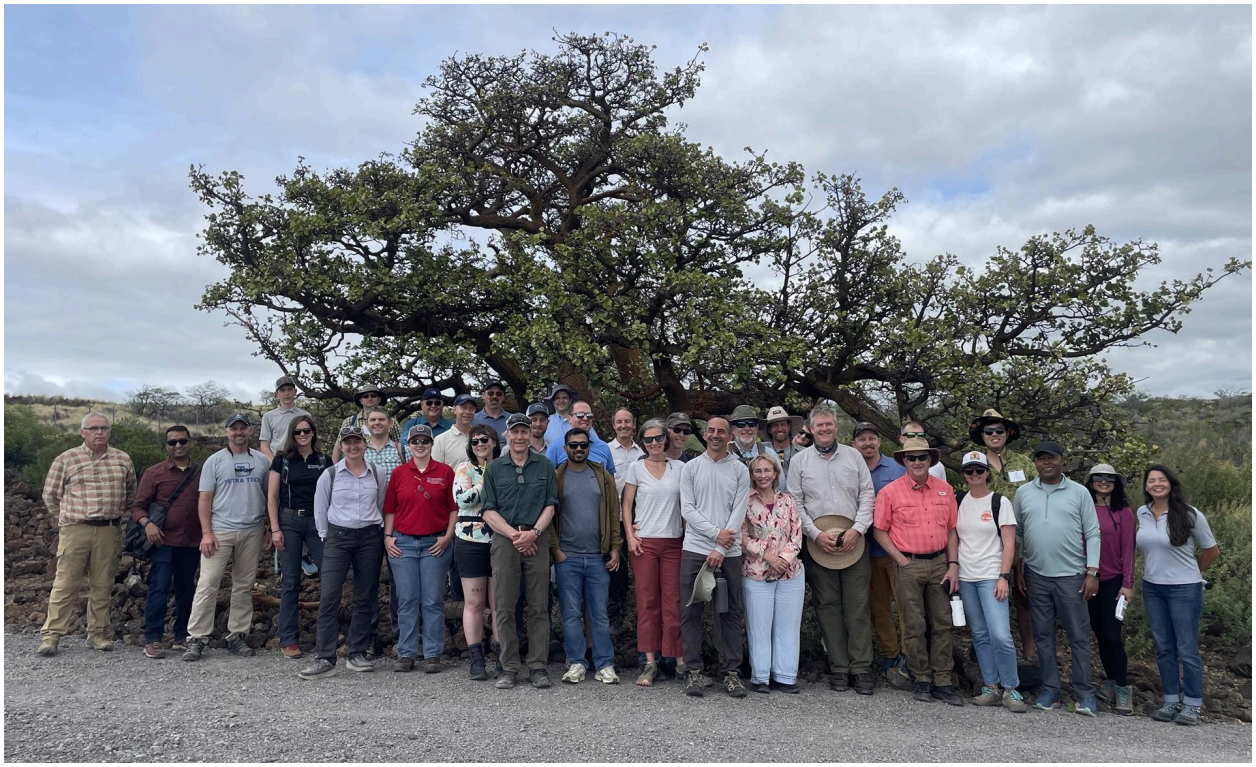
CAFS In-Person IAB Meeting
June 10-12, 2025
Meeting Summary & Notes

Meeting Webpage (pw: CAFS3; presentation and meeting recording links)

Recording is bookmarked to make it easier to find specific sections



Day 1: Tuesday June 10

1. Opening Remarks & Setting the Stage

Presenter: Aaron Weiskittel (University of Maine)

Summary:
Aaron Weiskittel opened the meeting by framing the current moment as a critical juncture for the Center for Advanced Forestry Systems (CAFS) and the broader forestry sector. He began with an overview of the 15-year legacy of CAFS, highlighting its success as a collaborative platform funded by the National Science Foundation (NSF). He emphasized the complex and intersecting challenges facing the industry, including technological disruption (AI, Big Data, remote sensing), market volatility (particularly in the Southeast and Northwest), and environmental uncertainty. A significant backdrop to the discussion is the steep decline in federal R&D funding for forestry, with Weiskittel noting a projection that the Forest Service's R&D budget could be zero in Fiscal Year 2026. This reality underscores the urgent need for CAFS to define a new, sustainable path forward as it graduates from NSF support.

Key Takeaways:

- **Urgency for a New Model:** With the end of 15 years of continuous NSF funding and a projected collapse in federal forestry R&D, CAFS must find a new, self-sustaining operational and funding model to survive.

- **Complex Operating Environment:** The forestry sector is simultaneously navigating technological advances, market shifts, and increasing demands for ecosystem services like carbon and biodiversity, making collaborative research more critical than ever.
- **Value of the CAFS Network:** The core strength of CAFS lies in its established cross-regional, multi-disciplinary network that connects universities, industry, and federal partners—a structure that would be very difficult to recreate from scratch.
- **Need for a National Consortium of Forest Centric R&D:** Addressing issues surrounding changing climate, forest health, new wood products & markets, integration of Big Data & AI, technology, and decision-support tools.

---

2. CAFS Legacy, Phase III Outcomes, & Future Options

Presenter: Aaron Weiskittel

Weiskittel detailed the successful history of the NSF Industry-University Cooperative Research Center (I/UCRC) program, which provided CAFS with over $12 million in direct funding for research, student internships, and collaborative projects over the past 15 years. Now officially "graduated," CAFS retains its NSF branding but receives no further funding, forcing a strategic decision about its future. Three primary options were presented for Phase Phase IV:

1. **Option A (Minimalist):** Continue as a simple forum for an annual meeting and idea exchange.

