Black Rock Forest Consortium
129 Continental Road, Cornwall, NY 12518

Seventh Research Symposium - June 20, 2011

PALISADES INTERSTATE PARK COMMISSION
NEW JERSEY SECTION

HENRI
Highlands Environmental Research Institute

BLACK ROCK FOREST CONSORTIUM

The Black Rock Forest Consortium is an alliance of academic institutions formed in 1989 to promote scientific research, education, and conservation associated with the nearly 4000 acre Black Rock Forest, located in southeastern New York State. Beginning in 1999, the Consortium has hosted a Research Symposium in late June of every second year. The purpose of the Symposium is to more widely communicate much of the research taking place in the Black Rock Forest and to provide a venue for investigators to meet each other and discuss their work. Since 2007, the Symposium has also included presentations about additional research projects taking place around the Highlands region.

Sessions, Presentation Titles and Authors

Session 1

William Schuster, Black Rock Forest Consortium, "The Future of Oak Forests experiment - goals, design and early results."

Robert Kakerbeck, USMA, West Point, "Forest change observed on the West Point Military Reservation, 1990 – 2011."

Allan Frei, Hunter College and A. Kalkstein, USMA, West Point, "Reconstructing historical climate variations in Black Rock Forest."

JD Lewis, Fordham University, "Getting to the root of the problem: Effects of forest degradation on soil microbial communities."

Jay Westerveld, New York Natural History Council, "Clam shrimp *Caenestheriella gynecia* observations in Orange County."

Dorothy Peteet, Lamont-Doherty Earth Observatory of Columbia University and S. Sundaresan, Columbia University, "A paleoenvironmental record of the last millennium from Constitution Marsh, Hudson River, adjacent to Black Rock Forest and West Point."

Alan Wells and D. Wells, Palisades Interstate Park League of Naturalists (PIPLON), "Dragonflies and damselflies of Lily Pond, Harriman State Park."

Emily Cunningham, Black Rock Forest Consortium, "Assessing Eastern Brook Trout population ptatus in the Hudson Highlands, 2008-2010."

Dorothy Peteet, LDEO of Columbia University and T. Maenza-Gmelch, Barnard College, "Strengths and weaknesses of Sutherland Pond vs. Fen archive, Black Rock Forest, New York."

Marnie Miller-Keas, Trailside Museums & Zoo, Bear Mountain, NY, "Nesting movements, juvenile recruitment and management of three turtle species of greatest conservation within Southern New York State Park Lands."

Session 2A

Simon Gruber, CUNY Institute for Sustainable Cities, "Watershed planning in Orange County, NY."

Peter Warny, Peter Warny Consulting, LLC, "Native and non-native reptile observations in the NY region."

Lindsey Milbrath, USDA-ARS, "Swallow-wort biological control update."

Alison Cucco, Fordham University, "Urbanization effects on nitrogen cycling and plant growth."

Jay Westerveld, New York Natural History Council, "Northern Cricket Frog and *Megamelus davisi*."

Matthew Shook, Highlands Environmental Research Institute (HEnRI), "Iona Marsh Restoration Project: 2008-2010."

Don Steinmetz, HEnRI, "Ramapo River Intermunicipal Council internet map server."

Ed Helbig, Orange County Water Authority, "Water data and research on Orange County and the Highlands in the new OCWA Website."

Session 2B

Nancy Falxa-Raymond, Columbia University/U.S. Forest Service, "Ecological physiology of nitrogen use in trees following forest disturbance."

Jen Levy, Columbia University, "Impact of a simulated pathogen attack on soil carbon at Black Rock Forest."

Kate Pavlis and W. Schuster, Black Rock Forest Consortium, "Environmentnal change with oak forest disturbance.."

Matthew Palmer, Columbia University/E3B, "The effects of canopy structure, slope position, and herbivore exclusion on understory vegetation at Black Rock Forest."

Vladimir Ovtsharenko, American Museum of Natural History and B. Zakharov, LaGuardia Community College, "Biodiversity, seasonal dynamics and biomass of spiders and other soil invertebrates in oak forests of Black Rock Forest."

Terryanne Maenza-Gmelch, Barnard College, Columbia University and R. Kelsey and A. Cox, Columbia Center for New Media Teaching and Learning Columbia University. "A web-based Paleoecology Module provides a virtual palynological experience for undergraduates: Virtual Forest Initiative at Black Rock Forest."

Kathy Weathers and A. Lindsey. Cary Institute for Ecosystem Studies, "Biogeochemical changes in soil water accompanying oak loss."

William Schuster, Black Rock Forest Consortium, "Oak forests and changes in tree biomass and growth."

Posters

Alan Frei, Hunter College, "Potential impacts of climate change on sustainable water use in the Hudson River Valley."

Ika Djukic and Krista McGuire, Barnard College, "Effects of losing oak species on soil microbial community composition in temperate forests in the USA."

