Center for Advanced Forestry Systems Lead Site Updates

Aaron Weiskittel
Director

1865 THE UNIVERSITY OF MAINE

Meeting Agenda

Center for Advanced Forestry Systems
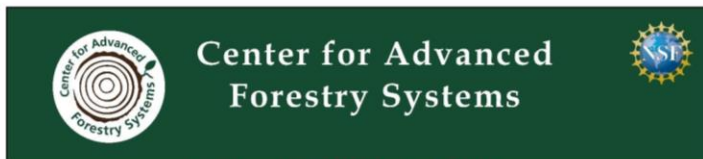
Semi-Annual CAFS IAB Meeting & Field Tour
June 7-8, 2022
Salish Lodge, Snoqualmie WA
https://maine.zoom.us/j/3914609418

Hosted by the University of Maine,
Center for Research on Sustainable Forests

Field tour June 8, 2022: Digital technology (forest inventory & soil mapping), SMC type 1 & 3 installations

IAB Meeting Agenda [Draft]
June 7, 2022 Pacific Time

Time	Item	Presenter
7-8 AM	Breakfast in meeting area	
8:00 AM	Welcome/Overview	Aaron Weiskittel, UM
8:05 AM	CAFS Lead Site & Phase III Updates, Funding Opportunities	Aaron Weiskittel, UM
8:10 AM	Current university forestry R&D capacity	Bob Wagner, Purdue
8:30 AM	NAFO's USDA Climate Smart Proposal	Edie Sonne Hall, NAFO
8:50 AM	IAB Discussion	All
Continuing Project Updates		
9:00 AM	16.69 Stand and tree responses to late rotation fertilization	Kim Littke, UW
9:15 AM	19.75 Assessing and mapping regional variation in potential site productivity	Cristian Montes, UGA
9:30 AM	19.76 Assessing and mapping regional variation in site carrying capacity	Mark Kimsey, UI
9:45 AM	20.78 Intraspecific hydraulic responses of commercial tree seedlings to nursery drought conditioning	Andrei Toca, UI
10:00 AM	**Break**	

10:15 AM	20.79 Multi-regional evaluation of new machine learning algorithms for mapping tree species distribution and abundance	Kasey Legaard, UM
10:30 AM	20.80 Using hyperspectral imaging to evaluate forest health risk	Sylvia Park, PU
10:45 AM	20.81 Resilience of soil organic matter to harvesting: A global study of long-term soil productivity experiments	Carlos Gonzalez, OSU
11:00 AM	20.82 Stand response to thinning: Enhancing response prediction through modeling	Eric Turnblom, UW
11:15 AM	20.83 Using predictive analytics to decompose site index	Jason Cross, UW
11:30 AM	20.84 Physiologic response to commercial fertilization programs in Pacific Northwest forest plantations	Kim Littke, UW
11:45 AM	21.85 Variation in productivity, wood quality and soil carbon of nine conifer species across a gradient in water deficit	Emily Von Blon, OSU
12-1 PM	**Lunch Break**	
Continuing Project Updates		
1:00 PM	21.86 Stem form of nitrogen fertilized Douglas-fir trees	Doug Mainwaring, OSU
1:15 PM	21.87 Linking leaf area index and remote sensing across different forest types	Andrew Trlica, NCSU
1:30 PM	21.88 Quantifying silvicultural treatment effect on lumber quantity and quality in loblolly pine	Joe Dahlen, UGA
1:45 PM	21.89 Quantifying carbon sequestration as a function of silvicultural treatment in loblolly pine	Joe Dahlen, UGA
2:00 PM	21.90 Improving forest sample estimation through UAS canopy structure stratification	Logan Wimme, UI
2:15 PM	21.91 NCSU START	Rachel Cook, NCSU
2:30 PM	21.92 UMaine START	Aaron Weiskittel, UM
New Projects		
2:45 PM	22.93 UMaine INTERN	Aaron Weiskittel, UM
2:55 PM	22.94 NCSU INTERN	Rachel Cook, NCSU
3:05 PM	22.95 Monroe SMART	Jon Little, Monroe CC
3:15 PM	**Break**	
Concurrent Business Meetings		

