NINTH RESEARCH SYMPOSIUM
JUNE 22, 2015
BLACK ROCK FOREST CONSORTIUM

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Black Rock Forest Consortium was formed in 1989 to promote scientific research, education, and conservation in the 4000-acre Black Rock Forest in southeastern New York State. Since 1999 the Consortium has hosted a Research Symposium in late June of every second year. The purpose of the Symposium is to communicate research taking place in the Forest and to provide a venue for investigators to meet and discuss their work. Since 2007 the Symposium has also included presentations about research elsewhere in the Highlands region.

TALKS

William S.F. Schuster, Black Rock Forest Consortium, "*Tree Community Response to Oak Loss after Six Years.*"

Peter Bower, Barnard College, **William S.F. Schuster**, Black Rock Forest Consortium, and **Emma Bartnick**, Barnard College, *"Testing the Allometric Equations: Biomass Storage and Carbon-Nitrogen Relations for Trees at Black Rock Forest."*

Timothy F. Sugrue, Beacon Institute for Rivers and Estuaries, Clarkson University, "*River and Estuary Observatory Network (REON) II.*"

Allan Frei, Hunter College, CUNY Institute for Sustainable Cities, *"The Seasonal Nature of Extreme Hydrological Trends Across the Northeastern US."*

Ed McGowan, **Matt Shook**, and **Max Garfinkle**, Palisades Interstate Park Commission, *"Iona Marsh Restoration: Ecological Response to Common Reed (Phragmites australis) Control in a Brackish Hudson River Tidal Marsh."*

Emma Rosi-Marshall, Cary Institute of Ecosystem Studies, *"Contaminants of Emerging Concern as Agents of Ecological Change."*

Thomas J. Rawinski, Northeastern Area State and Private Forestry, USDA Forest Service, "*Ecological and Sociological Aspects of the White-tailed Deer Overabundance Crisis*."

Kevin Griffin, Columbia University E3B Department and LDEO, **Ximeng Li,** Minzu University of China, **Chengyuan Xu,** Central Queensland University, "*Can Late Autumn Leaf Carbon Gain Provide a Fall Subsidy to Native Gymnosperms Growing in Northeastern Deciduous Forests?*"

Christopher Lindner, Bard College, *"Archaeology of the BRF Pathway from the Hagers' Place Toward an Old Mine Below Whitehorse Mountain."*

Adriana de Carvalho, Google, *"Formative Assessment of Engagement for Rapid Improvement of Field Station STEM Learning."*

Matthew Palmer, Columbia University E3B Department, *"Understory Responses to Canopy Change and Herbivore Exclusion."*

Natalie A. Bray, Columbia University E3B Department, *"Effects of Tree Girdling and Herbivore Exclusion on Soils and Microarthropod Communities in a Temperate Deciduous Forest."*

Vladimir Ovtsharenko, American Museum of Natural History, Hostos Community College, *"Spiders of Black Rock Forest."*

Katie R. Keck and **Kate W. McFadden** Clemson University, **Stephanie H. Seto**, Columbia University E3B Department, **Kate Pavlis** and **William S.F. Schuster,** Black Rock Forest Consortium, *"Understanding Abiotic and Biotic Responses of a Forest Ecosystem to a Simulated Pathogen Attack."*

Duncan Menge, Columbia University E3B Department, *"What Extent Does Robinia pseudoacacia Regulate How Much Nitrogen it Fixes Across a Nitrogen Gradient?"*

Angie Patterson, Columbia University DEES Department and LDEO, *"Physiological Response To Temperature Across Fifteen Northern, Central, and Southern Ranged Tree Species in a Northeastern Temperate Forest."*

Mathieu Levesque, Columbia University, Lamont-Doherty Earth Observatory, Tree Ring Laboratory, *"Climatic Response of Tulip Poplar: A Multiproxy Dendrochronological Analysis."*

Adefunke Sonaike, **Alex Huddell**, **Wenying Liao, Christa Shen, Kevin Griffin** and **Duncan Menge**, Columbia University E3B Department, *"The N-fixing Tree Robinia pseudoacacia Maintains Higher Physiological Activity and Chlorophyll Content at the end of Growing Season Compared to Neighboring Non-fixers in a Northeastern Deciduous Forest."*

Daniel E. Atha, The New York Botanical Garden, "*Flora of Ice Pond Conservation Area, Putnam County, New York."*

Meng Xu, University of New Haven, **William S.F. Schuster,** Black Rock Forest Consortium and **Joel E. Cohen**, Rockefeller University, "*Robustness of Taylor's Law under Spatial Hierarchical Groupings of Forest Tree Samples."*

Matt Decker, Hudson Highlands Land Trust, *"Legacy Landscapes."*

Rachel Arkebauer, Columbia University E3B Department, "*Respiratory Response to Temperature of Broadleaf Trees From the Northeastern US."*

Mary Figgatt, New York State Department of Health, "*Public Health Concerns Associated with Harmful Algal Blooms."*

Helen Forgione, Natural Areas Conservancy, "*Ecological Assessment of New York City's Forests: A Tool for Management."*

Simon Gruber, Institute Fellow, CUNY Institute for Sustainable Cities, "*Valuing Ecosystem Benefits of Forests & Trees: Trends & Regional Initiatives c. 1860-2015."*

Alan Wells, Della Wells and **John Lampkin**, Palisades Interstate Park League of Naturalists, "*Dragonflies and Damselflies of Lily Pond, Harriman State Park."*

Caroline DeVan, New Jersey Institute of Technology, and **John Ascher**, National University of Singapore and AMNH, "*The Bees of Black Rock Forest."*

Max Garfinkle, Palisades Interstate Park Commission, "*Golden-winged Warbler Surveys and Habitat Management."*

Randy Stechart, New York State DEC, Palisades Interstate Park Commission, "*Methods for Aquiring Timber Rattlesnake Demographic Data."*

Soon il Higashino, Ossining High School, "*Identification of Cutaneous Bacteria on Salamanders that Inhibit Chytrid Fungus.*"

Samantha Mello, Amanda Cheeseman, Jonathan Cohen, Chris Whipps and **Sadie Ryan**, Syracuse University, "*Invasive Species, Eastern Cottontails, and an Altered Landscape; Recovery Challenges Facing New York's Native New England Cottontail.*"

Terryanne Maenza-Gmelch, Barnard College, Columbia University, **William S.F. Schuster**, Black Rock Forest Consortium, **Cris Kenyon**, Orange County Land Trust, "*Black Rock Forest - Schunnemunk Mountain Important Bird Area Proposal.*"

John Brady and **William S.F. Schuster**, Black Rock Forest Consortium, "*Status of Whitetail Deer in Black Rock Forest 2015.*"

