BLACK ROCK FOREST NEWS

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Lodge Groundbreaking, Award Highlights of Consortium Day

Consortium Day 2003 highlighted Black Rock Forest's future, with groundbreaking for the new Forest Lodge; its past, with a talk on the region's environmental history; and its present, with Anne and Connie Sidamon-Eristoff receiving the annual Stillman award. The June 8 event also featured a variety of tours, demonstrations, and displays, and camaraderie among the participants from Consortium institutions and other friends.

Consortium Chair William T. Golden and Vice-Chair Sibyl R. Golden at Lodge groundbreaking; Consortium President Dr. Frank Moretti stands at left.

Standing at the newly cleared site for the 48-bed Lodge, Forest Director Dr. William Schuster invited Consortium Day participants to join in a ceremonial groundbreaking. Led by Dr. Frank Moretti, president of the Consortium, William T. Golden, chairman of the Consortium, and Sylvia Smith, the Fox and Fowle architect who designed both the existing building and the new Lodge, many of the attendees tossed a shovelful of dirt to the side. Dr. Schuster noted that construction is scheduled to begin by September and that the Lodge should be open for use by May 2004.

Like the award-winning Center for Science and Education, the Lodge will incorporate "green" and "smart" features. Four- and six-bed rooms will be divided between two wings, with a central common space that can accommodate 100 people for talks or 50 at round tables for dining, as well as a catering kitchen (see "New Forest Lodge," Winter 2003). "Black Rock Forest and the Consortium will be entering a new phase with construction of this Lodge," said Dr. Schuster. "It will enable more practical, prolonged, and productive use of the Forest for a wide range of scientific and educational purposes."

The Consortium presents its E. G. Stillman Award, named after Forest founder Dr. Ernest Stillman, each year to people who have provided environmental leadership and support for Black Rock Forest and its region. The 2003 recipients, Hudson Highlands residents Anne and Constantine Sidamon-Eristoff, have long contributed their time and effort to a lengthy list of organizations that benefit the region. As Dr. Schuster noted, Anne has served on the Consortium board since its inception, was board chair for the American Museum of Natural History for seven years, and is also on the boards of the Hudson River Foundation, the Storm King Art Center, World Wildlife

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Research Symposium

Scientists Present Diverse Studies

Some fifty scientists, educators, and other interested people gathered at Black Rock's Center for Science and Education on June 23, 2003, for the Third Black Rock Forest Research Symposium. Participants from as far away as New Zealand and as close as the Forest itself gave sixteen talks and two poster presentations on research at Black Rock. Divided into four sessions, the Symposium covered long-term studies, forest processes, animal population studies, and community studies. "Like the previous symposia, held in 1999 and 2001, this event offers researchers a good opportunity to meet and talk with fellow scientists working in the Black Rock Forest and surrounding areas," noted Forest Director Dr. William Schuster. "It provides a single forum that summarizes much of the current research underway, giving background for individual studies and in some cases leading to the development of collaborative studies."

Long-Term Studies

Dr. Schuster opened the symposium with a talk on past and potential future change in tree species dominance in the Forest (see also "What Is Happening to Our Forests?," Winter 2003). Using data from Black Rock's long-term plots, first installed in the 1930s, as well as from forest inventories and botanical surveys conducted repeatedly since then, he first described the makeup of the forest canopy and understory over the past 70 years and then projected that "changes now occurring may alter species dominance over time and

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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 3785-acre Black Rock Forest in New York's Hudson Highlands.

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Consortium Address

129 Continental Road
Cornwall NY 12518-2119
Phone: (845) 534-4517
Fax: (845) 534-6975

Web: www.blackrockforest.org

Black Rock Forest News
Sibyl R. Golden, Editor
Terry Murray, Photo Editor

Report from the Forest Director

Each and every year, the sun produces more energy than human societies have consumed in the earth's history. Each minute, enough sunlight reaches the earth's surface to meet the world's energy demand for a year. And the sun will continue to provide this energy every day for at least as long as the earth remains a habitable planet. Clearly, there is no more sustainable source of energy in our solar system.

