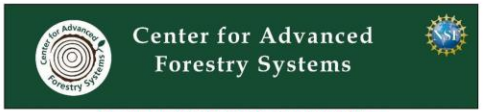
NSF's Center for Advanced Forest Systems (CAFS) Lead Site Update

Aaron Weiskittel
Director

Agenda



Semi-Annual CAFS IAB Meeting & Field Tour
June 11-12, 2024
Edgewater Hotel, Madison WI
https://maine.zoom.us/j/81580622354
Hosted by the University of Maine, Center for Research on Sustainable Forests
Field tour June 12, 2024: WholeTrees and University of Wisconsin Arboreteum

IAB Meeting Agenda

Tuesday, June 11, 2024, Eastern Standard Time

Time	Item	Presenter
7:30 AM	Breakfast in Meeting Room	-
8:30 AM	Welcome/Overview/Introductions	Aaron Weiskittel, UM
8:40 AM	CAFS Lead Site & Phase III Updates	Aaron Weiskittel, UM
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 site carrying capacity	Jaslam Poolakkal, UI
9:30 AM	19.76. Assessing and mapping regional variation in potential site productivity	Andrew Trlica, NCSU
9:45 AM	20.78. Intraspecific hydraulic responses of commercial tree seedlings to nursery drought conditioning	Andrei Toca, PU
10:00 AM	20.79. Multi-regional evaluation of new machine learning algorithms for mapping tree species distribution abundance	Kasey Legaard, UM
10:15 AM	Continuing Projects Review, Discussion and Vote	IAB
10:30 AM	**Break**	
11:00 AM	20.80. Using hyperspectral imaging to evaluate forest health risk	John Couture, PU
11:15 AM	20.81. Resilience of soil organic matter to harvesting: A global study of long-term soil productivity experiments	Jeff Hatten, OSU
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 & soil carbon of nine conifer species across a gradient in water deficit	Carlos Gonzalez-Benecke, OSU
12:00 PM	21.87. Linking leaf area index and remote sensing across different forest types	Andrew Trlica, NCSU
12:15 PM	Continuing Projects Review, Discussion and Vote	IAB
12:30 PM	**Lunch Break**	
Continuing Project Updates		
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	21.92. UMaine/UMFK START	Kennedy Rubert-Nason, UMFK
2:15 PM	22.98. Center for Advanced Forestry Systems Interactive Mapping Platform (CAFSIMP)	Okan Pala, NCSU
2:30 PM	Continuing Projects Review, Discussion and Vote	IAB
3:00 PM	**Break**	
3:15 PM	23.100 Use of carbon isotopes for assessing tree response to thinning	Lila Beck, UM
3:30 PM	23.101 Site-stand dynamics and pine beetle mortality in ponderosa pine ecosystems	Haley Anderson, UI
3:45 PM	23.102 Enhancing Resistance to Fungal Pathogens in Commercial Tree Seedlings	Abby Ferson, UI
4:00 PM	23.103 Determination of crown morphological traits using laser scanning in Douglas-fir and loblolly pine genetics trials	Doug Mainwaring, OSU
4:15 PM	Continuing Projects Review, Discussion and Vote	IAB
5:00 PM	Adjourn	
6:30 PM	**Dinner**	

Wednesday, June 12, 2024, Eastern Standard Time

7:30 AM	Breakfast in Meeting Room	
Finishing Project Updates		
8:00 AM	20.82. Stand response to thinning: Enhancing response prediction through modeling	Eric Turnblom, UW
8:15 AM	22.99. The effects of dominant tree height definition on loblolly pine growth and yield model outputs	Bronson Bullock, UGA
New Project Proposals		
8:30 AM	Robust small-area estimation strategies for developing accurate stand-level diameter distributions	Jaslam Poolakkal, UI
8:45 AM	Refining stand-level species distribution estimates using alternative small area estimation methods and high-	Mike Premer, UM
9:00 AM	PSAE #3	Sheng-I Yang, UGA
9:15 AM	PSAE #4	TBD

U.S. Forest and Forest Products R&D Capacity:

Results from 2020-21 Stakeholder Summit

Project Coordinator

Emily S. Huff, Ph.D.
Michigan State University

Project Directors

Robert G. Wagner, Ph.D.
Purdue University

J. Keith Gilless, Ph.D.
UC-Berkeley

Michael Goergen,
US Endowment for Forestry and Communities

Steering Committee

Susan McCord, NCASI
David Tenny, NAFO
Tom Martin, AFF
Justin Morrill, AWC
Alexander Friend, USFS