2. **Option B (Interim Funding):** Establish a tiered contribution model where universities, industry organizations, and affiliates pay annual fees to "keep the lights on" and fund collaborative work.

3. **Option C (Umbrella Organization):** Evolve into a broader national organization capable of launching multiple, large-scale initiatives (e.g., Digital Forestry, Forest Carbon Modeling).

Several universities (Purdue, Idaho, Maine) have already committed to Option B, creating a pool of approximately $130,000 now available to fund new collaborative projects.

- **Tangible Assets:** CAFS begins its new chapter with significant assets: the NSF brand, a strong collaborative history, and a $130,000 seed fund for new projects.
- **The "Chicken-and-Egg" Problem:** A key challenge is demonstrating value to industry partners. After 15 years of "free" participation, asking for membership fees requires a clear value proposition and tangible outcomes that partners can invest in.
- **Shift to a Project-Based National Consortium:** The emerging consensus leans toward using the pooled funds to support high-visibility, collaborative projects. This would position CAFS as a forum for developing and incubating new research, with industry partners having the option to directly fund projects they find valuable.

---

3. University Site Updates

University of Maine (Aaron Weiskittel)

The Cooperative Forestry Research Unit (CFRU) at Maine, now in its 49th year, operates on a member-driven model with a diverse portfolio covering silviculture, productivity, remote sensing, forest health, and carbon. The CFRU sits under the umbrella of the Center for Research on Sustainable Forests, one of UMaine's key research centers. CFRU has its largest and most diverse research portfolio since 2008, including long-term monitoring of a major spruce budworm outbreak, a 20-year commercial thinning research network, and the Maine Adaptive Silviculture Network (MASN), a large-scale experiment across 12 sites in the state. Weiskittel highlighted the university's focus on digital forestry, including statewide mapping using 3D NAIP data and its leadership role in a $160 million NSF Regional Innovation Engine proposal. He also noted the chilling effect of the freeze on USDA NIFA funding, which has stalled the collaborative Perseus project with Purdue and Georgia.

Research under CFRU

- **Adaptable, Member-Driven Research:** The CFRU model has proven resilient by evolving its research priorities to meet emerging threats like the spruce budworm outbreak.
- **Long-Term Data is Critical:** Decades-long data from thinning trials and monitoring plots provide an invaluable foundation for understanding forest dynamics and validating new models.
- **CFRU Top R&D Priorities:** Silviculture & productivity, remote sensing, forest health, wildlife habitat, and carbon.
- **Maine Forest Management Lab:** Development of high-resolution digital soil and species habitat maps.

Research under CRSF

- **Coalition of Northern Forest Innovation & Research (CONFIR)**:Accelerate the development and commercialization of technologies related to precision forestry and wood-based bioproducts.
- **ME-FOREST:** Integrated forest-based bioeconomy driven by science and technology.
- **PERSEUS:** Data-driven, stakeholder-informed framework to provide a “digital bridge” enabling both multi-objective optimization at the landowner-scale for practical tactics (e.g., species selection) and multi-stakeholder simulation and tradeoff analysis at the regional scale for informed decision and policy-making.

North Carolina State University (Rachel Cook)

The Forest Productivity Cooperative (FPC) is a multi-institutional and international cooperative with a 55-year history and partners across the Americas and Indonesia. Their research focuses on site-specific resource management for loblolly pine and eucalyptus. Covered the range of research from phases 1-3. Key initiatives include long-term silviculture-by-genetics trials, pioneering work with N-15 labeled fertilizer to trace nutrient uptake, and the development of the SPOT (Site Productivity Optimization for Trees) soil mapping system. Cook emphasized the rapid evolution of their remote sensing capabilities, moving from basic stand mapping to high-resolution LiDAR that can measure individual tree crowns and even detect forks. This technology allows for large-scale, precision experiments that were previously impossible.

- **Technology is Transforming Silviculture:** The cost and capability of high-resolution drone LiDAR have reached a point where it can be used to measure research plots more accurately and efficiently than ground crews, enabling new scales of experimentation.
- **Beyond Growth to Understanding "Why":** The FPC's research digs into the physiological mechanisms of tree growth, such as carbon allocation and nutrient competition between crop trees and weeds, providing deeper insights for management.
- **Carbon Storytelling is a Weakness:** Despite possessing the models and data to quantify the carbon benefits of managed forestry, the sector has not effectively communicated this story to policymakers and carbon markets.
- **Strategic Priorities:** Nutrition & site specific resource supply, vegetation control v. fertilization, remote sensing.

University of Georgia (Joe Dahlen)

UGA's research contributions focus on two areas: forward-time tree growth modeling and backward-time wood quality analysis. A major research driver is the "huge crisis" caused by pulp mill closures in the Southeast, which has shifted the focus from pulpwood production to sawtimber quality. The silviculture-by-density trials are therefore critical for understanding how to manage stands at lower densities to produce less pulpwood and higher quality lumber. Dahlen noted that UGA is undergoing a major faculty hiring initiative driven by the university's strategic goal of achieving AAU (American Association of Universities) status, which will strengthen its research capabilities in areas like forest biomaterials and precision forestry. He also candidly mentioned that administrative hurdles, such as slow intellectual property agreements, remain a challenge for collaboration.

- **Market Shifts Drive Research:** The decline of the pulpwood market is forcing a fundamental rethinking of silvicultural practices, elevating the importance of research into wood quality and low-density planting regimes.
- **Crown Architecture is a Knowledge Gap:** Spacing trials have revealed a lack of fundamental data on how stand density affects crown length and branch size in southern pines, which directly impacts lumber quality.
- **University Priorities Can Propel Research:** UGA's institutional ambition to achieve AAU status is creating new faculty positions and resources that will directly benefit its forestry research programs.

