



# Northeastern States Research Cooperative Annual Report 2023/2024



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## Northeastern States Research Cooperative

*Knowledge to guide the future of Northern Forest communities*

[BROWSE OUR PROJECTS](#)

[VIEW FUNDING OPPORTUNITIES](#)

[PUBLICATIONS](#)

### Northern States Research Cooperative Releases 2025 Indigenous Forest Knowledge Fund Request for Proposals (RFP)

The Northeastern States Research Cooperative (NSRC) is pleased to announce we will award up to \$1.2 million in 2025 to support projects with budgets ranging from \$75,000 to \$500,000 for one- to three-year funding terms. Project leaders and/or project settings shall be directly related to Tribal homelands/territories or ancestral territories of the Northern Forest region. **Proposals are due August 15, 2025.** [Learn more.](#)

### The Northeastern States Research Cooperative announces eighteen funded research projects

The Northeastern States Research Cooperative (NSRC) is pleased to announce 18 grants totaling nearly \$4.5 million of federal funding and close to \$2 million of matching funding for research that will focus on areas of concern identified by forest stakeholders in the Northern Forest region: State of the Forest, Measuring & Quantifying Impacts, Developing Tools for Response, and Rural Community & Economic Development. [Download the press release.](#)

### NSRC in the news

[How Vermont got so many town forests](#)—Vermont Public

[Past, Present, and Future: Ferrying Frogs and Measuring Mice](#)—Schoodic Institute

[PSU professors researching fire management practices in the White Mountain National Forest](#)—The Clock

#### New Publications:

Timalsina, S., Rahimzadeh-Bajgiran, P., Das, P., Meireles, J. E., & Bhattarai, R. (2024). Monitoring Eastern White Pine Health by Using Field-Measured Foliar Traits and Hyperspectral Data. *Sensors*, 24(18), 6129. <https://doi.org/10.3390/s24186129>

Wei, X., Hayes, D. J., Weiskittel, A., & Zhao, J. (2025). [Warming-driven shifts in dominant tree species potentially reduce aboveground biomass in northeastern United States forests.](#) *Forest Ecology and Management*, 580, 122536.

### Featured Projects



#### [Monitoring Moose and Other Wildlife on Penobscot Indian Nation Lands](#)

Moose and other wildlife are culturally important and a source of food for the Penobscot Indian Nation (PIN). However, recent declines in regional populations due to winter ticks have caused concern among the Tribe. NSRC researchers developed a multi-species monitoring program using remote

The NSRC website serves as a source of information about the program and a repository for results from funded projects. Webinar recordings, researcher profiles, grant RFPs, and project reports by NSRC researchers are accessible at [nsrcforest.org](https://nsrcforest.org).

## Message from NSRC Executive Committee

From 2001 to 2016, the Northeastern States Research Cooperative (NSRC) was a critically important source of funding for applied forest research and outreach efforts throughout the Northern Forest. During those years, the program has supported more than 335 projects, across 50 organizations. After years of declining congressional funding for the program followed by no funding from 2017-2019, we were delighted that Congress reinstated funding to support the NSRC in 2020. Our revitalized NSRC 2.0 strived to put regional forest research to work again across the Northern Forest in support of a vibrant and thriving economy and culture, rooted in forest health.

We are pleased to showcase here NSRC's revitalization progress and scientific contributions to the economy and culture of the Northern Forest. In 2023/2024, 23 projects were funded with nearly \$6.3 million to explore a broad range of concerns related to land use and sustainable forestry, rural communities and economic development, climate change, biodiversity, recreation and tourism, invasive pests and diseases, and Traditional Ecological Knowledge. These projects were carefully vetted by an external stakeholder panel, which prioritized research based on the potential to engage stakeholders and to have meaningful impact to the region. In future reports and on our website, we will share broadly the results and outcomes of these projects over the next three years.

In the meantime, with ongoing Congressional funding, we look forward to supporting high-impact science in 2025 with direct relevance for healthy forests, and welcome any and all feedback as we move forward.

Sincerely,

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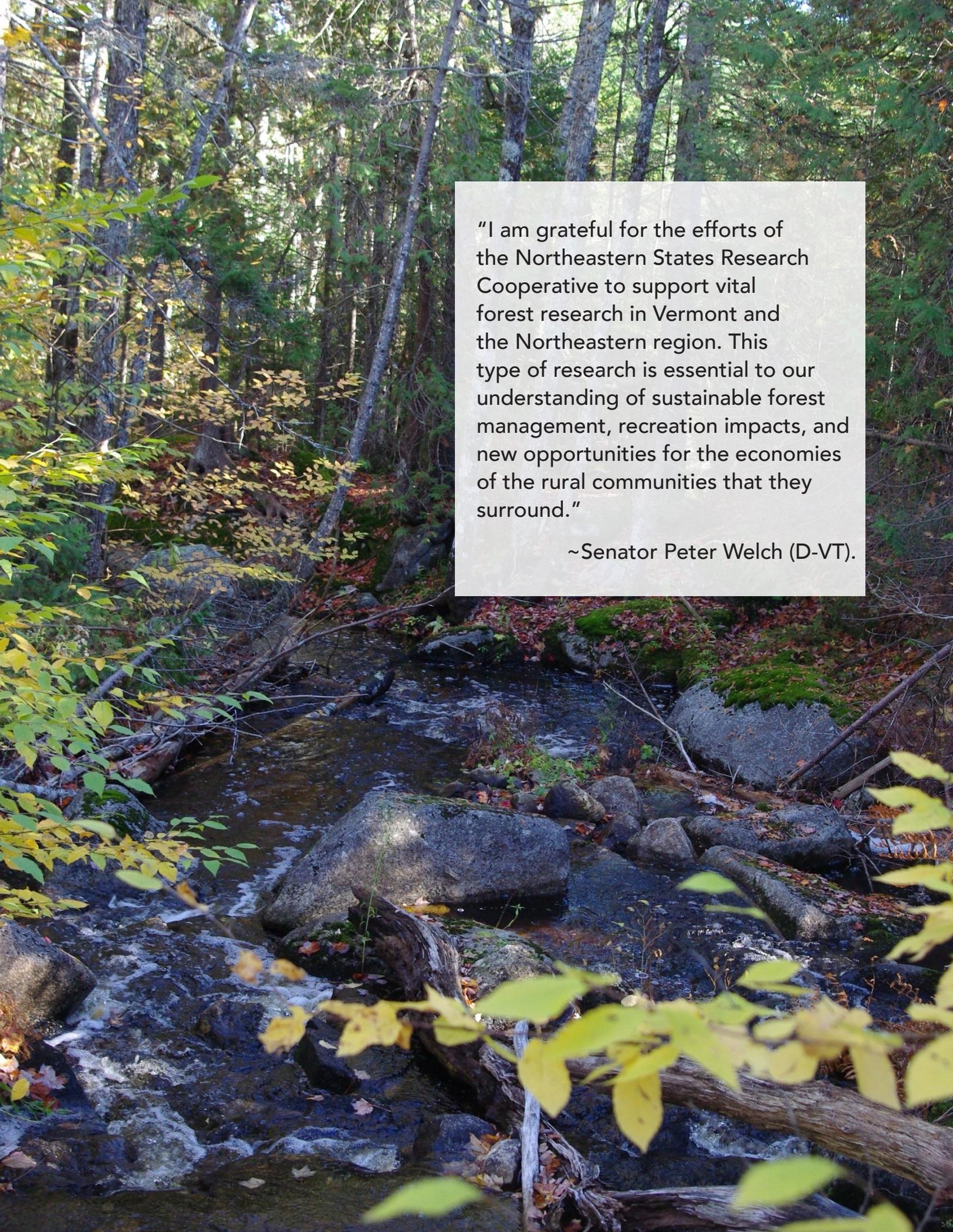
The mission of the Northeastern States Research Cooperative (NSRC) is to foster research that is relevant and beneficial to the people who live within the Northern Forest boundaries, work with its resources, use its products, visit it, and care about it.

NSRC aims to link research to practice to make a difference in forest-based communities. In this request for proposals (RFP), NSRC seeks to advance problem-driven research that yields actionable results useful to and used by forest stakeholders and decision-makers.

NSRC funds research, supports outreach, and catalyzes actions that balance protection and utilization of the Northern Forest.

# Contents

<b>Program Overview</b> .....	6
History .....	6
2001-2019 .....	6
2020-2023 .....	6
Collaborative Management Model .....	8
NSRC General Goals .....	8
NSRC Organizational Structure .....	9
Partnerships .....	10
NSRC Funding .....	10
<b>Advisory Committees</b> .....	13
External Advisory Committee .....	13
Tribal Nations External Consultants .....	15
<b>Research Proposal Process, 2023</b> .....	17
Overview .....	17
RFP Process .....	17
Indigenous Forest Knowledge Fund .....	19
Awarded Projects: 2023 .....	21
<b>Program Impacts</b> .....	28
Project Diversity .....	28
Recent Program Outputs .....	28
Prior Program Updates .....	30
<b>Appendix A</b>	
NSRC Congressional Authorization (Public Law 105-185) .....	32
<b>Appendix B</b>	
External Advisory Committee 2021 Summary Report .....	33
<b>Appendix C</b>	
List of the institutions represented in funded projects .....	37

A photograph of a forest stream flowing over rocks, with trees and foliage in the background and foreground. The stream is the central focus, with water cascading over large, dark grey boulders. The surrounding forest is dense, with trees showing signs of autumn, including yellow and orange leaves. The lighting is soft, suggesting a shaded forest environment.

"I am grateful for the efforts of the Northeastern States Research Cooperative to support vital forest research in Vermont and the Northeastern region. This type of research is essential to our understanding of sustainable forest management, recreation impacts, and new opportunities for the economies of the rural communities that they surround."

~Senator Peter Welch (D-VT).

# Program Overview

## History

### 2001-2019

The NSRC is a competitive grant program for Northern Forest research, directed and funded by the USDA Forest Service Northern Research Station (USDA-NRS) and a designated institution in each of the four Northern Forest states: The Rubenstein School of Environment and Natural Resources at the University of Vermont, the Department of Natural Resources at the University of New Hampshire, the Center for Research on Sustainable Forests at the University of Maine, and the State University of New York College of Environmental Science and Forestry. The Hubbard Brook Research Foundation in New Hampshire serves as the designated regional institution.

The origin of the NSRC dates back more than three decades. In the 1980s, the distinctive Northern Forest region—a working landscape with unique recreational opportunities, vast forested watersheds, and diverse northern wildlife—was designated a priority for national protection in response to growing concern that remaining forest land and its timber were at risk of unplanned fragmentation, piecemeal development, and real estate speculation. In response to these concerns, Congress allocated funding for collaborative research in the Northern Forest that focused on the environmental and economic impacts of these stressors.

From 2001 to 2016, NSRC was a critically important source of funding for applied forest research and outreach efforts throughout the Northern Forest. The program supported more than 335 research projects involving 50 organizations and hundreds of landowners and managers, conservation groups, government staff, and private citizens. NSRC developed original data, predictive tools, and recommendations to manage, protect, and monitor essential natural resources in a regional culture and economy that depends on a healthy, working Northern Forest.

In 2018, NSRC released a comprehensive Business Report (PDF) on the program’s sixteen years of contributions to knowledge about the environment and the economy of the Northern Forest. NSRC directors and Congressional delegations worked together to rebuild a program for renewed funding. This came to fruition in FY2020.

### 2020-2023

In 2020, Congress reinstated funding to support the ecosystem and economics of the Northern Forest through NSRC. The NSRC Charter was updated, revised, and signed by the collaborating institutions and executive directors. This document describes new governance and operational principles for NSRC 2.0 and serves as the foundation for the structure, governance, and guidelines for this cooperative. During summer of 2020, and in the midst of the COVID-19 pandemic, an External Advisory Committee (EAC) was convened virtually to identify key areas of research and priority issues facing forest stakeholders in

## MISSION

The Northeastern States Research Cooperative supports regional, collaborative research in the Northern Forest—a 26-million-acre working landscape that is home to more than two million residents and stretches from eastern Maine through New Hampshire and Vermont and into northern New York. Research goals are stipulated in the NSRC Congressional Authorization (Public Law 105-185). A central component of the program is the importance of the Northern Forest to society and the need for relevant research that benefits “the people who live within its boundaries, work with its resources, use its products, visit it, and care about it.

