

Collaborating for a Thriving Maine Forest Sector

by Katrina Pugh, Emily J. Uhrig, Meg Fergusson, Aaron Weiskittel, Shane Moeykens, and Jo D. Saffeir

INTRODUCTION

Much was at stake for the northern forests when a group of community leaders from industry, education, academia, government, and conservation came together in February 2023. The group was convened to weigh in on Maine's proposal for a \$7 million grant from the National Science Foundation (NSF) "Established Program to Stimulate Competitive Research" (EPSCoR) Research Infrastructure Improvement (E-RISE). Community leaders and grant planners explained their aspirations for EPSCoR, along with a sense of urgency to collaborate. Our report (Pugh et al. 2023) had found that collaboration was not optional if we wanted to sustainably grow the sector, address climate change, and increase community well-being.

In this commentary, we describe a coming together of the EPSCoR planning team with community leaders across the northeastern US forest sector. They came in support of this high-stake NSF proposal and in support of each other. As a result, their transdisciplinary deliberations on data and artificial intelligence (AI), economics, inclusion, and learning not only generated inputs to the recently announced \$7 million NSF EPSCoR E-RISE award (OIA-2416915), but also gave them new language to describe their collaboration capacity.¹

BACKGROUND

The forest sector in Maine, the largest in the Northeast, had an estimated impact of \$8.2 billion on the state's 2020 economy and contributed nearly 40,000 jobs (Leefer et al. 2020). Today, the sector is at a crossroads. Fourteen pulp or paper mills have closed in Maine since 2000, and only six remained as of 2017 (Crandall et al. 2017). Affluent recreation and tourism enthusiasts have migrated to Maine forests to escape congested cities, especially during the pandemic. The lure of "monetization" has (erroneously) pushed some landowners to think that they must choose between engaging in carbon markets and managing forests for production. At the same time, social media is rife with misinformation, including sensational articles on clear-cutting or deforestation of public lands, as reported by David Abel (2022). Community leaders interviewed for this article expressed this concern vividly:

Younger people who see how industrial forests have been overharvested want to stay away. They see a landscape of beech sprouts and they just don't trust any of the players.

—Forest Community Leader

Polarization around productive forests and environmental services presents a major obstacle for researchers and organizations. This fact was not lost on the grant planning team, which in

November 2022, began exploring ways to bring the community together to plan an NSF EPSCoR bid.

What began as "stakeholder conversations," turned into a mandate for "transdisciplinary collaboration" (Lawrence et al. 2022). The planning team looked to understand the diverse perspectives of community leaders and to find common ground. We began by conducting knowledge-sharing conversations with 11 community leaders from industry, government, land conservation organizations, pulp and paper manufacturers, research institutes, nondegree training organizations, and universities.

Leaders spoke candidly about forest management, workforce education, research, conservation, policy making, and Indigenous rights. Leaders were enthusiastic about the role of forests in climate and economy and about networking with each other. They generated dozens of recommendations, which our planning team consolidated into an eight-item "wish list" (Table 1).

Our team expressed concerns over the wish list items that were coming from Maine's government institutions, nonprofits, and industry players. The wish list reflected the fragmentation that leaders observed in the current policy responses to the industry's problems. Yet, it also exposed a remarkable consensus among community leaders.

Several leaders felt cross-disciplinary networks could help make progress on the wish list by increasing transparency, scale, reach, and cohesion as Pugh and Prusak (2013) describe. Yet the discussions revealed that there were already 19 relevant networks—a high number for an extended sector of only 40,000 workers. Community leaders pointed out that there were possibly too

TABLE 1: **Community Leaders’ Wish List for Content in the NSF EPSCoR Project Proposal**

