



Center for Advanced Forestry Systems Strategic Plan & Technology Roadmap





Vision



Support the US forest industry by solving problems with targeted, applied, and collaborative research coordinated across multiple universities



Mission

Optimize genetic and cultural management regimes to produce high-quality raw forest materials for new and existing products by convening scientists from different disciplines to define and conduct collaborative applied research on specific and compelling issues relevant to industry that transcend species, regions, and disciplinary boundaries



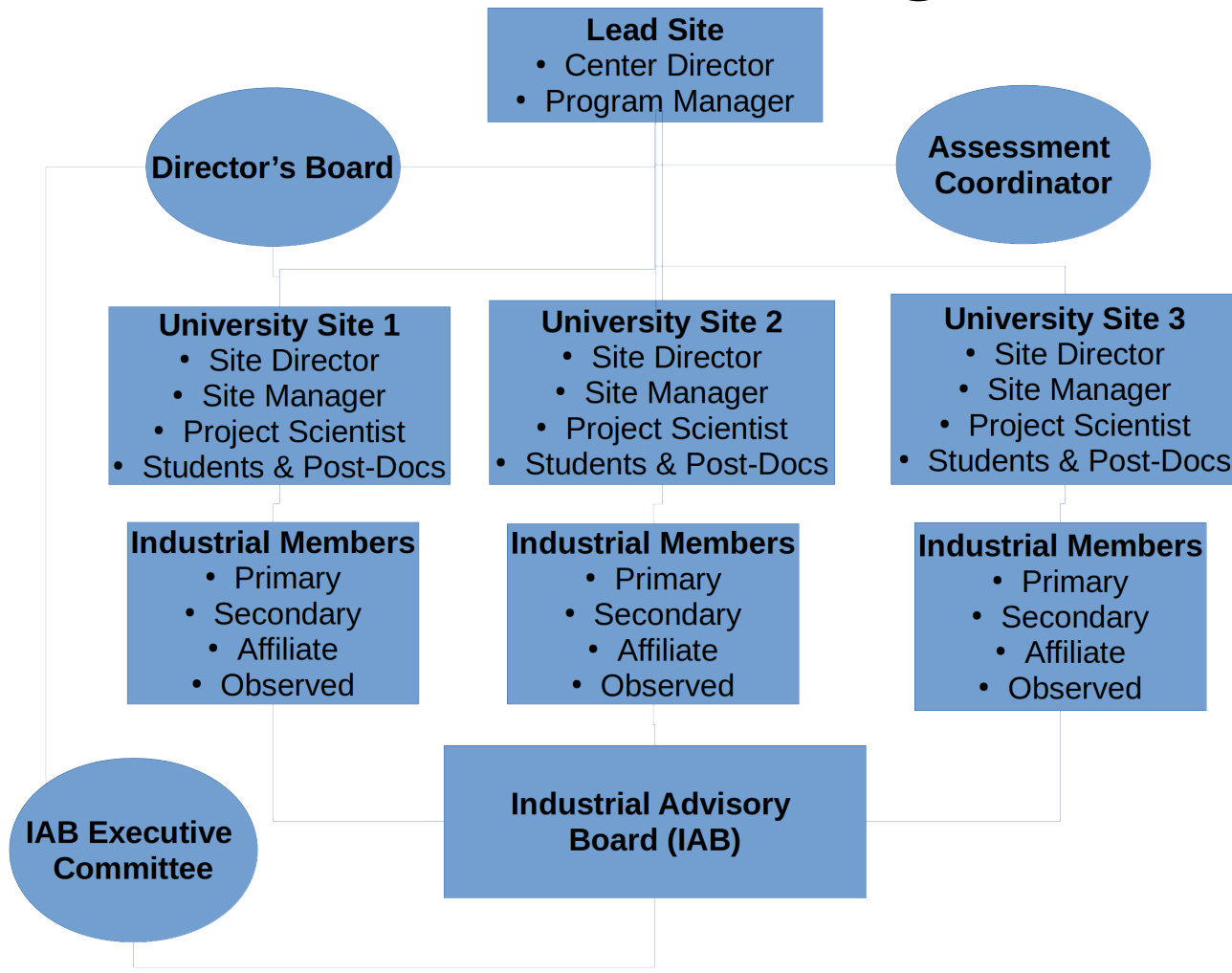
Objectives



1. Serve as 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 research needs of forest industry
5. Convene leading scientists from academia and industry who are prepared to address new/unforeseen challenges to the forest industry, such as changing markets.
6. Create national networking opportunities for universities and forest industry