Chris Bowser, New York State Department of Environmental Conservation, "*Update on American Eel Surveys in Hudson River Tributaries.*"

POSTERS

Daniel Chi, Columbia University E3B Department, "*The Effects of Aggregate Community Plant Traits on Local Ecohydrology in Herbivore-browsed and Non-browsed Forest Areas.*"

John Lampkin, Palisades Interstate Park League of Naturalists, "*Butterflies of Lily Pond and Environs, Harriman State Park, NY.*"

Maya Drzewicki, SRMP AMNH, LaGuardia Arts High School, **Ines Muravin**, SRMP AMNH**, Andrew Henriquez**, SRMP AMNH, Hunter College High School**, Oscar Pineda-Catalan**, SRMP AMNH**,** "*Population Ecology of Chrysemys picta and Chelydra serpentina at Black Rock Forest in Cornwall, New York.*"

Susan Stanley, Natural Resources Group, NYC Department of Parks and Recreation, *"Vernal Pools in an Urban Landscape."*

Christopher Lindner, Bard College, "*Archaeology of the BRF Pathway from the Hagers' Place toward an Old Mine below Whitehorse Mountain.*"

ABSTRACTS

Tree Community Response to Oak Loss after Six Years

William S.F. Schuster (Black Rock Forest Consortium)

This study evaluated the growth response of tree species other than oaks to the loss of oaks accomplished in 2008 by chainsaw notch girdling to mimic pathogen attack in the Future of Oak Forests experiment. The treatments were girdling of all oak trees on a plot, girdling of half of the oaks on a plot, girdling of all non-oaks on a plot, or no girdling (control) and each treatment was employed on plots 75 m on a side along three slope positions on Black Rock Mountain. In addition a fenced deer exclosure was installed on each plot. All non-oak trees in a central 25 m X 25 m subplot in the center of each plot were measured for diameter at breast height in the summer and winter of each year for six years after the treatment. In addition seedlings were counted and percent cover by each tree species was recorded on ten 1 m^2 quadrats on each plot and in this study the seedling results from 2013 were examined.

On control plots black birch has been slowly increasing in biomass compared to the other non-oak species, and only with deer exclusion fencing have seedlings of other species survived. On plots where half of the oaks were girdled, both black birch and red maple trees responded with faster growth than

the other tree species and also with much more leaf cover between 1 – 3 m of the ground with fencing. Finally, on plots where all oak trees were girdled, 3 of the four primary non-oak species (black birch, red maple, and sugar maple, but not black gum) responded by growing exponentially faster and tree seedlings were twice as abundant including many more tree species on these plots. Within fenced exclosures on these fully oak-girdled plots, tree leaf cover between 1 and 3 m of the ground was six times greater than on other treatment plots.

These results indicate that if oaks are killed by a pathogen in these forests, the response will depend on how many trees are killed and the level of deer browsing of woody plants. Black birch seems likely to increase in biomass and abundance compared to other species regardless. If half or fewer of the oaks are killed red maple is also likely to increase in biomass and abundance. If all oaks are killed a greater diversity of trees appear to be able to respond with substantially increased growth, especially if deer browsing is controlled. In all treatments there was very little evidence of non-native invasive trees becoming significant in future tree communities. The implications of these tree community composition changes for ecosystem processes and services in the future will vary depending on the species that fare best in the transition.

Testing the Allometric Equations: Biomass Storage and Carbon-Nitrogen Relations for Trees at Black Rock Forest

Peter Bower (Barnard College), William S.F. Schuster (Black Rock Forest Consortium), and Emma Bartnick (Barnard College)

Allometric equations that predict above-ground biomass from measurements of tree diameter have been used in published scientific papers to determine carbon sequestration in 80 year-old forest plots at Black Rock Forest. These equations were developed for specific species but in different climates and soils than those found at Black Rock Forest. Over the past decade a dozen red oaks and a dozen chestnut oaks of varying diameters were felled and weighed and these weights were compared to those predicted from the allometric equations. The results show that the equations are excellent predictors of tree biomass at Black Rock Forest.

C:N ratios have been determined for leaf, twig and stem for red oak and chestnut oak as well as major tree species. Because carbon is roughly 50% of dry biomass, and nitrogen content is low but measurable, both carbon and nitrogen can be quantified in forest biomass. Black birches of various sizes will be felled, weighed, and compared to allometric equations. Black birch has become an increasingly significant component of the forest. C:N ratios will be determined for leaf, twig, and stem for black birch. This will allow a comparison and hopefully an understanding of how C and N storage may change as black birch becomes more dominant.

River and Estuary Observatory Network (REON) II

Timothy F. Sugrue, Ph.D. (Beacon Institute for Rivers and Estuaries, Clarkson University)

Real-time data as applied to critical water challenges has the potential to revolutionize environmental monitoring by providing insights into contaminant behaviors, restoring habitats for endangered species, securing sound policy decisions, assisting homeland security practices, among other uses. Until now, financial infeasibility has limited efforts to put this sensor-based technology to work in the real world. We will discuss the evolution of the REON II network and promising next steps towards protecting our valuable water resources through “affordable adequacy.”

The Seasonal Nature of Extreme Hydrological Trends across the Northeastern US

Allan Frei **(**Hunter College, CUNY Institute for Sustainable Cities)

Recent analyses of extreme hydrological events across the US, including those summarized in the recent US Third National Climate Assessment (May, 2014), show that extremely large ("extreme") precipitation and streamflow events are increasing over much of the country, with particularly steep trends over the northeastern US. We demonstrate that the increase in extreme hydrological events over the northeastern US is primarily a warm season phenomenon. Since extreme precipitation events in this region tend to be larger during the warm season than during the cold season, trend analyses based on annual precipitation values are influenced more by warm season than by cold season trends. In contrast, the magnitude of extreme streamflow events at stations used for climatological analyses tends to be larger during the cold season: therefore, extreme event analyses based on annual streamflow values are overwhelmingly influenced by cold season, and therefore weaker, trends.

