

## Snow and Cold Weather Spur Fun and Research in the Forest

It may have been one of the snowiest winters in Black Rock Forest, but that didn't stop Consortium members who made it the busiest January and February ever in the Forest, enjoying such activities as winter animal tracking, snow and ice studies, ice fishing, snowshoeing, and bald eagle observations. Visitors included groups from the Spence School, the Calhoun School, the Hewitt School, and Hunter College, as well as the neighboring Cornwall and Newburgh schools.

even in March, the ice was 11 inches deep on the Upper Reservoir, enabling students to venture out onto the frozen surface.

### Fun with Snow and Ice

Hewitt School seventh and eighth graders came to the Forest as part of their week-long Winterim; their theme this year was wellness, and Black Rock provided the outdoor component of the program. The group broke into two, allowing stu-



Hewitt students on the frozen Upper Reservoir.

The Forest received 21 inches of snow in December, nearly 4 feet of snow in January, and almost 2 feet more in February and March (the fourth most snow since Forest snowfall records began in 1961). Thanks to the Central Park Conservancy, which donated snowshoes to the Consortium, more students than ever were able to explore the wintry woods. Additionally, ice buildup on the ponds was early and consistent;

dents to take turns enjoying the snow and ice and learning about the Consortium's Brookies at Black Rock trout program inside. Outside, the students hiked to the Upper Reservoir, looking for animal tracks along the way, and then "skated" across the frozen Reservoir. "Bill and the other guides were very helpful in explaining what the tracks indicated,"

*(continued on page 5)*

## Member Profile

### *Calhoun School Study and Research*

With its recent switch to a modular schedule for its upper school, the Calhoun School has begun to offer its students increased access to Black Rock Forest. Within the past year, students have not only made several overnight trips to the Forest, but have also studied English and astronomy as well as biology, and are participating in the one of the Consortium's research projects. Future trips may include art, such as landscape sketching and environmental/found objects, and social studies, such as Revolutionary War history and the history and politics of conservation in the United States. Calhoun is an independent K-12 school in New York City that has been a Consortium member since November 2002.

The new schedule divides the school year into five modules, rather than two semesters; within each module, students study three to five subjects, with some continuing for more than one module. Most class periods are 60 minutes, while some are 45 minutes, and 2-hour blocks of time are regularly scheduled for each subject; classes can also be scheduled for even longer blocks of time. As Calhoun's web site explains, the modular system allows "students to explore subjects in greater depth and facilitates interdisciplinary investigations. . . [They] are able to explore fewer subjects at a time in greater depth, which enables greater understanding and retention, as well as an enhanced ability to apply the concepts they are learning."

For years, Francesco Filiaci has taught biology to the entire 11th grade class, as well as an advanced

*(continued on page 4)*

## 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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American Museum of Natural History  
 Barnard College  
 The Browning School  
 The Calhoun School  
 Central Park Conservancy  
 Columbia University  
 Cornwall Central School District  
 The Dalton School  
 Frederick Douglass Academy  
 The Hewitt School  
 Hunter College  
 Marine Biological Laboratory at Woods Hole—The Ecosystems Center  
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*Black Rock Forest News*  
 Sibyl R. Golden, Editor

## Report from the Executive Director

Black Rock Forest is one of our nation's field stations – a place where field-based research about nature is a core part of the mission (along with environmental education and conservation, in many cases). Much of the knowledge we need to solve the earth's pressing problems will be generated by research at field stations across the country.

The Black Rock Forest Consortium is currently developing a strategic plan to guide its activity over the next several years. In one component, a consultant was hired to review research programs at the Forest, evaluate limitations to research productivity, and identify opportunities for increasing the amount and impact of research in the Forest. The consultant conducted interviews with eight scientists, some of whom are currently conducting research in the Forest and others who have a regional or national perspective.

Use of the Forest for research was generally seen to have been “growing at a steady and considerable rate” over the past two decades. But everyone agreed that it would be desirable to increase research use of the Forest. They concluded that, as a research facility, Black Rock could increase its research activity by a factor of two, five or even ten.

Everyone agreed that the habitat of the field station is generally in excellent condition and set up well for research. Neither the modest laboratory facilities nor the amount of available housing were considered to pose significant limitations on research. And even though the Forest can be a very busy place, the educational and public uses of the site were not considered impediments to research.