General Center Organization



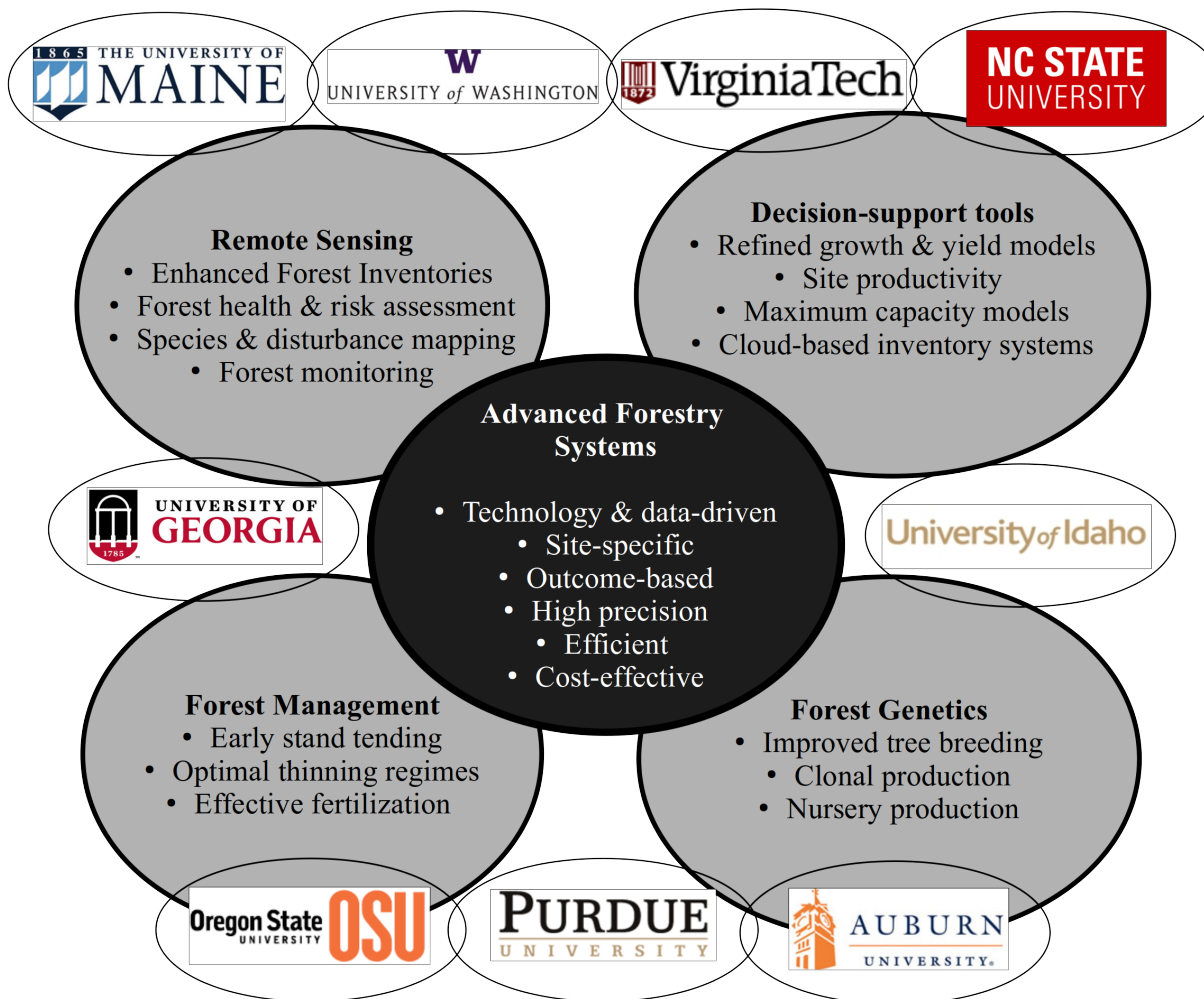


Leadership



- Center Director (Associated with the Lead University Site)
 - Oversee and allocate resources; Provide annual outcomes and budget
- Site Directors (Associated with Partner University Sites)
 - Serve as a liaison between CAFS and the appropriate academic units of their member universities; Work with Site Project Scientists
- Industry Executive Committee (Comprised of selected members of the Industry Advisor Board with at least one nominee from each Site)
 - Advise, assist, and approve all administrative and policy matters affecting the functioning of CAFS; Promote and publicize CAFS accomplishments to key stakeholders
- Director's Board (Comprised of Center Director, Site Directors, and Industry Executive Committee)
 - Define the mission, objectives, and guiding principles of CAFS; Maintain and update CAFS Strategic Plan and Technology Roadmap

Research Focal Area





University Sites



University	Expertise
Auburn University (AU)	Nursery technology, pine plantation management
North Carolina State University (NCSU)	Forest soils, pine plantation management, productivity modeling
Oregon State University (OSU)	Douglas-fir plantation management, growth and yield modeling, genetics, remote sensing
Purdue University (PU)	Genetics, central hardwoods management, nursery technology
University of Georgia	Genetics, pine plantation management, wood quality, remote sensing, growth and yield modeling
University of Idaho	Mixed-species management, natural regeneration, productivity modeling, remote sensing
University of Maine (UM; lead site)	Mixed-species management, natural regeneration, growth and yield modeling, remote sensing
University of Washington	Douglas-fir plantation management, wood quality, remote sensing, productivity modeling
Virginia Tech	Growth and yield modeling, productivity modeling, pine plantation management, genetics