LIFE Forms

https://iucrclife.chass.ncsu.edu/lifeforms/; PW=CAFS3

CAFS Website

- Resources
  - Strategic Plan & Technology Roadmap
  - Bylaws
  - Assessment Coordinator Reports

- Past/Current meeting materials
  - PW = "CAFS3"

https://crsf.umaine.edu/forest-research/cafs/

CAFS ByLaws

Center for Advanced Forestry Systems Bylaws
Approved: Dec 7, 2021

ARTICLE I – Introduction

The following operating procedures will be used to govern the Center for Advanced Forestry Systems (CAFS), a National Science Foundation (NSF) Industry & University Cooperative Research Center (IUCRC). Currently, CAFS comprises the following affiliated universities/sites: (1) University of Maine (lead institution); (2) University of Georgia; (3) University of Idaho; (4) Oregon State University; (5) Purdue University; (6) University of Washington; and (7) North Carolina State University. Current industry members and their annual contributions by university site are provided in Appendix A – Current CAFS Membership List by Site. Additional universities and members may join CAFS as specified below. Note that IUCRC Membership Agreement has precedence over the Center Bylaws and Memorandum of Understanding (MOU). The terms of these Bylaws shall be subject to the terms set forth in solicitation NSF 17-516.

ARTICLE II – Purpose

The mission of CAFS is to optimize genetic and cultural systems to produce high-quality raw forest materials for new and existing products by conducting collaborative research that transcends species, regions, and disciplinary boundaries. CAFS is a multi-university center that works to solve problems through multi-faceted approaches and questions on multiple scales, including molecular, cellular, and individual tree-, stand-, and ecosystem-levels.

Research focal areas include, but are not limited to: biological sciences (biotechnology, genomics, ecology, physiology, and soils), management (silviculture, planning, and optimization), and data analysis/synthesis (bioinformatics, modeling, remote sensing, and spatial analysis). Specific objectives of CAFS are:
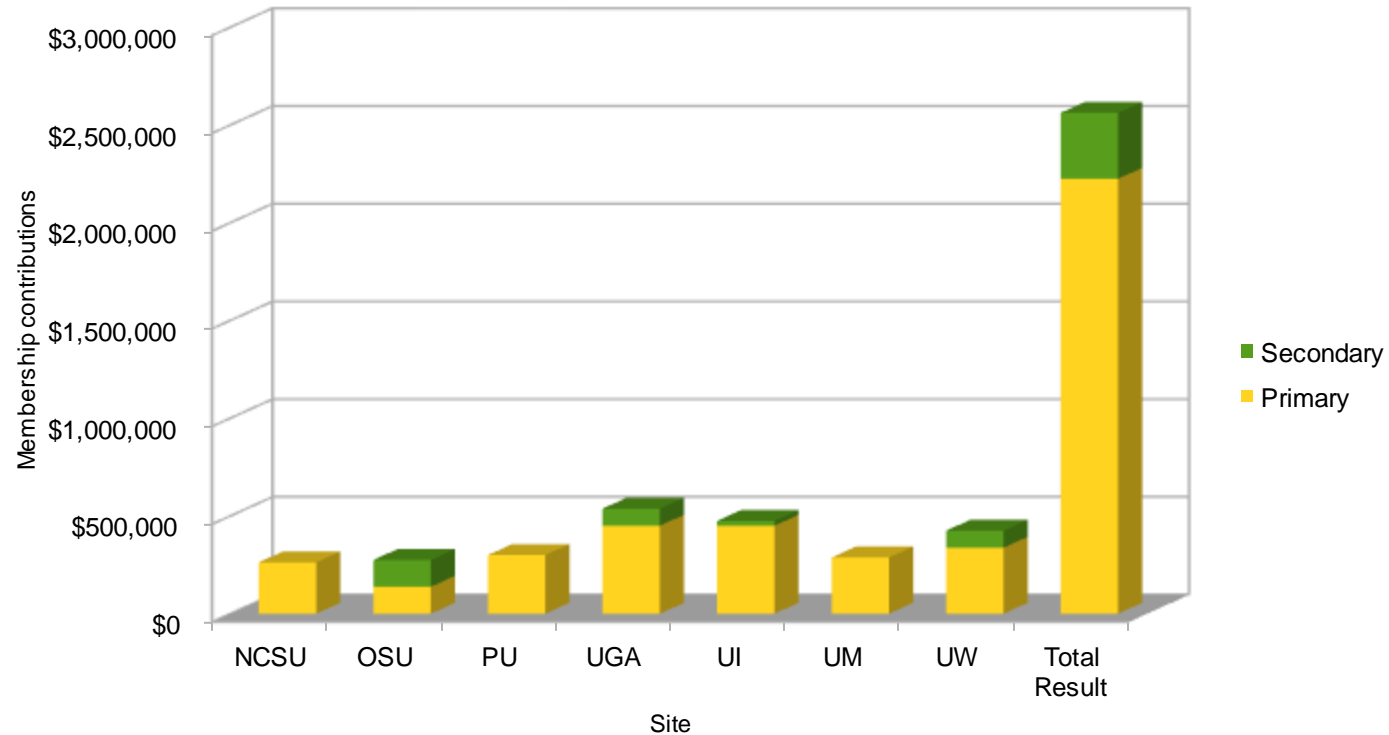
1. Serve as a national organization for R&D relevant to the forest industry;
2. Coordinate and perform national research activities across multiple sites that align with the prioritized needs of forest industry;
3. Document and communicate key research outcomes to relevant stakeholders;
4. Provide a long-term strategic vision for forest industry research needs;
5. Convene leading scientists from academia and industry who are prepared to address new/unforeseen challenges to the forest industry, such as changing markets; and
6. Create national networking opportunities for universities and forest industry.