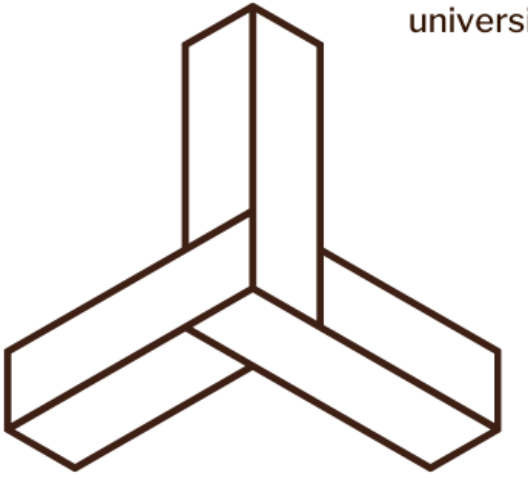
National Institute of Food and Agriculture Project #IND00136672G

	R&D Producers		R&D Consumers		R&D Producers and Consumers			
Research Priority	***Academic***	***USFS Station Directors***	***USFS National Forest System***	***Family Forest Owners***	***Private Large Forest Owners / Managers***	***NGOs***	***State Foresters***	***Industry***
#1	Carbon and Climate	Fire	Fire	Forest health	Forest Productivity	Carbon and Climate	Mass Timber	Markets for forest products
#2	Forest Health	Water	Water	Carbon and Climate	Carbon and Climate	Fire	Carbon and Climate	Social License to Operate
#3	Fire	Markets for Forest Products	Carbon and Climate	Water	Markets for Forest Products	Social License to Operate	Markets for Forest Products	Wood Energy

Current forest sector R&D capacity assessment with strong national alignment on certain topics (e.g. forest health, fire, carbon)

FOREST CENTRIC RESEARCH RELEVANCY IMPROVEMENT MODEL

Pillars of Success



Mission

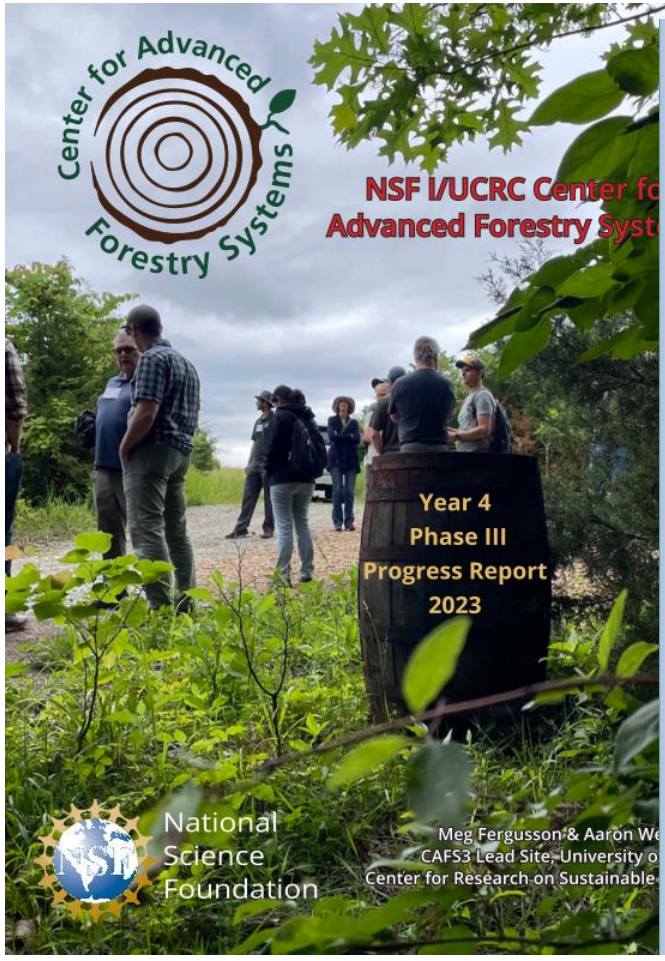
To actively support the US forest sector by solving problems with targeted, applied, and collaborative research coordinated across multiple universities and industry partners.