University of Idaho (Mark Kimsey)

Kimsey emphasized the complexity of the Inland Northwest, where management is driven by interactions between water, nutrients, geology, and aspect. Major projects at UI include White pine & Douglas-fir Genomics, White pine Blister Rust Resistance, Larch and Cedar Nutrient Dynamics, Western Larch Intensive Management, Drivers of Forest Regeneration Success (INTERN), Seedling Response to Drought Conditioning, UAS Photogrammetry for Enhanced Forest Inventory (INTERN), Accuracy Assessment of RS Sensors/Platforms for Individual Tree Identification & Measurement (INTERN), Industrial Scale Reforestation Supply Chain BMPs (INTERN), Machine Learning and Mapping of Forest Carrying Capacity across the US, Site-Stand Dynamics & Pine Beetle Mortality in Pine Ecosystems, and Robust SAE strategies for developing accurate stand-level diameter distribution. The strong public-private partnerships were emphasized.

- **Research Projects**: Reforestation, Density Management, LiDAR + 3D NAIP.
- **Toolsets for Managers**: Forest Site Type Calculator to define relative site quality.
- **Forest Innovations Institute**: Regional & national scope and collaboration to advance contemporary and emerging technologies and information systems, crosscutting research, interdisciplinary training and research, workforce development.
- **National Initiative:** To develop a coordinated innovation network to link research forest nationwide.

Purdue University (Doug Jacobs)

Began with an overview on the Hardwood Tree Improvement and Regeneration Center (HTRC), a collaborative partnership between USFS NRS and Purdue focused on the advancement of hardwood-focused research, development, and technology transfer in the Central Hardwood Forest Region. Highlighted opportunity to work collaboratively with other CAFS University sites to test theory, concepts, and technology with application to a unique forest type (high-value hardwoods).

- **Institute for Digital Forestry:** automated measurement, proactive monitoring, precision management, digital savvy mindset.
- **Tropical HTIRC:** Collaborative research and extension center for tropical tree breeding and silviculture. Focus on Acacia koa restoration, adaptive variation to cold tolerance, ʻōhiʻa

forest restoration in the face of rapid ʻōhiʻa death and invasive species, and Hawaiian sandalwood.

Oregon State (Doug Mainwaring, Carlos Gonzalez-Benecke)

Doug Mainwaring gave an overview of the OSU Center for Intensive Planted-forest Silviculture, whose primary objective is to produce decision support tools for intensive management of Douglas-fir and western hemlock. Membership covers ~7.3 million acres of intensively managed timberlands in western Oregon and Washington. Collaborative research with UW's Stand Management Cooperative (SMC) and other regional cooperatives.

- **Destructive sampling:** 20 sites along western coast, disks being saved for future projects
- **Western Taper, Volume & Weight Consortium**: 7 industry & state partners for data collection (208 trees on 26 sites)
- **Small Area Estimation:** 2 funded projects on managing forest soil carbon in relation to carbon markets and forest nutrition and productivity.
- **Research:** Long-term monitoring of soil moisture dynamics and stand water use, Long-term monitoring nutrients stock, Decision support system for Douglas-fir and western hemlock survival and growth, Genetic environment and early silviculture interactions study, Long-term monitoring stand biomass and NPP

University of Washington (Eric Turnblom)

Highlighted the collaborative work of the Stand Management Cooperative (SMC) and the Silviculture Institute for Planted Systems (SIPS) in developing new growth models and decision-support tools for the Pacific Northwest.

- **SMC:** Rich history as a field laboratory for the Pacific Northwest.
- **Experiments:** Spacing, thinning, fertilization; commercial thinning; planting density and PCT; genetic gain trials and spacing; soil type effects on tree, stand nutrition; paired-plot late-rotation fertilization.
- **CAFS-SMC:** 25 PhDs, 74 Masters, 57+ Undergraduates (and counting)
- **Continued CAFS Collaboration:** The cost of establishing and maintaining long-term research on the scale necessary to build an adequate regional database and understanding is beyond the capabilities of any single organization.

4. Field Tour Overview

Presenter: Nick Koch(GM Paniolo Tonewoods LLC)) / Doug Jacobs (Purdue)

Field tour planned for the Siglo Forest at Kapoaula, a relatively new commercial forestry plantation established in 2021, and the Waikoloa Dry Forest Preserve, a native restoration site. The presenters noted that forestry in Hawaii is far behind the mainland U.S., lacking reliable growth and yield models, site indexes, or a deep understanding of local diseases. The tour site itself is at a high elevation (2,800-3,200 feet) and is extremely dry, receiving only about 15 inches of rain per year. This makes establishment challenging and highlights the unique environmental conditions researchers face. Attendees were warned about the high UV index and potentially cool, windy weather at the high-elevation site.

- **A Frontier for Forestry Research:** Hawaii presents a "blank slate" for forestry research, with fundamental needs for growth models, site characterization, and species trials.
- **Extreme Environmental Gradients:** The tour provides a firsthand look at management in a water-limited, high-elevation environment, offering a sharp contrast to conditions on the mainland.
- **Value of On-the-Ground Collaboration:** The tour facilitates direct interaction with local managers and experts, providing invaluable context and fostering knowledge exchange.

