2014 Evaluator's Report Cover Sheet
Craig S. Scott

Period Covered by this report: 2014
[Last updated: May 31, 2014]

Center: Center for Advanced Forestry Systems (CAFS) Center Director: Barry Goldfarb
Deputy Director: Stephanie Jeffries

Site	Director	Award Period[1] (MM/YY-MM/YY)	Funding Phase (I, II, or III)
North Carolina State University	Jose Stape	10/12-09/17	II
Oregon State University	Glenn Howe	10/12-09/17	II
Purdue University	Charles Michler	10/12-09/17	II
Virginia Tech	Thomas Fox	10/12-09/17	II
University of Maine	Bob Wagner	04/14-03/19	II
University of Georgia	Michael Kane	04/14-03/19	II
University of Washington	Gregory Ettl	09/14-08/19	II
University of Florida	Eric Jokela	07/09-06/14	I
University of Idaho	Mark Coleman	02/10-01/16	I
Auburn University	Scott Enebak	03/14-02/19	I: Probation effective 1/15

[1] Please list the award period as it applies to each site; this information is available on the NSF website.
*Add additional lines here to list additional sites.

Significant Personnel Changes:

IAB Meetings	Meeting 1	Members Participating via Video/Phone Conference?	Meeting 2	Members Participating via Video/Phone Conference?
Date	May 2014	☐	CAFS has a 1 meeting exemption	☐
Location	Coeur d'Alene, Idaho			
Attendance: IAB/Total[2]	13/19 Full 6/59 Assoc [Total 59]			

[2] Please list total dues-paid members (not people) in attendance over total number of attendees.
*Please attach the Semi-Annual Meeting Best Practices Checklist as an Appendix to your Evaluator Report.

Membership Activity Table (as of December 2014)

Member Name	Site	Membership Fee Level (Full, Assoc., etc.)	Status: New, Left, Continuing
SPONSOR NAME	UNIVERSITY	FULL or ASSOC	ENTER STATUS
Agrium Advanced Technologies	VT	Full	Continuing
Agropical	NCSU	Assoc	Continuing
AgXplore	VT	Assoc	Continuing
American Forest Management	VT, PU, UW	Full	Continuing
APRIL Asia	NCSU	Full	Continuing
ArborAmerica	PU	Full	Continuing
ArborGen	NCSU, VT, PU, UF, UGA,	Full	Continuing

	AU		
Arkansas Forestry Commission	AU	Assoc	New
Atherton Foundation	PU	Full	Continuing
Baskahegan Corporation	UMaine	Assoc	Continuing
BBC	UMaine	Full	Continuing
Beasley Timber Management, LLC	UGA	Assoc	Continuing
Boise, Inc	NCSU	Assoc	Continuing
BTG Pactual (formerly RMK Timberland Fund)	NCSU	Assoc	Continuing
Buckeye Technologies	NCSU		
Campbell Global (formerly named Campbell Group)	VT, OSU, UGA, UW, AU	Full	Continuing
Canopy	UMaine	Assoc	Continuing
Carolina Soil	NCSU	Assoc	Continuing
Cascade Timber Consulting, Inc.	OSU, UW	Full	Continuing
CBD Technologies, Ltd./FuturaGene	OSU	Full	Continuing
Claritas / Campo / C3	NCSU	Assoc	Continuing
Clayton Lake	UMaine	Full	Continuing
CMPC Forestry - Forestal Mininco/Forestal Bosques del Plata	VT	Assoc	Continuing
Copener	NCSU		Terminated
Deforsa	NCSU	Assoc	Continuing
Delaney Development	AU	Assoc	New
Deltic Timber Company	UGA	Assoc	Continuing
Dougherty & Dougherty Forestry	NCSU	Assoc	Continuing
Dow AgroSciences LLC	UGA	Assoc	Continuing
Du Campo	NCSU	Assoc	New
DuPont Agricultural Products	NCSU	Assoc	Continuing
Eldorado	NCSU	Full	New
Evans Properties	NCSU	Assoc	New
Fazenda Campo Bom (FCB)	NCSU	Assoc	Left in 2013, but rejoined = New
F&W Forestry Services, Inc	VT, UF, UGA, AU	Full	Continuing
Fibria	NCSU	Full	Continuing
Florida Grown	NCSU	Assoc	Continuing
Foley Timber and Land, Inc	UGA	Assoc	Continuing
Forest Investment Associates	UGA, VT	Full	Continuing
Forest Resource Consultants Inc.	UGA	Assoc	Continuing
Forestaciones Operativas de México (FOMEX)	NCSU	Assoc	Continuing
Forestal Rio Biabo			Terminated
Forestry & Land Resource Consultants, Inc.	VT	Assoc	Continuing
Gavilon Fertilizer, LLC	VT	Assoc	Continuing
Georgia Forestry Commission	AU	Assoc	Continuing
Global Forest Partners	VT	Assoc	Continuing
GMO Threshold Timber Corp	UGA, PU	Assoc	Continuing
Government of South Africa	OSU	Full	Continuing
Green Diamond Resource	OSU, UW	Full	Continuing

Company			
Green Edge	VT	Assoc	Continuing
Greenwood Resources	VT	Assoc	Continuing
Hampton Affiliates	UW	Assoc	New
Hancock Forest Management	VT, OSU, UGA, UI, UW, AU	Full	Continuing
Idaho Dept of Lands	UI	Full	Continuing
IFOM	NCSU	Assoc	Continuing
Inland Empire Paper Co	UI	Assoc	Continuing
Innovatech	NCSU	Assoc	New
International Forest Company	NCSU, UGA, AU	Full	Continuing
International Paper	NCSU, UGA	Full	Continuing
International Plant Nutrition Institute	VT	Assoc	Continuing
J.D. Irving (Irving Woodlands)	UMaine	Full	Continuing
James W. Sewell Co.	VT	Assoc	Continuing
Jordan Lumber Company	NCSU	Assoc	Continuing
Katahdin Forest Management, LLC	UMaine	Assoc	Continuing
Kingwood Forestry	VT	Assoc	Continuing
Klabin	NCSU	Full	Continuing
Koch (AGROTAIN)	VT	Assoc	Continuing
Larson and McGowin, Inc.	VT	Assoc	Continuing
Lone Rock Timber Management Co.	OSU, UW	Full	Continuing
Longview Fibre Co. Timber Department			Terminated (was acquired by a member company)
Louisiana Department of Agriculture & Forestry	AU	Assoc	New
Lykes Brothers	NCSU	Assoc	Continuing
Milliken Forestry Company, Inc.	VT	Assoc	Continuing
Molpus Timberlands Management, LLC	UGA,VT, AU	Full	Continuing
Montana Dept of Natural Resources and Conservation	UI	Assoc	Continuing
MWV (formerly MeadWestvaco)	NCSU, VT	Full	Continuing
Native Forest Nursery	AU	Assoc	New
North Carolina Forest Service	AU, NCSU	Assoc	New
Oklahoma Forestry Services	AU	Assoc	New
Olympic Resource Management	OSU, UW	Full	Continuing
Oregon Department of Forestry	OSU, UW	Full	Continuing
Pacific Denkman Co.	UW	Assoc	New
Packaging Corporation of America	UF	Assoc	Terminated
Payne's Flying Service	VT	Assoc	Continuing
Plum Creek Timber Company	OSU, UF, UGA, UMaine, UW, AU	Full	Continuing
Port Blakely Tree Farms	OSU, UW	Full	Continuing
Potlatch Forest Holdings	UGA, UI	Full	Continuing
Prentiss and Carlisle Company, Inc.	UMaine	Full	Continuing