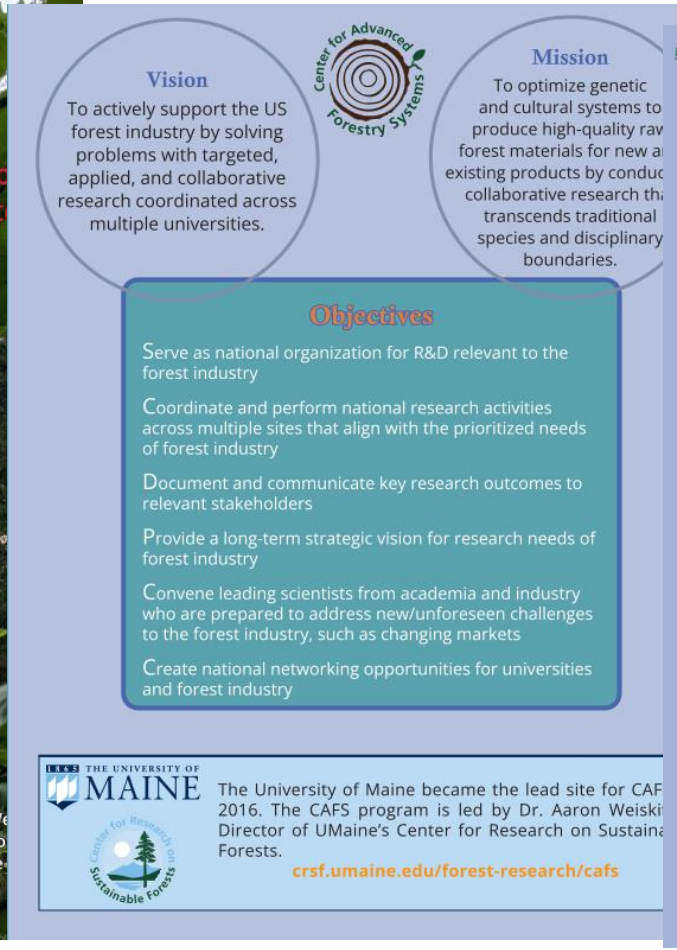
Value

A national leader affiliated with NSF in leading collaborative research in the forest sector to tackle present challenges and pave the way for future opportunities.

Capabilities

A nationwide network of engaged researchers and sector representatives who can leverage their expertise, resources, and local knowledge.



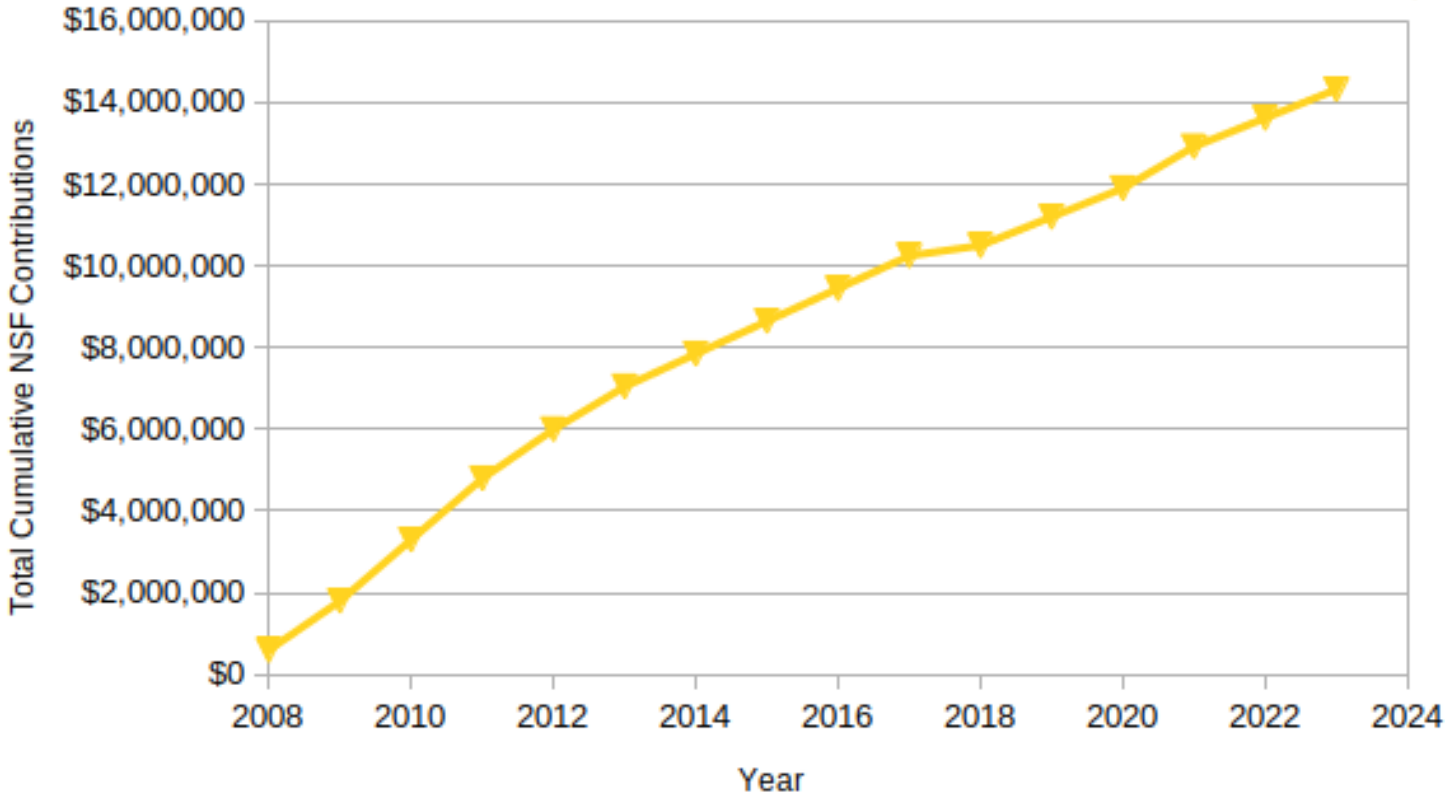


CAFS facilitates and support sector relevant applied R&D (https://crsf.umaine.edu/forest-research/cafs/)

