Consortium Celebrates Its 25th Anniversary!

The day after he released the US Third National Climate Assessment, Dr. John Holdren, President Obama’s science advisor, was the highlighted speaker at the Black Rock Forest Consortium’s 25th anniversary celebration and the recipient of the William T. Golden Award, named for the Consortium’s founder, which honors innovative leadership in science and science education. Held on May 7 at the Metropolitan Club, the luncheon’s theme was Water: Sustaining Life in a Changing World; it was chaired by Catherine Morrison Golden, with vice-chairs Valerie Colas-Ohrstrom, Kim Elliman, and David Redden. The luncheon also featured a talk by Dr. Allan Frei from Hunter College, a Consortium member institution, on climate change, water supply, and extreme events in our region.

A sold-out crowd of more than 230 people gathered for the festivities. Many member institutions, including founding and early members, 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 programs.

After mingling and signing up for a chance to win a 70-inch smart television generously donated by Sharp Electronics, the guests sat down to lunch. Sibyl R. Golden, the Consortium’s chairman, welcomed everyone, thanked the luncheon’s supporters, and told guests that the water at their tables came from Black Rock Forest. She then introduced Dr. Holdren, noting that this gave her a special pleasure since her father, William T. Golden, not only founded the Consortium but also recommended to President Truman the creation of the position of science advisor to the president. Currently the Assistant to the President for Science and Technology, Director of the White House (continued on page 3)
Report from the Executive Director

In our last newsletter, I discussed how high deer densities cause damage costing Americans about $10 billion per year. This came about because we created nutritious landscapes for deer and eliminated their natural predators. Overabundant deer eat so much vegetation that they substantially alter ecosystems to the detriment of other animals and plants and sometimes themselves. To solve this on a large scale will require more effort, expense, and cooperation than we are investing now.

The graph on page 4 shows that deer density in Black Rock Forest from the 1950s to the late 1970s grew exponentially. Then, up to the 1990s, it peaked several times at such high levels that deer were starving, as seen in the often gelatinous bone marrow of road-killed deer. Ecosystem impacts included no tree regeneration on the Forest’s long-term plots from the 1970s on. Deer produced a “browse line” 4 feet above the ground below which they had consumed every palatable green plant, bud, and seedling across the Forest, throughout highlands forests, and beyond.

But the graph also shows a recent decline to less than 15 deer per square mile. Simultaneously, there has been a burst in reproduction of 25 tree species around the Forest, evidence of benefit to the ecosystem. Re-flourishing of browse-sensitive native shrubs and herbs may not be far behind. Deer remain one of the most common large mammals in the Forest and their health indicators are good, but at low density they now have fewer detrimental effects on other animals. We will not try to reduce deer density further, aiming instead for small fluctuations around this level, and hope that fewer deer-vehicle collisions and less Lyme disease will also follow.

The Consortium's forest management emphasizes scientific principles and ongoing biological monitoring. We aim for a healthy mature forest with a full complement of native species and minimal disturbance beyond what nature creates. We work to promote native carnivores to enhance trophic balance. We work to enhance connectivity and reduce movement barriers to promote long-term resilience. We work with the local community, Consortium members, volunteers, and clubs, including the local hunting community. We aim to ensure informed and scientifically literate stakeholders, cognizant that we manage for the good of all species, aiming to enhance biodiversity and conserve healthy forest function over the long run.

A 2010 undergraduate thesis study showed that deer density in the Forest correlates with three factors: previous year’s hunting take, winter severity, and acorn crop size, which is correlated with higher density in ensuing years. The increasing maturity of the Forest may be a factor in declining deer density but does not explain the recent drop since many new openings in the Forest have been created by extreme weather and tree mortality. Winter severity also cannot explain the recent decline since there has been no trend toward harsher winters. One outcome of Forest staff working with the hunting community has been a significant increase in the proportion of does taken, especially since the late 1990s, thus reducing the number of fawns born in following years. Since 2007, this proportion has increased to 26% of the total population size, almost certainly a factor in bringing deer density to a healthy level. This has resulted from both willingness of New York wildlife regulators to grant enough doe permits for population control and increased appreciation by hunters that deer overabundance may seem to provide good hunting but actually causes problems that threaten the future of the Forest for their children and grandchildren.

Recent acorn failures have also played a role and, while deer tend to stay in their home range, there has almost certainly been net movement from the Forest to lower elevations and suburbs. Thus the current low deer density seems a result of long-term management combined with acorn crop failures. The question now is: can this density be maintained when abundant acorns return? We will find out as we continue our integrated, science-guided ecosystem management. In the next issue, I will discuss the larger context and suggest actions we can collectively take to address the situation at the national level.

