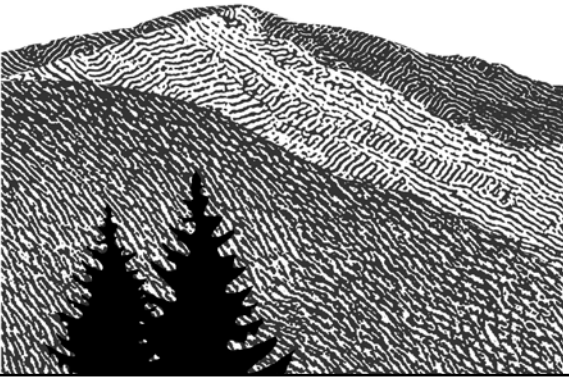


# BLACK ROCK FOREST NEWS

Spring 2013 The Black Rock Forest Consortium Volume XXIII, No. 2


## Benefit Luncheon: Biodiversity and Our Future

Bill Schuster and Sibyl R. Golden present Dr. Thomas Lovejoy with a photograph of the forest.

Biodiversity success stories were the focus of a benefit luncheon for the Black Rock Forest Consortium held on May 8 at the Metropolitan Club in New York City. Highlights of the event, co-chaired by Noah and Maria Gottdiener, included a keynote talk by Dr. Thomas Lovejoy on why biodiversity is essential to our quality of life and the presentation of the E. G. Stillman Award to Christopher Buck.

A sold-out crowd of more than 200 people gathered for the festive occasion; many member institutions took tables, as did board and Leadership Council members and other friends of the Consortium. All provided vital support for the Consortium's research, education, and conservation activities.

After the guests mingled and then sat down to lunch, Sibyl R. Golden, the Consortium's chairman, opened the program. She welcomed the guests, thanked the event's supporters, and then introduced Dr. Lovejoy. Currently the Biodiversity Chair of the Heinz Center for Science, Economics, and Environment and University Professor of Environmental Science and Policy at George Mason University, Dr. Lovejoy is a world-renowned conservation biologist. After conducting his doctoral research in Brazil's Amazon in the late 1960s, Dr. Lovejoy went on to create the Minimum Critical Size of Ecosystems project, which determines the minimum size for parks and biological reserves to effectively protect species; introduced the idea of conservation biology to the scientific community by helping plan the first international conference on the topic; developed the concept of debt for nature swaps, which have helped preserve many biologically important lands in developing countries; explored how climate change will affect biodiversity with two co-edited books; founded the public television series *Nature*; and served as the Chief Biodiversity Advisor for the World Bank and the Senior Advisor to the President of the United Nations Foundation.

*(continued on page 5)*

## Summer in the Forest: Students and Research

School may be out, but summer is a busy time in Black Rock Forest. This summer brings several new and expanded programs to the Forest, including the Summer Science Classes and Camp and a two-week visit by students in a Master of Arts in Teaching program at the American Museum of Natural History, as well as visits from the North American Dendroecological Fieldweek and the Lower Hudson Partnership for Regional Invasive Species Management group and research projects by undergraduates, graduate students, and scientists.

**Classes and Camp**

For a second year, the Consortium will offer week-long summer classes for high school and middle school students (see "Forest Learning," Winter 2013). This year's program builds on last year's pilot program by offering additional classes over three weeks at the Forest and at other sites. Students can take half-day or full-day classes and participate in the camp at the Forest Lodge, which includes indoor and outdoor recreational activities with camp counselors. Classes will be taught by graduate students and professors from Consortium and other institutions and will include such diverse topics as ornithology, biological illustration, and wetlands. A complete course catalog and camp schedules are available on the Consortium's home page, www.blackrockforest.org.

**Earth Science Teachers**

Graduate students in the American Museum of Natural History's Master of Arts in Teaching program for middle school earth science teachers will spend two weeks in the Forest in July. The

*(continued on page 3)*

# Report from the Executive Director

There is much cicada "buzz," both from the insects and from people interested in them. The cicadas make noise to find each other and to select mates. And human attention to natural phenomena is important for our own long-term well being.

