
Abstracts

THE
NEW YORK

NATURAL HISTORY
C O N F E R E N C E VI

APRIL 26 – APRIL 29, 2000
A FORUM FOR CURRENT RESEARCH

NEW YORK STATE MUSEUM

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Previous conference abstracts and conference updates are available from the Natural History Conference website:

<http://www.nysm.nysed.gov/nhc.html>

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Abstracts for Presentations

Adams, David J. (New York State Department of Environmental Conservation, New Paltz, NY 12561), and Bernd **Blossey** (Cornell University, Department of Natural Resources, Ithaca, NY 14853)

A Proposed Draft Purple Loosestrife Management Plan For The Lower Hudson River Valley—An Opportunity for Utilizing Community Involved Watershed Management

After decades of unsuccessful attempts to control *Lythrum salicaria* (purple loosestrife) using mechanical, physical, and chemical means, the successful development of biological control offers a new opportunity to better manage this serious exotic invasive species. After approval by federal and state regulatory agencies, two leaf beetles, *Galerucella californiensis* and *G. pusilla*, a root feeding weevil *Hylobius transversovittatus*, and a flower feeding weevil, *Nanophyes marmoratus*, have been released in New York State. This draft plan outlines goals, objectives and actions considered most appropriate to achieve long-term population reductions of purple loosestrife using a regional, area-wide management approach. The implementation of the draft management plan for the Lower Hudson River Valley will occur in three distinct phases.

Phase 1 (3–5 Year)

- Establish purple loosestrife biological control agents within each Town. Utilize partnerships whenever feasible.
- Continue long term on site monitoring to assess the efficiency of the bio-control agents.
- Assess the regional abundance and distribution of purple loosestrife utilizing remote sensing techniques.
- Develop and distribute educational materials targeting agencies, community organizations and private land-owners.
- Draft documentation required to initiate legislative action prohibiting the sale and distribution of purple loosestrife.

Phase 2 (3–5 Year)

- Review the establishment, spread, and impact of single and multiple species (bio-control agents) in suppression of purple loosestrife within different habitat types.
- Develop an economical landscape model for bio-control agent distribution and establishment.

Phase 3 (10–20 Year)

- Based on research results, plant distribution, insect life histories, insect availability and model recommendations, begin additional regional distribution and establishment of bio-control agents.
- Use a combination of monitoring techniques to assess the success of the purple loosestrife biological control program at different scales.
- Refine release procedures and assess the ecological value of restored wetland plant communities.

This project is funded in part by the NYS DEC Hudson River Estuary Management Program.

Alben, Katherine T. (New York State Department of Health, Albany, NY 12201), **Justin George** (Union College, Schenectady, NY 12308), and **Jamie V. Woodall** (Holy Names Academy, Albany, NY 12208)

Characteristics of Dissolved Organic Carbon from *Trapa natans* Wetlands

Dissolved organic carbon (DOC) is an important part of the trophic food web in aquatic ecosystems, but it remains an analytical challenge to identify the origin(s) of DOC and document its transformation in the environment. For this study, it was of interest to determine if DOC from two wetlands dominated by *Trapa natans* (water chestnut) could be differentiated from DOC at sites immediately upstream. Samples were collected from a *T. natans* wetland on the Mohawk River at Niskayuna (nontidal freshwater) and on the Hudson River at Tivoli South Bay (tidal freshwater). Enzyme assays were performed as an indirect means of characterizing DOC, but the results indicated little difference among samples, in terms of functional groups that were readily hydrolyzed. As an alternative, humic and fulvic acids were isolated by adsorption to a macroreticular resin, fractionated by pH adjustment, reconcentrated and purified by ion exchange. Green and pink pigments were obtained in samples from the tidal wetland, in addition to the brown concentrates of humic and fulvic acids. Analysis of the pigments by high-pressure liquid chromatography with diode array detection suggests that they are derivatives of chlorophylls: additional spectrometric analyses of the pigments are being carried out to determine if they result from *T. natans* or algae. The relative contribution of algae and bacteria to the composition of humic and fulvic acids is partially deduced from NMR analyses of the aliphatic vs. aromatic composition, but independent methods are needed to confirm these interpretations.