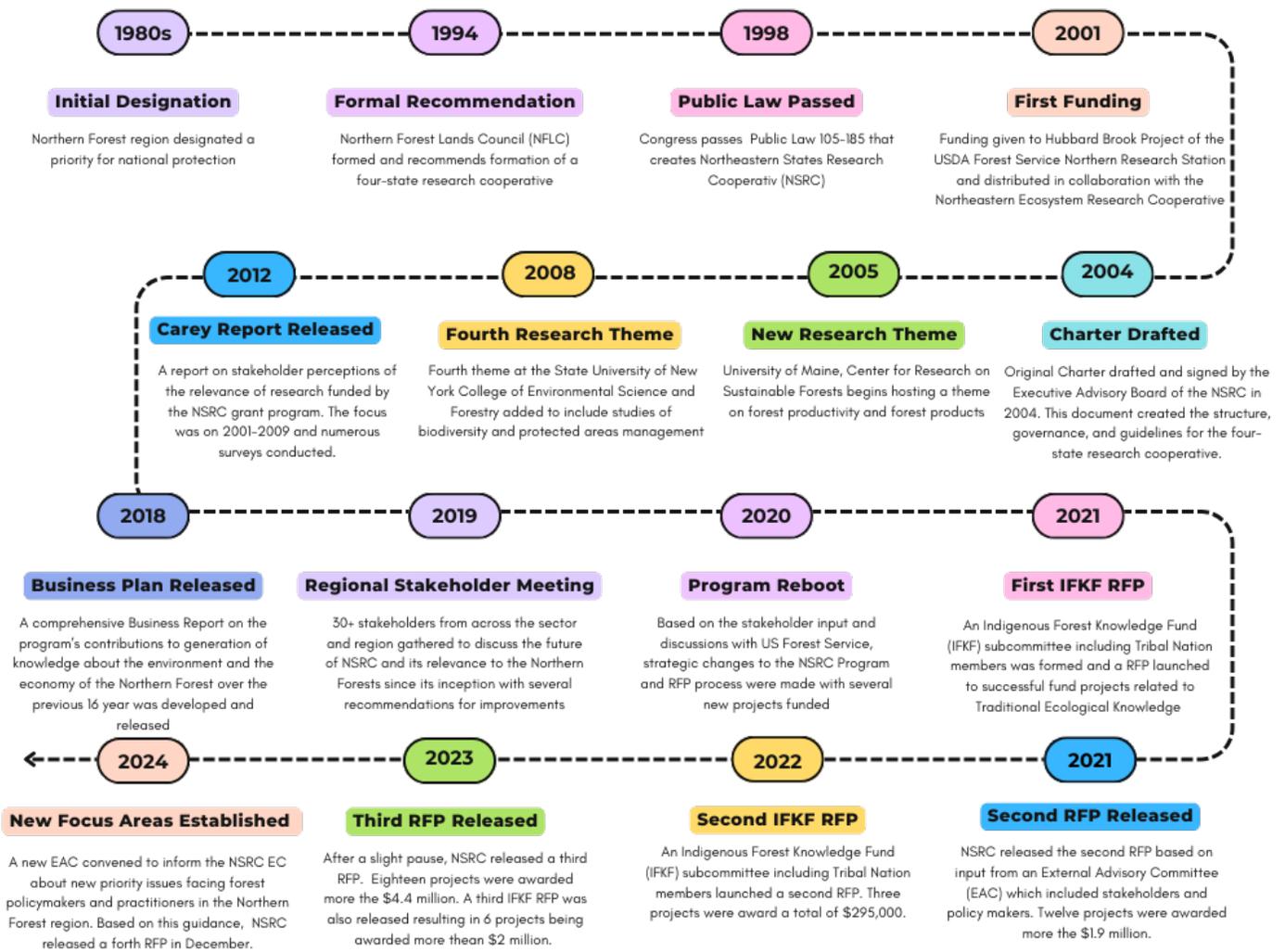


Figure 1. History of NSRC.

the Northern Forest region and to provide guidance crafting the request for proposals for the following year. The EAC is composed of seventeen Northern Forest stakeholders representing the communities, businesses, industries, and agencies in the Northern Forest Region who contribute to and benefit from knowledge generated by research funded via the NSRC.

With an anticipated \$1.5 million available to support research projects starting in 2021, the NSRC released a request for proposals (RFP) in September 2020 that addressed (1) the state of the forest, (2) measuring and quantifying impacts, and/or (3) developing tools for response. In response, the NSRC received 50 research project proposals requesting \$6.3 million in funding.

In May 2021, the NSRC Directors were pleased to announce 13 grants, totaling \$1.6 million of federal funding and \$0.8 million of matching funding for research that will serve priority issues identified by forest stakeholders in the Northern Forest region. The projects cover a broad range of concerns related to land use and sustainable forestry, rural communities and economic development, climate change, biodiversity, recreation and tourism, invasive pests and diseases, and Traditional Ecological Knowledge.

After a brief hold on federal funds, a new RFP was released in May 2023 and garnered strong interest from regional researchers (Figure 2). Sixty-six letters of intent were submitted; researchers were based at a variety of institutions across the region (35 colleges & universities, 14 state & federal agencies, and 29 private/NFP).

In September, nearly \$14M was requested across 49 full proposals.

In February 2024, the NSRC Directors announced the funding of 18 grants totaling nearly \$4.4 million of federal funding and close to \$2 million of matching funding for research that focused on areas of concern identified by forest stakeholders in the Northern Forest region: State of the Forest, Measuring & Quantifying Impacts, Developing Tools for Response, and Rural Community & Economic Development.

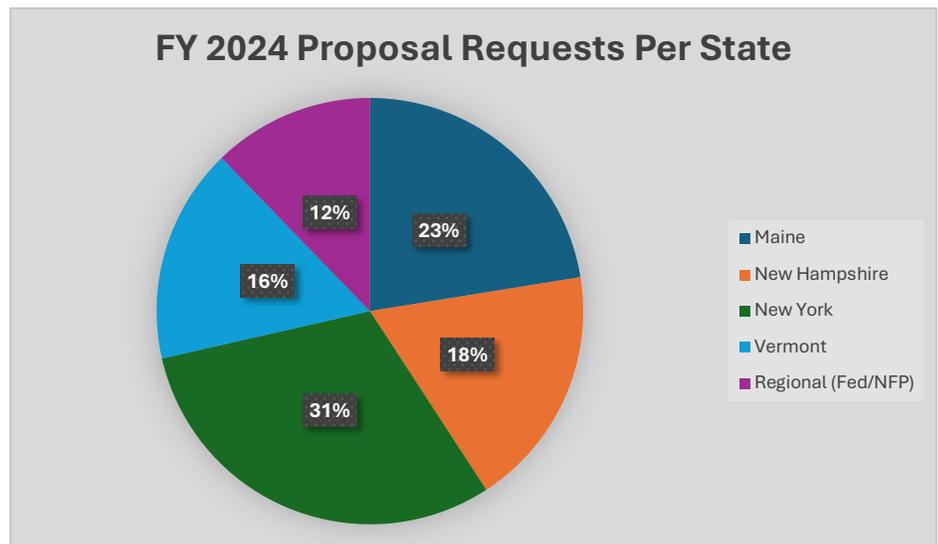


Figure 2

The new projects include research into long-term monitoring of rare plant populations, climate-smart biodiversity conservation practices, socio-ecological dimensions of forest management, production of bioplastics from forest biomass, forest climate adaptation and resilience, seedling establishment, and tools for rehabilitative silviculture to enrich habitats and restore productivity.

## Collaborative Management Model

NSRC continues to be administered through a collaboration of universities in each of the four states—the University of Vermont (UVM) (lead), the University of New Hampshire (UNH), the University of Maine (UM), the State University of New York College of Environmental Science and Forestry in New York (SUNY ESF)—a regional collaborator, the Hubbard Brook Research Foundation (HBRF), and a representative organization of Tribal Nations. The NSRC is sponsored by the US Forest Service through its Northern Forest Station. In addition, NSRC commits to expanding collaboration with Indigenous partners.

Each Collaborator has one Director to serve on the NSRC Executive Committee (EC) and may elect to designate a Manager who will support the EC via a Management Committee (MC). The Sponsor (USFS) shall designate one person to serve as an ex officio member on the EC and may elect a second member to serve on the MC.

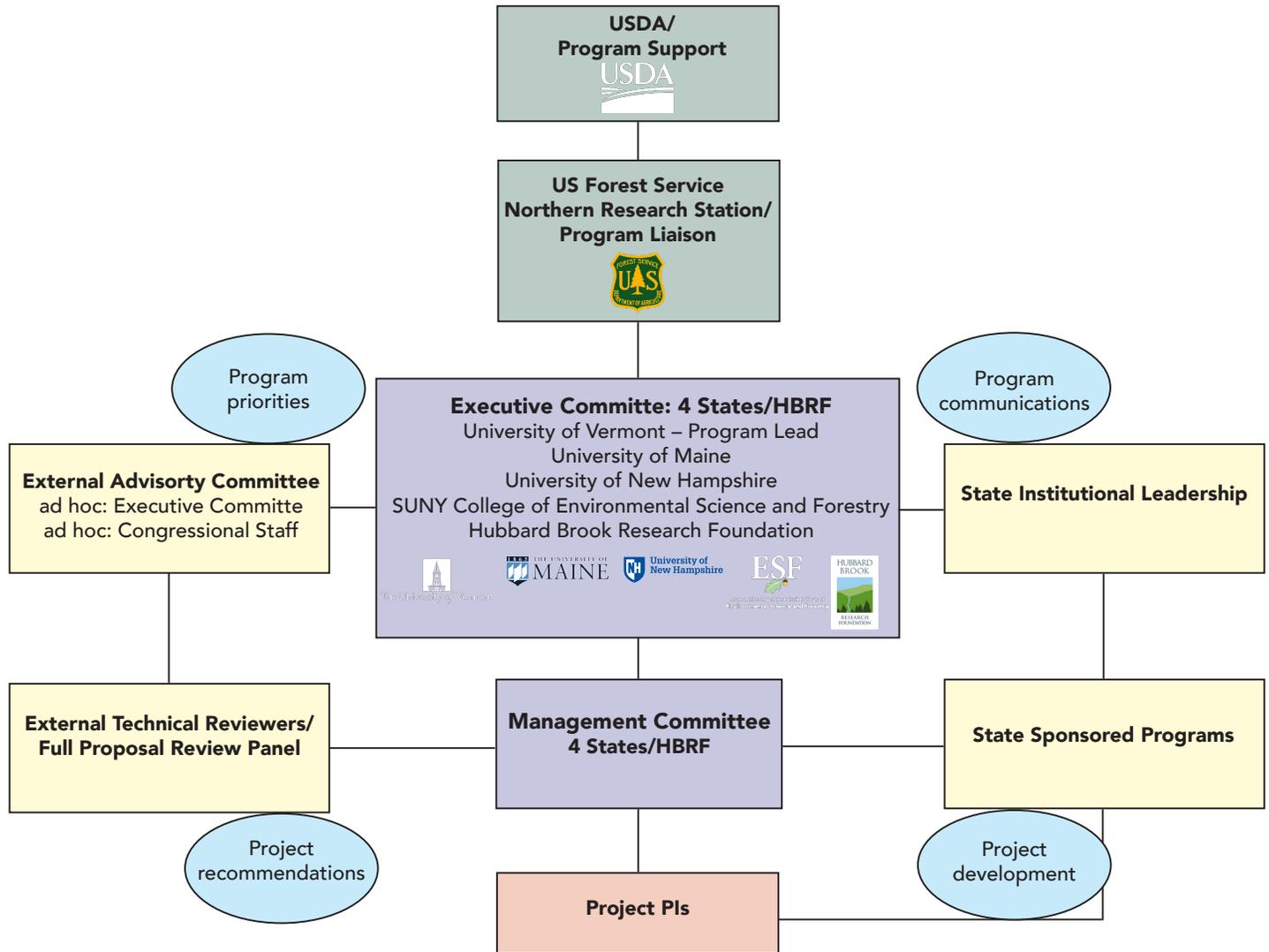
## NSRC General Goals

NSRC will continue to build on strong, existing partnerships and expand cooperation with regional partners to continue its robust partnership and outreach program. Partners include citizens of the Northern Forest, scientists, and experts from academic institutions; officials from local, state, and federal agencies; non-governmental organizations, and industry professionals; and private residents of the Northern Forest.

The NSRC will support and disseminate cross-disciplinary, collaborative ecosystem, socio-economic, forest products, and conservation research that benefits the unique landscapes and communities of the Northern Forest. The research agenda and communication strategies in which the NSRC will engage will be informed directly by an external advisory committee (EAC) composed of community leaders, landowners (private and commercial), federal and state agencies, business and industry leaders, and non-governmental organizations.

The NSRC management team also will continue to build on synergies with the Forest Ecosystem Monitoring Cooperative (FEMC) and the Northeast Forest Information Source (NEFIS). NSRC works closely with the FEMC and with NEFIS to ensure that data, publications, presentations, and reports from research supported by the NSRC are distributed widely and archived for easy public access.

## NSRC Organizational Structure



NSRC is a regional partnership built on collaboration and shared responsibilities. The primary organizational structure is outlined below, including the main parties for our mission and goals. The US Forest Service provides NSRC funding, helps set program priorities, and provides administrative or outreach input. The NSRC Executive Committee (EC) and Management Committee (MC) are representatives from four universities in each state and the Hubbard Brook Research Foundation. The EC administers the program by working with the External Advisory Committee and the US Forest Service to set current priorities, approve panel recommendations, and conduct program outreach, while working with the MC to ensure program delivery. The External Advisory Committee reviews program progress, helps to prioritize regional needs, and can serve on the full proposal review panel. The External Technical Reviewer assesses the strengths and weaknesses of submitted full proposals, which are provided to the Full Proposal Review Panel that reviews the input and prioritizes funding recommendations. Project PIs come from various regional organizations and conduct the specific activities outlined in their approved project proposal. Both program communication and project development are coordinated with state institutional organizations and sponsored programs.

# Partnerships

Strong partnerships are the foundation of the NSRC’s success. Partners include leaders from the USFS-NRS and the four universities overseeing the program, citizens of the Northern Forest, principal investigators and their co-researchers, and personnel from cooperating organizations. NSRC stakeholders include: (1) scientists and experts from academic institutions, (2) officials from local, state, and federal agencies, (3) NGO and industry professionals, (4) Tribal consultants, and (5) private residents of the Northern Forest (Figure 3).