Sylvia Bibbo, Columbia University, "Saproxylic mycodiversity in the Future of Oak Forests experiment."

Maggie Chan, Barnard College, "Reproductive trait variation in northern red oak, *Quercus rubra*."

Emily Spokowski, Barnard College, "Aquatic turtle growth in relation to pond pH."

Laura Diefenbach, Barnard College, "The relative influences of natural events and hunting on a small white-tail deer population."

Abstracts Listed Alphabetically by Author

Urbanization effects on nitrogen cycling and plant growth

Alison Cucco, Fordham University

Urban areas are subject to increased temperatures and elevated amounts of CO_2, pollution, heavy metal deposition, earthworm activity, and nitrogen deposition. Urbanization in New York City and other cities has been associated with increased growth in some plant species. This increase in growth may reflect high amounts of nitrogen deposition, as plant growth in many terrestrial ecosystems historically has been limited by nitrogen availability. The introduction of historically limiting nutrients, such as nitrogen, into terrestrial ecosystems can have potentially significant effects which have cascading affects on the soil microbial communities which regulate the decomposition of organic matter, thereby regulating nutrient availability for plants. One way to better understand changes in decomposition and nutrient cycling is to examine the function of extracellular enzymes mediating these processes. We investigated whether urbanization affects plant growth through effects on the nitrogen cycle. Complementary field and common-garden studies were conducted using ten sites varying in distance from the center of New York City, Central Park. In the common garden experiment, soils collected closer to New York City were associated with increased growth of red oak (*Quercus rubra*) seedlings, suggesting that below-ground factors contribute to increased productivity. In situ measurements indicated that both nitrate concentrations and pH decreased with increasing distance from Central Park, yet N mineralization and nitrification rates did not vary among the sites. Leaf N was not correlated with distance to Central Park, nor was leaf N correlated with total soil N. Leaf N was significantly correlated with inorganic nitrogen, suggesting inorganic N is the favored form of N taken up by red oaks. Glycine aminopeptidase, an extracellular enzyme related to nutrient metabolism and assimilation, significantly increased with increasing distance from Central Park. These results suggest that urbanization has led to changes in soil N processes, and these alterations may partially account for increases in plant growth with increasing urbanization.

Assessing Eastern Brook Trout population status in the Hudson Highlands, 2008-2010

Emily Cunningham, Director of Program and Resource Development, Black Rock Forest Consortium

Human activity transformed the Hudson Highlands landscape over the past two centuries, endangering habitat for *Salvelinus fontinalis*, the Eastern brook trout, and driving this species to the brink of extinction. A two-year population status assessment conducted by Black Rock Forest Consortium teams from 2008 to 2010 concluded that a handful of streams in the Hudson Highlands may well contain ancestral brook trout strains, suitable for restoration efforts. Restoration projects in other state park systems have met with success in recent years, most notably in the Great Smoky Mountains in Tennessee. Genetic testing could determine whether Hudson Highlands brook trout are heritage strain and thus valuable for restoration, or have been adversely affected due to stocking of domestically raised brook trout.

Ecological physiology of nitrogen use in trees following forest disturbances

Nancy Falxa-Raymond, Columbia University, US Forest Service

Nitrogen (N) is considered a key limiting element in northeastern US forests. Recent modifications to N cycling in these ecosystems due to large-scale anthropogenic disturbances

have the potential to change forest species composition and productivity, by altering soil N availability and ratio of ammonium (NH_4^+) to nitrate (NO_3^-). This project investigates the effects of two types of disturbance on tree growth and nitrogen use in forests: oak loss and urbanization. The first study assesses the response of black birch (*Betula lenta* L.) to oak girdling at the Black Rock Forest in southeastern New York, USA. Data were collected from experimental plots composed of three treatments: 100% oaks girdled, 50% oaks girdled, and control. The second study compares the response of serviceberry (*Amelanchier canadensis* (L.) Medik.), blackgum (*Nyssa sylvatica* Marsh.), black cherry (*Prunus serotina* Ehrh.), and red oak (*Quercus rubra* L.) to urbanization. In this study, data were collected at Black Rock Forest and in several urban New York City parks. Both studies found an increase in foliar N content and ^{15}N enrichment in the modified systems compared to the control. This result indicates that the disturbed forests have more soil nitrogen available and that it is cycling at a faster rate. It was more difficult to detect a trend in foliar nitrate reductase activity, which actually appeared to decrease in urban sites compared to rural sites, possibly due to drought stress. Changes in N availability and consumption can influence tree growth rates, which was observed following oak loss at the Black Rock Forest. An increase in black birch growth rates in oak-girdled plots suggests that this species is able to respond to additional N availability and/or increased light availability. Different species were also found to respond differently to urbanization in terms of their nitrogen use patterns. Together, these findings suggest that physiological differences between tree species could lead to changes in forest canopy composition in ecosystems with altered N cycles.