Iona Marsh Restoration: Ecological Response to Common Reed (*Phragmites australis*) Control in a Brackish Hudson River Tidal Marsh

Ed McGowan, Matt Shook, and Max Garfinkle (Palisades Interstate Park Commission)

Iona Marsh is a 152-acre brackish tidal marsh situated along the west bank of the Hudson River in Bear Mountain State Park, Rockland County, NY. Iona has the distinction of being the fifth largest Hudson River tidal marsh, part of the Hudson River National Estuarine Research Reserve, a National Natural Landmark, and NYS Bird Conservation Area. Pollen cores dating back 6400 years, as well as aerial images from the mid-20th century to the present, trace a history of vegetative change in the marsh. Native plant communities were invaded by Eurasian Common Reed (*Phragmites australis*) beginning in the early 1960s, the first colony appearing at a drainage outflow from a now defunct naval facility on Iona Island. From 1960 until 2008, *Phragmites* increased exponentially to cover nearly 90% of the marsh, displacing a more diverse, Narrowleaf Cattail (*Typha angustifolia*) dominated plant community. Concurrent numerical declines in marsh specialist avian species and state-listed rare plants were attributed to the expanding *Phragmites* monoculture. To address this, marsh restoration was begun in 2008 on an experimental basis in a 10-acre portion of the marsh still supporting scattered patches of *Typha*. Annual late-season herbicide treatments from 2008-2010 and again in 2013 and 2014 reduced *Phragmites* to <5% of the project area and created conditions for pioneering native plants to return. Three rare plant species, Spongy Arrowhead (*Sagittaria montevidensis spp. spongiosa*, NYS Threatened), New England Bulrush (*Bolboschoenus novae-angliae*, NYS Endangered), and Annual Saltmarsh Aster (*Symphotrichum subulatum,* NYS Threatened) increased significantly following treatment, the latter increasing from <10 detectable plants prior to the project to several thousand plants, qualifying as NY State's largest colony. Marsh specialist birds, including Virginia Rail (*Rallus limicola*), Marsh Wren (*Cistothorus palustris*), and Least Bittern (*Ixobrychus exilis*) were absent prior to management but returned as former *Phragmites* stands filled in with *Typha* and other native species. Encouraged by the results from this pilot project, management was expand to an additional 32 acres in 2013, bringing roughly 28% of the marsh area under management.

Contaminants of Emerging Concern as Agents of Ecological Change

Emma Rosi-Marshall (Cary Institute of Ecosystem Studies)

Pharmaceutical and personal care products (PPCPs) are now known to be ubiquitous in surface waters throughout the world. Their presence in aquatic ecosystems is an emerging concern for aquatic ecologists and the public. I will discuss the extent to which these novel contaminants occur in surface waters and will discuss the range of compounds present from antibiotics to illicit drugs. I will discuss various scales of inquiry that can be employed to measure the effects of PPCPs on aquatic ecosystem structure and function. I will present recent studies from my laboratory in that illustrate the potential effects of pharmaceuticals on stream ecosystem processes. New research also demonstrates that aquatic organisms may be developing resistance to these compounds and widespread occurrence of PPCPs may be leading to altered microbial communities with potential consequences for ecosystem function. Pharmaceuticals and personal care products represent a suite of compounds in aquatic ecosystems that may have ecological consequences and this talk will describe current research and highlight research gaps.

Ecological and Sociological Aspects of the White-tailed Deer Overabundance Crisis

Thomas J. Rawinski (Northeastern Area State and Private Forestry, USDA Forest Service)

Decades ago, our great ecologists sounded the alarm that overabundant white-tailed deer could have, and would have, profound detrimental impacts on forest ecosystems. Whitetails are a keystone species in forests. Their impacts cascade through the ecosystem in myriad ways. Millions of forest acres are no longer regenerating. These forests have lost much of their resilience to disturbance. Every tree that dies or topples over is not being replaced. These forests are disintegrating. These forests are dying. The deer themselves are suffering the consequences of habitat deterioration.

Some believe that the white-tailed deer overabundance crisis represents the greatest conservation challenge of our time. Despite the gravity of the problem, prominent conservation agencies and organizations have remained all too silent. Eco-environmental gentrification, willful blindness and the paucity of funding all contribute to this uniquely challenging conservation crisis. But at the grass-roots level, communities and organizations are taking actions that may soon reverberate far and wide.

Can Late Autumn Leaf Carbon Gain Provide a Fall Subsidy to Native Gymnosperms Growing in Northeastern Deciduous Forests?

Kevin Griffin (Columbia University E3B Department and LDEO), Ximeng Li (Minzu University of China), Chengyuan Xu (Central Queensland University)

Premise of the study: We hypothesize that a late Fall Carbon subsidy can play a critical role in determining the survival and growth of plants, and maybe a key to understanding the competitive equilibrium of a plant community. *Methods*: Leaf gas exchange characteristics and related leaf traits were measured for five gymnosperm evergreen species native to the oak-hickory deciduous forest in northeast USA in late Fall 2011 and Summer 2012. *Key results*: All five species investigated remained photosynthetically active in late Fall of 2011. However, temporal variation pattern of photosynthesis (A) was species-specific. Photosynthetic activity (A) of *Pinus rigida*, *Thuja occidentalis* and *Tsuga canadensis* was up-regulated in Fall; while A of *Pinus strobus* and *Chamaecyparis thyoides* showed the opposite seasonal trend. Dark respiration at a set temperature ($20^{o}C$, R_n) was higher in Fall than

that in Summer for *C. thyoides* and *T. canadensis* due to thermal acclimation. R_n of other three species was unchanged between seasons. Leaf carbon balance (A/R) was significantly higher in Summer than that in Fall for *C. thyoides*, but the pattern was opposite for *P. rigida*. Modeling results indicated that the leaf level Fall carbon gain ranged from 5.87 mol C m^{-2} to 13.1 mol C m^{-2}, with the contribution of this carbon gain to annual total spanning from 10.09% to 39.7% among the five species. *Conclusions*: Our findings illustrate that all five species were able to gain a Fall carbon subsidy with different underlying mechanisms, and may benefit from Fall warming trends.

Archaeology of the BRF Pathway from the Hagers' Place Toward an Old Mine Below Whitehorse Mountain.

Christopher Lindner (Bard College)

Archived photographic diaries of the Highlands and recent archaeological reconnaissance efforts connect prominent "hill people" of a century ago with a section of the proposed visitor access pathway at the entrance to Black Rock Forest. Avocational journalist William Thompson Howell (1873-1916) provides evocative accounts of Phil Hager and his wife Hopie between 1905 and 1908. Their retirement house was built near the Duggan trailhead by a prominent local family, the Matthiessens. The Pathway's viewpoint projects out only a few rods over from and above an abandoned mine, difficult to reach today across steeply sloping boulder scree. These places and others in Black Rock Forest may yield significant information about ancient indigenous and more recent historical activity.