ARTICLE III – Organization

CAFS consists of a Center Director, Site Directors, Project Scientists (individuals with a CAFS-approved research project), IUCRC Academic Leadership Team (CAFS Director and each Site Director), Industry Advisory Board (IAB; composed of
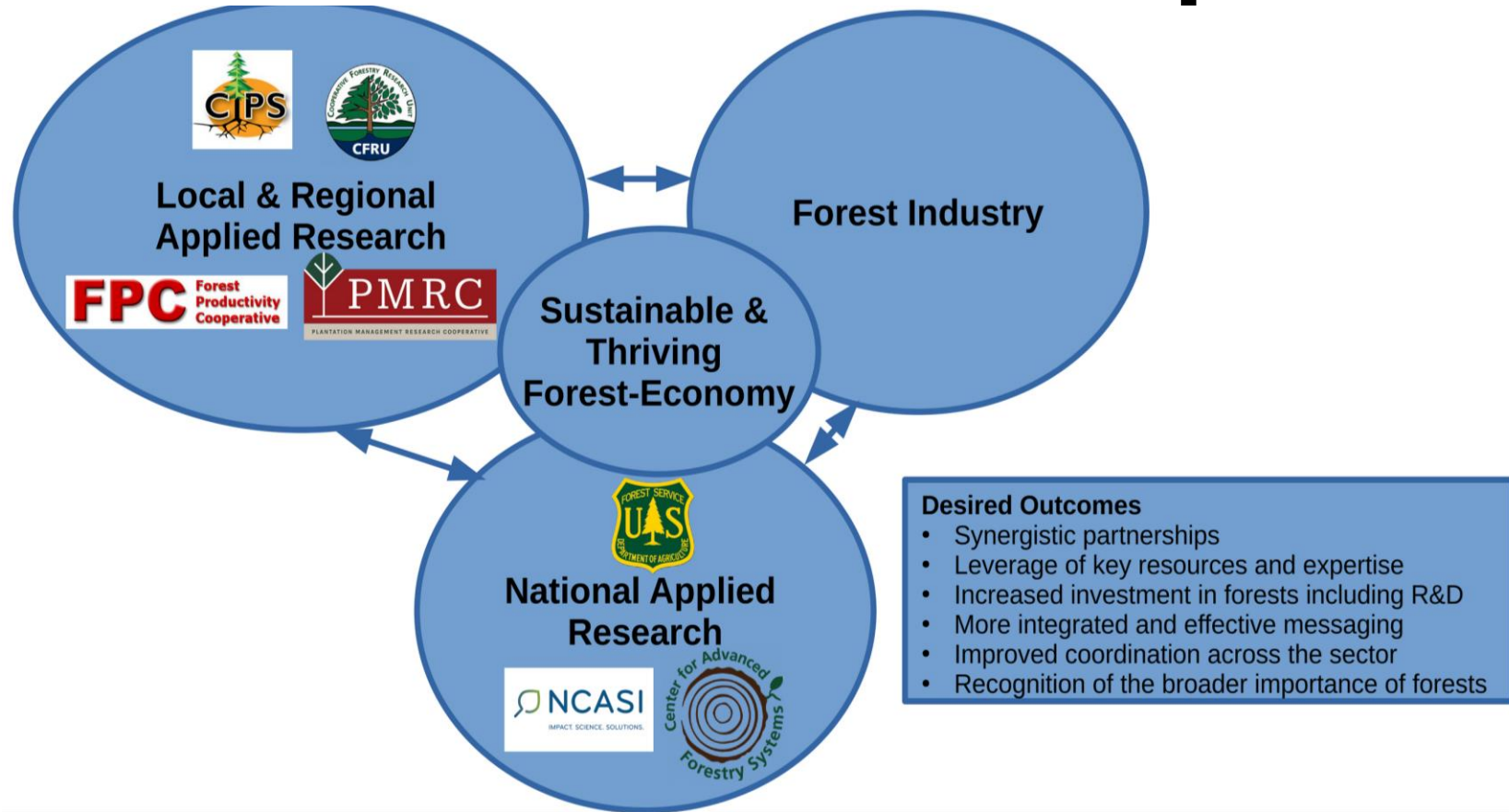
Membership Type	Membership Fee	Vote	IP Property Access
Full	$25,000/yr	10 votes per membership	Yes
Associate	$12,500/yr	5 votes per membership	Upon Approval
Observer	In-kind (<$10,000k)	0	No

