# BLACK ROCK FOREST NEWS

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## Summertime Means Research in Black Rock Forest

Summer is a prime time for research in Black Rock Forest, and this year was no exception. From the multiyear, multi-investigator Future of Oak Forests project to studies of mercury, amphibians, vegetation history, and more, some 30 scientists and students conducted research in the Forest.

### Oak Forest Project

The Future of Oak Forests study, led by a team of 13 faculty-level principal investigators, is the first direct, manipulative investigation of the cascades of impacts likely to follow from the loss of oaks, in advance of what may occur should they succumb to current and/or future threats. Oaks are a foundation taxon (a key species group) in northeastern forests, playing a vital role in the ecosystem. Using a species-removal technique, the study mimics the effects of pathogens, such as sudden oak death, in a series of experimental plots (some with all oaks girdled, some with half the oaks girdled, some with all non-oaks girdled, and controls). Part of each plot is fenced to exclude deer. Prior to girdling the trees, researchers obtained baseline data on flora, fauna, soil, and environmental variables. (See "Research on Future of Oak Forests," Winter 2010.)

Dr. Hillary Callahan working on root research with interns.

"Now, two years after the girdling and fencing, a wide range of significant results have become quite apparent compared to unmanipulated control areas," says Consortium Executive Director Dr. William Schuster. "The scientists are documenting the regulating roles of both oak trees and white-tailed deer on forest health and ecosystem processes."

For example, oaks control nitrogen cycling much more than non-oaks and, beyond a threshold level of oak loss (somewhere between 50 and 100%), nitrogen leaches into soil waters, potentially impacting streams and degrading drinking water quality. Additionally, oaks play a disproportionate role in carbon sequestration. Oak loss can also decrease native biological diversity, as small animals that rely heavily on acorns for food or on oaks for habitat migrate away. The physiology of some tree and shrub species has been altered too, with activity of a key enzyme, nitrogen reductase, increasing in some, indicating they may benefit from the loss of oak trees. The shrub witch hazel (*Hamamelis virginiana*) flowered nearly one month earlier in treated plots than in untreated ones. Deer browsing regulates relative abundances of some understory species and some animals such as spiders and earthworms, and can reduce the ability of forests to regenerate after major canopy disturbance.

"Oak trees also control environmental conditions, including the water cycle and snowpack," says Dr. Schuster. "For example, snow remained on plots with in which all the oaks were girdled days after it had melted on adjoining control plots.

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## Education

## *Students Learn and Conduct Research*

School may be out in June, but more than 400 students eagerly learned and worked in the Forest this summer. Many were enrolled in a Newburgh Schools – Black Rock Forest Consortium collaboration; others participated in the third year of the Consortium's Field Ecology Internship program for high school students or conducted their own research individually or in groups.

### Newburgh's Program

"Check us out,
we're doin' summer school.
Don't think it's lame,
it's mad cool.
We have the mic,
so listen to the beat.
Our site at Black Rock
was seriously neat."

That's the beginning of a rap composed by students from the Newburgh Enlarged City School District who had just completed fifth or sixth grade. Some 115 of them came to the Forest every day for two weeks as part of a program funded by a Title I School Improvement Grant from the US Department of Education that was designed to enrich their English, science, and math skills and avert the "summer slide," the loss of information when students are out of the classroom for the summer. Along with the program's facilitators, Emily Monahan and Hilda Galvez, and 13 Newburgh teachers (each leading a group), students spent half of each day in a Newburgh classroom and half the day at the Forest. On the final day, they demonstrated everything they had learned at a science symposium in the school.

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## Black Rock Forest Consortium

*Black Rock Forest News* is published three times a year by the Black Rock Forest Consortium.

The Black Rock Forest Consortium is an alliance of public and private schools, colleges, universities, and scientific and cultural institutions engaged in research, education, and conservation in the 3835-acre Black Rock Forest in New York's Hudson Highlands.

The Consortium is a not-for-profit 501(c)(3) organization supported by membership dues, grants, and gifts.