The earth's many ecosystems attest to the wisdom of solar energy use. The photosynthetic organisms that use sunlight to combine carbon dioxide into carbohydrates provide the energy base for nearly all of the other organisms in earth's food webs, including humans. Solar energy has enabled the biomass of the earth to increase from nothing to more than one trillion tons, and every day, on average, it enables the production of another five hundred million tons of organic material.

And yet, all of this life is produced using less than one percent of the solar energy that shines on the earth. The rest is reflected or absorbed and radiated back into space as heat energy. More than a quadrillion kilowatt-hours of energy each day remain uncaptured by plants or humans, shining on non-organic surfaces and eventually being lost forever. The amount currently unused is staggering: enough to fuel more than one hundred planetary biospheres the size of the earth's or ten thousand societies the size of the United States'.

Currently, we use fossil fuels to meet the great majority of our energy demands, consuming them at a rate millions of times faster than they are being replenished. These fossil fuels are remnant byproducts of solar energy from eons ago, fixed as biomass and then transformed into coal, oil, and gas. Undesirable aspects of burning fossil fuels for energy include environmental disturbance, pollution, dependence on infrastructure and petroleum reserves that are not always under our control, and the fact that fossil fuel burning is unsustainable in the long run.

Two possible responses to this situation are energy conservation and the generation of power from the vast unused reserve of energy provided by the sun. Black Rock Forest is one of a number of scientific field stations around the country now integrating environmental learning with the construction of environmentally enlightened facilities. "Green" design principles, incorporated into our Center for Science and Education, have enabled us to practice conservation in a very practical way, with annual energy cost savings of about 50 percent.

We are pleased to announce that the Black Rock Forest field station will soon become one of the larger producers of solar energy in the Hudson River Valley, thanks to an imminent grant from the New York State Energy Research and Development Authority (NYSERDA) to construct a 25-kilowatt array of solar photovoltaic (PV) panels (see p. 3). The roof and ground-mounted PV panels are projected to produce 34,400 kilowatt-hours of energy per year for us. Photovoltaic systems are among the most environmentally responsible methods of power generation. They are silent, use no fuel, and produce no waste. They can be connected to the grid or stand distinct from it. They have no moving parts, are durable, and are designed to last 30 years or more.

It is instructive to know that these systems are practical even in the cloudy, cool northeastern United States. In fact, photovoltaics work more efficiently at lower temperatures. We have successfully used PV panels since 1995 to power all of our remote environmental monitoring stations. We expect that the new arrays will provide half or more of the energy used in our buildings.

Over the past few decades, the efficiency of PV cells has increased while prices have decreased. With programs such as those offered by NYSERDA, the out-of-pocket costs for producing energy from the sun are now competitive with the costs of purchasing energy generated from burning fossil fuels. But the relative environmental costs and benefits are incomparable. In this regard we should learn a lesson from nature: thousands of earth ecosystems can't be wrong. ■

— Dr. William Schuster

Solar Panels to be Installed on Science Center

The New York State Energy Research and Development Authority (NYSERDA) has awarded a grant of $129,500 to the Black Rock Forest Consortium to cover 61 percent of the cost of installing a 25-kilowatt photovoltaic system (solar panels). The Consortium must still raise $82,800 to complete funding for the project, which is scheduled to be operational by November 30, 2003. "The system will use the sun to provide a large portion of the energy needed for the Science Center and Lodge," explains Forest Director Dr. William Schuster. "It will substantially reduce our reliance on fossil fuel burning to produce electricity, minimize our environmental footprint, and significantly lower our annual operating costs."

The photovoltaic system will consist of two arrays, one on the roof of the Center for Science and Education and one on the ground nearby, which together will produce some 34,400 kilowatt-hours per year (including estimated losses due to inverter efficiency and other factors), according to projections by Northern Power Systems, which will supply the photovoltaic arrays and inverters and will serve as the prime contractor and team leader for the project. This will offset roughly 50 percent of the building's electrical load; through reduced utility bills, the system should recoup the Consortium's share of its construction costs in less than a decade. The system will also reduce the solar heat load on the south roof of the Center, as the roof array will allow free airflow underneath it, and will provide environmental benefits by reducing the load for the local power system, particularly at times of peak use, with a resulting decrease in power plant emissions.