CAFS Timeline

Long history of a successful national public-private-academic partnership

NSF Support



CAFS has received over $15M in NSF funding since its inception through direct and supplemental contributions

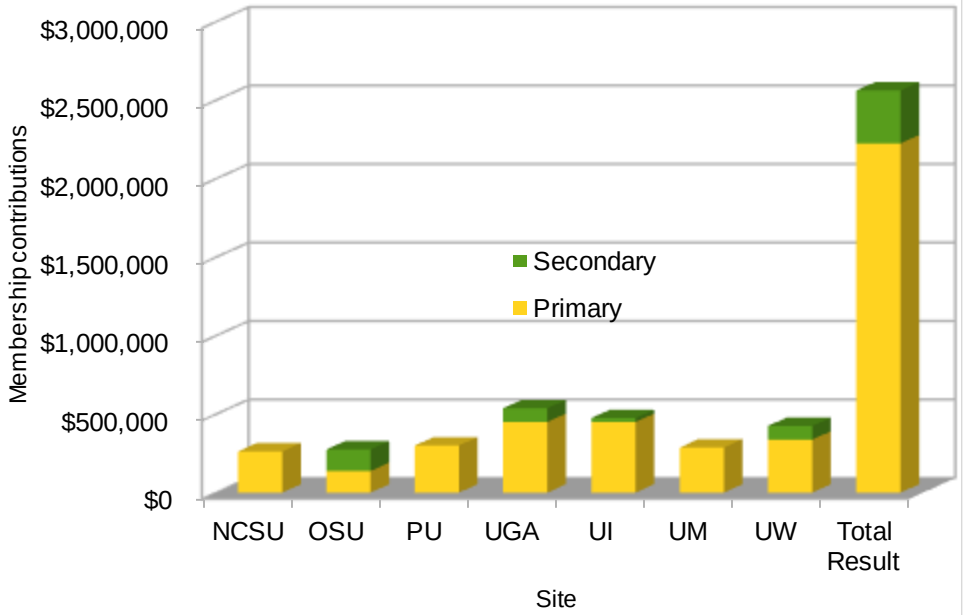
Phase 3 Technology Roadmap

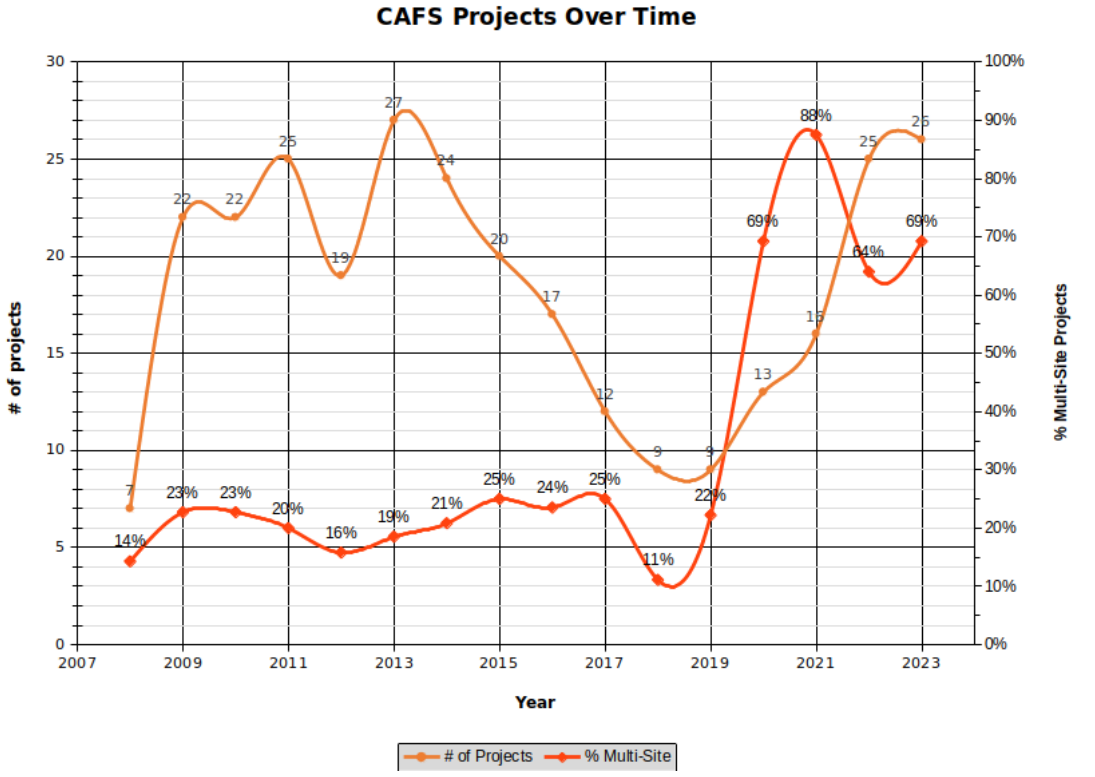
	2019	2020	2021	2022	2023	Outcomes
All CAFS Sites	■	■	■	■	■	IAB Meetings, evaluation, undergraduate education, publications, attendance at national meetings, securing of additional research support
Theme 1: Forest Modeling & Decision-Support Tools Primary IAB Partners: American Forest Management, Green Diamond, 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, 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
Theme 3: Improved Silvicultural Practices Primary IAB Partners: Hancock Forest Management, International Forest Company, Molpus Timberlands Management						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					