Wish list item	How	Named by
Target and spread forest learning	Develop and integrate nontraditional educational opportunities (e.g., nondegree, onsite or in the field, professional, and bridging experiences, such as gap year and fellowships). Target a range of learners, from K-12 through career changers.	73%
Control the narrative	Study misinformation patterns about forests; carbon use, sequestration, and storage; and careers. Academia, industry, government, community organizations, and nongovernmental organizations must work together to pilot and deploy campaigns that convey the rationale for viewing the forest as a solution for climate and economic issues.	64%
Democratize data	Large volumes of data need to be continuously synthesized, curated, and shared (e.g., sensor data; green, nanocellulose, mass timber product data; market data; supply chain data; citizen science data; education and training data).	55%
Harmonize data science, cultural literacy, and policy	Give prospective workers hands-on experience in both the hard and soft sciences: data science, engineering, cultural intelligence (e.g., diversity in ways of knowing), policy and policymaking.	45%
Make the forest work-life blend viable	Understand, improve 360-degree experience of forest industry workers, such as housing (including local wood, cross-laminated timber, 3-D printing), broadband, health care, and other community attributes.	36%
Increase risk literacy	Understand risk to investor, worker, and town from forest-related business opportunities. Consider risk-profile changes and understand risk by segment, especially in light of technology, climate, demographics, competitive use of capital, time, public investment, and social capital.	27%
Professionalize and pay for mentoring	Coordinate natural resource professionals and scientists who will provide mentoring, guidance, career counseling, training, and professional contacts	27%
Integrate Indigenous and inclusive decision-making	Incorporate different ways of knowing (especially Indigenous, other cultures). Forest management decision-making has traditionally been top-down. Incorporate decision-making models that respect local knowledge and management.	27%

Note: List generated from 11 knowledge-sharing conversations with community leaders in which we asked what they hoped would be in the NSF EPSCoR proposal. Sorted based on the percentage of community leaders who mentioned this wish list item.

many networks, with too many overlaps, and not enough support in terms of funds, volunteers, and awareness. In other words, a fix to the wish list fragmentation was fragmented itself.

Our belief was that, through conversations, these community leaders could reconcile the seemingly contradictory objectives of rural economic vitality, forest management, climate readiness, forest workplace attraction, and data science. Judging from the energy in the knowledge-sharing conversations, we suspected that leaders could generate unconventional, integrated solutions and connections to

each other if they were in conversation. Those solutions and connections, in turn, could inform the NSF EPSCoR research and policy agenda.

We staged a virtual, two-hour discussion in February 2023. Twenty-three community leaders and researchers were invited to this virtual meeting. Ahead of the meeting, we consolidated the wish list into four discussion breakout categories: data/artificial intelligence (AI), economics, inclusion, and learning (Table 2).

Once in the virtual meeting, we divided the group into four breakout groups corresponding to the four

wish-list categories. Each group had both planning team and community leaders in it.

From the reports we received from the groups, we knew we were making progress. Each breakout group added unconventional twists to their topics, as we elaborate below:

- data/AI as syncing ways of communicating,
- economics as working with analogies,
- inclusion as drawing out different ways of knowing, and
- learning as having the psychological safety to (also) *unlearn*.

TABLE 2: Meeting Breakout Categories Generated from Wish List

Breakout category	Original wish list items
Data/AI	• Democratize data • Control the information and narrative
Economics	• Better understand risk for individuals and towns • Make forest work-life blend viable
Inclusion	• Integrate Indigenous and inclusive decision-making • Harmonize data science, cultural literacy, and policy
Learning	• Target and spread forest learning • Professionalize and pay for mentoring

NEXUS SKILLS

As part of this project, the research team was also examining the nexus skills on display within each group. Coined in partnership with Hargadon (2003), former ETS (Educational Testing Services) innovation director, T.J. Elliott (2014), uses the term “nexus skills” to describe the practices for translating and remixing ideas across disciplinary, status, cultural, geographical, and other boundaries, in a word, *bridging*. Nexus skills are critical for policymakers responsible for integrating contradictory positions and perspectives, and, in turn, designing novel and inclusive programs. Elliott explains that nexus skills involve the capacity to empathize and name unique perspectives, to translate terms and concepts between disciplines, and to invest in having a forum for speaking up, even when it’s uncomfortable to do so. Nexus skills require what Hargadon (2003) refers to as having a foot in different worlds and are essential to boundary work. Clark et al. (2016: 4) point out that boundary work includes “tailoring [options] to local decision-makers’ needs and language.” That is, language everyone can relate to, rather than industry jargon. One of our tribal community leaders described this practice as integrating and respecting different “ways of knowing.” This table describes nexus skills on display among the participants.