Northern Power Systems, a Vermont-based company, is collaborating with Fox and Fowle Architects, which provided for the potential future installation of solar panels when it designed the Science Center. Fox and Fowle will be responsible for architectural design and integration with the existing structure, and a local contractor will be used for structural and electrical work. In the proposal to NYSERDA, Northern Power noted that the system "will be a pioneer installation in this area of New York State, both in terms of size and sophistication" and "a model of a cooperative effort between a nonprofit entity, an architectural firm, and a system installer."

The photovoltaic system will be linked to the Forest's existing data monitoring system. It will provide a variety of data, including hourly power production, daily and monthly energy summaries with comparisons to simulations based on meteorological data, and irradiance information. "We plan to provide learning opportunities in sustainable design for a wide range of audiences through tours, demonstrations, and new curricula designed to examine the energy production and efficiency of the system," notes Dr. Schuster.■

Consortium Day *(continued from page 1)*

Fund, and the New York Community Trust. Connie, an environmental attorney, was the Regional Administrator for the US Environmental Protection Agency from 1989 to 1993, served on the Advisory Committee for the Rivers and Estuaries Center on the Hudson, and is currently board chairman for Audubon New York and a director of the Boyce Thompson Institute for Plant Research. Congresswoman Sue Kelly joined in congratulating the Sidamon-Eristoffs on their work and the award.

Dr. Neil Maher, an environmental historian at Rutgers University, gave a brief talk on "Black Rock's Hidden Past: The Changing Relationship Between a People and a Forest." As a graduate student of the late, great ecological historian Warren Dean at NYU, Dr. Maher produced a voluminous report based on the Forest's pre-Stillman records, some of which was published in the *Hudson Valley Regional Review*. He also serves as the Consortium's historian.

The talk focused on three distinct phases in the Forest's and the region's history. The first was agricultural, moving from subsistence to cash crop grain farming, and finally to the cultivation of fruits, dairy products, and other perishables for New York City and other nearby communities. When the Erie Canal opened up

Anne and Constantine Sidamon-Eristoff with the 2003 Stillman Award.

trade with less expensive agricultural producers in the Midwest, the Hudson Highlands switched to logging to fuel the region's iron furnaces and brick kilns. As this phase ended, and the trees grew back, tourism took over, and New York City residents flocked to Cornwall which was thought of as a healthful retreat.

Consortium Day featured a plethora of other activities. Students from the Cornwall schools presented their amphibian study project (see "Amphibian Project," Winter 2003), Forest Manager John Brady released some of the brook trout raised at the Forest (see "Brookies at Black Rock," Spring 2003), herpetologist Peter Warny led his now-traditional amphibian hike, and Dave Karrmann demonstrated the American Museum of Natural History's turtle study (see "Small Grants," Spring 2003). Displays at the Science Center highlighted the School in the Forest program for New York City public school students (see "City Public Schools Gain Forest Access," Spring 2003); a beautiful new handmade white oak table in the Stowell Library; GPS (Global Positioning Systems) mapping; tanks with native brook trout, amphibians, and reptiles; and seedlings from the Forest's historic Continental white oak tree on sale as a fundraiser. Additional white oak seedlings are available for fall planting (see "Forest News in Brief," p. 7).■

Symposium (*continued from page 1)*
thus the rest of the forest ecosystem," noting that "the nature of the dominant producers in any ecosystem, their health, and productivity dramatically impact the other organisms in the system." Specifically, he pointed to increasing mortality in the oak-dominated canopy, caused partly by the series of drought years ending in 2002; failure of oaks to regenerate, with red maple and black birch now dominating the understory; hemlock mortality caused by the wooly adelgid infestation; disappearance of northern relict species and invasion of southern species and some invasive species; and damage from last winter's ice storm. Other regional challenges to oaks, such as oak wilt, oak dieback, and bacterial leaf scorch, may eventually impact forests in the New York-New Jersey Highlands. Dr. Schuster cited Forest studies by Dr. Terryanne Maenza-Gmelch of NYU and by Dr. Kerry Barringer and Dr. Steve Clemants of the Brooklyn Botanic Garden, and invited researchers to join him in studying succession in areas affected by the ice storm.