5. Project Updates

(access the meeting recording link on the webpage for post presentation discussions and links to presentation materials)

19.75 Assessing & Mapping Regional Variation in Site Productivity
21.87 Leaf Area Index Estimates to Inform Midrotation Treatments
Presenter: Rachel Cook, NCSU

- Built a soil-site classification system ("SPOT code") and calibrated site index models, differentiating between natural, planted, and industry-managed stands.
- Key findings/benefits: Industry and FIA planted stands showed increasing productivity post-1980s—attributed to advances in fertilization, genetics, and site selection.Natural stands also showed increases, likely due to rising CO_2, temperature, and genetic introgression from planted stock. Her “favorite graph” paints a compelling story for why silviculture matters and how it impacts productivity over time—valuable for carbon and ecosystem service narratives.
- Next steps: Moving beyond site index to model Leaf Area Index (LAI), Mapping deciduous vs. evergreen understory, economic modeling of NPV v. Risk, publish framework paper tying together site classification, LAI prediction, and ROI modeling, develop a GIS/web-based tool for co-op members, expand from pine to mixed pine-hardwood or hardwood systems.

19.76 Assessing and mapping regional variation in potential site carrying capacity
Presenter: Mark Kimsey, UI

- Companion to Rachel’s project. This collaborative project aims to improve forest density management through the development of regionally specific forest carrying capacity models. These models are designed to integrate ecological, economic, and climate resilience goals—a critical toolset in the evolving "cultural toolbox" of sustainable forest management. All project goals met: standardized methods across regions, site-species driven analytics, robust machine learning models, flexible models for assessing projected climate impacts on forest carrying capacity, and deployed for operational use across the US.
- Key findings/benefits: 3 platforms for SDImax models,consistent modeling methods and seamless prediction layers across stakeholder ownership; tailored SDImax estimates by unique ownership stand ID
- Next Steps: journal publication, improved G&Y estimates in FVS, determine site on site carrying capacity., translate SDI metrics into more commonly used BA thinning prescriptions, expand to incorporate beetle impacts on pine mortality.

20.84 Physiologic Response to Commercial Fertilization Programs in Pacific Northwest Forest Plantations

Presenter: Kim Littke, UW

- Long-term study on Douglas-fir response to nitrogen fertilization across the Pacific Northwest, highlighting how climate, soil, and stand conditions affect the magnitude and duration of response.
- Key findings/benefits: Fertilizer response varies by site, isotopic analysis helps explain physiological mechanisms behind growth changes. Main drivers of response: climate effects, soil & sand factors, fertilizer response. Web-based fertilization suitability map developed to assist in targeting responsive areas. Management implications: expect growth reductions from rising temperatures, prioritize fertilization in cooler, wetter regions, higher elevations, younger stands, and low site productivity areas.

21.85 Variation in Productivity, Wood Quality, and Soil Carbon of 10 Conifer Species Across a Gradient in Water Deficit

Presenter: Carlos Gonzalez, OSU

- Evaluate growth, productivity, carbon sequestration, wood properties, and soil dynamics of 10 conifer species across a climate gradient (wet → dry) in the Pacific Northwest. Three sites planted 27 years ago; now used to compare species under wet, intermediate, and dry water deficit conditions.
- Key findings/benefits: Species performance varies significantly by water availability, naturally regenerated plots had 10x less biomass than planted plots, unplanted plots did not show higher soil organic matter, despite more diversity and understory, drier sites have lower nitrogen, likely due to reduced productivity and decomposition feedbacks, failed Japanese larch plot found to support naturally regenerating Douglas-fir, leading to an unexpected research opportunity to compare planted vs. naturally regenerated systems (unplanted plots have significantly lower biomass, indicating slow carbon accumulation).
- Next steps: Soil and biomass analysis will continue, especially to refine belowground carbon pools; the study supports the importance of species selection and site suitability under future climate stress scenarios; further analysis will explore resilience strategies, especially for stable performers like Douglas-fir.

21.89 Quantifying Carbon Sequestration as a Function of Silvicultural Treatment in Loblolly Pine.

Presenter: Nawa Raj Pokhrel, UGA

- Understanding and quantifying carbon content in wood through chemical properties, specific gravity, and regional variation, with implications for carbon accounting in forest management. Carbon percentage is tied to chemical composition (cellulose, lignin, extractives).
- Key findings/benefits: Coastal region higher specific gravity, lower moisture & carbon content; Inland region lower specific gravity & carbon content. Bark properties not significantly different between regions.Specific gravity is the primary driver of carbon

variability, not carbon percentage. Carbon models must account for tree-level variation (radial & height), site conditions, management intensity, and wood maturity.

21.92 UMaine/UMFK START

Presenter: Libin Louis, UMFK

- This START project centers around **emerging research projects, capacity building at UMFK (University of Maine at Fort Kent)** including a trained workforce with leadership skills, assess tree responses to environmental conditions, and collect-curate-communicate data for management. Synergistic projects completed or in progress at UMFK.
- Key findings/benefits: 10+ underway focused on environmental change impacts on forests, research and uses of technology, and embedded teaching and mentoring; ongoing data collection and curation; collaboration with PERSEUS and NAU projects; workforce preparation for 10+ undergraduates.

Day 2: Wednesday, June 11 — Field Tour

Siglo Forest at Kapoaula

- Participants toured a 565-acre koa reforestation project, observing mixed native species plantings, soil preparation research, and disease-resistant seed orchards. The site is a model for combining timber production with native forest restoration.
- Successful reforestation in Hawaii requires tailored research on species selection, site prep, and pest management, highlighting the importance of CAFS's adaptable, collaborative approach.