Reconstructing historical climate variations in Black Rock Forest.

Allan Frei, Department of Geography, Hunter College, City University of New York and Adam Kalkstein, Department of Geography and Environmental Engineering, United States Military Academy, West Point, NY

Black Rock Forest (BRF) is located in the Moodna Creek watershed, in the Hudson Highlands region of southeastern New York State. Regular meteorological measurements are available at BRF, and in the Moodna Creek watershed, only as far back as the 1990s. Yet, information on historical climate fluctuations can be useful for a variety of studies. For example, in one published study, historical ecological processes in the forest were modeled based on climatic variations as measured at nearby West Point Military Academy. This makes sense because the West Point station is in close proximity, has a long record, and is part of the US Historical Climate Network (and is therefore supposedly quality controlled and representative of regional variations). We perform a statistical analysis of BRF compared to other stations in the region with long records, and find that due to the West Point station site, it may not be the best record to use for some purposes. We show preliminary results of our historical reconstruction of temperature and precipitation variations at BRF, including confidence intervals, and demonstrate how they will be used to drive a water balance model in order to estimate the full hydrological cycle in the Moodna Creek watershed.

Watershed planning in Orange County, NY

Simon Gruber, Fellow, City University of New York Institute for Sustainable Cities Member, Moodna Creek Watershed Intermunicipal Council

Watershed planning for several watersheds has been implemented over time by several agencies, including the Orange County Water Authority, Orange County Soil and Water Conservation District, and Orange County Planning Department, together with other partner organizations. Completed plans cover the Wallkill River and Moodna Creek basins, a planning process for the Quassaick Creek basin began recently, and preliminary work has begun for a Wawayanda Creek watershed plan. These plans include a focus on water quality, including data from a county-wide stream biomonitoring study; impervious surface mapping based on remote sensing data; discussion of the impacts of land use changes on stream hydrology, groundwater recharge, baseflow to streams, flooding, and stream channel erosion; and information about biodiversity, recreation and other related issues. Green infrastructure is one approach to mitigating these impacts, and the rain garden demonstration project at Black Rock Forest is one example of this.

Water data and research on Orange County and the Highlands in the new OCWA website

Ed Helbig, Conservation Education Coordinator, Orange County Water Authority (OCWA)

In March of this year, a new OCWA website went live. It offers significant new features of special interest to researchers. The most important change has been in the search structure of the site. The outmoded architecture has been replaced with a fully searchable file structure, including a Google custom search functionality. This means that researchers looking for data on water resources in Orange County now have access to all of the data created by the Authority as well as other water data now housed at the Authority's website.

Forest change observed on the West Point Military Reservation, 1990-2011

Robert Kakerbeck, Forestry Technician, USMA, West Point

A regime of frequent wildfire, long term logging, intrusive alien plants and other factors has created dynamic change within the 11,000 acres of oak dominated forest. After decades of negligible regeneration, thickets of various seedlings and saplings have recently developed as the canopy opens and deer browsing declines. Having survived drought and gypsy moth defoliation of decades past, our Red Oak has visibly aged and is losing ground to Maple, Beech and Birch. The proliferation of invasive shrubs and vines on disturbed ground and edges and into the interior continues to alter the character of the forest. The list of new species has grown. The spring season cannott come too early for some, and the phenology of forest tree bud break and leaf-out seems to be moving ahead in recent years.

Impact of a simulated pathogen attack on soil carbon at Black Rock Forest

Jen Levy, Columbia University

The goal of this study was to identify the short-term impact of a mimicked pathogen attack (Sudden Oak Death) on soil carbon stocks in a northeastern forest. Tree girdling was used to simulate the attack and trees were girdled according to five treatments: control (C), girdling all non-oaks on a plot (NO), girdling half of the oak trees on a plot (O50), girdling all the oaks on the plot (OG), and girdling all trees on a plot (ALL). Forest floor litter and soil organic carbon (SOC) at depth intervals of 0-3, 3-6, 6-9, 9-15 and 15-30cm were measured three years after girdling. We found no changes across treatments in the forest floor litter carbon, total soil organic carbon, or carbon concentration through the profile. Contrary to a

recently proposed hypothesis, our study does not support a short- term decline in the belowground carbon storage following a pest or pathogen attack. We propose that shifts in the source components of carbon within the belowground carbon pool could offset carbon losses resulting from altered decomposition rates.