Dr. William E. Wright, of the Tree-Ring Laboratory at Lamont-Doherty Earth Observatory, described research designed to test whether time series of stable oxygen isotope ratios in needle cellulose can be used as proxies for the timing of needle cell maturation in *Pinus strobus* (Eastern white pine) and for high-resolution local environmental information. Oxygen, like many other elements, exists predominantly in one atomic form, but also has a smaller number of atoms with slightly different numbers of neutrons in the nucleus. These naturally occurring stable isotopes, as part of water molecules, undergo physical processes (e.g., evaporation and condensation) and chemical reactions (e.g., photosynthesis) that can change the amount of each isotope in the resulting product. Throughout the 2003 growing season, he will measure needle extension, examine the oxygen isotope ratios in both natural waters (rain, soil water, etc.) and needle cellulose, and analyze weekly incremental growth and isotope ratio data to create a time series in hopes of correlating changes in the isotope ratios with cell growth information.

Determining the age of Sutherland Pond using paleomagnetic dating was the subject of a talk by Dr. Joseph Liddicoat of Barnard College. He explained that the inclination and declination in silt sediments from the lower 2 meters of a 10-meter core from the pond can be correlated with dated long-term changes in the earth's past magnetic fields in cores from Lake Ontario, other northeastern sites, and Mono Lake (California) to obtain a date of roughly 13,000 years before the present for the origin of Sutherland Pond, which was a product of the retreat of the Laurentide ice sheet. Citing pollen studies of the pond's sediment by Dr. Terryanne Maenza-Gmelch of NYU, he noted that forest vegetation developed in the Hudson Highlands by 12,600 years before the present.

Dr. Dorothy Peteet from Lamont-Doherty presented the results from a long-term study of the storage of terrestrial carbon in the Cascade Brook watershed, including work conducted by high school students and their teachers as part of the 2002 Institute of Climate and Planets Summer Institute (a collaborative project of the NASA/Goddard Institute for Space Studies, Columbia University, and the City University of New York; see "Summer Programs," Fall 2002). She explained that terrestrial carbon may be important as the "missing sink" for carbon and that its storage "has become a topic of great interest and debate in the wake of increasing levels of atmospheric carbon dioxide," with "conflicting estimates . . . on the amounts of carbon stored in forest ecosystems, and the relative amounts stored above- and below-ground." The ongoing studies have shown that more carbon is stored in soil than in trees and roots; more carbon was sequestered in wetlands when the climate was colder and wetter and spruce dominated the forest, compared to today's warmer, drier climate and oak-dominated forest; and, surprisingly, drier uplands today store more carbon than wetter lowlands, "probably due to the slow decomposition rate of the oak leaves in the duff layer relative to other species" more prevalent in the lowlands.

Forest Processes

The session on forest processes was introduced by Dr. Kevin Griffin from Lamont-Doherty who collaborated on all four of the projects covered as part of an international team that includes scientists from New Zealand, Texas, North Carolina, and Ohio, as well as Dr. Schuster and colleagues at Lamont. He noted that the overall goal of the team's research is an understanding of carbon, nitrogen, and water cycling at large spatial and temporal scales through gathering field data and using it to support model development. He then presented a study designed to test the major hypotheses about the causes of age-related productivity decline in trees, noting that "a mechanistic understanding of the patterns of growth associated with tree aging is fundamental to assessing the role of forests as carbon sinks, constructing mechanistic models of forest growth, predicting the response of forests to a changing climate, [and] to a basic understanding of forest form and function." Black Rock's historical records allow the team to work at sites representing five distinct age classes of canopy-dominant red oaks (*Quercus rubra*), from 35 to more than 130 years. They will "quantify the physiological capacity for carbon fixation, basic foliar respiration rates, leaf chemical and physical properties, and site leaf area index and standing biomass" in order to determine whether age-related decline is caused by a reduction in the ratio of photosynthesis to respiration, decreased nutrient supply, hydraulic constraints, and/or genetic changes in the primary carboxylating enzyme of photosynthesis (see "Small Grants," Spring 2003).