Aliberti, Maria A., and **Mark Chandler** (New England Aquarium, Boston, MA 02110)

Larval Odonates as Bioindicators of Pond Water Quality

Many studies have examined the relationship between macroinvertebrate abundance and pH, often concluding that pH exerts an indirect effect on macroinvertebrate abundance and diversity—for example, by influencing fish abundance—which causes the observed trends in community composition. We took a regional approach to this question, with the goal of isolating the effect of pH on odonate species richness from the other potentially confounding variables. Odonates (dragon- and damselflies) are one group of large, predaceous insects that may be potential indicator species in aquatic systems. During May and June of 1999, the larval odonates in depths of 1 m were sampled at 21 ponds in the Ipswich and Parker River drainage basins (Essex County, MA). Both quantitative (modified “Brunelle” sweeps) and qualitative (hunting sessions, seine nets) sampling techniques were used. The larvae were identified to as low a taxonomic level as possible (usually species), and their distribution data was analyzed to determine if odonate species richness is varying along a pH gradient. Other physical parameters of the ponds—alkalinity, turbidity, conductivity, transparency, maximum depth, pond area, number of distinct littoral habitats, density of highly predaceous fish—were also measured and assessed for potential effects on odonate species richness. Preliminary data analysis revealed a significant positive relationship between odonate species richness (range: 0–8.7 species/site) and pH (range: 4.88–6.60). Ponds with a lower pH had fewer species of odonates. Turbidity was found to exert a significant, but negative, effect on odonate species richness. The results of this study will be discussed.

Batcher, Michael (Consulting Ecologist and Environmental Planner, 1907 Buskirk-West Hoosick Road, Buskirk, NY 12028)

Ecological Processes in Natural Communities of the Northern Shawangunk Mountains, New York

As part of the Shawangunks Ecosystem Research Program, initiated in 1994, natural communities were mapped within the 30,000-hectare Northern Shawangunk Mountains. Spatial distribution and composition of these communities appear to be influenced by both environmental gradients and historic wildfires. Logistic regression was used to assess the relative importance of six variables derived from geospatial data (GIS): elevation, slope, aspect, landform curvature, a moisture index and solar insolation. Elevation and slope were significantly different between all community types. Differences in the other variables were significant in some cases, but not consistently so. Barrens and shrubland communities occur at the highest elevations in areas with the highest estimated solar insolation. Shrubland communities have higher moisture indices than barrens. Northern hardwood communities occur in areas with lower solar insolation and high relative moisture indices. Appalachian oak-pine/oak-hickory forests are at the lowest elevations with moisture indices comparable to shrublands and northern hardwoods. The variables were then used to “predict” natural community distribution compared to actual distributions. Prediction success varied from 71.8% in the chestnut oak forest to 16.2% for the hemlock-northern hardwood forest. Results indicate that the spatial distribution of some communities could shift depending on disturbance, such as wildfire. Species composition and fire history data indicate that disturbance from fire influences several natural communities. Data on historic fires indicates that wildfires varied in size, frequency and seasonality. Wildfires burned within both forest and barrens types, and likely influenced organic soil depth.

Bernstein, David J. (State University of New York at Stony Brook, Department of Anthropology, Stony Brook, NY 11794)

The Late Prehistoric Record from Long Island, New York

Throughout much of northeastern North America substantial changes in subsistence and settlement systems are observed archaeologically for the period A.D. 700 to 1300. However, these changes do not appear to have uniformly across the region. Unlike other sections of the Northeast, Long Island and other nearby coastal areas seem not to have witnessed major transformations in lifeways during the Late Prehistoric Period. Rather than being marked by change, the archaeological record from the coast is characterized by continuity in such things as the structure of resource use, technology, and pattern of settlement. Some possible explanations for this behavioral continuity are explored.

