2020	Hancock Forestry
2021	Plum Creek
2022	Rayonier
2023	Westervelt
2024	Weyerhaeuser

†Member will conduct the Coop business meeting held in that **fiscal year**.

*First Chairman randomly chosen for FY2011, subsequent Chairman will be alphabetical by company name.

AUBURN UNIVERSITY – FOREST HEALTH COOPERATIVE

Due to the nature of the members and the appearance of
possible impropriety these rules are in place.

THE EIGHT FUNDAMENTAL RULES OF ANTI-TRUST COMPLIANCE

1. Competitors may not agree on prices they charge for goods they sell.
2. Competitors may not agree on the prices they charge for services.
3. Competitors may not agree on terms of sale.
4. Companies may not use dominant market position to monopolize a market, control prices, or exclude competitors.
5. Competitors may not agree not to compete by allocating customers, territories, or markets.
6. Competitors may not agree not to compete on bids – i.e. bid-rigging.
7. Competitors may not agree on prices for products or services they buy.
8. Competitors may not join in a boycott of suppliers or customers to accomplish anti-competitive ends.

Rules and Policies
for
Auburn University
Forest Health Cooperative

Re-Approved February 1, 2011

MEMBERSHIP

1. Membership in the Forest Health Cooperative (FHC) is open to anyone in the southeastern region of the United States.

2. Members are required to pay annual dues which are as follows:

Full Member	$10,000
Associate Member	$ 5,000
Maintaining Member	$ 2,500
Sustaining Member	$ 500

3. Sustaining Members receive access to FHC Webpage, annual Newsletter, Priority Email and Telephone Consulting, and participation in Members Only Workshops and may participate at the Annual Advisory Meeting, but cannot serve on the Advisory Council. Maintaining Members receive the benefits of Sustaining Members, and Research and Technical Reports. Associate Members receive the benefits of the Maintaining Members, and Field Consulting and Laboratory Diagnostics. Full members receive all the benefits of Associate, Maintaining and Sustaining Members and serve on the Advisory Council and have full voting powers with respect to research program and budgetary decisions.

4. Membership is for one year beginning October 1. Membership may be terminated by either the member organization or by Auburn University by giving 60 days written notice before October 1.

5. Membership will be contingent on signing a memorandum of agreement with Auburn University.

6. After September 30, 2009, all new members at all levels will be required to contribute 1-3 x their annual membership dues in addition to their annual membership dues. The number of annual contributions will depend upon the year of membership beyond 2008.

Year of Joining	Contributions to Forest Health Cooperative
2008	1 Annual Membership
2009	1 Annual Membership + 1 Annual Membership
2010	1 Annual Membership + 2 Annual Membership
2011 and beyond	1 Annual Membership + 3 Annual Membership

ORGANIZATION

1. The Dean, School of Forestry and Wildlife Sciences, Associate Director Agricultural Experiment Station of Auburn University in consultation with the Forest Health Cooperative Executive Committee, will appoint the Forest Health Cooperative's Director.

   The Director will be responsible for:
   - A. Directing the activities of the Forest Health Cooperative;
   - B. Employing a competent staff;
   - C. Developing the Forest Health Cooperative's direction in conjunction with the Advisory Council;
   - D. Ensuring each member participates to a threshold level; and
   - E. Reporting research accomplishments to the Advisory Council

2. The Advisory Council will have an annual meeting in the first quarter of each fiscal year.

3. An Advisory Council consisting of one representative from each full member shall be established to:
   - A. Act as a liaison between the organization and the Director;
   - B. Develop Forest Health Cooperative policies;
   - C. Advise the Director on the Forest Health Cooperative's direction;
   - D. Approve the annual budget and membership fee.

4. An Executive Committee consisting of three Advisory Council members and the Director shall have the authority to meet and conduct routine business in the name of the Advisory Council. One Executive Committee member will be appointed annually according to a rotating schedule and will serve for 3 years. The Advisory Council chairman will be the senior member of the Executive Committee and will preside at the Executive Committee and Advisory meetings.

5. Contact representatives will be designated by each cooperating member/organization. This individual may or may not be the same person serving on the Advisory Council. Contact Representatives will be directly involved in research established with each member organization.

6. All information will be available to all members in the Forest Health Cooperative.

7. All members agree to keep confidential the data and information given to them for future publications and limit the spread of information to non-members that would benefit without paying annual FHC dues.

DUES and BUDGET

1. Membership dues will be set by the Advisory Council at its annual meeting.

2. The Cooperative will operate on the fiscal year October 1 to September 30. Invoices for membership fees will be sent to all member organizations on October 1 of each year, or by special arrangement with the individual organization.

RULES CHANGES

1. Changes in, deletions from, and additions to the membership rules may be adopted by a two-thirds vote of advisory members in attendance at regularly scheduled or special sessions of the Advisory Council.

DIVISION OF RESPONSIBILITIES BETWEEN AUBURN UNIVERSITY AND MEMBER ORGANIZATIONS IN THE AUBURN UNIVERSITY FOREST HEALTH DYNAMICS LABORATORY COOPERATIVE

1. Study plans will be developed by Auburn University in conjunction with the Cooperative's Advisory Council. Responsibilities for cooperative research will be delineated in individual study plans.

2. Auburn will do data analysis and processing, as well as manuscript preparation, and will insure timely distribution of results to cooperators.

3. Auburn University graduate students will be utilized to work on specific forest health problems.

4. All cooperators will be responsible for adhering to the study plans.

5. Information will be disseminated at annual Advisory meeting and in an annual Newsletter and Research Reports to members. A web site dedicated to Forest Health with the Cooperatives' research will be maintained by School of Forestry & Wildlife Sciences.

6. Results will also be disseminated at local, regional and national forest related meetings.

7. Site visits for risk assessment and diagnostic evaluations will be conducted by Auburn University staff. Full members get 2 days/yr, Associate Members get 1 day/ yr. Additional days are $1000 per day for all membership classes.

