WASHINGTON STATE UNIVERSITY

WSU PLANT PATHOLOGY SEMINAR
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Spore trapping and biotechnology approaches for detecting forest pathogens

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Attend in Person
9/15/25 @ 4:10 pm (Pacific)
Clark 149, Pullman, WA

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ABOUT THE PRESENTER

Taylor McNees is a Ph.D. student in the Department of Plant Pathology at Washington State University located at the Puyallup Research and Extension Center, where she is co-advised by Drs. Jana U'Ren and Joseph Hulbert. Her research is focused on understanding the biology, ecology, and population genetics of *Cryptostroma corticale*, the causal agent of sooty bark disease of maples. Outside of research, Taylor is currently a member of the department's Community Corner committee, the Puyallup Extension Center Safety Committee, and is serving as the treasurer of the Plant Pathology Graduate Student Organization.

ABSTRACT

Globally, there is an increasing area of wildland forests at risk of substantial canopy loss, due to tree mortality and dieback, much of which has been associated with pathogen related damage [1, 2]. For example, in the United States, approximately 6.7% of wildland forests are currently at risk of at least 25% tree mortality between 2013 and 2027 [1, 2]. Many urban forests also feel this pathogen pressure and are often exposed to an increased risk due to the stress of their urban environments [3]. Unlike agricultural systems, the use of pesticides and other intensive management practices to decrease disease pressure is generally not feasible in forested landscapes [4, 5]. As such, disease management in both native and urban forest ecosystems remains an ongoing challenge. In a recent review, LeBoldus et al. [1] discuss the use of biotechnology in the context of forest health, highlighting four significant challenges in forest disease management: (i) prevention of invasive species introduction, (ii) early detection of pathogens when they are at low abundance, (iii) achieving pathogen eradication, and (iv) the lack of resistant native plant populations. Many prominent forest pathogens are fungal, and several are dispersed through the aerial movement of spores [6]. Monitoring of these aerial spores provides an opportunity for increased early detection of forest pathogens, in turn increasing the likelihood of eradication success [7].

Spore trapping, alongside culturing and microscopy, was first employed during the late 1800s to study microbial aerial composition and diversity [8]. In 1952, Dr. John Malcom Hirst developed the first modern active spore trap, known as the Hirst trap, specifically designed to capture aerially dispersed plant pathogens [9]. This invention allowed for the collection of aerial spores from known volumes of air [9]. In this seminar, I will review how spore trapping, alongside modern biotechnological approaches, can be used to address three of the four key challenges in forest disease management. Since the advent of the Hirst spore trap, evolving technology has led to a wide variety of trapping methods and tools, ranging from passive to active, each designed to address specific challenges in the collection and downstream processing of samples. When coupled with quantitative real-time PCR [10], spore trapping enables precise identification and quantification of spores from targeted pathogens. When used alongside loop-mediated isothermal amplification [11], target pathogens can be identified quickly, easily, and at a low cost, and modified versions of these assays allow for the rapid quantification of spores. Although not quantitative, PCR-based NGS amplicon sequencing methods [12] with robust bioinformatic pipelines for sequence analysis allow for the simultaneous identification of multiple taxa within the same sample, providing the opportunity for more comprehensive bio-surveillance and monitoring. Overall, the integration of spore trapping with modern molecular, biological, and bioinformatic technologies provides rapid detection and quantification of pathogens at low abundance, thus enhancing our understanding of aerial plant pathogen composition and supporting eradication efforts by improving detection sensitivity and epidemiological knowledge of aerially dispersed species.

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