Charlotte Acharya and Bernd Blossey  
**Invasive species: Can they be controlled?**  
Non-native invasive species are considered a serious ecological and economic threat. Because of this, an increasing amount of resources are being devoted to invasive plant removal. Additionally, within the last ten years the number of organizations in the Northeast combating invasive plants has risen dramatically. However, little is known about the impact these organizations have on invasive plant populations. Are these organizations able to slow or halt the spread of invasive plants on the properties they manage? Also, in the areas where control has been performed, can organizations reduce the abundance of invasive plants for an extended period of time? Additionally, if an organization is successful at these things, what makes it so? I have attempted to answer these questions through surveying organizations in the Northeast which control invasive plants as a way to protect native plant communities. Last year I conducted an open-ended telephone survey and used this information to create a close-ended mail survey which asked the leader of each organization to self-assess their ability control invasive species. In addition, the leaders provided information about the priorities of the organization, the management strategies, and the resources they use for invasive plant management. The mail survey was completed in September and preliminary data show us that organizations are optimistic about their ability to control invasive species.

Mark Bain  
**The nature of environmental restoration in New York City**  
Environmental restoration is an active and important new pursuit in the City of New York. The common approach to restoration is bringing back a past state when the environment was more natural. New York became a world class city and center for culture under a forward looking perspective of building toward a better future. Several key agencies are promoting a vision for a "world class harbor estuary". As environmental restorationists, can we look forward rather than backward for guidance on what to do?

Daniel Bogan, Paul Curtis, Dan Decker, and Evan Cooch  
**New York suburban coyote study: Investigating the spatial and behavioral ecology of suburban coyotes**  
Human-coyote interactions in suburban areas are a new concern for wildlife managers, residential homeowners, and local municipalities across much of North America. While few studies have examined coyote ecology in suburban landscapes, far less have examined ways to mitigate negative interactions between people and coyotes. One study from California suggests a
stepwise progression in negative behaviors that indicate the level of coyote habituation to
developed landscapes which ultimately leads to coyote attacks on people. However, this
progression of negative behaviors is likely not simple, nor predictable. The current management
strategy in New York is to remove the offending coyote using lethal control. Non-lethal methods
to prevent the escalation of negative coyote behaviors in suburban areas are desired. The
NYSDEC implemented a standardized monitoring system in 2005 to record complaints of
coyotes encroaching on residential areas where coyotes previously were seldom observed.
Additionally, DEC and Cornell University are studying coyote behavioral ecology in the densely
human-populated northern suburbs of New York City, where many coyote complaints originate.
We are documenting individual coyote (n = 21) home ranges, movements, and habitat selection
using VHF and GPS tracking collars. Scats are collected to reveal the prevalence of
anthropogenic food items in coyote diets. This information will serve as a base-line to assess the
prevalence and nature of negative human-coyote interactions. Preliminary analysis indicates
coyotes primarily use undeveloped lands and occasionally commute through residential areas.
Negative coyote interactions result from opportunistic encounters with people and pets, thus
impeding the experimental development of behavioral modification techniques.

Eduardo Carrillo-Rubio
Ecological condition and governance of community forests: the social and ecological
implications of participatory management in the Sierra Madre of Chihuahua, Mexico
Research in Mexico over the past two decades has documented numerous successful and
unsuccessful experiences of community-based forestry and protected areas management.
However, the social conditions under which success or failure happens still elude researchers and
policy makers, and empirical analyses of the ecological implications of participatory
management are lacking. These problems will be addressed using quantitative techniques and
novel ecosystem-based methods to assess the social and ecological implications of active
democratic participation or lack thereof in community-based conservation-development
programs in the Sierra Madre of Chihuahua. The results of this research will be used to make
recommendations to national park managers, conservationists, and non-governmental
organizations currently involved with rural communities to improve biodiversity conservation
and rural development.

Jillian Cohen
The benefit of contemporary evolution: Combating the effects of invasive species with a
new approach to conservation
Our society spends billions of dollars each year to eradicate or control invasive species in order
to 'rescue' valuable native species from threats posed by the invaders. Such measures are
predicated on the view that native species are relatively fixed over modern time scales. However,
a growing body of evidence supports the claim that species can display significant adaptive
change over contemporary time scales, including cases where native species have displayed
adaptive responses to introduced species in less than 100 years. Evolutionarily enlightened
management would find ways to encourage native species to adapt to the presence of introduced
species and therefore persist indefinitely on their own. This would save valuable species without
the expense of eradication and control. I propose to study the interaction between the native
anurans Bufo americanus and Rana pipiens, and Lythrum salicaria, an introduced plant, to gain
further insight into how species adapt to selective pressures on contemporary time scales. Factors
such as population size, length of exposure to the introduced plant, history with similar plants, and species-level traits will be examined. Eggs and tadpoles will be exposed to plant extracts for several weeks, and tadpole development and survivorship will be monitored. A better understanding of the mechanisms affecting the rate of evolution is necessary so that key factors can be isolated and manipulated for conservation purposes.

**Jessie Comba and Jim Lassoie**

**Monitoring long-term ecological change in the landscapes of Susquehanna Country, PA**

Photomonitoring is the process of monitoring landscape change through the use of photographs. This qualitative research tool has proven very effective in gaining public support for conservation goals and documenting changes in the land. Another term used to describe this technique is repeat historical photography, which simply compares pictures from many years ago to recently re-photographed pictures from the same photo point as the original. These pictures are then compared to one another to see how the landscape has changed over time. Hypotheses can be determined for possible reasons of change and methods of conservation can be enacted. This documented proof of landscape change makes it easier for people to understand conservation and the effect that it will have on their community; therefore, they are more likely to support its implementation. The Department of Natural Resources has had ongoing conservation planning with the E.L. Rose Conservancy of Susquehanna County, Pennsylvania, since 1999. The methodology on this project was based on Dr. Lassoie's China project and then adapted to conservation planning on a smaller scale. Two high quality cameras were used throughout the summer of 2006 to obtain the landscape images. Over six-hundred geo-referenced pictures along eight transects have been photographed. A database of historical and current photographs is being established and will be archived with the conservancy and the historical society. As the landscape changes, the database will enable future photographs to be cataloged and improve strategies of ecological interpretation. Some of the indicators noted in a landscape are hilltop clearing, shoreline development, and unsustainable agriculture. In addition to the ecological changes, the community has expressed an interest in preserving the historical cultural attributes of the land such as old barns and stone walls. The photographs allow members of the community to take a personal interest in the land and to clearly see the changes that are taking place. These photographs and interpretations of the factors affecting landscape change will facilitate the implementation of conservation goals for the E.L. Rose Conservancy.