8. Laboratory diagnostic evaluations will be conducted by Auburn University staff. Full members get 10 sent in samples per year; Associate Members get 5 sent in samples per year. Additional samples are $100 per sample for all membership classes.

AUBURN UNIVERSITY – FOREST HEALTH COOPERATIVE

FY18 ADVISORY MEETING AGENDA

October 23-24, 2017

Monday – October 23

11:00 – 1:00	Registration	Elizabeth Bowersock
1:00 – 1:05	Introduction – Welcome	Dr. Janaki Alavalapati, *SFWS Dean*
1:05 – 1:10	Housekeeping	Dr. Lori Eckhardt, *Director*
	Forest Health Dynamics Lab Project Updates	
1:10 – 1:20	Forest Health Cooperative Diagnostics Laboratory Update & Sudden Oak Death Survey Update	Luis Mendez, *Research Assistant*
1:20 – 1:40	Screening elite loblolly pine families for structural integrity with near infrared-based chemometric models and acoustics	Charles Essien, *PhD Student*
1:40 – 2:00	Variation in tolerance of several loblolly pine families to *Leptographium terebrantis* and *Grosmannia huntii*	Dr. Pratima Devkota, *Postdoc – Michigan State University*
2:00 – 2:20	The role of *Leptographium terebrantis* and *Grosmannia huntii* invasion in driving drought-related decline in loblolly pine	Dr. Pratima Devkota, *Postdoc – Michigan State University*
2:20 – 2:40	Driving towards biocontrol of ophiostomatoid fungi by plant growth-promoting rhizobacteria	Dr. Pratima Devkota, *Postdoc – Michigan State University*
2:40 – 3:00	Intra-species variation in response of mature loblolly pine to root-infecting ophiostomatoid fungi	Dr. Pratima Devkota, *Postdoc – Michigan State University*
3:00 – 3:30	**BREAK**	
3:30 – 4:15	The effect of *Sirex* spp. woodwasps and their fungal associates on Alabama forest health	Dr. Lori Eckhardt, *Director*
4:15 – 4:50	Pathogenicity of *Leptographium terebrantis* to loblolly pine: effect of inoculum density	John Mensah , *PhD Student*

4:50 – 5:15	Physiological response of loblolly pine to *Leptographium terebrantis* in a naturally regenerated stand	John Mensah, *PhD Student*
5:15 – 5:30	Quantifying the impact of pine decline in the southeastern United States (Overview)	Dr. Ryan Nadel, *Assistant Research Professor*
5:30 – 6:00	Final Discussion – Questions	Dr. Lori Eckhardt, *Director*
6:00	Adjourn for the Day	
6:00 – 7:00	**Social and Posters**	

Poster Presentations:

1. Ahl, J.B., Eckhardt, L.G. and Beach, J.M. Can you identify spores of fungal species on coleopteran with hyperspectral interferometry?
2. Essien, C., Via, B.K., Gallagher, T., McDonald, T., and Eckhardt, L.G. Does tree species susceptibility to root feeding fungi affects wood quality?
3. Essien, C., Via, B.K., Gallagher, T., McDonald, T., and Eckhardt, L.G. Rapid characterization of genetically improved loblolly pine families using acoustic technique.
4. Acquah, G., Via, B.K., Eckhardt, L.G., Fasina, O.O. and Billor, N. Near Infrared based Partial Least Squares Regression Models for Predicting the Strength and Basic Density of Disease Tolerant *Pinus taeda* Families.
5. Wahl, A.C., Nadel, R.L., Slippers, B. and Eckhardt, L.G. A survey for *Sirex noctilio* and native woodwasps in Alabama.
6. Duwadi, S., Nadel, R., Feng, Y., and Eckhardt, L.G. Study of soil microbial biomass and soil moisture in loblolly pine (*Pinus teada*) stand.

Tuesday – October 24

7:00 – 7:45	**Breakfast**	
7:45 – 8:00	Nanocellulose/lignin: Possible BB Control	Dr. Sole Peresin, *Assistant Professor*
8:00 – 8:30	Business Meeting	Dr. Lori Eckhardt, *Director*
8:30 – 9:00	Budget Review	Dr. Lori Eckhardt, *Director*
9:30 – 11:00	Travel to Eufaula	
11:00 – 12:00	Lunch (Provided)	
12:00 – 2:00	Field Tour at “Decline Study”	
2:00	Adjourn – Have a safe trip home!	

AUBURN UNIVERSITY – FOREST HEALTH COOPERATIVE

FY 2018 ADVISORY COMMITTEE MEETING

Auburn, AL
October 24, 2017

MINUTES

by Luis Mendez

Q=Question, A=Answer, C=Comment/Suggestion

Meeting started at 1:05

FDHL Update and SOD-Luis Mendez

Q: Does (*P. ramorum*) infect pine? A: Dr.E- No

Q: Can you show a progression map (in reference to confirmed *Leptographium* root infections)?

Differentiate between the *Leptographium* species?

Screening Elite Lobolly pine families-Charles Eissen

Q: Were the pine trees in an artificial stand?

Q: Was there a site difference?/Any idea if there were a difference? A: Didn't do soil analysis. Comment: Perhaps a different geology.

Q: Do you know the cost benefit of using acoustics? A: Charles- Using Acoustics has a lower cost (equipment, but higher labor cost?) but does not offer density prediction. NIR just requires taking core samples.

Q: Does this work on cut wood?

Variation in tolerance of several Loblolly pine families-Pratima Devkota

Q: Rank? (Slide: Connector Families-Yearly Performance) A: Pratima- They are ranked based on the differences between each year, the order (on the graph) are the same for 2013-2017 (C: Dr. E no data for 2015, trees were killed by the cold)

Q: Were these (seedlings) grown in containers? A: Yes

Q: Did the spores change? A: Dr. E- No, we our cultures are always re-isolated from pine so that they don't lose pathogenicity/virulence.