— Dr. William Schuster
After guests enjoyed their main course, Dr. Kevin Griffin, the Consortium’s board president, cited a few of the Consortium’s quarter century of achievements, including creating cutting edge educational materials and opportunities, sponsoring important research projects, and collaborating with local and regional organizations to ensure ecosystem protection. He also noted that Black Rock has a long history of studying the importance of water to the ecology of the Forest, starting in 1940 with the publication of the first record of precipitation in the Forest. “By our count,” he said, “since 1940, researchers working in or with the Forest have published a total of 142 manuscripts, theses, and reports related to water, a wonderful accomplishment. My own research career at Black Rock began with a study of the environmental influences affecting tree growth at sites of high and low water availability.”

Dr. Griffin then introduced Dr. Frei, chair of the department of geography at Hunter College and deputy director of the CUNY Institute for Sustainable Cit- ies. Dr. Frei explained that his research shows that extreme storms and floods are occurring in our region at twice the rate that they did in the 20th century and that models show temperatures may increase by 5 to 9°F in our region, with slightly increased precipitation. He noted that some implications of these changes may be unintuitive; for example, slightly more precipitation will not lead to increased soil moisture because a longer and warmer growing season will have increased evaporation and transpiration. He also said that more extreme storms can affect water quality both directly, for example with sediment eroding from stream banks and entering reservoirs, and indirectly through changes in stream flow cycles and other ecosystem changes. He concluded by pointing out that water managers, mostly engineers, are aware of these changes and already working to solve the problems they create.

Finally, Dr. William Schuster, executive director of the Consortium, spoke about sustaining its future. Referencing many Consortium institutional members and partner organizations, he described the Consortium’s successes in research, including the ever-growing biennial re- gional environmental research confer- ence and the support the Consortium provides for young scientists (see “Early Training in the Forest,” p. 1); the growth in student visits to the Forest, including the immersive Summer Science Camp; and conserva- tion achievements, including a reduction in the deer population to a sustainable level (see “Forest Deer Pop- ulation,” p. 4), collaborative efforts to create barrier-free connectivity for wildlife, and providing the scientific information that can help resolve local environmental issues.

He talked about some of the exciting opportunities that lie ahead for the Con- sortium, including collaborations with Teachers College and the Open Space Institute, and concluded by noting that “Our 25th anniversary is a great milestone. The Con- sortium thrives because the concept of dedicating a slice of nature for scientific study by a broad group of institu- tions is sound, and has now stood the test of time. With the great people and organiza- tions that make up our community, the future looks bright indeed.”
Since joining the Consortium last year, Avenues: The World School has begun to make enthusiastic use of Black Rock Forest. This year, fifth and sixth graders studied aquatic macroinvertebrates in a project based on the River Continuum Concept. This concept involves looking at the feeding functions of the macroinvertebrates (shredders, collectors, grazers, and predators) to understand how a stream can be naturally cleaned. Depending on the physical and biological attributes of the stream, students can predict the relative percentage of each functional feeding group; for example, where the stream is narrow and there is little sunlight and plenty of canopy cover, they would predict that there are shredders that find microbes to eat by shredding the leaves and sticks that fall into the stream, collectors that gather the fine particles left by the shredders, and predators. Fifth graders went for two days with one overnight, and sixth graders for three days with two overnights.

The students hiked to an assigned site on a stream where they made initial observations about the stream and its setting, such as canopy cover, stream width, substrate, and ripples, and predicted the percentages of different kinds of macroinvertebrates they would find. On the second day, they returned to the site and collected macroinvertebrates using kick sampling, a method that involves placing a 1-mm mesh net on the bottom of a stream and kicking the substrate just upstream of the net for a specific amount of time so the macroinvertebrates in that area float downstream into the net. The students then went to the lab in the Science Center to identify the macroinvertebrates, categorize them, and count them.

When they returned to Avenues, they determined the percentages of the different species. Each student also produced an i-book field guide, a project that allowed students to insert photographs, drawings, and text into a predetermined format to create a field guide based on their own experiences and results. They also participated in a science symposium night, sharing their work with their families, faculty, and friends. Avenues plans to use this curriculum every other year, and next year will probably enlist humanities or other teachers to lead a project.

"Science was a big piece of the trip, but community and team building are critical components," says Sally Kent, a science teacher and lower and middle school science curriculum specialist. "We make it a full event with team building, hiking, meal preparation, games, and more. Kids worked in groups to prepare meals and to clean up. The kids brought some of the food and we ordered perishables from a market in Cornwall. And, in addition to the science trips in the spring, each middle school grade visited the Forest in the fall for a day of community building. It’s great to have teachers from other disciplines attend, and we always bring lots of chaperones. The students love studying in the Forest."