Purdue Research Foundation	PU	Full	Continuing
Purdue Univ. Forestry & Natural Resources	PU	Full	Continuing
Quinault Dept. Natural Resources	UW	Assoc	Continuing
Rayonier, Inc.	VT, OSU, UF, UGA, AU	Full	Continuing
Refofestadora de la Costa SA	NCSU	Assoc	Terminated
Renewable Resources LLC	VT	Assoc	Continuing
Resource Management Service, LLC	VT, UF, UGA, AU	Full	Continuing
Roseburg Forest Products	OSU, UW	Full	Continuing
SAPPI (Fine Papers & South Africa)	OSU, UMaine	Full	Continuing
Scotch Lumber Company	AU	Full	New
Seneca Jones Timber Company	OSU	Assoc	New
Seven Islands Land Company	UMaine	Full	Continuing
Sierra Pacific	UW	Assoc	New
Snowshoe Timberlands, LLC	UMaine	Assoc	Continuing
South Carolina Forestry Commission	AU	Full	New
St. Joe Company	UF	Assoc	New
Starker Forests, Inc.	OSU	Assoc	Continuing
Steelcase	PU	Assoc	Continuing
Stimson Lumber Company	OSU, UI, UW	Full	Continuing
Superior Pine Products Company	UGA, VT	Full	Continuing
Suzano	NCSU		Terminated (was acquired)
SweTree Technologies AB	OSU	Assoc	Continuing
Sylvan Timberlands, LLC	UMaine	Assoc	Continuing
Syngenta	NCSU	Assoc	Continuing
Tennessee Division of Forestry	AU	Assoc	New
TerraSource Valuation	VT	Assoc	Continuing
The Forestland Group, LLC	UMaine	Assoc	Continuing
The Nature Conservancy	UMaine	Assoc	Continuing
The Westervelt Company	VT, AU	Full	Continuing
Thrash Aviation, Inc.	VT	Assoc	Continuing
Timberland Investment Resources	UGA, VT	Full	Continuing
Timbervest, LLC	UGA	Assoc	Continuing
TimberWest-Coast Timberlands	UW	Full	New
University of Hawaii - Manoa	PU	Full	Continuing
USDA Forest Service Research	UF, UI, AU, NCSU	Full	Continuing
USDA Forest Service State and Private	PU, AU	Full	Continuing
USDI Bureau of Land Management	OSU, UI, UW	Full	Continuing
Valor Florestal	NCSU	Assoc	Continuing
Van Eck Foundation	PU	Full	Continuing
Varn Wood Products, LLC	UGA	Assoc	Continuing
Virginia Department of Forestry	VT	In-kind	New
Wagner Forest Management	UMaine	Full	Continuing
Washington State Dept. of Natural Resources	OSU, UI, UW	Full	Continuing
West Fork Timber Co., LLC	UW	Assoc	Continuing

Weyerhaeuser	VT, OSU, UF, UGA, UW, AU	Full	Continuing
	Key: NCSU - North Carolina State University OSU - Oregon State University PU - Purdue University UF - University of Florida UGA - University of Georgia UI - University of Idaho UMaine - University of Maine UW - University of Washington VT - Virginia Tech AU – Auburn University		

* Add additional lines here as necessary.

	Estimated Budget This Year (Sponsor $$s)	**Estimated Budget Last Year (Sponsor $$s)**
North Carolina State University	$350,500	$353,167
Oregon State University	$445,914	$398,870
Purdue University	$355,000	$355,000
Virginia Tech	$500,720	$406,740
University of Maine	$444,562	$444,562
University of Georgia	$427,740	$399,150
University of Washington	$563,238	$420,767
University of Florida	$237,875	$162,600
University of Idaho	$311,389	$311,389
Auburn University	$262,800	
Total Center Support (All Sources):	$3,899,738	$3,252,245

* Please change the label "Membership Support for Site XX" to reflect the appropriate university sites.

Research Breakthroughs: UW: Estimating Fertilizer Response of Douglas-fir throughout the Pacific Northwest

Concerns & Cautions: None

Supplemental IUCRC Awards REU Supplement to University of Washington Site

Center for Advanced Forestry Systems (CAFS):
Evaluator's Report for 2014

http://cnr.ncsu.edu/fer/cafs/

North Carolina State University
Oregon State University
Purdue University
University of Florida
University of Georgia
University of Idaho
University of Maine
University of Washington
Virginia Polytechnic Institute and State University
Auburn University

Attachment A: NSF/IUCRC Fall 2014 Annual Surveys of PIs & IAB Reps
Attachment B: 2014 CAFS Success Story
Attachment C: CAFS Developmental Milestones
Attachment D: CAFS Meeting Best Practices Checklist

Submitted by Craig S. Scott

The Center for Advanced Forestry Systems (CAFS) bridges 10 leading universities' forestry research programs with representatives of forest industry sponsors for the purpose of solving complex, industry-wide problems. In 2014, CAFS will complete its 7th year of operation as an IUCRC with North Carolina State University as the lead institution.

The NSF continues to consider CAFS to be a model IUCRC that is vitally important to the US and international forestry industry. It is a productive collaborative enterprise that has become a national resource within academia and industry because of strong center leadership and organization, a geographically representative set of universities and a wide base of industry and governmental sponsors. The Center also has exceptionally strong, experienced and supportive support staff. A genuine strength of the Center is the interest in and willingness of the industry participants to focus on a wide variety of research with various species of plants and trees.

The Center for Advanced Forestry Systems works to solve problems via multi-faceted approaches to basic problems in molecular, cellular, individual-tree, stand, and ecosystems research. The collaborative consortium involves scientists with expertise in biological sciences (biotechnology, genomics, ecology, ecophysiology, and soils). It encompasses a broad spectrum of research areas related to forestry management and processing including: growth and yield, stand and plantation management, wood quality, soils and nutrition, genetics and biotechnology, modeling, and remote sensing,

CAFS research themes combine traditional genetics, biotechnology and silviculture into integrated systems with quantitative models to support decision-making and value enhancement. The research is conducted by a core of over 25 faculty, 9 post-docs, 32 doctoral, 27 masters, and 25 undergraduate students.

As of May 2014, CAFS represented $720,000 of NSF funding leveraged by $3.25 million Coop dollars. There is a total of $9.1 million in CAFS funding including underlying Coop programs.

MISSION

The CAFS mission 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. It's major goal remains to increase the economic value and utility of plantation forests; thereby enabling foresters to more efficiently produce greater volumes of high-quality wood materials.

CENTER ADMINISTRATION

CAFS management includes:

Center Director, Barry Goldfarb, NCSU, 919.515.4471, barry_goldfarb@ncsu.edu
Deputy Director, Stephanie Jeffries (effective Nov. 1, 2013)
Past Deputy Director, Lee Allen (effective Nov 1, 2013), 919.612.1456, lee_allen@ncsu.edu
Operations Coordinator, Lisa Schabenberger, 919.513.7368, lisa_schabenberger@ncsu.edu
Outreach Coordinator, Liz Jackson, 765.583.3501, jackson@purdue.edu
IAB Chair, Randall Greggs, Green Diamond Resource (thru 5/15), rgreggs@greendiamond.com
Past IAB Chair, Marshall Jacobson, Plum Creek, (thru 5/2014)
Past IAB Chair, Howard Duzan of Weyerhaeuser (retired 2011)
Center Evaluator, Craig Scott, University of Washington: 425.466.6535, scottcs@uw.edu.