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The Calhoun School
Central Park Conservancy
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The Dalton School
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*Black Rock Forest News*
Sibyl R. Golden, Editor



# Report from the Executive Director

The biggest change I have seen over 18 years in the Black Rock Forest may be the spread of Japanese stiltgrass, *Microstegium vimineum*. The first patch of this non-native, invasive plant appeared near the Upper Reservoir in the mid-1990s. Now it is found all over, especially along roadsides and trails and in forest openings. A challenger for "biggest change" is the decline of eastern hemlock trees. Once dominant in three of Black Rock's main stream drainages, now 60% of the hemlocks are dead and the rest weakened mainly due to another recently introduced invasive species, the hemlock wooly adelgid (*Adelges tsugae*). And the latest non-native, invasive threat in our region is the emerald ash borer (*Agrilus planipennis).* This Asian insect bores into ash trees, "girdles" them by blocking food and water transport around the trunk, and is always fatal to the tree. First confirmed in western New York last summer, it has spread rapidly. In July, New York prohibited most movement of ash firewood or wood products. The borer is now confirmed in dozens of locations in the Hudson Valley and has the potential to kill the majority of the state's ash trees.

It can be difficult to decide how to react to these recurring situations. Human activities are involved in the spread of most problematic organisms; controlling their ranges can be expensive, have undesired side effects, and not always be possible.

There are some things we should not do, such as label all non-native species "bad" and try to battle them. Claiming that any species that arrived before humans is "native" and all others are "non-native" is an arbitrary distinction. On a long timescale all species, including humans, are non-natives, and many relatively recent arrivals play important roles in our ecosystems and society. It is a mistake to think we can recreate some past era; change is ubiquitous. We can work to manage the changes, and must realize that we are part of the nature that we want to manage.

One argument is that we should do nothing about the spread of other species. This would prevent wasteful, fruitless efforts and seems easy. But human actions inevitably impact other species; removing ourselves from the system is not an option. Nature will not resolve everything to our liking. Invasive species can cause huge economic damage, harm human health, or destroy ecosystems. And do we want a world with a cosmopolitan flora and fauna dominated by the most mobile, aggressive, and adaptable species? If so, we will lose natural heritage all around the world.

A counter argument states that we must act because our species caused the rate of new species introductions to increase so dramatically, bringing with it the spread of species harmful to humans and other organisms. The spread of invasive species is one of the greatest threats to worldwide biological diversity, potentially harming species that may prove useful for the future of humanity and causing some to go extinct. Human activity could further increase the rate of new introductions, especially as climate changes. And removing an introduced species once it is established can be difficult or impossible.

Clearly we must make our decisions thoughtfully and pick our battles carefully. We might have eliminated that first population of stiltgrass, but given its current ubiquity and continuing spread by wind, water, boots, tires, and pant cuffs, the effort would have been fruitless. We tried to stop the hemlock wooly adelgid, but when this proved impossible switched to managing its impacts by replanting damaged areas with other native conifers. So don't move that firewood! We may yet be able to save our ash trees from the emerald ash borer. We will not stop the spread of all harmful organisms, but we can reduce the rate of new invasions, in part by minimizing disturbance. And we should support invasive species research to help us devise smarter and more cost-effective strategies.

On a larger scale, we must accept that changes in species composition over time are natural and that with management and policies geared toward the health of our ecosystems we can pass on a world that still retains most of its wonders. To quote ecologist Dan Botkin, "nature in the twenty-first century will be a nature that we make." ■

*— Dr. William Schuster*

**Students** *(continued from page 1)*

Jack Caldwell, the Consortium's operations manager, and Katie Pavlis, the Consortium's research associate/ environmental educator, conducted a two-day training program for the 13 teachers before the program started. Along with other Forest staff, they developed a program for the students and teachers that included engaging them in scientific research by gathering and analyzing data about trees. The students marked off a study plot, measured and identified trees, and created graphs to analyze species composition, tree sizes, and the marketable value of the trees in each plot. Each group had its own study site.

