BLACK ROCK FOREST NEWS

Black Rock Forest | 65 Reservoir Road, Cornwall, NY 12518 | Spring 2020

Then Barnard student, Kiran Singh-Smith, tests reservoir samples for surface pH and conductivity (left); collects samples from 8.25 meters deep (center and right). Photo by Dr. William Schuster

Reversing Negative Impacts

Nearly 4 decades later, waters recover from acid rain

By Jeff Simms

In 1985, a pair of scientists traveled around the Hudson Highlands to study the effects "acid" rain on dozens of regional bodies of water. Taking samples from ponds and lakes in Black Rock Forest, as well as Harriman, Sterling Forest and Fahnestock state parks, they found waters with low alkalinity and pH values — the results of a century of poisoned rainfall.

First discovered in 19th century England, acid rain impacts both terrestrial and aquatic ecosystems by introducing pollutants into water, soil and air. The U.S. adopted the Clean Air Act in 1970 to limit pollution and protect the earth's ozone layer, but harmful emissions were still being released from cars, power plants and other sources at high levels well into the 1980s. Surface waters were thus frequently subjected to toxic rain and snow, particularly at high elevations where it had yet to be neutralized by soils during runoff.

The scientists' findings in the Highlands confirmed just that, showing the ripple effect that begins with the emission from manmade sources of gases like sulfate and nitrogen oxides. After their release, the gases mix, high in the atmosphere, with water and oxygen, before returning to the earth's surface as precipitation — establishing acidic conditions and weakening and killing fish and other aquatic life.

In 2018, Barnard College student Kiran Singh-Smith, along with one of her mentors, William Schuster, the executive director of Black Rock Forest, hopped on a rowboat and began retracing the scientists' steps in an effort to measure the results of the Clean Air Act and other emissions controls enacted in the decades since. What Singh-Smith found was remarkable. *(continued next page)*

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Out of 43 bodies of water studied in 1985 in Black Rock Forest and the surrounding Highlands, 25 of them were considered threatened, meaning they had little ability to ward off the effects of pollutants and acid rain. By 2018, however, four ponds that were previously classified as endangered or critical had recovered enough to be considered satisfactory for aquatic life. Ten others that had been deemed vulnerable to acid deposition had become more resilient, as well.

Half of the ponds had significantly higher pH values while more than 60 percent had higher alkalinity levels. A majority were now classified as satisfactory for aquatic life and less vulnerable to acid deposition.

Singh-Smith's findings are significant not just for the upturn in water quality but because the Highlands — situated in the downwind northeast pocket of the country — are particularly vulnerable to pollutants emitted as far away as the Midwest and deposited here by the wind.

The *Phyllonorycter propinquinella* is an adult moth reared from a leaf mine collected at BRF for a small grant study. Photo by Charley Eiseman

The results are in! 2019 Small Grants Reports

By Kate Terlizzi, BRF Research Manager

The results are in! 2019 David Redden Conservation Science Fund small grant recipients have submitted the results of their research and added to the rich research archive here at Black Rock Forest. Three of the six recipients have been awarded additional funds to continue their research into 2020 and therefore their results are still pending.

Dr. Jason Dombroskie (Cornell University) and Charley Eiseman spent just a few days in Black Rock Forest collecting individuals from the Order Lepidoptera (butterflies and moths) and found nearly 100 different species. Sixty-five of the species collected have been fully identified and of those, 17 had never been observed in NY state before and 27 had never been observed in BRF's ecoregion. Mr. Eiseman stated that these moths have likely always been here, but that little effort had been made to fully survey them until now. Many of them are very small leaf-mining insects which are often neglected in studies.

Dr. Brendan Reid (Kellogg Biological Station-Michigan State University) examined the plausibility of using DNA found in the environment or "eDNA" to identify the presence of rare aquatic and semi-aquatic

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(2019 Small Grants Report continued)

turtles in BRF and the surrounding region. Dr. Reid found that eDNA has potential to be helpful in the arena, however, fine tuning of the methods will be required.