CAFS Sites Directors:

NCSU Site Director, Jose Stape, (919) 513-4041, jlstape@ncsu.edu
Oregon State University, Glenn Howe, S541.737.9001, glenn.howe@oregonstate.edu
Purdue University, Charles Michler, 765.496.6106, michler@purdue.edu
University of Florida, Eric Jokela, 352.846.0890, ejokela@ufl.edu
University of Georgia, Michael Kane, 706.542.3009, mkane@warnell.uga.edu
University of Idaho, Mark Coleman, 208.885.7604, mcoleman@uidaho.edu
University of Maine, Robert Wagner, 207.581.2903, bob_wagner@umenfa.maine.edu
University of Washington, Gregg Ettl, 206.543.9744, ettl@uw.edu
Virginia Polytechnic Institute & State University, Thomas Fox, 540.231.8862, trfox@vt.edu
Auburn University, Scott Enebak, 334.844.1028, awarded March 2014, enebasa@auburn.edu

Between annual meetings, the 10-member CAFS Executive Committee (EC) serves as a sounding board for the Director, the Deputy Director and site directors on research and administration issues. The EC provides timely input (outside of regularly scheduled annual meetings) on issues, including final review of project selections, budget adjustments and related concerns, and location and organization of annual meetings.

MEMBERSHIP

CAFS has two levels of membership. Full members pay an annual fee of $25,000. Associate member fees range from $5,000 to $25,000. These fees have remained stable since the Center was established.

CENTER TRANSITIONS

In 2010, the center grew to include 9 university sites. In 2003-2004, Oregon State University's Tree Genetic Engineering Research Center (TGERC) merged into Purdue University's Center for Tree Genetics (CTGr). In 2007, CTGr was subsumed into North Carolina State University's new IUCRC, the Center for Advanced Forestry Systems (CAFS).

In June 2011, Scott Enebak of Auburn University submitted a letter of intent to become CAFS's 10th site. The LOI received approval from Babu DasGupta to do a "fast track" proposal. Auburn University resubmitted the LOI in 2012. In 2013, he received approval to submit the full proposal. The award was made effective March 1, 2014.

In 2012, the original four sites of CAFS submitted a Phase II proposal to the NSF that sought support for a 2nd 5-year period of IUCRC funding. That proposal was approved and funded, effective August of 2012.

COMPLIANCE WITH IUCRC MODEL

In all but one respect the Center remains faithful to the IUCRC Model. The one exception is that when the Center was founded it was granted a meeting frequency waiver that enables it to convene just one meeting annually and remain in good standing. The argument was based on the nature and pace of the technical field of forestry research, wherein research proceeds at a somewhat slower and more deliberate pace than research in the typical IUCRC. Also, the various co-op members of this Center typically meet separately one or two times per year.

ANNUAL CENTER MEETING

On May 20-21, 2014 the University of Idaho hosted the 7th annual meeting of the Center for Advanced Forestry Systems (CAFS) in Coeur d'Alene, Idaho. Once again CAFS set the standard for others to follow. The center director Barry Goldfarb, the deputy director Stephanie Jeffries, and Lisa Schabenberger (NCSU) and Liz Jackson (Purdue) should all be commended for an extremely effective meeting. There was nearly 100% compliance on meeting best practices (see attached BP Checklist). NSF was represented by Craig Scott.

Attendance was good: 59 attendees (see table below) - All sites were represented.

CAFS Annual Meeting Attendance:
2013 & 2014

	April 2013 Georgia	**May 2014 Idaho**
Faculty	24	21
Ind/gov members	26	24
Students	11	14
TOTALS	**61**	**59**

CAFS' innovative and efficient agenda format was used for the 4th time. Presentations included: 7 final reports, 10 new proposals, 12 continuing/ePosters, and an update on the ongoing fundamental research project. This model agenda provided increased time for small group-based participant interactions within four, 15-minute 3-ePoster sessions. Attendees were cycled in groups through each session's posters so that everyone was more able to interact with each poster presenter in small groups; an excellent mechanism for many more to get their questions answered than would be the case had the presentations occurred in larger sessions.

LIFE forms were completed on all presentations and posters (except for final reports). The NSF's Online LIFE System was used to gather feedback on continuing and new proposals. The comments, questions and suggestions were discussed immediately following each of four groups of presentations.

The center director reported (as of May 2014) a total of 99 total members made up of 41 full and 58 associate members. As of May 2014 there were 16 large corporations sponsors (>500 employees), 70 small, 7 governmental agencies, and 6 not-for-profit organizations. There were over 25 faculty, 9 post-docs, 32 doctoral, 27 masters, and 25 undergraduate students.

A complete set of 1-page summaries was available online several weeks before the meeting. The ppts were available electronically four days before the meeting and were updated following the meeting. At the meeting, all attendees received: a listing of meeting participants, faculty profiles, and a meeting evaluation form. Meeting binders included; the director's status report and the NSF presentation; 1-page executive summaries and ppts for all final reports, progress reports and new proposals. NDA were available but were not needed as there were no industry visitors. "Closed Meeting" signs were not posted.

Center directors Stephanie Jeffries and Barry Goldfarb shared leadership responsibilities for coordinating the technical meetings. Barry teamed with the IAB chair to lead the closed IAB portion of the meeting the agenda for which included: executive committee nominations and elections (one member needed from each site); nomination and election of new IAB chair (Randall Greggs of Green Diamond Resource Company elected to a 1 year term); discussion of timing, process, and potential topics for future fundamental research projects; a discussion of the role of the deputy director (such things as: outreach/communication, methods for elevating the visibility of CAFS' coops, increasing collaborations, obtaining additional funding, and increasing graduate student involvement).

An industry only IAB session was convened at which there was an open agenda. The following items were discussed: 1) Are projects being presented that received no or little support from the IAB? If so, the IAB would like to know why. 2) There was a consensus amongst the IAB that there needs to be more quality control; a mechanism or process for better assuring that the science and the hypotheses are more consistently sound. 3) Some on the IAB expressed concern that some conclusions could be tighter and thus more in line with the results, or lack thereof. 4) There was also IAB concern about the fact that some final reports had not really been brought to a conclusion. The IAB wants final reports that are not quite final to be finalized, updated in writing

and posted permanently on the website. Final reports are the deliverables that sponsors want. 5) On balance there was a consensus that the work coming out CAFS is, on the whole, better than was being produced heretofore. 6) There was support for instituting a project numbering system such as the one suggested below. 7) The IAB wants a mechanism to have private discussions about new proposals so that better guidance can be given to either improve of forestall proposals that should be improved before they move forward. One suggestion: Perhaps have all new proposals on day one, before the LIFE forms are filled out. There were others.

Other that the above, there were no major issues with this meeting.

RECOMMENDATION:

On the listing of meeting participants, add each individual's role (eg., faculty, student, postdoc, sponsor).

SUGGESTION:

Beginning with the projects funded at this meeting I suggest implementing a project numbering system. This would make it easier to ascertain when each project was started and its funding term. A "funding defining" number would be assigned to and permanently *affixed onto the end of each project's title*. The number would be included every time a project is listed on future agenda and on project presentation title pages. For example, the number 14042 at the end of a progress or final report's title would be for project funded in April of 2014 for a two-year period. Continuing projects that predate the May 2014 meeting should be assigned numbers retrospectively based on when they were funded and the length of their term.

MEETING STRENGTHS

Center strengths include the its highly regarded research program, its innovative meeting format, its field trips and its professional and administrative leadership.

All meeting details are well thought out and executed.

Attendees are absolutely dedicated to gaining thorough understandings of the CAFS research, its possible implications for their operations, and to getting things right. This is evident in the quality of the Q & As following each presentation and in the LIFE feedback and discussions thereof. This is a real asset for the Center.

MEETING SUMMARY

The May 2014 meeting was another in a series of successful 2-day meetings followed by the traditional 1-day field trip.

TECHNOLOGY TRANSFER

In 2014, CAFS supported 70 projects with approximately $3.9 million of IAB support from 126 industrial members. This research involved approximately 41 faculty, 34 MS students, and 33 PhD students.

As of May 2014, CAFS represented $720,000 of NSF funding leveraged by $3.25 million Coop dollars. There is a total of $9.1 million in CAFS funding including underlying Coop programs.

In 2014, based on center-supported research, center faculty and students accrued a total of 70 publications and made 85 scholarly and industry- related presentations (excluding presentations at center meetings).