Forest Deer Population at Lowest Level in 50 Years

This graph displays average late-winter deer density across all of Black Rock Forest. Data since the late 1970s derive mainly from Forest Manager John Brady’s intensive winter tracking studies, supported by occasional deer pellet count surveys. Earlier estimates are extrapolated from anecdotal information, but there is no doubt that deer were very scarce prior to 1960. In contrast to the peaks of the large fluctuations in the 1970s to 1990s when there were more than 200 overwintering deer in the Forest, there are now only about 75, fewer than at any time in the past 50 years and similar to estimated deer density in the period before colonization.

Volunteers recently helped Consortium staff accomplish a Forest-wide pellet count survey: 11 individuals traversed 26 miles of terrain and evaluated 906 8-foot-diameter plots for numbers of deer pellets. The survey estimated average deer density of about 10 deer per square mile, compared to recent tracking estimates of 12-15 per square mile. These densities should allow regrowth of sensitive plant species and tree saplings and should benefit many other animals. Anyone interested in helping with the survey next March/April can contact the Forest staff. See the Executive Director’s report on p. 2 for more information about deer in the Forest.
10-year career with the National Park Service and Department of the Interior.” With supervision from Dr. Kevin Griffin from Columbia’s Department of Earth and Environmental Sciences, Dr. Engel’s graduate research quantified the linkages between tree canopy water use and stream flow variation in the Cascade Brook watershed, finding predictable differences in water use between ridge-top trees and those next to the stream. “Some of the most meaningful experiences I had at the Forest were the opportunities to interact with other, more senior scientists also pursuing research there,” he notes. “Talking science while standing over an instrument or field computer with eminent scientists helped inspire me to dedicate my career to the ecological sciences.”

Nancy Falxa-Raymond is an ecologist at the US Forest Service’s New York City Urban Field Station. She credits her masters research on the Consortium’s future of oak forests and urban-rural gradient projects with “informing the study design of other urban forest ecology research that I am now working on.” Working with Dr. Griffin and Dr. Matt Palmer from Columbia’s Department of Ecology, Evolution, and Environmental Biology, she analyzed nitrogen characteristics of tree foliage in response to two types of forest disturbance: widespread oak mortality and urbanization. One aspect of her research compared foliar nitrogen measurements in four tree species widely planted in New York City reforestation projects to trees of the same species found in the Forest. “The opportunity to stay on site while conducting research and to observe a working field station was also an important experience for me, and one that continues to shape how I help run our Urban Field Station,” she adds.

Dr. Gonçalo Ferraz, now an assistant professor at the Federal University of Rio Grande do Sul in Brazil, remembers the Forest as a great field site. “I’m not sure I noticed this back then, but after 15 years working in more unpredictable settings, I really appreciate having done my PhD field work in such a well managed place,” he explains. With Dr. Joel Cohen of Rockefeller and Columbia universities as his doctoral advisor, he explored interactions among birds of different species, focusing on changes in flocking behavior when the birds were exposed to a predator or to additional food. “I felt free to do my research at the Forest even though my project involved unorthodox methods, such as scaring chickadees with trained hawks and spreading 60 bird feeders along one mile of Forest roads,” he says.

Dr. Terrynne Maenizia-Gmelch, now a Senior Lecturer at Barnard College, has been working at Black Rock Forest since her graduate student days when, supervised by Dr. Cal Heusser of New York University and Dr. Dorothy Peteet of Columbia’s Lamont-Doherty Earth Observatory, she received dissertation support to core Sutherland Pond to see what the fossil pollen had to say about the Forest’s Late-glacial and Holocene vegetation, climate, and fire history. She has been teaching field ecology classes at the Forest ever since. “Black Rock has been an awesome place to lead students through explorations and projects. The natural resources that flow, crawl, evapotranspire, buzz, and fly by make it a hot spot for creativity and learning,” she explains. “Additionally, my interactions with the amazing Forest staff and colleagues from other institutions inspired interesting collaborations in research and education, including creating the paleoecology module for the Virtual Forest Initiative with the Columbia Center for New Media Teaching and Learning and working with Cornell’s Laboratory of Ornithology to archive Forest habitat soundscapes and individual bird songs.”