**Jason Corwin**

**Community management of energy resources in the Seneca Nation of Indians**

Renewable energy development is growing at a fast pace worldwide as people seek solutions to climate change and other hazards that result from non-renewable energy usage. Indigenous communities have often borne the brunt of unsustainable resource extraction and its associated environmental problems. Within the claimed boundaries of the United States several Native nations have implemented or are in the process of implementing, both small-scale residential and large-scale commercial renewable energy projects. A case study of one such nation in the mid-stages of a renewable energy development plan, the Seneca Nation of Indians would be useful for understanding the mechanisms by which Native communities take control of their energy use and production, combining traditional values of environmental caretaking with modern technologies, in order to foster sustainability, self-determination and empowerment. Coupled with a literature review of community-based management of natural resources, sustainable
development and energy policy, focusing particularly on renewable energy projects in the developing world, I will conduct research on the mechanisms by which the Seneca Nation's energy plans are or are not successful in fostering community participation in the management of their natural energy resources.

Kathy Crowley and Barbara L. Bedford

Moss effects on vascular plant growth in rich fen wetlands

Mineral-rich fens support high plant species richness and many rare species, making them critical conservation targets, but the ecological mechanisms supporting their diverse flora are poorly understood. Within fens a moss layer can cover the soil surface, intercepting water and nutrients, providing a substrate for plant roots, and thus influencing the physical and chemical environment. We used a field study and a moss removal experiment to investigate the effects of the moss layer on growth of vascular fen plants. In the presence of a moss layer, measures of forb seedling density, plant root biomass, root branching, and the number of root tips were greater, indicating a beneficial effect of mosses on root growth. Increased root branching suggests two primary hypotheses for moss effects on vascular plants: (1) mosses may increase localized nutrient availability, thereby encouraging root branching as a foraging response, or (2) mosses may aerate surface soils and thereby improve physical conditions for root growth. Preliminary data suggest that both mechanisms may operate. By facilitating seedling establishment and growth of shallowly rooted forbs, the moss layer may affect plant species composition and diversity in mineral-rich fens. Understanding such biotic interactions will be essential for conservation and effective restoration of these unique wetlands.

Amielle DeWan and Mike Richmond

Are two heads better than one? The costs and benefits of multiple-observer bird surveys

Monitoring programs that track the status of natural resources have become increasingly popular in state and federal agencies, as well as conservation and non-governmental organizations. In New York State, monitoring trends in wildlife diversity and abundance has become a priority for the Department of Environmental Conservation. Although monitoring can be an important tool for conservation and resource management, many existing programs fail to adequately account for sources of error in population estimation. Specifically, differences in detection between observers, among species, or in varying habitats may significantly influence the overall estimate of abundance. I used a two-observer approach to estimate abundance of forest breeding birds for the Hudson River Valley's wildlife monitoring program. Breeding bird point counts were conducted at random sampling locations throughout the Hudson Valley ecoregion between May 12-June 30, 2006. Each site was visited a total of 3 separate times, with two-observers recording all birds seen and heard in a 10 minute period. Models that accounted for differences in detection among species and observers were tested using the program DOBS. Preliminary results suggest that adding an additional observer increases overall detection across species. Differences between observers accounts for the most variation in detection. Overall detection was estimated at p=.987. Although there are some costs in adding additional field personnel and applying statistical models, this study suggests that the double-observer approach may provide more precise estimates of abundance.

Rebecca Dore and Andrew Pershing

Investigating the impact of increased herring presence on right whale reproduction in the
**Gulf of Maine**

In the period between 1992 and 2002 the Northwest Atlantic Shelf saw a dramatic increase in freshwater input, presumably from a shift in the Labrador Current. Labrador Sub-arctic Slope Water (LSSW) displaces warmer, more saline Atlantic Temperate Slope Water with fresher water, consequently increasing water stratification. This stratification in turn leads to an increase in phytoplankton abundance and a corresponding increase in zooplankton abundance (including Calanus finmarchicus), particularly during autumn and winter. The reason for this is that the stratification allows phytoplankton to remain longer in the euphotic zone. The impact of this salinity shift can be seen further up the food chain as well. During the 90's peaks in Atlantic herring (Clupea harengus) abundance correspond with plankton peaks. However, within the same time period, the North Atlantic right whale (Eubalaena glacialis) experienced a decrease in the total number of calves as well as an increase in the length of time between birthing events. This change in reproduction has been linked to decreased larval recruitment of C. finmarchicus observed during this period which is paradoxical given that overall zooplankton abundance was high. This leads to a series of questions: If the 90's saw an increase in fresh water and thereby an increase in Calanus reproduction rates, why is there a decrease in larval recruitment? Can this decrease be explained by the increased presence of herring? Is the impact large enough to create a competition effect for resources with right whales and is the impact negative for both species or is only the right whale population harmed by the interaction of the two.

William Fetzer, Tom Brooking, Lars Rudstam and J. Randy Jackson

**Is over-winter mortality of gizzard shad (Dorosoma cepedianum) in Oneida Lake, NY decreasing?**

Winter limits resource availability in temperate lakes, exerting a strong influence on the northern distributions of many temperate fish species by altering the recruitment of age-0 fish. Winter mortality of gizzard shad (Dorosoma cepedianum) in central New York lakes is high and appears to be close to 100% in Oneida Lake, NY. However, increases in summer water temperatures and decreases in winter severity and ice duration across the region could affect the winter survival rates of this species. Increased over-winter survival of gizzard shad is likely to affect many aspects of ecosystem function, including nutrient cycling, water quality, and predator-prey interactions. Shad size at the end of fall is dependant on summer temperature, and increased growth may result in higher over-winter survival by reducing the risk of predation and starvation. Over-winter survival of shad is therefore both a function of summer temperature and winter duration. We predict that shad survival will increase with climate warming, and that this will have large effects on the Oneida Lake ecosystem.