One constraint on the level of research activity is that researchers around the country are still not very familiar with Black Rock. The station has largely supported investigators from Consortium institutions, with opportunities for other scientists to use the Forest for research. The report recommended clarifying how non-Consortium scientists can use the Forest and more effectively promoting research opportunities to the national research community.

Many of the potential opportunities to increase research use of the

Forest require additional funding. One popular idea was the development of an annual graduate student grant competition. The report also suggested that “a new staff position conducting research part-time while seeking outside collaborations part-time could lead to increased productivity.” Another approach would be to provide a partial summer salary to enable young faculty members in the northeast who are conducting relevant research to work in the Forest.

Several suggestions were grouped in the category of “making the web site more research-friendly.” The web site should make it very easy for potential investigators to figure out exactly what they need to do to get a project off the ground. There was agreement that more abundant web-based information about the station's flora and fauna, environmental data streams, map layers, and past and current research activities would greatly assist other researchers.

Overall, the scientists felt that Black Rock has promise as an important site for research on eastern deciduous forests and, given its proximity to New York City, for comparisons with urban ecology. Watershed studies, upland-river flux studies, long-term response to climate changes, and the dynamics of native versus non-native species are some other logical research opportunities. The report concluded that there are no real structural limitations to research other than funding and occasional confusion about research opportunities for those not at Consortium institutions.

The Consortium will now decide which specific actions to pursue. Maintaining a productive and highly relevant research program at the Forest in the future will also enrich the Consortium's other work. It is important for students to experience science in a way that focuses on the world around them and deals with real issues that impact people. Direct interaction with the way science is done, and with interpreting research results can help students understand how nature really works and inform their overall thinking process. Today's students will be making the important decisions in the future. ■

— *Dr. William Schuster*

## ***Small Grants Support Summer Research and Education***

Since 1990, Black Rock Forest's Small Grants Program has helped scientists and educators from Consortium institutions start new projects, funded summer student research, and produced a wealth of publications and theses. This year, the 22nd (the tenth generously funded by the Stiefel Foundation), the Program awarded \$20,100 to four research projects and one education project, bringing the total to 136 grants and more than \$500,000.

The four research projects are all part of the Consortium's Future of Oak Forests project (see "Summer Research," Fall 2010). Dr. Mary Killilea of New York University is studying the impact of oak mortality on the black-legged tick (*Ixodes scapularis*), the primary vector for Lyme disease. The grant will support undergraduate trips to collect and identify ticks and the equipment. Dr. Kate McFadden, from the Department of Ecology, Evo-

lution, and Environmental Biology at Columbia University, will continue her study of the effects of oak loss on small mammal populations, begun in 2008. She hypothesizes that changes in vegetation following the girdling will affect invertebrate populations, which in turn will affect small mammals, and has already observed decreases in small mammal diversity in the treated plots. The funds will support student interns and equipment.

Dr. Krista McGuire from Barnard College is studying the impact of oak loss on microbial community composition and function, specifically ectomycorrhizal fungi which have a symbiotic relationship with oaks and other trees. Her study will test her hypothesis that "declines in oak abundance may have cascading effects on below-ground microbial community composition, carbon storage, and nutrient cycling patterns." The grant will be used for DNA testing.

Dr. Kevin Griffin of the Lamont-Doherty Earth Observatory received funding to support the final year of Jennifer Levy's doctoral research on below-ground carbon storage and carbon cycling in the experimental plots (see "Student Research Spotlight," Spring 2008), allowing her to transform her data into several papers that will be published and will comprise her doctoral dissertation.

The education grant was given to Dr. Don Melnick of Columbia's Department of Ecology, Evolution, and Environmental Biology and Rebecca Johnson from Columbia's Center for Environment, Economy, and Society (CEES) to enable sixth and eighth graders from the Lyons Community School in Brooklyn to come to Black Rock Forest as part of the forest ecology component of the CEES Integrated Ecology Curriculum. Consortium members will also be able to use the curriculum package. ■

## ***Addition to Forest's Land Helps Build Wildlife Corridor***

When the Open Space Institute (OSI) acquired two parcels of land abutting the southern boundary of Black Rock Forest in February, land that will ultimately become part of the Forest, another step was taken towards creating a wildlife corridor stretching from the Forest on the east to Schunemunk Mountain State Park on the west. "We are attempting to protect the small but important link between the two," said Joe Martens, president of OSI last September when it acquired the 151-acre Houghton Farm property that adjoins the State Park (he is now Commissioner of the state's Department of Environmental Conservation). "The link will afford the wildlife in these areas the natural area it needs to roam."