Getting to the root of the problem: Effects of forest degradation on soil microbial communities

J.D. Lewis. Department of Biological Sciences, Fordham University

Widespread declines of dominant tree species, due to invasive species, forest fragmentation, and climate change, may lead to cascading effects on soil microbial species. In turn, changes in the soil microbial community may affect forest responses to these declines, through effects on nutrient cycling and uptake. Over the last 12 years, we have studied forest responses at Black Rock Forest to eastern hemlock (*Tsuga canadensis* (L.) Carr) decline, associated with infestation by the hemlock woolly adelgid (HWA; *Adelges tsugae* Annand). Northern red oak (*Quercus rubra* L.) is a common replacement species as hemlock stands decline, but reduced mycorrhizal inoculum potential in infested hemlock stands may cause oak to grow more slowly compared to oak in oak stands. We compared red oak seedling growth in declining hemlock-dominated stands infested with the HWA and in adjacent oak-dominated stands. Ectomycorrhizal root tip density and morphotype richness in soil cores were 63 and 27% less, respectively, in declining hemlock stands than in oak stands. Oak seedlings in hemlock stands had 29% less dry mass than oak seedlings in oak stands, and oak seedling dry mass in declining hemlock stands significantly decreased with decreasing ectomycorrhizal percent colonization and morphotype richness. These results suggest that oak seedling growth in declining hemlock stands may be affected by reduced ectomycorrhizal inoculum potential. Using forest fragments in the NYC metropolitan area, we are currently testing a model developed from this research to determine if forest degradation due to fragmentation has similar effects on nutrient cycling and uptake, and tree growth, through effects on the diversity of the soil microbial community.

A web-based Paleoecology Module provides a virtual palynological experience for undergraduates: Virtual Forest Initiative at Black Rock Forest

Terryanne Maenza-Gmelch, Barnard College, Columbia University and Ryan Kelsey and Alice Cox, Columbia Center for New Media Teaching and Learning Columbia University

A web-based Paleoecology Module was created to provide a virtual palynological experience for an undergraduate course in the Environmental Science Department at Barnard College that has a three-week component on land-use history. This module uses pollen photomicrographs and pollen percentage data from Sutherland Pond in Black Rock Forest, NY in two separate activities:

A Pollen Identification Tool was designed to introduce students to pollen morphology and the use of a diagnostic key. The 15 most common pollen types from the real core are used. Plant macrofossil images and data are also included.
The Sediment Sampling Tool allows students to visualize the core and select sampling levels. Once selected, a pie chart of the most abundant pollen types and their percentages at a given core level is shown. Multiple samplings and review of the corresponding pie charts facilitate the visualization of changes in the abundance of various taxa. Students can then choose to download the entire Excel spreadsheet of Sutherland Pond pollen percentage data and select various taxa from this top 15 to graph

against the AMS radiocarbon data that are also provided.

The Paleoecology Module provides to the student a means for learning the discovery process inherent in reconstructing a forest's ecosystem using paleoecological techniques without the time and resource constraints that make actual sediment coring and pollen processing impossible in a classroom setting. Activities incorporating this module may be designed to enable student mastery of sediment core sampling strategies, pollen and plant macrofossil identification, the application of radiocarbon dating methods to core samples, and the use of modern range maps as a means of interpreting paleoecological data. As a teaching and learning strategy, this module provides key interactive and inquiry-based learning opportunities for students, facilitating synthesis of key palynological concepts and skills within the time frame of a traditional lecture based undergraduate course.

The Paleoecology Module is one of many ecological and environmental science learning modules currently being developed by the Columbia Center for New Media Teaching and Learning (CCNMTL) in collaboration with Barnard College and Columbia University faculty. These modules are part of CCNMTL's Virtual Forest Initiative at Black Rock Forest (http://blackrock.ccnmtl.columbia.edu/paleoecology).

Swallow-wort biological control update

Lindsey R. Milbrath, USDA-Agricultural Research Service Biological Integrated Pest Management Research Unit, Ithaca, New York

Swallow-worts (*Vincetoxicum rossicum*, pale swallow-wort, and *V. nigrum*, black swallow-wort) are European viny milkweeds (Apocynaceae) that have become increasingly invasive in eastern North America. A classical biological control program, which involves the importation and release of host-specific insects and/or pathogens that attack the invasive plant in its native range, is being developed. Nine insect species and one pathogen have been collected from *Vincetoxicum* spp. in Europe, Siberia and the Russian Far East to date. Preliminary host-range testing has been conducted overseas on the insect species *Abrostola asclepiadis, A. clarissa* (defoliating noctuid moths), *Chrysochus asclepiadeus, C. chinensis* and *C. goniostoma* (beetles with root-feeding larvae). *Chrysochus* spp. appear to present a risk to some native milkweeds; *Abrostola* spp. appear to be more specific in their host range. Foreign surveys and screening are continuing, and plant population studies are being conducted to identify points in the swallow-wort life cycle to target for disruption as a potential way to enhance biological control success.