Lead Site	PI	Project/Title	Status 2023
UW	Turnblom et al.	16.69 Stand and tree responses to late rotation fertilization	Continuing
UI*	Kimsey et al.	19.75 Assessing & mapping regional variation in site carrying capacity across the primary forest types in the US	Continuing
NCSU/UGA*	Cook et al.	19.76 Assessing & mapping regional variation in site productivity across the primary forest types in the US	Continuing
UI*	Nelson/Jacobs/Gonzalez	20.78 Intraspecific hydraulic responses of commercial tree seedlings to nursery drought conditioning	Continuing
UM	Legaard/ Weiskittel	20.79 Multi-regional evaluation of new machine learning algorithms for mapping tree species distribution and abundance	Continuing
PU*	Couture/Jacobs	20.80 Using hyperspectral imaging to evaluate forest health risk	Continuing
OSU*	Hatten	20.81 Resilience of soil organic matter to harvesting: A global study of long-term soil productivity experiments	Continuing
UW*	Turnblom and Cross	20.82 Stand response to thinning: Enhancing response prediction through modeling	Continuing
UW	Cross and Turnblom	20.83 Using predictive analytics to decompose site index	Ending
UW	Littke	20.84 Physiologic response to commercial fertilization programs in Pacific Northwest forest plantations	Continuing
OSU*	Gonzalez	21.85 Variation in productivity, wood quality and soil carbon of nine conifer species across a gradient in water deficit	Continuing
NCSU*	Trlica	21.87 Linking leaf area index and remote sensing across different forest types	Continuing
UGA*	Dahlen et al.	21.88 Quantifying silvicultural treatment effect on lumber quantity and quality in loblolly pine	Continuing
UGA	Dahlen et al.	21.89 Quantifying carbon sequestration as a function of silvicultural treatment in loblolly pine	Continuing
NCSU*	Cook et al.	21.91 NCSU START: NSCU, Montgomery Community College, Wayne Community College	Continuing
UM*	Weiskittel et al.	21.92 UMaine START: UM & UMaine at Fort Kent	Continuing
UI	Coleman	22.95 UI INTERN: Improving tree seedling survival with defense-enhancing endophytes	Ending
NCSU	Pala	22.98 CAFS Interactive Mapping Platform (CAFSIMP)	Continuing
UGA*	Bullock et al.	22.99 Effects of dominant tree height definition on loblolly pine growth & yield model outputs	Continuing
UM*	Premer et al.	23.100 Use of carbon isotopes for assessing site-specific response to thinning	New
UI	Kimsey et al.	23.101 Site-stand dynamics & pine beetle mortality in Ponderosa pine ecosystems	New
UI	Nelson et al.	23.102 Enhancing resistance to fungal pathogens in commercial tree seedlings	New
OSU*	Mainwaring	23.103 Determination of crown morphological traits using laser scanning in Douglas-fir and loblolly pine genetics trials	New
OSU*	Hailemariam et al.	23.104 Interplay between sampling design and small area estimation to improve forestland inventory	New

National R&D consortium with priorities and projects driven by the support and needs of membership