Ryan Galt

**Farmer resources and the geography of pesticide use: Vicious and 'virtuous' cycles of society-environment relationships in northern Cartago, Costa Rica**

This paper examines Costa Rican vegetable farmers' pesticide use and spatial production strategies, and their consequences for capital accumulation, socioeconomic differentiation, and environmental degradation. It argues that farmers' access to better quality land is determined largely by investment resources. Using the case of farmers of export mini-squash and potato for the national market, it shows that resources have permitted resource-rich farmers to experiment spatially by testing different areas' environmental suitability for production of their crops. Resource-rich farmers leverage resources and knowledge to move their production to exploit
"environmental advantage"-defined as a production advantage that accrues from the environmental characteristics of a certain locale-outside of the climatically problematic cloud belt in the area. This strategy increases yield and quality and allows for decreased pesticide use. Evidence suggests that this leads to larger profit margins for resource-rich farmers because they obtain higher differential rents from production environments better suited to their crops. While wealthier farmers have been able to reduce their pesticide use, investment-poor farmers are stuck in the humid cloud belt, use higher levels of pesticide, and remain on the pesticide treadmill. The paper conceptualizes the difference between wealthy and investment-poor farmers as virtuous and vicious cycles of society-environment interaction, respectively, adding an important outcome-ecological improvement-to political ecology's conceptualization the environmental change and socioeconomic differentiation.

**Gary Goff**

**4-H Exotic and Invasive Plants Project**

Exotic and invasive plants are an ever growing issue in NY State. Their proliferation threatens the functioning of natural ecosystems and causes management concerns for farmers, forest owners, and landowners across the state. This project was developed for use by Cornell Cooperative Extension Educators with 4-H Youth responsibilities. It consists of a poster, a fact sheet, and display materials for 2 "hands-on" activities. It has been used at county fairs and the NY State Fair.

**Brian Greene**

**A privet-al question: The interface between flooding, invasion and plant biodiversity**

The natural flow regime has been identified as a critical factor in maintaining the ecological functions of riverine systems. Floodplain forests in the southeastern United States depend on the periodic flooding to provide the conditions that native plants and animals need. In many areas human land use has altered the flow regime potentially promoting conditions that favor biological invasions. One invasive plant species that is rapidly expanding in floodplain forests is Chinese Privet, Ligustrum sinense. I am proposing a study to examine how human mediated changes to flood frequency influence plant community changes through biological invasions. To capture the total effects of flooding I will examine flood effects at the organism, community and landscape level. Using experimental flooding and "community gardens" I will examine competition and rates of survival between native tree species and L. sinense under varying hydrologic conditions. Hydroecological mapping will be used to identify watersheds with varying degrees of hydrologic alteration. In the field, vegetation surveys of these areas will investigate if there are differences in plant community composition. All of this will be done with a landscape perspective to explore how land use and development influence hydrologic and plant community change. The results of this study will provide insights for how proper watershed management and smart development can promote conditions that favor native plant communities.

**Jareevichaya Hatachote**

**Supportive factors and obstacles in implementing community-based ecotourism in Thailand**

Community-based Ecotourism (CBET) is considered as a form of community-based natural resource management which attempts to involve communities actively in the process of framing
management and making decision over ecotourism activities within their own areas. To be the effective mean of supporting biodiversity conservation, CBET needs to be implemented wisely. Otherwise, it could degrade the environment and worsen local development, instead of preserving natural resources and strengthening community. This study aims to explore obstacles and challenges, including supportive factors from CBET practices in Thailand by examining three cases on ground. Both qualitative and quantitative research methods will be conducted: observation, focus-group interview and a survey by using the questionnaire. Key stakeholders will be assigned and asked to participate in the interviews. Then, the hypothesis will be drawn and tested by using questionnaire based on the information gathered from focus-group interview with larger samples of the population to find the statistical association. The results of this study would be beneficial for the Royal Thai government or other organizations to develop guidelines to promote and implement CBET. Moreover, it can fulfill the knowledge about CBET practices and encourage others to conduct researches in other CBET destinations.

Bob Howarth

White House briefing on extents, impacts, and causes on nitrogen pollution
On November 3, 2006, I gave a briefing at the White House to senior staff in the Office of Science and Technology Policy and the Office of Management and the Budget at their request. The interest of White House staff was in learning more about how severe of a problem nitrogen pollution is in the coastal marine waters of the United States, and in my providing advice on science priorities regarding this issue. I gave a 45 minute presentation followed by an hour of discussion. In my talk, I briefly presented the nature of the problem and noted that nitrogen is the largest pollution problem in the coastal waters of the United States, with 2/3rds of our coastal rivers and bays moderately to severely degraded. I further discussed what we know about the sources of the problems, and the nature of the science behind this assessment. Much of my briefing focused on the erosion of our information base over the past 15 years as critical national monitoring programs have been severely cut (particularly USGS surface-water quality monitoring and EPA and NOAA atmospheric deposition monitoring programs). I highlighted that the importance of atmospheric deposition as a source of nitrogen to coastal waters has probably been underestimated severely in the past, and that current monitoring efforts do not even begin to address this issue.

Stefanie Hufnagl-Eichiner

Organizational responses to nitrogen pollution in the Gulf of Mexico
Recent studies of human-caused ecological problems focus on the reciprocity of nature and society relations in order to explain and predict change. Within such a reciprocal framework I aim to explore the degree to which nature and society are coupled or could be coupled in a way that serves to maintain both at a healthy state. The nitrogen pollution in the Gulf of Mexico, known as hypoxia or "dead zone", serves as an example for nature-society feedbacks. Hypoxia is mainly caused by agricultural activity within the Mississippi River Drainage Basin. The focus of inquiry hence is the agriculture-pollution-mitigation complex in the Basin. Within this complex I aim to study the social landscape - laws, organizations, activities - that impacts nature. I will use the concept of the organizational field to delineate the network of actors engaged in nitrogen management in the Basin. I will inquire about the resources available to these actors as well as their capabilities to address nitrogen management by conducting interviews and analyzing organizational and secondary data. Analysis will include standard statistical methods as well as
network analytic tools. The ultimate goal of my study is to overlay its results, a picture of the social landscape in the Basin, with the results of other scientists who simultaneously develop a picture of the bio-physical landscape - soils, hydrology, nitrogen pollution. Such an overlay will allow assessing spatial associations between the state of nature and the state of society, in essence, the level of coupling of the two systems.