Q: When do you receive the seedlings? A: January

Q: Was there a correlation between seedling size (in reference to lesion), ie Pathology studies on small trees having smaller lesions? A: Pratima- did not look at this

The role of *Leptographium terebrantis* and *Grosmannia huntii* invasion-Pratima Devkota

C: Virulence of two fungi increase under drought through different mechanisms- Asked to be better explained (posted to website?)

Q: Publishing research? A: Dr. E- She is currently work on several manuscripts to be submitted.

Q: Studies done on other Pine species?

Q: Were these grown in containers? A: Pratima- Bare root.

Q: Fertilizer? A: No

Driving towards biocontrol of ophiostomatoid fungi-Pratima

Q: So you did above ground biomass? A: Pratima-Total plant biomass, Needles, stem, and Roots

Q: Do the strains occur in nature? A: Yes.

Q: How would you operationally apply this (bacteria)? A: Pratima- Haven't tried it yet. Dr.E- Could inoculate via root dips or inoculate the seeds.

Q: Any idea how long does the bacteria stay in the soil?

Q: Can these bacteria be purchased?

Q: How is this being used in Ag?

The answer to the last 3 were that it is still in its research phase…

** Dean Alavalapati came in right after one of Pratima's presentations

Forgot to take notes for his visit, but I remembered that there was an overall praise for the co-op and how it is helping people/people just getting started.

Intra-species variation in response of mature loblolly pine-Pratima

Q: You tested lots of families, what are we missing in terms as testing (screening)?

Q: More research?

Q: New direction?

The effect of *Sirex* spp. woodwasps and their fungal associates-Dr. Eckhardt

Q: How many traps/sites? A: 32 sites.

Q: Why noctilio? (What does the name mean?)

Pathogenicity of Leptographium terebrantis-John Mensah

Q: What's the protocol for inoculated tree as in disposal after the experiment?

Physiological response of Loblolly pine-John

Q: Did you sample the same needles? (Stomatal conductance) A: Just the same Tree.

Quantifying the impact of pine decline-Dr. Nadel

Q: Are you measuring height? A: Yes, we measure them in December as the trees aren't growing.

Closing Remarks and Q&A-Dr. Eckhardt

Q: Will you be publishing your findings (SOD)? A: We will be publishing a first report.

Q: Any correlation to activity i.e. thinning (pine decline)? A: No correlation.

Q: What's the age you see the disease? A: 17.

Meeting ended 6:00

Day 2

Meeting started 8:04, Dr. Eckhardt introduces Dr. Sole

Nanocellulose/lignin possible bark beetle control-Dr. Sole

Q: How fine are the particles? A: 20 nanometers

C: Simulating Nozzle spread? And issues with spreading materials onto neighboring stands.

Q: How much is this being used in Ag? A: This is very new and is still in its research phase.

Q: Effect on Bees? Sensitivity to plants? Slow release?

Q: Has the nursery co-op heard your presentation? C: Nursey would be a great start.

FY 2017 Accomplishment-Dr. Eckhardt

Q: What's the timeline for the whole project? A: 2020.

FY 2018 Work plan

C: Letter to congressman (don't remember what Alan was talking about, maybe for funding?)

FY 2017 Budget

We had one member (Alan Wilson) that can vote at the meeting and he approved the budget.

Conference meeting ended, left for field meeting at Eufaula site.

Field Meeting

We arrived at the site at 11:00

Weather Station-Dr. Nadel

Q: How much does this cost? A: Nadel- about $1,000.

C: Could you summarize the weather data and post that to the website?

Q: Is this study accessible to the public (can people find this study by doing a simple google search? C: Opportunity to promote research and draw in more members.

Radial Growth Measurement & Treatment Application-John

Q: What's the cost of the ceptometer? A: Nadel-Couple of grand.

C: Explain dendrometer bands.

How does Leptographium terebrantis affect insect population? –Jessica

No Questions or Comments

Leaf Area Index-John

Question: How come May LAI is higher than February (all graphs)?

What is killing my trees? –Jessica

C: Can you post the data (poster?) on the website.

Study of fine root abundance by minirhizotron-Nadel

Q: How much does this periscope cost? A: 15,000, that's the price of the periscope and the tubes.

Q: When did she start recording data? A: we waited for 5 months to allow the soil to settle.

The effect of soil moisture content in soil microbial biomass-Nadel

Q: What's her hypothesis? A: To see whether seasonal changes has an effect on MB with treatments.

Q: How many replicates per treatment? A: 3.

Concluding Remark

Q: Are there chemicals that treat the fungus? A: Dr. E-talked about tree chemicals and their effects on fungal growth. (I think he was asking about the Plant Growth Promoting Bacteria and their ability to suppress Leptographium growth)

Q: Do the treated tree have effect on their adjacent tree (root grafting)? A: we have not observed that, but there is evidence showing this in long leaf pine in Fort Benning.

C: How can we help with recruiting new members? Have you put up pine decline information on what can be done? What can be done Silviculturally? Tip moth control. More information/Article about the co-op. For article, you could include the members (%private, %etc.). And more marketing.

Field Meeting ended at 2:00

AUBURN UNIVERSITY – FOREST HEALTH COOPERATIVE

FY2017 BUDGET - PROJECTED VERSUS ACTUAL

(October 2017)

FISCAL YEAR
(Oct. 1, 2016 - Sept. 30, 2017)

		FY17 (Projected)	FY 17 (Actual)	Difference
REVENUE				
Carryover from Previous Year		155,716	170,425	14,709
Current Year's Income - CAFS		82,500	55,000	(27,500)
Current Year's Project & Non-CAFS		33,984	61,152	27,168
Total Revenue		**272,200**	**286,577**	14,377
EXPENDITURES				
Personnel Costs				
	Professional/Non-Faculty	26,904	0	(26,904)
	Technician/Staff	0	0	0
	Graduate Assistants	52,180	50,059	(2,121)
	Other Personnel (Student Wages)	10,000	13,777	3,777
	Employee/GA Benefits (ESTIMATED)	11,114	2,718	(8,396)
	Total Personnel Costs	**100,198**	**66,554**	(33,644)
Operating Costs				
	Travel/Vehicle Mileage	12,000	9,537	(2,463)
	Supplies/Equipment	8,000	6,230	(1,770)
	Total Operating Costs	**20,000**	**15,768**	(4,232)
Project Costs				
	Travel/Vehicle Mileage	5,000	2,694	(2,306)
	Supplies/Equipment	20,800	1,951	(18,849)
	Lab Analysis	7,570	0	(7,570)
	Total Project Costs	**33,370**	**4,646**	(28,724)
Total Expenditures		**153,568**	**82,321**	(71,247)
CARRYOVER FOR NEXT YEAR		**118,632**	**204,255**	85,623