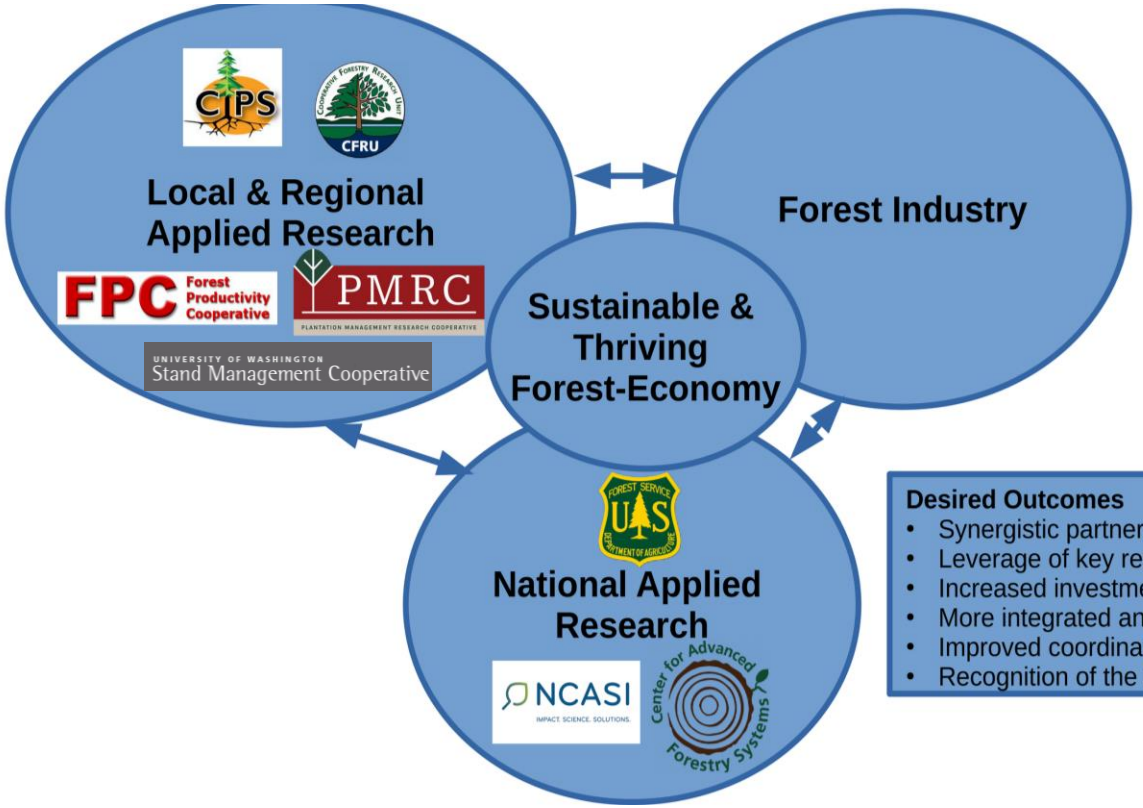
Center Funding & Projects





Funding and membership remain stable, while projects have continued to increase and are now 70% multi-site

Future of Forestry R&D?

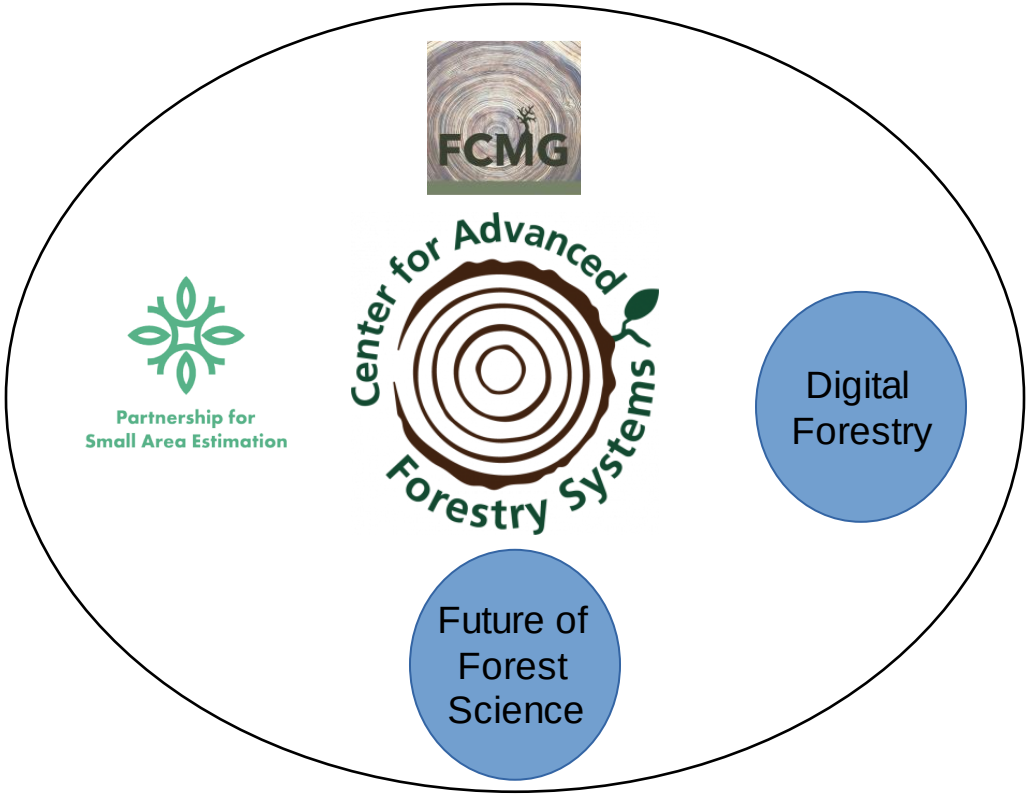


Desired Outcomes

- 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

A national public-private-academic R&D consortium is needed, which CAFS fulfills

Potential National R&D Parternships?