Clifford Kraft, Dana Warren, and William Keeton

**Spatial patterns of wood distribution in northeastern North American streams**

The spatial distribution of large wood in eight northeastern North American streams was evaluated using two neighbor K statistics: (1) a previously reported one-dimensional version of Ripley's K, and (2) a newly developed modification of the previous statistic that evaluates spatial pattern at specific distance intervals ("bins"). The new "binned" neighbor K statistic more accurately reflects the distance scales at which wood aggregates and more effectively identifies recurring intervals devoid of wood. In our study streams, regularly recurring intervals without wood were less frequent as the number of debris dams increased and trended toward greater frequency with larger dam size, both of which reflect fluvial transport. Limited support was found for expectations that bankfull width would influence large wood spatial distribution patterns.

Marianne Krasny and Keith Tidball

**Civic Ecology**

Civic Ecology is a set of asset-based tools that can be used in international and community development, natural resources management, and education. Urban community greening, community-based biodiversity monitoring, and participatory watershed restoration provide examples of Civic Ecology tools. The Initiative for Civic Ecology encompasses an education program, the goal of which is to build resilient communities, through supporting youth and adults to develop and apply an understanding of science and of diverse cultures, and to be active, contributing, and informed members of their community. Civic Ecology Education attempts to draw on the assets of the community to create constructive positive feedback loops. For example, community gardens, and the adults who initiate and maintain these sites, represent important assets in urban neighborhoods. When young people work in the garden and learn from the elder gardeners, the elders may experience a sense of pride and feel more included in the community. This can lead to elders taking greater interest in the youth's education and in protecting the garden sites from development. This, in turn, can lead to stronger communities.

Scott Krueger, Randy Jackson, Tony VanDeValk, and Lars Rudstam

**Creel survey data collection: Methods comparisons**

Predator-prey interactions are central to ecosystem structure and function. In aquatic ecosystems that support fisheries, anglers are typically the top predator and can significantly influence ecosystem dynamics through the harvest of targeted species. Understanding the impacts of angling on fish populations requires cost and labor intensive surveys that provide estimates of effort, catch and harvest. Several alternate survey strategies have been examined, all with potential biases, but few studies have explicitly compared two or more survey strategies on a single waterbody. Instantaneous counts of anglers from one or more vantage points are generally preferred, but time spent traveling to count points reduces time available for angler interviews, which provide catch and harvest rate data. Progressive counts can be made as part of an
interview circuit, but prior literature has indicated that the effort estimates produced can be biased low. The Oneida Lake Creel Survey (2003-2005) has employed both instantaneous and progressive count methodology in order to facilitate empirical comparisons of effort estimates from the two approaches. Additionally, traffic counters were deployed at several access areas as a remote sensing alternative to estimating angling effort with direct counts. Comparisons of instantaneous and progressive counts showed no consistent differences or systematic bias. Preliminary results from traffic counters suggest that in a diffuse access fishery, such as Oneida Lake, there is a linear relationship between instantaneous counts and a single access point.

Alex Kudryavtsev
Global environmental education programs: Principles of design and learning outcomes
Traditionally, environmental education programs have focused on local natural history and environmental issues (e.g., place-based education). A more recent movement toward global sustainability education programs has attempted to teach youth about environmental issues that cross the borders of communities or even nations. A challenge posed by the UN Decade of Education for Sustainable Development (DESD) is how to build awareness and understanding of local and global environments and cultures (Cloud, 2005; McKeown, 2002; Agenda 21, 1992). Further, DESD attempts to develop education models that integrate knowledge about environment, society, and the economy, and promote achievement of sustainable development. One approach to reaching DESD goals is creating opportunities for youth from different cities to communicate via the Internet, thereby facilitating peer-to-peer learning about both local and "exotic" environments. I conducted a preliminary research/outreach project that engaged inner-city youth from the US and Russian high school students in online discussions of local environmental issues via blogs (www.gm-bronx-tomsk.blogspot.com, www.gm-baltimore-tomsk.blogspot.com). My initial results indicate that such programs are welcomed by youth and educators in urban areas where youth have limited opportunities to make connections beyond their neighborhood. The youth survey showed that short-term blogging helped participants to learn about local and "exotic" environments, and to develop some skills (e.g., ability to effectively present information), but the blog was not very successful in facilitation of local environmental actions. Given the interest among urban community-based organizations in global environmental education programs, my future research questions are: 1) What features of computer-mediated communication lead to youth learning about science, the environment, and different cultures, and to youth engagement in local environmental action? 2) How can global environmental education programs achieve DESD goals?

Jim Lassoie
Maintaining environmental priorities in the age of terrorism
This presentation examines the thesis that the American public's fear of terrorism, as manipulated by the current administration, has hijacked the decision-making process, which is deflecting society's ability to adequately address pressing environmental issues. I will argue that although fear of bodily harm may have motivated environmental activism in the past, today's fears arising from the threat of terrorism, both real and especially perceived, are having just the opposite effect. In fact, such fear may be forcing environmental decisions that could prove far more universally harmful and long lasting than most acts of real terrorism. I will use global climate change to illustrate my argument and the geo-political context will be the United States.
Kirsten Leong, Dan Decker, and Jim McKenna

Integrating the human and ecological dimensions of biological resource management to improve decision-making in the National Park Service

National Park Service biological resource management must be: (1) faithful to the values for which the agency and its specific units were created, (2) based on sound ecological science, and (3) carried out for the benefit of current and future generations. Within these sideboards, many possible ends and means can be considered for any complex management issue. The diversity of stakeholders affected by and desiring input in management has grown dramatically in the last few decades, and managers of public trust resources are increasingly expected to consider the interdependence of human and ecological dimensions in biological resource management. To illustrate this interdependence, we examine: the scales of management influence (local to national), the types of stakeholders activated at different stages of planning, and implications for effectively addressing expectations for public participation. We conclude with an example of an integrated approach that enhanced decisions about deer management at Acadia National Park.