AUBURN UNIVERSITY – FOREST HEALTH COOPERATIVE

THREE YEAR FINANCIAL STATEMENT

(October 2017)

(SOD and CAFS Grants Paying for Professional until FY19)

	FISCAL YEAR October 1 - September 30		
	FY18 (Projected)	**FY19** (Projected)	**FY20** (Projected)
REVENUE			
Carryover from Previous Year	204,255	155,842	92,874
Current Year's Income - CAFS	55,000	-	-
Current Year's Project & Non-CAFS	51,152	106,152	106,152
Total Revenue	**310,407**	**261,994**	**199,026**
EXPENDITURES			
Personnel Costs			
Professional/Non-Faculty	42,558	44,686	46,920
Technician/Staff	0	0	0
Graduate Assistants	34,933	54,950	37,236
Other	12,000	12,000	12,000
Professional/GA Benefits (estimated)	11,114	11,114	22,441
Total Personnel Costs	**100,605**	**122,750**	**118,597**
Operating Costs			
Travel/Mileage	12,000	12,000	12,000
Supplies/Equipment	8,000	8,000	8,000
Total Operating Costs	**20,000**	**20,000**	**20,000**
Project Costs			
Travel	9,000	9,000	9,000
Supplies/Equipment	12,800	12,800	12,800
Lab Analysis	12,160	4,570	4,570
Total Project Costs	**33,960**	**26,370**	**26,370**
Total Expenditures	**154,565**	**169,120**	**164,967**
CARRYOVER FOR NEXT YEAR	**155,842**	**92,874**	**34,059**

INCOME STRUCTURE - FY2018

Dues	**Full member -**	**$10,000 / year**
	Associate -	**$5,000 / year**

Annual Income	**Dues**	**$ 112,280**
	Auburn	**$ 691,935**
	External	**$ 528,500**
	Total	**$1,332,715**

For every dollar of dues, Coop members receive $133 of research and technology.

****We are still hoping for some outstanding grants to increase our external dollar amount for FY18!****

Income Structure

Fisical Year	$$ of Research and Technology per $ of dues paid
FY2008	$ 41
FY2009	$ 59
FY2010	$ 62
FY2011	$ 69
FY2012	$ 78
FY2013	$108
FY2014	$125
FY2015	$133
FY2016	$135
FY2017	$133

FY 2015 ACCOMPLISHMENTS

As presented to the Forest Health Cooperative Advisory Committee

Dr. Lori G Eckhardt - Director

12/3/2015

AUBURN UNIVERSITY - FOREST HEALTH COOPERATIVE

FY 2017 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 3

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

Novel analytical tools for the selection of superior loblolly pine genotypes for improved plant health, fuels, and chemicals – SFWS, Forest Products Development Center and AU-IGP (Good to Great Grant). *Year 3

- ***Accomplishments: Funded by AU-IGP (Good to Great Grant)***

Seedling production and forest health in the Southeastern United States – in cooperation with the Southern Forestry Nursery Management Cooperative. *Year 5

- ***Accomplishments: Funded by NSF***

Testing of a rapid PCR Screening test for the presence of *Fusarium circinatum*, the causal agent of pitch canker on pine planting material – FHM for supplies, travel and postdoc. *Year 5

- ***Accomplishments: Funded by USFS Forest Health Protection grant.***

Sudden Oak Death (*Phytophthora ramorum*) Detection Survey (Stream Sampling) in AL and MS – FHM, USFS for all travel, supplies and laboratory technician. *Year 7

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

Wood chemistry and disease resistance – SFWS, Forest Products Development Center. *Year 5

- ***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 5

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

Objective 2. Recruit graduate students

Currently there are no openings for a graduate student 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:*** **During the 2016, a preliminary study on the Pathogenicity of *Leptographium terebrantis* to loblolly pine trees under field conditions was completed. The study tested the pathogenicity of the test fungus and the effectiveness of the inoculation method using colonized toothpicks. A second study was conducted to determine how *Leptographium terebrantis* infection affected water status of loblolly pine in naturally regenerated habitat. Insects have been collected biweekly and are being identified and processed. Microbial biomass, soil cores and foliar samples have been taken and are being processed.**

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

- ***Accomplishments: Study complete and manuscripts being worked on and submitted. Research reports being completed.***

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

- ***Accomplishments: Data is being analyzed and manuscript/report is under preparation.***

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

- ***Accomplishments: Two families one susceptible and one tolerant to Grosmannia huntii and Leptographium terebrantis were chosen and seedlings were planted in moisture stress boxes. Three different levels of moisture treatments: (a) drought (b) moderate drought and (c) normal moisture have***

been applied. The fungal inoculations completed. Final physiological and pathogenicity measurements have been completed. Data analysis completed and manuscript preparation is underway.

Resistance of *Pinus taeda* families under artificial inoculations with native and non-native *Leptographium* species involved in premature mortality. Working with the Tree Improvement Cooperative to determine families to be tested for tolerance/resistance.

- ***Accomplishments: Year four screening and data analysis is complete. Year 5 data collection and analysis is underway.***

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

- ***Accomplishments: Manuscripts and research reports being prepared.***

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

- ***Accomplishments: Families selected from the screening study and LGEPop on Plum Creek and Rayonier property. Trees harvested on Plum Creek and Rayonier property Spring 2014 and Spring 2015, processed in the forest products lab. Data currently being analyzed and manuscripts and research reports being prepared.***

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 and research report being prepared.***

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. (Eckhardt)

- ***Accomplishments: The website has updated Advisory Meeting 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 plan on producing Research Reports and Technical Notes in FY12 now that research projects are underway.

