Continuing Project

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

CAFS.21.92

Investigators

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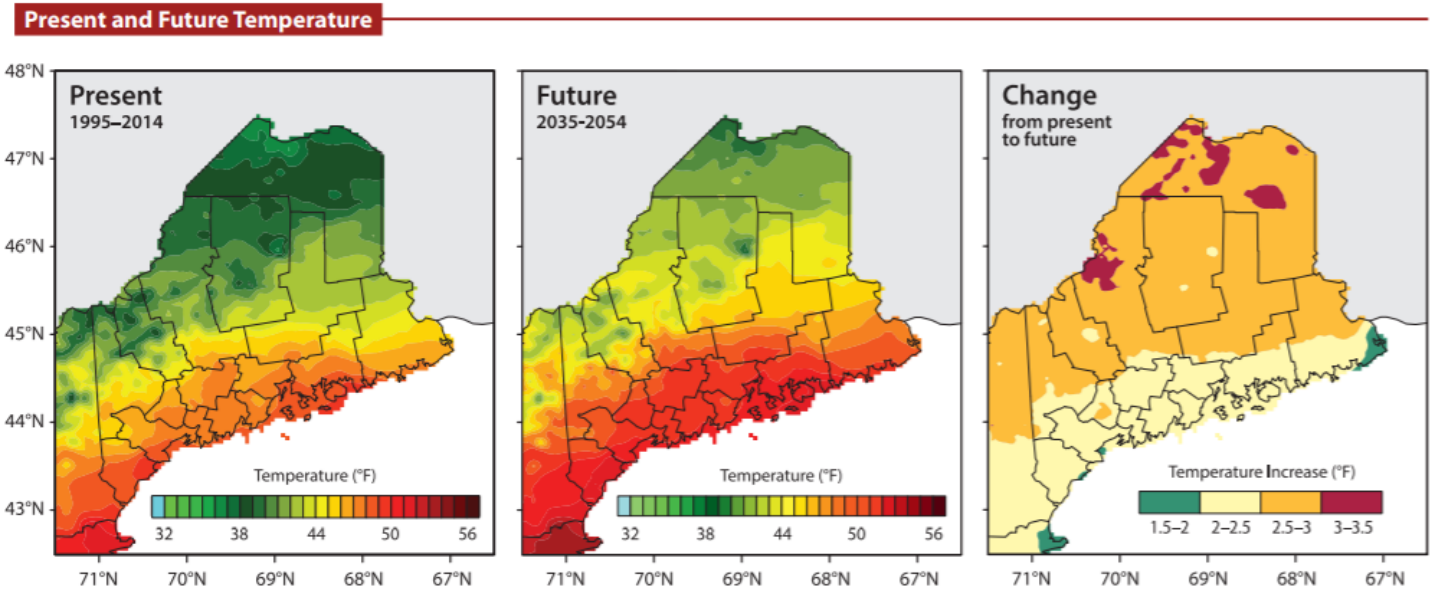
Justification

A. Environmental change affects commercial forests[1]

- Growth + health
- Assessment and forecasting inform management

B. Forest products industry requires trained workforce[2]

- Collaborative, leadership and multicultural skills
- Applied methods + procedures



1. Fernandez, I.J., Schmitt, C.V., Birkel, S.D. *et al*. (2015) *Maine's Climate Future: 2015 Update*. University of Maine, Orono, ME
2. *Maine Science and Technology Action Plan* (2010) https://digitalmaine.com/decd_docs/1

Hypotheses or Objectives

Objectives

A. Assess tree responses to environmental conditions

B. Prepare UMFK Forestry students for workforce

Projects

1. Rapidly assess tree health from hyperspectral images
(Rubert-Nason *et al.* UMFK. Sponsor: *Maine Economic Improvement Fund*)

2. Evaluate effects of microclimate on forest regeneration
(Rogers *et al.* UMaine. Sponsor: *Cooperative Forestry Research Unit*)

3. Estimate wood moisture content
(Li *et al*. UMaine. Sponsor: *Maine Research Reinvestment Fund*)

4. Identify, rank order probable causes of, and manage cedar health decline
(Landry *et al.* UMFK)

Methods

- Geospatial analysis
- UAV and ground-based hyperspectral imaging
- Physical tree measurements
- Specimen collection
- Phytochemical analysis
- Physiological measurements
- Operate climate monitoring equipment
- Data curation and analysis

Photos: K. Rubert-Nason

Major Findings

1. Hyperspectral analysis of forest health

- **~150 ea. unique spruce and poplar trees evaluated for health: morphology, phytochemistry, physiology**
- **mPLS prediction algorithm pending dataset completion**

Example: RR-1 spruces (sampled 2022)

