

# HUBBARD BROOK RESEARCH FOUNDATION

# Annual Report

December 2018



*Long-term monitoring often provides insights that are not available otherwise. We are very fortunate to have been able to continuously monitor the chemistry of precipitation and stream water at Hubbard Brook for more than 55 years. These are now the longest integrated measures of this type in the world. These records are particularly valuable now because of proposed policy changes that could dramatically change air and water pollution in the eastern U.S. We need to know if these changes are happening and whether they are unusual. Our long-term records will provide those answers.*

*– Gene E. Likens, Co-Founder of the Hubbard Brook Ecosystem Study*

*Mirror Lake is among the most studied freshwater ecosystems in the world and a cornerstone of Gene Likens' seminal theories about air-land-water interactions.*

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## THE HUBBARD BROOK COMMUNITY

For more than half a century, long-term studies of air, water, soils, plants, and animals at the 8,000-acre Hubbard Brook Experimental Forest have led to landmark discoveries including acid rain; the effects of lead, salt, and nitrogen pollution in streams and lakes; and the factors affecting migratory songbird abundance. Hubbard Brook is a network of environmental thinkers, including scientists, communicators, educators, stakeholders, and engaged citizens.

### Hubbard Brook Research Foundation

#### *Administrative Offices*

30 Pleasant Street, Woodstock, VT 05091  
(802) 432-1042

### Pleasant View Farm & Mirror Lake Campus

25 Dobson Hill Road, Thornton, NH 03285

### Hubbard Brook Experimental Forest

#### *Robert S. Pierce Laboratory*

234 Mirror Lake Road  
North Woodstock, NH 03262  
Operated by the USDA Forest Service  
Ian Halm, Site Manager  
(603) 726-8902

**[www.hubbardbrook.org](http://www.hubbardbrook.org)**



## From Our Executive Director

### We are all natural-born scientists

As a mother and K-12 environmental educator, I learned long ago that every kid's favorite word is "why." We are all natural-born scientists, hard-wired for curiosity. Hubbard Brook investigators spend their adult lives following their curiosity into the forest and the lab, asking and answering questions about our changing world. Unless you're a professional ecologist, life and work can take you away from nature and from inquiry, but the scientific wiring that we were all born with is always there. Let's reconnect it.

Recently, HBRF has been exploring outreach opportunities that focus not just on *what we know* about Hubbard Brook but *how we know it*. We are beginning to bring techniques for studying ice storms to students and volunteers, assessing long-term forest recovery with land trusts, and understanding corporate sustainability using a small-watershed approach.

When schoolyards, backyards, working and protected lands become living laboratories, we break down the perceived barrier between scientists and non-scientists and build a culture of everyday inquiry.

Let's stay curious. Let's reclaim our scientific instincts. Let's keep asking why.



Anthea Lavallee  
HBRF Executive Director



Photo: John Yannopoulos



Photo: Hannah Vollmer



Photo: Eliza Minnucci



## Hubbard Brook Supporter

**Carol Pierce** is a founding family member of the Hubbard Brook Ecosystem Study. Carol's husband, Dr. Robert Pierce, USFS, was Project Leader for the Hubbard Brook Experimental Forest from 1958 to 1991. Bob believed in the power of intellectual community and welcomed the participation of the Dartmouth College collaborators who co-founded the Hubbard Brook Ecosystem Study at a time when the Forest Service and academic research were distinct and often separate scientific spheres. "Bob wanted everyone to be equally valued. In the early days of Hubbard Brook's annual meetings, it was important to Bob that every student and investigator be understood and respected. There were no silos." Sharing Bob's dedication to inclusivity, Carol worked as an Organization Development Consultant, specializing in the diversity field. She chaired the New Hampshire Commission on the Status of Women from 1970 to 1975 and served a term in the New Hampshire State Legislature. As a current member of Hubbard Brook's Advisory Council, Carol's insights and perspectives recall the origins of the Hubbard Brook Ecosystem Study and the collaborative spirit that continues to define it.