Dr. Rachel Cox (Riverdale Country School) mentored two high school students from her school who examined the epigenetic differences in DNA expression between low latitude and high latitude white spruce trees. They found that the trees in BRF (low latitude) expressed more of their genes and made more proteins than the trees in Alaska.

The three continuing projects are 1) examining box turtle movements throughout the Forest using DIY GPS "backpacks" and VHF radio transmitters (Macey and Palmer); 2) exploring how tree species diversity affects carbon storage, water use and soil moisture in an eastern deciduous forest (Bruner); 3) utilizing natural soil moisture gradients along north and south facing slopes to examine how future water stress may affect tree growth (Deas and Reinmann).

The next round of funding for the David Redden Conservation Science Fund small grants has begun and once again we were able to fund six out of the nine proposals we received. All of the proposals received had merit, however, with a limited funding the committee reached the decision to fund the following six projects:

1. Akana, Palani. Columbia University: "How does an invasive nitrogen-fixing tree affect the spatial distribution of soil nitrogen, tree access to soil nitrogen, and seedling growth?"
2. Bruner, Sarah. Columbia University: "The portfolio effect in forests: linking tree diversity to forest function."
3. Deas, Ayo. CUNY Hunter College: "Leveraging natural gradients in microenvironment to interactive effects of changes in climate and forest tree species composition."
4. Macey, Suzanne and Matthew Palmer. American Museum of Natural History and Columbia University: "High-resolution tracking of rare turtles at Black Rock Forest: Development of new tools for wildlife conservation."
5. Mifsud, Isobel. Columbia University: "Quantifying rates of N fixation on xylophagous beetle larvae."
6. Taylor, Benton. Harvard University: "How drivers of the forest understory shift between biotic and abiotic controls based on deer browsing and oak mortality."

Ash tree at BRF with signs of Emerald ash borer damage (See "Ash Trees, Invasives and Forest Evolution" next page). Photo by Aaron Culotta

BLACK ROCK FOREST NEWS

Ash Trees, Invasives And Forest Evolution

By John Brady, BRF Forest Historian

The winter of 2018-2019 displayed the collapse of yet another native tree species. Winter's sunlight angles through the leafless forest canopy, highlighting the freshly chiseled trunks of white and black ash trees. The bare stems are evident from lowland to ridge top forest stands, infected with yet another non-native invasive insect, emerald ash borer (EAB), (*Agrilus planipennis),* which has little or no population regulation, and which continues to disrupt native forest composition, diversity, and integrity. In recent years and in neighboring states, especially Pennsylvania, one can see the abrupt voids in mountainside forest canopies, foreshadowing the approach of the ash trees' demise in our area. Most notable are the distinctive diamond-shaped fissures and interlacing ridges of ash tree bark, having been chiseled away by pileated woodpeckers and others seeking nourishment from the excessive number of emerald ash borer eggs and EAB larvae feeding on the trees' phloem and cambium layers beneath the bark.

A recent, similar case is that of the hemlock woolly adelgid *(Adelges tsugae),* a hemlock species-specific insect with no natural predators in this region. The adelgid prefers to feed on healthy, mature hemlock trees, finishing by girdling the flow of the trees' irreplaceable nutrients. The emerald ash borer girdles healthy trees, too. The sheer number of insects feeding will eventually fatally disrupt the flow of water and nutrients that the trees need to survive.

Domestic use of white ash wood from the Forest can be traced back to shipments to Ellenville, New York, to become branded Adirondack baseball bats. Locals also used white ash for tool handles, fine lumber, and premier firewood. Black ash was used by earlier patrons of Black Rock Forest. One of these was Furman Conklin, a forest friend from Stony Point, who collected black ash to split, pound, and steam into staves for handmade baskets and chairs.