Nexus skill	What is it?
Vocabulary sync	Translating terms across different domains (Data/AI group)
Analogies	Borrowing a narrative from another context (Economics group)
Systems perspective	Seeing novel interconnections, feedback loops (Inclusion group)
Trust-building	Building trust about the sector and by the sector (Learning group)

Nexus skills may contribute to resolving sustainability dilemmas and may help make science a place where diverse voices are heard and incorporated.

FINDINGS

Data/AI

The data/AI group argued that all data (especially open data and citizen science) can be a source of sector-wide transformation. For example, democratized data could improve the applicability of forest management, climate science, and advanced manufacturing to common problems. The data enterprise, they argued, should integrate data (including satellite data) on climate, biodiversity, human behavior, social media, supply chains, Indigenous knowledge, and community sentiment. The group specifically called for having the community collectively manage the data enterprise, including overlayed GIS data and media-based (mis)information.

There is a huge need for data management professionals with expertise in specific domains, or collaborators with natural resource expertise.

—forest community leader

The data/AI group advocated a vision of public interest technology, which Toomey and Sweeney (2022) wrote, “works for good, for all, for now, and into the future.” The data/AI group described a need for “greater resolution across both biological and social challenges.” They argued that, at several scales, different terms apply, and that translating those terms can help local decision-making. They went on to point out that researchers and local land managers could discover common objectives when they take the time to translate their objectives into terms that each is familiar with. The group highlighted the opportunity to connect youth who are interested in data and AI, but who are unaware of forest sector data. Games, immersive AI, virtual reality, and other digital experiences, they contended, were important ways of

drawing in younger workers and researchers.

Economics

The economics group had a similar concept of translating, but at the scale of story. They pointed to headwinds for the forest-sector economy, such as surging energy prices, capital equipment costs, and labor shortages. The group pointed out that carbon markets complicate the economic outlook with both a short-term opportunity for cash flow, but also uncertainty about the markets' longevity. They added that the misinformation about forest management further drives investor and worker hesitancy. While there are government, nonprofit, and industry efforts to address such perception issues, they stressed that success stories need to be told.

The group recommended translating lessons learned from several other sectors and programs. One group member introduced an analogy. They proposed that the northern forest sector could learn from public health programs. Another group member suggested learning from multiple other states' forest-sector programs to determine what is "portable."

Inclusion

The inclusion group members saw that inclusion practices—centering diversity, equity, and inclusion—are an attempt to stem a wicked problem (a problem that is difficult to solve), influenced in nonlinear ways by many factors (Lawrence et al. 2022). Factors include immigration, local knowledge, training, health care, local amenities, and (sometimes outdated) assumptions. A group member added that new Americans face many economic and social obstacles:

At the community level there are housing challenges. But, there are also issues about welcoming these people of different

racial and cultural backgrounds. This goes beyond the workplace itself.
—forest community leader

The inclusion group pointed out that every rural family has unique needs, some of which are difficult to provide at small scales. The group reinforced the economics group's message: To scale up, the northern forests need to address the whole system. Inclusion initiatives must encompass everything from pulp and paper engineering, to data science, cultural sensitivity, and even springtime potholes (Figure 1).

One member of the inclusion group remarked that diversity as part of the research agenda and diversity in the stakeholders contributing to it are both a national priority. They pointed to the National Science Board's recent resolution to address the "missing millions" (Blatecky et al. 2021). Other inclusion group members suggested studying programs like Hubbard Brook Research Foundation's "Welcome to the Woods."² Others added that a lesson could be learned from the Maine Forest Products Council's (2023) advocacy for a state-wide investment in child care.