**"Hubbard Brook is blossoming into an educational role with the public, reaching out into the world. Bob would be so proud of that. It's what keeps me connected."**



ROBERT S. PIERCE  
ECOSYSTEM LABORATORY

## Undergraduate Scholar



A city boy at heart, **James Zhang** made a bold choice when he joined Hubbard Brook's vegetation crew last summer. With his sights set currently on a career in urban ecology, Hubbard Brook brought this Cornell University sophomore deep into the

mountains and far from his metropolitan comfort zone. It was a formative experience; James learned the value of flexibility and creative problem-solving at a remote forest field site, where weather, equipment failures, and other curve balls conspired against careful plans. The physicality of the work also made an impression. Long days of hiking through tangled vegetation were rewarded by stunning mountaintop views or evening naps on a paddle board, adrift in Mirror Lake. James found a role model in Crew Leader and longtime Hubbard Brook Investigator, Natalie Cleavitt. "Her work ethic and passion rubbed off on me. **I developed a new appreciation for trees. Before, they had always been in the background. Now, I identify them as critical parts of the ecology.** The interest in plants and the work went hand-in-hand; as I worked, I developed a love for them, and it fed my conviction to work harder. Nat led me to appreciate the grandness of an American Beech and to meticulously



Photo: Clara Chaisson

*Left to right: Nat Cleavitt, Molly Bergum, Rachel Goland, and James Zhang.*

assess its canopy health. I also never realized a plant could be so cute!" James described, in vivid detail, the pine seedlings that he cataloged — standing 2 cm tall, with exquisite spirals of tiny needles.

From the forest trail to the cityscape, James' career path holds great promise. Contributing to and benefiting from the intellectual development of this thoughtful young researcher has been a privilege. Like the seedlings that so captivated him, James will always have roots at Hubbard Brook.

## HBRF Staff Spotlight



“Science Adjacent.” That’s how writer **Clara Chaisson** describes her role as Hubbard Brook’s Outreach and Communications Manager. Clara joined the HBRF team in the winter of 2017 and applies her dual passions for science and creative writing across a range of new media projects. Accompanying scientists in the field, Clara “collects” experiences while researchers collect data. Direct observations infuse her writing with vitality and rich detail. “It’s interesting to see how much creativity and

troubleshooting go into field work. The data seem so clean and precise, but what goes into them is actually very creative and dynamic.” Clara has her own way of processing the science — translating technical information for general audiences, discerning key concepts, and distilling the story through her distinctive, clear style. Expanding that “science adjacent” space and inviting others to join her there are powerful motivators. In an atmosphere of skepticism and when empty rhetoric threatens the truth, Clara believes it’s crucially important to share information from accurate sources. **“Good communication can convince people to become more engaged.”**

Regardless of the sociopolitical climate, Hubbard Brook investigators are driving the science forward. Clara is upfront and along for the ride, keenly perceiving vital information about our changing world. As her reader in the adjacent seat, you are too.



*Left: Clara as a research technician at the Plum Island LTER.*

*Right: With co-worker Gabe Winant at HBRF’s staff retreat to Squam Lakes Natural Science Center*



## USDA Forest Service Lead Scientist

**Dr. Scott Bailey** has been working at Hubbard Brook for more than 20 years. His current project, funded by the National Science Foundation, explores the dynamic relationships among water, rock, and soil. Water interacts with rock to create soil, and soil properties influence subterranean and surface water quality. At its mountain source, each stream has a unique chemical signature, determined in part by the soil. Unbraiding the Hubbard Brook main stem reveals that some tributaries make especially important contributions to downstream water quality (e.g., high calcium concentrations). In combination with aerial sensor scans (LiDAR) at the landscape scale, Scott's findings can feed computer models to generate targeted land management prescriptions that protect water quality at crucially important hot spots. Scott explains, **"The thin skin of soil on planet Earth is what makes life possible."** His work will uncover water-soil interactions for predicting and protecting water quality from the mountain top to the tap.



*At the top of Watershed 3, Scott Bailey (center), Maddy Schreiber (left), and Jenny Bower, University of Vermont Ph.D. student (right), process a sample core of glacial sediment that is more than 23 feet deep.*

**Project collaborators include Kevin McGuire, Virginia Tech; Don Ross, University of Vermont; Madeline Schreiber, Virginia Tech; and Brian Strahm, Virginia Tech.**



## HUBBARD BROOK SCIENCE AND PROGRAM UPDATES

- 🍃 In July, Hubbard Brook celebrated **50 years of continuous bird research**, under the direction of Dartmouth Research Professor of Biology, Richard Holmes.
- 🍃 HBRF received a 3-year award from the **National Science Foundation** for public engagement with science.
- 🍃 Hubbard Brook's mobile **forest tour app** is now available for free download from the App Store, Google Play, and on the web at [hubbardbrook.oncell.com](http://hubbardbrook.oncell.com).
- 🍃 HBRF launched *Forest Science News*, a **monthly e-newsletter** featuring research related to the forests of the northeastern U.S. and southeastern Canada.
- 🍃 **Dr. Lindsey Rustad**, Research Ecologist and Hubbard Brook Team Leader, presented results from the Ice Storm Experiment to officials at the New Hampshire Department of Homeland Security and Emergency Management.