Angelica Patterson is currently conducting research at the Forest as a doctoral candidate in Columbia’s Department of Earth and Environmental Sciences, but she is no stranger to Black Rock. Working as a research assistant in a Barnard plant biology lab after graduating from Cornell, she helped gather data for various research projects, mentored several undergraduates engaged in senior projects in the Forest, and became a teaching assistant in the Consortium’s field ecology research internship program for high school students. Her doctoral research focuses on understanding species shifts that have been observed in the Forest’s long-term records, with more southern tree species moving north and northern species moving out of the Forest. She is conducting physiological measurements on trees at the northern and southern limits of their ranges, as well as those in the center of their ranges. “Over the years, I have realized how important Black Rock Forest is as a resource for any budding scientist not only to do research, but also to mentor those interested in ecology,” she explains.

“Training and supporting the training of young scientists in environmental field research is one of our most important responsibilities,” says Dr. William Schuster, the Consortium’s executive director. “It is also one of the most rewarding as we watch them pursue solutions to problems and develop into science leaders and mentors themselves, around the country and the world.”
RESEARCH STUDIES IN THE BLACK ROCK FOREST 2014

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

Nitrogen Fixation and Nutrient Cycling Experiments in Black Rock Forest. Duncan Menge (Columbia University). Contact: dm2972@columbia.edu

Resolving Advection Issues in Eddy-Flux Measurements in Complex Terrain. Chuixiang Yi, Xiyan Xu, Eric Kutter, and George Hendrey (Queens College). Contact: Chuixiang Yi (Chuixiang.Yi@qc.cuny.edu)

Are Garlic Mustard Effects on Soil Processes and Microbial Communities Reversible? Kristina Stinson (Harvard Forest) and Serita Frey (University of New Hampshire). Contact: Kristina Stinson (kstinson@harvard.edu)

Mercury Concentrations and Exposure Levels in Terrestrial Food Webs: Pathways for Mercury Bioaccumulation in Insectivorous Songbird Communities in New York State. David Evers (Biodiversity Research Institute). Contact: devers@bri.com

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). Contact: peteet@ldeo.columbia.edu

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). Contact: Terryanne Maenza-Gmelch (tm263@columbia.edu)

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). Contact: Joel Cohen (jcohen@rockefeller.edu)

Physiological Response to Temperature across Nine Tree Species in a Northeastern Temperate Forest. Angelica Patterson and Kevin Griffin. Contact: Kevin Griffin (griff@ldeo.columbia.edu)

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

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

Native Plant Performance along an Urbanization Gradient. Kevin Griffin (Lamont-Doherty Earth Observatory of Columbia University), William Schuster (Black Rock Forest). Contact: Kevin Griffin (griff@ldeo.columbia.edu)

Effects of Tree Girdling and Herbivory on Mesofauna Communities in a Temperate Deciduous Forest. Natalie Bray (Columbia University) and Kevin Griffin (Lamont-Doherty Earth Observatory). Contact: Natalie Bray (nab2165@columbia.edu)

Introducing Two Vice-Presidents

T he Consortium elected two new vice presidents last year: Sam Keany and Dr. Mary Leou.

Currently Dean of Students and Chair of Science at the Browning School, Mr. Keany has been involved with Black Rock Forest since 2001. Since moving from Australia, he has spent 20 years teaching science and working in administration at independent schools, including Saint Ann’s in Brooklyn Heights and the Chapin School. He studied physics at the Australian National University’s Research School of Physical Science.

“I look forward to learning more about the broader efforts of the Consortium’s Executive Committee, and how I can contribute within this group,” Mr. Keany explains. “Specifically, I hope to be able to support the development of student research in the Forest at all ages, harnessing its real and virtual resources.”

Dr. Leou is a Clinical Associate Professor of Environmental Education at New York University’s Steinhardt School of Culture, Education, and Human Development, founding director of the Wallerstein Collaborative for Urban Environmental Education, and director of the Environmental Conservation Education graduate degree program. Formerly the Director of Education with the City Parks Foundation, she worked on one of the city’s largest urban forest restoration and education projects. Dr. Leou co-chairs the New York State Environmental Literacy Committee, a coalition of organizations developing an environmental literacy plan for the state. She earned her undergraduate and doctoral degrees from Columbia University.

“As vice-president, I want to help create initiatives that will deepen collaborations among Consortium members,” she says. “Through collaboration, we can enrich STEM learning opportunities for learners of all ages and create new funding streams for long-term education, research, and conservation.”

“Mary, Sam, and I share a dedication to teaching and research and have a common vision for exciting students of all ages,” says Dr. Kevin Griffin, the Consortium’s president. “We work well together, complementing each other and thinking collectively to stimulate some exciting ideas.”