Nesting movements, juvenile recruitment and management of three turtle species of greatest conservation need within Southern New York State Park Lands

Marnie Miller-Keas, Trailside Museums and Zoo, Bear Mountain, NY

In response to local and, ultimately, worldwide turtle population declines, Trailside Museums and Zoo and the Highlands Environmental Research Institute partnered to undertake a three year State Wildlife Grant funded project to evaluate and manage Species or Greatest Conservation Need (SGCN) turtle populations in Harriman and Bear Mountain State Parks. While other species of SGCN turtles are extant within the study area (*Sternotherus odoratus*, *Chelydra serptina*), we chose to work with the Wood Turtle (*Glyptemys insculpta*), Spotted Turtle (*Clemmys guttata*), and Eastern Box Turtle (*Terrapene carolina*) owing to noted declines in their populations as well as plentiful data on past locations from historical records.

Our efforts focused on mature females to identify nesting habitat, monitor nesting behavior, and determine hatchling success. Extensive field surveys were conducted throughout each of the three years of the project period (2008-2010), with particular emphasis placed on nesting season (May – July). Field surveys conducted in three targeted watersheds within the project area revealed multiple sub-populations of each species, providing some insight into population demographics, individual habitat usage and home range, and juvenile recruitment. Radio-telemetry of 52 adult female SGCN turtles amounted to 1,069 total telemetry locations and led to the identification of critical habitats, including nesting sites. During the three-year study, 7 turtle nests were protected with handmade wire-mesh cages and an experimental turtle nesting predator exclosure was constructed and deployed in a heavily used Box Turtle nesting site. Additionally, 500 feet of silt fencing was used to capture wild-hatched turtles. Wood and Box Turtle hatchlings collected from the nest protectors, exclosure, and silt fence were headstarted at Trailside Zoo, the first cohort being released in the summer/fall of 2010. Post-release monitoring of the headstarted Wood Turtle hatchlings will continue in 2011 with the support of the Norcross Wildlife Foundation while others continue to serve as an important educational tool for relaying turtle conservation issues until their release. In our poster presentation we will discuss in detail the results of the three year study, including the status and sustainability of turtle metapopulations in Harriman and Bear Mountain State Parks, and mitigation such as nesting habitat management, headstarting, and population augmentation.

Biodiversity, seasonal dynamics and biomass of spiders and other soil invertebrates in Oak Forests of BRF

Vladimir Ovtcharenko, American Museum of Natural History, ovtshare@amnh.org and Boris Zakharov, Natural Sciences Department, LaGuardia Community College, bzakharov@lagcc.cuny.edu

Our study is part of a large, multistage BRF project: "Ecosystem Consequences of Dominant Taxon Loss: the Future of Oak Forests." The study focuses on biodiversity, seasonal dynamics and the biomass of spiders, harvestmen, ticks, and soil invertebrates in oak forests of BRF. Spiders and other soil invertebrates were studied on two designated sets of plots: a pilot project area and a main project area. The pilot project includes two areas: fenced and unfenced. The fenced area protects vegetation against different wild animals, mostly deer. Invertebrates were collected by pitfall traps: 3 pitfall traps in the line, total 20 lines with 60 pitfall traps. Materials were collected once a week from May until October in 2008, 2009, and 2010. We collected in the oak forest 210 species of spiders and also representatives of different orders of invertebrates such as: insects, diplopods, chilopods, myriapods, crustaceans, mollusks, mites, ticks, nematodes, earth worms, etc. Preliminary data show that spider biomass outside of the fenced area in June is reaching its maximum and is slightly higher than spider biomass inside of the fenced area. This data suggests that ground inhabiting spider's community is not significantly affected by herbivorous mammals, such as deer. Spider biomass outside of the fenced area reached its maximum only once in a season, for a short period of time in the middle of the June. Also in June, spider biomass outside of the fenced area showed a very strong correlation with the type of experimental plots. For example, the lowest spider biomass was on the plot with all oak trees

girdled, next on the plot with 50% oak trees girdled, next all non-oaks trees girdled, and the maximum spider biomass was recorded on the control plot. This data definitely shows that the state of dominant tree's health plays an important role in species diversity and total spider biomass. This data strongly indicates that spider biomass could be an important indicator of the state of the oak forest's overall health.

The effects of canopy structure, slope position, and herbivore exclusion on understory vegetation at Black Rock Forest

Matthew Palmer, Columbia University Dept. of Ecology, Evolution and Environmental Biology (E3B)

As part of the Future of Oak Forests experiment, we have been monitoring the response of understory vegetation to canopy alterations and herbivore exclosure along the north slope of Black Rock Mountain. Ten replicate 1-m^2 plots have been sampled in each of the twelve central subplots periodically since 2006, with sampling expanded in 2009 to include an additional ten plots in each deer exclosure. The understory vegetation on north slope is generally quite sparse, with native shrubs (*Vaccinium* and *Gaylussacia*) and tree seedlings (*Acer*, *Betula*, *Hamamelis*, *Liriodendron*, *Fraxinus*, and *Nyssa*) being the most abundant. Non-native invasive species are generally infrequent, although *Microstegium vimineum* can be locally abundant. Total cover increases in most, but not all, of the exclosures relative to the unfenced center portions of each plot. In addition to describing the changes in understory vegetation through time, these data will be used in research on plant functional traits and on the relationship between plant functional diversity and soil microbial structure.