On the 2012 technology transfer study an IAB representative of Wagoner Forrest's (WF), a forestry management firm, reported significant impact for the company of a product referred to as the Acadian version of the Acadian Variant of Forest Vegetation Simulator-Northeast variant (FVS-NE) that was developed and maintained by the US Forest Service. The Northeast variant encompasses Maine to Maryland and westward through Ohio, whereas the Acadian variant encompasses data from throughout the Acadian forest (Quebec, New Hampshire, Maine, New Brunswick, Nova Scotia and Newfoundland. This technology is used for modeling and to develop management plans for WF's client's forest management activities that involve their regionally developed proprietary volume tables. This product is enhancing the accuracy of their modeling efforts because it incorporates extensive data specific to the Acadian forest and it's various intensive management techniques. Dr. Weiskittel has developed new taper and volume equations; improved predictions regarding natural regeneration and ingrowth, and; effects of commercially thinned stands and the impact of spruce budworm. As a result it will be much more in-tune with the type of forests that WF manage. Because the technology is just being rolled out, it is not yet possible to estimate the commercialization impacts on the organization. Wagner Forrest's IAB representative anticipates a significant impact relatively soon but has not actually had the opportunity to use a

final product.

Scott's June 2012 Technology Transfer Survey identified the following additional tech transfer instances: 1) Use of fertilization response data to make operational decisions (Hancock Forest Management); 2) Baseline long-term control plot data used for modeling: (Hancock Forest Management), and; Updated growth & yield NE models that improve Huber's understanding of volume production - early non-quantified commercial yield increases were reported (Huber Resources Corporation). NOTE: In 2012, CAFS reported that its fundamental research project helped spawn a 20 million USDA grant for the southeast region of the US that involves 50 co-investigators and 12 institutions.

Scott's April 2013 Technology Transfer Survey and related discussions identified the following tech transfer as having occurred: 1) Growth and yield models & update of growth equations in Maine Early commercial thinning – timing & intensity trails have led to better understandings of options (unnamed Main sponsor: just starting to use so it's not possible to speculate in economic impact); 2) Fertilized nitrogen fate studies (Eric Vance (evance@ncasi.org) - National Council for Air and Stream Improvement; 3) Abbie Acuff (abbie.acuff@potlatchcorp.com) of Potlatch cited use of CAFS's twin plot research site set-up because it is economical to install, small enough to not interfere with operations and yet yields desired results; 4) John Welker (john.welker@amforem.biz) of American Forrest Management reports that CAFS has helped foster more cooperation and sharing between forest research corporations and has accelerated some of the growth and yield modeling work.

Scott's May 2014 Technology Transfer Survey and related discussions identified the following tech transfer as having occurred: 1) Spruce growth and yield (Kenny Fergusson, k.fergusson@huber.com, Huber Resources Corporation); Incorporated "know-how" from the Southern Pine Silviculture work (Tom Trembath, ttrembath@forestinvest.com, Forest Investment Association); Growth and yield modeling of genetically enhanced trees (Rayonier); Data & outcomes of various projects have been incorporated in management decisions (John Paul McTague, johnpaul.mctague@rayonier.com, Rayonier); CAFS Program is used as an example of collaborative research in our firm's SFI certification (Plum Creek Timber); CAFS has created wonderful exchanges among universities and we have benefitted as an industry from these collaborations (Conner Frisco, conner.frisco@plumcreek.com, Plum Creek Timber); The Green Diamond Resource Company befefitted directly from The CAFS work on fertilization response, vegetation management, genetic gain through breeding (Randall Greggs 1greggs@greendiamond.com), and: CAFS work contributed to our twin pilot study for density management and the CAFS cut/thin work is directly applicable to our operation (Abbie Acuff abbie.acuff@potlatchcorp.com: Potlatch).

Center Evaluator's 2014 Economic Impact Interview

In accordance with the IUCRC economic impact assessment the following interview of an IAB member was conducted in May of 2014, during the IAB meeting. The interviewee expressed a desire to remain anonymous:

Is your firm primarily interested in process or products?

Primarily processes although there have been some CAFS applications influencing modeling for our inventory that have been interesting and are definitely relevant to our firm's bottom line.

Have these processes been useful for commercialization purposes?

There is the modeling for the forest. We've also learned a considerable amount from CAFS about thinning and fertilizing. We are currently thinning but not fertilizing, so in order to justify getting back into those practices the CAFS results have been helpful. For both activities, results are or will favorably impact our economic bottom lines though the impact is almost impossible to quantify with any precision.

Are you under pressure to document ROI?

Yes! I must show value from the resources that we put into this center. Only then do I get follow-on funding approved.

Can you speculate regarding economic impact of CAFS involvement?

My primary area of focus is in plantations and in early stand development. Economically, these studies can have a huge impact on our company if by applying fertilizer we can reduce the rotation by five

years. Success here means more money in our pocket. We are coming to a point where we are going into younger stands to boost them up and get more volume from them. This is very important economically.

Over a stand rotation, when you are considering all stands that have been established, if we can reduce the rotation on that we are probably talking about hundreds of thousands of dollars over the length of that rotation. To me that's quite an impact. I justify our investment in CAFS by saying that we are definitely recouping our costs. By applying results to our land base we probably benefit by 50 to 100K per year. Center results are also impacting our internal work in ways that will benefit economically because we can better figure out what we need to do and when we should do it. Stands need treatment. The extent to which we can optimize stand growth has increased because of CAFS research. That's why we are so interested in staying involved.

Have you realized cost avoidance?

We can't do all of the studies that we would like to do. Our internal research budgets are regularly shrinking. By coming in with CAFS I have the opportunity to look at multiple projects. It is very cost effective for us to both more wisely spend to improve stands and to avoid expenditures that would otherwise need to be made. Insights we get from being involved in CAFS are very valuable to us.

Issues facing the Center that have financial ramifications:

There is a general consensus that it would be helpful to have more research dollars to support the high cost of field-based forestry research. While more cross-site multidisciplinary collaboration is happening, center administration continues to strategize on how to promote further improvements in this area.

CENTER STRENGTHS

CAFS is a true national center that includes coast-to-coast and some international geographical spread.

CAFS leaders (directors and staff) are to be commended for the diligence they exhibit on all aspects of Center functioning. Dedicated site directors are committed to the concept of cooperative research. The Center also has a dedicated and innovative core of research and administrative faculty and graduate students.

CAFS' ePoster protocol for sequential, grouped poster sessions is the best I've seen

CAFS has an industrially relevant research focus that has considerable potential for benefit to sponsors.

The Center benefits from a solid, stable base of industry with common interests and needs.

Sponsors respect the researchers and the values of the work they are doing.

Sponsors have demonstrated a willingness to focus on a wider variety of methodologies and species than they typically study.

Sound operations are made possible by professional collaborative efforts of the center director, the deputy director, the site directors and their truly exceptional support staff.

NSF ANNUAL OUTCOME SURVEYS

IAB reps of CAFS' major sponsors and PIs were conducted again at the end of 2014 according to the I/UCRC Program's Center Evaluation Protocol (see attachment A). Response rates for the IAB rep and researcher surveys were 33% (14 of 43) and 30% (6 of 20), respectively. I surmise that the IAB and researcher survey results likely overestimate results that might have been obtained with a more representative sample. That said:

IAB SURVEY RESULTS

In 2014, regarding the focus on the research program - responding IAB representatives indicated that: they were interested in 59% of the projects; it would take them about 26.4 months for their organizations to plan, conduct and complete the center's typical research project internally (national mean 16.9), and; on average approximately 2.7 projects were important enough for the their organization to consider conducting them internally, within the next few years, if the center was not doing so.