The students also used GPS devices to track elevation while climbing Mount Misery and then graphed their hike, an activity developed by teacher Lisbeth Uribe of The School at Columbia; teacher-to-teacher sharing is an important benefit of Consortium membership and a key component of the Consortium's winter teacher training workshops (see "Forest News in Brief, p. 7). Other activities included an ecosystem hike to learn about the interconnectedness of plants and animals and an observation challenge to find camouflaged or disguised objects placed around the Upper Reservoir trail.

"The program was a resounding success," said facilitator Emily Monahan, "and the positive energy and joy in a job well done were actually palpable during the Science Symposium. The students and teachers were in awe of the beauty of the Forest. Everyone accepted the physical and intellectual challenges of the Forest and classroom tasks to learn and grow together and to further hone skills in science, technology, English language arts, and math."

## High School Interns

This was the third year for the Consortium's Field Ecology Research Internship program, and 11 high school students participated in the two-week residential program, several on scholarships generously funded by the Peter and Carmen Lucia Buck Foundation. The internship's goal is to help science-interested students gain exposure to future careers in the sciences while learning skills needed to participate in scientific investigations. This year's students, a mixture of prospective 10th, 11th, and 12th graders, came from member schools, including the Urban Assembly School for Applied Math and Science, Cornwall Central High School, the Newburgh school system, and the Storm King School, as well as from two non-member schools, one in Rockland County and one in Massachusetts. Dr. Terryanne Maenza-Gmelch and Angelica Patterson, both from Barnard College, led the program.

In the first week, the students learned to identify plants, birds, and insects in the field; surveyed trees, birds, and turtles to learn surveying and data analysis techniques; kept field journals; and wrote papers in the same format researchers use for scientific publications. Daily hikes, readings, and lectures rounded out the program. Over the weekend, in addition to working on their papers, the students visited the Storm King Art Center, built benches at the Stone House, restored turtle habitat, tie-dyed, and competed in hula hoop, frisbee, touch football, and ping-pong.

In the second week, the students worked on research projects taking place in the Forest. They helped Barnard College students collecting data for their senior environmental science thesis projects; caught fish by electrofishing and seine netting as part of the Consortium's trout survey and restoration project (see "Restoring Brook Trout," Winter 2010); helped gather data for the ongoing study of painted turtles (*Chrysemys picta*) in Aleck Meadow Pond (see "Analyzing Turtle Census Data," Winter 2005); helped Dr. Maenza-Gmelch with wetland sediment coring for her project investigating the development of pitch pine/scrub oak habitat; and worked with Ms. Patterson in the field and in the lab on morphological tree root data from research she is conducting with Barnard's Dr. Hillary Callahan.

"This year," says Dr. Maenza-Gmelch, "the students were encouraged to develop independent scientific investigations and present the results of their projects in a PowerPoint session." The subjects included hemlock tree diameter in relationship to stream proximity, whether prairie warblers are a specialist or generalist species, the fish species of Cascade Brook, and a comparison of tree root-tip characteristics among species. Students commented that they enjoyed exploring the Forest and learning how to design an experiment, come up with good questions, and write a paper for a journal.

Newburgh students in Forest.

High school interns working on trout project. (*Photo: Angie Patterson.*)

## Student Research

Several undergraduates and graduate students conducted their own research in the Forest over the summer and helped with the Consortium's multiyear, multi-investigator Future of Oak Forests project. Topics ranged from insects and small mammals to tree physiology and ecohydrology to turtle conservation and trout restoration. See "Summer Research," p. 1, for more information about student research activities.

In addition, Alyssa Trombitas, a former high school internship participant, worked on the oak forest project as an intern, and Sarah Kuehnis, a visiting college student from Switzerland, volunteered as a helper on all the projects in exchange for lodging and help with learning English.

"In summer, the Forest community swells with an influx of graduate, undergraduate, and occasionally upper-level high school students," says Dr. Schuster. "Their energy and vitality contribute to the success of several research projects. They form teams to help support other projects and thus learn a variety of techniques. And they seem to find ways to have a lot of fun at the same time!" ■

# Student Research Spotlight: Tree Nitrogen Physiology

*by Nancy Falxa-Raymond*

Nitrogen deposition has been increasing throughout the world due mostly to fossil fuel emissions and agricultural fertilizer use. These increases are expected to alter forest system dynamics through changes in plant physiology and productivity. In a system with chronic nitrogen deposition, biological retention of nitrogen becomes ineffective and net primary productivity decreases while nitrate leaching increases substantially. Excess nitrate in streams can have long-lasting effects on water quality and human health.

