Center for Advanced Forestry Systems (CAFS) Update and Plans for Phase III
Agenda

1) IAB Approval of Bylaws, Membership Agreement, and Strategic Plan
2) Update on Phase III proposals
3) June IAB meeting
4) Open Discussion

Meeting materials available online:
https://crsf.umaine.edu/research-2/center-for-advanced-forestry-systems/
New CAFS Leadership

• After 10+ years of service as CAFS Director, Dr. Barry Goldfarb stepped down
• Dr. Aaron Weiskittel agreed to provide Phase III leadership and started in 2017
  - Oregon State grad
  - Prior industry experience
  - University of Maine Center for Research on Sustainable Forests Director since 2016
• University of Maine is now CAFS Lead Site
  - Meg Fergusson is CAFS Program Manager
Membership Agreement

- Defines relationship between CAFS and IAB members
- Revised existing membership agreement
  - Additional language on IP
  - Publication procedures
- IAB members should be willing to sign document
ByLaws

• Define center policies and operations
  - Organization
  - Roles & Responsibilities
  - Membership
  - Voting Procedures

• Should be presented and approved by IAB
Strategic Plan & Technology Roadmap
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

- Lead Site
  - Center Director
  - Program Manager

- Director’s Board

- University Site 1
  - Site Director
  - Site Manager
  - Project Scientist
  - Students & Post-Docs

- University Site 2
  - Site Director
  - Site Manager
  - Project Scientist
  - Students & Post-Docs

- University Site 3
  - Site Director
  - Site Manager
  - Project Scientist
  - Students & Post-Docs

- Industrial Members
  - Primary
  - Secondary
  - Affiliate
  - Observed

- Industrial Advisory Board (IAB)

- Assessment Coordinator

- IAB Executive Committee
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 Advisory 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

Remote Sensing
- Enhanced Forest Inventories
- Forest health & risk assessment
- Species & disturbance mapping
- Forest monitoring

Decision-support tools
- Refined growth & yield models
  - Site productivity
- Maximum capacity models
- Cloud-based inventory systems

Advanced Forestry Systems
- Technology & data-driven
  - Site-specific
  - Outcome-based
  - High precision
  - Efficient
  - Cost-effective

Forest Management
- Early stand tending
- Optimal thinning regimes
- Effective fertilization

Forest Genetics
- Improved tree breeding
- Clonal production
- Nursery production
## University Sites

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

<table>
<thead>
<tr>
<th>Membership Type</th>
<th>Membership Fee</th>
<th>Vote</th>
<th>IP Property Access</th>
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<tbody>
<tr>
<td>Primary</td>
<td>$25,000/yr</td>
<td>10 votes per membership</td>
<td>Yes</td>
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<tr>
<td>Secondary</td>
<td>$10,000/yr</td>
<td>5 votes per membership</td>
<td>Upon Approval</td>
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<td>Affiliate</td>
<td>$5,000/yr</td>
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<td>No</td>
</tr>
<tr>
<td>Observer</td>
<td>In-kind (&lt;$10,000k)</td>
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<td>No</td>
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## Members

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<thead>
<tr>
<th>Membership</th>
<th>AU</th>
<th>NCSU</th>
<th>OSU</th>
<th>PU</th>
<th>UGA</th>
<th>UI</th>
<th>UM</th>
<th>UW</th>
<th>VT</th>
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<td>4</td>
<td>8</td>
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<tr>
<td>Secondary</td>
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<td>Affiliate</td>
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<td>2</td>
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</table>

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 IAB 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 Improvement
  - 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

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Fiscal Year</th>
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<tbody>
<tr>
<td>Apply for &amp; secure NSF Phase III funding</td>
<td>![ ]</td>
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<tr>
<td>Approve bylaws, strategic plan, &amp; technology roadmap</td>
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<tr>
<td>Initiate research projects identified on technology roadmap</td>
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<tr>
<td>Revise and refine bylaws, strategic plan, &amp; technology roadmap</td>
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<tr>
<td>Secure additional partners including industry, academia, and non-profit sectors.</td>
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<tr>
<td>Integrate center research and education activities that effectively train and benefit undergraduate and graduate students</td>
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<tr>
<td>Survey, document, and prioritize industry member research needs</td>
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<tr>
<td>Plan and host biannual meetings</td>
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<tr>
<td>Annually report progress, outcomes, and finances</td>
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# Phase III Research Roadmap

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

<table>
<thead>
<tr>
<th>Project 7: Quantifying long-term gains using advanced genetics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lead Partners:</strong> PU, UGA, OSU, NCSU</td>
</tr>
<tr>
<td><strong>Outcomes:</strong> 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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project 8: Modeling forest response to early stand treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lead Partners:</strong> UW, UI, NCSU, VT</td>
</tr>
<tr>
<td><strong>Outcomes:</strong> 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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project 9: Identifying type and level of response to forest fertilization</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lead Partners:</strong> UW, UI, NCSU, PU</td>
</tr>
<tr>
<td><strong>Outcomes:</strong> 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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project-wide activities informed by Research Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Incorporation of advanced and emerging technologies</td>
</tr>
<tr>
<td>- Delivery of multi-platform, decision-support tools</td>
</tr>
<tr>
<td>- Harmonization, and synthesis of available regional datasets to generalize trends</td>
</tr>
<tr>
<td>- Multi-disciplinary, knowledge to action, and stakeholder-drive framework</td>
</tr>
</tbody>
</table>

**IAB meetings, evaluation, undergraduate education, publications, attendance at national meetings, securing of additional research support**
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 billion
• ~$100 billion economic impact or >5% of manufacturing GDP

Phase III Proposals

- Phase III proposals due to NSF from each Site on 12/19/18
  - $85-100k/yr per site
- Provide another 5-years of funding from NSF
- Can leverage other NSF programs if successful
  - REU
  - INTERN
June IAB Meeting

- Next IAB meeting is June 4-5, 2019
- Hotel Indigo in Athens, GA
- Indoor session and field tour
- Held in conjunction with Manomet’s Climate Smart Land Network
  - Joint field tour
Questions/Comments?

aaron.weiskittel@maine.edu
207-581-2857
https://crsf.umaine.edu/research-2(center-for-advanced-forestry-systems/)