HUBBARD BROOK RESEARCH FOUNDATION

Donor Report

December 2016

With Your Help...

Working at the interface of science and society, our goal—with your help—is to bring scientists and citizens into conversation. As you know, science won't assert itself unless we make it accessible to the teachers, students, policy-makers, land-managers, and citizens who depend on it. During this particularly turbulent time, we will turn to science more than ever for reality-based decision-making about our environment.

In 2016, we expanded our roundtable dialogue program, provided curriculum resources to every public school and library in New Hampshire, and increased our logistical support for Hubbard Brook scientists who work collaboratively to bring our region's ecology into sharper focus.

From informed environmental policy to place-based education, there is tremendous opportunity for Hubbard Brook science to do good work in the world. Together, we can unlock this potential.

You are an important member of the Hubbard Brook community, and we are deeply grateful for your support.

Sincerely,

Anthea Lavallee
HBRF Executive Director

Hubbard Brook Research Foundation

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Operated by the USDA Forest Service
Ian Halm, Site Manager
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HUBBARD BROOK RESEARCH FOUNDATION

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THE HUBBARD BROOK RESEARCH FOUNDATION (HBRF) COMMUNITY

Hubbard Brook is a network of environmental thinkers including scientists, stakeholders, concerned citizens, and you, the donor. In this report, we share "snapshots" of staff and other members of this network in order to give you a sense of our work and how, together, we create a close-knit, diverse, dedicated, and dynamic community.

SCIENCE POLICY AND OUTREACH PROGRAM LEADER

Photo: Anne Skidmore

Sarah Garlick, the HBRF's Director of Science Policy and Outreach since May of 2014, is a science writer from North Conway and a self-described "geology nerd." She brings community outreach and science communication skills to her work which focuses on engaging the public with Hubbard Brook research. She is the author of two books on geology and an avid rock climber.

Highlights of Sarah's outreach work so far in 2016 include:

- A Hubbard Brook Roundtable about climate change and land management in the White Mountains, which led to a climate change adaptation workshop facilitated by the Northern Institute of Applied Climate Science and the University of New Hampshire Cooperative Extension
- A Science Communication Workshop for the Hubbard Brook Committee of Scientists with trainers from the American Association for the Advancement of Science
- Media coordination and outreach for the Hubbard Brook Ice Storm Experiment (see page 6)
- A series of science "pub nights" with partners including the University of New Hampshire, USDA Forest Service, Mt. Washington Observatory, Upper Saco Valley Land Trust, and Tin Mountain Conservation Center

"Hubbard Brook brings together a rich and lively community of people who are a delight and an inspiration — it's what I love most about working here. Together we work to answer the question 'how do we build new and better connections between science and society?' This is the ultimate challenge of my work and the essence of the Foundation's mission."

— Sarah Garlick

FORESTER AND SITE MANAGER

Ian Halm is a forester and Site Manager for the U.S. Forest Service at Hubbard Brook. Ian has been working at Hubbard Brook since 1990—with the Forest Service since 1995—splitting his time between research and site management. This past year, Ian was instrumental to the successful launch of Hubbard Brook's groundbreaking Ice Storm Experiment (see page 6).

Ian's leadership, integrity, and rock-solid work ethic are a reflection of Hubbard Brook's core values.

"Ian's talent with managing people and resources, his mechanical ability, knowledge of Hubbard Brook, the ins-and-outs of research and regulations—and his willingness to extend himself to others, with good humor—is amazing. Ian is key to the 'Hubbard Brook way of life,' a wonderful life indeed."

– Don Mower, Hubbard Brook Field and Maintenance Technician

COOPERATING SCIENTIST

Dr. Pamela Templer is an Associate Professor of Biology and the Director of the Ph.D. program in Biogeoscience at Boston University. Pam is also a HBRF Trustee and a Hubbard Brook researcher since 2006.