Jesse Lepak, Jason Robinson, Dana Warren, Dan Josephson, and Cliff Kraft

Changes in mercury bioaccumulation in apex predators in response to removal of an introduced piscivore

Mercury is a major human health contaminant in fish throughout the United States and is of serious concern worldwide. We evaluated mercury levels in a native top predator, lake trout (Salvelinus namaycush) before and after the large-scale removal of an introduced competing predator, smallmouth bass, (Micropterus dolomieu). The removal was initiated in a 270 hectare Adirondack lake in 2000 and has continued for the past five years, resulting in a 90% reduction of adult smallmouth bass. By 2002, lake trout ?13C values (-25.9 to -24.9) and trophic position (3.5 to 3.9) increased significantly, reflecting a switch from invertebrate to prey fish consumption, and this result was supported by stomach content analyses. Differences in lake trout age, length and weight were accounted for using multiple regression in order to compare mercury levels before and after the smallmouth bass removal. Following the smallmouth bass removal, lake trout mercury levels increased from a mean of 0.60 to a mean of 0.73 ppm from 2000 to 2005. Results from our study suggest that changes in fish community composition and food web linkages can produce changes in mercury bioaccumulation in apex predator fish.

Kendra Liddicoat

45 years of outdoor education: Assessing the long-term impact

Many environmental educators hope that their programs will have a life-long impact on the participants. We have goals that include sparking a new interest, inspiring new values, and changing behaviors. Interviews with environmental educators and activists have shown that early-life experiences related to the environment can have long-term impacts of this sort. However, most program assessments gather their data on learning outcomes and behavioral impacts shortly after the experience, or at best a few months or years later. This study combines retrospective interviewing with assessment of a specific outdoor education program to document long-term impacts on people who are now in a variety of professions. Our research capitalized on the 45-year history of residential outdoor education programs at Bradford Woods for all fifth graders from Martinsville, IN. I conducted interviews with 45 adults who participated in the program between 1961 and 1992 to determine what aspects of the three-day program they
remember, what impact they think the experience has had, and what they are doing now in terms of profession, leisure pursuits, and environmental behaviors. Although it would be impossible to definitively link current behaviors and attitudes to a single educational experience, this research has allowed us to assess which types of activities led to detailed, long-term memories that may still be influencing participants 15 to 45 years later. We were also able to identify impacts that are not apparent immediately after a residential outdoor education experience such as the significance of being away from home for the first time, the possible benefits of being able to identify local plant species, and the influence of community validation on long-term memories of the experience.

Rebecca Lohnes
Impacts of anthropogenic factors on common nighthawk nesting frequency and distribution and social behavior
The Common Nighthawk (Chordeiles minor) is thought to be declining across its range. The species is on the IUCN Red List and has also been designated as threatened by BirdLife International. Nighthawks often nest in areas that have been altered by humans, including cities and rangeland. I will investigate how anthropogenic factors affect nesting dynamics and social behavior in altered landscapes. I plan on working in the tallgrass prairie ecosystem to investigate the effects of burning and artificial lights. I will nest search and census in areas that have different burning histories (from unburned for 20+ years to burned annually). I will also conduct censuses at those areas and at locations with and without artificial lights. At the symposium I will be presenting ideas and methods for feedback.

Ursula Mahl, Robert Howarth, Christy Tyler, Caroline Turner, and Roxanne Marino
Linking benthic macroinvertebrates, nitrogen cycling and eutrophication in shallow estuaries
Understanding eutrophication in estuaries and applying this information to management requires a comprehensive understanding of the factors that control nitrogen dynamics in these systems. At early stages of eutrophication, the rate of organic matter production depends largely on the proportion of nitrogen input that is available in the water column for uptake by phytoplankton and macroalgae. Thus, the relative dominance of nutrient transformation pathways that promote removal versus retention of nitrogen can determine a system's response to nitrogen pollution. However, little is known about how reaction rates for nitrogen transformations are affected by changes that can occur in estuaries as eutrophication progresses, such as increased decomposition, altered sediment redox conditions and change in benthic community structure. Benthic invertebrates likely play a key role because their burrowing and feeding activities can affect transformation, movement and availability of nutrients. Few experiments have examined the relationship between nitrogen cycling and the composition of invertebrate communities. Using laboratory microcosms, the proposed research will evaluate the link between variation in invertebrate function and density, nitrogen flux and the reaction rates of different nitrogen transformations in shallow estuaries. This work will inform models for response of shallow estuaries to nitrogen loading and aide in the management eutrophied systems.

Matthew Mirabello
Where did all that P go? Characterization of the phosphorus pools of fertilized Panamanian lowland tropical rainforest
It is commonly accepted that productivity in tropical forest ecosystems is limited by the availability of phosphorus in soil. This is attributed to the age and weathering of the soils, which results in primary phosphorus being occluded in organic matter and or iron oxide rich secondary minerals. To test this notion, a tropical lowland rainforest in Panama has been fertilized with N, P, K in a factorial experimental design. After seven years of annual fertilizer application, plots fertilized with phosphorus did not show significant increases in productivity to account for the added phosphorus. The amount of phosphorus added to the soil over the 7-year period was roughly a 35% increase from the initial level in the top 15 cm of the soil profile. Sequential extraction of phosphorus pools, via a Hedley fractionation revealed that total P increased in the fertilization plots and accounted for approximately 75% of the added fertilizer. The unfertilized soil had a total phosphorus value of 660±220 mg P per kg soil. The uniform fertilization of phosphorus let only to an increase in the size of less recalcitrant pools in addition to a decrease in their heterogeneity. The results of this study show that added P moves into relatively recalcitrant pools, in part, owing to biological activity.