Much of the eastern US is now experiencing reemergence of Brood II of the remarkable genus *Magicicada*. These insects spend 17 years underground sucking fluid from tree roots and then they emerge synchronously, metamorphose into adults to mate and lay eggs, and then die. The tiny larvae then hatch after a few weeks, drop to the soil and burrow down to drink from roots for the next 17 years.

You cannot help but notice these cicadas after they emerge due to several unusual aspects of their biology. Periodical cicadas emerge in numbers as high as one million per acre, becoming briefly the most abundant herbivore in the forest. This strategy makes mate-finding easy and also ensures that the species will survive by satiating all of the available predators. One also cannot escape hearing the male "chorus" in trees: by vibrating abdominal muscles attached to their exoskeletons in unison by the thousands, they collectively make one of the loudest sounds of any animals in nature.

One trait these cicadas share with humans is incredibly lengthy juvenile development: indeed they have the longest developmental period in the insect world. The genus *Magicicada* is thought to have originated in glacial times in a climate when summers were often too cold for the insects to successfully reproduce. Longer developmental periods were favored because, mathematically, the less often a brood emerges, the more likely it is to escape a killing summer. And a 17-year cycle, since it is a large prime number, also means that these cicadas only rarely emerge at the same time as cicadas that cycle over shorter periods, thus avoiding hybridization which could produce offspring with intermediate life cycles, preventing the mass synchronization so important to their success.

Periodical cicadas have effects on trees that change forests over time. Broods are composed of two or three different species each with their favorite host species, and trees with numerous late-stage nymphs on their roots can exhibit reduced growth and then a growth rebound after emergence. Trees that adult females lay eggs on can experience twig damage and breakage that can also reduce growth, especially in small trees. Conversely, cicada feeding on roots locally enhances soil moisture, their burrowing increases soil aeration, and the huge flux of nitrogen and other nutrients added to soils every 17 years after they die *en masse* enhances plant, insect, and microbe growth in the years following emergence. Thus these cicadas significantly affect forest dynamics over large areas.

The most important ecosystem effect of cicadas is the huge cyclical pulse of energy and nutrients through the food web. While underground, cicadas are important food for moles and shrews. After emergence they are readily consumed by a variety of predators. Predators benefitting from this pulse of energy can increase in population — they are certainly a boon to our small mammals now suffering from three years since an acorn mast — and some of the other prey of these predators may get a temporary reprieve.

Periodical cicadas have no defenses, are readily caught, and are recognized as being tasty and nutritious across the animal kingdom, including by humans. I enjoyed them dry roasted and also chocolate-coated this past emergence, though my limited-sample-size experiment indicated about 50% of eastern North Americans could not get them past their lips.

Periodical cicadas also represent a type of environmental sensor we should pay attention to. Over-compaction and other challenges to soil health may underlie the recent disappearance of cicadas from some parts of their natural range. I also value them as indicators of public awareness of nature and have been heartened by what seems like a higher level of interest compared to 17 years ago. So appreciate these amazing insects: aside from chance encounters you may have when digging deeply in the garden, it will be another 17 years until you have the chance to enjoy them again. — *Dr. William Schuster*

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**Summer** *(continued from page 1)*
Museum's program, which is funded in part by the New York State Department of Education and the National Science Foundation, as well as by Museum donors, is designed to address the shortage of qualified science teachers in the state, especially in "high-needs schools with diverse populations," according to Dr. James Webster, a curator in the Museum's Department of Earth and Planetary Sciences and one of the scientists who will be teaching the students in the Forest. Students in the program commit to working in a high-needs school in New York for at least four years, take classes at the Museum, and have residencies in partner schools before earning their degree from the New York State Board of Regents.

At the Forest, the students will engage in geologic field training and astronomical observations, guided by staff members from the Museum's departments of Earth and Planetary Sciences, Astrophysics, and Education, both in the Forest and in other regional parks. "They will learn about the ancient metamorphic rocks in the Forest and elsewhere, surficial geologic features in the Forest resulting from prior glacial activities, the iron-bearing deposits enriched in the mineral magnetite and the importance of these deposits in the cultural history of this region, the important magmatic rocks of the Palisades sill located along the west side of the Hudson River near New York City, the Cortland complex exposed in Peekskill and Stony Point, and fossiliferous sedimentary rocks near Kingston," explains Dr. Webster. "And for two evenings, Museum astrophysicists will bring the students to the Stone House to introduce them to observing the night skies by telescope and gathering astronomical data."