As was the case last year, IAB reps ratings of the quality of the research program and of the capabilities CAFS faculty generally hovered close the national means but trended a bit lower for items related to the scope of the

centers being so broad. For example, Focus of research (CAFS mean 3.4, national mean 3.9) and Relevance of the research to my organization's needs (CAFS mean 3.0, national mean 3.7).

Notably, on the upside was IAB reps' mean rating of the Likelihood of their renewing their memberships (CAFS mean 4.5 versus the national mean of 4.1).

On the downside were, Enhanced organizations' ability to identify/recruit well-qualified graduate students to hire organization (CAFS mean 1.5 versus the national mean of 2.5); Percent indicating "Yes" Center accelerated organization's internal R&D (CAFS 43% versus the national 53%); Percent indicating "Yes" Center stimulated new or re-directed R&D in organizations (CAFS 36% versus the national 48%) and the extent that participation in the Center enhanced their organization's commercialization efforts via new technical knowledge; Expanded intellectual property resources; improved/or new products, processes, services, improved sales; or new or retained jobs (CAFS mean 2.0, national mean 2.4.).

36% indicated the research is helping their organizations avoid R&D costs (national mean 48%); to the tune of $650,000 annually.

Finally, responding IAB representatives reported that they were on average "quite" satisfied with CAFS administrative operations (mean 3.9; national mean: 4.1). Again, respondents' estimates of the likelihood of their renewing their memberships were above the national mean; between "Probably" and "Definitely" Yes (CAFS 4.5 versus 4.1 nationally).

Overall, IAB representatives reported few criticisms of the Center's research program.

PI SURVEY RESULTS

Responding faculty members remain pleased with the quality of the Center supported research program and view it as a well-run organization.

Attachment A

CAFS IAB Survey: Fall 2014

[Response Rate: 33%: 14 of 43*]

I) CENTER RESEARCH PROGRAM

Means Displayed as follows - [*Center mean* (*Bold & Italicize*d) –** *2013 National Mean* (smaller]

PPR3	**59%**	Percent of projects relevant to organizations' future R&D needs.
NSM	**26.4**/16.9	Mean number of scientist-months (full-time) it would take organizations to plan, conduct, and complete the center's typical research project internally
NPHP	**2.7**/2.4	Mean number of current research projects considered high enough priority that organizations would conduct them internally or by contract (within the next few years) if the Center was not conducting this research.

Means Displayed as follows - [*Center mean* (*Bold & Italicize*d -** *2013 National Mean* (smaller)]

CF/QRP:	**4.1**/4.2	Capabilities of faculty and quality of the research program (1=Not Satisfied; 2=Slightly Satisfied; 3=Somewhat Satisfied; 4=Quite Satisfied; 5=Very Satisfied)
BRT:	**3.8**/3.9	Breadth of the research topics covered (1=Not Satisfied; 2=Slightly Satisfied; 3=Somewhat Satisfied; 4=Quite Satisfied; 5=Very Satisfied)
FOR:	**3.4**/3.9	Focus of research (1=Not Satisfied; 2=Slightly Satisfied; 3=Somewhat Satisfied; 4=Quite Satisfied; 5=Very Satisfied)
RRON:	**3.0**/3.7	Relevance of research to my organization's needs (1=Not Satisfied; 2=Slightly Satisfied; 3=Somewhat Satisfied; 4=Quite Satisfied; 5=Very Satisfied)

ITEM: How can the center improve its research program? What features of the research program would your organization definitely want to see continued?

Make sure timelines for deliverables are clear and are met.

It appears to be a regional function. Different regions have different goals and if you are in an 'under-represented' region, you are more likely to have a minority of research 'more' applicable to your needs. We are, however, happy some of our priority research is picked up at CAFS.

An operations focus is critical.

Avoid competing projects and integrate similar project under same umbrella. This is making the PI to collaborate share and leverage resources instead of competing for them. Encourage multi discipline/universities projects.

Need a more descriptive feedback loop to PI's from industry members and back again, which was addressed since the last meeting.

Need more interaction with industry in the process of developing research proposals.

Need more cooperative projects involving multiple sites. Certainly sites within the same region but between regions is very useful for many reasons.

II) BENEFITS OF BELONGING TO THIS CENTER

A. NETWORKING & HUMAN CAPITAL BENEFITS

	Mean	
OAN	**3.1**/3.3	Enhanced R&D organizations' ability to network and build scientific capability via cooperation with industry and university scientists outside your organization (1=No Impact; 2=Slight Impact; 3=Moderate Impact; 4=High Impact; 5=Very High Impact)
OAR	**1.5**/2.5	Enhanced organizations' ability to identify/recruit well-qualified graduate students to hire. (1=No Impact; 2=Slight Impact; 3=Moderate Impact; 4=High Impact; 5=Very High Impact)
SH	**1**	Number of center-trained students hired by center organizations

B) RESEARCH & DEVELOPMENT BENEFITS

ARHA	**43%**/53%	Percent indicating "Yes" Center accelerated organization's internal R&D: Access to Center research findings and outputs helped accelerate the pace and/or completion of some R&D projects already underway at organizations
ARHDA	**36%**/48%	Percent indicating "Yes" Center helped avoid new R&D costs: Access to Center research findings and outputs helped my organization to decide against initiating a new project organization otherwise would have conducted

If "Yes" to the above question (ARHDA), taking into account personnel, facility and related costs, sum of organization's estimates of how much these accelerated AND/OR avoided project(s) would have cost your organization:

Total Costs Avoided by Respondent Organizations **$675,000***

If organization indicated "other" to the previous (ARHDA) question, they indicated:

NA

ARTD	**36%/40%**	Percent indicating "Yes" Center stimulated new or re-directed R&D in organizations: Access to Center research findings and outputs has triggered the development of new R&D projects in organizations, or significantly redirected current R&D

If "Yes" to the above question (ARDT), organizations' estimates how many projects were triggered/stimulated:

5

If "Yes" to the above question (ARDT), combined total dollar value of organization's new or redirected projects:

$625,000

If organization indicated "other" to the previous (ARDT) question, they indicated:

NA

Mean

ECE **2.0**/2.4 During the past year, to what extent has participation in the Center enhanced your organization's commercialization efforts via new technical knowledge; expanded intellectual property resources; improved/or new products, processes, services, improved sales; or new or retained jobs? (1=No Impact; 2=Slight Impact; 3=Moderate Impact; 4=High Impact; 5=Very High Impact)

In my view, the benefits of the Center are often related to similar type research questions in different species and regions. This often helps build the business case and confidence in proceeding in particular directions. This is difficult to quantify but very real.

Improvement in modeling process. Refined data and greater level of regional applicability.

Executive support of an internal R&D department is low. CAFS along with the cooperatives gives us access to current research and data to help guide our internal resource management decisions. Without it, we likely would not replace with internal research and industry advancement would slow for a time.

III) IAB VIEWS OF CENTER ADMINISTRATION & OPERATIONS

Mean

CAOps **3.9**/4.1 Center administrative operations
[Range 3 > 5] (1=Not Satisfied; 2=Slightly Satisfied; 3=Somewhat Satisfied; 4=Quite Satisfied; 5=Very Satisfied)

IMPCOpps? How can the center improve its administration and operations program? Please put CHECKS next to any issues that can be improved:

A. Planning the Research Program	14%
B. Project Selection	28%
C. Project Development and Management	21%
D. Dissemination of Results via Publications via Pubs	36%
E. Technology Transfer	50%
F. Intellectual Property Management	0
G. Fund Raising and Recruitment of New Members	0
H. IAB Meeting Planning	0
I. IAB Meeting Content	7%
J. IAB Meeting Execution	0
K. IAB Meeting Follow-up	14%
L. Communications	7%
M. Center Personnel	0

Other (see below):

NONE

How can the area(s) be improved? (Please identify by letter if listed above, and comment.)

I prefer to see high-level summary documents of what the Center is funding. Short bullet form summaries of projects and funding.