For my master's thesis, I am studying nutrient cycling and associated physiological changes in several native tree species in response to the loss of oak trees and urbanization, two types of disturbance that affect soil nitrogen dynamics and nitrogen availability in forest ecosystems. In Black Rock Forest's Future of Oak Forests research (see "Summer Research," p. 1), soil nitrate and ammonium levels have become higher in the girdled stands than in the control plots. Previous studies have also found increases in nitrogen mineralization and nitrification in urban oak stands relative to rural stands.

I am measuring nitrogen content, nitrogen isotope ratios (to identify the source of nitrogen in a plant), and the activity of a key leaf enzyme, nitrate reductase (to determine how much nitrate the plant is taking up) in young black birch trees (*Betula lenta*) throughout the growing season. I expect to find higher nitrogen content and increased enzyme activity in the oak-girdled plots than in the control plots, demonstrating the ability of black birch to utilize the increased amounts of nitrate available in the soil.

I am also collaborating with the New York City Department of Parks and Recreation, a Consortium member, to study the nitrogen use of several native tree species in five urban parks that have been reforested as part of the MillionTreesNYC initiative. I expect to find higher nitrogen content and enzyme activity in the trees at the urban sites than at Black Rock Forest. I will explore whether some species are better able to take advantage of the available nitrate through increased enzyme activity.

Modified nitrogen use by regenerating trees may have cascading, ecosystem-level effects on an entire forest. I hope to elucidate the physiological response of trees to changes in nitrogen cycling. This will have implications for carbon sequestration, water quality, and species composition, all of concern for urban and rural ecosystem management.■

*Nancy Falxa-Raymond is an MA candidate in Columbia University's Department of Ecology, Evolution, and Environmental Biology.*

# Consortium Day: Stillman Award , Green Building Tour, and More

Consortium Day was held on June 13, and some 110 friends of Black Rock Forest and representatives of member institutions enjoyed an afternoon of tours, talks, food, and camaraderie, highlighted by the presentation of this year's E. G. Stillman Award to the Hudson Highlands Nature Museum**.**

The afternoon began with a choice of a green campus tour, led by Consortium Executive Director Dr. William Schuster, or an opportunity to feed and release brook trout and learn about efforts to restore New York's state fish (see "Restoring Brook Trout," Winter 2010), led by John Brady, the forest manager. Tour participants observed green features of the Science Center and the Forest Lodge, learned about the solar panels, saw the demonstration wind turbine and the rain garden (see "Rain Garden," Winter 2010), and heard about the possibility of developing a microhydro energy project (see "Forest Demonstrates Renewable Energy Options," Winter 2008). In the basement of the Science Center, the visitors saw the electrical connections for the solar panels and parts of the geothermal heating and composting toilet systems.

After refreshments, Dr. Schuster presented the Stillman Award to Jacqueline Grant, executive director of the Hudson Highlands Nature Museum, and David N. Redden, its board chairman. He noted that the Museum, a neighbor of the Forest in Cornwall, was celebrating its 50th anniversary of providing environmental education to people of the region and applauded it for its mission of developing responsible caretakers of the natural world. Named after the Forest founder, the Stillman Award is given annually for environmental leadership and actions that benefit Black Rock Forest and the Hudson Highlands region.

**Dr. Schuster, Jackie Grant, and David Redden with Stillman Award. (*Photo: Francie Schuster.*)**

Guests heard brief talks by scientists working in the Forest. Dr. Krista McGuire, from Barnard College, discussed her research on the critical microbial ecology of forests, Dr. Shahid Naeem of Columbia University talked about placing values on ecosystem services from forests, and Dr. Schuster explained some of the changes taking place in our northeastern forests.