- ***Accomplishments: Research Report 2016-1 and several currently being written which will be online before the end of the year.***
- Devkota, P. and Eckhardt, L.G. 2016. Variance in tolerance of different families of loblolly pine (*Pinus taeda* L.) to *Grosmannia huntii* and *Leptographium terebrantis.* Research Report 2016-01. Forest Health Cooperative, School of Forestry and Wildlife Sciences, Auburn University.

Newletters (Staff)
Newsletter distribution will be planned for March FY2016. Members are encouraged to submit articles.

- ***Accomplishments: A Spring2016 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	Smith	Nadel
Phone calls	**34**	**6**	**0**
Letters	**1**	**0**	**0**
Emails	**65**	**23**	**1**
Site Visits	**10**	**3**	**0**
Diagnosis	**29**	**8**	**0**

Short Courses
Forest Health Short Course will be offered in odd years starting with FY2009. Not enough members signed up for the course in FY2009 or FY2011 and if there is enough interest, a Short Course in Forest Health will be planned for August 2017. (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 2017 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 FY18 Advisory Committee Meeting will be held the last week in June 2018. 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 29-30, 2016.***

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 43 presentations and published 6 articles on the subject of Forest Health.***

*Wahl, A.C., Nadel, R.L., Slippers, B. and Eckhardt, L.G. **2017**. The effect of *Amylostereum* spp. on forest health in Alabama. IUFRO 125th Anniversary Congress, Freiburg, Germany

*Wahl, A.C., Nadel, R.L., Slippers, B. and Eckhardt, L.G. **2017**. A survey for *Sirex noctilio* and native woodwasps in Alabama. IUFRO 125th Anniversary Congress, Freiburg, Germany

*Devkota, P. and Eckhardt, L.G. **2017**. How do different mature *Pinus taeda* families respond to root-infecting fungi? IUFRO 125th Anniversary Congress, Freiburg, Germany

*Duwadi, S., Nadel, R., Feng, Y., and Eckhardt, L.G. **2017**. One year study of soil microbial biomass and soil moisture in loblolly pine (*Pinus teada*) stand. IUFRO 125th Anniversary Congress, Freiburg, Germany

*Devkota, P. and Eckhardt, L.G. **2017**. Induced systemic resistance of *Pinus taeda* to *Leptographium terebrantis* and *Grosmannia huntii* by plant growth-promoting rhizobacteria. This is Research: Student Symposium, Auburn, AL

*Wahl, A.C., Nadel, R.L., Slippers, B. and Eckhardt, L.G. **2017**. Competitiveness of *Amylostereum* spp. fungi against *Leptographium* spp. fungi. This is Research: Student Symposium, Auburn, AL

*Acquah G. E., Via B. K. and Eckhardt L. G. **2017**. Screening elite loblolly pine families for structural integrity with near infrared-based chemometric models. Southeastern Society of American Foresters Annual Meeting, Sandestin, FL

*Wahl, A.C., Nadel, R.L., Slippers, B. and Eckhardt, L.G. **2017.** The effect of *Sirex* species on Alabama forest health. Southeastern Society of American Foresters Annual Meeting, Sandestin, FL

*Mensah, J.K., Sword Sayer, M.A., Nadel, R.L., Matusick, G., Fan, Z., and Eckhardt, L.G. **2017**. Effect of *Leptographium terebrantis* on tree physiology and growth of loblolly pine. This is Research: Student Symposium, Auburn University, Auburn, AL

*Duwadi, S., Nadel, R., Feng, Y., and Eckhardt, L.G. **2017**. Study of soil microbial biomass and soil moisture in loblolly pine (*Pinus teada*) stand. This is Research: Student Symposium, Auburn University, Auburn, AL

*Ahl, J., Beach, J., Nadel, R., Held, D. and L. Eckhardt. April 2017. Insect Populations associated with *Leptographium terebrantis*, a Fungus that Contributes to Southern Pine Decline. This is Research: Student Symposium, Auburn University, Auburn, AL

*Duwadi, S., Nadel, R., Feng, Y., and Eckhardt, L.G. **2017**. Study of soil microbial biomass and soil moisture in loblolly pine (*Pinus teada*) stand.

*Mensah, J.K., Sword Sayer, M. A., Nadel, R. L, Matusick, G., Fan, Z., and Eckhardt, L.G. **2017**. Impact of *Leptographium terebrantis* on loblolly pine trees in naturally regenerated forest. Sigma Xi Student Research Showcase. (Virtual)

*Devkota, P. and Eckhardt, L.G. **2017**. Loblooly pine and vascular-inhabiting fungi. Sigma Xi Student Research Showcase. (Virtual)

*Wahl, A.C., Nadel, R.L., Slippers, B. and Eckhardt, L.G. **2017**. *Sirex* woodwasps and their symbionts in Alabama forests. Sigma Xi Student Research Showcase. (Virtual)

*Ahl, J.B., Eckhardt, L.G. and Beach, J.M. **2017**. Can you identify spores of fungal species on coleopteran with hyperspectral interferometry? Sigma Xi Student Research Showcase. (Virtual)

*Ahl, J.B., Eckhardt, L.G. and Beach, J.M. **2017**. Can you identify spores of fungal species on coleopteran with hyperspectral interferometry? Weaver Lecture Graduate Student Poster Session, Auburn University, Auburn, AL

*Devkota P., Nadel R.L., & Eckhardt L.G. **2017**. How do different mature *Pinus taeda* L. families respond to root-infecting fungi? Weaver Lecture Graduate Student Poster Session, Auburn University, Auburn, AL

*Wahl, A.C., Nadel, R.L., Slippers, B. and Eckhardt, L.G. **2017**. A survey for *Sirex noctilio* and native woodwasps in Alabama. Weaver Lecture Graduate Student Poster Session, Auburn University, Auburn, AL