Figure 3

# NSRC Funding

Federal funding to support NSRC research projects comes from Congressional appropriations through a partnership with the research and development arm of the USDA Forest Service (Figure 4). In 2023,

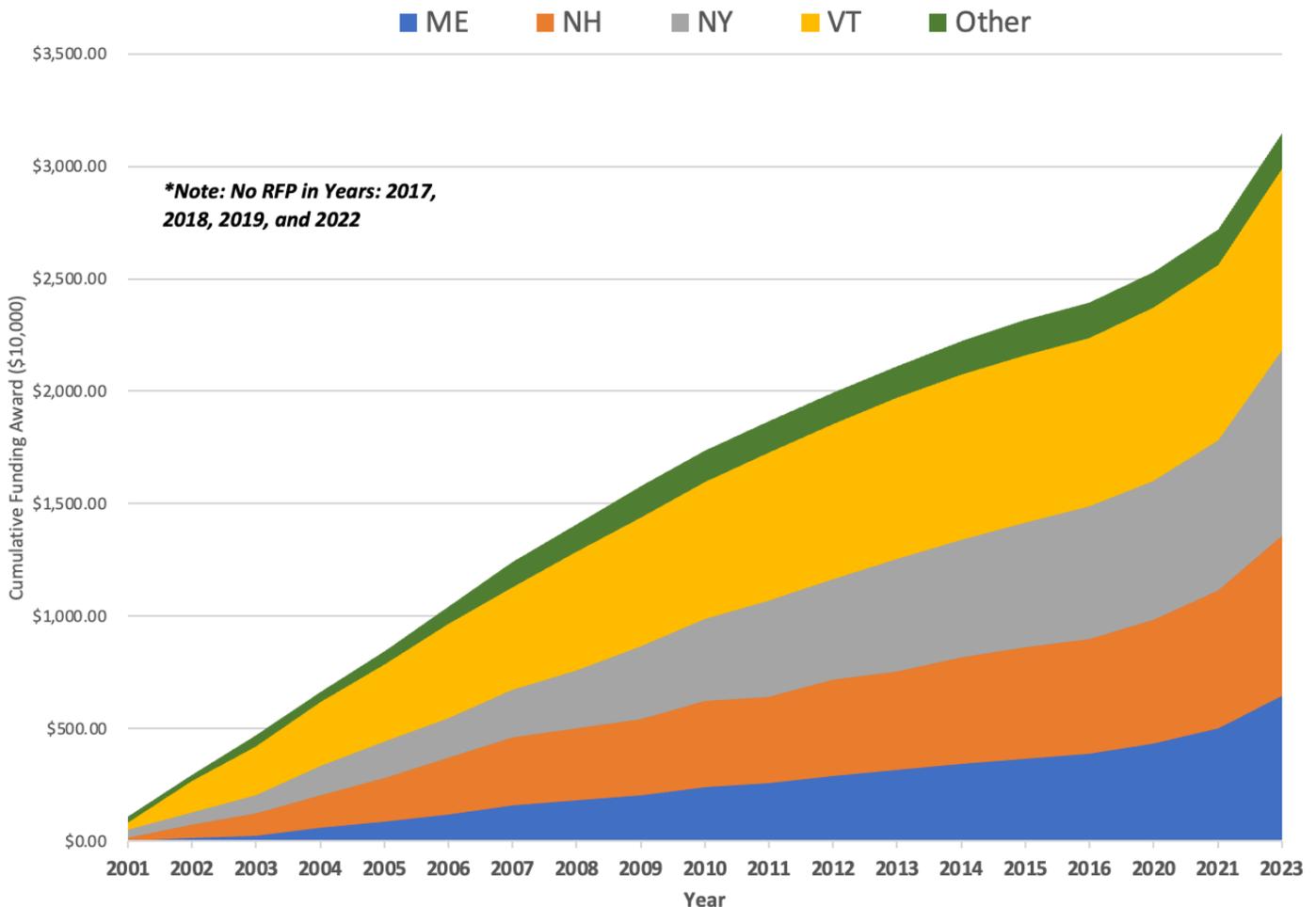


Figure 4

Congress allocated \$6.0 million to NSRC, with nearly \$4.3 million directly to support research projects by scientists, resource managers, policy makers, and other stakeholders identified as the most relevant and transformative to forest lands in the northern tier of New York, Vermont, New Hampshire, and Maine (Table 1).

Additionally, the private sector, states, and other organizations offer significant matching funding (\$1.8 million) for proposed projects, thereby expanding the reach and impact of the research projects. With federal support, NSRC will continue to support and disseminate cross-disciplinary, collaborative research that focuses on ecosystems, socio-economics, forest products, and conservation among communities in the Northern Forest region.

State	NSRC Funding
Maine	\$1,434,643
New Hampshire	\$ 972,389
New York	\$1,642,439
Regional	\$ 107,964
Vermont	\$ 219,624
<b>Total</b>	<b>\$4,377,056</b>

Table 1

In early 2024, NSRC announced its third year of funding for the Indigenous Forest Knowledge Fund (IFKF), releasing a request for proposals seeking projects with high cultural significance to Indigenous communities and lifeways (e.g., the health of brown ash and Indigenous peoples’ access to lands for hunting, fishing, gathering materials, and other purposes). The IFKF promotes education and training of Indigenous youth in Traditional Ecological Knowledge about forest systems and applied forest research that advances tribal priorities. IFKF projects are in addition to the NSRC research projects awarded earlier in the year.

There was a very strong response to the 2024 IFKF RFP: 10 full proposals requesting \$3.2 million were submitted for consideration. A Tribal External Review Committee considered each proposal for alignment with IFKF goals and requirements described in the RFP; clarity of project objectives; and quality of research approach and methods.

In addition to the general funding, NSRC also funded six new Indigenous Forest Knowledge Fund (IFKF) projects, totaling nearly \$2 million in NSRC funding. Under the direction of Tribal consultants, the IFKF grants support education and training of Indigenous youth in applied forest research and applied forest research to advance communications, outreach, and economic programs for Tribal Nations and Indigenous communities. The list of all funded projects can be seen in Table 2.

Table 2. FY23 research project funding. \*Indigenous Forest Knowledge Fund awardees.

State	PI	Institution	Project Title	Award	Match
NH	Asbjornsen, Heidi	University of New Hampshire	Using a functional trait approach to inform assisted migration for climate adaptation in the Northern Forest Region	\$365,261	\$182,634
Regional	Benedict, Les *	Saint Regis Mohawk Tribe	Saint Regis Mohawk Tribe- Restoring Tribal Relations and Forest Knowledge FY24 Project	\$340,220	N/A
Regional	Carr, Tish *	Wabanaki Youth in Science (WaYS)	WaYS to Utilize Indigenous Knowledge and Technology	\$212,540	\$31,740
NY	Dovciak, Martin	SUNY ESF	The effects of seed dispersal and seedling establishment limitations on climate-driven tree species range shifts in the northeastern U.S.	\$389,996	\$156,003
NY	Foppert, John	Paul Smith's College	Tools for rehabilitative silviculture to enrich habitat and restore productivity in degraded hardwood stands	\$436,645	\$223,067
VT	Harris, Lucas	University of Vermont	Assessing the future Northern Forest through the lens of seedling survival and sapling recruitment	\$219,624	\$52,429
ME	Hayes, Daniel	University of Maine	Northern Forest Historical Atlas Project	\$231,776	\$122,734
Regional	Hoban, Sean *	The Morton Arboretum	Partnership with Abenaki for conservation and restoration of the threatened, declining	\$413,482	\$108,600
ME	Johnston, Jason	University of Maine	Assessing eDNA as a monitoring tool for forest arthropod biodiversity and pests	\$119,256	\$52,591
NY	Juneja, Ankita	SUNY ESF	Sustainable Co-production of Bioplastics and Hydrochar from Forest Residue Biomass: A Novel Hybrid Conversion Approach	\$178,385	\$91,725
NY	Kloster, Danielle	SUNY ESF	Private forest landowner engagement in forest management programs for carbon sequestration	\$328,102	\$167,064
ME	Mech, Angela	University of Maine	Post-release non-target impacts of hemlock woolly adelgid biocontrol	\$250,880	\$125,688
NH	Ollinger, Scott	University of New Hampshire	Decadal-scale trends in northern forest carbon storage in relation to nutrient availability and rising carbon dioxide	\$298,237	\$150,324
NH	Pendleton, Simon	Plymouth State University	Assessing fire-dependency in natural red pine forests of the Northeast	\$308,891	\$0
ME	Premer, Michael	University of Maine	Digital Species-Site-Suitability Systems for Regenerating Northern Forests	\$271,035	\$53,574
ME	Rahimzadeh-Bajgiran, Parinaz	University of Maine	Satellite Monitoring of Eastern White Pine (EWP) Health through Assessing the Forest Structure	\$122,671	\$61,338
ME	Rahimzadeh-Bajgiran, Parinaz *	University of Maine	Integrating Advanced Geospatial Analysis and Indigenous Forest Knowledge for Protecting Ash Species	\$250,000	\$39,975
ME	Record, Sydne	University of Maine	A predictive scaling framework of forest structure and functional diversity in a non-equilibrium world	\$197,260	\$99,183
NY	Salehi, Bahram	SUNY ESF	Mapping Canopy Height Model and Aboveground Biomass of Northeastern Forests Annually at 25 m Resolution through Remote Sensing Data Fusion and Machine Learning	\$267,641	\$137,580
ME	Simons Legaard, Erin	University of Maine	Social, Economic, and Ecological Dimensions of Forest Management for Climate Change Adaptation and Resilience	\$241,765	\$132,645
Regional	Simpson, Benjamin *	Penobscot Nation	Ecosystem responses to the interacting forces of bridge improvements and beavers	\$403,807	N/A
NY	White, Kayla	Adirondack Mountain Club	Long-Term Monitoring of Rare Plant Populations in the Adirondack Alpine	\$41,670	\$10,613
Regional	Whitman, Andrew	Manomet	Climate-smart biodiversity conservation practices for managed forest landscapes	\$107,961	\$107,769
Regional	Ziegler, Carolyn *	Appalachian Mountain Club	Managing for Tomorrow's Panawahpskek Forests Today: An Integrative Approach to Submerchantable Competition Control	\$358,442	\$30,392
Totals				\$6,355,548	\$2,137,668

# Advisory Committees

## External Advisory Committee

During the summer of 2021, staff from the Hubbard Brook Research Foundation (HBRF) convened a sixteen-person External Advisory Committee (EAC) to identify priority issues facing forest stakeholders in the Northern Forest region and therefore set the research agenda for the 2022 and 2023 request for proposals (RFP). For an outcome summary of the EAC meeting, see Appendix A.

Prior to the meeting, individual EAC members were interviewed by NSRC staff about key challenges and knowledge gaps of importance to the forests and people of the Northern Forest region. They requested that NSRC funds research with clear links to application and use by stakeholders and decision-makers in the Northern Forest region. Successful proposals will clearly articulate the research question they are asking, their rationale for why that question is important to stakeholders, and their strategy for making their results actionable.

They requested that the proposals should encompass one or more of the following focus areas:

- 1. State of the forest:** Research that elucidates the state of the Northern Forest region, with preference given to projects related to forest health and those with predictive power.
- 2. Measuring and quantifying impacts:** Research that measures/quantifies ecological, social, policy, management, and economic changes in the Northern Forest, with consideration for how to create shared or standardized measurement approaches across the region.
- 3. Developing tools for response:** Research that leads to practical, standardized tools for practitioners and other decision-makers to predict and respond to change. These tools could include management approaches/techniques, new technologies or applications, decision support tools, and messaging/communication strategies.
- 4. Rural community and economic development:** Research that addresses the challenges of forest-based communities and economies and contributes to a shared vision of the region's future.

The issues that people raised in their interviews clustered into the following priority issues:

- ▶ Invasive pests and diseases
- ▶ Climate change and energy: mitigation, adaptation, and carbon accounting
- ▶ Adapting to climate change
- ▶ Land use, sustainable forestry, and forest fragmentation
- ▶ Forest products industry and innovative technologies
- ▶ Recreation and tourism
- ▶ Environmental justice, equity, and inclusion
- ▶ Biodiversity and connectivity

The EAC recommended that the NSRC prioritize research by: (1) how relevant it is across the four-state region, as opposed to a narrower focus on localized areas or individual states; and (2) how actionable it is to practitioners, decision makers, and other stakeholders.

Strengthen the language within the RFP, the application form itself, and the selection criteria to promote problem-driven, engaged research with solid communications work. The language should ask more from the applicants about the applied question that they are asking, their

rationale, and their strategy for making their results actionable for management and policy. This could be distilled to instructions for applicants so that there is no ambiguity in their responses; for example, in a matrix that steers responses from concept to action.

## EAC Recommendations on Research Approaches

1. **Strengthen the RFP, application form, and selection criteria** to promote problem-driven, engaged research with strong communication efforts. Applicants should clearly outline the applied question they are addressing, their rationale, and their strategy for making results actionable for management and policy. This can be simplified into clear, step-by-step instructions to avoid ambiguity, possibly through a matrix guiding responses from concept to action.
2. **Require applicants to assess the “readiness” level** of their proposed research, similar to the “technology readiness levels” used in other fields. A spectrum of readiness levels, from basic to applied research or commercialization, could be included as a checkbox, helping NSRC report on funding allocation.
3. **Reconsider the 50% match requirement**, as it may pose a barrier for applied projects or those led by non-university groups, raising equity concerns. Consider offering a mechanism for teams to request assistance in securing a match, if needed, for promising projects.
4. **Encourage alignment with policy timelines**, either through shorter, one-year projects or multi-stage projects with annual milestones.
5. **Expand outreach** for the RFP beyond the usual basic research community.
6. **Include funding for relationship-building and engagement**, possibly through smaller planning grants. This can also add flexibility for full awards, allowing teams to adjust their projects based on stakeholder input. Smaller grants may also help address equity concerns by supporting smaller organizations in building capacity or proof-of-concept for future applications.
7. **Ensure relationship-building funds are tied to a clear and strong approach**. One method is to require a partner with a proven track record of outreach and engagement on the project team.
8. **Review the timing of the NSRC award and Indigenous Forest Knowledge Fund (IFKF)** to allow enough time for Tribal-led projects to participate in the general call and, if necessary, restructure for the IFKF.

Further, the EAC recommended that the RFP and proposal review process: (a) be intentionally designed to support interdisciplinary teams that demonstrate genuine grounding of the research in stakeholder priorities, with buy-in and engagement at the project design phase and throughout its execution; and (b) include clear communication plans for how research results and products will serve broader stakeholder groups and communities in the region.