Pam inspires her students to become attuned to both harmony and dissonance in nature, whether they're in a lecture or measuring snow depths at Hubbard Brook. She leads the Climate Change Across Seasons Experiment at Hubbard Brook, now in its third year.

"I really enjoy working at Hubbard Brook! It is a wonderful community of scientists, students, and staff—all working together to do solid, collaborative science and meaningful outreach to the public."

– Pam Templer

HUBBARD BROOK SUPPORTER

A true Hubbard Brook champion, **Dr. Peter Martin** volunteers his time as the current Chair of the HBRF's Board of Trustees. He and his wife Lynn Freeman live on a farm in Meriden, New Hampshire, where they maintain hiking and riding trails that are shared with the public. The undeveloped portion of their property is a managed woodlot, and their approach to forest stewardship reflects their appreciation for conservation and healthy forest ecosystems.

Like so many members across the Hubbard Brook community, Peter appreciates the important contribution donors make to the success and advancement of Hubbard Brook science.

"I consider it a privilege to be able to help support the important world-class science at Hubbard Brook. This work helps us better understand the complex ecology of the northern forest. A better understanding is an essential step in crafting policy and monitoring change, as we face global challenges. I am so glad to interact with the people doing such great work—scientists, staff, trustees—and our many donors."

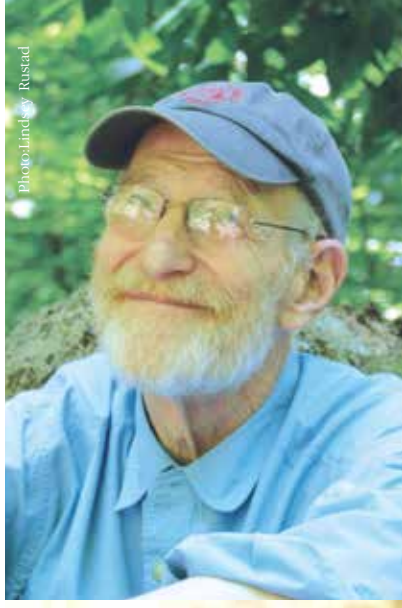

Photo: Lindsey Rustad

UNDERGRADUATE STUDENT

In this excerpt from his essay *Learning to be a Naturalist at Hubbard Brook,* **Torrin Hallett**, music composition, horn performance, and mathematics student at Oberlin College and Conservatory, shares his thoughts on Hubbard Brook's Research Experience for Undergraduates program.

"I left my tiny dorm room and musician friends in Ohio to spend ten weeks living in a house with science students, scientists, and technicians. I created a musical representation of water cycle data [part of the WaterViz data visualization project] *that had been collected at Hubbard Brook the previous year.*

"I also assisted other researchers—and I learned from them. I learned about the hidden beauty of a stream while watching it and listening to it flow. And, by climbing into a soil pit, I saw all of the layers hidden in the soil below. So much that is unseen plays a vital and beautiful role in the forest ecosystem. I had a life-changing experience, one that forever altered my ideas about science and nature."

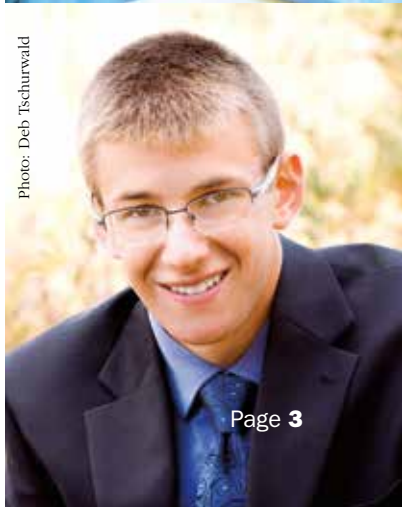

Photo: Deb Tschurwald

HUBBARD BROOK SCIENCE AND PROGRAM UPDATES

- The **Ice Storm Experiment** (see page 6) broke new ground (and many branches!) in this controlled simulation designed to reveal the immediate and long-term consequences of these extreme winter events. As the impacts of the ice storm continue to unfold, Hubbard Brook scientists are studying its effects on forest growth, nutrient cycling, and susceptibility to pests and pathogens.