"We conserve nature and individual species for several reasons," explains Consortium executive director Dr. William Schuster. "One is to preserve the goods and resources that they provide. Another is the consensus that we should avoid driving other species to local or global extinction, so that the world of future generations will remain rich in its biologi-

cal diversity." Ecological connectivity is important because animals need space to survive. "Many need to migrate seasonally through different habitats for purposes of feeding, breeding, and overwintering," he continues. "And all organisms need opportunities for young to disperse, and populations remain healthier if they at least occasionally exchange genes with nearby populations over time."

The Black Rock Forest Consortium is participating in a regional effort to preserve land for wildlife corridors. Its current direct partners, in addition to the Open Space Institute, are the Storm King Art Center, which is particularly interested in viewsheds; the New York-New Jersey Trail Conference, interested in human as well as nature connectivity; and the Orange County Land Trust, interested in protecting the county's natural resources. It is building a coalition that will continue to grow: one potential new partner is the Black Rock Fish and Game Club, which owns 350 acres of forested land between the Forest and Schunemunk, and others include the Palisades Inter-

state Park Commission, local governments, state agencies, and the Nature Conservancy. The coalition intends to work with the state Department of Transportation and the Thruway Authority to overcome road barriers and steer wildlife to safe crossing areas, since they have an interest in minimizing animal-vehicle encounters.

"Ecological connectivity is a large-scale issue," Dr. Schuster points out, "and no single organization can resolve it. It will require dialogue, study, collaboration, and actions, and the Consortium is contributing to the process. In our area, we can contribute our knowledge of animal population distributions and movement patterns. We can stimulate and guide this kind of research. We can meet with other landowners to make plans, form partnerships, work with government agencies, and participate in joint efforts to secure support and funding for specific actions."

"We are committed to a continuing partnership with Black Rock Forest and many others on this important, long-term project," adds Kim Elliman, OSI's chief executive officer. ■

# Student Research Spotlight: Turtle Population Studies

by Martha Villalba

The ponds of Black Rock Forest are home to several species of turtles, including the eastern painted turtle (*Chrysemys picta*). The painted turtle is a small turtle with red markings on the sides of its neck, legs, and tail, and a smooth, flattened, and oval carapace. It has been found in all of the ponds at Black Rock that have been previously studied. However, no recent studies have been made regarding turtle populations and their viability in the Forest's ponds, so I decided to study this species and analyze its population.

Last summer, I conducted research for my senior thesis. My goal is to do a thorough assessment of the population and determine viability of painted turtles in the Upper Reservoir and Aleck Meadow Pond, both artificial ponds, and Sutherland Pond, the Forest's only natural pond.

I captured turtles daily by setting a hoop trap baited with a can of sardines. If I caught any, I took out one turtle at a time and determined if it had previously been captured by checking whether it had been electronically tagged with a tiny PIT (passive integrated transponder) tag or had a pattern of notches on its carapace. If it had never been captured, I PIT-tagged it.

I determined the sex of each turtle and measured its length, width, height, and mass. I also observed the pattern of the lines of the carapace plates to determine the subspecies because the ponds have some midland painted turtles (*Chrysemys picta marginata*) and hybrids. I determined approximate age by counting rings on the carapace sections or scutes, and noted holes in the carapace or plastron, missing legs or tail, etc.

To analyze my data, I will estimate the total population and determine the sex ratio and the age structure of the turtles in each pond. I will compare this to data from previous years and to numbers from the literature to assess how viable the turtle population is in each of the ponds.

Initial analyses show that most of the turtles that were captured are adults and there weren't as many younger ones as we had hoped to see. Also, a lot of the turtles were captured multiple times. I will be returning to Black Rock this summer to continue my research. I plan to collect more data that will complement the data from last year to allow me to analyze the data thoroughly. ■

*Martha Villalba is majoring in Environmental Biology at Barnard and will be a senior in the fall.*

## Calhoun (continued from page 1)

biology class for seniors called Origins and Black Rock Forest. This year, with the new schedule, he created a more intensive course, focusing on ecology, during one of the modules, with extra long blocks of time that gave him flexibility in scheduling field trips. During this module, students took two overnight trips to the Forest.