Because the NSRC Executive Committee is composed primarily of academic forest researchers, the EAC suggested that extra

**NSRC should prioritize problem-driven, engaged research with solid communications to stakeholders. Partnerships between researchers and practitioners are strongly encouraged, as are projects that aim to inform and align with the timeframes of management and policy decisions. NSRC encourages projects that may be at different stages of development, including:**

- ▶ Early-stage partnership development and problem investigation
- ▶ New investigations with regional scope and importance
- ▶ Synthesis of existing knowledge, perspectives, and tools/resources
- ▶ Implementation of research results to practice
- ▶ Scaling a local project or result to the broader Northern Forest region

effort should be made to assess the practical, economic, and social elements of each proposal with consideration for social/human dimensions, synthesis, interdisciplinary teams, and scalability and applicability. The EAC also proposed that the RFP be organized around four categories of research: State of the Forest, Measuring and Quantifying Impacts, Developing Tools for Response, and Rural community and economic development.

## Tribal Nations External Consultants

To ensure alignment with on-the-ground issues and emerging priorities, Tribal consultants and an External Advisory Committee representing forest industry, natural resource management, conservation, wildlife, and economic development set the research agenda for the general requests for proposals, issued in September 2020, 2021 and 2022 and 2024 (please note no RFP was distributed in 2023).

The general RFP encouraged projects of high cultural significance to Indigenous communities (e.g., the health of brown ash and Indigenous peoples' access to lands for hunting, fishing, gathering materials, and other purposes). NSRC leaders were committed to going further to 1) acknowledge and address structural inequities in opportunities for Indigenous youth to participate in forest research and 2) invest in the cultural and intellectual sovereignty of Tribal forest traditions alongside other forms of applied forest research. The NSRC recognizes and respects the deep, primary knowledge of Tribal Nations in the Northern Forest region and established an Indigenous Forest Knowledge Fund for:

- ▶ The education, mentorship, and training of Indigenous youth in applied forest research and/or Traditional Ecological Knowledge about forest systems;
- ▶ New applied forest research that advances Tribal priorities; and
- ▶ The synthesis and translation of forest research and/or Traditional Ecological Knowledge to advance communications, outreach, and economic programs for Tribal Nations and Indigenous communities.

With these goals in mind, approximately \$295,000 in NSRC funding was awarded in 2022 to support three projects, for one- to three-year funding terms. In 2024, six IFKF projects were awarded totaling nearly \$2 million. See table 3 for all awarded IFKF to date.

PI	Institution	Project Title
Asbjornsen, Heidi	University of New Hampshire	Supporting Abenaki Stewardship of Atlantic White Cedar Swamp Ecosystem
Benedict, Les	Saint Regis Mohawk Tribe	Saint Regis Mohawk Tribe- Restoring Tribal Relations and Forest Knowledge FY24 Project
Carr, Tish	Wabanaki Youth in Science (WaYS)	WaYS to Utilize Indigenous Knowledge and Technology
Daigle, John	University of Maine	Protecting the Brown Ash
Hoban, Sean	The Morton Arboretum	Partnership with Abenaki for conservation and restoration of the threatened, declining butternut tree, an ecologically and culturally important hardwood
Kimmer, Robin	SUNY College of Environmental Science and Forestry	Haudenosaunee Forest Principles
Rahimzadeh-Bajgiran, Parinaz	University of Maine	Integrating Advanced Geospatial Analysis and Indigenous Forest Knowledge for Protecting Ash Species
Simpson, Benjamin	Penobscot Nation	Ecosystem responses to the interacting forces of bridge improvements and beavers
Simpson, Benjamin	Penobscot Nation	Monitoring Culturally Important Wildlife on Penobscot Nation Lands
Wymore, Adam	University of New Hampshire	NEBI (Water): Connecting N'dakinna (Land), Bilowagizegad (Climate), and Alnobak (People)
Ziegra, Carolyn	Appalachian Mountain Club	Managing for Tomorrow's Panawahpskek Forests Today: An Integrative Approach to Submerchantable Competition Control

Table 3. Indigenous Forest Knowledge Fund awardees.

"The Northeastern State Research Cooperative has been an important source of regional research funding for the last two decades. This new set of projects demonstrate an effective partnership between the US Forest Service, regional stakeholders, and applied researchers. We look forward to continuing to build this vital regional program in the years to come."

~ Aaron Weiskittel,  
Director of the Center for Research on Sustainable Forests  
at the University of Maine

The NSRC greatly appreciates the time and effort expended by the following members of the External Advisory Committee.

**2021 External Advisory Committee**

*Susan Arnold*, Vice President for Conservation, Appalachian Mountain Club

*John Bartow*, Executive Director, Empire State Forest Products Association

*Tyler Everett*, Passamaquoddy Forestry, United South and Eastern Tribes, Inc.

*Rich Grogan*, Executive Director, Northern Border Regional Commission

*Patrick Hackley*, State Forester and Director, NH Division of Forests and Lands, State of New Hampshire

*Derek Ibarguen*, Forest Supervisor, White Mountain National Forest

*Kathy Fallon Lambert*, Senior Advisor, Harvard T.H. Chan School of Public Health, Center for Climate, Health, and the Global Environment; Co-Founder, Science Policy Exchange

*Donald Mansius*, Director, Forest Policy and Management Division, Maine Forest Service

*Craig McLaughlin*, Wildlife Research and Assessment Supervisor, Maine Department of Inland Fisheries and Wildlife

*Neil Patterson, Jr.*, Assistant Director, Center for Native Peoples and the Environment, SUNY ESF

*Tyler Ray*, Founder and Principal, Backyard Concept

*Sean Ross*, Managing Director, Lyme Timber Company

*April M. Salas*, Executive Director, Revers Center for Energy at Tuck School of Business, Dartmouth College; Chief Sustainability Officer, Town of Hanover, NH

*Joe Short*, Vice President, Northern Forest Center

*Michael Snyder*, Vermont State Forester and Commissioner of Vermont Forests, Parks, and Recreation, State of Vermont

*Casey Thornbrugh*, Northeast and Southeast Tribal Climate Science Liaison, United South and Eastern Tribes, Inc., and Northeast and Southeast Climate Adaptation Science Centers

# Research Proposal Process, 2023

Participation in the research proposal process is open to scientists, resource managers, policy makers, and other stakeholders pursuing research relevant to forest lands in the northern tier of New York, Vermont, New Hampshire, and Maine. Proposals were required to encompass one or more of four focus areas: State of the Forest, Measuring and Quantifying Impacts, and Developing Tools for Response. Investigators were encouraged to address one or more of the research topics identified by the EAC. The 2023 NSRC Request for Proposals (RFP) process attracted 65 high quality letters of intent and ultimately yielded 49 full proposals. For this RFP, \$18.5 million was requested at the letter of intent stage and \$14 million was requested at the full proposal stage, well in excess of the \$5 million available to distribute. Furthermore, in recognition of the deep, primary knowledge of Tribal Nations in the Northern Forest region, NSRC released a second RFP in both the spring 2022 and 2024, the Indigenous Forest Knowledge Fund, making an additional \$100k funding available (proposal requests exceeded \$150k). Consequently, many very good proposals submitted in 2020-21 could not be funded (Figure 5).

## RFP Process

The general RFP was issued in summer 2023 for projects to be funded in winter 2024. The first step in the process was the submission of a letter of intent. Receipt of all letters of intent was acknowledged, but there was no assessment of the intellectual or technical merit of the proposed project. Sixty-five letters of intent were submitted from across the region (Figure 3).

Forty-nine (49) full proposals were submitted and reviewed for technical merit by two external experts (researchers, practitioners, or both). Technical reviewers provided their perceptions of the major strengths/weaknesses of proposals and their assessments of whether the proposals are impactful and worth funding. Each project received a rating (strong to weak) for the following:

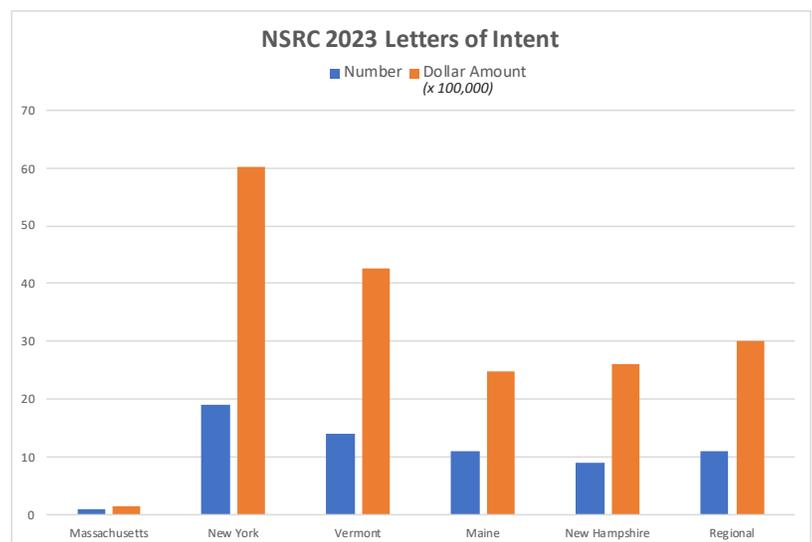


Figure 5.

Each project received a rating (strong to weak) for the following:

1. The problem is clearly defined, justified, and relevant to the Northern Forest.
2. The project goals and supporting objectives clearly address the problem and have potential benefit to the Northern Forest.
3. The approach and methods are well defined and appropriate.
4. The budget fits the scope of work proposed and has a favorable cost-benefit ratio.
5. There is a high likelihood of success within the project period.

The reviewers were also asked to answer the following short-answer questions:

1. Describe the major strengths of the proposal.
2. Describe the major weaknesses of the proposal.
3. Given adequate resources, would you recommend this proposal for funding and why?

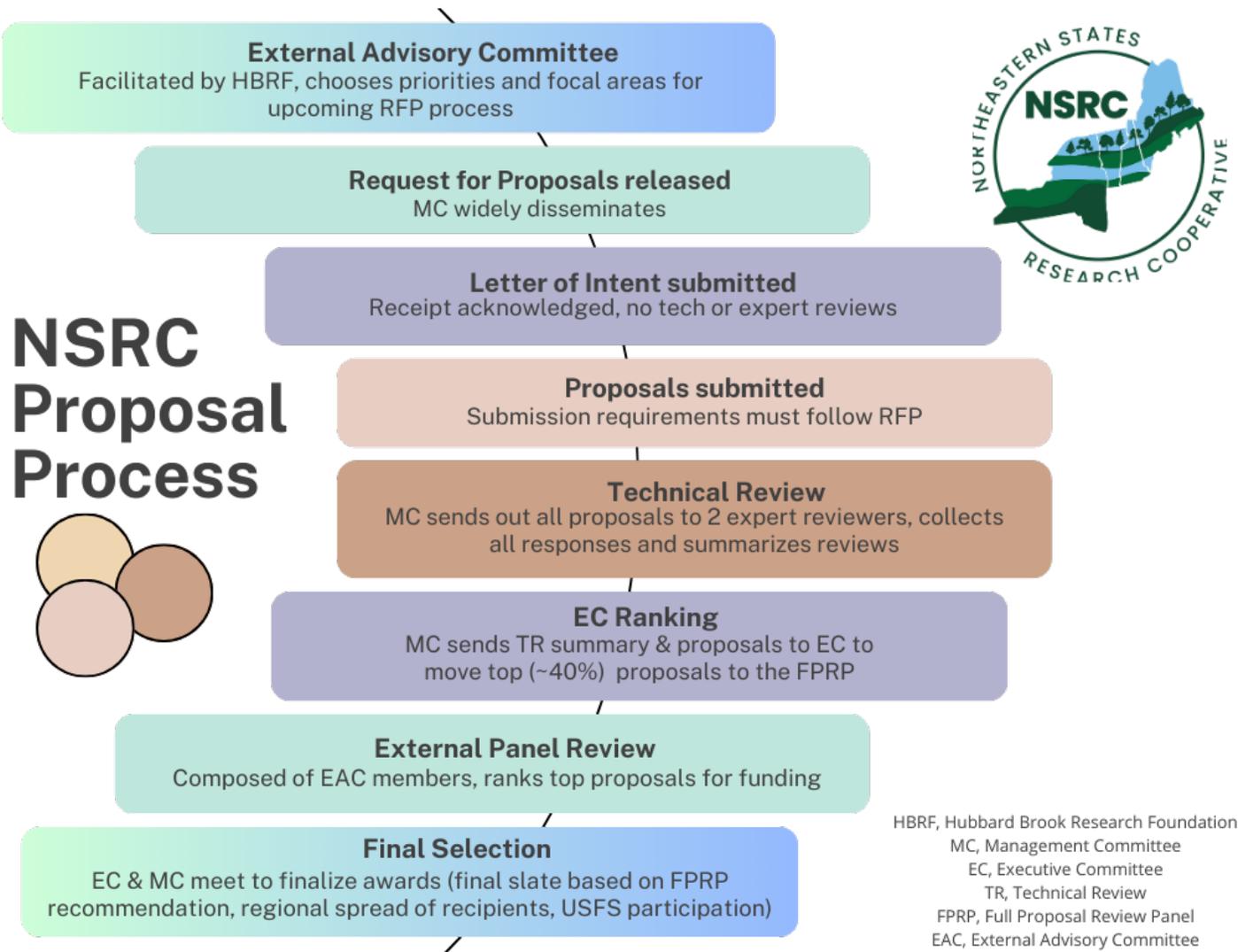


Figure 6. NSRC Proposal Process.

### Prioritization of Top-ranked Proposals

The NSRC Executive Committee (EC) then ranked all submitted proposals based on technical merit and applicability to the NSRC RFP. The EC recommend the top-ranked twenty-eight (28) proposals for review by the Full Proposal Review Panel (FPRP).

### Full Proposal Review Panel

An ad hoc FPRP was composed of forest stakeholders who had reasonable knowledge of the areas covered by the annual RFP and how this knowledge could serve regional stakeholders. Each proposal chosen for review by the FPRP was fully reviewed by one FPRP members The FPRP used the criteria listed below to evaluate full proposals, and the FPRP reviewers also respond to three short-answer questions.

