Progress Report

NSF START: University of Maine and University of Maine Fort Kent

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Investigators

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Project Overview

Goal: Better-understand commercial tree responses to stress

1. Hyperspectral imaging to assess tree health (Rubert-Nason *et al.* UMFK)

- Develop computational model for health assessment of *Populus* and *Picea* trees from hyperspectral images
- *Skills*: Tree measurement, specimen collection, phytochemical analysis

2. Effects of microclimate on forest health and regeneration (Rogers, Li, Zhang [UMaine], Landry & Thompson [UMFK])

- Identify climactic variables that influence tree health and regeneration
- *Skills*: Install climate monitoring equipment, conduct FIG surveys, collect physiological and phytochemical measurements, do tree health assessment

3. Estimation of wood moisture content (Li *et al*. UMaine)

- Develop computational model for using NIR spectroscopy to rapidly estimate wood moisture content
- *Skills*: Operate portable NIR spectrometer, tree coring, gravimetric analysis

Transferrable skills: Communication, innovation, critical thinking, and leadership

Current Progress

1. Hyperspectral tree health assessment

- All field data collected for *Populus* & *Picea*
- >90% of lab analyses complete
- Geospatial analysis and predictive model creation underway

2. Microclimate, forest health & regeneration

- All climate monitoring stations installed + operating
- FIG plots established and surveyed (2022 & 2023)
- Pilot sites established for studying cedar tree decline

3. Wood moisture content

- ~50 wood core samples collected, scanned and analyzed for moisture content
- Predictive algorithm developed, with a scientific paper in preparation

CAFS funded three student interns, and indirectly supported 10+ undergraduates since 2021. CAFS also sponsored travel by 2 UMFK faculty to attend the 2022 conference in Louisville, KY.

Future Plans

1. Hyperspectral tree health assessment

- Finish laboratory analysis & data curation (AY2024-24)
- Peer-reviewed publication (AY2023-25)
- Share computer code for predicting tree health from hyperspectral images

2. Microclimate and forest regeneration

- Continue data collection and archival
- Establish FAIR-compliant long-term database

3. Wood moisture content

- Publish results in a peer-reviewed journal

4. Proposed initiatives (in prep./review)

- Investigate causes of cedar decline
- Evaluate ecological impacts of biochar application
- Fund undergraduate learning network