**Other Visits**
The 23rd North American Dendroecological Fieldweek will take place in the Forest starting in late June. "The Fieldweek is an international training program that works through original research projects to train future dendrochronologists," explains Dr. James Speer of Indiana State University. The program brings graduate students along with faculty members, professional foresters, and some undergraduates to a different area each year. "We use research projects to make the education more meaningful," adds Dr. Speer, "and to allow the volunteer group leaders to test out new research directions." Projects are designed in consultation with local researchers and, as the group's web site notes, "have effectively combined elements from many different disciplines to design novel solutions to ecological hypotheses." Participants become familiar with the region and then work on specific projects, first in the field and then in the lab. This year's projects include examining the fire history of areas in Black Rock Forest, studying the history and structure of an old-growth forest stand near Mohonk, conducting a dendroarcheological project on an historic structure in Hurley, and doing a dendroclimatic analysis of a site near the Forest. The groups will produce reports of their work for the Consortium's records.

Hold your spot in the Summer Science Class program! Download the brochure from our home page; call 845-534-4517 to register.

Barnard College's Dr. Terryanne Maenza-Gmelch is leading a week-long intensive graduate course in ecology and field biology for 19 graduate students in the Environmental Conservation Education masters program at NYU's Steinhardt School of Culture, Education, and Human Development, another Consortium member. The students, who are preparing for careers in environmental education in non-school settings, will develop data collection, data analysis, and communication skills as they become familiar with the Forest's flora and fauna. Field work may include quantification of plant communities, characterization of shrub communities using diagnostic keys, surveys of animals, from birds to aquatic invertebrates, and paleoecological analysis of sediment cores.

The New York-New Jersey Trail Conference, a Consortium member, is the regional manager of the Lower Hudson PRISM (Partnership for Regional Invasive Species Management) group, which will hold a meeting at the Forest in July. The Trail Conference has its own Invasives Strike Force, in partnership with Rutgers University and other organizations, which engages volunteers in both identifying and removing invasive species along the trails it manages. The Lower Hudson PRISM is a partnership of organizations and individuals working on invasive species education, research, monitoring, and control in the lower Hudson Valley. At this meeting, leaders from the neighboring Catskills and Long Island/Staten Island PRISMs will present information and strategies from their regions.

**Summer Research**
Summer is always a busy time for student research in the Forest. This year, Madeline Hirshan, a Barnard student, will study wildlife movement for her undergraduate thesis; she will work with Consortium staff to provide scientific input to the wildlife connectivity project (see "Addition to Forest Land Helps Build Wildlife Corridor," Spring 2011). Graduate student researchers include Angie Patterson, working on her NSF-sponsored doctoral research on trees and climate change in Columbia's Department of Earth and Environmental Sciences, and Caroline Devan from the New Jersey Institute of Technology, who is using the Forest's more than 20 deer exclosures to study how deer impact bee populations.

"Summers are always a high-activity period in the Forest and a real community develops between the various groups in residence for research and education projects," says Dr. William Schuster, the Consortium's executive director. "We work to facilitate interactions to broaden everyone's experience, and encourage others who are interested in studying in this rich field station setting to contact us."

STUDENT RESEARCH SPOTLIGHT

## *Hemlock Response to Adelgids*

Eastern hemlock (*Tsuga canadensis*) is experiencing widespread mortality across its range in the eastern United States due to hemlock woolly adelgid (HWA) infestation. Although the patterns of decline of this important coniferous species have been studied, many questions about predictive factors and characteristics of mortality remain unanswered. The woolly adelgid arrived in Black Rock Forest in the early 1990s, and after 20 years it is now possible to look at how trees responded to the infestation with more perspective. In the summer of 2012, I used dendrochronology to investigate the declines of two different groups of trees: one group that was dead by 2002, and another group that was still alive. I cored ten living hemlock trees to determine tree growth by measuring annual rings and compared the data with measurements from the dead trees cut down in 2002.