Meet project deliverable deadlines

Appears all projects get funded. I am not sure how the voting process works other than it appears to be a way to track project popularity. If for example, this results in several 'unpopular' projects, is there a mechanism(s) where funding can be redirected to more popular ones? Similarly, do we know if there are projects not getting funded because of previous scenario? I am not sure how to get at research results. But admittedly this can easily be my lack of paying attention.

Need stronger focus on operational applications of research.

Better coordinate PI research project, "fuse" them when it makes sense to promote further collaboration. Some projects presented last meeting seems were written the day before, very poorly presented.

Need direct access to published articles or white papers outlining results and current conclusions.

Need better written summaries of the results to member organization.

Provide more information on how this specific research project could be used in the industry.

Need more formal reports that summarize projects in abstract form so that specific projects that may be of benefit can be analyzed further.

Area(s) of excellence should the Center continue or repeat next year:

The rotating of meeting location is good. Although difficult to attend regularly, they present great opportunities for interactions with researcher.

Continuing good research. I believe it to be very good now. Need a better understanding of how projects come to pass and updates of ongoing projects. Expectations etc.

K: Follow-up has been good, especially with director attending coop meetings.

The director should continue to travel to member site meetings.

The center should continue to push the member sites to work together and there should be extra funding made available to those sites willing to work together.

IV) GENERAL EVALUATION

	Mean	
LMR	4.5/4.1	Likelihood of membership renewal (1= Definitely Not; 2=Probably Not; 3=Uncertain; 4=Probably Yes; 5=Definitely Yes)

7 of 14 respondents indicated “Probably” they would renew
7 of 14 respondents indicated “Yes” they definitely would renew

What can the center do to make your renewal more likely?

Survey IAB to scan for projects that are more relevant for the industry and operational execution.

IAB should be able to come with ideas for the Center Scientist to work on, rather than Scientist proposing something and evaluating the level of interest from IAB.

Provide more updates on research and its relevance to our industry.

CAFS Faculty & Research Scientist Survey: Fall 2014

[Response Rate: 30%: 6 of 20]

FACULTY SATISFACTION WITH CENTER

**Means Displayed as follows - [*Center mean* (*Bold & Italicize*d - *2013 National Mean* (smaller)]

	Mean	
QCR	**4.0**/4.2	Quality of center supported research program (1=Not Satisfied; 2=Slightly Satisfied; 3=Somewhat Satisfied; 4=Quite Satisfied; 5=Very Satisfied)
RCR	**4.2**/4.3	Relevance of center's research program to my professional goals. (1=Not Satisfied; 2=Slightly Satisfied; 3=Somewhat Satisfied; 4=Quite Satisfied; 5=Very Satisfied)

How can the center improve its research program? What features of the center's research program do you definitely want to see continued into the future?

Continue Good mix of applied/basic research.

Additional RFPs and dollars just available to center members to apply for to help strengthen research

Enhance the collaborative work between sites within the center.

The CAFS's goals are very hard to get funding to work on. I think having this group of people working on making US forestry competitive is almost as important as funding these kinds of proposals. Having more graduate students attend would be very useful, but definitely keep the meetings.

CI	**3.8**/4.0	Which option best expresses your current intentions? Next year I will submit my best research ideas in a center funded proposal. (1 = Definitely Not; 2 = Probably Not; 3 = Uncertain; 4 = Probably Yes; 5 = Definitely Yes)
CAO	**4.5**/4.3	During the past year, how satisfied were you with center administrative operations (1=Not Satisfied; 2=Slightly Satisfied; 3=Somewhat Satisfied; 4=Quite Satisfied; 5=Very Satisfied)

IMPCOpps? How can the center improve its administration and operations program? Please put CHECKS next to any issues that can be improved:

% Checking Area

Communication	33%
Planning & development of res program	17%
Management of projects	0
Project selection	17%
Proposals and publications	0
Technology transfer	17%
Intellectual property	0
Fundraising	17%
Other:	7%

Other (see below):

Need pooled resources for funding.

ITEM: Any features of the administration and operations with which you are particularly pleased?

CAFS is a well-run operation.

The dedication of CAFS administration staff is and has been very impressive.

I was very pleased with the support of center administration in our project, since there is intense interest in our work, and a very high level of idea-sharing throughout every aspect of CAFS.

Attachment B

CAFS Research Highlight for 2014

Prepared by: Kim Littke **Date**: 12/19/14	**Contact phone**: Kim Littke **Contact email**: littkek@uw.edu
Award Numbers: 9.19	**Funding directorate/division**: IIP **Funding program**: I/UCRC
Highlight title: Estimating Fertilizer Response of Douglas-fir throughout the Pacific Northwest	

Highlight text (limit 300 words):

Two-, four-, and six-year fertilizer response has been analyzed on Douglas-fir plantations throughout the Pacific Northwest. Two-year response models have been published in the Canadian Journal of Forest Research in 2014. Greater basal area and volume response were found on installations with high forest floor C:N ratios, low basal area mean annual increment, steep slopes, and low soil available water supply ratings. Models predicting basal area, height, and volume response from mapped variables were projected across the Pacific Northwest to predict regions that would respond the greatest to fertilization. This research is still being prepared for publication, but the regions with the greatest predicted basal area and volume response are the Cascade Range in Washington and Oregon, Coast Range in Oregon, and the Klamath Mountains in Oregon (Figure 1).

Two-year and preliminary fertilizer response levels were discussed in a 2014 publication in Forest Ecology and Management. Douglas-fir trees showed the most response to fertilizer through basal area growth with 48% of the installations responding after two years while significant height response was seen in only 27% of installations. The percent of installations responding was halved in years 2-4 after fertilization. Although the incidence of response decreased, the average growth of responding stands remained the same in years 0-2 and 2-4.

In terms of *intellectual merit*, why was this outcome notable and/or important?

The researchers have identified readily available variables that can predict fertilizer response in Douglas-fir. The map presented here demonstrates the regions of the Pacific Northwest that will likely respond significantly respond to fertilization. The research on extended fertilizer response will allow industry professionals to estimate the timing of repeated fertilization throughout the region.

In terms of *broader impacts*, why was this outcome notable and/or important?

Previous research stated that 70% of Douglas-fir stands will respond to fertilization. Our research suggests that the percent of responding stands is quite a bit lower due to recent silviculture and the concentration of forest plantations on high productivity soils.

If applicable, tell us how this research is or may be transformational.

Research from the paired-tree study demonstrates that tree-based fertilization with on-site replication are able to measure fertilizer response at a cheaper cost and a smaller land requirement than plot-based studies.

If applicable, tell us how this research represents broadening participation.

This study was possible due to the cooperation of forest industries, government agencies, colleges, the Stand Management Cooperative, and the Center for Advanced Forestry Systems.

If applicable, tell us how the research may have societal benefits, e.g. the economy.

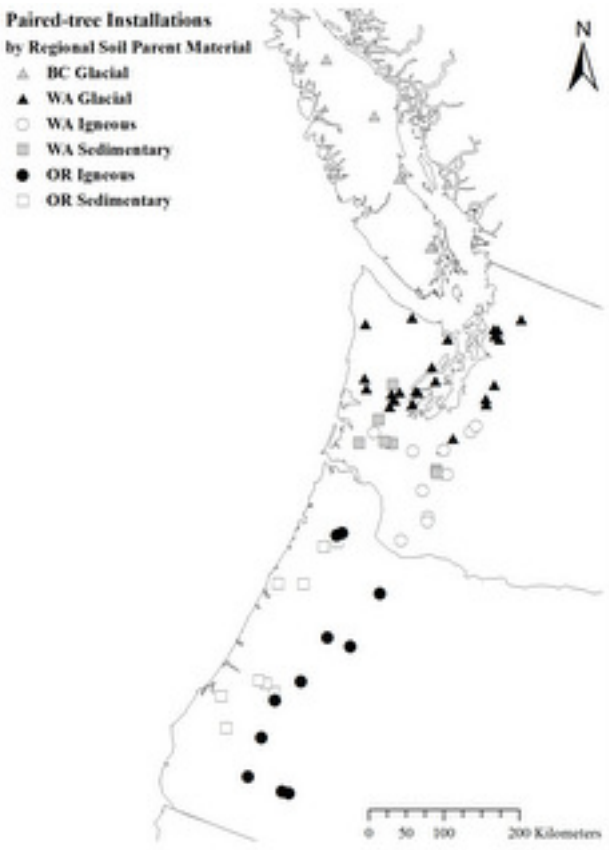
This study improved the understanding of where to avoid fertilization, which will save money spent on fertilization throughout the Pacific Northwest as well as lessening the amount of unnecessary nitrogen fertilizer applied to the environment.