Center Funding

Funding and membership remains stable

NCASI Partnership

Local & Regional Applied Research

Forest Industry

Sustainable & Thriving Forest-Economy

National Applied Research

Desired Outcomes
- Synergistic partnerships
- Leverage of key resources and expertise
- Increased investment in forests including R&D
- More integrated and effective messaging
- Improved coordination across the sector
- Recognition of the broader importance of forests

28% of CAFS members are also NCASI members

NSF Supplemental Opportunities

INTERN DCL-NSF-21-013

REM DCL-NSF-21-121

Phase III Research Roadmap

	2019	2020	2021	2022	2023	Outcomes
Theme 1: Forest Modeling & Decision-Support Tools **Primary IAB Partners: American Forest Management, Green Diamond, and Campbell Global**						Provide IAB members with improved tools that allow better and more precise forest management and planning
Project 1: Assessing and mapping regional variation in potential site productivity Lead Partners: NCSU, UI, UGA, UW, PU	■	■	■			Better understand how potential site productivity differs across the key forest regions in the US, the most influential factors, and produce high-resolution maps for IAB members to aid planning
Project 2: Assessing and mapping regional variation in site carrying capacity Lead Partners: UI, UM, OSU, VT, UGA, UW	■	■	■			Derive consistent estimates of maximum stand density index, evaluate most influential factors, and provide high-resolution maps to aid management
Project 3: Evaluation and refinement of regional GY models Partners: UM, VT, UGA, OSU, PU			■	■	■	Using the outcomes from Projects 1 and 2, evaluate regional growth and yield behavior and refine as possible
Theme 2: Effective Use of Remote Sensing Technologies **Primary IAB Partners: JD Irving, Rayonier, and Weyerhaeuser**						Evaluate and leverage emerging remote sensing technologies to improve planning
Project 4: Mapping species composition and past disturbance using optical sensors Partners: UI, UM, UGA	■	■	■			Optimal sensors like Landsat and Sentinnel-2 offer the ability to annual map species composition and past disturbance, but have yet to be tests across the US
Project 5: Improving efficiency and accuracy of Enhanced Forest Inventories derived from LiDAR Partners: UW, OSU, UGA, UM	■	■	■	■	■	LiDAR is becoming increasingly used to produce Enhanced Forest Inventories, but uncertainties on ground data, necessary metrics, and modeling method remain.
Project 6: Using hyperspectral imaging to evaluate forest health risk Partners: VT, NCSU, OSU, UM			■	■	■	Forest health risks are extensive and difficult to detect. Hyperspectral imaging from terrestrial and/or airborne sensors can help detection and quantification