Daniel Pendleton, Andrew Pershing, Charles Mayo, and Moira Brown

North Atlantic right whale presence and the abundance of copepods in the Gulf of Maine

Each winter and spring a portion of the North Atlantic right whale (Eubalaena glacialis) population enters the Cape Cod Bay (CCB) critical habitat to feed and to nurse their young. Later in the spring, aggregations of right whales are found feeding and socializing in the Great South Channel (GSC) critical habitat, a region that is transected along its nearshore boundary by the Boston shipping lanes. Several right whale-vessel collisions have been documented in the past two decades in this vicinity. Right whale movements within and between the CCB and GSC habitats are thought to be driven by their need to feed on small and ultra-dense patches of copepods. Using aerial sighting data of right whales and measurements of copepod abundance from vessel-based oceanographic sampling, we test the hypothesis that regional-scale average copepod abundance is an indicator of right whale presence in the CCB and GSC critical habitats. Our analysis shows a strong time-averaged correlation between the copepod Calanus finmarchicus and right whale abundance in the Great South Channel. The relationship between copepods and right whales in Cape Cod Bay is less clear, suggesting that resource acquisition is not the only reason right whales visit this habitat. Understanding the relationship between region-wide average concentrations of copepods and presence of right whales could provide managers with a useful proxy to right whale abundance, which may in turn support management strategies to balance right whale conservation with the fishing and shipping demands in the region.

Dana R. Warren, Clifford E. Kraft, William Keeton, Emily Bernhardt, Robert Hall, Jr., and Gene Likens

Wood in northeastern forest streams: Future projections and ecosystem implications

Large woody debris (LWD) and organic debris dams are important features in forested stream ecosystems. High LWD frequency can increase the number of pools and create complex habitat beneficial for fish and invertebrates. LWD also retains both organic and inorganic material in streams and these areas of retention can be hotspots of biogeochemical cycling in streams. Given its importance to biological processes in forested streams, predicting future patterns of LWD accumulation can help to predict changes in ecosystem processes. In this paper we 1) develop a model to predict future wood loading based on empirical data from a range of forests across New York and New England, 2) Illustrate the relationship between stream LWD and nutrient
dynamics in streams - specifically phosphate uptake and 3) Use estimates of future LWD loading and the relationship between LWD and phosphate uptake to estimate future changes in P dynamics in northeastern streams.

Nalini Rao, Zachary Easton, Tammo Steenhuis and David Lee
Optimization of best management practice implementation: Integrating economic and spatial features
Best management practices (BMPs) have proven to be an effective means of reducing non-point source contaminant loading to surface waters at the field and farm scale. To a great extent, the effectiveness of BMPs depends on their location relative to hydrologically sensitive areas, as greater reductions can be obtained when BMPs are correctly sited. BMPs designed for farm fields often include strategies such as filter strips, nutrient management plans, seasonal manure spreading, prescribed grazing, and livestock exclusion from streams. The following costs are associated with each BMP: an installment cost, a maintenance cost and an opportunity cost. The benefits associated with each BMP include its effectiveness in reducing P loading in runoff. The effectiveness can range in value based on site characteristics. We will combine spatial, water quality and economic analysis to examine different scenarios of watershed management, and to determine the optimal spatial extent over which a BMP should be implemented for effective P loading reduction.

Hannah Shayler and Clifford Kraft
Mercury contamination: Strategies for community action
Mercury contamination poses a known threat to human and ecosystem health, yet the degree of contamination in many waters remains unknown. High mercury concentrations measured in fish from Adirondack waters - including sport fish prized by anglers - indicate an important water quality issue. Our research will build upon ongoing assessments of mercury contamination in New York State waters by linking existing fish mercury data to humans. We will gain a more comprehensive perspective of how mercury contamination affects communities by quantifying angling catch records, surveying fish consumption by anglers and their families, testing hair samples from community volunteers, and estimating exposure using a mercury toxicity model. We will conduct interviews with key informants and focus groups with anglers and their families to gather information about community attitudes towards and awareness of the issue of mercury contamination in order to frame our results within the appropriate social context. We will use our findings to more effectively communicate with the angling community about how to relate mercury data to fish consumption choices. By increasing access to information and resources, we aim to foster science-based decision making. Continued communication efforts will ensure that communities possess the tools needed for an informed and proactive response to contamination issues. We will build upon our established partnership with Adirondack anglers to better understand this community's fish consumption habits, awareness of mercury pollution, and decision making strategies in order to offer insights that will be broadly applicable to other communities facing environmental challenges.

Jennifer Shirk
Exploring new paradigms for conservation research: Interpretivism, narratives, and natural resource scientists
Rigor in research demands the most appropriate methods for addressing the question at hand.
Although interpretivist approaches such as narrative analysis can offer complex contextual understandings of social phenomena, their merits are not widely appreciated in the field of Natural Resources. In the context of my dissertation investigating scientists' motivations for citizen science partnerships, I will provide illustrations of the knowledge contributions that can be made through narrative work.

Samuel Simkin, Barbara Bedford, and Kathleen Weathers

**Winter wetland sulfide and iron porewater chemistry**

Anthropogenic atmospheric deposition and natural bedrock dissolution each contribute sulfur inputs to freshwater wetlands. In coastal wetlands that receive abundant sulfate from the ocean, high sulfide production results in species-specific plant responses. The consequences of sulfide production are less fully understood in freshwater wetlands. The overall goal of this project is to link variations in wetland sulfur supply, and its sources, to plant tissue chemistry and growth through its interaction with iron and phosphorus availability. In this presentation, we present initial cross-site contrasts in sulfide and iron porewater chemistry during the winter, a time when plant uptake and rhizosphere oxygenation should be minimal. Winter porewater concentrations should mostly reflect microbial activity, especially during mild winters, and therefore may represent a null model of plant effects on porewater. We will also discuss plans for future analyses of porewater, soil, and plant tissue chemistry during the growing season, when porewater chemistry should influence plant uptake and growth.

Peter Stevens

**Identifying groundwater-influenced habitat for young-of-year brook trout (Salvelinus fontinalis) using a topographic index**

Adirondack brook trout (Salvelinus fontinalis) are dependent on locations of groundwater upwelling for spawning, nursery habitat and thermal refugia for both young-of-year (YOY) and adult fish. Landscape-scale anthropogenic disturbances, such as logging and road construction, have the potential to influence brook trout habitat by altering these groundwater regimes. Despite the importance of groundwater discharge zones to brook trout, few attempts have been made to empirically model or predict groundwater discharge into lakes. We are building upon previous efforts to model nearshore groundwater discharge by: 1) improving resolution, using 10m digital elevation models (DEMs) and 2) pre-processing DEMs to remove spurious pits and sinks. To verify the efficacy of this model, three lakes were sampled in the southwestern Adirondacks to determine if 1) the TI model predicts locations of nearshore groundwater-influenced habitat and 2) if these locations are preferentially used by YOY brook trout. Logistic regressions and t-tests for means showed a statistically significant correlation between high shoreline TI values and an increased likelihood of finding both groundwater-influenced habitat and YOY brook trout in the nearshore zone. In addition, a preliminary analysis shows the possibly of a density-dependent preference by YOY brook trout for stream habitat over seep habitat. These results suggest that the TI model may provide managers and scientists with a useful tool to predict locations of YOY nursery habitat for further study and protection.

