Title: Remote Sensing for Brown Spot Needle Blight

Location: Auburn University

Duration: 2 years

Cost: $46,260.00

Project leader and Cooperators:

Lead: Dr. Lori Eckhardt (Auburn University, Forest Pathologist / Entomologist)

Cooperator: Dr. Lana Narine (Auburn University, Remote Sensing and Modeling)

Remote sensing plays an increasingly important role in monitoring forest health over the US (Potter and Conkling 2020), given the capability to observe forests over broad spatial extents. The application of remotely sensed data for detection of infections in forests has been demonstrated primarily with the use of airborne hyperspectral imagery. Limited studies highlight the use of multi-sensor data, such as hyperspectral and lidar data, and fewer demonstrate the application of space-based earth observation information with airborne data and ancillary products. However, given free and open access to high-resolution remote sensing data and particularly earth observation (EO) data, there are exceptional opportunities for mapping the spatial distribution of infection and development of a monitoring framework.

Changes in vegetation spectral response as a result of discoloration or chlorosis, allow for detection using multispectral imagery and imagery-derived products, particularly visible and infrared wavelengths and indices like the normalized vegetation index (Cotrozzi 2021) and red-edge metrics. Defoliation represents a structural symptom, highlighting the potential for light detection and ranging (lidar) for extracting relevant information to aid mapping efforts. Increasing availability of airborne lidar from the U.S. Geological Survey (USGS) 3D Elevation Program (3DEP) (Lukas and Stoker 2016) and high temporal and spatial resolution satellite imagery from the ESA's Sentinel-2 program, present a unique opportunity to achieve detailed, finer-scale observations for analyses. Key benefits of using Sentinel-2 EO data are availability of imagery with high temporal frequency (5-10 days), number of spectral bands and bandwidths for computing a broad range of vegetation indices, and high spatial resolutions (10-20 m). The primary objective

is to examine the application of multi-sensor data, including space-based EO data and airborne lidar-derived parameters, for spatially explicit detection of infections at the landscape scale. Where possible, available lidar and aerial imagery, would be integrated.

Project Objectives:

The primary objective is to examine the application of multi-sensor data, including space-based EO data and airborne lidar-derived parameters, for spatially explicit detection of infections at the landscape scale.

Budget:

Proposed Study (Remote Sensing)			
	Graduate Assistants (MS Student)	18,000	18,000
	GA Benefits	630	630
	Travel/Mileage	1,000	2,000
	Supplies/Equipment	5,000	1,000
	Total Operating Costs	**24,630**	**21,630**

References:

Cotrozzi, L. (2021). Spectroscopic detection of forest diseases: a review (1970–2020). *Journal of Forestry Research*

Lukas, V., & Stoker, J.M. (2016). 3D Elevation Program—Virtual USA in 3D. In, *Fact Sheet* (p. 1). Reston, VA

Potter, K.M., & Conkling, B.L. (2020). Forest health monitoring: national status, trends, and analysis 2019. In (pp. 1-189)