Environmental change with oak forest disturbance.

Kate Pavlis and William Schuster, Black Rock Forest Consortium

In ecology it is important to understand not only how the biotic environment responds to change, but how the abiotic environment changes as well. On the Future of Oak Forests project we have been measuring a variety of these abiotic factors to understand how the loss of oaks will effect these factors. The factors being measured are light, snow pack, air temperature, soil temperature and soil moisture. Light has been measured twice each year since 2008 using canopy photos, snowpack was monitored during the winters 2009-2010 and 2010-2011. The remaining factors are part of the environmental monitoring arrays set up on 10 of the 13 experimental plots including all control plots and two plots of every other treatment. We have seen an increase in light and snow pack on oak girdled plots as well as a decrease in soil temperature. Soil moisture has been less consistent with treatment, and more extensive statistical tests will need to be performed in order to ascertain any differences. All this data is available either on our website or via request from either Katie Pavlis or Matthew Munson.

A paleoenvironmental record of the last millennium from Constitution Marsh, Hudson River, adjacent to Black Rock Forest and West Point, NY

Dorothy Peteet, NASA/GISS, Columbia University and Sriya Sundaresan, Columbia University

This research constructs a detailed paleoecological record over the last millennium for Constitution Marsh, an Audubon sanctuary on the east shore of the Hudson River. Twenty samples of macrofossils, loss-on-ignition, and XRF were obtained from a 1-meter core in order

to construct this high-resolution record for Constitution Marsh. Two distinctive paleoecological zones are defined and a date of 1029 A.D. marks the base of the first meter, prior to European impact. The upper zone began in 1537 A.D. and contained invasive plant species, accompanied by an increase in inorganic sedimentation rate, as well as increases in elemental concentrations, all linked to human influence. The environmental history of Constitution Marsh provides a new understanding of the local paleoecology in the framework of nearby Hudson River marsh records, and documents the various influences that humans have had on the larger region including uplands. This information can help facilitate wetland and marsh restoration and conservation in the Hudson River Valley.

Strengths and weaknesses of Sutherland Pond vs. Fen archive, Black Rock Forest, New York

Peteet, D., NASA/GISS, NY, NY and LDEO, Palisades, NY and Terryanne Maenza-Gmelch, Barnard College, NY

Sutherland Fen, approximately the same area (4ha) as adjacent Sutherland Pond, NY, is located in Black Rock Forest, southeastern NY. A previous study (Maenza-Gmelch, 1997) documented the pond paleovegetational history. We utilize a new pollen stratigraphy coupled with a high-resolution (2 cm) macrofossil record from the fen to improve our understanding of the local and regional signature of vegetation in both depositional environments. Both records indicate initial sedimentation about 15,000 years ago, and while the pond clays indicate a sparse pine-tundra pollen assemblage lacking macrofossils, tundra/spruce forest is represented in the fen clays (willow, spruce). The A-123 pollen zone features similar percentages of pine (up to 50%) and oak (up to 20%) in both environments, and a *Pinus banksiana* needle is present in the fen. However, spruce pollen % is higher in the fen where needles are abundant locally while fir percentages are higher in the pond, reflecting the upland preference for the latter. The overlying colder Younger Dryas (A-4) zone contains both spruce and fir macrofossils in the fen. But as pine pollen percents decline in the pond, birch and alder pollen increases are pronounced there, reflecting regional disturbance. Lack of fen shallow aquatics suggests deeper water. The warming Holocene (B zone) is marked by significant increases in pine (up to 60% in pond, 40% in fen) and oak (up to 30%) concurrent with the demise of spruce and fir, and abundant white pine macrofossils in the fen. Herbs and sedge percentages are extremely low, implying a drier climate. While the overlying oak-hemlock zone (C-1) records fen increases in oak pollen to 35%, in the pond oak achieves 70%, showing regional significance. Pitch pine needles in the fen are characteristic of this zone, signifying a drier climate, while alder macrofossils also become abundant. The oak-hickory (C-2) zone records peak drought with similar pollen percentages to the previous zone, but the aquatics give way to emergent fen taxa such as *Chamaedaphne* and *Cephalanthus*. The uppermost oak-chestnut zone (C-1) records declines in pine percentages in the fen only, and pond increases in human-induced disturbance species (ie. ragweed).