1. Proposal clearly states (a) problem of practice or (b) research question or hypothesis to be addressed and why it is important in the Northern Forest.
2. The problem to be addressed is well-defined, with an appropriate approach and methods that correlate to a high likelihood of success within the project period.
3. The project is widely applicable to the NSRC region (versus narrow benefit to a specific location or entity).

4. The proposal has a solid rationale and communications plan, and outputs will lead to wide use by practitioners, decision-makers, or other target audiences.
5. Partners and stakeholders will be involved throughout the design and execution of the project.
6. The project demonstrates a favorable cost-benefit ratio and justifies the requested budget.
7. The project has high or exceptional potential to address stakeholder priorities in the Northern Forest.

The reviewers were also asked to answer the following short-answer questions:

1. Describe the major strengths of the proposal.
2. Describe the major weaknesses of the proposal.
3. Given limited resources, would you recommend this proposal for funding? Why?

The entire FPRP discussed and ranked the proposals during the FPRP virtual meeting. The panelists prioritized research based on potential to engage stakeholders and have meaningful impacts in the region. Ultimately, eighteen (18) proposals under the general RFP were recommended for funding.

## Indigenous Forest Knowledge Fund

While the general RFP encouraged projects of high cultural significance to Indigenous communities and lifeways (e.g., the health of brown ash and Indigenous peoples' access to lands for hunting, fishing, gathering materials, and other purposes). NSRC leaders were committed to going further to (1) acknowledge and address structural inequities in opportunities for Indigenous youth to participate in forest research and (2) invest in the cultural and intellectual sovereignty of Tribal forest traditions alongside other forms of applied forest research. With these goals in mind, NSRC awarded nearly \$295,000 in funding for three projects in 2022, and nearly \$2 million in funding for six projects in 2024. These projects were chosen by a committee composed of program organizers representing forest science, public outreach and education, and Tribal climate/forest science and cultural values.



The NSRC could not have adequately and thoroughly reviewed the forty-nine proposals submitted in response to the RFP without the expert help of our technical reviewers. We thank them for volunteering their time and care in consideration of the proposals.

Adams, Alison, University of Vermont  
Belair, Ethan, The Nature Conservancy  
Bennett, Karen, University of NH, emeritus  
Bittner, Tonya, Department of Natural Resources and the Environment, Cornell University  
Clark, Stacy, USDA Forest Service, Southern Research Station  
Connolly, Stephanie, USDA Forest Service Northern Research Station  
Costanza, Kara, USDA Forest Service, Forest Health Protection  
Cyr, Dominic, Environment & Climate Change Canada  
Deisenhofer, Florian Department of Natural Resources, Washington State  
Fernandez, Ivan, UMaine SFR  
Fraser, Jacob, USDA Forest Service - Northern Research Station  
Gifford, Neil, Albany Pine Bush Preserve Commission  
Glover, Katherine, Climate Change Institute, University of Maine  
Groover, Andrew, US Forest Service  
Gunn, John, TNC  
Hagenbuch, Steve, National Audubon Society (Audubon Vermont)  
Heckel, Christopher, Hillsdale College  
Homayouni, Saeid, Center for Water, Land, and Environment, INRS, Quebec, Canada  
Huggett, Brett, Bates College  
Ian, Prior, Seven Islands Land Company  
Ireland, Lloyd, UMaine  
Duncan, Jim, Vermont Forests, Parks and Recreation  
Labonte, Nicholas, US Forest Service, Region 9 Regional Office  
Langen, Tom, Clarkson University  
Lemieux, Stacy, Forest Service, White Mountain NF  
Leopold, Donald, SUNY ESF  
Lhotka, John, University of Kentucky  
Lightbody, Anne, University of New Hampshire  
Livingston, Bill, University of Maine  
Lombard, Kyle, NH Division of Forests and Lands  
Mahar, Eugene, LandVest, Inc.  
McGann, Tessa, State of Vermont, Department of Forests, Parks and Recreation  
Mosher, Brittany, University of Vermont  
Munger, J. William, Harvard University  
Nelson, Sarah, Appalachian MTN Club  
Novak, Abigayl, University of Maine Cooperative Extension  
Parry, Dylan, SUNY ESF  
Patrick, Green, Virginia Tech  
Poudel, Krishna, Mississippi State University  
Preisser, Evan, University of Rhode Island  
Randall, Eric, PA State System of Higher Education and SUNY BuffaloState (retired)  
Rittenhouse, Chadwick, University of Connecticut  
Rosovsky, Judy, Agency of Agriculture, Food and Markets  
Ross, Don, Emeritus at UVM  
Schlawin, Justin, Maine Department of Agriculture, Conservation and Forestry  
Smith, Regina, Cooperative Forestry Research Unit  
Song, Xiaopeng, University of Maryland, College Park  
Sutton, Alex, Bangor University  
Tilley, Jeff, Green Mountain National Forest  
Titus, Valorie, Paul Smiths College  
Wagner, John, SUNY ESF  
Wikle, Jess, University of Vermont  
Williams, Neil, USDA Forest Service RMRS / ORISE (Oak Ridge Institute for Science and Education)

## Awarded Projects: 2023/2024

Eighteen projects received nearly \$4.4 million in federal funding with an additional \$1.9 million of matching funding. The research covers a broad range of concerns related to land use and sustainable forestry, rural communities and economic development, climate change, biodiversity, recreation and tourism, invasive pests and diseases, and Traditional Ecological Knowledge. Principal investigators come from throughout the region. The following pages showcase project synopses for research to be conducted over the next 2-3 years.

### **SEED: SOCIAL, ECONOMIC, AND ECOLOGICAL DIMENSIONS OF FOREST MANAGEMENT FOR CLIMATE CHANGE ADAPTATION AND RESILIENCE**

**Lead Principal Investigator: Erin Simons-Legaard, University of Maine**

The Northeast includes the nation's most populous city, the most heavily forested states, and tree species at their northern or southern range limits and likely to experience climate change impacts. As such, the region's forestry practitioners have the opportunity to set the standard for socially informed management for climate change adaptation and resilience. Yet little experimentation has occurred on this topic in the northern conifer (spruce-fir) forest that covers 6 million acres of the region. To fill this knowledge gap, we will answer three questions: "What are alternatives for climate-adaptive northern conifer forest management? What are the ecological and economic outcomes? What are practitioners' and landowners' values and perceptions?" Work will proceed in three phases. First, we will initiate a 400-acre experiment in Maine to assess operational-scale climate-adaptive forest management. Measured and modeled outcomes will include climate adaptation, ecological resilience (e.g., microclimate, habitat diversity, and soil health), and economic outputs. Second, we will use surveys and focus groups across the region to determine values and perceptions of climate-adaptive silviculture among those who own and manage forestland. Third, we will use a range of approaches to communicate findings on forest management for climate change adaptation with implications for ecological resilience, economic outcomes, and social license. In the future, the experiment will be integrated into the U.S. Forest Service's research portfolio, allowing confirmation of early results. This project will advance forest climate change adaptation and resilience in a context of economic and social constraints, facilitating more resilient forest and human communities.

### **USING A FUNCTIONAL TRAIT APPROACH TO INFORM ASSISTED MIGRATION FOR CLIMATE ADAPTATION IN THE NORTHERN FOREST REGION**

**Lead Principal investigator: Heidi Asbjornsen, University of New Hampshire**

Assisted migration (AM) has been proposed as a silvicultural tool to mitigate the effects of climate change on ecosystem services including biodiversity, carbon sequestration and forest-based products. Foresters and natural resource managers in the northeast U.S., however, lack guidelines on selecting climate-adapted species and seed source populations for nursery inventory and AM implementation. This project will considerably expand our understanding of the variation in functional traits within northeastern tree species to assess acclimation potential and inform AM strategies that promote climate-ready forests. Through measurements of morpho-physiological traits and seed quality, this project will document intraspecific variation in potential seed source populations at 12 sites across elevational-latitude climate space in 6 northeastern states, targeting the northern forest region. This project leverages a well-established NSRC-funded long-term study on seedling and sapling recruitment and contributes to the USFS Green Mountain National Forests Range Expansion Seed Collection Project. Outreach activities include educational programs for diverse stakeholders on AM as a silvicultural tool and the significance of functional trait variability, scientific and professional papers and presentations, and catalyzing a long-term common-garden experiment to support future AM efforts. This project involves collaboration between the USFS-VT, universities across NH, NY and ME, multiple stakeholder groups and will support one early career scientist, a University of New Hampshire PhD student/intern for the USFS Pathways Program and undergraduate field/laboratory technicians. We will provide a trait-based approach to guide AM strategies for maintaining the ecologically, economically and culturally important Northern Forest in the face of climate change.

#### **SATELLITE MONITORING OF EASTERN WHITE PINE (EWP) HEALTH THROUGH ASSESSING THE FOREST STRUCTURE**

**Lead Principal Investigator: Parinaz Rahimzadeh-Bajgiran, Postdoctoral Researcher, University of Maine**

Eastern white pine (*Pinus strobus* L.; EWP), is an ecologically and economically important tree throughout New England and the Northern forest ecosystem. Various biotic and abiotic stresses cause degradation to EWP-dominated stands. Accurate data on EWP-stand structure are important to assess stand health and resilience to various stresses, including drought. The live crown ratio (LCR) is one of the key indicators of EWP-stand structure that has been understudied at a landscape level using remote sensing data. Moreover, the canopy density (indicated by leaf area index; LAI) and crown diameter (CD) are two additional indicators of EWP-stand structure. This study aims to quantify the relationship between multiple structural attributes leading to the development of a new EWP-stand health index or resilience map. The proposed study aims to conduct field surveys to collect structural attributes data at the plot level in three NSRC states (Maine, New Hampshire, and Vermont). The field data will be used to develop regression models using remote sensing data, which will be applied for wall-to-wall mapping of various structural attributes. The derived structural attribute layers will be integrated to develop the health index or resilience map. The study will exchange collected and available field data on EWP-stands in the New England area with the US Forest Service (USFS) and Maine Forest Service (MFS), as well as remotely sensed derived EWP structural map on LCR, which is unavailable to date. The generated spatial layers will be hosted on a WebGIS platform for public accessibility to support stand management activities.

#### **THE EFFECTS OF SEED DISPERSAL AND SEEDLING ESTABLISHMENT LIMITATIONS ON CLIMATE-DRIVEN TREE SPECIES RANGE SHIFTS IN THE NORTHEASTERN U.S.**

**Lead Principal Investigator: Martin Dovčiak, Ph.D., SUNY College of Environmental Science and Forestry**

The Northern Forest is maintained mostly by natural regeneration, but assisted migration may be required as climate changes. However, our ability to predict tree species' establishment under changing climate in this complex mountainous region is still rudimentary. While the regeneration of the boreal cold-tolerant conifers species (red spruce, balsam fir) appears to be shifting upslope, this is not true for the dominant temperate deciduous species (sugar maple, American beech). Although edaphic factors (soil pH, mycorrhizae) explain some of this deciduous species' 'failure to migrate', an empirical model is needed to integrate fine-scale seedling establishment with intermediate-scale seed dispersal to better understand tree regeneration under changing climate. We propose to develop species regeneration models by integrating field and greenhouse experiments with field observations across a large, well-established network of sites spanning all four U.S. states containing Northern Forest (previously funded by NSRC and NSF awards to the lead PI). We will quantify how regeneration of the four dominant species can be limited by (1) seed dispersal and (2) seedling establishment by conducting (a) seed addition experiments on plots in the network and (b) seedling establishment experiments in greenhouse and field settings. Our models will provide quantitative guidelines on target densities and site conditions (preparation) for adaptive forest management and conservation using assisted migration along regional climate-edaphic gradients. The project will train an early-career (post-doctoral) scientist, a graduate student, and several undergraduates. Our collaborators will help facilitate workshops to disseminate project findings to appropriate stakeholder groups across the region.

#### **REHABILITATION TOOLS TO ENRICH AND RESTORE PRODUCTIVITY IN DEGRADED HARDWOOD STANDS**

**Lead Principal Investigator: John Foppert, Paul Smith's College**

Across the Northern Forest, critical early-seral habitat is in decline, while millions of acres of hardwood stands languish in a degraded condition. Creative researchers and practitioners throughout the region have developed effective rehabilitative silviculture strategies for such stands. If more widely implemented, these practices will significantly enrich habitat quality at the landscape scale while also increasing the diversity, productivity, and resilience of the stands they are applied to. This project aims to advance the research, technology development, and landowner and manager communications required to overcome the barriers to implementation of these valuable forest management practices. We will (1) develop refined management guidance and implementation protocols for rehabilitative silvicultural treatments in degraded hardwood stands; (2) quantify the potential impact of these practices at stand, landscape, and regional scales; (3) equip land managers with quantitatively rigorous, easy-to-use support tools to help them implement these practices confidently and efficiently; and (4) effectively communicate the benefits of these practices to landowners and policy makers.

#### **ASSESSING THE FUTURE NORTHERN FOREST THROUGH THE LENS OF SEEDLING SURVIVAL AND SAPLING RECRUITMENT**

**Lead Principal investigator: Lucas B. Harris, University of Vermont**

Regeneration of key tree species in the Northern Forest is threatened by a suite of factors including climate change, non-native pests and pathogens, disturbance and herbivory. Concerns over tree regeneration have led to calls to rethink forest management strategies including applications of different silvicultural systems, treatments to increase seedling survival and tree planting. Yet, tree regeneration assessments within the region tend to rely either on in-depth surveys that are limited in extent or coarse surveys from the national forest inventory, meaning that a regional picture of the state of tree regeneration and how it might be improved through management is lacking. Therefore, a need exists to develop a more accurate system for monitoring regional-scale tree regeneration patterns and its implications for the future of the Northern Forest. We will build upon recently-developed methods that use an emerging regional-scale dataset in which tree seedling are tallied within six height classes to make improved predictions of seedling survival and sapling recruitment. These methods will be applied to plots throughout the Northern Forest to assess what current tree regeneration patterns imply for forest compositional shifts, future carbon storage and climate resilience. We will also forecast impacts of climate change on seedling survival and evaluate the potential efficacy of different treatments for improving seedling survival at a regional scale. The proposed project will create a system for monitoring regional tree regeneration patterns and their implications that can be updated in the future and will be useful for formulating management strategies to improve regeneration success.