*Mensah, J., Duwadi, S., Ahl, J. and Eckhardt, L.G. **2017**. Quantifying southern pine decline: the role of *Leptographium terebrantis.* Weaver Lecture Graduate Student Poster Session, Auburn University, Auburn, AL

*Wahl, A.C., Devkota, P. and Eckhardt, L.G. **2017**. Foes of the forests in the southern United States. SFWS Open House Poster Session, Auburn, AL

*Mensah, J., Duwadi, S., Ahl, J. and Eckhardt, L.G. **2017**. Quantifying southern pine decline: the role of *Leptographium terebrantis*. SFWS Open House Poster Session, Auburn, AL

*Ahl, J.B., Eckhardt, L.G. and Beach, J.M. 2017. Can you identify spores of fungal species on coleopteran with hyperspectral interferometry? Southeastern Branch of the Entomological Society of America. Memphis, TN

*Wahl, A.C., Nadel, R.L., Slippers, B. and Eckhardt, L.G. **2017.** The effect of *Sirex* species on Alabama forest health. Southeastern Branch of the Entomological Society of America. Memphis, TN

*Devkota P., Singh A., & Eckhardt L.G. **2017**. Phenotypic Screening of Loblolly Pine Families Tolerant to Pathogenic Root-feeding Bark Beetle Vectored Fungi. Alabama Natural Resources Council, Outreach Symposium and Landowner Awards Banquet, Tuscaloosa, AL

*Devkota P., Kloepper J.W., & Eckhardt L.G. **2017**. Induction of Systemic Resistance in *Pinus taeda* to Root-infecting Fungi by Plant Growth-promoting Rhizobacteria. Alabama Natural Resources Council, Outreach Symposium and Landowner Awards Banquet, Tuscaloosa, AL

*Devkota P., Nadel R.L., & Eckhardt L.G. **2017**. How Do Different Mature *Pinus taeda* L. Families Respond to Root-infecting Fungi? Alabama Natural Resources Council, Outreach Symposium and Landowner Awards Banquet, Tuscaloosa, AL

*Devkota P., Enebak S., & Eckhardt L.G. **2017**. Virulence of Ophiostomatoid Fungi to Loblolly Pine under Varying Soil Moisture Levels**.** Alabama Natural Resources Council, Outreach Symposium and Landowner Awards Banquet 2017, Tuscaloosa, AL

*Ahl, J.B., Eckhardt, L.G. and Beach, J.M. **2017**. Can you identify spores of fungal species on coleopteran with hyperspectral interferometry? Alabama Natural Resource Council Outreach Symposium, Tuscaloosa, AL

*Wahl, A.C. Nadel, R.L., Slippers, B. and Eckhardt, L.G **2017.** The effect of terpenes emitted by *Pinus* spp. on *Amylostereum areolatum*. Alabama Natural Resource Council Outreach Symposium, Tuscaloosa, AL

*Wahl A.C., Nadel R.L., Slippers B., Eckhardt, L.G. **2017**. *Sirex* woodwasp and their symbionts in Alabama forests. Alabama Natural Resources Council, Tuscaloosa, AL

*Wahl A.C., Nadel R.L., Slippers B., Eckhardt, L.G. **2017**. Competitiveness of *Amylostereum* spp. fungi against *Leptographium* spp. fungi. Alabama Natural Resources Council, Tuscaloosa, AL

*Essien, C., Via, B., Gallagher, T., McDonald, T., and Eckhardt, L. **2017**. Applying discriminate analysis and acoustic tool to assign loblolly pine families into susceptibility classes. Alabama Natural Resources Council, Tuscaloosa, AL

*Devkota P., Enebak S., & Eckhardt L.G. **2017**. Does Pathogenicity of *Leptographium terebrantis* and *Grosmannia huntii* to *Pinus taeda* L. Alter under Varying Soil Moisture? Southeastern Society of American Foresters Annual meeting, Sandestin, FL

*Devkota, P., Singh, A., and Eckhardt, L.G. **2017**. Response of different *Pinus taeda* L. families to root-infecting ophiostomatoid fungi. Southeastern Society of American Foresters Annual Meeting, Sandestin, FL

*Devkota, P., Kloepper, J.W., and Eckhardt, L.G. **2017**. Induced systemic resistance of *Pinus taeda* L. to *Leptographium terebrantis* and *Grosmannia huntii* by plant growth-promoting rhizobacteria. Southeastern Society of American Foresters Annual Meeting, Sandestin, FL

*Essien, C., Via, B., Gallagher, T., McDonald, T., and Eckhardt, L. **2017**. Acoustic stiffness characterization of loblolly pine (*Pinus taeda* L.) families used for improved forest health. Southeastern Society of American Foresters Annual Meeting, Sandestin, FL

*Acquah G. E., Via B. K., Fasina O. O., Adhikari S., and Eckhardt L. G. **2017**. Rapid assessment of forest biomass for biofuel applications: A comparative study of three analytical tools. Southeastern Society of American Foresters Annual Meeting, Sandestin, FL

*Devkota, P., and Eckhardt, L.G. **2017**. Does pathogenicity of *Leptographium terebrantis* and *Grosmannia huntii* to *Pinus taeda* L. alter under varying soil moisture? Southeastern Society of American Foresters Annual Meeting, Sandestin, FL

*****Wahl, A.C**.** Nadel, R.L., Slippers, B. and Eckhardt, L.G **2017.** *Sirex noctilio* in the southern pine forest. USDA Forum on Invasive Species, Annapolis, MD

*Wahl A.C., Nadel R.L., Slippers B., Eckhardt, L.G. **2016**. Effect of Growth Rate on Amylostereum spp. Fungus by Terpenes. Sigma Xi Annual Meeting and Student Research Conference, Atlanta, GA

*Devkota, P., and Eckhardt, L.G. **2016**. Variation in tolerance of *Pinus taeda* families to ophiostomatoid fungi *Grosmannia huntii* and *Leptographium terebrantis*. Sigma Xi Annual Meeting and Student Research Conference, Atlanta, GA

*Devkota, P., and Eckhardt, L.G. **2016**. Virulence of Ophiostomatoid Fungi on Loblolly Pine Families under Drought Stress. Society of American Foresters Annual Convention. Madison, WI

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

*Chieppa, J.J., Eckhardt, L.G., and Chappelka, A.H.. **2017**. Simulated summer rainfall variability effects on loblolly pine (*Pinus taeda*) seedling physiology and susceptibility to root-infecting ophiostomatoid fungi. Printed online first: DOI 10.3390/f8040104. Forests 8:000-000.