Learning

The learning group pointed out that workers have to trust the sector and have confidence in their ability to move up professionally. The sector businesses, in turn, have to trust nontraditional workers, working arrangements (such as hybrid or role-sharing), and worldviews. One group member put it bluntly:

If you don't have the trust of the younger generation, as you think about partnerships, you lose them. You need to include the trust factor.
—forest community leader

The group highlighted several obstacles to trust building, the first of which being the forest-sector image. One participant noted, "Some people

don't see the forest sector as part of the green economy. People hear about clear-cutting and don't venture to learn about career opportunities." As Jason Wilson (2017) described for logging in the Northwest, many workers are unaware that there are less dangerous forest jobs, such as data science, lab research, and riding high-tech forwarders with mechanical arms.

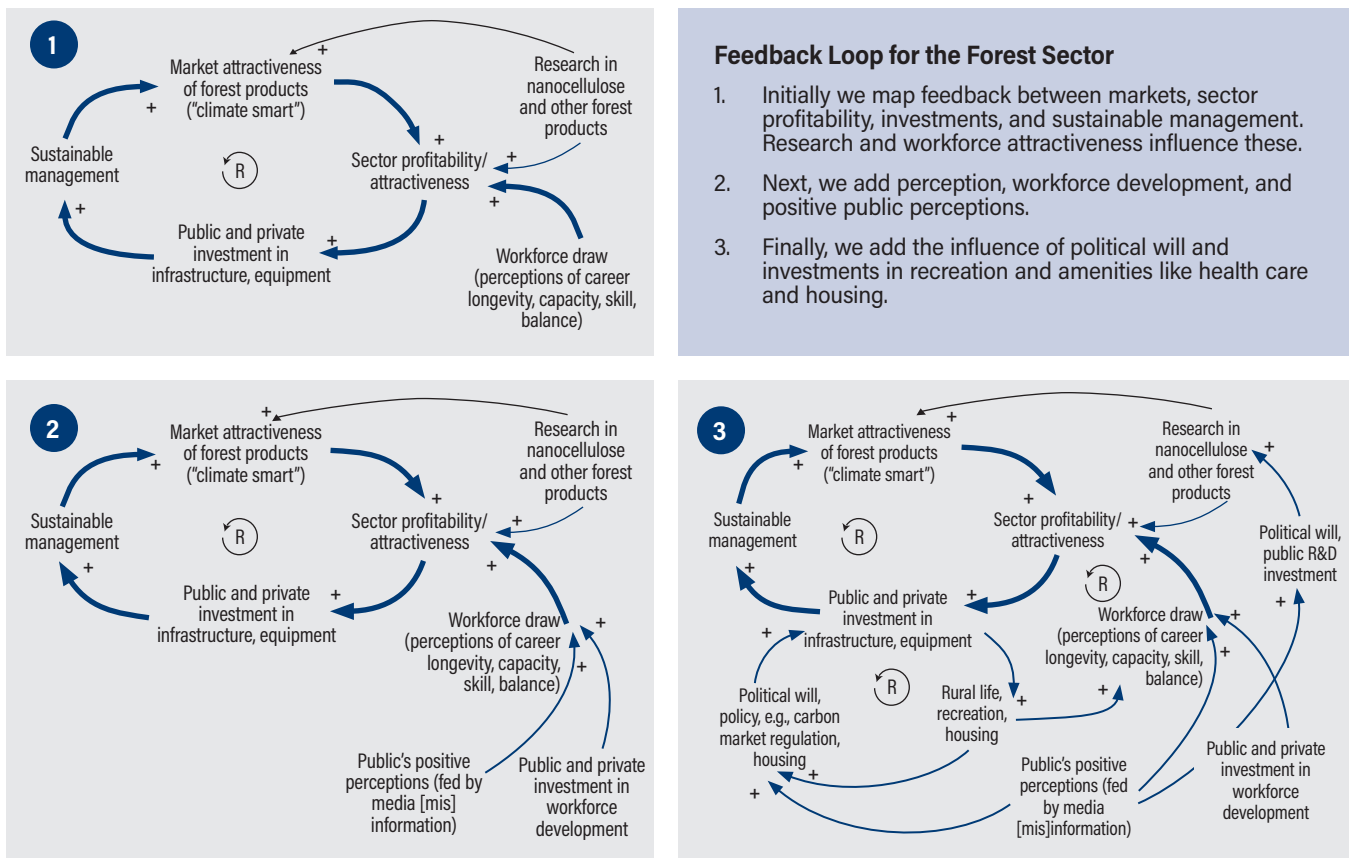
One community member in the knowledge-sharing session before the workshop argued that while it's important to debunk the myths, it's equally important to bring in topics that are more relatable to a modern learner. "We can't change society, cultures, and lifestyles, but we can meet people where they are," the participant noted. Varying the learning content in forestry education programs is one form of meeting people where they are. The community member went on:

Students interested in forestry are more interested in broader issues, such as resource management, public policy, and water resource issues for the Penobscot Nation. They are interested in tribal well-being.

—forest community leader

Varying the learning modality is another form of meeting people where they are. Accommodating the rapidly changing demographics of learners needs to be a priority, the group noted. The group pointed to mentorship and internships, such as those at forest management company Sappi North America. Examples of existing Maine forest education programs include webinars, field tours, e-newsletters, projects, summer programs, camps, and scouting. These are offered by UMaine's Center for Research on Sustainable Forests and within the Consider Engineering four-day summer program for high schoolers, offered by the University of Maine's Pulp and Paper Foundation.³

FIGURE 1: Feedback Loop for the Forest Sector



Note: "R" means that the loop reinforces. "+" means that, when the item at the beginning of the arrow goes up or down, so, too, does the item on the end of the arrow. "-" means that they move in opposite directions.

For employers, meeting people where they are is a necessity when public programs, statewide publicity, and immigration policy widen the labor pools. These programs help the sector to integrate nontraditional backgrounds (e.g., nonscience majors, people from out of state, and new US citizens or residents). To build trust among nontraditional learners and their forest-sector partners, the forest sector is effectively using its own "tactics of trust" as Sawyer and Ehrlichman (2016) call it. Hubbard Brook Research Foundation's Welcome to the Woods provides a good example of the use of such tactics.

POLICY IMPLICATIONS AND FUTURE ACTIONS

From these group discussions we can distill a set of policy implications and future actions that can help ensure Maine's forest sector will thrive. The policy implications from the data (AI) group include increased investments in AI literacy (with data harmonization across sectors), improved data management, open access to these data, and more education around the ethics of data collection and inclusion. Policy implications from the economics group include the need to design programs with multiple scales in mind, to think

about state and federal investment at the same time, and to couple regulations with economic incentives. In addition, the economics group recommended the environment, social, and governance (ESG) policies of departments, corporations, and nonprofits glean implementation ideas from other sectors.

Policy implications from the inclusion group included education, data collection and continuous improvement on diversity, equity, inclusion, and accessibility (DEIA) standards. Notably, they also recommended that the systems perspective should reflect traditional ecological knowledge, and that in policy

centers, such as the Margaret Chase Smith Policy Center at the University of Maine and the Goldfarb Center for Public Affairs at Colby College, multiple disciplines should team up routinely (e.g., economic developers, cultural designers, traditional knowledge-holders, and environmental policy experts).