The first trip examined dissolved oxygen in natural waters. The students drilled holes in the ice on the Upper Reservoir and determined the parts per million of oxygen in the water; they looked at samples from the top and bottom levels of the lake. On the second trip, the students helped gather data for the Consortium's Future of Oak Forest project (see "Summer Research," Fall 2010) by using meter sticks to measure snow and ice depths along transects in the experimental plots. "Some of this was taken from an old AP biology lab," Mr. Filiaci explains, "but I wanted the students to do more research, gather novel information, and understand problems from a more inquisitive, unanswered perspective."

In another trip, English teacher Ellen Kwon took 11th

grade students to the Forest for a silent hike to "get a sense of Ethan Frome's frozen environment, since the environment plays such a significant role in Ethan's saga."

"The Forest is integral to our fourth grade science curriculum," adds Andrew Hume, now Calhoun's director of enrollment, "connects with our study of history, and is where we build community and communication skills." The fourth graders visit the Forest three times, including an overnight in the spring. "We want our students to find joy in the natural world," he says, "to love the earth as we foster environmental awareness."

The students are also participating in the Consortium's urban-rural

## Students measure oak seedlings in greenhouse. (Photo: The Calhoun School/Beth Krieger)



gradient study which is looking at differences in plant growth at four sites from New York City to the Catskills, including Black Rock Forest. They measured 120 acorns from the four sites and brought them back to Calhoun to plant them in 6-inch pots and grow them in the school's greenhouse. The students water the plants and measure their growth; two students who are taking a statistics class are analyzing and graphing the data.

At the end of their senior year, Calhoun students have a 6-week work project. This year, one student, Chris Kelly, is interning at the Forest, where he is training to do research on trees, soils, and water samples and assisting with ecology teaching.

"I strongly believe in experiential learning," says Mr. Filiaci. "Kids love the Black Rock trips. We get to snowshoe, laugh, make a fire, and have moments of silence to reflect and get in touch with nature. I am trying to mitigate nature-deficit disorder and I believe we learn more when we leave our habitual settings. Learning is messy and we are constantly learning new things every moment of existence. I want my students to see more science, do more science, and contribute to more science." ■

**Winter Fun** *(continued from page 1)*

notes Joan Wolf, the seventh grade life science, biology, and anatomy teacher who accompanied the Winterim group. Forest staff cored the ice at regular intervals to make sure it was thick enough to support the students.

Inside, the students were interested in seeing how large the brook trout can grow; Hewitt participates in Trout Unlimited's Trout in the Classroom program but their trout are released at the end of each school year in early June.

Calhoun 11th graders cored the ice on the Upper Reservoir and then took samples of water at top and bottom levels to study dissolved oxygen, measured snow and ice depths in experimental plots for the oak forest study, and experienced the frozen environment as part of an American literature course (see "Calhoun School Study and Research," p. 1).

### Studying the Snow

Dr. Allan Frei of Hunter College brought a group of undergraduates, mostly geography majors and environmental studies majors, to the Forest for a day of activities that included learning about forest ecology and succession, lake ice, and the green features of the Consortium's buildings, as well as participating in snow measurements.

The students sampled snow in some of the Forest's experimental plots, using a 5-foot-tall tube, in order to measure how much snow there was and determine the snow-water

**Dr. Alan Frei and Hunter College students measure water content of snow.**



**Calhoun students coring ice on the Upper Reservoir.**

equivalent (how much water is in the snowpack). "This was great for us," says Dr. Frei, "because the students contributed to a real research project, rather than just learning how to make measurements."

The work related directly to the students' classroom studies in which they learn about climate and how the cryosphere of the earth is changing. "Sea ice, lake ice, and snow cover on land are all important components, and when we show them how measurements are made, and the structure of the lake ice, it directly relates to our classroom discussions," explains Dr. Frei. "Also, hearing the Consortium staff talk about the ecology of the Forest is very valuable, because the students learn how the

general principles they study in class apply to the specific case of Black Rock Forest."