Waikoloa Dry Forest Preserve

- The afternoon tour visited a native dry forest restoration project, examining challenges in ecological restoration and community engagement.
- Restoration in challenging environments benefits from science-based management and partnerships, reinforcing CAFS' mission of applied, collaborative research.

Day 3: Thursday June 12

6. Continuing Project Updates

Note: for post presentation discussions, please access the meeting recording

23.100 Density Management Strategies for Enhancing Carbon Sequestration in U.S. Working Forests

Presenter: Lila Beck, UM

- Density management will continue to be a useful tool in our toolbox – but more research is needed to optimize treatments. Using new technology while leveraging long-term datasets to develop site-specific thinning regimes has tremendous value.
- Current progress: Majority of CTRN cores processed, first round of samples sent to Columbia University, UW cores will be processed when they arrive this summer.
- Key findings/benefits: Goal is to provide silvicultural guidelines and geospatial tools for treatment priority and response by levergaging long-term cooperative data sets. Further quantifying carbon sequestration for carbon-based forest management. Methodology approach can be extended to other areas of future research (M/CSP, nutrition, tree improvement, species migration).

23.101 Incorporating bark beetle outbreak hazard into pine density management thresholds

Presenter: Haley Anderson, UI

- Research linking stand density conditions directly to the susceptibility of pines to beetle attacks. Limitations of existing models and guides to assess economic, abiotic, and biotic impacts. Goal is to build a machine learning model that modifies existing maximum stand density index equations to include variables indicating hazard of pine beetle outbreaks in the northwestern United States under current and projected climate scenarios.
- Current progress: summary of existing research complete; small grant secured for additional summer of research; and stand, beetle, and physiographic data collected.
- Future plans: data collection and processing, modeling of current and future climate scenarios, incorporate beetle data into existing SDImax web interface.

23.104 The Interplay of Sampling Design and Small Area Estimation

Presenter: Suchana Aryal, OSU

- Project to evaluate the efficiency of alternative sampling designs and sampling intensities for stand-level SAE of merchantable volume.
- Current progress: prepared cruise+covariate stand-level dataset, variable selection to fit Fay-Heeriot on stand data for predicting total merchantable volume, implemented two-stage sampling strategies to determine whether an optimal design existed.

- Future plans: protocols for linking remote-sensing and ground data to improve timber inventory SAE, quantifying uncertainty of SAE predictions under different sampling intensities; summary report for member companies.

24.105 Robust small-area estimation strategies for developing accurate stand-level diameter distributions

Presenter: Jaslam Poolakkal, UI

- Goal is to demonstrate robust, interpretable machine learning framework for stand-level SAE estimates across multiple US regions. Challenge is sparse field data and complex forest structure.
- Current progress: Forest Inventory Data: Engaged with industry partners, public land managers, and research networks to compile data across the Pacific Northwest and Southeast U.S. Auxiliary Data: Leveraging publicly available datasets and initiating procurement of 3D NAIP products via project collaborations.LiDAR preprocessing workflow: 1. Noise filtering, 2. Ground classification, 3. Normalization, 4. Metric gridding, 5. Canopy surface modeling: stand-level auxiliary variables. Most influential predictors across methods: Cruise Design, Canopy Height Metrics, Soil and Drought Variables repeatedly significant and strong in effect size.
- Future plans: Validate and extend reliable, scalable tools for partners to support planning, inventory, and reporting to full diameter distributions with multivariate and ML-based SAE.

24.107 Using Small Area Estimation and 3D-NAIP/Sentinel-derived Variables for Multivariate Prediction of Stand Attribute

Presenter: Sukhyun Joo, OSU

- Project aims to develop accurate predictions for key forest attributes (trees per acre, basal area, and merchantable cubic foot volume).
- Current progress: SAE provides substantial improvement over direct estimation 25-40% reduction in RMSE.3D-NAIP height metrics and Sentinel-2 spectral indices proved successful auxiliary predictors in the SAE model. FIA unfuzzed data are now accessible–Material Transfer Agreement completed, data access now approved for OR, WA, GA, AL
- Future plans: Develop models with FIA unfuzzed data, validate models on independent industry data, refine multivariate predictor selection, improve multivariate model structure.

24.106 Integrating SAE methods with stand-level forest inventory and growth projection for southern pine plantations

Presenter: Nawa Pokhrel, UGA

- Project to evaluate the applications of unit-level SAE techniques in improving the stand-level inventory and model projection systems for southern pine plantations.

- Current progress: PhD student and post-doc researchers recruited, searching for one more grad student; acquisition of Wateree data from South Carolina; canopy height model construction from LiDAR point cloud.
- Future plans: Examine the unit-level SAE model performance for different stand variables with the Wateree dataset; Request additional data from other industry partners; Recruit additional students for the project.

24.108 The Effect of Silvicultural Treatment on Douglas-fir Stem Form
Presenter: Doug Mainwairing, OSU

- Project goals are (1) to test for significant treatment effects on stem form, and where pertinent, to construct taper modifier equations to adjust a conventional taper prediction and (2) collect SLAM LiDAR data on standing trees subject to felled or climbed upper stem diameter measurements, and to validate the remotely collected data and/or calibrate it to correct for any bias.
- Current progress: Upper stem diameter measurements were made on trees on paired treatment plots in Oregon and Washington; SLAM LiDAR scanning of the same trees was conducted where scanner availability and weather conditions intersected, Laser scanning of sample trees awaiting processing.
- Key findings/benefits: typical thinning treatments in intensively managed Douglas-fir stands did not significantly alter Douglas-fir stem form, 8-20 years post-thinning; Early and aggressive vegetation management did not significantly alter mid-rotation Douglas-fir stem form; Despite the larger overall size of genetically elite trees relative to woods run, the largest elite trees had significantly smaller USD, all else being equal.
- Future plans: Processing of LiDAR point clouds; Assessment of hand-held laser scanner ability to accurately estimate upper stem diameter; Further exploration (expansion of dataset?) into a proper continuous variable for predicting USD of genetically select tree taper.