In the future, forest wildlife will need to find substitutes for the palatable seeds, buds and leaves of the ash trees. Cavity shelters in ash trees, often excavated by woodpeckers and used by nesting animals, will someday be scarce. For now, though, life goes on as usual, with abundant advantage being taken of the decaying, insect-riddled trunks and their bird-excavated cavities.

The recent loss of hemlock and ash as major forest components is reminiscent of the fate of two former dominant forest species that were devastated in the early 20th century: American chestnut and American elm. Chestnut and elm trees both succumbed to introduced and uncontrollable Asiatic pathogenic fungi. The effects were disheartening: the superior, rot-resistant wood and lumber of American chestnut became no longer available, and their once abundant and nutritious nuts disappeared. Wildlife population certainly suffered until the treeless voids became re-occupied, mostly by red and black oaks, and occasionally by white ash. The statuesque, vase-shaped elms that shaded so many main streets, making you feel like you were looking at the world through a green tunnel, are also now gone. Some have been replaced with more resistant tree species. In spring, elms were the earliest producers of mature seeds available to wildlife. Forest and field elms, once a favorite for the hanging hammock nests of Baltimore orioles, were replaced by black locust, red maple, cherry, white ash, and non-native ailanthus and barberry.

Hemlock mortality has led to the vigorous growth of black and grey birch, big-toothed aspen, striped maple, and sassafras. Fortunately, these species create conditions that may someday regenerate forests

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(Ash Trees, Invasives and Forest Evolution continued)

of conifers, such as pine and spruce, beneficial to many species of nesting birds and over-wintering mammals.

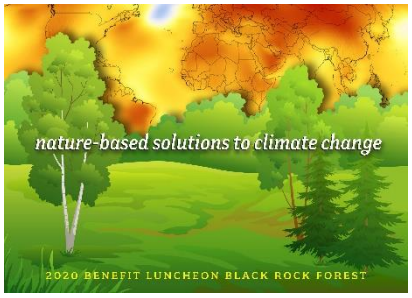
What will replace the void created by emerald ash borer? Native cherry, hickory, birch, maple, and oak trees are common neighbors of ash; non-native invasives such as tree-of-heaven, Norway maple, barberry, and devil's walking stick (angelica tree) are also possible candidates. In addition, the great advances being made in developing blight-resistant American chestnuts may play a part, allowing these trees to reforest stands of dead ash trees after its own demise.

The devastation of such principal native forest components is likely to continue in years to come. Forest studies have revealed the constant state of change within forest ecosystems. Forest integrity and resilience originate from evolution and the continual metamorphosis of tree species composition and interrelations. Slow or abrupt, adaptation to current influences is what creates our present-day forest.

Forest News in Brief

Grayson Badgley, PhD

We are delighted to announce that Dr. Badgley, a recent PhD awardee from Stanford, will be Black Rock Forest's first Postdoctoral Fellow in Forest Ecology, initiating our endowed fellowship program. Dr. Badgley aims to arrive in May and we look forward to his joining our team. He will focus on refining his novel method for quantifying forest canopy-level photosynthetic carbon uptake.



2020Benefit Luncheon

The benefit to be held at the Metropolitan Club, titled "Nature-Based Solutions to Climate Change" honoring Anne P. Sidamon-Eristoff, a founding member of the BRF Board of Directors, and featuring Dr. Chris Field as the keynote speaker, has been postponed till the fall. The event is being retooled to ensure that it will be safe, enjoyable, and inspiring. Updated information can be found at blackrockforest.org.

Calling Photographers!

BRF is looking for your amazing photos of the Forest for use in our annual calendar and on social media. Images can be of any season or topic as long as they were taken at Black Rock Forest. Amateur submissions are welcome, but high resolution, horizontal images are preferred and should include date and location. Please submit to info@blackrockforest.org

Photo by S. Schaffner

Conserving our trees, future editions of the newsletter will be sent electronically unless a hard copy is requested at info@blackrockforest.org