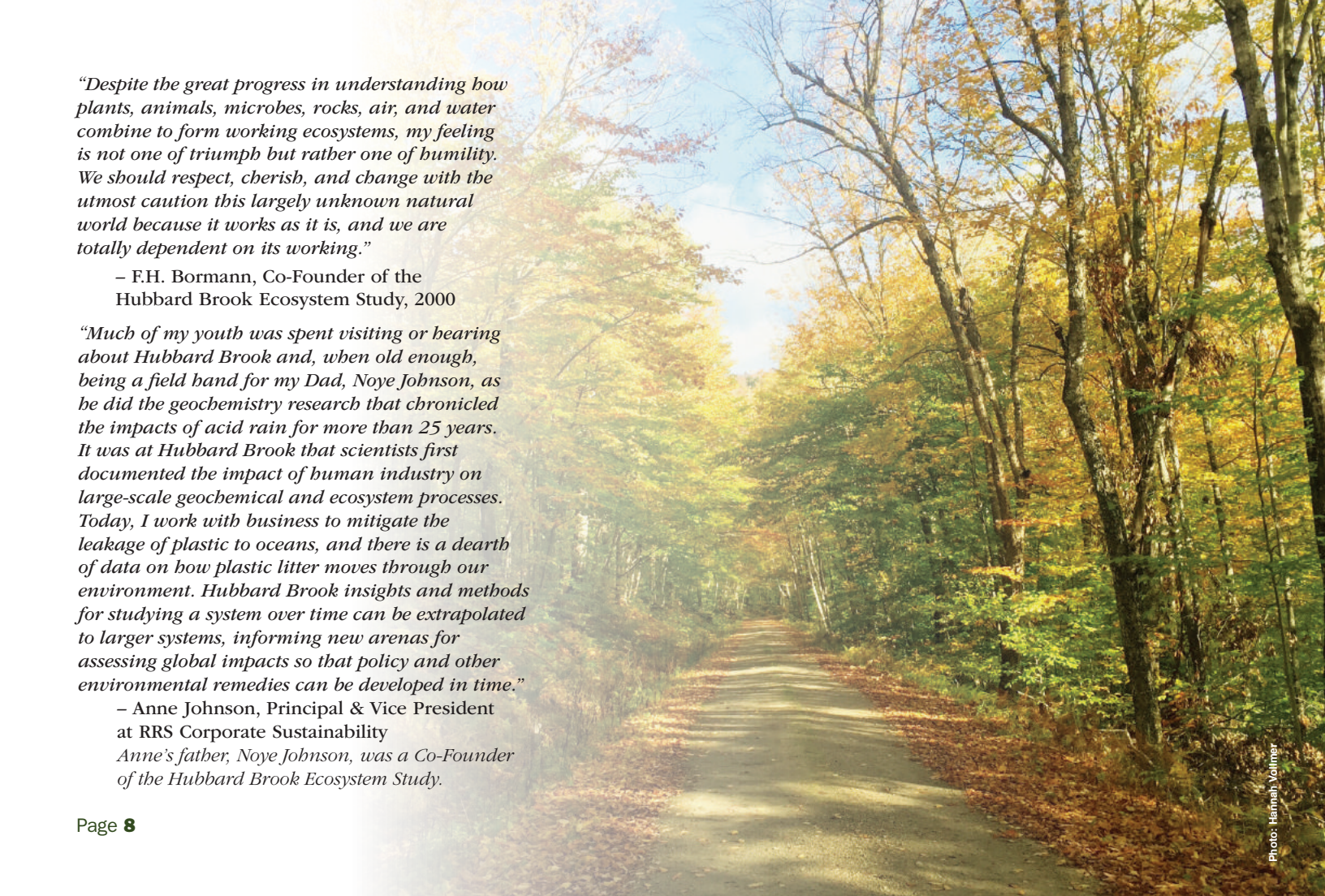




- Principal Investigator, **Nat Cleavitt**, visited K-8 school classrooms across New Hampshire, sharing hands-on activities inspired by Hubbard Brook science.
- HBRF coordinated round table dialogues on the topics of *Our Changing Winters*, *Resilience*, and *A Climate Economy in the Northern Forest*.
- Hubbard Brook was featured in the **Centennial Exhibit of the White Mountain National Forest** at the Museum of the White Mountains.
- Hubbard Brook hosted a workshop to **develop a volunteer ice measurement protocol**. Participants represented the Community Collaborative Rain, Hail, and Snow Network and the National Weather Service.
- U.S. Senator Jeanne Shaheen** (top) visited Hubbard Brook in August for a briefing on science, education, and outreach.
- A team of students from the Tuck School of Business at Dartmouth (middle) conducted a project that identified connections between Hubbard Brook and the science of corporate sustainability.
- Hubbard Brook Educators **Sarah Thorne** and **Amey Bailey** and Principal Investigator **Lindsey Rustad** (bottom) presented *WaterViz* at the New Hampshire Science Teachers' Association Fall Conference in October. *WaterViz* will be exhibited at the Miami Media Festival in Doral, Florida, from November 10, 2018 through January 15, 2019.

*"I love the challenge of finding new ways to connect Hubbard Brook science with the everyday lives of people who live and work in New England's forests. Creating opportunities for civil, face-to-face dialogue among people with different perspectives and values seems to me like one of the most important tasks of our time."*

– Sarah Garlick, HBRF Director of Science Policy & Outreach



*“Despite the great progress in understanding how plants, animals, microbes, rocks, air, and water combine to form working ecosystems, my feeling is not one of triumph but rather one of humility. We should respect, cherish, and change with the utmost caution this largely unknown natural world because it works as it is, and we are totally dependent on its working.”*