"Consortium Day provides a good opportunity to display some of the exciting activities happening in the Black Rock Forest," says Dr. Schuster. "And it is always nice to formally recognize and thank those people and organizations who have really helped our region." ■

**Research** *(continued from page 1)*
This probably occurs because winter soil temperatures are significantly colder on treated plots."

"Early comparison of these results to those in a similar experiment in the Harvard Forest in Massachusetts indicates that some aspects of the loss of foundation species, whether oaks or hemlocks, may be generally expected," he adds. "Other responses appear to be much more specific to certain types of forests."

## This Summer's Oak Work

While continuing all the measurements from previous field seasons, several new studies were added this year, including investigations of saproxylic (wood-decaying) fungi, ecohydrology, ticks, and earthworms.

Dr. Silvia Bibbo, a visiting scientist in Columbia's Department of Ecology, Evolution, and Environmental Biology, is taking advantage of the large amount of dead wood, or coarse woody debris (CWD), created by girdling in the treated plots to study the diversity of saproxylic fungi. "These fungi live in the decaying wood of dead trees," she explains, "and are essential for the functioning of forest ecosystems because they recycle lignin, cellulose, and mineral nutrients back into the system, enabling forest regeneration and thus providing habitat for many other species." She is looking at whether the increase in CWD will result in an increase in saproxylic biodiversity.

Working with Drs. Shahid Naeem and Matthew Palmer, both of Columbia University, Jessica Guo, who just received her undergraduate degree in environmental biology from Columbia, has been measuring the amount of water that percolates through the soil in girdled and untreated plots; the researchers have quantified how the lysimeters at the base of a slope collect more water than those at the top. They are also examining how the water balance affects plant functional traits, traits that determine how different species function in a particular environment (e.g., whether they grow quickly or slowly or have tough leaves or easily damaged ones). "Diversity of functionality in a community is important for ecosystem processes and conservation," Ms. Guo explains.

The earthworm study examines their prevalence throughout the study plots and within and outside the deer exclosures. "We clear leaf litter from a small area and pour a mustard solution over it; this irritates the worms and brings them to the surface where they can be counted," explains Katie Pavlis, the Consortium's research associate/environmental educator, who conducted the earthworm research with summer interns. So far, the loss of trees, and especially of oak trees, seems to increase populations of non-native earthworms.

Jennifer Levy continued her examination of Black Rock's belowground carbon budget for her doctoral research at Columbia University's Lamont-Doherty Earth Observatory. "Soils are the largest component of the terrestrial carbon sink," she explains, noting that carbon in the soil is used as an energy source by many soil organisms and that a byproduct of this activity is the release of carbon dioxide to the atmosphere. By measuring the percentage of carbon in the soil at four different depths in soil cores taken from girdled and control plots, and in the forest floor litter, she is hoping to learn more about "how much carbon is stored in the soils of the Forest and how the immediate response to a major disturbance, such as losing a foundation tree species, impacts carbon storage."

Studies of spiders and other invertebrates (by Dr. Vladimir Ovtsharenko of the American Museum of Natural History) and of ant responses to the treatments (by Dr. Aaron Ellison's team from Harvard) also continued.

## More Research

Research continued on the Consortium's urban-to-rural gradient study (see "Urban-Rural Gradient," Winter 2007). Adding to ongoing investigations of plant physiology and growth and atmospheric $CO_2$ concentrations at four sites from New York City north to the Catskills, Alison Cucco, a student of Dr. J.D. Lewis of Fordham University, is examining the influence of soil nutrients on soil microbial structure along the gradient.

Dr. Anthony Carpi from John Jay College has been building on earlier work in Black Rock on the transport of mercury in the environment (see "Research Symposium," Fall 2009). With an undergraduate and a graduate student, he took emission measurements at a site near the Stone House before and after forest vegetation was removed. "Emissions from soil are a major contributor to the atmospheric and environmental load of mercury," he explains. "We are interested in finding out how deforestation, such as that in the Amazon and elsewhere, might influence soil mercury emissions."