CAFS could serve as an umbrella organization to provide R&D support of ongoing and future national research initiatives driven by members

CAFS Future Options

Option	Details
A	Wrap-up and close-out CAFS
B	Seek $15k/yr from participating sites and invite other sites to join
C	Option B + Federal funding
D	Request actual membership contributions directly for CAFS
E	Re-direct regional co-op contributions for CAFS
F	?

Evaluating various options for long-term sustainability with strong support for Option C

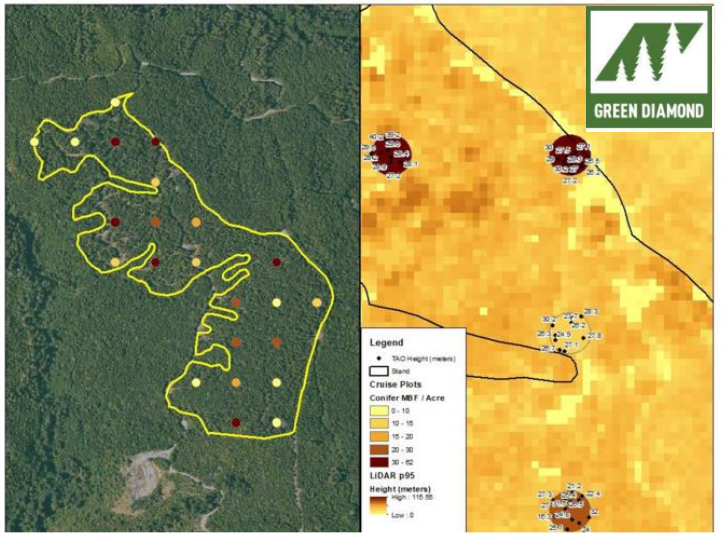
Partnership for Small Area Estimation

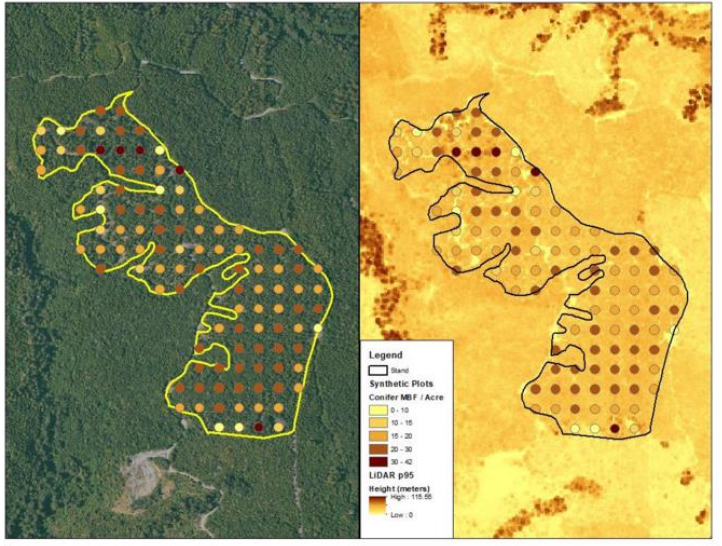
Small Area Estimation

- Statistical technique for refining estimates using auxiliary information (e.g. remote sensing)