When each breakout group summarized the headlines from their discussions, one participant pointed out that the boundaries of the categories were becoming “porous.” Thus, at the meeting’s end, participants reframed the remedy for forest-sector problems and opportunities as practices that could be used across the topics of data/AI, economics, inclusion, and learning. Participants advocated for policies that fostered collaboration, experimentation, and knowledge co-creation:

1. **Collaborate and translate:** Cut across data/AI, economics, inclusion and learning categories. Describe the positive feedback loops from these (as in Figure 1).
2. **Pilot, adapt, and spread:** Take action, initiating (or expanding) pilots and connecting the line the between those pilots or projects.
3. **Manage knowledge, big and small:** At a macro scale, brand the forest sector as the green economy, and use that as an opener for (co)learning. At a local scale, use mentoring and internships to improve workers’ self-confidence and affinity for the sector.

Ultimately, the planning team emerged with a proposal that was more convergent and coherent, and that won the \$7 million NSF award. Meanwhile, the community leaders showed each other that they are equipped and

motivated to collaborate. Notably, they showed themselves to be allies who are unafraid to jump over disciplinary lines, share practices, and widen the perspective. As Hsiao and Wei-Skillern (2022) wrote about network leadership, our participants were prepared to “invest in building authentic, trust-based relationships as the foundation.”

One community leader expressed this nicely, “I would love to see how we could combine initiatives, raise funds, put the pieces together, and maximize collective impact.” Indeed, more than 10 years after John Kania and Mark Kramer (2011) described the term, a *collective impact* for a thriving Maine forest sector is likely, thanks to the award of the NSF EPSCoR Research Infrastructure Improvement E-RISE (OIA-2416915), and a cross-disciplinary community of leaders ready to bring together data/AI, economics, inclusion, and learning to get the project done.

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NOTES

- 1 The support for this work came from an NSF EPSCoR Planning Grant award (OIA-2241675) and an NSF RII E-RISE award (OIA-2416915).
- 2 <https://hubbardbrook.org/welcome-to-the-woods/>
- 3 <https://umainepfp.org/consider-engineering/>

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Katrina (Kate) Pugh is a researcher and educator on human behavior, data science, and the environment, using generative AI to measure the impact of collaboration on sustainability outcomes. Since 2011, Pugh has taught at Columbia University's Information and Knowledge Strategy's M.S. program in the School of Professional Studies. She held leadership roles at JPMorgan, Intel, and Fidelity Investments and worked as a consultant with EY, PwC, Deloitte, and AlignConsulting.

Emily J. Uhrig is a collaborative project coordinator for the University of Maine's Center for Research on Sustainable Forests. She has a research background in zoology and extensive experience in teaching and science communication. At UMaine, Uhrig's role has included working on an NSF EPSCoR RII Track-2 project and an NSF NRT project, wherein she has focused on facilitating collaborations and supporting students.

Meg Fergusson is the communications and outreach specialist for the University of Maine's Center for Research on Sustainable Forests (CRSF), where she leads a wide range of strategies to engage researchers and disseminate complex research content and convey its relevance to stakeholders, policymakers, and the public. She is responsible for developing creative content for CRSF's website and social media outlets. Prior to joining CRSF, Ferguson worked for many years in academic publishing.

Aaron Weiskittel is the director of University of Maine's Center for Research on Sustainable Forest and NSF's Center for Advanced Forestry Systems, as well as the principal investigator on the NSF EPSCoR RII Track 1 planning grant and RII e-RISE award. Weiskittel is an applied forest scientist with extensive academic and private sector experience. His research focuses on broad-scale forest dynamics and trends from a quantitative lens that supports practical decision-making tools.

Shane Moeykens has been the Maine EPSCoR director at the University of Maine since 2015, serving as the associate project director of two NSF EPSCoR RII Track-1 projects and the principal investigator of an NSF EPSCoR E-CORE RII project in that period. Before joining the University of Maine, he worked in the engineering industry for more than 20 years.

Jo D. Saffeir is a natural resource professional with over 30 years of consulting experience in the fields of forestry, agriculture, natural climate solutions, land conservation, and environmental philanthropy. She currently serves in the administration of Governor Janet Mills as special assistant to the commissioner of the Maine Department of Agriculture, Conservation and Forestry.