Before I looked at how the infestation affected the trees, I compared the two groups of trees to look for any differences and to provide a context for the use of the two groups in the study. I found significant differences in growth, size, and age between the two groups of trees. Once I began looking more specifically at time period of the infestation, I found that the growth of both groups of trees was significantly reduced following HWA infestation. Although the two groups of trees have different demographics, the reduction in growth following the HWA infestation was not significantly different between the two groups. Despite this, these groups of trees differ in a major way: one group survived the infestation; the other did not.

Trees that were smaller, younger, shorter, and overall less robust tended to do worse in the face of an HWA infestation and tended, in my study, to be part of the group of dead trees that were cut down in 2002. These trees were located on a hillside, so they could have been less robust because they were in a drier environment than the trees that survived, which were located near the water of Canterbury Brook. Moisture could have a twofold effect on how trees respond to HWA —on lifetime tree performance, and on the tree's defensive response during the time of infestation. Future work should attempt to separate tree demographics from tree locations, and sample more extensively to pick up any existing patterns. This project begins to address the important question of why certain trees die while others live, which has large implications for any effort to protect hemlocks in the face of HWA.

*— Jonah Peterschild received his BA in biology from Bard College in December 2012. This research was part of his undergraduate thesis.*

# Member Profile The Calhoun School

With its modular schedule, the Calhoun school, a member of the Consortium for many years, is able to schedule longer visits to the Forest for its upper school students. The modular system substitutes five 30- to 34-day "mods" for the traditional semester system, allowing students to explore some subjects in greater depth, while facilitating interdisciplinary investigations. In addition to the frequent visits made by Francesco Filiaci, an upper school science and biology teacher, and his classes, Calhoun's art and photography teachers have brought students to the Forest. Calhoun's fourth grade also visits the Forest, first in the fall for a one-day visit and then in the spring for their first overnight.

Calhoun students prepare to measure dissolved oxygen in a Forest pond.

In the upper school, Mr. Filiaci brings the entire junior class (in sections) to the Forest for visits in both the spring and the fall. He also teaches a senior elective entitled "Origins and Black Rock Forest" that focuses on a deeper understanding of evolution; for these classes, the intensive modular schedule allows students to take frequent overnight trips in the late fall and winter. Activities have included hiking and snowshoeing, learning anatomy through dissecting a freshly killed deer, and learning about plant and animal adaptations from Forest collections.

"The connections I make with Black Rock Forest and its staff are what make these courses so incredibly three-dimensional," says Mr. Filiaci. "Helping to gather data or develop a new curriculum and learning from the scientists and educators at the Forest help me become a better biologist and teacher. From a hunter's meeting led by Forest Manager John Brady discussing how to reduce the deer population to collecting frogs and discussing their reproduction at Sphagnum Pond with Education Director Jeff Kidder and my students at 10 PM — these are the terrific and exciting memories that stay with me."

## Benefit Luncheon

*(continued from page 1)*

In his talk, Dr. Lovejoy discussed why biodiversity is so important to our future, both in lessening our impact on the environment and in improving our health. He noted that "our ability to decrease our impact will depend in great degree on the vast array of biodiversity as a source of biologically based forms of production that, among other things, will have wastes that are not toxic but rather are subject to normal decomposition." And he pointed out that many of the medicines people now rely on are derived from biological sources, including vipers, slime molds, and heat-loving bacteria. He concluded that "the biggest threat to biodiversity and the possibility of a sustainable future lies in our tendency as a social species to focus too much on each other and to ignore the rest of nature and our impact on the natural world and thus on our own future."

