Scope of Work

Project Title: Biological Invasions Detection via Sentinel Gardens in Alabama

Applicant: (PI)Dr. Lori Eckhardt, Pathologist & Entomologist, College of Forestry, Wildlife and Environment, Auburn University; (CoPI): Dr. Annakay Newell, Pathologist & Entomologist, College of Forestry, Wildlife and Environment, Auburn University

Applicant POC: Elizabeth Lebow

Cooperators: Alabama Cooperative Extension Service, City of Mobile, Port of Mobile, Southern Forest Nursery Management Cooperative, Alabama Forestry Commission, Alabama Forestry Association, Alabama Invasive Plant Council. We are planning to add more cooperators after listening sessions and recruiting meetings.

Project Summary:
Ports of commerce are important bottlenecks in biological invasion pathways. Monitoring plants near ports promotes the early detection of forest pests and pathogens, but surveillance capacity is limited, and novel invasions can go undetected. These plantings will act as bait for invasive pests that may be virulent on North American trees. Alabama has a significant port of entry and because it is located near urban population centers, there is a great opportunity for engaging urban communities in bio-surveillance to add capacity for early detection of new pests and pathogens. Installing these plantings will be a proactive approach in screening for invasive species entering through our ports.

Background:
Infectious diseases of plants are an ongoing and increasing threat to international biosecurity, with a wide range of implications. These outbreaks in plant populations have devastating economic, environmental and societal consequences. Sentinel plantings give an opportunity for fast detection of invading pathogens and insects acting as an early warning beacon which is essential to prevent widespread transmission. Lovell-Read et al. (2023) has been shown that including sentinel plants in monitoring programs can reduce the expected prevalence of infection upon outbreak detection substantially, increasing the feasibility of local outbreak containment.

Project Description:
Partner Deliverables:
This project will provide (1) Establishment of 2-3 sentinel gardens (Port of Mobile and Mobile &/or Fairhope Experiment station); (2) Establishment of a training garden at the Mary Olive Thomas Tract; and (3) 1 – 2 educational workshops per year; (3) Communicating knowledge to U.S. regulatory agencies for incorporation into early detection programs.

Project Objectives:
This proposal will (1) establishing and demonstrating a sentinel planting approach; (2) conduct general surveys and sampling for exotic insects and diseases, including non-regulated species; (3) incorporating education and community science in monitoring; (4) measuring the immediate and longer-term impacts

of outreach on the effectiveness of early detection; (5) establishment of a communication system between U.S. regulatory agencies of damaging pests.

Methodology:

Partnering and Scouting: We will initiate meetings with multiple groups across the State of Alabama to determine workable partnerships for the project that can help in land base, sampling, site maintenance, citizen science and other cooperative functions. We will visit and hold meetings with the Mobile Port Authority and City of Mobile to find suitable locations for the sentinel gardens as well as the Mobile and Fairhope Experiment Stations. We will work with extension faculty to form a citizen science network. We will design and launch a webpage for information about the project for stakeholders and reporting as well as a place to volunteer or sign up as a cooperator.

Garden Design: We will design and initiate a survey to stakeholders to determine priority plants and pests to monitor at the planting sites. We will also engage with stakeholders through several listening sessions (Mobile, Montgomery and Huntsville). The goal is to have economically, culturally, and ecologically regionally important species in the gardens. We will also include a few species that overlap with the gardens in the WSU project. We will meet with different nurseries around the state about sapling acquisition via the Auburn University Southern Forest Nursery Management Cooperative. Gardens will be identical at all locations. At each site we propose to plant saplings in a randomized complete block method on a 1 x 1 m grid. Size is yet to be determined as number of species will be determined during stakeholder surveys in year one.

Plantings: We propose to establish sentinel gardens in 3-4 locations: Port of Mobile, Mobile &/or Fairhope Experiment Station(s), and Mary Olive Thomas Tract (AUCFWE MOTT). The AUCFWE MOTT sentinel garden will be used as both a sampling and a training site (technicians, community scientists, students) for workshops and demonstrations. Tree species will be selected from the surveys and listening sessions and be prioritized for the gardens. Sources will be contacted, and saplings acquired. Sites will be prepped, and gardens installed.