Phuntsho Thinle

**Spatial modeling of key tiger (Panthera tigris) conservation areas and corridors in Bhutan using ecological and human dimensions**

Habitat loss and fragmentation are driving rapid decline in species worldwide. This is especially
evident in the case of large mammals such as Bengal tigers (Panthera tigris), whose populations have already lost one subspecies and arguably many different populations. Even the large populations in India and Nepal are diminishing towards extirpation in the near future. With large contiguous tracts of relatively undisturbed habitats offered by its 72.5 percent forest cover, Bhutan may offer one of the last remaining refuges of the Bengal tiger. Driven by strong Buddhist sentiment in the form of environmental protection, as well as the strong political will, Bhutan has set a national goal to preserve and sustain a long term viable population of Bengal tiger. Towards that goal, nine protected areas, encompassing 26 percent of the country, were established where tigers were known to exist. Along with these preserves, in 2000, twelve interconnecting pathways were designated as potential corridors for tiger interchange and gene flow. This was an important first step towards tiger conservation in Bhutan, but to-date there has been no confirmation or assessment of the effectiveness, nor even the quality of these pathways as tiger corridors. Furthermore, there is evidence that there are good, or possibly better, habitats for tigers existing outside of the designated preserves. Therefore, at this critical juncture, this crucial study is the first scientific attempt to assess and validate the currently designated corridors and tiger habitats in the country. This study proposes to develop a spatially explicit model based on the key ecological features that reflect the essential requirements of tigers and important human dimensions that may directly influence tiger occurrence. The model developed using the latest landsat images, land use and habitat characteristics, and GIS tools will be employed to quantify tiger distribution throughout the country, assess the importance of current corridors, and possibly identify new areas of occurrence and potential new corridors. Ultimately, the model can be incorporated into global conservation strategies for tigers and other wide-ranging mammals.

Nancy Trautmann, Arthur Lembo, Jr., Rebecca Schneider, and Linda Wagenet

Student studies of stormwater runoff using Internet-based GIS

Connecting impervious surfaces with natural streams, roadside ditches influence the sediment loads, hydrologic regime, and quality of surface runoff. However, the extent and types of ditches have not been mapped in most watersheds. Preliminary findings of Cornell research indicate that exposed substrates resulting from ditch scraping contribute greatly to sediment loads in streams and lakes. Studies have quantified the efficacy and environmental impacts of specific ditch designs and management practices, including use of bioswales and mowing rather than scraping. Combined with maps showing ditch types and management practices, such knowledge can help to identify areas in greatest need of remediation. High school and middle school students can contribute to this research by investigating roadside ditches near their schools. Cornell has created a web-based GIS application that enables students to enter data about roadside ditch locations and conditions and then to visualize and analyze their ditch systems in real time on the Internet. Using GPS web-based GIS, students can provide valuable data on location, conditions, and types of roadside ditches in their study area. Simultaneously, through their ditch studies, students can learn key concepts in earth science, physics, biology, and chemistry, along with awareness of how GPS and GIS technologies can be applied to local environmental issues.

Nancy Trautmann

Learning to teach: How can graduate school best prepare future faculty?

Research universities such as Cornell prepare most future faculty but represent only a fraction of the institutions in which these faculty will work. Teaching skills are particularly important for
those going into careers at liberal arts or community colleges. However, future faculty with teaching responsibilities in any type of institution will need to be skilled science educators, facing challenges including increasing student diversity and a shift in emphasis toward student-centered learning. In spite of this need, many graduate students receive little or no guidance in developing teaching skills, and they may encounter mixed messages about the importance of teaching in academic careers. I propose to briefly present results of a survey I conducted last year of all Cornell doctoral students in science and engineering fields, comparing professional development opportunities with funding sources and career goals, and to reserve time for discussion of the perspectives of DNR graduate students and faculty.

Heather Van Den Berg and Bruce Lauber
The role of print media coverage in informing public understanding of deer management issues in New York state
Print media, particularly local and regional newspapers, have the potential to significantly influence deliberations and decisions about community-based deer management. Yet, little is known about the role of newspaper articles in this deer management milieu, aside from anecdotal evidence, while mass communication theories suggest newspapers both reflect and shape public understanding. Before communities recognize deer as a public problem that needs to be addressed, newspaper articles on deer-related impacts or on residents' attitudes towards deer can thrust deer management into the spotlight. Once communities recognize the need to address deer-related problems, newspaper articles can provide important information for committee members and residents assessing various management options. These newspaper articles can provide information that helps identify management objectives, propose and debate management alternatives, or report outcomes of management actions. We analyzed local and regional newspaper coverage of deer, from 2001-2006 in the state of New York, to determine what information is printed and how it contributes to community-based deer management. We identify additional opportunities where new newspaper coverage enables community-based deer management.

Jim Watkins, Ed Mills, and Lars Rudstam
Evaluating the impacts of exotic mussels on a native benthic amphipod
Great Lakes populations of the native benthic amphipod Diporeia started declining in the 1990s. The disappearance of this lipid rich food source has put several fish species, particularly lake whitefish at risk. Several studies have correlated the amphipod's decline with the increase in exotic dreissenid mussels on a broad spatial scale, but the mechanisms remain unknown. Two possibilities are that the mussels intercept the settling diatom food source or expose the amphipod to pathogens or toxic pseudofeces. So far, declining Diporeia populations have not demonstrated classic signs of food limitation. Nor have they shown high infection rates by parasites or pathogens. Several smaller deep cold-water lakes, including Cayuga Lake in the Finger Lakes of upstate New York, have maintained historic population densities of Diporeia that coexist with abundant dreissenids. The coexistence of mussels and Diporeia in Cayuga Lake is a unique opportunity for learning. We hypothesize that Lake Ontario Diporeia populations have declined because 1) dreissenids have intercepted phytoplankton food, or 2) Lake Ontario dreissenids carry a pathogen. Diporeia populations in Cayuga Lake have survived because 1) terrestrial matter provides an alternative food source not intercepted by dreissenids, or 2) Cayuga Lake dreissenids do not carry a pathogen. Stable isotope and fatty acid analysis of field collected Diporeia, dreissenid mussels, and potential food items from Lake Ontario and Cayuga Lake will
provide information on food sources. An experiment exposing populations from the two lakes will be our first step towards evaluating whether a pathogen plays a role.