Images are important. Please include one as a separate file with your highlight submission. Files must be GIFs or JPEGs. Maximum width and height are 240 pixels. Please submit the NSF Form 1515 with your image.

Image file name: 25 characters or less: FBARMAPC.jpg	Can NSF use the image? Yes

Image credit line: Kim Littke

Image caption: Predicted percent basal area fertilizer response throughout the Pacific Northwest according to boosted regression models of two-year response.


Paired-tree Installations
by Regional Soil Parent Material
BC Glacial
WA Glacial
WA Igneous
WA Sedimentary
OR Igneous
OR Sedimentary
N
0 50 100 200 Kilometers

Attachment C:

CAFS Developmental Milestones:
Since NSF's original Involvement in the
Tree Genetics Engineering Center (TGE)

5/1998 TGE Center Technical Meeting, Portland, Oregon. Preparation for a planning grant: Alex Schwarzkopf and Craig Scott, the NSF Evaluator, presented a summary of the IUCRC Program.

11/1998 TGERC Annual meeting, University of Washington Urban Horticultural Center, Seattle, Washington. Introduction to NSF I/UCRC Centers & LIFE forms (Schwarzkopf, Scott); Operational requirements of NSF I/UCRC Centers (Schwarzkopf); Evaluator role in I/UCRC Center function (Scott); Discussion of changes in TGERC from "conversion" to NSF/I/UCRC (Strauss); Presentation of LIFE form results (Meilan).

5/1999 TGERC Proposal submitted to NSF

11/1999 TGERC Annual meeting (Technical & IAB Meeting), LaSells Stewart Center, Oregon State University, Corvallis Oregon:

Major issues at the IAB meeting were: 1) the amount and nature of public concern about genetically altered products and their potential impacts on the environment, and 2) a new 26% indirect cost rate on sponsors' fees to be applied by OSU to all OSU cooperative research centers that that would take effect when NSF support ceases.

1/1999 Letter to Wilson Hayes, OSU Vice Provost, from John Trobaugh TGERC IAB Chair (The Timber Company), on behalf of the IAB, protesting the possible imposition of overhead charges on TGERC sponsor dues.

1/2000 Steven Strauss announced a 50% reduction in the 26% indirect cost rate that was to have been imposed by OSU on sponsors' fees when NSF support ceases.

8/2000 Center Director and Center Evaluator meet to discuss Center-related issues

11/2000 TGERC Annual meeting (Technical & IAB Meeting), Seattle, Washington: Meeting was proceded by short course entitled "Gene School II" chaired by Meilan and Bradshaw. Included within the Meeting was a report entitled "Flowering Control in Euculypts" by Simon Southerton of Australia's Commonwealth Scientific and Industrial Research Organization (CSIRO). Major issues at the IAB meeting were: 1) discussion of intellectual property, research conduct, confidentiality of results and publicity; 2) Review of membership projections, sponsor dues and implications for NSF support; 3) TGERC research directions, and; 4) summary/discussion of LIFE form numeric results and project-specific comments.

7/2001 Symposium on ecological and societal aspects of transgenic plantations (Skamania Lodge).

11/2001 TGERC Annual meeting (Technical & IAB Meeting), Corvallis, Oregon:Meeting proceeded by short course entitled "Gene School II" chaired by Meilan and Bradshaw. Included within the Meeting was a report entitled "Flowering Control in Euculypts" by Simon Southerton of Australia's Commonwealth Scientific and Industrial Research Organization (CSIRO). Major issues addressed at the IAB meeting were: 1) funding problems amidst consolidations; 2)

Review of membership projections, sponsor dues and implications for NSF support; 3) TGERC research directions; 4) the possibilities for affiliate memberships; 5) new funding or operations models; 6) the distractions of public controversies and the need for and implications of public interactions, and; 7) summary/discussion of LIFE form numeric results and project-specific comments.

11/2002 TGERC Annual meeting (Technical & IAB Meeting), Corvallis, Oregon. Major issues addressed at the IAB meeting were: 1) funding problems and center continuation as an NSF/IUCRC, and 2) Review of membership projections, sponsor dues and implications for NSF support.

3/22003 Purdue Planning Grant submitted to NSF.

11/2003 TGERC Annual meeting (Technical & IAB Meeting), West Lafayette, Indiana:

8/1/2004 Official start date of Purdue University's Center for Tree Genetic Research (CTGr) NSF/I/UCRC.

10/2004 CTGr Annual meeting (Technical & IAB Meeting), Corvallis, Oregon. Eight projects were presented at the technical meetings. The center essentially held two center meetings under an almost transparent umbrella of the Center for Tree Genetics (CTG). IAB meeting included: possible collaborating relationships with Kasetsart University of Thailand; interest in mechanisms for funding seed proposals; center growth goals and the possible addition of Virginia Polytechnic Institute and State University and North Carolina State University; activating/tagging direction, and; nomination of a new CTGr IAB chair (new chair to be from Purdue).

10/2005 CTGr Annual meeting (Technical & IAB Meeting), West Lafayette, Indiana.

1/2006 CTGr Directors' Planning Meeting of current Center administrators (Michler, Meilan & Scott) and NCSU's Tom Fox and Virginia Polytechnic Institute and State University's Barry Goldfarb, (Arlington, Virginia).

9/2006 CTGr Annual meeting (Technical & IAB Meeting) and CAFS Planning Meeting, Atlanta, Georgia): Schools represented – North Carolina State University, Purdue University, Virginia Tech and Oregon State University.

4/2007 University of Vermont, Purdue and Oregon State University receive IUCRC funding (effective May 31, 2007).

2/2008 CAFS Technical and IAB Meeting (Portland, Oregon). Topics addressed included: Center structure and function; IAB executive committee approved (selection of IAB chair to follow); voting process (proportional to dues); How to foster strong participation @ center meetings.

2/2009 University of Georgia and University of Main received I/UCRC funding, becoming CAFS's 5^{th} and 6^{th} sites (effective November 2, 2009). The University of Washington received an award letter just before the meeting. Both Florida and Idaho made brief presentations and were preparing to submit a proposal.

2/2009 CAFS Technical and IAB Meeting (Charleston, South Carolina). 68 total members, including: 21 large, 35 small, 12 governmental agencies & not-for-profit, 28 full and 40 associates. 8 new proposals presented; 6 continuation presentations. The new CASF

sites (Georgia and Maine) made presentations about their research capabilities. Florida and Idaho made capability presentations as potential new sites. IAB meeting included: Executive committee (structure, function, nominations and appointment by acclamation); project voting (satisfaction with last year's funding allocations, ideas for obtaining greater voting participation); membership agreement – minor modification needed [to reflect new sites without naming them in the standard agreement - no re-signing should be needed]; open and closed discussion of potential new sites (Florida and Idaho). Both of the aforementioned schools received approval from the IAB to go forward with their proposals.

4/2009 University of Florida becomes 7th CAFS site (effective April 2, 2010).