Dr. Frei noted that although many of the students had very limited experience outside of the city, especially in winter, they all reacted wonderfully to the trip, having been prepared in advance to expect cold weather and long periods outdoors. "They came with the proper clothing and the proper attitude," he says, "and they helped each other up the icy spots on the trail. Several students have told me on more than one occasion, weeks after the trip, what a great experience it was for them."

### Winter Opportunities

"Winter in the Forest provides special opportunities," notes Executive Director Dr. William Schuster. "You can see across the landscape, which reveals features not visible when the leaves are on trees, and really feel the controlling influence of the environment on living organisms. Life goes on even during heavy snow and sub-zero temperatures because of the adaptations we can observe in different species. Human adaptations are mostly behavioral and cultural — warm clothes, snowshoes, hot chocolate, and vigorous activity allow us to experience a wonderful time of year that many other creatures just sleep through."

It's not too soon to start thinking about visiting the Forest next winter. Consortium staff can help you plan your trip. ■

## 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. ■

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

**Impacts of Oak Mortality on the Black-Legged Tick (*Ixodes scapularis*), the Primary Vector of Lyme Disease.** Mary Killilea (New York University). *Contact: mek5@nyu.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.*

**The Carbon and Nitrogen Dynamics of Coarse Woody Debris in an Oak-Dominated Northern Forest.** Matthew Palmer and Dan Flynn (Columbia University) and Kevin Griffin (Lamont-Doherty Earth Observatory, Columbia University). *Contact: Matthew Palmer (mp2434@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: kum6@columbia.edu.*

**Insect and Arachnid Diversity of Black Rock Forest.** Vladimir I. Ovtsharenko and Boris Zakharov (American Museum of Natural History). *Contact: Vladimir Ovtsharenko (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).* ■

## Schuster Sabbatical

The Consortium's executive director, Dr. William Schuster, will be taking a well deserved sabbatical from July through December, and Dr. Kevin Griffin, a professor in Columbia University's Department of Earth and Environmental Sciences and a long-term researcher in the Forest, will serve as acting executive director. "I am very happy to serve as the acting director during Bill's sabbatical," notes Dr. Griffin, "because I enjoy the Forest and the people working there, I believe in its mission, and I am very much looking forward to reinvigorating my own research program in the Forest and spending time collecting data."

Dr. Schuster last took a sabbatical in 2000; at that time, as a visiting professor at the University of Colorado, he wrote a science plan for the Consortium, a grant proposal that was funded, and a key research manuscript. This time, he plans to write a series of manuscripts based on the Consortium's Future of Oak Forests study (see "Summer Research," Fall 2010). "The results are very exciting, but I have little time to write them up," he says. "Over the summer, I will be a visiting scientist at the University of Wyoming's Grand Teton Yellowstone Research Station, and I will attempt to interpret our results in a larger context, comparing them to data from other large forest disturbances, including the Yellowstone fires and the pine beetle epidemic in the west."

Dr. Griffin and his students have worked in the Forest since 1997 on projects related to forest physiology, productivity, and biogeochemistry; their current efforts focus on the oak forest study.

"My research interests are in looking for mechanistic physiological explanations that facilitate a predictive, functional understanding of emergent ecological patterns at larger scales of organization," he explains. "As a biologist, I find working within the broader context of earth and environmental sciences provides an opportunity to scale physiological processes to the levels that matter most, and to broaden my research perspective." ■

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

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### Forest News in Brief

**Research Symposium June 20.** The Black Rock Forest Consortium, in partnership with the Palisades Interstate Park Commission and the Highlands Environmental Research Institute, is hosting its seventh biennial Black Rock Forest/Highlands Research Symposium on June 20 from 9 AM to 4 PM. There will be 15-minute presentations on current research projects in biology and environmental science, as well as poster presentations. At the last symposium, in 2009, 21 scientists from Consortium member institutions and other organizations around the Hudson Highlands presented papers on topics including forest ecology, biological diversity, mercury cycling and impacts, exotic and endangered species, and historical records of carbon dioxide in the region. Please contact the Forest office if you are interested in attending.