Monitoring: The gardens near the Port of Mobile and on the Experiment Station(s) will be priority monitoring sites for staff and partners. Community scientists will be engaged to help monitor vegetation (including mature trees) nearby and beyond the priority gardens. The Mobile Experiment Station Garden would share a border with the wooded area of the Mobile Botanical Garden which we are working to include in the surveillance. Plantings will be monitored for signs and symptoms of insects and disease monthly. Insect traps (panel traps) and spore traps will also be installed and screened monthly. A combination of morphometric and molecular approaches will be used to confirm the identity of pathogens causing disease on symptomatic plants. Partners will be leveraged for pest ID or diagnostics where needed.

Key Personnel:

Pi: Dr. Lori Eckhardt will oversee administration of the project and present any findings through the appropriate channels. She will meet with potential collaborators and partners and be involved in the selection and setup of the gardens.

Co-PI: Dr. Annakay Newell will oversee the workshops and citizen science portion of the project.

Research Associate: Will coordinate and manage the monthly activities and be the liaison between partners. They will also organize sample collection, data collection and analysis.
Research Assistant: Will work with the research associate in organizing workshops, assist in training citizen scientist, ordering materials, and collect and process samples.
Undergraduate Student Intern: Will assist in all aspects of the project where needed.

Estimated Timeline:
Anticipated Period of Performance: 3 years
Reporting Frequency: Yearly (or more frequently if necessary)

Task	**Year 1**	**Year 2**	**Year 3**
Design gardens, select tree species and sources			
Order, acquire and propagate seedlings			
Select locations for gardens			
Site prep			
Establish plantings (Fall Year 2 and Year 3)			
Maintenance of planting site (watering, weeding, etc)			
Monitoring			
Insect Trapping			
Spore trapping			
Organize workshops			
Train and engage citizen scientists			
Measure project impacts			

Budget:

Budget items	Cost ($)			
	Year 1	**Year 2**	**Year 3**	**TOTAL**
Salaries				
PI – Dr. Eckhardt (0.5 Mo)	5,172.00	5,327.16	5,486.97	15,986.13
Co-PI – Dr. Newell (1.0 Mo)	6,916.67	7,124.17	7,337.89	21,378.73
Research Associate (3 Mo)	13,971.00	14,390.00	14,822.00	43,183.00
Research Assistant (6 Mo)	23,300.00	23,999.00	24,719.00	72,018.00
Undergraduate Student Intern (670 hours)	6,700	6,700	6,700	20,100.00
Total	56,059.67	59,065.87	52,365.87	172,665.86
Fringe (30.9%)	15,252.00	15,710.00	16,181.00	47,143.00
Supplies (field and laboratory supplies)	1,000.00	12,500.00	12,500.00	26,000.00
Travel	8,032.00	9,468.00	9,468.00	26,968.00
Total	80,343.67	95,218.33	97,214.87	272,776.86
Overhead (53% Year 1; 54% Year 2 & 3)	42,582.14	51,417.90	52,496.03	146,496.07
TOTAL (Year 1-3)	**122,925.81**	**146,636.22**	**149,710.89**	**419,272.93**

Budget Justification:

Our total budget request for the three-year period which includes a is $419,272.93 (Y1 - $122,925.81, Y2 - $146,636.22, Y3 - $146,710.89). The following is a concise justification *by year* for all direct costs for each budget category specified.

Year One total budget is $122,925.81 ($80,343.67 direct costs plus $42,582.14 indirect costs). Salary costs totaling $71,311.67 ($56,059.67 + 15,252.00 fringe) includes the salary + fringe for Dr. Lori Eckhardt PI (0.5 mo) is $6,770 ($5,172 + $1,598 fringe), salary + fringe for Dr. Annakay Newell Co-PI (1 mo) is $9,053.27 ($6,916.17 + $2,137.10 fringe), salary + fringe for the project Research Associate (3 mo) is $18,288.04 ($13,971 plus $4,317.04 fringe), a Research Assistant at $30,500 ($23,300 + $7,200 fringe); and salary for an undergraduate student intern at $6,700 (670 hours at $10/hr). Supply costs totaling $1,000 cover the materials for workshop, training and survey supplies (printing, name tags, presentation materials, etc). Travel costs of $8,032 are needed to cover hotel, perdiem and vehicle cost for trips to conduct site visits to scout locations (x3) at Port of Mobile, City of Mobile and ACES Extension Stations (Mobile and Fairhope), listening sessions in Mobile, Montgomery, and Huntsville, meetings with cooperators to set up partnerships and citizen science network.

