ML 2015, CH. 76, Art. 2, Sec. 6a, MITPPC Sub-Project #8 Project Abstract
For Period Ending January 31, 2021
Amended December 8, 2022

PROJECT TITLE: Sub-Project #8. Accurate detection and integrated treatment of oak wilt *(Bretziella fagacearum)* in Minnesota

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FUNDING SOURCE: Environment and Natural Resources Trust Fund

APPROPRIATION AMOUNT: $356,382
AMOUNT SPENT: $356,382
AMOUNT REMAINING: $ 0

Sound bite of Project Outcomes and Results

This project developed methods and approaches for better detection of oak wilt using spectroscopic technology and documented best practices to prevent spread of the disease.

Overall Project Outcome and Results

Our team has made substantial progress on the development of methods and approaches for accurate detection of oak wilt in Minnesota forest using spectroscopic technology. We have also documented best practices for management efforts to prevent spread of the disease. Specifically, we have completed physiological experiments demonstrating the disease can be differentiated from other stress factors under controlled conditions (Activity 1). A manuscript on the greenhouse seedling experiment using leaf and whole plant spectroscopic data to differentiate oak wilt from bur oak blight and drought has been published in *Tree Physiology*. We have advanced analyses and ground-truthing of AVIRIS NG airborne imagery including model development and spectral index development for stress physiology in response to the oak wilt disease (Activity 2). In an outdoor field experiment using naturally growing oak saplings at the Cedar Creek Ecosystem Science Reserve, oak saplings were inoculated with oak wilt and compared to healthy saplings using leaf and canopy spectroscopy. Results indicate that physiological disease symptoms can be readily detected using spectral sensors at both leaf and canopy scales using statistical models and simple indices from spectral features linked to physiological stress. Lastly, treatments were completed at 20 oak wilt sites with a new "double plow line" to prevent spread of the disease through root grafts. Initial assessments indicate the approach is highly effective, but a final determination will be made 5 years after treatment, beyond the life of this project (funding secured from USDA Forest Service). Two postdoctoral scientists, a technical scientist, a first-year graduate student and two undergraduate research assistants received training and mentoring during the project.

Project Results Use and Dissemination

Our team has disseminated new knowledge from this project to local, regional, national and international audiences. A significant peer-reviewed publication has already come this project (Beth Fallon, Anna Yang, Cathleen Lapadat, Isabella Armour, Jennifer Juzwik, Rebecca A Montgomery, Jeannine Cavender-Bares. 2020. Spectral differentiation of oak wilt from foliar fungal disease and drought is correlated with physiological changes. *Tree Physiology* 40(3): 377–390, https://doi.org/10.1093/treephys/tpaa005). Others are in development. The team delivered 11 talks, three posters, and one field tour to professional audiences. In addition, the project was featured in *The Minnesota Daily* and Market Science (scientific engagement at farmers' markets).