Formative Assessment of Engagement for Rapid Improvement of Field Station STEM Learning

Adriana de Carvalho (Google)

Abstract not available

Understory Responses to Canopy Change and Herbivore Exclusion

Matthew Palmer (Columbia University E3B Department)

Abstract not available

Effects of Tree Girdling and Herbivore Exclusion on Soils and Microarthropod Communities in a Temperate Deciduous Forest

Natalie A. Bray (Columbia University E3B Department)

Experimental simulations of forest disturbances can be used to study altered resource availability and changes in soil-related processes, and can potentially lead to a better understanding of the long-term and differential effects for belowground communities. The goal of this study was to examine the effects of tree girdling and herbivore exclusion on soils and mesofauna communities at Black Rock Forest (Cornwall, NY) by the collection of leaf litter and soil arthropods. Girdling had a statistically significant effect on total arthropod abundances in leaf litter and only had a significant effect on mite abundances in soils, where abundances were lower in girdled plots. Herbivore exclusion did not have any significant effects on arthropod abundances in leaf litter or soils. Soil moisture was significantly higher inside exclosures compared to open forest and soil pH was higher in girdled plots compared to control plots. No significant effects of girdling or herbivore exclusion were observed for carbon and

nitrogen content. The effect of girdling on microarthropod abundance illustrates some of the important links between aboveground and belowground communities mediated through roots and their surrounding habitat. The decreased abundances six years after girdling are indicative of long-term changes in belowground communities with an aboveground disturbance. The consequences of reduced microarthropod populations in forests will likely have important effects on food web dynamics in forest ecosystems. The lack of effect from herbivore exclusion in microarthropod abundances but some changes in soil properties indicates that long-term changes in the soil environment are likely to be important relative to changes to the belowground communities.

Spiders of Black Rock Forest

Vladimir Ovtsharenko (American Museum of Natural History, Hostos Community College)

Abstract not available

Understanding Abiotic and Biotic Responses of a Forest Ecosystem to a Simulated Pathogen Attack

Katie R. Keck and Kate W. McFadden, Clemson University, Stephanie H. Seto, Columbia University E3B Department, Kate Pavlis and William S.F. Schuster, Black Rock Forest Consortium

This study was designed to test the hypotheses that i) a simulated pathogen attack in an oak forest would produce some environmental changes in the forest, and ii) our disturbance emulation would lead to increases in the most abundant small mammal species due to their adaptability as generalists.

Oaks were systematically notch-girdled to cause tree mortality, mimicking the symptoms of sudden oak death. Intentional girdling to quantify species response to altered habitat conditions is a novel method in small mammal ecology. Small mammals were live trapped for five summers following girdling to assess population response to disturbance over time. In addition to small mammal mark-recapture data, a suite of environmental variables was collected throughout the duration of the study to quantify abiotic changes.

Nine small mammal species were captured over the 14,960 trap nights of this experiment, resulting in 5,135 total small mammal capture events. The two most frequently encountered species were white-footed mice (*Peromyscus leucopus*) and eastern chipmunks (*Tamias striatus*) and were the focal species of this study.

We used principal components analysis (PCA) to identify the environmental variables which best represented habitat changes over time. A groundcover gradient was observed in PC 1. A canopy openness gradient was observed in PC2. These principal components were included as explanatory variables in mixed model analysis of variance, with small mammal relative abundance as the response variables. Eastern chipmunk abundance was significantly influenced by ground cover and canopy openness while white-footed mouse relative abundance was not significantly influenced by ground cover but increased with canopy openness.

Synthesis and Applications – Generalist small mammals, whose biomass make up the largest amount in small mammal assemblages, may serve as effective biological indicators of ecosystem integrity. By monitoring their shifts in abundance and distribution following disturbance events, land managers can better understand the scale and severity of these events and their impacts on multiple trophic levels. As

the movement of pathogens globally accelerates, it will be increasingly important for ecologists to understand the bottom-up cascade of events related to the loss of foundation tree species.

What Extent Does *Robinia pseudoacacia* Regulate How Much Nitrogen it Fixes across a Nitrogen Gradient?

Duncan Menge **(**Columbia University E3B Department)

Nitrogen (N) is a necessary nutrient for plant growth. Although the atmosphere mainly consists of nitrogen gas (N_2), this form of N is extremely stable. Most plants can't directly access N_2 and their rate of growth is limited by the presence of available N in the soil. Therefore, some species of trees have evolved a symbiosis with a special class of bacteria that "fix" atmospheric N_2 and convert it into a plant available form. These "N-fixing trees" have abundant access to N, but there is a cost to this symbiotic association: these trees provide carbon to bacteria and therefore sacrifice some of their own growth to maintain the symbiosis. As a result, N-fixing trees comprise only a small proportion of tree species on earth. In theory, N fixation is only advantageous in ecosystems that have very limited amounts of N in the soil. N-limited forests tend to be more common at higher latitudes (temperate and boreal) than at lower latitudes (tropics and subtropics), but curiously, N-fixing trees are actually most common at lower latitudes. In fact, N-fixing trees are ten times less abundant at higher latitudes than at lower latitudes. Why is this the case? This project will test a potential explanation. The "differential regulation hypothesis" states that variation in the degree to which N-fixing trees regulate N fixation can explain the pattern. N-fixing trees that rapidly adjust N-fixation to meet N demand should be more abundant, as is the case in lower-latitude forests. In contrast, species that cannot regulate N-fixation, or are poorly regulate N fixation, should be less abundant, as observed in higher-latitude forests. This project will measure the extent to which the regulation of N-fixation actually varies across latitudes, as well as the metabolic costs of regulating N-fixation and the relationship of these costs to temperature. The results will provide a long sought after explanation for the distribution of N-fixing trees on earth, which is an essential component of the growth of forests worldwide.

The project will involve a field experiment in forests at different latitudes as well as two greenhouse experiments. The field experiment will fertilize forests with labeled N to vary the degree of N limitation and measure the regulation of N fixation. The experimental locations are New York (with *Robinia pseudoacacia*, and *Betula nigra* as a reference plant), Oregon (with *Alnus rubra*), and Hawaii (with *Morella faya, Casuarina equisetifolia*, *Gliricidia sepium*, and *Sophora chrysophylla*) and span the latitudinal threshold for N-fixing tree abundance (35° N). There are two major types of N fixing symbioses (actinorhizal and rhizobial) and the field sites were chosen to capture both. The experimental design in the field consists of four treatments: tracer levels (1 kg N/ha/y), 100 kg N/ha/y, 150 kg N/ha/y, and 150 kg N/ha/y + 150 kg P/ha/y. The greenhouse experiments will test a larger number of species and involve more highly controlled conditions. The greenhouse experiments will also evaluate how quickly plants can regulate N fixation. The N we will apply in the field and the greenhouse will be isotopically labeled.