#### **THE NORTHERN FOREST HISTORICAL ATLAS PROJECT**

**Lead Principal investigator: Daniel Hayes, University of Maine**

The Northern Forest Historical Atlas Project will bring to life the University of Maine's Sewall Archive of over 700,000 historical aerial photographs covering the Northern Forest region dating back to the 1940's. While over 99% of the archive remains un-digitized and inaccessible to researchers and the broader public, these film photographs—remarkable for their detail, age, and geographic extent—provide a sweeping historical record of the Northern Forest. At native pixel resolutions of 2032 dots per inch (dpi), most photos provide 40 cm spatial detail of the historical landscape. However, given the time and labor intensity of manually digitizing large format film at high resolutions, automation of the scanning process is essential for digitization at archival scale. GeoDyn scanners are the only scanners on the market globally with automated film drive capacity, scanning photos 250 times faster than manual digitization using an otherwise state-of-the-art photo scanner. During the 3 month scanner lease period, 180,000 photos will be digitized, prioritizing imagery that is oldest, most spatially contiguous, and covering Areas of Interest to our Research Users. Using modern photogrammetry software, photos will be stitched together into high accuracy orthomosaics and Digital Surface Models (DSMs) to analyze long-term forest change, extending the remote sensing record of the Northern Forest by decades.

Using unprecedented historical data, the goal of the Historical Atlas Project is to explore landscape-scale changes across the Northern Forest and make the Sewall Archive accessible to the research community, land managers, educators and the broader public.

#### **ASSESSING EDNA AS A MONITORING TOOL FOR FOREST ARTHROPOD BIODIVERSITY AND PESTS**

**Lead Principal Investigator: Jason C. Johnston, Ph.D., University of Maine at Presque Isle**

Arthropods including insects and spiders are an integral component of forest food webs and ecosystems, provide the primary food source for many wildlife species, and are critical to maintain healthy forest ecosystems. Some arthropods are also important pest species - including both native, cyclical insects such as Eastern Spruce Budworm and introduced, potentially invasive insects, such as Emerald Ash Borer. It is critical to be able to measure forest biodiversity generally and detect these pest species, and while significant pest monitoring already occurs, a new approach may add increased ability to detect pests as well as biodiversity more broadly. Using environmental DNA (eDNA) researchers will assess the ability to detect pest species in known infestations, emerging areas, or areas with small or no population detected and to determine at what scale environmental DNA (eDNA) sampling approaches may be used. A second objective of this project is to reduce barriers to successfully using an eDNA approach for forest managers. We will provide tools to support the identification of arthropod species by publishing sampling and laboratory protocols, and through development of a user-friendly data analysis framework and open-source software. One outcome of this work is that forest stakeholders would be better able to detect forest pests and biodiversity, in order to maintain healthy Northern Forest ecosystems, especially in light of these current and emerging threats. Thus, broader outcomes include positive impact on conserving the economic and indigenous cultural value of these resources, in addition to broader ecological and societal value.

## **SUSTAINABLE CO-PRODUCTION OF BIOPLASTICS AND HYDROCHAR FROM FOREST RESIDUE BIOMASS: A NOVEL HYBRID CONVERSION APPROACH**

**Lead Principal Investigator: Ankita Juneja, State University of New York College of Environmental Science and Forestry**

In the face of pressing environmental challenges, our project addresses the urgent need for sustainable alternatives to fossil-based materials and energy sources. Forest residue biomass (FRB), an underutilized resource, has the potential to revolutionize industries by replacing food-based feedstocks with a low-cost, eco-friendly alternative. We focus on utilizing abundant FRB to produce valuable bioproducts while reducing greenhouse gas emissions. We propose a biorefinery system designed for the complete conversion of FRB, harnessing its sugars for biodegradable bioplastics (Polyhydroxybutyrate, PHB) production and its lignin component for hydrochar (analogous to biochar). Our innovative approach integrates thermochemical and biochemical technologies, optimizing resource utilization and reducing processing costs. Unlike traditional methods that rely on expensive solvents, we employ hydrothermal-mechanical pretreatment, saving energy and minimizing environmental impact. Our work also encompasses comprehensive techno-economic and life cycle assessments, ensuring both economic viability and environmental sustainability. This project seeks to bridge the gap between science and practical application. We are committed to sharing our findings on technology, economics, and environmental benefits with stakeholders, policymakers, and the wider community to promote the adoption of sustainable bioproducts and innovative technologies. This information is critical for investors seeking sustainable alternatives and policymakers working toward GHG reduction targets and rural economic development. Our project aligns with the Northeastern States Research Cooperative's (NSRC) focus on forest products and innovative technologies, promising workforce stability and new market opportunities. By unlocking the potential of FRB, we aspire to rejuvenate local economies, create jobs, and contribute to climate change mitigation in the Northern Forest region.

## **PRIVATE FOREST LANDOWNER ENGAGEMENT IN FOREST MANAGEMENT PROGRAMS FOR CARBON SEQUESTRATION**

**Lead Principal Investigator: Danielle Kloster, SUNY College of Environmental Science and Forestry**

Under the 2019 Climate Act, New York State has ambitious, mandatory greenhouse gas emission reduction targets, including greater carbon sequestration in the state's forests. With most NYS forestland owned by private landowners, engaging landowners in forest carbon management will be necessary to meet the targets. However, the lack of information on landowner attitudes and engagement in forest carbon management programs, particularly among disadvantaged communities, remains a serious gap when developing such programs. We aim to understand why private, nonindustrial landowners in the Adirondack-North Country region do or do not engage in existing forest management programs (e.g., RegenerateNY, 480a tax program) and what would be required for them to engage in programs being developed (e.g., carbon certification, tax incentives). In a survey of landowners in the ANC region, with particular attention to disadvantaged communities, we will explore reasons for owning land, previous and planned forest management, awareness of forest management programs, engagement in forest management programs and reasons for (non)engagement, interest in potential future programs, and demographics. In subsequent focus groups, we will also explore strategies to increase willingness to participate, including the effectiveness of different communication strategies, such as the use of realistic, immersive landscape visualizations of future forest conditions. The primary product will be a set of guidelines for program administrators seeking to engage a much broader range of landowners in forest carbon management, including communication guidelines indicating where landowners are getting information and how programs can be framed to improve willingness to participate, particularly among disadvantaged groups.

## **Post-release non-target impacts of hemlock woolly adelgid biocontrol**

**Lead Principal Investigator: Angela Mech, University of Maine**

One of the most sustainable tools to combat invasive species is the use of biological control. However, studies of non-target impacts of biocontrol agents following release are often lacking. The hemlock woolly adelgid (HWA), an invasive species in eastern North America, has had a management program involving the releases of multiple predator species from Asia and the Pacific Northwest since the 1990s. The northern part of eastern hemlock's range contains a high diversity of conifer species, and therefore a high number of other adelgid species as well as their predators, many of which are congeners of HWA's introduced predators. It is currently unknown how prevalent host alternating is with both the native and non-native released adelgid predators, and what direct and indirect effects may be occurring due to it. It is possible that the changes in predator and adelgid species richness in a forest area introduces new relationships that could change predator-prey dynamics in this system, with cascading effects on tree health. The objective of this research is to contribute to HWA biological control programs by better understanding the potential non-target impacts of predator releases (on other adelgids, their predators, and their host trees) in the Northern Forest where there is a high diversity of these insect groups. Results will help promote healthy conifers, including eastern hemlock and eastern white pine, of the region.

## DECADAL-SCALE TRENDS IN NORTHERN FOREST CARBON STORAGE IN RELATION TO NUTRIENT AVAILABILITY AND RISING CARBON DIOXIDE

**Lead Principal Investigator: Scott V. Ollinger, University of New Hampshire**

Understanding trends in wood production and carbon sequestration in the Northern Forest region is critical for societal priorities related to climate mitigation, economic development and managing for resilient forests of the future. Despite a wealth of research on forest carbon cycling, researchers still do not have a sense of how these variables will change in the coming years. At the Bartlet Experimental Forest in NH, data from an intensively studied carbon flux research site indicate decadal-scale reductions in wood growth and carbon storage, but an increase total carbon uptake by photosynthesis. These contrasting trends are surprising, but are consistent with emerging data pertaining to the effects of rising atmospheric CO<sub>2</sub> on plant growth and nutrient availability.

Increasing evidence from research sites in the Northern Forest region and elsewhere suggest that rising CO<sub>2</sub> has caused declines in nitrogen (N) availability by increasing N demand and reducing decomposition through production of more carbon-rich plant litter. The proposed research will assess the degree to which relations among wood growth, carbon sequestration and N availability has changed over time by revisiting a network of plots that our research team last sampled 25 years ago. We will supplement this approach by making additional carbon flux measurements at the Bartlett and Howland, Maine carbon flux tower sites that will clarify mechanisms responsible for observed trends. This approach represents a unique opportunity to resolve questions about forest growth and carbon sequestration that will help plan for more sustainable and resilient forests of the future.

## ASSESSING FIRE-DEPENDENCY IN NATURAL RED PINE FORESTS OF THE NORTHEAST

**Lead Principal Investigator: Simon Pendleton, PhD, Plymouth State University**

In the face of changing climate, the need for data driven management practices of Northern Forests, especially with respect to the use of fire, is becoming increasingly vital. Changes in climate, land use, and fire suppression attitudes since the 1910s have decreased the frequency and severity of wildfires in the region, shrinking and fragmenting the fire-adapted forest ecosystems. Some advocate that this absence of fire helps return the Northern Forest to a more natural trajectory following the high fire frequency of the colonial to industrial periods. Another interpretation postulates that fire is a natural and required component for fire-adapted forests, such that continued suppression risks loss of remaining, relic stands of the pre-colonial era. By reconstructing fire histories using a multi-method approach, our research seeks to provide context for wildfire, and aid in managing northeastern forests for future climates, based on historical structure and function, and use of fire as an adaptation tool. In the Upper Saco and Swift River Valleys in northern New Hampshire, we will combine tree-ring records from fire-adapted red pine stands, with charcoal and pollen analyses from nearby lake and bog sediments to build comprehensive regional records of fire from modern to pre-colonial times. These data will be disseminated to the relevant agencies and stakeholder groups, including the Indigenous community, to guide development of evidence-based forest management practices with respect to fire. Additionally, the proposed work will support hands-on experiential learning and training for multiple undergraduate students at Plymouth State University.

## DIGITAL SPECIES-SITE-SUITABILITY SYSTEMS FOR REGENERATING NORTHERN FORESTS

**Mike Premer, University of Maine**

Spatiotemporal distribution of tree species reflects change in land use policy, silvicultural practices, and site-specific resource constraints. Despite differences in management, natural regeneration provides a template of potential habitat that varies with climate and topographic trends, where individual species occur but might not dominate given competitive interactions or active silviculture. To date, there is a rich volume of work reporting the effect of variations in harvest methods on regenerating species and structure in Northern Forests. Yet, there is a dearth of information that quantifies the influence of site on species distribution at a spatial resolution compatible with management activities under future growing conditions. Recently, integration of geospatial data and with field records has been demonstrated as an attractive method to provide precise estimates of species-site compatibility and potential species diversity. This project proposes to leverage a robust network of forest vegetation and soil pedon data to build high resolution (1/5-acre) digital soil and site maps for the Northern Forest. A suite of geospatial products will serve as a framework to construct baseline estimates of site-suitability across 15 tree species in the region. Changes in suitability will be assessed through 6 future climate scenarios through modifications in growing conditions. Results can be used to [i] generate decision support tools to spatially allocate forest management operations and silvicultural treatments to meet long-term goals; [ii] quantify future potential forest successional pathways; [iii] enhance understanding of site-vegetation dynamics; and [iv] parameterize landscape simulation models; and [v] build a foundation for climate-smart forestry practices.

## **A PREDICTIVE SCALING FRAMEWORK OF FOREST STRUCTURE AND FUNCTIONAL DIVERSITY IN A NON-EQUILIBRIAL WORLD**

**Sydne Record, University of Maine**

A key challenge to understanding the state of ecosystem services provided by the Northern Forest region (e.g., carbon stocks, habitat) lies in estimating forest dynamics across landscapes. With increasing disturbances (e.g., severe storms, drought) linked to climatic change, northeasterners need better predictive frameworks of forest dynamics that connect remotely sensed and in-situ data. Without theoretical grounding, relationships between in-situ and remotely sensed data may be limited to correlational analyses. Most existing theories relating tree sizes and abundances assume an equilibrium state, limiting insights into a world that largely exists in a non-equilibrium state due to disturbances. Our proposed work develops a framework for non-equilibrium scaling theory that links in-situ and remotely sensed data for predicting tree size distributions to better understand the distribution of carbon stocks and wildlife habitat connectivity across northeastern U.S. forests. The proposed research will aid in understanding carbon stocks at a landscape extent as it will provide a model for predicting whole forest functional type abundances by size if only remotely sensed canopy information is known. Research output will also provide landscape extent information on tree size distributions by functional type from the ground to the canopy that will inform biodiversity and connectivity studies by providing estimates of vegetation structure. By working with partner organizations that need information on carbon stocks and biodiversity connectivity between conserved and working lands in the Northern Forest region throughout the project, we will ensure that the research is relevant to societal needs.