The Future of Oak Forests experiment - goals, design and early results

William Schuster, Black Rock Forest Consortium

Forests of the region around Black Rock Forest have been undergoing many changes that include recent canopy tree mortality and widespread regeneration failure. Oak trees have dominated the forest canopy of Black Rock and much of the surrounding 4-million acre Highlands region for the past 10,000 years and are considered Foundation taxa- species that

exert control over key ecosystem processes- but their future status is in doubt. The *Future of Oak Forests* experiment was designed to better understand the role that oaks, as compared to other taxa, play in these ecosystems and to determine how their loss would impact ecosystem components and processes. In 2008 oak trees were girdled with a chainsaw to mimic death by a pathogen on a series of plots each 0.56 hectares in size in a randomized block design. Other treatments girdled only half of the oak trees on each plot or girdled all of the non-oak trees. More than a dozen investigators from eight different institutions have been involved in studies on the plots ranging from biogeochemistry to microbial ecology, insect and small mammal studies, and modeling efforts. Deer exclosures were installed in each plot to further investigate response in the presence or absence of high levels of deer herbivory. Early results documented how the loss of oak trees produced changes in key environmental factors like soil temperature, water and light. Several animal taxa (ants, spiders, millipedes, mice chipmunks) have shown significant abundance changes in response to the treatments, but often in different directions or at different times. Chemical changes have been noted in the forest litter and soil layers and have begun to impact soil water chemistry and process rates including nitrification and nitrogen mineralization. The experiment will continue for at least five years and forest models will explore what the implications may be up to a century in the future.

Oak forests and changes in tree biomass and growth

William Schuster, Black Rock Forest Consortium

The Future of Oak Forests experimental area is situated at the base of the north slope of Black Rock Mountain. Forest composition there is dominated by red maple (24% of all stems), black gum (18%), black birch (16%), and sugar maple (14%). However most of these are small trees and collectively they represent only 16% of the total live aboveground biomass. The canopy is dominated by oak trees- red and black oaks (57% of live aboveground biomass), chestnut oak (18%), and white oak (6%). Red oak, and to a lesser extent chestnut oak, are important species because they have accumulated biomass faster, and thus have stored substantially more carbon, than any other species over the past 80 years. Total aboveground biomass averaged about 250 metric tons per hectare before trees on the experimental plots were girdled by chain saw in June/July 2008 to mimic the effects of pathogen attack. Unmanipulated control plots have continued to increase in biomass at a slow, steady rate, but on plots where all of the oak trees were girdled the aboveground portions of most trees died within a single year and live biomass dropped to about 65 metric tons per hectare. Where only half of the oak trees on plots were girdled, a higher proportion of trees were able to keep their aboveground parts alive, either temporarily through using internal stored energy and nutrient reserves or by growing new conducting tissues across the cut area. Remaining live aboveground biomass on these plots is about 190 metric tons per hectare. On the plots where non-oak trees were girdled, the girdling took longer to take effect and proportion of trees that survived was even higher so that live aboveground biomass on these plots only dropped to about 230 metric tons per hectare two years after the treatment. On these plots there was no indication that the remaining oak trees exhibited any increased growth after the girdling of non-oaks. In contrast, on oak-girdled plots the non-oak trees, especially sugar maple, black birch, and black gum trees, showed a significant increase in growth rate. The impacts of treatments on tree species are important to understand to properly

interpret responses of other ecosystem components and processes.

Iona Restoration Project: 2008-2010

Matthew Shook, Assistant Director, Highlands Environmental Research Institute (HEnRI)

In 2007, the PIPC and its partners the Hudson River National Estuarine Research Reserve (HRNERR) and the Highlands Environmental Research Institute (HEnRI) received funding through the NY Department of Environmental Conservation's (DEC) Aquatic Invasive Species Eradication Program to conduct a pilot restoration project within a 10-acre area of Iona Island Marsh, NY. The results of bird and plant surveys within the restoration area will be discussed along with implications for future work at Iona Marsh. Overall, after three years of surveying, both native plant and marsh bird species seem to be rebounding well with increases in percent cover of *Typha angustifolia* and presence of marsh resident species such as Marsh Wren, Swamp Sparrow, and Virginia Rail. Additionally, State rare plant species have begun to reemerge. Survey work will continue through 2012 when the overall results of the project will be published.

Ramapo River Intermunicipal Council Internet Map Server

Don Steinmetz, HEnRI

HEnRI, in conjunction with the Town of Ramapo, is developing an internet map service that will allow any concerned parties to access, view, and query interactive maps depicting a variety of hydrologic, geologic, and political data representing conditions within the Ramapo watershed. The Ramapo is a designated sole source aquifer serving approximately two million people in the highlands of New York and New Jersey. The Intermunicipal Council is comprised of the 26 municipalities and four counties that contain the watershed, all have agreed to cooperate in the protection and management of this irreplaceable resource. We expect this map server to be an essential tool in disseminating scientific data, riparian zoning, and land use information to all concerned parties; providing transparency and a solid foundation for dialogue.

Native and non-native reptile observations in the New York region

Peter Warny, Peter Warny Consulting LLC

Random introductions of exotic turtles from the pet and food trade are resulting in the non-native Red-eared Slider being an abundant turtle species in urban ponds, Reproduction is low in "pseudopopulations" of long lived turtles. Such urban eco-phenomona will be discussed as documented in N.Y.C, Long Island, Westchester and the Hudson Highlands. Comparisons with native southern populations will be depicted and contrasted with observations in New York.