Dr. Allan Frei from Hunter College, who worked with Dr. Carpi in the past, is using meteorological data from Black Rock Forest and other nearby weather stations to model the water cycle of the Moodna Creek watershed. He is collaborating with Simon Gruber, an Orange County environmental consultant, and with a climatologist from West Point Military Academy, which has records going back to the early 20th century.

Martha Villalba, an environmental science major at Barnard College working under the direction of Dr. Peter Bower, examined the viability of painted turtle populations (*Chrysemys picta*) in three Forest ponds as part of the Forest's ongoing turtle research. She estimated the turtle population size of each pond using the mark-recapture method; gathered data about turtle size, age, and sex; and compared these to data from earlier years. Her early results show populations may be declining.

Black Rock Forest is one of ten sites in the Hudson Valley in a study of the distribution of amphibians in vernal pools (temporary pools of water) conducted by the state's Hudson River Estuary Program in partnership with Cornell University, the Region 3 Bureau of Wildlife of the state's Department of Environmental Conservation, and its Wildlife Grants program. The study will be used to develop conservation strategies.

Using sediment cores taken from small wetlands near ridge tops, Dr. Terryanne Maenza-Gmelch is studying the vegetation history of the pitch pine/scrub oak communities on ridge tops in the Forest. "Little is known about when or how these ridge-top communities developed," she says, "after the ice sheet melted."

"Some exciting results are certainly coming out of this summer's research in the Forest," says Dr. Schuster. "We look forward to seeing many of these published in journals and presented at our Research Symposium next spring." ■

# Research at the Forest

The Black Rock Forest Consortium is committed to encouraging collaboration among member institutions and also between researchers and students. To help members learn what other members are doing and explore opportunities for collaboration, we here present a list of current research projects at the Forest, along with contact information. ■

**Ecohydrologic Study of Plant Traits and Ecosystem Function.** Matt Palmer, Shahid Naeem, and Jessica Guo (Department of Ecology, Evolution, and Environmental Biology, Colubmia University. *Contact: Matt Palmer (mp2434 @ columbia.edu).*

**Consequences of Oak Loss on Microbial Community Composition and Function.** Krista L. McGuire (Barnard College). *Contact: kmcguire @ barnard.edu.*

**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 (Cary Institute for Ecosystem Studies), and Jerry Melillo (The Ecosystems Center, Marine Biological Laboratory). *Contact: William Schuster (schuster @ blackrockforest.org).*

**Population Dynamics of Painted Turtles in the Black Rock Forest.** Christopher Raxworthy (American Museum of Natural History), William Schuster (Black Rock Forest), and Martha Villaba (Barnard College). *Contact: William Schuster (wschuster @ blackrockforest.org).*

**Cycling of Mercury in Terrestrial Environments.** Anthony Carpi (John Jay College, City University of New York) and Alan Frei (Hunter College, City University of New York). *Contact: Anthony Carpi (acarpi @ jjay.cuny.edu).*

**Native Plant Performance along an Urbanization Gradient.** Kevin Griffin and Natalie Boelman (Lamont-Doherty Earth Observatory), William Schuster (Black Rock Forest), Matthew Brown (Central Park Conservancy), and J. D. Lewis (Fordham University). *Contact: Kevin Griffin (griff @ ldeo.columbia.edu).*

**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). *Contact: cjohnson1 @ amnh.org.*

**Functional Ecology of Complex Plastic Traits in Forest Trees: Pilot Studies of Reproductive and Root Traits.** Hilary S. Callahan (Barnard College) and Louise Comas (Pennsylvania State University). *Contact: Hilary S. Callahan (hcallahan @ barnard.edu).*

**Diversity of Saproxylic Fungi: Effects of Treatments in the North Slope Experimental Permanent Plots.** Fabio Corsi and Silvia Bibbo (Columbia University). *Contact: Fabio Corsi (fc2257 @ columbia.edu).*

**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, Columbia University). *Contact: peteet @ ldeo. columbia.edu.*

**Small Mammal Response to Oak Removal.** Kate McFadden (Department of Ecology, Evolution and Environmental Biology, Columbia University). *Contact: kwm6 @ columbia.edu.*