*Acquah, G., Via, B.K., Fasina, O., Adhikari, S., Billor, N., and Eckhardt L. **2017**. Chemometic modeling of thermogravimetric data for the compositional analysis of biomass. Published online first: DOI:10.1371/journal.pone.0172999. PLOS-1 00:000-000.

*Essien, C., Via, B.K., Eckhardt, L., Cheng, Q., Gallagher, T., McDonald, T., and Wang, X. **2017**. Multivariate modeling of acusto-mechanical response of fourteen year old suppressed loblolly pine (*Pinus taeda*) to variation in wood chemistry, microfibril angle and density. Published online first: DOI 10.1007//s00226-017-0894-9. Wood Sci. and Technol. 00:000-000.

*Trautwig, A. Eckhardt, L.G., Hoeksema, J., Carter, E.A., and Loewenstein, N. **2017**. Mycorrhizal communities in *Imperata cylindrical* invaded and non-invaded commercial *Pinus taeda* stands. Printed online first: http://www.ingentaconnect.com/content/saf/fs/pre-prints/content-forsci16016. For. Sci. 62:000-000.

*Acquah, G., Via, B.K., Fasina, O., and Eckhardt L. **2016**. Raped quantitative analysis of forest biomass using Fourier transformation spectroscopy (FTIR) and partial least squares (PLS) regression. J. Anal. Meth. Chem. 00:000-000. Published online first doi:10.1155/2016/1839598.

*Acquah, G., Via, B., Billor, N., Fasina, O., and Eckhardt, L. **2016**. Identifying plant part composition of forest logging residue using infrared spectral data and linear discriminant analysis. Sensors. Published first online: DOI: 10.3390/s16091375.

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 $656,500:***

    1. Eckhardt and Enebak. 2017. Sudden Oak Death – *Phytophpora ramorum* surveys - $36,000.
    2. Eckhardt, Nadel, Matusick, Sword, Cater. 2015. Quantifying loblolly pine decline – FHC and SFWS – SFWS portion $60,000
    3. Eckhardt and Enebak. 2016. Sudden Oak Death – *Phytophpora ramorum* surveys - $34,000.
    4. Enebak and Eckhardt. 2014. Testing of a rapid PCR Screening test for the presence of *Fusarium circinatum*, the causal agent of pitch canker on pine planting material – FHM - $150,000.
    5. Enebak and Eckhardt. 2014. Seedling production and forest health in the Southeastern United States – NSF-CAFS - $300,000 ($150,000 to FHC).
    6. Eckhardt. 2014. Root disease model – SFWS - $64,500.
    7. Hoeksema and Eckhardt. 2014. Mycorrhizal fungal colonization and disease resistance – SFWS and University of Mississippi - $25,000.
    8. Via and Eckhardt. 2014. Wood chemistry and disease resistance. SFWS - $5,000.
    9. Eckhardt and Wingfield. 2015 *Pinus* related diseases and molecular aspects. SFWS and FABI – University of Pretoria South Africa for travel and supplies and a graduate student stipend at UP - $30,000.
    10. Via and Eckhardt. 2015. Novel analytical tools for the selection of superior loblolly pine genotypes for improved plant health, fuels, and chemicals – IGP - $100,000.

FY 2015 ACCOMPLISHMENTS

As presented to the Forest Health Cooperative Advisory Committee

Dr. Lori G Eckhardt - Director

12/3/2015

AUBURN UNIVERSITY - FOREST HEALTH COOPERATIVE

FY 2018 WORK PLAN

GOAL A: RESEARCH

Objective 1. Identify research projects

Proposed FY2017:

1. Quantifying the impact of root disease on the function of a tree - NIFA-AFRI for travel, supplies, graduate students and post-doc $497,691 – *Reviewed as high priority with good reviews for 2015 submission. Wanted more preliminary data, asked to resubmit July 2016. Not funded.* W*ill resubmit July with modifications if suitable RFP released.*
2. Novel analytical tools for the selection of superior loblolly pine genotypes for improved plant health, fuels, and chemicals – NIFA-AFRI for travel, supplies, graduate students and post-doc $494,377 – *Reviewed as high priority with good reviews in 2015. Wanted more preliminary data, asked to resubmit July 2016.* W*ill resubmit July with modifications if suitable RFP released.*
3. Ecology of siricids and fungal associates in southeastern pine forests: potential for biological control and competition – APHIS for travel, supplies and graduate student $99,493 - *Decision pending dependent upon continuation of funds*
4. A *Hylastes* species-*Leptographium* species mutualism and *Pinus palustris* restoration – DoD (3 years) $211,404 - *Decision pending dependent upon continuation of funds*
5. Exploring soil microbial communities as mediators of complex threats to southern conifers – Agriculture and Food Research Initiative Competitive Grant (3 years) $497,000 - W*ill resubmit July with modifications if suitable RFP released*
6. Sudden Oak Death (*Phytophthora ramorum*) Detection Survey (Stream Sampling) in AL and MS – FHM, USFS for all travel, supplies and laboratory technician $36,000 – *Will submit March 2018*

Newly Funded FY2017:

1. Sudden Oak Death (*Phytophthora ramorum*) Detection Survey (Stream Sampling) in AL and MS – FHM, USFS for all travel, supplies and laboratory technician $34,000.
2. Collaboration between SFWS and FABI – University of Pretoria South Africa to work on *Pinus* related diseases and molecular aspects. $5,000 per participant (3 years)