Phase III Research Roadmap

|	2019	2020	2021	2022	2023	Outcomes
Theme 3: Improved Silvicultural Practices **Primary IAB Partners: Hancock Forest Management, International Forest Company, and Molpus Timberlands**						Forest managers have a variety of silvicultural regimes to select from, but it is often unclear on selecting the best practices for each site
Project 7: Quantifying long-term gains using advanced genetics Lead Partners: PU, UGA, OSU, NCSU	■	■	■			Tree genetics has seen significant advances in recent years due to better breeding practices and cloning, but a synthesis of the long-term potential effects of these practices across multiple species has yet to be presented
Project 8: Modeling forest response to early stand treatments Lead Partners: UW, UI, NCSU, VT	■	■	■			Vegetation management is critical to successful rotations, but its prediction is complicated by a variety of factors such as the type and extent of competing vegetation. Leveraging long-term datasets, the outcomes of contrasting treatments would be assessed and modeled.
Project 9: Identifying type and level of response to forest fertilization Lead Partners: UW, UI, NCSU, PU			■	■	■	Forest fertilization is a widely used silvicultural practice that is difficult to predict. Using long-term and newly available data, methods to improve predictions of forest responsiveness would be evaluated.
Project-wide activities informed by Research Plan	• Incorporation of advanced and emerging technologies • Delivery of multi-platform, decision-support tools • Harmonization, and synthesis of available regional datasets to generalize trends • Multi-disciplinary, knowledge to action, and stakeholder-drive framework					

IAB meetings, evaluation, undergraduate education, publications, attendance at national meetings, securing of additional research support

Current Projects

Project	Lead Site	PI	Title	Status for 2021-22	Presenter	Email
16.69	UW	Turnblom et al.	Stand and Tree Responses to Late Rotation Fertilization	Continuing	Kim Littke	ect@uw.edu
19.75	UI	Kimsey et al.	Assessing & mapping regional variation in site carrying capacity across the primary forest types in the US	Continuing	Cristian Montes	mkimsey@uidaho.edu
19.76	UGA	Montes et al.	Assessing & mapping regional variation in site productivity across the primary forest types in the US	Continuing	Mark Kimsey	crmontes@uga.edu
20.78	UI	Nelson/Jacobs/Gonzalez	Intraspecific hydraulic responses of commercial tree seedlings to nursery drought conditioning	Continuing	Andrew Nelson	asnelson@uidaho.edu
20.79	UM	Legaard/Weiskittel	Multi-regional evaluation of new machine learning algorithms for mapping tree species distribution and abundance	Continuing	Kasey Legaard	kasey.legaard@maine.edu
20.80	PU	Couture/Jacobs	Using hyperspectral imaging to evaluate forest health risk	Continuing	Sylvia Park	couture@purdue.edu
20.81	OSU	Hatten	Resilience of soil organic matter to harvesting: A global study of long-term soil productivity experiments	Continuing	Jeff Hatten	jeff.hatten@oregonstate.edu
20.82	UW	Turnblom and Cross	Stand response to thinning: Enhancing response prediction through modeling	Continuing	Turnblom	ect@uw.edu
20.83	UW	Cross and Turnblom	Using predictive analytics to decompose site index	Continuing	Cross	crossco@uw.edu
20.84	UW	Littke	Physiologic response to commercial fertilization programs in Pacific Northwest forest plantations	Continuing	Littke	littkek@uw.edu
21.85	OSU	Gonzalez	Variation in productivity, wood quality and soil carbon of nine conifer species across a gradient in water deficit	Continuing	Gonzalez	carlos.gonzalez@oregonstate.edu
21.86	OSU	Mainwaring	Stem form of nitrogen fertilized Douglas-fir trees	Continuing	Mainwaring	loug.mainwaring@oregonstate.edu
21.87	NCSU	Trlica	Linking leaf area index and remote sensing across different forest types	Continuing	Andrew Trlica	altrlica@ncsu.edu
21.88	UGA	Dahlen et al.	Quantifying silvicultural treatment effect on lumber quantity and quality in loblolly pine	Continuing	Joe Dahlen	jdahlen@uga.edu
21.89	UGA	Dahlen et al.	Quantifying carbon sequestration as a function of silvicultural treatment in loblolly pine	Continuing	Joe Dahlen	jdahlen@uga.edu
21.90	UI	Kimsey et al.	Improving forest sample estimation through UAS canopy structure stratification	Continuing	Logan Wimme	lwimme@uidaho.edu
21.91	NCSU	Cook et al.	NCSU START	Continuing	Rachel Cook	rlcook@ncsu.edu
21.92	UM	Weiskittel et al.	UMaine START	Continuing	Aaron Weiskittel	aaron.weiskittel@maine.edu
22.93	UM	Weiskittel et al.	UMaine INTERN	New	Aaron Weiskittel	aaron.weiskittel@maine.edu
22.94	NCSU	Cook et al.	NCSU INTERN	New	Rachel Cook	rlcook@ncsu.edu
22.95	MCC	Little et al.	Monroe Community College START	New	Johnathan Little	jlittle@monroecc.edu