Year Two total budget is $146,636.22 ($95,218.33 direct costs plus $51,417.90 indirect costs). Salary costs totaling $73,250.33 ($59,065.87 + $15,710 fringe) include the salary + fringe for Dr. Lori Eckhardt (0.5 mo) is $6,973.25 ($5,327.16 + $1,646.09 fringe), salary + fringe for Dr. Annakay Newell (1 mo) is $9,325.54 ($7,124.17 + $2,201.37 fringe), the salary + fringe for the Research Associate (3 mo) is $18,836.51 ($14,390 plus $4,446.51 fringe), a Research Assistant (6 mo) at $31,414.69 ($23,999 + $7,415.70 fringe); and salary for an undergraduate student intern at $6,700 (670 hours at $10/hr). Supply costs totaling $12,500 are needed to cover the materials for site prep and garden installation ($1,000 - stakes, flagging, seedlings), insect monitoring ($2,000 - insect panel traps, poles, spray bottles, collection kits, vials, consumables and chemicals for collecting and processing insects), spore traps monitoring ($1,500 - spore traps, poles, flagging, rechargeable batteries, solar panels, microscope slides, collection strips, consumables for collecting), sampling monitoring ($2,500 - petri dishes, antibiotics, media, bags, coolers, ice packs), PCR & sequencing ($5,500 – tips, tubes, plates, seals, other consumables and chemicals, DNA extraction kits, sequencing consumables and chemicals) for meetings and trainings (printing, name tags, presentation materials). Travel costs of $9,468 covers hotel, perdiem and vehicle cost for trips to establish and install sites (2 – 5 day trips - includes site prep and planting, installing spore and insect traps), monthly monitoring visits and trap (spore and insect) collections, workshops and training activities with cooperators and citizen science network.

Year Three total budget is $149,710.89 ($97,214.87 direct costs plus $52,496.03 indirect costs). Salary costs for totaling $75,246.87 ($52,365.87 + $16,181 fringe) include the salary + fringe for Dr. Lori Eckhardt (0.5 mo) is $7,182.44 ($5,486.97 + $1,695.47 fringe), salary + fringe for Dr. Annakay Newell (1 mo) is $9,605.30 ($7,337.89 + $2,267.41 fringe), the salary + fringe for the Research Associate is $19,402 ($14,822 plus $4,580 fringe), a Research Assistant at $32,357.17 ($24,719 plus $7,638.17 fringe); and salary for an undergraduate student intern at $6,700 (670 hours at $10/hr). Supply costs totaling $12,500 are needed to cover the materials for site prep and garden installation ($1,000 - stakes, flagging, seedlings), insect monitoring ($2,000 - insect panel traps, poles, spray bottles, collection kits, vials, consumables and chemicals for collecting and processing insects), spore traps monitoring ($1,500 - spore traps, poles, flagging, rechargeable batteries, solar panels, microscope slides, collection strips, consumables for collecting), sampling monitoring ($2,500 - petri dishes, antibiotics, media, bags, coolers, ice packs), PCR & sequencing ($5,500 – tips, tubes, plates, seals, other consumables and chemicals, DNA extraction kits, sequencing consumables and chemicals) for meetings and trainings (printing, name tags, presentation materials). Travel costs of $9,468 covers hotel, perdiem and vehicle cost for trips to establish and install sites (2 – 5 day trips - includes site prep and planting, installing spore and insect traps), monthly monitoring visits and trap (spore and insect) collections, workshops and training activities with cooperators and citizen science network.