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Undergrad Theses Based on Forest Research. Four Barnard College students graduated in May with senior theses based on research at Black Rock Forest. Madeline Hirshan analyzed biomass estimation techniques for two oak species; Crystal Elaine Quallo looked at the relationship between tree migration and respiratory quotient; Jamie Yu studied tree respiratory response to changing temperatures; and Jesse Wayne looked at the impact of establishing and removing deer exclosures on vegetation diversity and biomass and on tree regeneration. In addition, Columbia College senior Rachel Arkebauer also studied the respiratory response of broadleaf trees to temperature for her thesis.

Archaeology at the Stone House. Metropolitan Montessori School sixth graders became archaeologists as they dug near the Stone House, where century-old farm implements had already been found. With the guidance of Forest Manager John Brady, the students took on the excavation systematically as a class project. They uncovered old iron nails, hinges, barrel hoops, and pottery remnants. They also investigated around the site of the former Isaac O’Dell cabin. The Stone House, originally built in 1834, is the only structure left from a period when farms, homesteads, and orchards occupied the less rugged parts of what is now the Black Rock Forest.

Birding Workshops Sold Out! The two Birding by Ear workshops, led by Dr. Terrryanne Maenza-Gmelch of Barnard College, on May 31 and June 7 filled up rapidly and were a huge success with participants. At the first workshop, participants saw and/or heard 43 species. The experienced birders helped the beginners, and one found an American redstart nest. Dr. Maenza-Gmelch also helped the less experienced birders by reviewing the songs and features of the birds they were seeing and hearing on her tablet. The Consortium will plan more birding workshops in the future, as well as a Fall Family Day on Saturday, October 11, over Columbus Day weekend.

Scholarship and General Support for the Summer Science Camp. Thanks to the generosity of the Dyson Foundation and Time Warner Cable, scholarships are available for Hudson Valley students who need them to attend the Consortium’s Summer Science Camp for grades 7-12. Students and their parents can apply on the Consortium’s web site or call the Forest for more information. Thank you also to The Bay and Paul Foundations for providing grant support for the core costs of the Camp.

Corporate Support for 25th Anniversary Luncheon. The Black Rock Forest Consortium thanks our 25th anniversary celebration corporate sponsors, Bloomberg and the Hearst Corporation. We also thank Sharp Electronics for donating a 70-inch Aquos LED television which was raffled off at the event.

Join Us! Become a Friend of Black Rock Forest.

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Forest News in Brief
The Forest’s roads and trails were created over the years to access the resources, beauty, and lessons of Black Rock Forest. Their layout and construction did little to disturb the integrity of the land. But, sometimes, the long-term effects of creating access can be unforeseen.

Horse and walking trails lead to the well-worn, rocky peaks of the Highlands. Their inspiring vistas sometimes share the summer season with basking timber rattlesnakes. These once feared reptiles were extirpated from most trail-accessed peaks years ago by visitors who believed that killing the snakes protected their loved ones. Timber rattlesnakes now have protected status in New York State. They are devoted to their specific summer range, returning from their winter dens annually to the same precise ridge or mountain top. There have been no reports of rattlesnake sightings at trail vistas at Black Rock Mountain, Split Rock, Eagle Cliff, or Rattlesnake Hill in over 30 years. Other areas in the Highlands retain the strong core of a healthy timber rattlesnake population. This conflict of species appears to have worked itself out over time with little consequence.

The era of reservoir building (1898-1928) was an intrusive period. Road building and land clearing had to be carried out in a way that protected forests and watersheds. Archived photographs show heavy use of manual labor with aid of horses and mules, avoiding the impacts of large machinery. The resultant water impoundments have increased the biodiversity at higher elevations of Black Rock Forest, enhancing fish, bird, reptile, and amphibian populations for many decades. This land management decision provides a good example of serving human needs while benefiting the land.

The oldest Forest access corridor is Continental Road, built in 1782 by the Continental Army, bisecting the Forest north-south. Travelers along the once public road between 1840 and 1960 witnessed farming and forestry. Both sides of the road, from Two Gates to 0.5 mile south of the Chatfield place, are bordered by stone walls and were farmed until 1911. Before the abandoned fields became reclaimed by native forest, travelers from 1928 on viewed tree plantations of pine and spruce. Planted in rows and periodically weeded and trimmed, they gave the appearance of nature beautifully controlled and structured. Now the plantations are crumbling, due to extreme weather events and maturity, giving way to increased growth of invasive species like Japanese barberry and hay-scented fern. Recently, the thorny devil’s walking stick along with the dangerous giant hogweed have seeded into the soil disturbed by trees blown down by Hurricanes Floyd, Irene, and Sandy. This island of invasives and plantations is surrounded by native forest species. Only time will tell what the outcome will be.

The land practices of past generations survived great challenges, with a view, a farm, a forest, and the lessons of the land along the way.

— John Brady