**Insect and Arachnid Diversity of Black Rock Forest.** Vladimir I. Ovtsharenko (American Museum of Natural History). *Contact: ovtshare @ amnh.org).*

**Total Below-Ground Carbon Budget in Black Rock Forest.** Kevin Griffin and Jennifer Levy (Lamont-Doherty Earth Observatory, Columbia University. *Contact Kevin Griffin (griff @ ldeo.columbia.edu).*

**An Assessment of the Effects of Girdling on Nitrogen Availability, Foliar Nitrogen Content, and Nitrogen Reduction of Forest Trees.** Kevin Griffin (Lamont-Doherty Earth Observatory, Columbia University), Angie Patterson (Barnard College) and Nancy Falxa-Raymond (Barnard College). *Contact: Kevin Griffin (griff @ ldeo.columbia.edu).* ■

# *NSF Grant Awarded*

The Natural Science Foundation (NSF) has awarded the Black Rock Forest Consortium a $40,000 grant to improve data management at the Forest and access to data streams by investigators. Most of the money will go for equipment, but some will be used for expert consulting to help with installation and networking.

The Consortium has always been committed to instrumenting the Forest and providing environmental monitoring data to its members. Soon after its founding in 1989, it began installing sensors to track and record data on climate, soil conditions, streams. and atmospheric chemistry. As the NSF grant description indicates, "the sensor systems employ different systems for data collection and storage, and methods of access . . . vary from direct web-based retrieval to individual processing of data requests." The grant will allow the Consortium to install additional equipment and software "to collect and automate the delivery of the majority of the station's environmental data streams, with appended metadata . . . which will provide ready data access, visualization, and storage in a data repository."

The grant description notes that the "new and openly accessible data streams" will assist "researchers not affiliated with the Consortium, who seek remote access to environmental data from many sites to conduct regional, national, and global-scale studies . . . [and] will also create new opportunities for teaching, learning, and the integration of research with education."

"We are thrilled to receive this grant," says Dr. William Schuster, the Consortium's executive director, "because it will allow us to provide our member institutions – and, indeed, the wider community – with real-time data about a wide array of environmental conditions and access to much of the Consortium's deep archive of scientific data. Our Virtual Forest Initiative will also directly benefit from the ability to utilize automated data streams for interactive educational applications" (see "Virtual Forest Initiative," Winter 2009). ■

# Join Us! Become a Friend of Black Rock Forest!

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Please make checks payable to the Black Rock Forest Consortium and mail with this coupon to: Black Rock Forest, 129 Continental Road, Cornwall NY 12518-2119. *All contributions are tax-deductible; the Consortium is a 501(c)(3) organization. Thank you!*

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## *Forest News in Brief*

**Cocktail Fundraiser September 30!** The Black Rock Forest Consortium will hold a cocktail fundraising party on September 30 from 6 to 8:30 PM. Cochaired by Sibyl R. Golden, the chairman of the Consortium, and Richard Bartlett, the chairman of the Consortium's new Leadership Council (see "Leadership Council," Spring 2010), the festive and informative event will give new and long-term friends of the Forest an opportunity to mingle, enjoy drinks and hors d'oeuvres, learn more about the Forest, and hear a brief talk by noted ecologist Daniel Botkin. For more information about tickets, please contact the Forest office.

**Plan Your Winter Trips to the Forest Now**. Winter is a beautiful and inspiring time in Black Rock Forest, with opportunities for activities that are unavailable the rest of the year. Last winter, for example, students enjoyed animal tracking, ice and snow coring and analysis, viewing bald eagles, snowshoeing and hiking in the winter landscape and, of course, warming up by a fire and drinking hot chocolate in the Stone House, among other activities. Groups also engaged in teacher training, peer leadership retreats, and a writing workshop (see "Winter Inspires Visitors to Explore the Forest," Spring 2010). "Winter is a great time for visiting the Forest," says Executive Director William Schuster. "You can see the landscape better and do activities that can't be done at any other time."

**The Consortium's Newest Members.** The Hewitt School, an independent K-12 girls' school in New York City, and the Frederick Douglass Academy, a public high school in Harlem, are becoming the Consortium's newest members. More information about both schools and their plans for working in the Forest will appear in future issues.