Physiological Response to Temperature across Fifteen Northern, Central, and Southern Ranged Tree Species in a Northeastern Temperate Forest

Angie Patterson (Columbia University DEES Department and LDEO)

Extensive botanical surveys and long term plots at Black Rock Forest in southeastern New York have shown that since the early 1930's, three northern-ranged tree species were extirpated and eleven tree species were introduced or had migrated from southern USA. These observations are consistent with a

warming climate and suggest the Hudson River Valley may be an important location to study the effects of climate change on Northeastern forests. In this study, we compared a suite of physiological and leaf traits across fifteen broad-leaved tree species that have one of three distribution ranges (northern, central, and southern). Foliar carbon to nitrogen ratio (C:N), nitrogen content (N), and specific leaf area (SLA) differed significantly between species and range category. Carbon assimilation rates at ambient temperature and light saturation (A_{max}) differed significantly across species but not range category. Maximal rate of carboxylation (Vc_{max}), electron transport rate (J_{max}), triose phosphate use limitation (TPU), and dark respiration (R_d) differed significantly between species and range, where centrally-ranged species had the lowest maximum photosynthetic and respiration rates relative to their northern and southern counterparts. There were strong correlations between leaf traits and physiological traits, revealing that trees with high N content (northern and southern species) and/or high SLA (southern species) had higher photosynthetic and respiration rates. Although centrally-ranged species may display significantly lower physiological rates, their ratio of A_{max} to R_d was comparable to northern and southern species, suggesting that their climatic provenance is not a factor in predicting their physiological efficiency to maintain carbon gain under current temperatures. Our study provides evidence that supports significant differences in photosynthetic capacities among range categories, where centrally-ranged species, such as the dominant red oak, may be physiologically disadvantaged, threatening their persistence under elevated temperatures and thereby influencing the carbon sequestration capabilities of northeastern temperate forests.

Climatic Response of Tulip Poplar: A Multiproxy Dendrochronological Analysis

Mathieu Levesque (Columbia University, Lamont-Doherty Earth Observatory, Tree Ring Laboratory)

Understanding the growth and gas exchange responses of trees to changing climatic conditions and rising atmospheric CO_2 concentration is critical to understanding their vulnerability to global change. Radial growth analysis was combined with interannual $\delta^{13}C$ and $\delta^{18}O$ measurements to investigate the growth and physiological responses of tulip poplar (*Liriodendron tulipifera* L.) to climate for the period 1950–2014 at Black Rock Forest. Correlation analysis revealed that mean maximum temperature, total precipitation and moisture availability during summer months influence significantly the growth, photosynthesis and stomatal conductance of tulip poplar. Radial growth was significantly and positively correlated to the climatic water balance (precipitation minus potential evapotranspiration) from June to August ($r = 0.44$). $\delta^{13}C$ and $\delta^{18}O$, which are used as proxies for photosynthesis and stomatal conductance at the leaf level, were strongly significantly correlated to June to August climatic water balance ($\delta^{13}C$, $r = -0.72$; $\delta^{18}O$, $r = -0.71$). Prior to the mid 1980s, low water availability resulted in low stomatal conductance and high intrinsic water-use efficiency, but since that period pluvial conditions in the northeastern United States have enhanced stomatal conductance, carbon uptake and growth as supported by rising basal area increment and declining $\delta^{18}O$.

The N-fixing tree *Robinia pseudoacacia* Maintains Higher Physiological Activity and Chlorophyll Content at the end of Growing Season Compared to Neighboring Non-fixers in a Northeastern Deciduous Forest

Adefunke Sonaike, Alex Huddell, Wenying Liao, Christa Shen, Kevin Griffin and Duncan Menge (Columbia University E3B Department)

Leaf senescence is a process during which the cellular disassembly and mobilization of released materials can occur. In particular, nitrogen (N) can be resorbed and reused by many plant species.

Symbiotic N-fixing plants (hereafter "N fixers"), which form symbiosis with N-fixing bacteria in root nodules, have been shown to resorb N less proficiently compared to other non-fixers. Why do N fixers resorb less N? This research investigates this question from a physiological aspect, investigating whether the low proficiency of resorbing N is associated with better physiological performance. Throughout leaf senescence, we measured physiological activities and pigment composition of *Robinia pseudoacacia*, the most dominant N fixer in northeast region, and two maple species *Acer saccharum* and *Acer rubrum*, two common players in this region. We found that *Robinia pseudoacacia* maintains higher physiological activities and higher chlorophyll content compared to two maple species. Essentially, *Robinia* sustains and protects its photosynthetic machinery more efficiently. These differences are likely related to low N resorption of N fixers, since N is the one of the key elements powering photosynthesis.

Flora of Ice Pond Conservation Area, Putnam County, New York

Daniel E. Atha (The New York Botanical Garden)

This study documents 550 species of vascular plants growing spontaneously within the Ice Pond Conservation Area in the Hudson Highlands of eastern Putnam County, New York, U.S.A. The study area covers 300 hectares (741 acres) at the southern edge of the Great Swamp, one of New York State's largest wetlands. This is the first published flora for any area within Putnam County, New York. The flora is comprised of 550 species in 319 genera and 112 families (428 native and 122 non-native). Seventy-eight percent of the species are native. Two species are ranked by the New York Natural Heritage Program as endangered and 5 are category S3. *Stylophorum diphyllum* is new for New York State. Two hundred and four species are new records for Puntam County. The Asteraceae is the largest family with 57 species and *Carex* is the largest genus with 46 species, followed by *Persicaria* and *Dichanthelium* each with 9 species. Habitats and plant conservation status are described using the classification system of the New York Natural Heritage Program.

Robustness of Taylor's Law under Spatial Hierarchical Groupings of Forest Tree Samples

Meng Xu (University of New Haven), William S.F. Schuster (Black Rock Forest Consortium) and Joel E. Cohen (Rockefeller University)

Testing how well Taylor's law (TL) describes spatial variation of the population density of a species requires grouping sampling areas (patches of habitat) into blocks so that a mean and a variance of the population density can be calculated over the patches in each block. The relationship between specific groupings and TL remains largely unknown. Here, using tree counts from a deciduous forest, we studied the effect of four biological methods of grouping sampling areas into blocks on the form and parameters of TL. Regardless of the method of grouping, the species-specific basal area densities obeyed TL, and the estimated slopes were not significantly different from one grouping method to another. Surprisingly, TL remained valid when four kinds of randomizations were performed to the biological groupings and tree census. These randomizations randomly assigned sampling areas to blocks, and/or randomized the species composition within or across sampling areas. We found that the form of TL was robust to different grouping methods and species randomizations, but its parameter values depended significantly on species compositions at sampling areas.

Legacy Landscapes

Matt Decker (Hudson Highlands Land Trust)

Land conservation organizations need good information to focus their work on areas with the highest conservation value. The Legacy Landscapes Project is a GIS-based analysis of all parcels within the mission area of the Hudson Highlands Land Trust. We used conventional and unconventional data sources to map 32 criteria that approximate the conservation value of each parcel. The resulting map will be used to inform our land conservation efforts and communicate our work to the communities in which we work.