Black, David W. (University of New Brunswick, Department of Anthropology, Fredericton, New Brunswick, E3B 5A3, Canada)

Late Woodland Subsistence and Settlement in the Quoddy Region, New Brunswick, Canada: A Historical Summary

Archaeologists have speculated about prehistoric Native subsistence practices and settlement patterns in the Quoddy Region since S.F. Baird's work in the region last century. Here, such speculations and interpretations are reviewed with particular reference to the Middle-Late Woodland transition, and the Late Woodland period. Recent research indicates that significant changes in site structures, subsistence practices, and settlement patterns coincide with the early part of the Late Woodland. In the insular part of the region, these changes include shifts from shell midden-dominated components to black soil midden-dominated components, from evidence of year-round seasonality to evidence of warm-season occupation, and from larger encampments at the same locations as Middle Woodland occupations to smaller encampments at locations not previously occupied.

Blossey, Bernd (Cornell University, Department of Natural Resources, Ithaca, NY 14853)

Biological Control of Invasive Plants in Natural Areas of the Northeast

Biocontrol of invasive plants in natural areas in the Northeast began with the program targeting purple loosestrife (*Lythrum salicaria*). Seven years after introduction of host-specific insects to North America, several million insects have been released in over 1200 wetlands nationwide. The success of the control program (reductions in purple loosestrife biomass of >95%) resulted in increased interest in weed biocontrol in natural areas. The biocontrol program in the Department of Natural Resources at Cornell is currently coordinating new projects on garlic mustard (*Alliaria petiolata*) and common reed (*Phragmites australis*). Additional programs targeting Eurasian watermilfoil (*Myriophyllum spicatum*) and Japanese knotweed (*Fallopia japonica*) are under development.

The control program targeting purple loosestrife set precedence for incorporating basic scientific inquiry into applied weed control programs. Research focused on improvement of selection and establishment criteria of insect biocontrol agents, and plant insect interaction studies (is simultaneous attack of a root feeder and a leaf feeder providing faster control or are the 2 species competing and thus reducing control success?). With success in reducing purple loosestrife populations, our research now includes assessments of succession and ecological "value" of replacement communities (are the replacement communities made up of native species, do wetland specialists return, or are we replacing one invasive by another?). In addition we are evaluating whether traditional marsh management (water level manipulations, disking, fire) after biocontrol of loosestrife can enhance and accelerate return of native species.

An important aspect of our work in new projects includes cross continental comparisons and the development of standardized long-term monitoring programs. The ultimate goal of this research is to better understand factors underlying successful invasions by assessing the role of genetics, growing conditions, and herbivores and their natural enemies, on population dynamics of host plant and specialized natural enemies.

Bongaarts, Karina (Byram Hills High School, Science Research Program, Armonk, NY 10504), and David E. **Karrmann** (American Museum of Natural History, Education Department, New York, NY 10024)

Assessment of Eastern Painted Turtle Population in an Artificial Pond

A population of Eastern Painted Turtles (*Chrysemys picta*) has colonized a small (0.1-acre), 65-year-old artificial pond located in Ward Pound Ridge Reservation in Westchester County. Eutrophication has significantly reduced pond volume and size, while reforestation has decreased basking and nesting sites. Total population size, ratios of mature to immature members of each sex, and nesting/hatching success will be assessed to evaluate whether there is any significant trend to support the suggestion that these turtles are locally endangered. Preliminary work during the summer of 1999 utilized a combination of dip netting and floating traps set for 24–48 hour periods. Captured turtles were marked for future identification using a scute notching code. Recorded data consisted of: species ID; capture method; sex; estimated age; weight; carapace length, width, and height; results of egg palpation; microlocation of capture, air and water temperature, weather, and any distinguishing characteristics. A total of 15 individual turtles of two species, 4 snapping turtles (*Chelydra serpentina*) and 11 *C. picta*, were collected in 28 captures. The *C. picta* population was comprised of: 6 mature females (average mass = 386 g, average size = 140 × 103 × 52 mm), 4 mature males (average mass = 235 g, average size = 122 × 91 × 41 mm), and one hatchling (yearling). To develop a high degree of confidence in the estimated total population size, trapping will continue through the 2001 season.