TOP LEFT: **Christopher Buck accepts the Consortium's E. G. Stillman Award.** TOP RIGHT: **Luncheon co-chairs Maria Gottdiener (left) and Noah Gottdiener (second from right) and friends.** ABOVE: **Headmaster Stephen Clement (fourth from right) and a group from the Browning School.**

After guests enjoyed their main course, Dr. William Schuster, the Consortium's executive director, noted that the Forest has remarkable biodiversity, even though it is just 50 miles from New York City. "Because of its size and lack of fragmentation and because it adjoins more than 100 protected square miles in New York and New Jersey," he said, "even animals with large home ranges can persist over time." He identified some of the many research and educational activities in the Forest that involve biodiversity, and mentioned the Consortium's participation in a multi-institution project to develop wildlife corridors in the region. He described several of the Consortium's new projects, including an effort to create a postdoctoral fellowship in forest ecology and the upcoming summer science classes and camp (see "Summer in the Forest," p. 1), and noted that, in his role as president of the Organization of Biological Field Stations, he has observed many field stations exploring the benefits of Black Rock's consortium model.

He then introduced Christopher C. Davis, chairman of the board of the Hudson Highlands Land Trust, to present the E. G. Stillman Award. Named after the Forest's founder, the Stillman Award honors environmental leadership and support in the mid-Hudson region. Mr. Davis discussed Christopher Buck's accomplishments, and noted his modesty. As president of the Peter and Carmen Lucia Buck Foundation, Mr. Buck supports a range of science- and nature-focused programs; he also serves on the board of Scenic Hudson and as vice-chair of the board of the Hudson Highlands Land Trust, and has been quite active in conservation efforts in the mid-Hudson region, including efforts to oppose sprawl, promote smart growth, and preserve key parcels of land, such as Popolopen Ridge.

In accepting the award, Mr. Buck cited the influence of his father, a scientist and a businessman, and said he sees himself as a messenger for his father's vision. He first observed how the Consortium infuses science into the curriculum when he accompanied his second-grade son to the Forest for a field trip in which they identified the nymphs of aquatic insects. "I was struck at how quickly these young students rose to a very high degree of scholarship and quickly learned how to carry out a sophisticated science survey," he said, and was further impressed by the extent of the Consortium's educational program, from kindergarten through postdoctoral research. He noted that he turns down most requests to be honored for his charitable work, but accepted the Consortium's because "Black Rock Forest is clearly an institution that assures that the scientists of tomorrow have an appropriate laboratory in which to cut their teeth and hone their skills and passions."

"It was wonderful to see so many friends, as well as new faces, in the room," Dr. Schuster said. "The funds you provided directly support new research, education and conservation activities in the Forest. Next year will be our 25th anniversary, and we are delighted that Dr. John Holdren, the science advisor to President Obama, will be our speaker. We look forward to seeing all of you then."

## RESEARCH AT THE FOREST

The Black Rock Forest Consortium is committed to encouraging collaboration among member institutions and also between researchers and students.

**Resolving Advection Issues in Eddy-Flux Measurements in Complex Terrain.** Chuixiang Yi, Xiyan Xu, Eric Kutter, and George Hendrey (Queens College).

**Are Garlic Mustard Effects on Soil Processes and Microbial Communities Reversible?** Kristina Stinson (Harvard Forest) and Serita Frey (University of New Hampshire).

**Mercury Concentrations and Exposure Levels in Terrestrial Foodwebs: Pathways for Mercury Bioaccumulation in Insectivorous Songbird Communities in New York State.** David Evers (Biodiversity Research Institute).

**Linking Holocene Vegetation and Carbon Accumulation with Hydrological Change Using Macrofossils, C/N, Stable Isotopes and Biomarkers from Sutherland Pond/ Fen and Tamarack Pond.** Dorothy Peteet (Lamont-Doherty Earth Observatory of Columbia University).

**Analysis of Avian Diversity in Relation to Vegetation Composition and Structure in the Black Rock Forest-Schunnemunk Mountain Wildlife Corridor.** Sarah Gilly and Terryanne Maenza-Gmelch (Barnard College).

**Scaling of Variability in Populations, Individuals, and Ecosystems: Taylor's Law and beyond.** Joel E. Cohen and Meng Xu (Rockefeller University), and William Schuster (Black Rock Forest).

**Physiological Response to Temperature across Nine Tree Species in a Northeastern Temperate Forest.** Angelica Patterson and Kevin Griffin.

**Consequences of Oak Loss on Microbial Community Composition and Function.** Krista L. McGuire and Ika Djukic (Barnard College).