Respiratory Response to Temperature of Broadleaf Trees from the Northeastern US

Rachel Arkebauer (Columbia University E3B Department)

Rising atmospheric temperatures appear to be driving the geographic distribution of tree species northward. The mechanism for this range shift seems to be related to increased respiration lowering the competitive ability of trees growing on the southern margin of their ranges. Current models that predict future species ranges often do not incorporate species specific physiological data for factors such as respiration, or do so in a simplistic manner. However, understanding the respiratory response of tree species will be important for accurately predicting plant growth, competitive ability and future CO_2 fluxes into the atmosphere. Northern-, centrally-, and southern-ranged tree species in the northeast United States were sampled to determine how their respiratory responses varied across temperature gradients. Northern ranged species were found to have a lower energy of activation and a higher respiration rate at environmentally realistic temperatures of 10˚C and 20˚C, compared to their central and southern counterparts. Analyzing specific leaf area and percent nitrogen by range showed evidence that northern-ranged species did not have a higher overall metabolism, but rather had a higher respiratory output due to abiotic stress. These results suggest that northern-ranged species are at a physiological disadvantage due to reduced competitive ability compared to centrally- and southern-ranged species. This reduced competitive ability among northern-ranged tree species may lead to a decline of those populations and the persistence of centrally- and southern-ranged tree species in Black Rock Forest as temperatures rise in the region.

Public Health Concerns Associated with Harmful Algal Blooms

Mary Figgatt (New York State Department of Health)

Harmful algal blooms (HABs) are an excessive aquatic growth of microorganisms that can produce toxins. HABs can cause a variety of negative impacts on public health, the environment, tourism, and fishing. Increases in nutrient runoff, changes in climate, and eutrophication of ambient and marine waters can lead to HAB growth.

Toxins produced by HABs, such as microcystins and cylindrospermopsins, and the algal blooms themselves have the potential to cause illness in humans and other animals. In addition, algal blooms themselves have the potential to cause illness, regardless of the presence of toxins. Exposure can occur from recreational activities, drinking contaminated water, or consuming contaminated fish and shellfish. Some documented illnesses and symptoms associated with HAB exposure include: dermal reactions, gastrointestinal symptoms, respiratory symptoms, neurological symptoms, and liver damage.

In response to this emerging issue, New York State is conducting surveillance on HABs and associated illnesses.

Ecological Assessment of New York City's Forests: A Tool for Management

Helen Forgione (Natural Areas Conservancy)

New York City's municipal park system is home to nearly 6,000 acres of natural forest which provide incredible ecological and social benefits to over eight million people. To advance the management and understanding of the urban forest in New York City, a comprehensive ecological assessment was conducted across all forest types in city-owned parkland. Over two field seasons we collected quantitative data on vegetation structure, composition and percent cover and metrics related to tree health, herbivory, litter layers and soil quality. Using the suite of ecological health and threat metrics collected during this citywide forest assessment, we are working toward creating a weighted equation of forest condition to use in prioritizing management, setting goals and developing ecological thresholds.

Our results provide specific guidance for focusing forest management across a large metropolitan region as well as providing indicator metrics for health and threats within complex urban systems. This approach can be adapted to other forest types and cities across the nation serving as a valuable tool and approach for guiding land management and restoration decisions.

Valuing Ecosystem Benefits of Forests & Trees: Trends & Regional Initiatives c. 1860-2015

Simon Gruber (Institute Fellow, CUNY Institute for Sustainable Cities)

Green infrastructure for managing stormwater runoff and protecting water quality, including street trees, has been recognized in recent years as a beneficial strategy for managing water resources in developed landscapes. Trees planted along streets and in yards, parks and other areas in urbanized areas can also provide very significant benefits for reducing greenhouse gas emissions by reducing energy use in buildings in warm and cold seasons, and for reducing urban heat island effects. Evapotranspiration by trees is one of the cooling mechanisms responsible for these energy and urban heat island benefits. This talk introduces these ideas as a priority for addressing emerging sustainability goals for community planning in the region, and describes these current issues in the context of historical deforestation, landscape change and forest management trends since the European settlement of the northeast U.S. The talk touches on the important contribution of George Perkins Marsh to our early understanding of evapotranspiration and other relevant biophysical mechanisms in forests, in his landmark 1864 work, Man and Nature (a later edition was titled The Earth As Modified by Human Action), which has been described by William Cronon as "the founding text of the modern environmental movement." This book laid the groundwork for passage of the Forever Wild laws and policies to protect Adirondack forests in New York in the late 1800s. Today, 150 years after the book was first published, some of the fundamental mechanisms and ideas Marsh articulated for larger forest tracts can now be seen as prescient and highly relevant for managing water, energy use, and microclimates in urban neighborhoods.

Dragonflies and Damselflies of Lily Pond, Harriman State Park

Alan Wells, Della Wells and John Lampkin (Palisades Interstate Park League of Naturalists)

Lily Pond is a waterbody of approximately 2 ha formed by beaver activity on Whitney Brook in Harriman State Park, Rockland Co., NY (41° 12' 56" N, 74° 06' 42" W, Elv 302 m). As part of the New York Dragonfly and Damselfly Survey we surveyed this site periodically from 2005 through 2009. Following the statewide survey, we began a more systematic examination of this particular site with visits on approximately a weekly basis during May through October. Results of this ongoing study were presented at the 2011 Black Rock Forest/Highlands Research Symposium. Since that presentation, there have been subtle changes to the pond. Silt accumulation has increased and *Phragmites* has begun encroaching along the northwest shoreline. Eighteen odonate species new to the site have been discovered since 2011 bringing the site total to 68 species. At least one species, *Enallagma erbium*, has not been seen since 2011. The ongoing research has revealed several additional insights. Notably, the first emergence date for several species may differ from year to year by up to approximately a month, depending on weather conditions. In 2011 the only confirmed fall darner was *Aeshna clepsydra*. Subsequent closer inspection has added five additional species: *A. tunerculifera*, *A. umbrosa*, *A. verticalis*, *A. canadensis*, and *Rhinoaeschna mutata*. A cryptic Cordulid species, *Epitheca canis*, was initially found flying among *E. cynosura* in 2012. It has been observed in several subsequent years, with the greatest numbers so far observed in 2015. Was it just initially overlooked or are the numbers increasing as the pond habitat changes? By photographing as many specimens as possible, we were able to document microhabitat preferences between *Arigomphus furcifer* and *A. villosipes*.