Bosco, Salvatore (United States Department of Agriculture, Washington, D.C. 20250)

Agriculture, Biological Weapons and Terrorism

The US Department of Agriculture, the second largest department in the Federal government, is preparing to respond to the challenges imposed by the threat of the deliberate use of pathogens against agriculture and the food supply system. The size and demographics of US agriculture compound the problems imposed by the proliferation of biological weapons by former cold war adversaries into the hands of other state and interest groups with their own nefarious agendas. Under the impetus of Presidential Decision Directive 62, the Department is preparing to respond to this challenge in a number of key commodity areas. The Special Interagency Office has been created to coordinate and integrate USDA requirements to identify potential threats and to provide for detection, protection and other capabilities should they be needed.

Bouton, David (Mountain Meadow, Box 158, Davenport, NY 13750)

Getting Past the Myths: Butterfly Houses, and Encouraging Butterfly Presence

The media and the marketplace have been known to create, invent, and market regardless of accuracy. When it comes to butterflies, often informative books and articles are authored by writers who have little direct experience with the topic. Too often butterfly houses and landscaping are designed by architects, marketers, and crafters, not lepidopterists. This results in misleading those genuinely interested in being butterfly friendly. Brief presentation steps outside of the commercial realm and focuses on the central principals of attracting butterflies as used at Mountain Meadow Butterfly Preserve. Butterfly house designs based on actual butterfly behavior will be presented.

Bouton, David (Mountain Meadow, Box 158, Davenport, NY 13750)

Return to Nature: Hayfield into Butterfly Preserve over 35 Years

A south sloping twelve-acre hayfield at approximately 2,000 feet altitude in the Catskill foothills was part of a subsistence farm from the late 1800s through 1964. When purchased for the preserve, it was essentially totally cleared except for several old tumbled stone wall hedgerows. Slowly, for over thirty-five years, it has been returning to the wild under continuous observation and management by a naturalist. Presentation includes charts of various forms of wildlife that have gradually taken up residence on the preserve to date, particularly 56 species of butterflies and 175 species of moths (about 1/2 of moth species now resident). Charts include overwintering data, adult flight season, lepidopteral larval foodplant and habitat choice.

Breisch, Alvin R., and John W. **Ozard** (New York State Department of Environmental Conservation, Division of Fish and Wildlife, Delmar, NY 12054), Glenn **Johnson** (State University of New York College at Potsdam, Department of Biology, Potsdam, NY 13676), and Peter **Ducey** (State University of New York College at Cortland, Department of Biology, Cortland NY 13045)

Herpetofaunal Diversity in New York

The New York Amphibian and Reptile Atlas Project, a ten-year statewide survey, was completed in 1999. Over 55,000 species reports were contributed by 1800 volunteers. Not counting sea turtles, 63 native species were documented in the state. At least one species was recorded in 967 of the 979 atlas blocks (99% of the state). Fifteen species were recorded in at least half the blocks. The most diverse block has 40 species. Whereas mapping species distributions was the primary goal of the atlas, the database can also be used to identify areas of high herpetofaunal diversity or which have unusual species assemblages. Areas that have high total diversity, high diversity at the order level (salamanders, frogs, turtles, snakes), or groupings of rare species are discussed. Southeastern New York has the highest overall diversity and the highest diversity for salamanders, turtles and snakes. The St. Lawrence River drainage has the highest diversity for frogs. Western Long Island, the Niagara Region, and the high peaks of the Adirondacks and Catskills have generally low diversity. Unusual species assemblages are not necessarily associated with high species richness because many species reach their range limits in the state. A species that is common in one part of the state may be rare in another ecozone. Herpetofaunal diversity will be discussed at several spatial scales including ecozone, county, town, Atlas block (topographic quadrangle) and specific sites. This diversity is influenced by both ecological and edaphic factors.