**Consortium Engages in Strategic Planning.** On May 5, about 50 representatives of Consortium member institutions, including leadership level staff as well as individuals who visit the Forest regularly, met in New York City to look at how the Consortium can be most effective over the next five years. Building on the Consortium's successes so far — creating the Forest's physical infrastructure (green buildings, environmental monitoring stations) and human infrastructure (new staff members, collaboration with regional partners) — the participants discussed ways member institutions can increasingly collaborate with each other and with the Consortium, as well as ways the Consortium can work with compatible organizations outside the immediate region. The Consortium obtained a mini-grant for

strategic planning from the Dyson Foundation, and Marc Smiley of Solid Ground Consulting facilitated the session. Future issues of this newsletter will include more information about the results of the session and the Consortium's plans for the future. Thank you to all who participated.

**Field Ecology Internships.** The Consortium is again holding its two-week, residential, high school Field Ecology Research Internship program this summer. As in the past, it is led by Dr. Terryanne Maenza-Gmelch from Barnard College; 12 students from Consortium and other schools have been accepted into the needs-blind program.

**Teacher Workshop.** The Consortium's third annual teacher workshop on March 4 and 5 attracted 17 attendees from five member institutions. The first morning of the program, led by Jack Caldwell and Katie Pavlis, introduced the teachers to Forest staff and the Consortium's web site and then engaged them, individually or in teams, in developing a set of activities for future Forest trips that tied in with their classroom curricula. After lunch, they took tours or hikes or continued with curriculum development; heard a presentation on the Consortium's Virtual Forest initiative by Dr. Ryan Kelsey from the Columbia Center for New Media Teaching and Learning; and discussed ideas for the Consortium's first biennial education symposium, planned for 2012. Five teachers stayed overnight in the Forest Lodge; the next morning they planned the schedule for their next Forest visit and took another hike.

**Barnard Board Retreat.** The Barnard College Board of Trustees held a one-day retreat in the Forest in March. ■

**Research Symposium**  
**June 20**  
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## ***Report from the Forest Manager***

The winter of 2011 reminded elders of old-time winters. The 85 inches of snow were not a record (109 inches in 1996), but it was a cold one for the Hudson Highlands. There were 16 snow events; many layers could be seen in a cross section of snow pack.

Overwintering mammals such as the white-tailed deer and eastern coyote react instinctively to seasonal extremes. This can be seen in the footprints after snow events, a method used by Black Rock Forest to determine the population density of deer.

The deer herd's population trends have been affected by a chain of natural events, starting with the ice storm of December 12, 2009, then the abnormally high acorn crop of 2010, and now the winter of 2011.

The first snow of December 27 dropped 20 inches of snow. Fawns born the previous May experienced their first snow. A slight panic set in as the bumper acorn crop that had fallen three months earlier was now covered by nearly 2 feet of snow. Panic led to movement of small family groups throughout the Forest.

Matt Munson, Ben Brady, and I put on snowshoes and walked nearly 20 miles, getting an idea of deer group numbers and distribution. We determined there were about 17 deer per square mile, a manageable density with robust potential for the spring birthing months.

Additional snow events let us check the accuracy of the census. This year, the cold kept the accumulating snowpack for 92 straight days, ranging from 12 to 30 inches in depth. Deer numbers began to drop; groups were converging on small sheltered ranges. Once we found these areas, we saw combined groups of deer, or their beds in the snow, of 7 to 15 deer, up from the less than three per group earlier in the month. Deer will tolerate each other during a shortage of usable range and food; otherwise, groups would disperse as a relief to such density and stress.

This seasonal convergence of deer groups, called yarding, is common in areas of the north woods, from the Adirondacks to Maine. The deer of the Hudson Highlands show a compara-

tively weak drive to yard, as winters are commonly not so severe, but do so when it is needed.

This movement of deer does not go unnoticed. Coyotes react; deer become more a part of their hunting. Trackers see coyote tracks around the perimeter of the enlarged deer groups, sometimes chasing or fronting the group. It is uncommon for coyotes to take down healthy deer, but they may herd them into their home range. On February 12, prints in the 24-inch snowpack told the story of three coyotes surprising a male fawn lying at rest and quickly dispatching it. Their advantage was surprise and a surface ice crust that held their weight but not the weight of the hooved animal.

In March, deer are at their greatest disadvantage, weakened by the winter months; a March blizzard could take its toll. This year there was no March blizzard. As spring arrived, deer groups dispersed to former ranges. Their survival instincts were successful again and a promising fawning season will be upon them. ■

— John Bra