– F.H. Bormann, Co-Founder of the  
Hubbard Brook Ecosystem Study, 2000

*“Much of my youth was spent visiting or hearing about Hubbard Brook and, when old enough, being a field hand for my Dad, Noye Johnson, as he did the geochemistry research that chronicled the impacts of acid rain for more than 25 years. It was at Hubbard Brook that scientists first documented the impact of human industry on large-scale geochemical and ecosystem processes. Today, I work with business to mitigate the leakage of plastic to oceans, and there is a dearth of data on how plastic litter moves through our environment. Hubbard Brook insights and methods for studying a system over time can be extrapolated to larger systems, informing new arenas for assessing global impacts so that policy and other environmental remedies can be developed in time.”*

– Anne Johnson, Principal & Vice President  
at RRS Corporate Sustainability  
*Anne’s father, Noye Johnson, was a Co-Founder  
of the Hubbard Brook Ecosystem Study.*





## THANK YOU FOR YOUR SUPPORT *The following list gratefully acknowledges donors who contributed to Hubbard Brook between October 1, 2017 and September 30, 2018*

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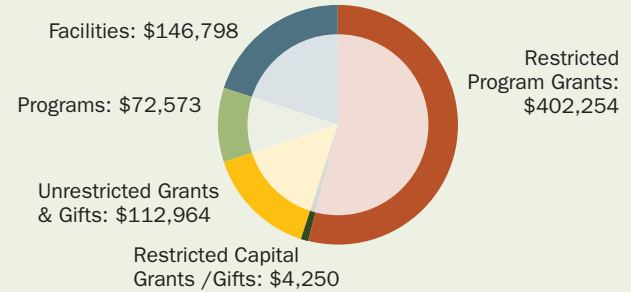
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In memory of Phyllis Likens <sup>2</sup>  
In memory of Robert S. Pierce <sup>3</sup>  
In memory of Tom Siccama <sup>4</sup>

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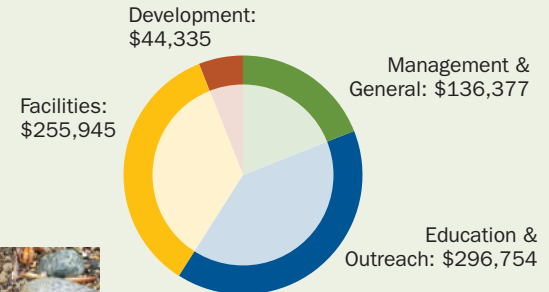
## **Hubbard Brook Research Foundation**

**October 1, 2017 – September 30, 2018**

### **Revenues \$738,839**



### **Expenses 733,411**



*Thanks to the generous support of nearly 200 campaign contributors, HBRF achieved debt-free ownership of the Likens Conservation Campus at Mirror Lake in July 2018.*