

F22.032: Quantifying Change in Forest Resistance through Induced Resin Defenses on Public and Tribal Lands in the Southwest.

Faculty mentor: Kristen Waring

Overview

This project aims to quantify forest resistance and resilience to bark beetles across a variety of management strategies, silvicultural practices, and land ownerships. Bark beetles (*Ips* and *Dendroctonus*) in the western United States are one of the most disturbing and destructive forest insects, causing extensive tree mortality during bark beetle outbreaks. In response to these disturbances, forests can exhibit short term resistance by allocating energy to induce a physical response to bark beetle outbreaks. Oleoresin (resin ducts) are present inside trees and can act as an induced response to bark beetle outbreaks by increasing resin flow in the presence of wounding. Resin duct metrics are not only associated with increased forest resilience but one of the strongest indicators for tree survival of bark beetle outbreaks. Forests in the southwestern United States have endured changes in resistance to disturbing agents as a response to the changes of post-colonial forest management. We will compare resin duct density and production in forest stands exposed to a history of varying silvicultural treatments and management strategies over the past several decades. Our study is using dendrochronology techniques (analysis of tree cores: tree aging, ring width analyses and resin duct size and abundance) and will occur on public and tribal lands in Northern Arizona and New Mexico.

What the student will DO and LEARN

Field observations and tree core samples were collected by a PhD student in the School of Forestry during the summer of 2021; additional data and samples will be collected in summer 2022. During the 2022-2023 academic year, the intern will assist with the processing and analyzing of tree core samples and help with ongoing forest resilience lab work. Specifically, the student will assist with tree core mounting and use a sanding belt to prepare tree cores for scanning. The student will also use a microscope to assist with dating tree core samples. The student lastly will use an image processing software to assist with counting and measuring resin ducts in the tree cores. All training on tree core sample processing will be provided. This is an excellent opportunity for students who are interested in biology, forestry, dendroecology, forest health, learning about public and tribal management, and quantitative ecology.

Additional benefits

The student will gain valuable experience working in a research laboratory and learn and execute in its entirety the protocol for conducting dendroecology research. The student will have the opportunity to learn about forest treatment types and learn about the implications of various management strategies and land usages in the Southwest. The student will work closely alongside a PhD student and a faculty member in the School of Forestry, which is a great opportunity for students who are interested in learning more about graduate school or pursuing research in the future. Finally, the student will contribute to our efforts to quantify forest resistance in the Southwest and have the opportunity to meet, interact and network with Forest Service personnel.

Additional qualifications

Preferred qualifications:

- Experience using a microscope
- Experience working in Microsoft Excel and Google sheets
- Coursework in forestry, biology, ecology, or natural resources

Time commitment

6 hrs/week for 30 weeks