24.109 Throughfall Reduction Impacts on Loblolly Pine Plantations Pre- and Post-Thinning
Presenter: Lainey Paulus, UGA

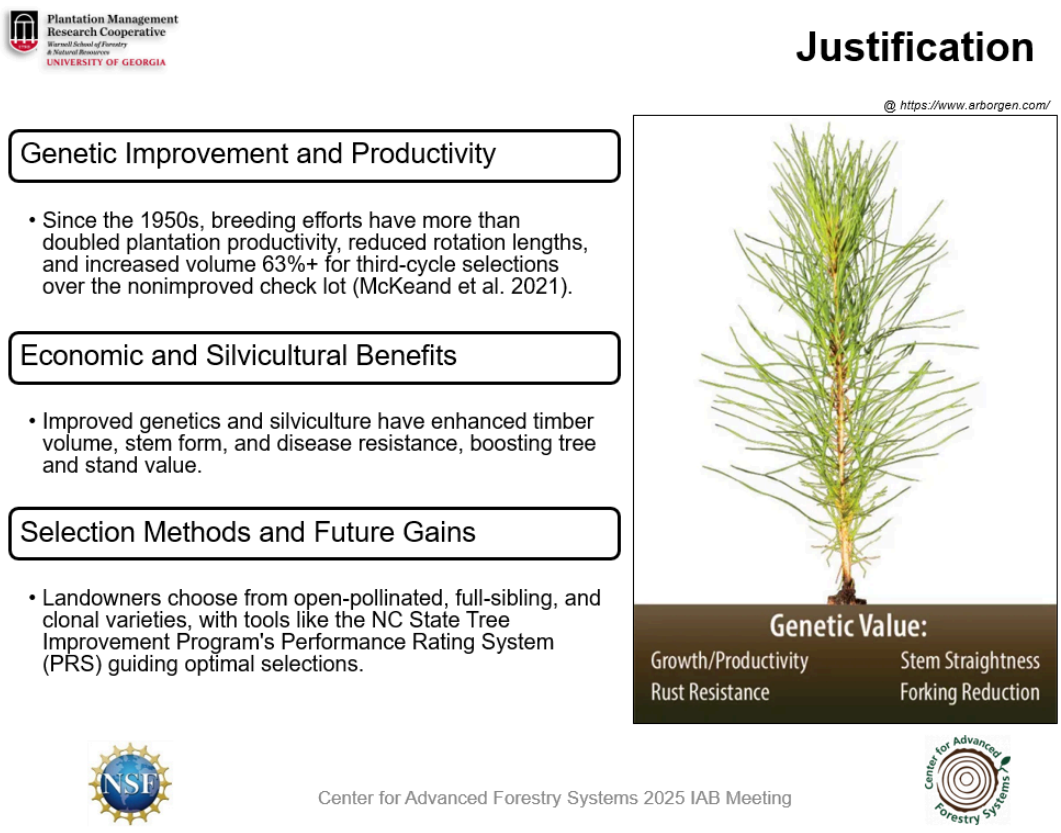
- Future precipitation variability may cause reductions in growing season rainfall that could have an impact on the productivity of southern forests. Thus the need for examination of the impact of fertilization and long-term throughfall exclusion on the growth of loblolly pine. Leveraging the PINEMAP installation in Georgia.
- Key findings/benefits: Significant reduction in DBH, no significant reduction in height although there is a slight trend for reduced height in R treatment; reduced throughfall on loblolly pine growth as a proxy for potential future climate variability may reduce growth, comparable to control, but fertilization helps mitigate this effect; thinning would allow more resources to residual crop trees and opening the canopy, potentially reducing the effect of throughfall exclusion.
- Future plans (recommendations): Continue site monitoring and measurements to evaluate treatment response over time, impose thinning treatment 2025-26 dormant

season; destructively sample for wood quality of subset of felled trees from treatment plots.

New Project Proposals

Two proposals were presented, indicating the future trajectory of collaborative research:

- **Quantifying Wood Property Variation from Different Loblolly Pine Families (Joe Dahlen, UGA):** How does genetic variability play out across time and up in height? Sample from 2017 showing with height, consistent across families. A proposal to conduct detailed analysis of wood quality characteristics across different genetic families, supporting the industry's shift toward value over volume. Goal is to get a framework for genetic modifiers for wood property models. Better genetics are needed for reduced planting densities, better wood properties = shorter rotations.
- **A Combined Silvicultural and Genetic Approach to Understanding Forest Growth and Yield Responses in the Southeastern US (Lainey Paulus, UGA):** New project proposed by Dr. Bronson Bullock to evaluate survival rates and juvenile height growth to assess the effects of improved genetics and intensive silviculture on loblolly pine development. Regionwide (southeast) sites.



Invited Guest: OneFortyOne

Ashwood Caesar (GIS Manager, OneFortyOne) shared international perspectives on forest management and innovation. He is the recipient of a Gottstein Fellowship Study to tour USA/Canada to conduct his project: Advancing Sustainable Forestry GIS Platforms for Future Challenges. OneFortyOne is a trans-Tasman business that owns and manages softwood plantations (~346,000 acres) and operates sawmills in Australia and New Zealand that produces and distributes timber and forest products across and the countries and internationally. Focus on GIS data for empowering their workforce, while keeping it secure.