Dr. Matthew Turnbull, a team member from the University of Canterbury in New Zealand, discussed research on the response of tree respiration to temperature for different canopy-dominant species, for different positions in the canopy, for sites of varying water availability within a single catchment, and for sites with different landscape level characteristics in order to "examine the extent to which canopy level changes in dark respiration can be applied across forest biomes, and the appropriateness of scaling rules to calculations of whole-canopy carbon efflux." At Black Rock, they discovered variation in the response of respiration to temperature by species (two species of oak and one species of maple), water availability (upland and lowland), and position in the canopy; they have made comparable measurements in New Zealand's Okarito Forest, a slow-

growing, nutrient-poor, high-rainfall, conifer-dominated forest. Thus, they "concluded that canopy position, site, and landscape-level differences in leaf respiratory characteristics should be considered in modeling efforts attempting to estimate whole-canopy respiration over large scales."

Another team member, Dr. David Tissue from Texas Tech University, presented a study led by Dr. David Whitehead of Landcare Research in New Zealand that tested "the hypothesis that total night-time respiration is dependent on total photosynthesis during the previous day, and that the response is mediated through changes in storage in carbohydrate pools." In a canopy of red oaks (*Quercus rubra*), the team measured both processes at approximately hourly intervals for five days and nights in fully sunlit upper canopy leaves, shaded lower canopy leaves, and artificially shaded upper canopy leaves, revealing "a strong linear relationship" between total night-time respiration and the preceding day's photosynthesis. Analysis of soluble sugar and starch concentrations in leaves showed that starch concentrations, but not sugars, are reduced after several days of shading, suggesting that this decrease caused the lower night-time respiration rates. In models, introducing the dependence of respiration on photosynthesis reduced total night-time respiration (compared to holding respiration constant), thus highlighting "the need for a process-based approach linking respiration to photosynthesis when modeling long-term carbon exchange in forest ecosystems."

Winding up the forest processes session, Will Bowman, one of Dr. Griffin's graduate students, described measurements of carbon dioxide efflux (respiration) in woody stems of red oak (*Quercus rubra*) from stands of three ages (30, 70, and more than 90 years). He then calculated carbon dioxide efflux rates by both sapwood volume and stem surface area, and found a positive correlation between respiration expressed per unit sapwood volume and the reciprocal of stem diameter, showing that the source of the carbon dioxide "is located close to the stem surface, such as [in] the cambium and the thin layer of living sapwood" (as opposed to the deeper xylem cells). He concluded that, at least for red oaks, stem surface area might be the best variable for scaling up respiration to the stand and landscape levels.

Animal Population Studies

Dave Karrmann, an educator at the American Museum of Natural History, presented a three- to five-year study of the eastern painted turtles (*Chrysemys picta*) in the Forest's ponds. The project, which integrates research and education, is designed to obtain an accurate census of at least eight distinct subpopulations resident in discrete habitat patches using a rigorous mark-recapture effort, PIT (passive integrated transponder) tags, and extensive data recording (see "Small Grants," Spring 2003). Tissue samples stored in the Museum's frozen tissues collection will be used for an analysis of rate of gene flow among the populations and the degree of integradation of subspecies *C. p. picta* and *C. p. marginata*. The education component of the project not only allows students to participate in the research through class trips and year-long internships, but also "encourages [them] to develop important cross-disciplinary skills in math and biological, environmental, and physical sciences, as well as . . . writing and communication skills."

Elizabeth Nichols, a graduate student at Columbia University, described research on the impacts of urbanization (an extreme form of habitat fragmentation) on the diversity, distribution, and abundance of dung beetles that she is conducting with colleagues Dr. James Danoff-Burg from the Center for Environmental Research and Conservation (CERC) and Dr. Fred Koontz of Wildlife Trust. Decomposers such as dung beetles provide vital ecological services, including burying dung and carrion, dispersing seeds, and aerating soils, that have direct impacts on both ecosystem and human health: "without these services, plant diversity and regenerative ability . . . decrease, soil nutrient levels fall, and vertebrate parasite levels rise." By sampling beetles in contiguous forest and in forest fragments found within matrix habitats ranging from agricultural to suburban to urban, she expects to see higher species diversity and body size in rural habitats, and lower diversity and small-bodied, highly vagile generalist species in urban habitats. Understanding the impact of urbanization on beetle community structure and function "has direct implications for maintenance and management of isolated parks and green areas . . . [and for understanding] the impact of losing decomposers on long-term ecological and human health . . . as dung beetles are postulated to be important in the reduction of fly larvae, protozoans, and other parasites found in undecomposed fecal effluence."