- ***WaterViz* for Hubbard Brook: A New Water Cycle Visualization and Sonification Tool** — This project explores the interface of hydrology, visual arts, music, and information design. Real-time data representing the water cycle at Hubbard Brook drive artistic visualization and sonification programs. The results create new interpretive tools for making data dynamic and more accessible.

- **Smart Forests Technology** — At regular intervals over the course of the day, sensors at Hubbard Brook measure stream temperature and flow, precipitation, relative humidity, and air temperature. Rendered in real-time and in meticulous detail, the data create a multi-dimensional profile of the forest. Hubbard Brook has been a leader in Smart Forests Technology and a model for other experimental forests across the region.

- Hubbard Brook principal investigator Pam Templer (see page 2) studied the impacts of reduced snowpack, altered freeze-thaw cycles, decreased rain, and increased soil temperature on northern hardwood forest health, nutrient uptake, and carbon sequestration in her **Climate Change Across Seasons Experiment**.

- **The U.S.-China Climate Change and Forests Initiative** — Scientists from Hubbard Brook recently traveled to China to exchange research results with representatives from two demonstration forests in a coordinated effort among the U.S. Department of State, the U.S. Forest Service International Programs, and the China State Forestry Administration. The goal is to explore global strategies for climate change mitigation and adaptation through collaboration and joint research. We look forward to hosting a delegation of Chinese scientists at Hubbard Brook this spring.

- **Gene Likens,** co-founder of the Hubbard Brook Ecosystem Study and HBRF Trustee, recently received the Organization of Biological Field Stations Award for Distinguished Service to Field Science. In his acceptance speech, Gene emphasized the potential for field stations, like Hubbard Brook, to kindle a lifelong passion for science among young researchers.

EDUCATION

Long-time Hubbard Brook researcher and New Hampshire native **Natalie Cleavitt** authored a children's book entitled, *Seeking the Wolf Tree*, as part of the National Science Foundation's Long Term Ecological Research Network's Children's Book Series. Set within the Hubbard Brook Experimental Forest, this adventure story is geared for elementary reading levels and describes a quest for a rare and ancient tree. More than 2,500 copies of *Seeking the Wolf Tree* have now been distributed across the state, and every New Hampshire school (grades 4-6) and town library has received one or more copies.

Hubbard Brook's education programs include professional development for teachers, free math and science lessons, school partnerships and curriculum consulting, and research experiences for undergraduates. Selected highlights from our 2016 education programs are listed below.

- Three teachers took part in the summer-long Research Experience for Teachers program
- Eight students participated in the 10-week Research Experience for Undergraduates program
- We recorded 300 unique downloads of free educational materials from the Hubbard Brook website
- We continued to develop our long-term, close partnerships with 10 public schools, with a special focus on those situated in the five districts closest to Hubbard Brook
- Hubbard Brook educators presented at the New Hampshire Science Teachers' Conference and at the New Hampshire Environmental Education Conference
- We provided professional development training to 40 teachers through New Hampshire's Education and Environment Team Math-Science Partnership Program
- Hubbard Brook staff conducted guided forest tours for 350 teachers and students