Global perspectives enrich CAFS's approach and highlight opportunities for international collaboration.

Invited Guest: David Diaz, Vibrant Planet

Aaron Weiskittel introduced David in the context of NSF feedback on the CAFS program to include a wider range of perspectives. Sees CAFS as a broad umbrella organization going forward, momentum on carbon modeling, etc. **Question as to FVS and FIA–vulnerability of disappearing data availability from federal sources.**

Vibrant Planet

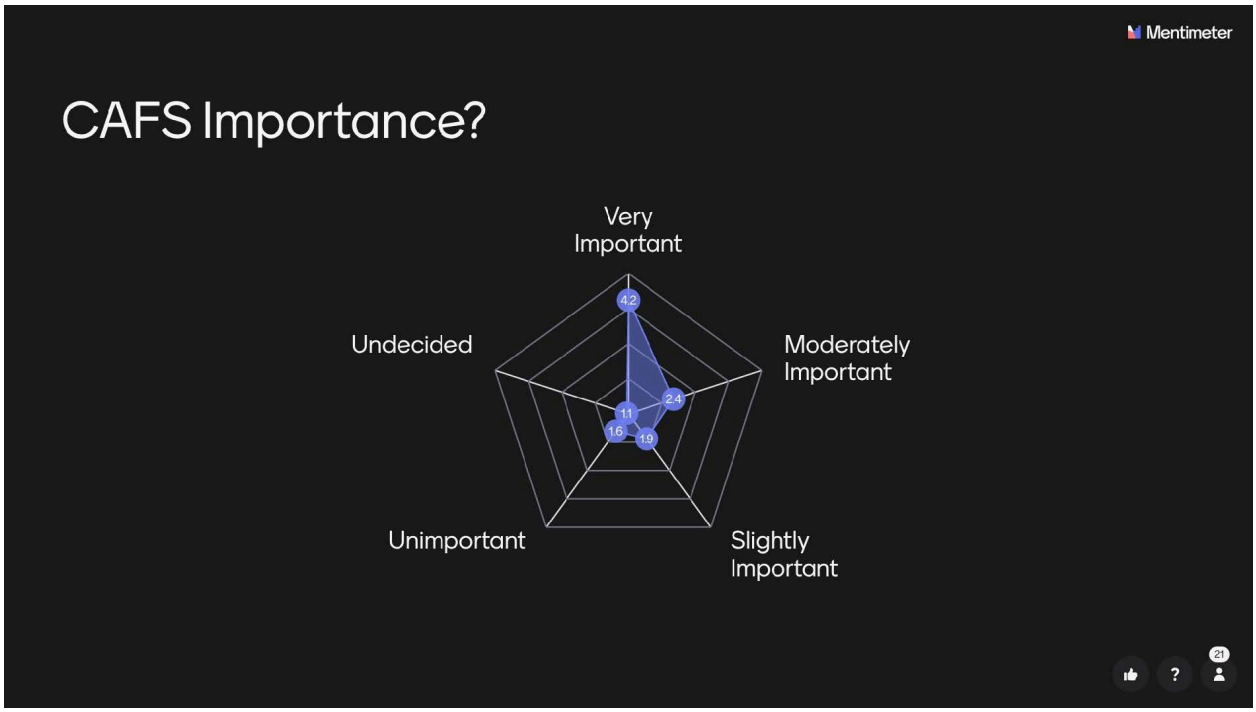
- Startup company (~50), fully remote, goal to create a common operating system for fire & forest resilience planning. Decision support webapp to enable those who are developing plans at a landscape scale to get through the what are our options.Trying to enable collaborative groups to move forward quickly. Currently deployed across 70M+ acres.
- **Focus for CAFS:** challenges and solutions for next-generation G&Y–what it "should" look like. Motivation: what is needed to do what? FVS is limited (fortan code, divergent implementations, limited adoption by software engineering, capacity to fix bugs and issues) and is expected to get worse. Open source is a benefit but requires investment to maintain.
- US government is so far unable or unwilling to adopt modern software development patterns or enable community contributions.
- Diaz discussed reproducibility solutions–build & scale, robust, "Micro FVS API" with clearly defined inputs, outputs, and reusable building blocks.
- Benchmarking challenges include validation protocols, systemic bias in multiple regions.
- Possible solutions include using FIA data stream as the foundation for validation protocols. Shared proving ground necessary but not sufficient to enable community development and limit redundancy.
- **Beyond FVS: New Models**
    - Stable API and automated benchmarking in an open-source repo allow community development and iteration while maintaining data contract with users.
    - G&Y engine can be abstracted to a black box that maps tree + stand initialization data and simulation configs to schema-compliant outputs.

    - New models are free to bring new data, features, algorithms to bear so long as they can be derived from existing FVS inputs (e.g., lat/lon) or be submitted to API as optional inputs by users.
- We will all benefit (including fed) by enabling community contribution (CAFS?) to a shared G&Y framework, but that needs to involve clear standards and expectations and honoring them in practice.
- This will require a steering group of core contributors and maintainers who would ideally lead definition of a roadmap for priority development tasks that will benefit the community.
- The size, scope, and ambition of this group and effort can be scaled according to capacity and funding while prioritizing basic service remains available or at least reproducible.
- Potential Project for CAFS???
- See meeting recording for extended followup discussion with Diaz, IAB members, and site researchers.

CAFS: Where We Are, Where Are We Headed?