Dr. Koontz from Wildlife Trust, and Andres Gomez, a Columbia/CERC graduate student, presented a team investigation of coyotes in the Hudson Highlands and explained the New York Bioscape Initiative, of which the study is a part. The coyote project, which builds on earlier work of Dr. Matthew Gompper (see "Coyotes and Raccoons," Spring 2000) also involves Black Rock Forest staff and the Center for Humans and Nature. It will examine coyote behavior and spatial ecology (using GPS-based telemetry) and health (including the impact of land use and urbanization on coyote health and the role of coyotes in the ecology of disease); the impact of their role as top predators on the ecosystem; and human attitudes. The researchers plan "to use the results to inform regional wildlife biologists, public health officials, and citizens with science-based coyote management recommendations . . . and contribute to finding solutions to the increasing human-coyote conflict in the region." "Bioscape" is a concept that uses "a common sphere of human influence" to define ecological regions in order to help integrate environmental and natural resource management, public health policy, and local values "to ensure sustainable ecological health." The New York Bioscape Initiative (www.nybioscape.org) covers 44 counties in New York, New Jersey, Connecticut, and Pennsylvania (within an average 100-mile radius from New York City) and involves a transdisciplinary team of 34 scientists from 15 institutions.

John Brady, Black Rock's Forest Manager, discussed a 19-year study of whitetail deer in the Forest. Since 1984, inspections and measurements of more than 1000 harvested deer at the Forest's deer station (certified by the state's Department of Enviromental Conservation) have provided "excellent indications" of herd health.

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Symposium *(continued from page 5)*
In 1989, the Forest initiated a winter deer tracking census to monitor group sizes, ranges, and health, and in 1995 added annual acorn production measurements. Population age structure can be determined by looking at this data over time; age structure affects the health of the herds as younger animals learn behavior from older ones, and females aged 3.5 to 6.5 years are critical in determining herd reproduction. This data is available to both researchers and students at the Forest. Areas needing additional study include the effects of deer on forest regeneration and carrying capacity.

Community Studies

Dr. J. D. Lewis from Fordham University presented the results of his study, in the Forest and in other sites in the metropolitan area, of tree and stand responses to the decline of the eastern hemlock (*Tsuga canadensis*) due to the hemlock wooly adelgid (*Adelges tsugae*). After briefly outlining the scope of the threat and the history of the wooly adelgid invasion, he described his research in the Black Rock Brook watershed. One series of experiments showed that very low levels of average adelgid density (0.5 adelgids per needle) reduce net photosynthesis by 30 percent, but that this rate does not decrease further as density increases to two adelgids per needle. Noting that "despite significant reduction in eastern hemlock growth, growth of co-occurring red oak, red maple, and sugar maple did not significantly vary with the relative dominance of eastern hemlock," he discussed studies of the ectomycorrhizal (fungal) community in soil cores from different stands. These showed "significant reductions in fungal abundance and diversity in hemlock-dominated relative to oak-dominated stands" and that "92 percent of the variation in the growth of red oak seedlings outplanted into oak and hemlock stands could be explained by variation in fungal abundance and diversity." These results are consistent with the prediction that "infestation by the hemlock wooly adelgid may have cascading impacts on other trophic levels and on tree regeneration within affected stands." Dr. Lewis's current research in Black Rock Forest is designed to test whether these differences in mycorrhizal colonization reflect effects of the adelgid or of fungi in hemlock stands not colonizing oak seedlings as readily as fungi in oak stands.

American Museum of Natural History entomologist Dr. Jerome G. Rozen, Jr. described a summer 2003 bee survey of the Forest (see "Small Grants," Spring 2003). "Because of their ability to pollinate plants and their abundance and diversity," he noted, "bees play a fundamental role in maintaining and perpetuating terrestrial ecosystems." Survey methods include using hand nets (which make it possible to associate bees with flowers), pan traps, and trap nests from spring through mid-fall in order to collect as many species – social and solitary, floral specialists and floral generalists – as possible. The survey will provide baseline data to monitor future changes in diversity, distribution, and community ecology. Collected specimens will be added to the Museum's dry and frozen tissue collections, and a synoptic collection will be deposited at the Forest.