11/2009 University of Washington becomes 8th CAFS site (effective November 30, 2009).

2/2010 University of Idaho becomes 9th CAFS site (effective February 1, 2010).

4/2010 CAFS Technical and IAB Meeting (Indianapolis, Indiana). 58 total members (not including Idaho's 4), including: 24 large, 49 small, 8 governmental agencies & not-for-profit, 46 full and 43 associates. Presentations included: 11 new proposals; 2 completed and 12 continuing projects. IAB meeting included: overall discussion of LIFE feedback (project-specific discussions occurred after each session); business meeting. Field trip hosted by Hardwood Tree Improvement and Regeneration Center (HTIRC) to Danzer/HTIRC research plots and the ecosystem experiment in Morgan-Monroe State Forrest.

6/2011 CAFS Technical and IAB Meeting (Seattle, WA). 99 total members made up of 44 full and 55 associates. There are an estimated 23 large, 60 small, 9 governmental agencies & 7 not-for-profit (involving special arrangements). The technical meeting included: 11 continuation proposals and 1 new one; 2 completed and 12 continuing projects. The meeting followed an innovative agenda format that reduced the number of presentations and increased time for two-way communications by having a series of 11 single highlighted presentations followed by a total of 13 focused, grouped poster sessions. LIFE forms were completed on presentations and posters and feedback was discussed. There was an invited talk by Eric Vance of the National Council for Air and Stream improvement. The closed IAB meeting included: election of replacement members for the executive committee (it has 9 members; 1 per site); discussion of the meeting format and of support from industry for student travel (this year sponsors donated $4,500); discussion of graduate student participation at annual meeting; discussion of CAFS functioning (controlling meeting costs, center processes and projects); Possible collaborations with other NSF's IUCRCs; Planning for Phase II of CAFS, and; date for 2012 meeting in Maine.

6/2012 CAFS Technical and IAB Meeting (Bangor, ME). Meeting included 3 final reports, 6 proposals for new projects, 15 posters that updated continuing projects, and an update of the CAFS Fundamental Research Project on the use of stable isotopes to tract nitrogen that is on a no cost extension. CAFS reported 99 total members made up of 47 full and 52 associate members. There are an estimated 23 large (>500 employees), 60 small, 9 governmental agencies & 7 not-for-profit (involving special arrangements) and foundations. Center consists of a core of over 25 faculty, 4 post-docs, 16 doctoral, 17 masters, and several undergraduate students. In 2012, 7 PhD and 8 MS students completed their studies. Eighteen (18) students are continuing their graduate studies (9 PhD, 9 MS). IAB meeting agenda included: In-kind memberships; potential new NSF IUCRC Fundamental Research Proposal; possibilities for an International Supplemental Proposal;

8/2012 NCSU, OSU, Purdue and Virginia Tech receive Award Letter for Phase II

3/2013 Auburn University, 10th CAFS site (effective Mar 01, 2014, expires Feb 28, 2019).

4/2013 CAFS Technical and IAB Meeting (St. Simons Island, GA). Meeting included 7 final reports, 7 proposals for new projects, 1 continuing project and 12 ePosters. IAB items included: election of University of Florida Executive Committee Member (a nine member group that: 1) consults amongst site directors and recommends allocation of resources amongst projects and, 2) handles needed between-meeting business and concerns; Update on fundamental research proposal; Update on Auburn University's proposal to become the 10th university site; Discussion of meeting format (combination of plenary and ePosters), and; Graduate student and post doc participation at meetings (most want to continue presentations by graduate students, perhaps with more pre-and during-meeting quality control by the PIs - a few wanted PIs to do all presentations but this was not a majority nor a consensus); Managing director opportunity, and; Open discussion of CAFS functioning process and projects.

3/2014 Auburn University becomes 10th CAFS site (effective March 1, 2014).

4/2014 CAFS Technical and IAB Meeting (Coeur d'Alene, Idaho). Presentations included: 7 final reports, 10 new proposals, 12 continuing/ePoster, and an update on the ongoing fundamental research project. IAB meeting included: executive committee nominations and elections (one member needed from each site); nomination and election of new IAB chair (Randall Greggs of Green Diamond Resource Company elected to a 1 year term); discussion of timing, process, and potential topics for future fundamental research projects; a discussion of the role of the deputy director (such things as: outreach/communication, methods for elevating the visibility of CAFS' coops, increase collaborations, obtaining additional funding, and increase graduate student involvement). An industry only IAB session was convened at which there was no particular agenda. The following items were discussed: 1) Are projects being presented that received no of little support from the IAB? If so, the IAB would like to know why. 2) There was a consensus amongst the IAB that there needs to be more quality control; a mechanism or process for better assuring that the science and the hypotheses are more consistently sound. Concern was expressed by some that some conclusions could have been tighter and thus more in line with the results, or lack thereof. There was also concern expressed that some of the final reports had not really been brought to a conclusion. The IAB wants final reports that are not quite final to be finalized, updated in writing and posted permanently on the website. These are the deliverables that sponsors want. On balance there was a consensus that the work coming out CAFS is, on the whole, better than was being produced heretofore. There was support for a project numbering system. Finally, the IAB wants a mechanism to have private discussions about new proposals, perhaps after each one's presentation, so that better guidance could be given to either improve or forestall proposals that should be improved before they move forward. One suggestion: Perhaps have all new proposals on day one, before the LIFE forms are filled out.

NEXT MEETING: May 2015 in Ashville, North Carolina.

Attachment D:

CAFS Annual Meeting Best Practice Checklist

[Annual Meeting: May 2014]

☐ The Center has 2 face-to-face meetings of IAB, Center scientists & students per year:
- ☐ One primarily dedicated to proposal presentations w/ LIFE feedback (+ closed IAB Mtg).
- ☐ One primarily dedicated to technical review of progress w/ LIFE feedback (closed IAB Mtg).

Comments: CAFS has exemption for 1 mtg per year. Excellent attendance, participation and collaborative spirit. Always a mix of presentations

☒ At Point of Registration, "Non-Disclosure Form" is signed by each non-member industrial attendee. Comments: Available, but no visitors.

☐ At Meeting: "Closed Meeting" sign posted;

☐ Materials (including PPTs) labeled "Center Proprietary"

☒ A "List of Attendees" (industry, university) is contained in each attendee's registration packet.

☒ A Center Update Report that includes:
- ☒ A review of the center's vision and research roadmap and/or priorities
- ☒ A membership status report (including MIPRs and/or gov agency commitment involvement)
- ☐ An annual financial statement x site (w/ member fees collected & amt available for projects)
- ☒ Some discussion of center-related technology advances & economic impact
- ☒ An up-to-date listing of publications list plus PI awards & research highlights (OK if online)

Comments:

☒ A common presentation template is used and adhered to by most presenters (w/deliverables, milestones, timetable, budget & time limits).

Comments:

☒ 1-page executive summaries are available to all attendees at each bi-annual IAB meeting.

Comments: Online before the meeting.

☒ LIFE forms are completed following each presentation.

Comments: For all presentations except final reports

☒ LIFE feedback is discussed by industrial attendees in session(s) scheduled for that purpose.

Comments:

☒ There is a closed IAB session (members can make it open) that includes an opportunity for IAB representatives to raise and discuss issues about center policies, procedures and research direction.

Comments: There was an effective "IAB only" closed door session within the closed IAB session.

☒ A "state-of-the center" discussion by IAB members.

Comments:

☒ Clear procedures (voting/ranking) are used for project continuation/selection.

Comments: Voting occurs after the meeting. Voting is proportional to level of membership

☒ Meeting activities are included that support industry/ university networking; such poster sessions, evening hors d'oeuvres or dinner, and industry-driven mentoring sessions.

Comments: Very effective ePoster sessions

☒ A discussion of and preferably a decision on the date and location of the next meeting.