3. Wood chemistry and disease resistance – SFWS and Forest Products Development Center (to get additional preliminary data for larger grant) $5,000
4. Ecology of siricids and fungal associates in southeastern pine forests: potential for biological control and competition – SFWS and FABI $20,000

Funded FY2016:

1. Sudden Oak Death (*Phytophthora ramorum*) Detection Survey (Stream Sampling) in AL and MS – FHM, USFS for all travel, supplies and laboratory technician $36,000.
2. Collaboration between SFWS and FABI – University of Pretoria South Africa to work on *Pinus* related diseases and molecular aspects. $5,000 per participant (3 years)
3. Wood chemistry and disease resistance – SFWS and Forest Products Development Center (to get additional preliminary data for larger grant) $5,000
4. Ecology of siricids and fungal associates in southeastern pine forests: potential for biological control and competition – SFWS and FABI $20,000

Funded FY2015:

1. Seedling production and forest health in the Southeastern United States – NSF-CAFS - $300,000.
2. Rapid assessment tools for the genetic improvement of forest products and bioenergy – HATCH for travel, supplies and graduate student $50,000.
3. Sudden Oak Death (*Phytophthora ramorum*) Detection Survey (Stream Sampling) in AL and MS – FHM, USFS for all travel, supplies and laboratory technician $36,000
4. Testing of a rapid PCR Screening test for the presence of *Fusarium circinatum*, the causal agent of pitch canker on pine planting material – FHM for supplies, travel and postdoc - $150,000

Funded FY2014:

1. Identification of Climate Effects on Microbial Symbionts of Longleaf Pine – ERDC-CERL in collaboration with CERL personnel (Ryan Busby) and University of Mississippi for all travel and supplies - $50,000
2. Interactions of future climate change scenarios of elevated tropospheric ozone and decreasing rainfall amounts with loblolly pine decline – HATCH for all travel, supplies and graduate student - $49,986.
3. Sudden Oak Death (*Phytophthora ramorum*) Detection Survey (Stream Sampling) in AL and MS – FHM, USFS for all travel, supplies and laboratory technician $36,000.
4. Field evaluation of a controlled vapor delivery method in an integrated pest management system for citrus and loblolly pine – AU-IGP in collaboration with AU Chemical Engineering for all travel, supplies and student worker - $97,000

5. Root disease model to determine how pine decline and annosum root rot interact – SFWS for travel, supplies, graduate student stipend - $64,000
6. Mycorrhizal fungal colonization and disease resistance – SFWS and University of Mississippi for all travel, supplies and graduate student stipend - $25,000
7. Wood chemistry and disease resistance – SFWS and Forest Products Development Center (to get preliminary data for larger grant) $5,000
8. Collaboration between SFWS and FABI – University of Pretoria South Africa to work on *Pinus* related diseases and molecular aspects. $5,000 per participant (3 years)

Funded FY2013:

1. Hylastes population dynamics and forest health evaluation in association with thinning and fertilization on new RW19 in Louisiana – Funding through FHP and FHC
2. Delineating loblolly pine decline in the Southeast using FHM/FIA data – submitted to FHM, USFS for all travel and supplies associated with the project $35,000 – (Funded Year 2 for $17,000)
3. Sudden Oak Death (*Phytophthora ramorum*) Detection Survey (Stream Sampling) in AL and MS – FHM, USFS for all travel, supplies and laboratory technician $47,000
4. Mature root inoculation of families from screening study found in the LGEPop study in GA and FL (Study 3 of the Resistance of *Pinus taeda* families under artificial inoculations with native and non-native *Leptographium* species involved in premature mortality under different nutritional regimes project) – SFWS and Forest Health Cooperative.

Objective 2. Recruit graduate students

No current openings.

Objective 3. Initiate and continue 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. Following successful inoculation of the trees in 2017, the growth performance of the inoculated and control trees within the experimental plots will be monitored and evaluated. During the period (2018), radial and height growth; leaf area index; foliar nutritional analysis and total phenolic content will be assessed.
2. Continue processing and sorting insect samples collected at the Eufaula, AL QPD site. This past February, we installed another type of pitfall trap with antifreeze in the bottom to allow entry of larger ground based beetles; there is one per plot for a total of fifteen.

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

- Data analyzed and manuscripts written.

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

- Research report/manuscript being prepared.

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

- Research report/manuscript being prepared.

Resistance of *Pinus taeda* families under artificial inoculations with native and non-native *Leptographium* species involved in premature mortality.

- Families for FY17 screening have been harvested and data is being collected.

Identification of cogongrass effects on microbial symbionts and physiological vigor of loblolly pine.

- Working on manuscripts for publication.

Blue-stain fungi associated with wild pigs causing rooting damage in longleaf and loblolly pine stands.

- Working on manuscripts for publication.

Wood chemistry and disease resistance.

- Working on manuscripts for publication

Mycorrhizal fungal colonization and disease resistance.

- Working on manuscripts for publication

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. (Eckhardt)

Leveraging Forest Health Cooperative Data
The Forest Health Cooperative staff will continue to stress the importance of the Cooperative membership and when possible, leverage Cooperative information for grant proposals. (Staff)

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 FY17.

Newsletters
Newsletter distribution will be planned for March (Spring) 2018. 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. (Eckhardt/Bauman)

Short Courses
The Forest Health Cooperative will offer a Forest Health Short Course in Auburn for member personnel in July 2019. We need a minimum of 20 attendees and will survey the membership in January 2019 for 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 FY19 Advisory Committee Meeting will be held on June 27-28, 2018. 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 Cooperative Membership
The Forest Health Cooperative staff should make an effort to recruit new members. (Staff)

Update the Cooperative Membership Directory
An on-going activity with an updated directory distributed annually. (Bowersock)

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)

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

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 forest health.

Interaction with other Research Cooperatives
The Forest Health 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 forest health.