Membership



Membership Type	Membership Fee	Vote	IP Property Access
Primary	\$25,000/yr	10 votes per membership	Yes
Secondary	\$10,000/yr	5 votes per membership	Upon Approval
Affiliate	\$5,000/yr	0	No
Observer	In-kind (<\$10,000k)	0	No



Members

Membership	AU	NCSU	OSU	PU	UGA	UI	UM	UW	VT	Total
Primary	0	5	4	8	2	8	7	8	8	50
Secondary	16	5	14	0	19	2	8	12	12	88
Affiliate	4	3	0	2	0	0	2	0	3	14
Total	20	13	18	10	21	10	17	20	23	152

Diversified membership with strong variation across sites due to the regional and highly specific nature of the forest industry as well as land ownership partners



Governance

- Bylaws annual assessed and approved
- Standard agreements maintained and adhered
 - Inter-institution MOUs for university
 - Industry membership agreements for industrial members
- Research projects and bylaw amendments require majority approval
- Reporting and center business conducted at biannual meetings or as needed



Primary Metrics of Success

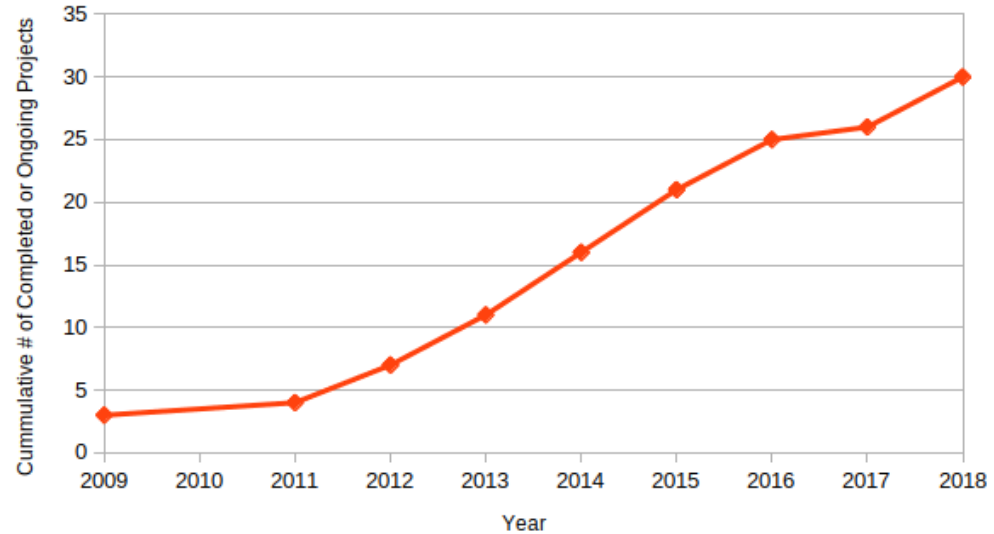


- Return on investment (% return on member dues)
- # of successfully completed research projects
- # of outputs from research projects
 - Publications, presentations, students trained
- # of collaborative grant proposals among universities
- \$ of additional funding for Center activities
- % of total center budget from member dues (<70%)
- # of alumni employed by industry members
- # of members (>30% Primary)



Accomplishments

- 30 completed or ongoing research projects including two multi-site fundamental research grants
- Strong and growing industry participation
- Several alumni working for industry members
- Diversified and productive staff
 - 9 Site Directors, 7 Administrative Staff, 6 post-docs, 25 undergraduate students, and 40 graduate students