**Teacher Training Workshop in March.** The Consortium will hold its next teacher training workshop on March 5-6. Teachers who attended previous workshops found them an excellent opportunity to network with their colleagues, learn more about the Forest, and develop new curricula (see "Teacher Workshop," Spring 2010). To reserve a spot now, contact the Forest office.

**High School Internship Graduates Continue to Excel.** Several students from the Urban Assembly School for Applied Math and Science (a Consortium member) who formerly participated in the Consortium's Field Ecology Research Internship Program for high school students (see "Students Learn and Conduct Research," p. 1) built on the experience over the summer. Liza Morales was named a 2010 Bezos Scholar by the Bezos Family Foundation, which gave her the opportunity to attend the World Science Festival, meet with scientists participating in the event, perform immunology research over the coming school year, and present her results at next year's Festival. John Itua did immunological research at Columbia University's College of Physician and Surgeons; Jasmine Perez was accepted into the Science Research Mentoring Program at the American Museum of Natural History, where she will take special classes and conduct research; Lordlyn Osei-Ofori hiked on a glacier in the Cascades for 11 days as part of the Girls on Ice program; and Chad Singh held a plant science internship run by Wave Hill and Lehman College. ■

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***Teacher Workshop! March 5-6 See p. 7***

## *Inside This Issue*



# *Report from the Forest Manager*

While hiking any of the 23 trails of Black Rock Forest, the care involved in clearing and marking them is evident. Volunteer maintainers from the New York—New Jersey Trail Conference, led by John Blenninger, have meticulously worked and enjoyed these trails for more than 30 years. But hikers will also notice trail erosion. Maintainers and the Forest crew use trail relocation, drainage barriers, and stone steps to remedy or slow the effects of human traffic.

Many trails lead to former work sites that had high erosion potential: those used for open-pit charcoal making from the pre-revolutionary war era until the late 1800s. This method required earthen material to be successful. Cants of wood (lengths of 4 to 6 feet) were stacked on end and piled to heights of 16 to 18 feet; then a slow burn was needed to create charcoal. Large sheets of sod called floats were cut to cover the piles of wood to maintain this slow burn. Skill was required to maintain the burn by creating holes for drafts and placing earthen plugs to kill flames. A central wooden chimney or "pigpen" was used to ignite the charge. Charring a 15-cord pile could take up to two weeks. These sites can be identified by the heat-caused fractures of rock fragments and evidence of charred stone.

Henry Tryon, the first director of Black Rock Forest, was aware during the 1920s of the erosion problems created by this method. The sod-mud and earth required to control the burn had to be scraped from the surrounding areas. Stripping the already thin layer of organic material from an impoverished glacial till and then sterilizing the soil by burning was unacceptable by the standards of the budding science of forestry.

The Forest was a product of repeated wood cutting for lumber, posts, railroad ties, mine timbers, fuel wood, charcoal, wagon stock, hoop poles, and boat fenders, regenerated by sprouting from cut stumps. Growing quickly, the sprouts outgrew single-stemmed trees that grew from seed, narrowing the diversity of tree species. Tryon believed the harvesting of the fast-growing sprouts had occurred every 30 to 40 years since the 1700s. Surprisingly, Tryon noted "very little evidence of destructive erosion on the forested lands."

Tryon applied a method of selectively and efficiently harvesting low-grade wood. Searching for a product outlet, Tryon saw a market in homes, factories, trains, and steam boats for the space-saving capacity of charcoal over wood. Tryon identified his economic outlet and was able to test his version of charcoaling: the Black Rock Forest Portable Kiln.

This circular metal oven could char a half cord of wood in one day, controlling temperature with metal draft vents to maximize efficiency. The metal kiln was competitive with larger ovens of brick and steel but was set apart by its portability, which lessened impact on Forest soils.

Economically successful and environmentally aware, Tryon demonstrated a less destructive method of wood processing. Further lessons were to follow. Today, this Forest demonstrates to the general public the education and research of a new generation, including solar, wind, water, and geothermal power. ■

*— John Brady*