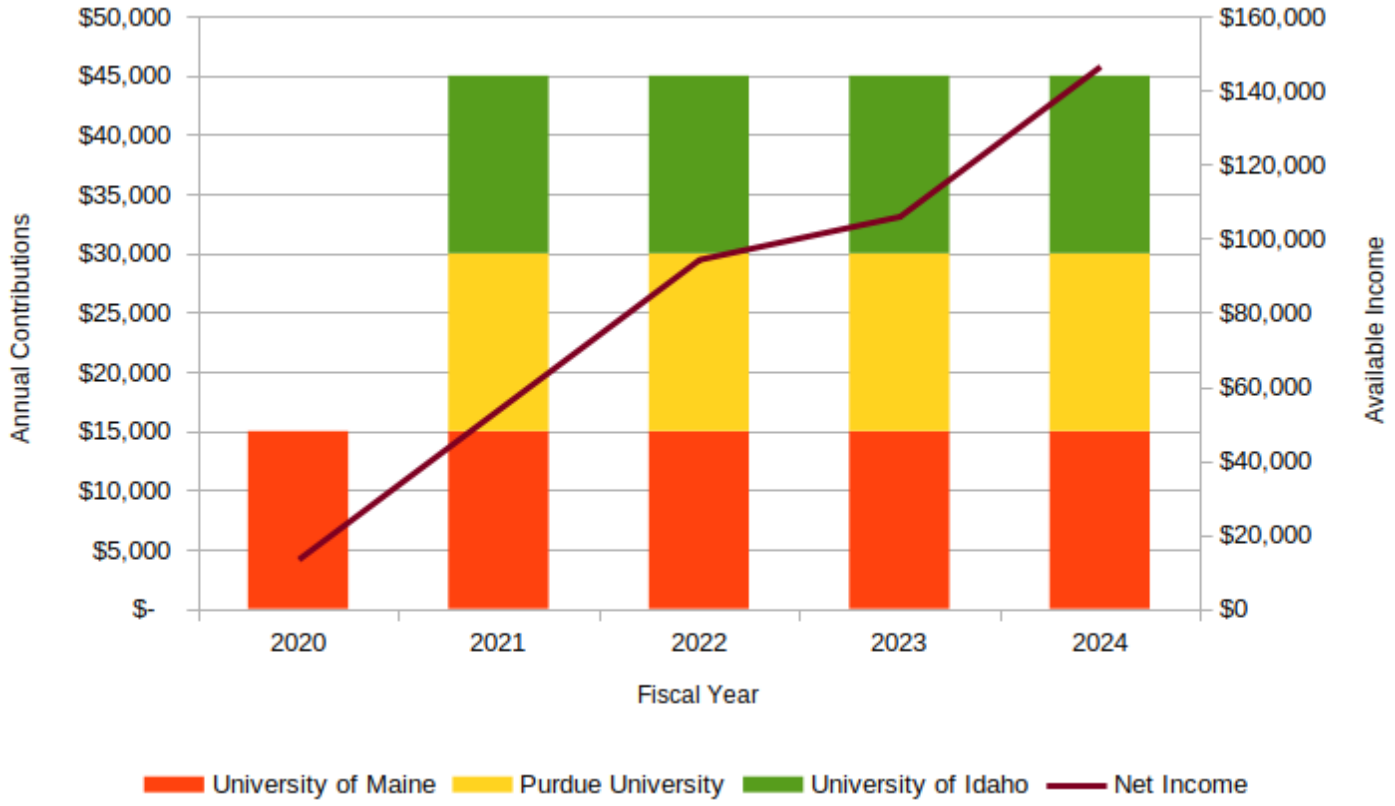
- Ongoing partnership between NCASI, USFS FIA, universities, and other organizations (e.g. state agencies, NGOs, industry)
  - Science Panel
  - User Panel
  - Development Panel

- Current PSAE solicitation on stand-level SAE applications
  - 600K to $700K for three to five proposals
  - Representatives from multiple stakeholder groups are encouraged
  - Spatial scales ranging from stand level polygons (~50-120 acres) to larger regions of ~100,000+ acres





Available Budget



Due to contribution by a few CAFS Sites, there's $150k in funding available now

Summary

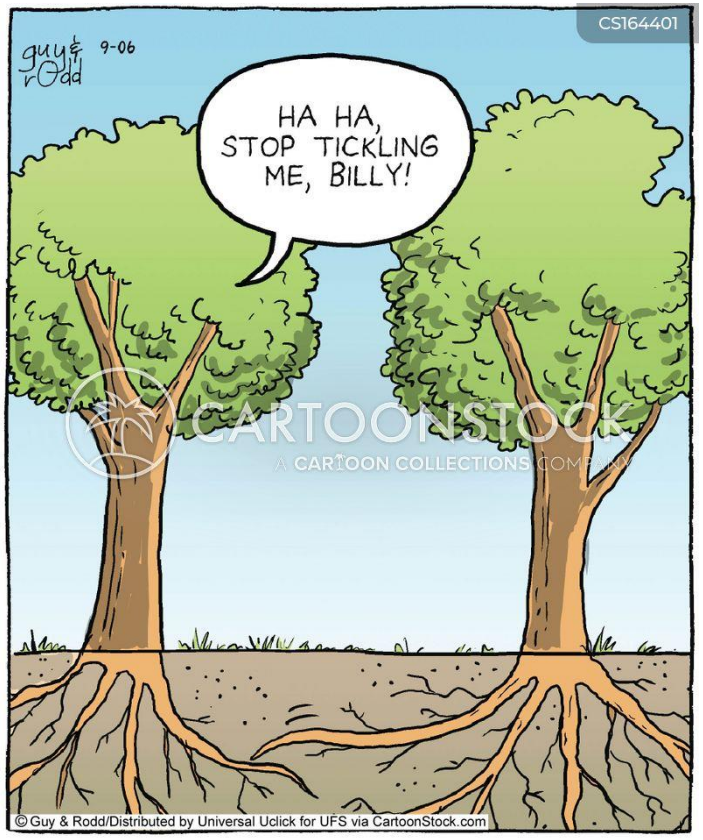
-CAFS has been a net benefit for all and addresses the need for a national consortium

- -Provided direct funding
- -Built a strong collaboration network
- -Leveraged research investments

-CAFS officially graduates from NSF at the end of Phase III (12/24)

-Be highly difficult to recreate CAFS from scratch or do another NSF IUCRC

Questions/Comments?



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