The Bees of Black Rock Forest

Caroline DeVan (New Jersey Institute of Technology) and John Ascher (National University of Singapore and AMNH)

A 2003 survey of the bees of Black Rock Forest (Giles & Ascher 2006) recorded 144 bee species including many rare bee species and one new state record. In the spring of 2013 Caroline DeVan performed a smaller survey at Black Rock Forest focusing primarily on bee communities found in and out of deer exclosures. This talk will compare the spring species found in 2013 to those found in 2003. It will also compare bee richness and abundance in and out of deer exclosures with the hypothesis that deer exclosures will promote bee diversity via protection of floral resources from deer herbivory.

Golden-winged Warbler Surveys and Habitat Management

Max Garfinkle (Palisades Interstate Park Commission)

I will discuss up-to-date research and habitat restoration work for the Golden-winged Warbler (*Vermivora chrysoptera*) on local parklands since 2013, including surveys in Fahnestock State Park, the importance of the Golden-winged warbler globally and in its sub-populations, and as the latest insights into the "preferred" habitat of this enigmatic species.

Methods for Aquiring Timber Rattlesnake Demographic Data

Randy Stechart (New York State DEC, Palisades Interstate Park Commission)

Abstract not available

Identification of Cutaneous Bacteria on Salamanders That Inhibit Chytrid Fungus

Soon il Higashino (Ossining High School)

Amphibians are experiencing sharp population declines that have been associated with environmental disruptions, such as habitat loss and the dissemination of chytridiomycosis, a skin disease caused by the pathogenic chytrid fungus *Batrachochytrium dendrobatidis.* Chytridiomycosis has been associated with high mortality rates in amphibians around the world; however, its growth is mitigated by certain cutaneous bacterial species found on some amphibian species. Prior research has suggested that environmental conditions may influence the presence of beneficial cutaneous bacteria that may inhibit the fungus, thereby increasing an amphibian's susceptibility to infection and risk of decline. This study examined the impact of specific habitat conditions, such as urbanization and habitat types, on the presence of cutaneous bacteria on eastern redback salamanders (*Plethodon cinereus*) that may inhibit the growth of the chytrid fungus and set out to identify such bacterial species through DNA analysis. Coverboards were set up in stream-side, mid-upland, and high upland habitats within nine urban, suburban, and rural areas. Salamanders detected were swabbed for cutaneous bacteria, which were cultured and isolated in a laboratory setting. Challenge assays were conducted between bacterial isolates and the fungus to determine inhibitory abilities. Bacterial isolates exhibiting inhibitory abilities were identified using the Sanger sequencing method. Our results indicate that bacterial communities found in rural areas were less diverse when compared to communities from suburban and urban areas, suggesting that increased urbanization may actually result in increased bacterial diversity. Additionally, out of ten bacterial isolates, one bacterial isolate has exhibited the ability to inhibit fungal growth. This research may help conservationists further understand the relationship between habitat characteristics and an amphibian's susceptibility to disease.

Invasive Species, Eastern Cottontails, and an Altered Landscape; Recovery Challenges Facing New York's Native New England Cottontail

Samantha Mello, Amanda Cheeseman, Jonathan Cohen, Chris Whipps and Sadie Ryan, (Syracuse University)

The New England cottontail (*Sylvilagus transitionalis*) is a shrubland obligate lagomorph. Historically common throughout New England and eastern New York, the New England cottontail has experienced range-wide declines. This decline has prompted the United States Fish and Wildlife Service to consider the New England cottontail for listing under the Endangered Species Act. Loss of early successional forest is widely recognized as the driving factor behind the decline of New England cottontail. Presence of eastern cottontails (*Sylvilagus floridanus*) is also suggested to limit colonization of new habitat patches by New England cottontail. Programs throughout the Northeast have been instated to restore early successional forest, with the goal of increasing New England cottontail populations in the region. However, it is unknown if this species undergoes seasonal changes in habitat and if NEC can effectively recolonize newly restored early successional forest patches. Using radio telemetry, we examined seasonal home range size and habitat composition of adult and juvenile New England and non-native eastern cottontails in the lower Hudson Valley, NY. Home range of New

England cottontails included both native and invasive vegetation patches. Results also indicated a shift in core home range from dense shrubland during winter to grassland and young shrubland during summer. These results suggest young shrubland and grassland might be important summer habitat components for New England cottontail when juxtaposed with suitable overwintering habitat.

Black Rock Forest - Schunnemunk Mountain Important Bird Area Proposal

Terryanne Maenza-Gmelch (Barnard College, Columbia University), William S.F. Schuster (Black Rock Forest Consortium), Cris Kenyon (Orange County Land Trust)

A proposal, nominating the Black Rock Forest - Schunnemunk Mountain Biological Corridor for IBA designation, was submitted to the Audubon New York's Important Bird Areas Program in November 2014. The Important Bird Areas (IBA) program is an international bird conservation initiative whose goals are to identify and conserve important bird habitat. Survey participants were from the Black Rock Forest Consortium, Barnard College, Orange County Land Trust and Mearns Bird Club.

Stationary counts (point counts) and traveling counts were conducted in spring and summer of 2012 throughout the nomination area. Sites included Black Rock Forest, Schunnemunk Mountain State Park, Houghton Farm, Clove Brook Farm, Black Rock Fish and Game Preserve, Hudson Highlands Nature Museum (Kenridge Farm), Hilmare, and Storm King Art Center.

Surveys revealed that the proposed area meets all three criteria of the IBA program: significant populations of "listed" species, presence of all or most of the responsibility species , and large numbers of migratory birds. In particular, thresholds of key individual birds such as Cerulean Warbler, Worm-eating Warbler, Wood Thrush, Blue-winged Warbler and Prairie Warbler were well above the required levels.

An IBA designation would lead to an increased awareness about integrating bird conservation into the management of the region and serve as an important factor to consider in any environmental review of land-use projects that could potentially impact the area.

Status of Whitetail Deer in Black Rock Forest 2015

John Brady and William S.F. Schuster (Black Rock Forest Consortium)

This paper addresses four questions: how many deer are in Black Rock Forest? What is their health status? What factors appear to affect population size and health? What are some of the research and education opportunities related to the BRF deer population?

The number of deer in the Forest is highly dependent on time of year, with a big increase in spring each year when fawns are born and then decreases due to mortality through the rest of the year and the winter. Winter tracking studies indicated about 70 deer in the Forest last winter, a density of about 12 per square mile. Deer scat surveys in April produced estimates of about 9 deer per square mile. Deer are much harder to study in later spring but these numbers may have increased to 100 – 120 after fawning. Health is best assessed by examining deer brought to the check station each hunting season. Particularly good indicators are yearling antler beam diameter and fawn weights. Both indicated moderate health of Black Rock Forest deer. Factors that appear to affect health and populations size include summer precipitation and the amount of green plant matter produced, the size of the fall acorn crop, total take during hunting season, winter severity (especially the number of days with snowpack

deeper than 1 foot), extreme weather events, and possibly mortality due to predation. Consortium staff are happy to share information and data with anyone interested in studying aspects of the deer population. Particularly suitable activities for education include helping with the fall acorn counts and springtime scat surveys.