Aaron led off the discussion on what CAFS has been and can be and where things stand in the forest research-industry space, followed by a future forest science R&D priorities survey ***(see meeting webpage for results and the meeting recording for extended discussion based on the survey questions)*** covering:

- CAFS Importance
- Ranking of 2018 Objectives:
    a. National network
    b. National org for R&D
    c. Provide long-term/broad strategic vision for R&D
    d. Convene and coordinate R&D activities
    e. Doc and communicate key R&D outcomes



Mentimeter

Ranking of CAFS Priorities

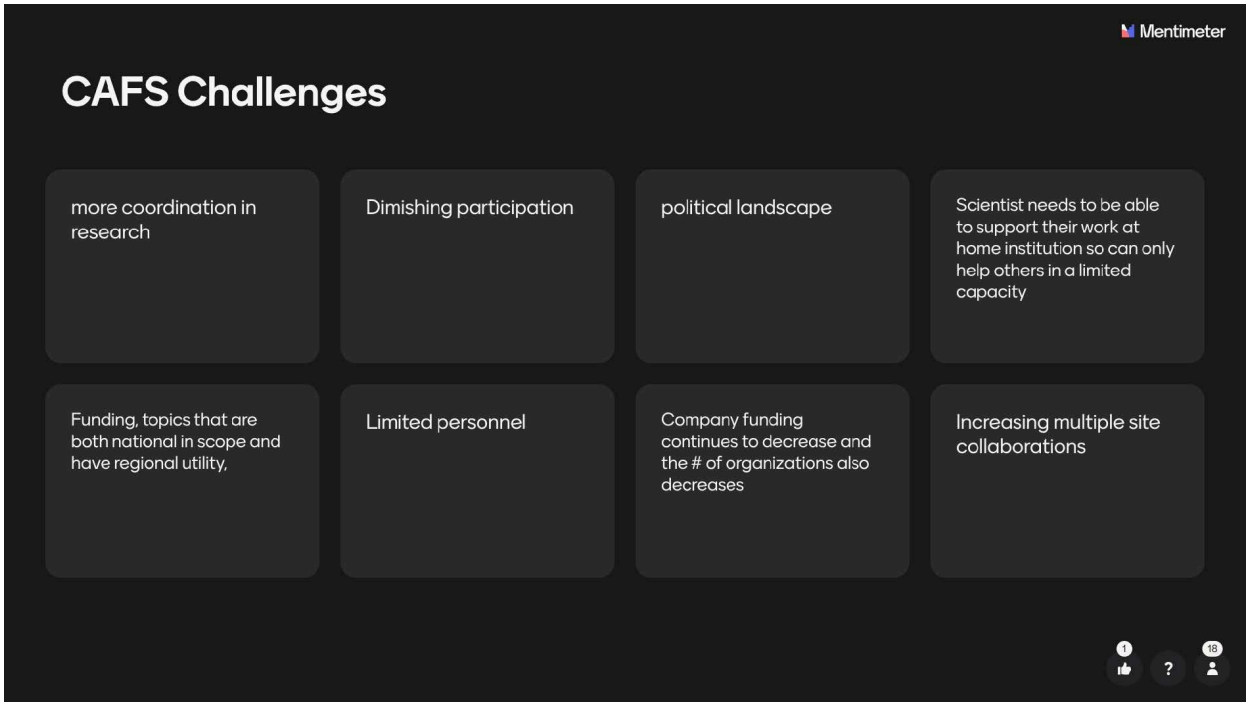
3 ? 23

Mentimeter

CAFS Strengths

Diverse portfolio of skills and alignment of interests and needs	National scope	Solid community engagement	Collaboration across regions not limited to specific topic
National R and D network for collaborative sharing and creativity	Potential collaboration, expertise, university assets, Meg, history	Leadership and administration	Responsive leadership

1 ? 23



- Funding Allocations Across Priorities
    a. Remote sensing
    b. Decision-support tools
    c. AI/Digital forestry
    d. Forest biometrics
- Likert Scale Topics (Strongly Agree-Strongly Disagree
    a. Sustainability of CAFS
    b. CAFS is current priority
    c. Interest in seeing CAFS continue
    d. CAFS achieved success in Phase III
    e. CAFS has solid leadership and strong momentum
- CAFS Strengths (open ended, sample of responses below)
    a. Collaboration
    b. Leadership
    c. Networking
    d. National industry/university partnerships
    e. Diverse skill set
    f. Forum for industry current/important issues
- CAFS Challenges (open ended, sample of responses below)
    - Funding/financial stability (by far most noted)
    - Keeping group together
    - Trust, complacency
    - Perspectives
    - Clarity/cohesiveness of mission and message

- Questions/Comments
    - What funding is needed? (AW: min $50K to fund grad student to work across, $300-400K to fund 3-4 projects, endowments would be nice)
    - Best resource for project results? (Survey support discussed)
    - NC Data Portal (experiment, still being updated with data)
    - Meetings (conjunction with other meetings–maybe annually)
    - Continue graduated NSF IUCRC

IAB/Site Meeting Next Steps/Follow-up

- Site directors that have contributed to the NCASI/CAFS fund come forward with collaborative proposals supported by the IAB
- Convene Fall virtual meeting to rank the projects and provide seed funds (go back to industry for remaining needed
- Keep it simple, keep the momentum, get more projects launched
- Highlight the needs for a national consortium (create a briefing document from the summative report?)
- A number of the industry are ready to commit
- Coordination with regional Coops
- AW will layout the process to move forward and financial commitments by Fall 2025
- Proposal session/Projects committed Fall 2025