Biogeochemical changes in soil water accompanying oak loss

Kathleen C. Weathers and Amanda M. Lindsey, Cary Institute of Ecosystem Studies, Millbrook, NY

Soil water samples collected (zero tension lysimeters) at Black Rock Forest from 2008 through 2010 for the Future of Oak Forests project showed no significant effect of girdling treatment on the amount of water collected, although the variability was large both over time and among plots. However, post complete girdling of all trees, nitrate concentrations were elevated in soil water. Among the 12 main plots, excluding the all trees girdled plot, a 3-way ANOVA with treatment, slope position, and fencing (with or without) revealed treatment differences for nitrate and total dissolved nitrogen. Past work in the Catskill Mountains

of New York has found species effects on nitrogen cycling, with oak forests having lower nitrification rates than other species. It appears that at Black Rock Forest, this "oak legacy" on the soils may persisit-- even after up to 50% of oaks have been girdled; how long this legacy may last is unknown.

Dragonflies and damselfies of Lily Pond, Harriman State Park, NY.

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

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). The pond was the site of an old mill until at least 1934, but has been relatively undisturbed since that time. The pond is aptly named as water lilies (*Nuphar and Nymphaea*) occur over most of the surface during the warmer months of the year. The waters are richly organic and highly stained. As part of the New York Dragonfly and Damselfly Survey of 2005-2009, we surveyed this site periodically. Following the statewide survey, we began a more systematic examination with visits occurring approximately weekly during May through October, 2010. Initially, only species presence or absence was recorded; beginning in late July, counts were made of all individuals encountered. Over the period 2005 through 2010 approximately 50 species of Odonata have been observed from the pond and surrounding fields. Sightings include several species of conservation interest, including previously unknown populations of *Enallagma laterale* and *Aeshna clepsydra*. Observations at Lily Pond yielded four species of damselfly and four species of dragonfly that were new to Rockland County. The relative abundance and seasonal occurrence patterns will be discussed.

Clam Shrimp (*C. gynecia)* observations in Orange County, NY

Jay Westerveld, New York Natural History Council

A crustacean previously unknown in Orange County, NY, and confirmed in only 13 sites worldwide, the "Feminine Clam shrimp", *C/C gynecia*, (placed in *caenestheriella* by Mattox, 1950; *Cyzicus* by McLaughlin et al. in 2005), was confirmed in 2009 at the Glenmere reservoir lands in Chester and Warwick, NY, by Jay Westerveld, Peter Warny and Jonelle Orridge. Westerveld first noted the cryptic, parthenogenetic crustaceans in a series of puddles along a relic dirt road adjacent to the Glenmere reservoir, and then identified individual Clam Shrimp in the reservoir, itself, where specimens evidence longer lifespan and larger size than previously recorded at their type habitat and similar puddle locales. In 2011, Westerveld identified the species at habitat near Cascade Lake in Warwick, NY. Westerveld notes that occurrence in puddles on dirt roads frequented by ATV traffic indicate possible ovidispersal via residual mud in ATV wheel wells.

Westerveld's 2009-2011 egg overwintering study, ecological significance of adult Clam shrimp, and movement/locomotion from puddle to permanent water habitat are discussed.

Northern Cricket Frog and *Megamelus davisi*

Jay Westerveld, New York Natural History Council

The role of the Water-lily Planthopper (*Megamelus davisi*) and the Aquatic springtail (*Podura aquatica*) in Northern Cricket frog (*Acris crepitans*) migration and population sustenance; How collateral *M. davisi* eradication may have secondarily-effected *A. crepitans* decline in NY. In New York State, the Northern

Cricket frog has evidenced acute decline since the 1970s.

At *Acris'* largest remaining NY metapopulation node, the delphacid *Megamelus davisi* occurs en masse over hundreds of acres of wetland habitat. Acris are observed to predate *M. davisi* with near-exclusivity throughout the warmer months. Comprehensive surveying of other NY historic/extirpated *Acris* in Harriman State Park, etc., habitat reveals absence of *M. davisi*. Much of this historic-extirpated habitat was (aerially) treated with pesticides in the 1970s to control the gypsy moth (*Lymantria dispar)*; The Glenmere metapopulation site, centered around a public water supply, was spared *L. dispar* control. Unlike *L. dispar*, *M. davisi* is both a habitat specialist and, in most cases, flightless, and would be unlikely to repopulate treated habitat quickly. The eradication of *M. davisi* at many historic *Acris* habitats may help to explain the present site vicariance.

The possible role of collateral *M. davisi* eradication in *A. crepitans* decline and the proactive reestablishment of *M. davisi* populations at planned *A. crepitans* repopulation sites is discussed, as is the role of *P. aquatica* dispersal in *A. crepitans* vernal migration.

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