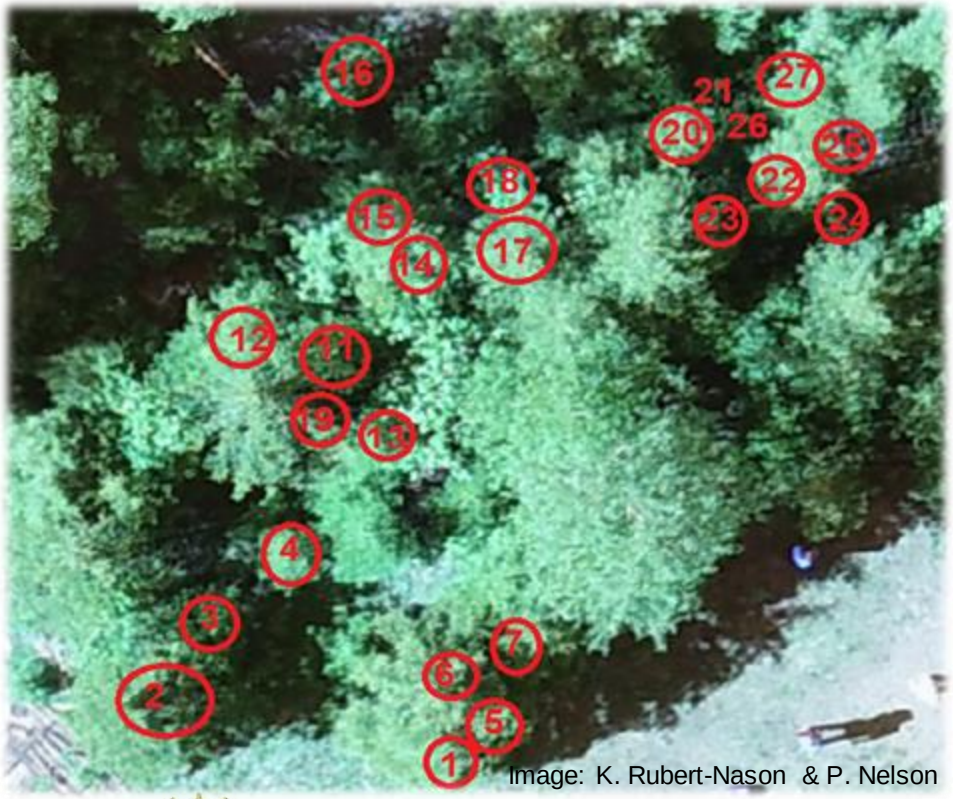
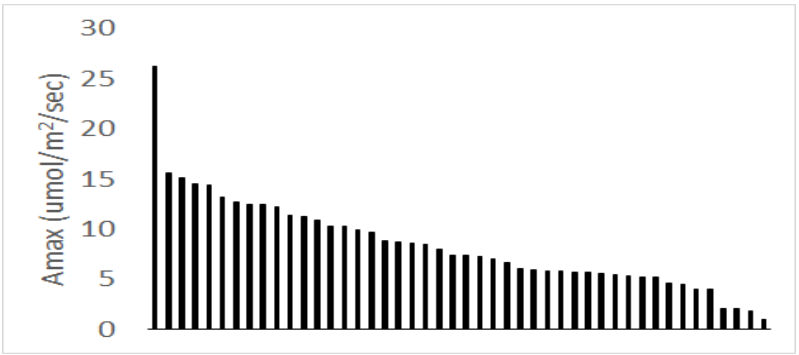


Image: K. Rubert-Nason & P. Nelson



Deliverables

A. Advances in tree quality/health assessment

1. Computational (AI) method to rapidly + affordably identify changes in tree health will inform management decisions (pending)
2. Long-term microclimate data may benefit forest management planning
3. Rapid estimation of wood moisture content benefits shipping + processing
4. Associations between environment and cedar health can inform management planning (pending)

B. Prepare UMFK Forestry students for successful careers in forest management + products workforce (ongoing)

Company Benefits

A. Assess tree responses to environmental change

- Financial loss mitigation: Faster + cheaper ways to identify changes in tree health
- Optimize site selection for future plantings to maximize yield
- Synergistic projects

B. Workforce preparation for UMFK + UMaine students

- Collaborative, leadership and multicultural skills
- Field work
- Logistics
- Critical thinking
- Tools and procedures
- Networking

Photos: K. Rubert-Nason

Recommendations

A. Environmental change impacts on forests

- New tools + methods + data aid forest management

B. Workforce preparation

- Ongoing training opportunities needed
- Invest in marketing + recruitment
- Overcome demographic disparities

Photo: P. Nelson

Photo: K. Rubert-Nason

Summary: CAFS funds to UMFK have supported...

- 4+ ongoing projects
- 2+ UMFK undergraduate interns
- 6+ proposed projects, including
  - Teaching + mentoring
  - Cedar health
  - Soil microbiology
- Collaboration and networking:
  - Across UMS campuses
  - Forest products industries
  - Public agencies
  - Nonprofit organizations
- Technological innovation


Photo: K. Rubert-Nason