Wildlife Trust's Dr. Koontz discussed a project led by landscape ecologist John Mickelson of the Center for International Earth Science Information Network (CIESIN) at Columbia, and also involving the Forest's Dr. Schuster, to make more accurate and detailed use of Landsat imagery for environmental purposes. The researchers plan to use a combination of satellite imagery, geospatial data, and GPS-referenced ground plots to "evaluate the spectral and spatial signals that ecological communities . . . exhibit across the growing seasons" and to develop products that can be used for mapping, monitoring, and modeling "multivariate environmental dimensions across both spatial and temporal scales." To this end, they have built a system that uses information from more than 1000 vegetation plots in New York State and have created a partnership to obtain and share images with mapping programs at Cornell, Rutgers, and Syracuse University. The next steps involve integrating the ground plot and image data they have already gathered and acquiring additional vegetation data to fill in spatial and composition gaps. In addition to producing more detailed information for the Forest, they hope to create "a methodological template and image-processing engine that will drive the construction of the same level of detail for the entire New York bioscape."

Dr. James Danoff-Burg from CERC presented a novel collaboration with a fellow Consortium member, the New York-New Jersey Trail Conference, to assess the impact of single-path hiking trails on arthropod and bird community diversity within Black Rock Forest and neighboring Sterling Forest. Linear disturbances such as roads, power lines, and water canals that cut though previously undisturbed forest can lead to habitat degradation and loss and then to species loss; the study asks whether the least of these linear disturbances, hiking trails, affects species diversity. The team is looking at both birds and necrophage beetles, which past research has shown are very negatively affected by large roads, under three conditions: alongside a woods road, alongside a trail, and in intact forest. In the case of beetles, the cues at the edges are thought to be primarily the absence of litter, but also light, wind, heat, and visual distance, all of which are both abiotic and very proximate. Somewhat surprisingly, the results so far have shown the greatest beetle species diversity trailside, and the least in the intact forest.

Aaron Kimple, formerly of Black Rock's staff and the recipient of a master's degree from Bard College, created a poster presentation on spatial patterns of hemlock wooly adelgid damage and adelgid impact on tree physiology and water use, based on research he conducted in the Forest with Dr. Schuster (see "New Findings of Forest Research," Spring 2002). His data suggest that damage to hemlock stands progresses in a linear manner along stream courses and from the forest/stand exterior to the interior, allowing managers some time to implement control strategies in the interior, but that these spatial differences in mortality decline over time. He also found that adelgid damage reduces tree sap flow and transpiration only in heavily damaged trees over the summer, and in both heavily and moderately damaged trees during the fall.■

Editor's Note: The usual list of research studies does not appear in this issue because this article on the Research Symposium discusses the projects in detail.

Forest News in Brief

Historic White Oak Seedlings Available. Black Rock Forest's historic Continental white oak tree is an estimated 250 years old. It stands at the high point of Continental Road, which was built during the American Revolution by George Washington's Continental Army. Although it shows signs of age deterioration, it produced a bumper crop of sound acorns in 2001. Forest staff successfully germinated many of these acorns and planted the seedlings in the nursery. You can help the Forest and spread the legacy and genes of this historic tree. If you make a special donation (suggested amount $25 or more) to the Black Rock Forest Consortium, you can pick up a Continental White Oak seedling in a pot (along with care instructions) that you can plant wherever you like. Seedlings are available now for September and October planting; please contact the Forest office for more information.

Green Buildings Open House at Forest. The American Solar Energy Society has chosen the Forest's Center for Science and Education as one of its Green Buildings Open House locations. On Saturday October 4, Simon Gruber, an environmental consultant who specializes in research, education, and project development for municipalities, businesses, and nonprofit organizations, will lead tours of the Center, assisted by Forest Director Dr. William Schuster. The tours will take place at 11 AM and 12 noon; if you would like to attend, please register in advance by calling the Forest office.