## **MAPPING CANOPY HEIGHT MODEL AND ABOVEGROUND BIOMASS OF NORTHEASTERN FORESTS ANNUALLY AT 25 M RESOLUTION THROUGH REMOTE SENSING DATA FUSION AND MACHINE LEARNING.**

**Lead Principal Investigator: Bahram Salehi, SUNY College of Environmental Science and Forestry**

Forests are recognized for their multiple benefits and values, including their role as natural climate solutions, as habitat for terrestrial biodiversity, and as providers of clean water, air, and wood products, feedstock for bioenergy and biomaterials, and diverse recreational and educational opportunities. Quantifying and frequently monitoring changes in forest canopy height models (CHMs) and aboveground biomass (AGB) are essential for assessing, managing, and conserving forests, addressing climate change, carbon, and energy issues, and ensuring the sustainable use of forest resources. Although the Northern Forest is more extensively forested now than it has been in several generations, forest landscapes face many novel stressors and drivers of change. This necessitates a consistent, standard, and cost-efficient way to study the current state and monitor the changes of forest landscapes across the Northeastern Forests (NF).

Building upon our recent progress in generating high-resolution forest structure and biomass products for New York State using remote sensing technology, this project's goal is to extend these capabilities to encompass the entire NF region. Specifically, our goal is to create annual wall-to-wall CHM and AGB maps at 25-meter spatial resolution, covering the entirety of the NF regions including New York, Vermont, New Hampshire, and Maine. This effort is conducted in close collaboration with the U.S. Forest Service and stakeholders from the broader NF region. Our approach capitalizes on a fusion of data from a range of Earth observation instruments, including publicly available spaceborne optical, radar, and lidar sensors. These data are harnessed through advanced machine learning techniques calibrated and validated on several pilot sites across NF region using airborne lidar data and forest plot measurements.

The output of this research is annual maps of CHM and AGB for 2024, 2025, and 2026 along with the machine learning tools to support creation of these maps in the future. The maps will provide a consistent, standardized, and reliable database of forest structure and biomass across the entirety of NF region on an annual basis, which are not only useful for studying the current state of forests, but also helps practitioners and decision makers to understand the changes and to predict and respond to those changes. This research proposal aligns with the first three NSRC focus areas including the State of Forest, Measuring and Quantifying Impacts, and Developing Tools for Response. The research will provide direct support for pressing concerns related to climate change, forest carbon accounting, and the implementation of forest-based natural climate solutions. Additionally, it addresses issues pertaining to land use, sustainable forestry, and forest fragmentation as well as biodiversity and connectivity.

#### **LONG-TERM MONITORING OF RARE PLANT POPULATIONS IN THE ADIRONDACK ALPINE**

***Kayla White, Adirondack Mountain Club***

New York's Adirondack alpine zone harbors many rare vascular plants threatened by climate change, atmospheric deposition, and damage from recreational use. Monitoring these rare plants increases our ability to detect population change over time while incorporating environmental variation to help us understand the factors controlling how densities change across the Adirondack alpine landscape. This population monitoring has been conducted over three events at 6-year intervals in 15 alpine areas over a 13-year span. We will re-sample for these species using a stratified random sampling procedure to generate population status estimates. The objectives of this study are to: 1. estimate, for 2024, the population and sub-populations of selected rare species growing throughout the Adirondack alpine zone, 2. test for any divergence in population size, and 3. better understand if and how plant population levels are linked to environmental heterogeneity and hiker education. Outputs include a fourth round of sampling, analysis from New York Natural Heritage Program, and sharing results with land managers, researchers, stewardship organizations, and the public. Short-term, this status assessment will help evaluate which populations and sub-populations are of the highest quality and help guide management activities that could benefit these rare species. Long-term, this method can help determine if other environmental factors may be linked to climate change vulnerability. Changes documented through this project may help in making predictions about the effects of a changing climate on other alpine areas in the Northern Forest region.

#### **CLIMATE-SMART STRUCTURAL RETENTION FOR BIODIVERSITY FOR MANAGED FOREST LANDSCAPES IN THE NORTHERN FOREST REGION.**

***Andrew Whitman, Manomet***

Biological conservation in managed forests of the Northern Forest region relies on structural retention practices developed in a stable environment. Structural retention is a widely applied forestry practice used to conserve old trees, sensitive species, and other biodiversity components. It ranges from retaining scattered old trees to old growth forest and is used to help meet forest certification requirements. Climate change is projected to change regional forest ecosystems over the next century and may reduce the conservation effectiveness of structural retention.

The project goal is to determine how to make structural retention practices effective in the long-term. The project will (1) re-survey plots to assess the long-term effectiveness of structural retention and (2) use modelling to project future effectiveness of structural retention under climate warming. Re-measurements of trees, logs, snags, sensitive species, and microclimate and will be used to determine how well scattered trees, forest patches, and stands have maintained forest structure, sensitive species, and microclimate 20 years after logging of surrounding forest. Modelling will use climate projections and microclimate data to predict which of these retention practices are effective for maintaining biodiversity components and sensitive species under different future climate scenarios. The research findings will be shared through peer-reviewed papers, a forester webinar and workshop, and how-to materials with guidelines which foresters and landowners can use to apply the results. This will help all land managers improve the long-term effectiveness of conservation in managed forests and help them meet new forest certification requirements.

# Program Impacts

## Project Diversity

The Northern Forest is a complex and dynamic region that is highly dependent on its abundant natural resources, particularly its sustainably managed and multi-use forests. The Northern Forest is managed by a variety of landowners, including non-industrial private, industrial private, federal and state agencies, and non-governmental organizations. Management policies and practices vary by state but are highly dependent on available local product markets, tourism, and recreation. Over its history, the NSRC has maintained a diverse array of research projects across 14 primary interest areas that reflect stakeholder priorities. In 2016, NSRC released a comprehensive Business Report on the program's contributions to generation of knowledge about the environment and the economy of the Northern Forest since 2001.

To date, nearly 335 projects have been completed. The highest concentrations of research from those years fell under the focus of these areas: (1) Forest Management & Productivity; (2) Atmospheric Pollution; (3) Forest Health & Invasive Species; and (4) Climate Change.

Research supported by the NSRC resulted in more than 300 peer-reviewed publications. A complete bibliography of these publications can be found and sorted according to Interest Areas on the NSRC website (<https://nsrcforest.org/interest-areas>). Additionally, hundreds of reports, guides, tools, and plain-language documents, videos, etc. were developed for Northern Forest stakeholders.

## Recent Program Outputs

In 2024, eighteen research projects were awarded to investigators from Maine (7), New Hampshire (3), Vermont (1), New York (5), and two regional organizations. These projects address a wide range of issues, including: forest management for climate change adaptation and resilience; rehabilitative silviculture tools to enhance habitat; the use of eDNA as a monitoring tool for forest arthropod biodiversity and pests; post-release, non-target impacts of hemlock woolly adelgid biocontrol; fire-dependency in natural red pine forests; long-term monitoring of rare plant populations; and climate-smart biodiversity conservation practices.

These projects are in their early stages and remain ongoing, with progress reports available on the NSRC website. In addition to producing four peer-reviewed journal articles and six more in preparation, project teams have actively participated in conferences and talks (8 total), and have engaged numerous graduate and undergraduate students in their research efforts.

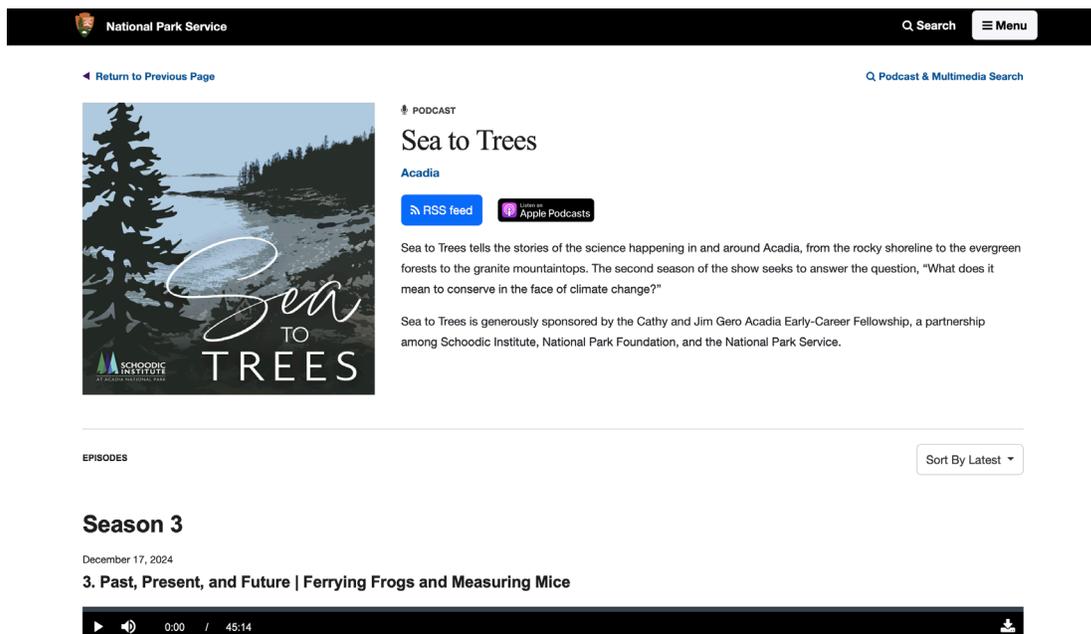


Figure 4. Screen shot of podcast which is an NSRC output.



NEWS TOP STORIES

# PSU professors researching fire management practices in the White Mountain National Forest

1 year ago

Alison Kaiser

She/Her

Staff Writer

2/28/24

Plymouth State University's professors Simon Pendleton and Lisa Doner were approached by colleagues from the White Mountain National Forest sector of the United States Forest Service to conduct research addressing the future of controlled burns and fire management practices in the White Mountains.



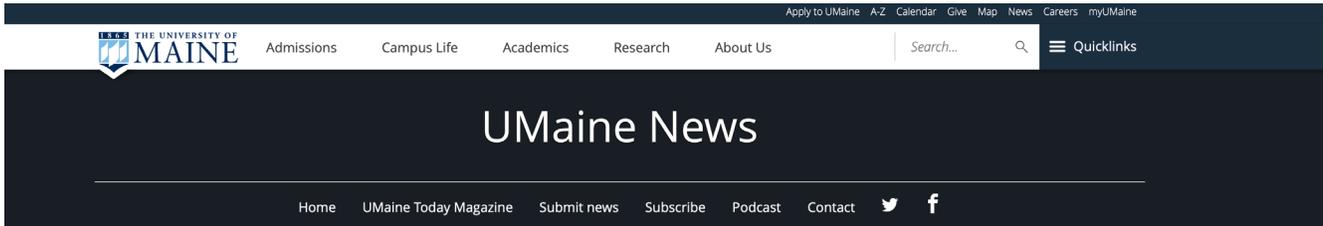
The project, titled 'Assessing fire-dependency in natural red pine forests of the Northeast', is set to take place over the next three years and is funded by a grant of \$308,891 from the Northeastern States Research Cooperative.

The grant funding allows Pendleton, Doner, and co-principal investigator Chris Guiterman of the National Centers for Environmental Information to employ three to nine undergraduate students over the course of the three-year project, an aspect Pendleton looks forward to. "One thing that all of us get really excited about is the involvement of students. To be able to get them out into the field and get their hands into the mud, literally" he said.

The project was designed for student involvement and will include participation in all aspects including fieldwork, laboratory analysis, and data interpretation. This will give students an opportunity to engage in real-world application of the curriculum, while also making a significant impact on the forests in their backyard.

The main research objective is to determine what role past fire activity and consequent fire suppression have played in the composition of our forest ecosystems, and what role it should play in the future.

Figure 5. Screen shot of article in Plymouth State publication regarding an NSRC project.



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- Bangor-area media highlight Maine Science Olympiad at UMaine  
Published: April 15, 2025



## UMaine researcher will digitize thousands of historical photos to understand changes in the Northern Forest Region

May 21, 2024

Tucked away in a quiet, climate-controlled building on the University of Maine campus is a collection of old film. Donated to Fogler Library's Special Collections by the James W. Sewall Company (Sewall) in 2019, the collection includes over 3,000 large canisters, each with a bright yellow "Kodak" sticker on the front and 250 photos contained within.