Update on American Eel Surveys in Hudson River Tributaries

Chris Bowser (New York State Department of Environmental Conservation)

Abstract not available

POSTERS

The Effects of Aggregate Community Plant Traits on Local Ecohydrology in Herbivore-browsed and Non-browsed Forest Areas.

Daniel Chi (Columbia University E3B Department)

Plant communities influence both biotic and abiotic properties of ecological systems, but the significance of plant diversity, particularly in forest understories, remains poorly understood. Given increasing environmental pressures on biodiversity, understanding the consequences of changes in biodiversity can help predict how ecosystem properties will respond to biodiversity loss. We examine this issue using a trait-based approach to uncover how herbivore-induced changes in plant community composition influence local ecohydrology. We will sample a suite of plant traits [leaf area, fresh mass, dry mass, SLA (specific leaf area), LDMC (leaf dry matter content), stomatal density, ^{12}C:^{13}C ratio, %C (percent carbon), %N (percent nitrogen), SWP (stem water potential), and stomatal conductance of CO_2 and water vapor] from individuals of 13 relatively abundant species at Black Rock Forest: *Microstegium vimineum*, *Gaylussacia baccata*, *Vaccinium pallidum*, *Betula lenta*, *Hackelia virginiana*, *Polystichum acrostichoides*, *Thelypteris noveboracensis*, *Dennstaedtia punctilobula*, *Liriodendron tulipifera*, *Acer rubrum*, *Rubus phoenicolasius*, *Polygonum sagittatum*, and *Nyssa sylvatica*. Samples will be taken from 13 plots, 12 of which have fenced-off deer exclusion areas within. We will then collect data on several water characteristics (groundwater volume, nitrogen/phosphorus levels, and soil moisture) both inside and outside the exclosures at all sites in an attempt to find a correlation between aggregate community plant traits and local ecohydrology. Preliminary results from five years ago have shown no statistically significant difference between groundwater levels in browsed versus un-browsed sites, but I expect to see a significant difference in ecohydrology now that fenced communities have had more time to develop. By finding a correlation between functional biodiversity of plant communities and ecohydrology we create functional targets for ecological restoration (Laughlin, 2014).

Butterflies of Lily Pond and Environs, Harriman State Park, NY.

John Lampkin (Palisades Interstate Park League of Naturalists)

Lily Pond is a waterbody of approximately 2 ha formed by beaver activity on Whitney Brook in Harriman State Park, Rockland Co., NY (41° 12’ 56” N, 74° 06’ 42” W, Elv 302 m). Since 2012, butterfly counts were conducted more or less weekly from April through October and data from each count was posted in the online database of the North American Butterfly Association. The area covered is formed by an irregular loop formed by the abandoned Johnsontown Road and Lake Welch Parkway

and includes two approximately one-acre meadows, several smaller clearings, woodland and pondside trails, a wetland marsh and the sides of Lake Welch Parkway. In this richly varied habitat a 56 species of butterflies were observed. Several, like the Oak Hairstreak, *Satyrium favonius,* are seldom seen in Rockland County. The most remarkable discovery was a large well-established colony of Appalachian Browns, *Satyrodes appalachia,* that utilizes the abundant Tussock Sedge there as a larval host plant.

Population Ecology of *Chrysemys picta* and *Chelydra serpentina* at Black Rock Forest in Cornwall, New York

Maya Drzewicki (SRMP AMNH, LaGuardia Arts High School), Ines Muravin (SRMP AMNH), Andrew Henriquez (SRMP AMNH, Hunter College High School), Oscar Pineda-Catalan (SRMP AMNH)

Chrysemys picta and *Chelydra serpentina* are two of the most abundant and widespread species of freshwater turtle in North America. It is important to study these species in order to better understand their ecology and the health of their natural populations. We focused on populations from Black Rock Forest, a protected area located in Cornwall, New York. Our goals were to estimate the population demographics, genetic diversity, and prevalence of Apicomplexa parasites, blood parasites that cause malaria. We evaluated the following demographic parameters: number of individuals per species and gender, number of individuals captured per pond, number of recaptures (i.e. individuals captured more than once), and inter-pond movements by individuals. Our results showed no gender bias in either species. While *C. serpentina* shows an even distribution across the ponds, most *C. picta* individuals were captured in Aleck pond. However, we do not have information related to capture effort. Most individuals were caught once (n=125/286 for *C. picta* and n=35/54 for *C. serpentina*). We evaluated the haplotype diversity by analyzing the DNA barcoding region (~600 base pairs of the C01 mitochondrial gene 5' end). We found that all the *C. picta* individuals shared the same haplotype, but *C. serpentina* individuals displayed three different haplotypes, two of which had not been published on GenBank. Our results can be used as a reference for future studies on organisms and their populations in this location and elsewhere.

Vernal Pools in an Urban Landscape

Susan Stanley (Natural Resources Group, NYC Department of Parks and Recreation)

In 2011 the New York City Parks Department initiated a study of vernal pools to better understand how these ephemeral ecosystems function in an urban environment. Fifteen pools were selected in three boroughs of New York City and ten pools in less-disturbed areas outside New York City, including Black Rock Forest. Amphibian egg masses were counted and invertebrates sampled in early spring, amphibian larvae were sampled in late spring and data were collected on average depth, size and hydroperiod. A diversity of taxonomic groups, including pool-dependent amphibians such as spotted salamander (*Ambystoma maculatum*) and wood frog (*Rana sylvatica*) as well as macroinvertebrates like the vernal fairy shrimp (*Eubranchipus vernalis*), were present in New York City pools. Preliminary work shows that although pools in heavily urbanized areas contain lower overall diversity, lower abundances of amphibians and greater proportions of the most common macroinvertebrate taxa, they also support a higher richness of aquatic beetles (Coleoptera).

Archaeology of the BRF Pathway from the Hagers' Place toward an Old Mine Below Whitehorse Mountain.

Christopher Lindner (Bard College)

Archived photographic diaries of the Highlands and recent archaeological reconnaissance efforts connect prominent "hill people" of a century ago with a section of the proposed visitor access pathway at the entrance to the Black Rock Forest Preserve. Avocational journalist William Thompson Howell (1873-1916) provides evocative accounts of Phil Hager and his wife Hopie between 1905 and 1908. Their retirement house was built near the Duggan trailhead by a prominent local family, the Matthiessens. The Pathway's viewpoint projects out only a few rods over from and above an abandoned mine, difficult to reach today across steeply sloping boulder scree. These places and others in Black Rock Forest may yield significant information about ancient indigenous and more recent historical activity.