21 ongoing projects (16 regular, 5 supplemental)

CAFS Field Tour
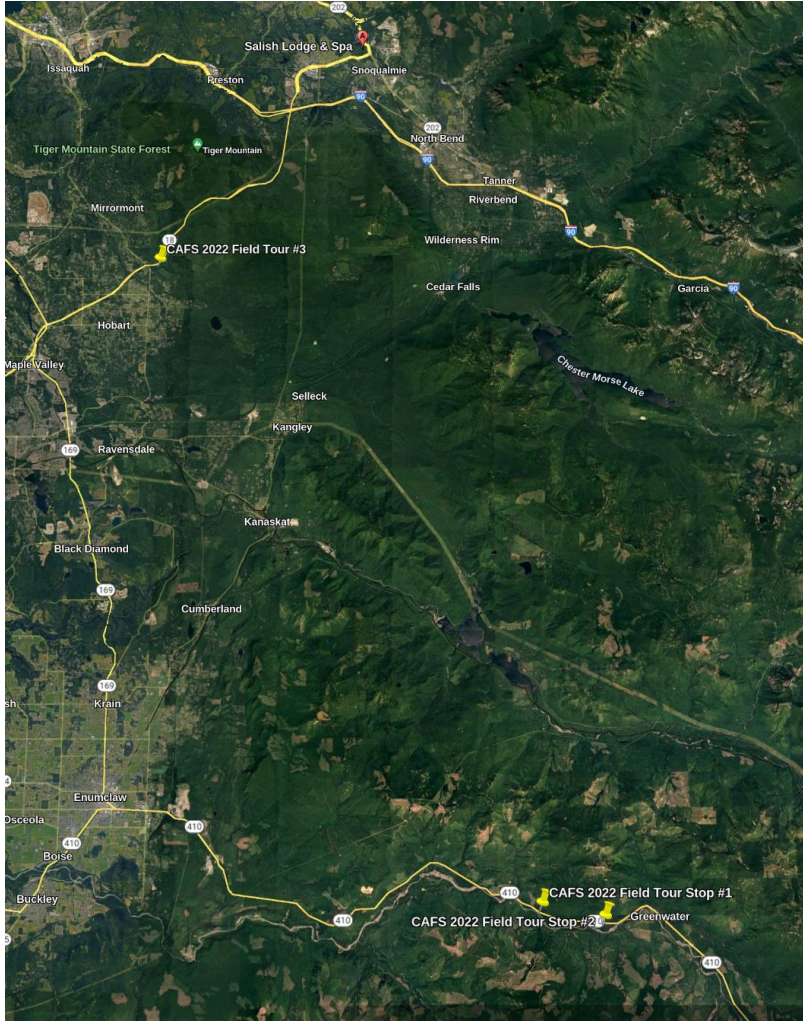
- Leaving Salish at 8 am and returning ~4 pm

- PPE is recommended particularly proper footwear

- Three primary stops
  - Manulife (Digital forestry)
  - Federation Forest (history & habitat)
  - WA DNR (Early stand management)

Questions/Comments?

aaron.weiskittel@maine.edu

207-581-2857

https://crsf.umaine.edu/forest-research/cafs/