Trail Conference Starts Science Program. The New York-New Jersey Trail Conference, a Consortium member, has hired a biologist, Dr. Edward McGowan, as Science Director to head a new science program. Dr. McGowan, who earned his Ph.D. from SUNY Binghamton with doctoral research on the timber rattlesnake (*Crotalus horridus*), will develop a program to address recreational ecology issues in the metropolitan area by, for example, recruiting and training volunteer "citizen scientists" to monitor endangered species and their habitats, invasive exotics, and forest pest outbreaks. The Trail Conference's science program will also help the scientific community fill knowledge gaps, including engaging in collaborative research projects such as the current study with CERC at Black Rock (see p. 6), and educate the hiking community about ecological and other scientific issues.

School at Columbia University To Visit Forest. In October, the new School at Columbia University plans to bring thirty of its teachers to Black Rock Forest for orientation. A new Consortium member, The School opened its doors this fall to 200 students in kindergarten through fourth grade, and will eventually extend through eighth grade. According to Dr. Mark Meyer, its Director of Research and Curriculum Design, The School features an integrated curriculum that uses thematic/topical units of study in which traditional disciplines are meshed together in a challenging and rigorous way. "The School and Black Rock Forest intend to foster a close educational partnership," he notes. "Our teachers' day at the Forest will highlight how it can serve as an educational resource for elementary school children." ■

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☐ Sugar Maple	$100
☐ Individual	$20
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_____

☐ Please send me information concerning:
☐ Gifts of land/real estate ☐ Memorial gifts

☐ I would like to volunteer to help with the following:

_____

Report from the Forest Manager

The many students participating in the "Brookies at Black Rock" program have left their legacy in the streams of the forest. After seven months of nurturing, two hundred and forty five brook trout now reside in Black Rock and Canterbury Brooks (see "Brookies at Black Rock Brings Trout to Students," Spring 2003).

Since November 2002, the New York State fish has been the focus of fish biology and behavior labs for elementary school students visiting Black Rock Forest. They developed an understanding and appreciation for trout needs during the winter months, and these were put to good use in the spring investigating our mountain streams.

The Forest has four main watersheds: Black Rock, Canterbury, Mineral Springs, and Cascade Brooks. Mineral Springs and Cascade Brook are watersheds unaffected by human water usage and are currently monitored, studied, and protected.

The Canterbury Brook and Black Rock Brook watersheds harbor the reservoirs that supply the drinking water for the Town of Cornwall. These brooks that are affected by human water use have had altered stream flow over the past century. This condition was greatly pronounced by the mid-1960s drought. A few observant, long-time residents of Cornwall noticed the absence of brook trout in streams west of Route 9W following those dry years.

This issue was brought further to light during the 1990's. Participants in educational projects studying these waters under the new Black Rock Forest Consortium recognized the absence of the typical native macropredator, the brook trout. Weekly measurements in Canterbury and Black Rock Brooks from 1995 to 1999 were well within the critical summer limits of brook trout survival. Water temperature did not exceed 65°F and pH levels remained close to neutral, while streamflow was constant, although sometimes at a trickle. Further investigation of the abundant invertebrate and black-nosed dace populations revealed a good habitat for brook trout.

The brookies selected to stock our streams were raised from two sources: the Cold Spring hatchery on Long Island, where three pairs of breeders provided us with thousands of eggs, and Emma and Emmit, our resident breeders, assumed to be wild strain (heritage) brook trout from the Adirondacks of New York, who supplied hundreds of additional eggs.

The season ended with the Coyote Callers (see "Coyote Callers Brings Community Kids to Forest," Winter 2002) stocking thirty heritage-strain brook trout of 4-inch length in Canterbury Brook on Labor Day. Appropriately, these kids and their parents had helped maintain our trout and tanks every Friday for thirty weeks.

The new season will begin in November with the natural spawning of brook trout. Any teachers and students wanting to participate, just call the Forest. All are welcome to come visit our brookies.■

— John Brady

Black Rock Forest Consortium
129 Continental Road
Cornwall NY 12518-2119

Phone: (845) 534-4517
Fax: (845) 534-6975

Web: www.blackrockforest.org

White Oak Seedlings for Fall Planting See page 7

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