**Impacts of Oak Mortality on the Black-Legged Tick (*Ixodes scapularis*), the Primary Vector of Lyme Disease.** Mary Killilea (New York University).

**The Future of Oak Forests.** William Schuster (Black Rock Forest), Kevin Griffin (Lamont-Doherty Earth Observatory of Columbia University), Shahid Naeem (Columbia University), Kathleen Weathers and Amanda Elliott Lindsey (Cary Institute for Ecosystem Studies) and Jerry Melillo (The Ecosystems Center, Marine Biological Laboratory).

**Native Plant Performance along an Urbanization Gradient.** Kevin Griffin (Lamont-Doherty Earth Observatory of Columbia University) and William Schuster (Black Rock Forest).

**Ecology of Slave-Maker Ants and Their Hosts: The Effect of Geographic Variation in Parasite and Host Range on Co-evolutionary Trajectories**. Christine A. Johnson (American Museum of Natural History).

**The Carbon and Nitrogen Dynamics of Coarse Woody Debris in an Oak-Dominated Northeastern Forest.** Matthew Palmer (Department of Ecology, Evolution and Environmental Biology, Columbia University) and Kevin Griffin (Lamont-Doherty Earth Observatory of Columbia University).

**Loss of Foundation Tree Species: Consequences for Small Mammal Assemblages in Forest Ecosystems.** Katie Keck and Kate McFadden (Clemson University), and Katie Pavlis and William Schuster (Black Rock Forest Consortium).

# Teacher Workshop

With snow still on the ground, 23 teachers from a variety of Consortium member institutions, including the Newburgh Free Academy, The School at Columbia, and Harlem Academy, arrived at the Forest on the first Friday in March for the Consortium's fourth teacher training workshop. Dr. Jeffrey Kidder, the Consortium's education director, led the workshop, and many other Consortium staff participated in the lab and field sessions. The workshop focused on the new mammal curriculum developed as part of the grant from the Toyota USA Foundation (see "The Virtual and the Real," Fall 2012). Participating teachers learned to use materials and activities at the Forest and in their classrooms.

The program began with a look at using skulls of Forest mammals to teach and learn about biological classification, a concept central to middle- and high-school life science. The teachers also learned about creating and using dichotomous keys, an important tool for all of organismal biology. Activities continued with an introduction to live trapping, including random sampling, compass and GPS use, setting live traps, and mapping and recording data, so that teachers would be prepared to participate with their students in the mammal habitat study. After dinner, the workshop focused on evolution and adaptation through inquiry-centered activities around form and function using mammal pelts and skulls.

In the morning, the teachers checked the traps, recorded data, discussed their observations, and released the captured animals. They learned about mammal fetal development through dissection of the uterus of a pregnant pig, and about mammal skull preparation by looking at the dermestid beetle colony used to clean soft tissue from the skeletons of vertebrate animals.

Everyone had a great time learning new things and sharing ideas. "From dissections to exploding balloons . . . Wow!" was a comment from School at Columbia science teacher Lisbeth Uribe. She was eager to try out the activities with her students and share what she learned with colleagues. Teacher Rebecca Stern from Millennium Brooklyn High School said, "I learned a ton about mammal skulls, fur, and reproduction."

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# Forest News in Brief

**Consortium to Celebrate 25th Anniversary in 2014.** Plans are already in the works for the Consortium's 25th anniversary celebration next May, and the exciting news is that Dr. John Holdren, the science advisor to President Obama, will speak and receive the William T. Golden Award, named after the Consortium's founder, which is given for innovative leadership in science and science education. Much more information will come in future issues.

**Dyson Foundation Supports Scholarship Students.** A generous grant from the Dyson Foundation allows the Consortium to provide scholarships for its Summer Science Class and Camp program to economically disadvantaged students from Columbia, Dutchess, Greene, Orange, Putnam, and Ulster counties. Thank you, Dyson Foundation.