Illustration: Marjorie Leggitt

THE ICE STORM EXPERIMENT

The Hubbard Brook Experimental Forest Crackles with Scientific Insight

Last winter, after more than a year of planning and baseline measurements, Hubbard Brook researchers succeeded in creating one of Mother Nature's most extreme winter events. Although ice storms are related to climate change and expected to become more common and severe in our region, they are unpredictable and difficult to study. At the end of January, with the forecast calling for an opportune layering of cold air under warm air, a team of scientists from the U.S. Forest Service, Syracuse University, the Cary Institute of Ecosystem Studies, Cornell University, University of Vermont, and the Hubbard Brook Research Foundation trekked into the forest in pre-dawn, single-digit temperatures. They used fire hoses and high-pressure pumps to spray water from the Hubbard Brook 100 feet into the air, coating experimental plots in a fine, freezing mist. Eight plots, each about the size of a basketball court, were treated with varying degrees of glazing. Decked in ice from base to tip, the forest was undeniably beautiful, until it literally began falling apart, raining bits of broken branches into sample collection baskets which enabled researchers to quantify the damage, down to the gram.

Lindsey Rustad, U.S. Forest Service Team Leader for Hubbard Brook and principal investigator on the experiment, explained "This research will provide the scientific community, land managers, and the concerned public greater insight on the impacts of these powerful, frightening, and curiously aesthetic extreme winter weather events on ecosystem dynamics in northern hardwood forests."

Hubbard Brook investigators continue to monitor the long-term consequences in the aftermath of the ice storm, including tree growth, species composition, susceptibility to forest pests and pathogens, impacts on wildlife, and nutrient cycling.

Photo: Joe Klementowich (both)

"It is critical to identify the effects of human-accelerated environmental change on the functions and services forest ecosystems provide."

– U.S. Forest Service Research Ecologist, John Campbell

HUBBARD BROOK IN THE MEDIA

This year marked the release of *Hubbard Brook: The Story of a Forest Ecosystem*, by **Richard T. Holmes** and **Gene E. Likens**. For more than 50 years, the Hubbard Brook Experimental Forest in the White Mountains of New Hampshire has been one of the most intensely studied landscapes on earth. This new book highlights many of the important ecological findings amassed during the long-term research conducted there and considers their regional, national, and global implications. The book and its authors have been featured across a wide range of local, regional, and national media. Recent coverage includes a *Living on Earth* episode, entitled "Hubbard Brook: An 8,000-acre Test Tube" which was broadcast nationwide, on public radio in September.

Other Hubbard Brook Media Coverage in 2016:

- Ice storm Experiment: The Weather Channel, NHPR, local papers, NSF *Science Now*
- Climate Change Across Seasons Experiment: HBO News
- "Discovering Acid Rain at the Hubbard Brook Experimental Forest," WBUR Boston

Dick Holmes and Gene Likens are pictured here with Living on Earth *host Steve Curwood.*

THANK YOU FOR YOUR SUPPORT

The following list acknowledges donors who have contributed to Hubbard Brook in 2016, to date.

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Capstone Campaign for Mirror Lake in Memory of Phyllis C. Likens

Since launching the Capstone Campaign for Mirror Lake in the fall of 2015, we have raised $165,000 toward full ownership of the property. As of November 1, 2016, we have $167,000 left to raise.

Housing, lab, and storage facilities at the Mirror Lake Campus accommodate more than 100 researchers annually.

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Mitch, Leslie (Likens), Sam, Noah, & Jason Armbruster
Christopher Barton & Sarah Tebbens
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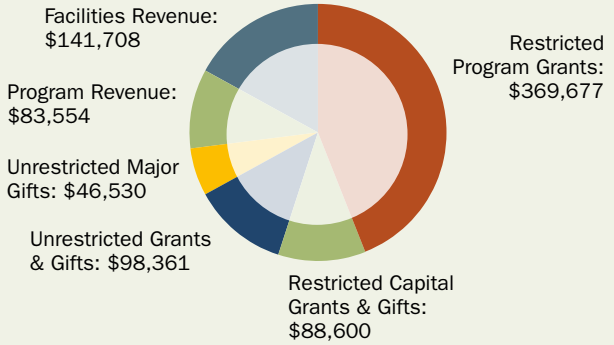
Hubbard Brook Research Foundation
FY 2016 (October 1, 2015 – September 30, 2016)

Revenues $828,430



Expenses $767,820