Taken from airplanes between 1946 and 2015 for land surveying purposes, much of the photo collection tells a

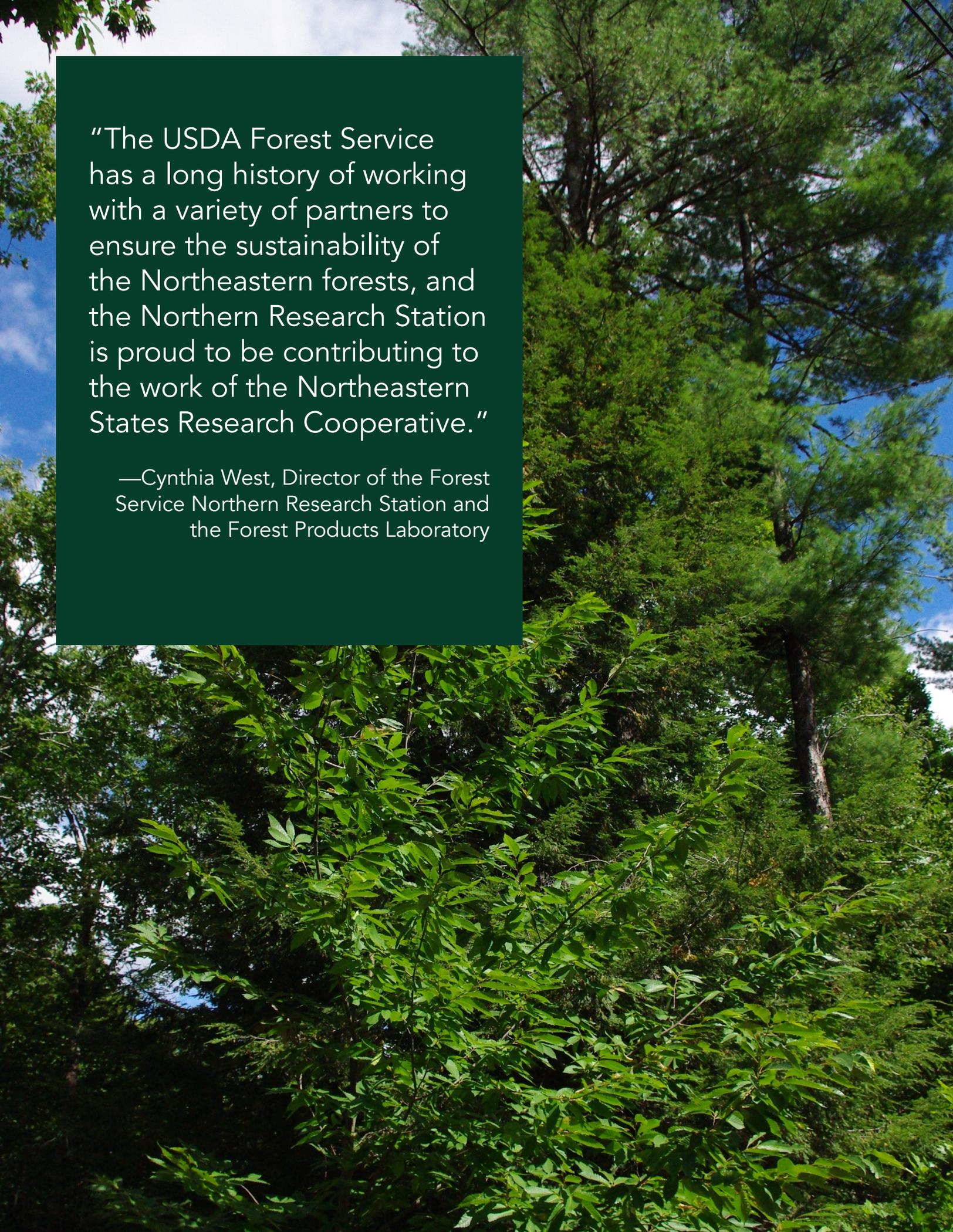
Figure 6. Screen shot of article in UMaine News highlighting NSRC research.

# Prior Program Updates

Projects awarded in 2020 and 2021 have either been completed or are nearing completion, and they have reported numerous outcomes. Over the past few years, these projects have collectively produced 20 scholarly articles, 36 conference presentations, and 19 outreach activities—including webinars, social media posts, and website content—highlighting their progress and findings.

Figure 7. Screen shot of webinar highlighting NSRC research.

Figure 8. Screen shot of article in Granite geek highlighting NSRC research.



“The USDA Forest Service has a long history of working with a variety of partners to ensure the sustainability of the Northeastern forests, and the Northern Research Station is proud to be contributing to the work of the Northeastern States Research Cooperative.”

—Cynthia West, Director of the Forest Service Northern Research Station and the Forest Products Laboratory

# Appendix A

## NSRC Congressional Authorization (Public Law 105-185)

Authorization (from Public Law 105-185, Forest and Rangeland Renewable Resources Research Act of 1978 section 1642 (d) (3) as amended in 2003

“At the request of the Governor of the State of Maine, New Hampshire, New York, or Vermont, the Secretary may cooperate with the northeastern States of New Hampshire, New York, Maine, and Vermont, land-grant colleges and universities of those States, natural resources and forestry schools of those States, other Federal agencies, and other interested persons in those States to coordinate and improve ecological and economic research relating to agriculture research, extension, and education, including —

- (A) research on ecosystem health, forest management, product development, economics, and related fields;
- (B) research to assist those States and landowners in those States to achieve sustainable forest management;
- (C) technology transfer to the wood products industry of technologies that promote efficient processing, pollution prevention, and energy conservation;
- (D) dissemination of existing and new information to landowners, public and private resource managers, State forest citizen advisory committees, and the general public through professional associations, publications, and other information clearinghouse activities; and
- (E) analysis of strategies for the protection of areas of outstanding ecological significance or high biological diversity, and strategies for the provision of important recreational opportunities and traditional uses, including strategies for areas identified through State land conservation planning processes.”

# Appendix B

## External Advisory Committee 2021 Summary Report

*This report was utilized for the 2023 RFP*



### External Advisory Committee for the Northeastern States Research Cooperative 2021 Summary Report

August 23, 2021

Prepared by: Sarah Garlick, Anthea Lavallee, Julianna White, Meg Fergusson

#### **Overview of the Committee Charge and Process**

The charge of the External Advisory Committee (EAC) for the Northeastern States Research Cooperative (NSRC) is to inform the NSRC Executive Committee about the priority issues facing forest stakeholders in the Northern Forest region and to provide guidance to the NSRC Executive Committee for crafting the 2021 request for proposals (RFP) in response to broader stakeholder interests and needs. This report is a summary of responses from the EAC following individual feedback via an anonymous questionnaire, a two-hour facilitated EAC group meeting via Zoom held on August 5, 2021, and EAC member feedback on a draft of this report during a ten-day comment period, August 12–22, 2021.

#### **2021 External Advisory Committee Members**

*Susan Arnold*, Vice President for Conservation, Appalachian Mountain Club

*John Bartow*, Executive Director, Empire State Forest Products Association

*Tyler Everett\**, Passamaquoddy Forestry, United South and Eastern Tribes, Inc.

*Rich Grogan\**, Executive Director, Northern Border Regional Commission

*Patrick Hackley*, State Forester and Director, NH Division of Forests and Lands, State of New Hampshire

*Derek Ibarguen*, Forest Supervisor, White Mountain National Forest

*Kathy Fallon Lambert*, Senior Advisor, Harvard T.H. Chan School of Public Health, Center for Climate, Health, and the Global Environment; Co-Founder, Science Policy Exchange

*Donald Mansius*, Director, Forest Policy and Management Division, Maine Forest Service

*Craig McLaughlin*, Wildlife Research and Assessment Supervisor, Maine Department of Inland Fisheries and Wildlife

*Neil Patterson, Jr.*, Assistant Director, Center for Native Peoples and the Environment, SUNY ESF

*Tyler Ray*, Founder and Principal, Backyard Concept

*Sean Ross*, Managing Director, Lyme Timber Company

*April M. Salas*, Executive Director, Revers Center for Energy at Tuck School of Business, Dartmouth College; Chief Sustainability Officer, Town of Hanover, NH

*Joe Short\**, Vice President, Northern Forest Center

*Michael Snyder*, Vermont State Forester and Commissioner of Vermont Forests, Parks, and Recreation, State of Vermont

*Casey Thornbrugh*, Northeast and Southeast Tribal Climate Science Liaison, United South and Eastern Tribes, Inc., and Northeast and Southeast Climate Adaptation Science Centers

\*Did not participate in the EAC meeting but provided input via email and the pre-meeting questionnaire.

### **Summary of Recommendations**

An early comment during the EAC videoconference set the tone for the discussion:

“Looking at the RFP, our input [from last year] seems to have been heard, and that’s really fun to see. [...] And then looking at the funded projects, they’re interesting and informative, but what I wonder about is what was the range of applications and proposals and what didn’t get funded, because I’m kind of curious about that. I guess I’ll say that I’m a little bit underwhelmed by the list of funded projects, relative to the RFP, and the focus areas, and the principles embedded in it.”

Following this comment, the EAC discussed a general feeling that there was a gap between the list of funded projects and the principles in the RFP about informing practitioners and policymakers. As one EAC member stated, “[This is] a good list of topics, but the nature of the work is pretty far removed, I would say, from application.”

The discussion then explored several ideas about why that might be the case and what recommendations might be made to close this gap. EAC members asked for a list of all of the proposed projects to try to ascertain if a group of applied projects did come through the call for proposals, but that they were not chosen because of merit, in which case the problem to address would be how to encourage better projects. This conversation led to a number of recommendations including:

#### **I. General Recommendations:**

1. Strengthen the language within the RFP, the application form itself, and the selection criteria to promote problem-driven, engaged research with solid communications work. The language should ask more from the applicants about the applied question that they are asking, their rationale, and their strategy for making their results actionable for management and policy. This could be distilled to instructions for applicants so that there is no ambiguity in their responses; for example, in a matrix that steers responses from concept to action.
2. Consider requiring the applicant to assert the “readiness” level of their proposed research for application like “technology readiness levels” used in other scientific fields. A commonly accepted spectrum of “commercial readiness” levels ranges from basic to applied research, and/or commercializing to scaling projects. Consider including a “readiness level” as an explicit check box which would also help NSRC in future reporting about where its funding goes.
3. Reconsider the 50% match requirement as this could be a structural barrier for applied projects and projects led by groups outside of universities. This is also an equity issue. Could there be a mechanism for asking if projects either have a match or if they need a match, and if a match is needed for a promising project, could there be a process for working with that team to find a solution? (Note from the NBRC: the NBRC has not found this to be an issue, but if equity is a concern, the NBRC has used a waiver system in the past (e.g., for COVID-related hardship)).

4. Encourage projects that demonstrate alignment with the timeframe of policy decisions. This may mean shorter projects on one-year timelines or multi-stage projects that have longer horizons but also account for interim annual milestones.
5. Spread the word about the RFP “beyond the usual suspects” in basic research.
6. Build in funding for relationship-building and engagement. This could look like a smaller award such as a planning grant. This could also include flexibility built into full awards such that research teams can modify their projects midstream based on engagement with partners and stakeholders. Smaller planning grants also help to address the equity issue because smaller or less-well-resourced organizations could possibly be competitive for smaller awards that build support or provide proof-of-concept for future applications.
7. Funding for relationship-building and engagement should be tied to a clearly articulated and strong approach (i.e., as one participant put it, “money alone is not the answer.”). One strong approach to ensuring engagement is to require a partner/organization on the project team who has the track record and demonstrated networks in place to partner with academia on that outreach and engagement.
8. Review the timing of the general NSRC award and the Indigenous Forest Knowledge Fund (IFKF). There needs to be enough time between the general RFP process and notice of awards and the IFKF application due date such that Tribal-led projects could participate in the general call and then restructure for the IFKF if needed.

## **II. Specific Topics:**

### A. Environmental Justice (EJ) and Diversity, Equity, and Inclusion (DEI)

The group discussed the topics of environmental justice (EJ) and diversity, equity, and inclusion (DEI). Several members of the EAC advocated for these topics to retain the current emphasis in the RFP to ensure that the NSRC is meeting its mission to be “relevant and beneficial to people and environment.” The group discussed the “mixed messages” in the pre-meeting questionnaire responses (see Appendix A) regarding this topic. Two participants made the point that “these are important issues, but could be de-emphasized as relative to other topics.” One participant countered that it was important to know if “our services are benefitting those we serve. Looking at the NSRC geography and NSRC mission, we should not assume the work and research in their current design benefits all communities in the NSRC region.” Another participant illustrated the value of looking “through a lens of DEI” to reach new conclusions and recognize blind spots. The final comment of this discussion suggested that research that helps to define EJ as it relates to ecology and natural resource management would be helpful and that the RFP could clarify this focus.

### B. Rural Community and Economic Development

In the RFP, the topic of rural community and economic development is quite broad and needs more alignment with the rest of the document. In the RFP, the EAC recommends moving this point higher in the document to be the fourth cross-cutting focus area.

### C. Areas of Emphasis or De-emphasis

In general, the EAC felt like the issues emphasized in the RFP were still relevant. There were suggestions for more emphasis on the timber industry, forest products, and economic connections to forest management, recreation, and workforce development. Several participants emphasized the importance of regional approaches — research that facilitates cross-border, regional thinking, for example in invasive species research and response.

There was a discussion about whether COVID-related topics should be de-emphasized (see responses in the pre-meeting questionnaire). One participant advocated that COVID-related changes in visitors and residents in the Northern Forest are still quite relevant with long-term implications, for example, increasing wealth and income inequality by an influx of new remote workers. Another participant noted that COVID-related topics may be less relevant with regard to *why* changes have occurred, and instead should move quickly toward an emphasis on better understanding these changes through data, and then engaging with them as they are.

### D. Review Criteria

The EAC recommends that the principles in the RFP become more clearly reflected in the proposal review criteria and review process, including both the technical reviews and the external panel reviews. One group suggested the concept of bonus points for clearly applied research. “We’re going to hear a lot of basic research proposals and that’s good — I don’t think that’s going to change. But if we want to drive more toward applied, [consider] a bonus points program for [rewarding proposals with] active partnerships between basic researchers and managers.”

The EAC recommends adjusting the percentages of the research criteria and moving the “additional considerations” higher in the list with their own percentages. For example, the applicability question is 20%. Could this be increased directly or could the concept of “bonus points” described above add weight to this criterion? The group did not suggest an exact figure, but expressed that this is a clear priority of the EAC and should be weighted as such.

As one participant put it, the key is to make what were termed “additional considerations” in the 2020 RFP a formal and substantial part (at least 20 points) of the scoring rubric, not just “additional” or “bonus” items. “The 2020 approach suggests that these are nice to have but not must-have items, when I think the strong consensus of the committee in 2020 (and in 2021 as well) was to not just encourage but require projects that are “problem-driven, engaged research with solid communications work.” Looking at last year’s points values, none of the points in the scoring rubric actually spoke to this, so it is not surprising that funded projects didn’t reflect it.”

One participant suggested having a single person who is fully immersed in the subject matter of the RFP screen all proposals for alignment with the priorities before they are sent to the reviewers/evaluators.

Regional efforts need to be ranked more highly than local efforts.

**III. Attached:** Compiled individual responses to the pre-meeting questionnaire.

# Appendix C

## List of the institutions represented in funded projects

*This includes both the general fund and the IFKF*

Adirondack Mountain Club  
Appalachian Mountain Club  
Manomet  
Paul Smith's College  
Penobscot Nation  
Plymouth State University  
Saint Regis Mohawk Tribe  
SUNY ESF  
The Morton Arboretum  
University of Maine  
University of New Hampshire  
University of Vermont  
Wabanaki Youth in Science (WaYS)