**Queens College Joins Consortium.** Queens College, one of the senior colleges of the City University of New York, is the newest member of the Consortium. Dr. George Hendrey and Dr. Chixiang Yi, both from the School of Earth and Environmental Sciences, are investigating how topography influences the transport of air over the landscape and through a forest ecosystem. They have installed a 90-foot-tall tower and have equipped it, and the Consortium's tower on the hill behind the Stone House, with instruments that monitor air motion and the $CO_2$, water, and energy content of the air at each of five levels. The experiment will determine whether a portion of the Forest functions as a carbon sink or a net source to the atmosphere. It allows measurement in complex terrain which has been problematic until now.

**OSI Purchase of Legacy Ridge Helps Wildlife.** In March, the Open Space Institute, involved in a collaborative project with the Consortium, purchased a 702-acre parcel in the town of Woodbury known as Legacy Ridge. Acquisition of the parcel is an important step in creating a permanent wildlife connectivity area between Schunemunk Mountain and Black Rock Forest (see "Addition to Forest Land Helps Build Wildlife Corridor," Spring 2011). "The Legacy Ridge property has high ecological value because of its large size, varied topography, and habitats from streams and wetlands to forests and ridgelines," said Dr. William Schuster, the Consortium's executive director. "Forest interior birds, mammals, and New York's state fish, the brook trout, all have better chances of long-term survival when properties bordering other undeveloped lands are conserved. It also protects stream water quality, preserving recreation opportunities and ecosystem health."

**Awards for Student Researchers in Forest.** Angie Patterson, a doctoral student in Columbia University's Department of Earth and Environmental Sciences, has received a competitive and prestigious National Science Foundation graduate fellowship to support her research. Peter Gmelch, a Monroe Woodbury high school student who is the son of Dr. Terryanne Maenza-Gmelch, a long-time researcher and teacher in the Forest, is a finalist for the American Museum of Naturalist History's Young Naturalist Award.

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## Inside This Issue



# Report from the Forest Manager

The land known as Black Rock Forest has an accessible past. Land management of this nearly 4000-acre tract began with the laborious building of the Continental Road around 1780. This created the access farmers and foresters needed to practice their trades. Effects on the land can still be seen in roads, trails, and stone walls. Many current trails are remnants of horse-drawn wagon paths and show more erosion from foot travel than from previous use by livestock and wood cutters.

Early management was designed to support the harvest of raw materials of wood, stone, water, and game as necessity. This type of management went on for over 100 years until the Stillman family purchased the land in the early 1900s, coinciding with the development of a new culture of forest management that included the concept of sustainability.

The era of Stillman and Forest director Henry Tryon (1927-1949) began with the application of silvicultural practices under the influence of activities at the Harvard Forest. The challenge was to reclaim forests which had been repeatedly cut to provide resources for growing economies and war-time efforts. Previously, little thought of future forests was considered since natural resources had appeared nearly endless.

With a crew of 12 to 15 men, draft horses, and wood wagons, Tryon produced lumber, fuel wood, and charcoal to fund new forestry practices, chiefly by harvesting trees of poor form and undesirable species. Oaks and maples were favored for future profitable harvests. By restricting competition, thereby allowing trees to accelerate their growth, a healthy canopy of timber- and seed-producing trees ensued. Shade-tolerant tree species became well stocked in the understory. Black Rock became a well stratified, diverse forest in less than three decades. The efforts of labor, organization, experimentation, and dealing with chestnut blight and Dutch elm disease were not simple, but the knowledge and relations of native plants seemed well in hand. That was about to change.

Due to factors including the drought of the 1960s, acid rain, the explosion of herbivore populations, infestations by gypsy moth and hemlock woolly adelgid, aggressive non-native plants, and reduction of active forest management, the dynamics of the Forest have been changing. A century of oak growth has supported a natural wildlife dependency on a sensitive and unpredictable acorn crop. Oaks' difficulty in regenerating creates a challenge for wildlife, which will need to adapt to an unproven mix of local and world-wide species.

New technologies and global climate change feed off one another to create new understandings. Forest science possesses more knowledge than ever before, and forest spiritualism is as strong as ever. Black Rock's Golden and Schuster era has entered its third decade. The careful, painstaking decisions of land management are of utmost importance as the Black Rock Forest legacy evolves. — *John Brady*