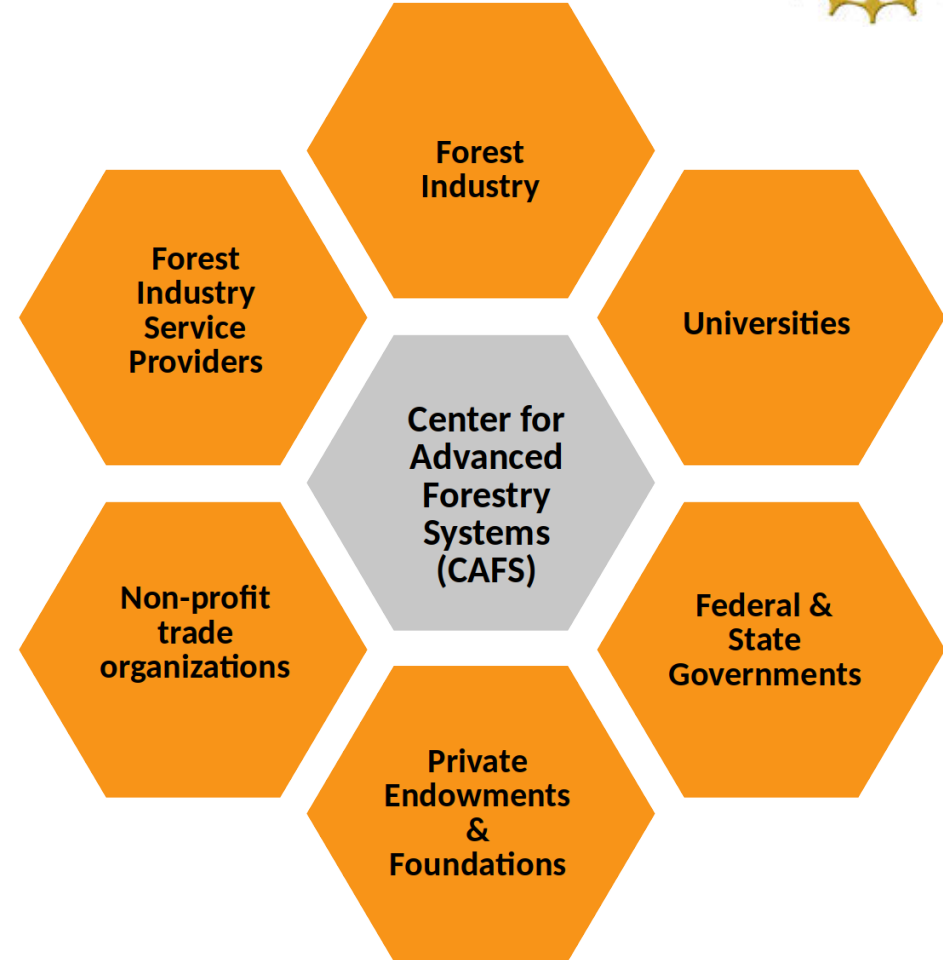




Potential Future Partners



- **Non-profit trade organizations**
 - National Council of Air & Stream Quality
 - American Forest Foundation
 - Sustainable Forestry Initiative
 - Climate Action Reserve
- **Private Endowments & Foundations**
 - U.S. Endowment for Forestry & Communities, Inc.
- **Service Providers**
 - ESRI Inc.
 - Sanborn
 - SilviaTerra
 - LimGeomatics





Sustainability



- Multi-faceted approach to future sustainability
 - Continue to recruit new members, particularly foundations
 - Seek private support
 - Federal research grants and contracts
 - Explore international memberships and partnerships
 - Direct site contributions



Phase III Timeline & Milestones



Milestone	Fiscal Year				
	18-19	19-20	20-21	21-22	22-23
Apply for & secure NSF Phase III funding					
Approve bylaws, strategic plan, & technology roadmap					
Initiate research projects identified on technology roadmap					
Revise and refine bylaws, strategic plan, & technology roadmap					
Secure additional partners including industry, academia, and non-profit sectors.					
Integrate center research and education activities that effectively train and benefit undergraduate and graduate students					
Survey, document, and prioritize industry member research needs					
Plan and host biannual meetings					
Annually report progress, outcomes, and finances					



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 Sentinell-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	<ul style="list-style-type: none"> • 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



Logic Model

Things as They Stand Now (Prior to Phase III)

- Over decade of history
- Existing partnerships & recognized national reputation
- Past/ongoing multi-site research projects
- Supportive and engaged membership
- Continuity across US
 - Available & diverse regional datasets
- Changes in Key Site Directors and Lead Site
 - Support from NSF



Strategies for Moving Things Forward

- More integrated & nationally relevant research projects
- Build upon & expand partnerships
 - Improved communications & reporting
- Additional IAB meeting
- Stronger leadership & engagement of Executive Committee
- Better leverage of NSF contributions (e.g. REU)



Achieved/Desired Outcomes

- Strong, engaged, & diversified members across the entire US
- Long-term organizational sustainability
 - Influential research outcomes that guide forest management
- Vision that continues research partnerships
- A more robust forest industry that leverages developed technology
 - Increased funding



Broader Impacts



- Forests provide numerous ecosystem services, particularly sustainably managed forests
- Train next generation of forest managers and scientists
- Secure and broaden the national forest-based economy
- >2.7 million jobs dependent on forests with total payroll over \$110 billion¹
- ~\$100 billion economic impact or >5% of manufacturing GDP¹

• ¹Forest2Market. 2016. The Economic Impact of Privately-Owned Forests in the United States. Online:
https://www.forest2market.com/hubfs/Blog/Forest2Market_Economic_Impact_of_Privately-Owned_Forests_April_2016.pdf