Heather Wieczorek Hudenko, Daniel Decker, William Siemer

Coyotes in suburbia: The gap between public concern and likely risk
As humans and coyotes in suburban communities of New York State increasingly navigate the same space, the potential for negative human-coyote interactions increases. Wildlife managers' ability to launch a proactive response to this emerging issue is constrained by lack of information about interactions between humans and coyotes in suburban areas. We studied human and biological dimensions of human-coyote interactions in Westchester County, NY to increase understanding of the extent and nature of public experience with coyotes. We conducted semi-structured interviews with key informants (n=42) and a telephone survey of residents (n=1160) in four Westchester towns. The majority of key informants believed area residents were unaware of the presence of coyotes in the county, but we found most (85%) residents were aware of coyotes in Westchester and half (52%) had seen a coyote. The disparity between key informants' and residents' perceptions of coyotes has implications for information gathering and communication by wildlife agencies. While few (4%) residents actually experienced problems with coyotes, many expressed concern about potential negative impacts. Preliminary analysis suggests public perception of risk greatly exceeds actual risk from coyotes. We found both an information void and an interested audience, indicating a timely opportunity for educational intervention designed to align perceived threats with objective risk from coyotes. Our study indicates that the potential exists for wildlife agencies and local conservation NGOs to be proactive about retaining "resource" status for coyotes, a species of wildlife that might otherwise join the growing list of "pest" species in suburban areas.

Joseph Yavitt, Tracy Bartella, and James Walter Towers Cornwell

Chemical properties, decomposition, and methane production of tertiary relict plant littlers: Implications for atmospheric trace gas production in the early tertiary
Throughout the early Tertiary (ca. 65-38 Ma) Taxodiaceae-dominated (redwood) wetland forests occupied the high latitudes and were circumpolar in their distribution. Many of these forests had high standing biomass with moderate primary productivity. The geographic extent and amount of Tertiary coals and fossil forests throughout Arctic Canada suggests large areas of wetland forests that may have cycled substantial quantities of carbon, particularly methane until they were replaced by cold tolerant Pinus, Picea, and Larix following climatic cooling associated with the Terminal Eocene Event. To test this hypothesis we compared physiochemical properties, decomposition, and trace gas production of litter from extant Metasequoia, Pinus, Picea, and Larix. Initial results from plantation-grown trees indicate Metasequoia litter is a better source of labile organic substrate than pinaceous litter. Metasequoia litter contained the least lignin and highest amounts of water-soluble compounds of the four litter types studied. Analysis of the lignin structure using cupric oxide oxidation indicates that Metasequoia lignin is enriched in 4'-hydroxyacetophenone and 4'-Hydroxy-3'-methoxyacetophenone relative to the pinaceous litter. In a 12-month decomposition study using litterbags, average litter mass loss was greater for Metasequoia litter (62%) compared to the pinaceous species (50%). Moreover, Metasequoia litter incubated under anoxic conditions produced nearly twice as much CO2 (ca. 4.2 umol/g.day) and CH4 (2.1 umol/g.day) as the pinaceous litter (2.4 umol/g.day for CO2; 1.2 umol/g.day for CH4). Our results support the idea of greater decomposability and palatability of
Metasequoia litter as compared to Larix, Picea, or Pinus. Provided that the biochemical properties of Metasequoia have remained relatively stable through geologic time, it appears that early Tertiary Metasequoia-dominated wetland forests may have had higher microbial driven trace gas production than the Pinaceae-dominated forests that replaced them in the late Tertiary.

Robert Young

**Urban ecological governance in sustainable resource management**

Both the academic and popular press have presented the field of urban ecology as a necessary new direction in urban and ecological studies (Collins et al. 2000; Economist, 2006). This new direction is presented as a required response to the unprecedented character of urbanization encompassing both the growth and scale of cities (UN, 2005) and their contemporary impact on natural resource stocks and human and ecological health (Rees, 1997). In addition, urban ecology research has been described as a necessary corrective to an historical bias in Western intellectual tradition. This bias is identified as conceptually separating human and ecological systems and thereby under-developing theories that incorporate them in a unified manner (Rees, 1997; Niemela, 1999; Collins et al. 2000; Simmons et al. 2002). This paper explores these assertions by examining urbanization and its impacts within a spatial and temporal framework. By placing the demographic, biophysical, and social impacts of cities within the context of uneven historical development, theoretical paradigms that emerged locally to address the nature/society divide but have subsequently been undervalued can be brought to the fore and placed in relation to contemporary discussions. In doing so, an alternative thread in Western intellectual tradition can be "daylighted" while connecting contemporary urban ecology research to its historical legacy.

Elise Zipkin, Evan Cooch, and Patrick Sullivan

**Harvest strategies to control structured populations: applications to smallmouth bass and white suckers**

Much of the current research on harvest and its subsequent effects on population dynamics focuses on maximizing yield. However harvest can also be an effective method to control overabundant species where the goal may not be to maximize yield, but to maintain a population at some predetermined size. For example, management objectives may include holding the population at a stable level below its carrying capacity, maximizing the presence of specific size classes, or limiting population growth in specific spatial locations. In structured (i.e. age, size, stage, or space) populations, control through harvest is more complicated. We developed theoretical models to determine proportional (constant effort) harvest strategies to control structured populations with density dependent fecundity. We applied the models to two freshwater fish populations in the Adirondack Mountains, NY: smallmouth bass in Little Moose Lake and white suckers in two lakes, First and Second Bisby. The models indicate: (1) control of smallmouth bass requires significant harvest (>80% of either juveniles or adults) to reduce the total population and (2) harvest efforts should focus on Second Bisby to minimize the number of adult white suckers that compete with other species for resources.