Brown, Grant E. (Union College, Department of Biological Sciences, Schenectady, NY, 12308), James C. **Adrian**, Jr. (Union College, Department of Chemistry, Schenectady, NY, 12308), Michael G. **Lewis** (Union College, Department of Biological Sciences, Schenectady, NY, 12308), and Jon **Tower** (Union College, Department of Biological Sciences and Department of Chemistry, Schenectady, NY, 12308)

Effects of Acidification on the Alarm Response in Ostariophysan Fishes

Hypoxanthine-3-N-oxide, the putative Ostariophysan alarm pheromone, is characterized by a purine skeleton and a nitrogen-oxide functional group. Recent findings demonstrate that the N-O functional group acts as the molecular trigger, eliciting an increase in anti-predator behaviour. These data suggest reduced pH, as would occur in acidified waterways, will reduce the functionality of the Ostariophysan alarm

pheromone. We tested this hypothesis by exposing fathead minnows to conspecific skin extract or H_3NO at normal or reduced pH in an A-B-A design. Minnows exhibited stereotypic anti-predator responses when exposed to either stimulus at normal pH (8.0; pre- and post-acid treatment), but exhibited no stereotypic anti-predator response when tested at reduced pH (6.0). Additional experiments demonstrate that this decrease in reactivity is due to irreversible structural changes of the alarm pheromone molecule. These data suggest that under acidified conditions, Ostariophysan fishes may suffer from an inability to detect and respond to species-specific anti-predator cues.

Brumbach, Hetty Jo (University at Albany, State University of New York, Department of Anthropology, Albany, NY 12222), and Susan **Bender** (Skidmore College, Department of Anthropology, Saratoga Springs, NY 12866)

Foraging, Fishing, and Farming (?) in the Upper Hudson River Valley: In the Land of the Mohican

Woodland Period culture history in the upper Hudson River valley can be divided into two periods. The first was characterized by stable settlement and subsistence systems which had persisted relatively unchanged for several millennia. The long period of pre-horticultural stability was supported by the dependable and abundant runs of anadromous and catadromous fish in the Hudson River and some of its tributaries. During the second period, begging ca. A.D. 1100–1200, corn was gradually introduced into the pre-existing subsistence system encouraging subtle shifts in settlement type and location. This paper will discuss the archaeological evidence for the first period, including settlement locations, ceramic continuity, and the structure of the fish resource, in order to set the stage for later changes in the economy. Discussion of the reorganization of labor during the latter part of the Woodland Period will take a gendered approach.

Burger, Michael F. (National Audubon Society of New York State, c/o Cornell Lab of Ornithology, Ithaca, NY 14850), Jan **Beyea** (Consulting in the Public Interest, Lambertville, NJ 08530), Graham **Cox** (National Audubon Society of New York State, Albany, NY 12203), and James **Arrigoni** (c/o Belize Foundation for Research and Environmental Education, Punta Gorda, Belize)

Incorporating Non-game Wildlife Values in Private Forest Management in New York

Private forests provide an important majority of forest wildlife habitat in New York State and the Northeastern US, and their retention is critical for conservation of many species. Polls show that most private forest owners value wildlife and claim that it is one of the most important reasons they own forests, but economic pressures force many either to sell their forests or derive revenue from them by harvesting trees. Our goal is to provide information on how various management practices affect faunal diversity in private forests in the Adirondacks and elsewhere in New York State so that management can incorporate the wildlife values of landowners. During the summer of 1999, we studied 28 northern hardwood forest stands in the Adirondacks to determine how harvest techniques and intensity affect species richness and abundance of amphibians and breeding birds. Researchers measured habitat characteristics such as the percentages of overstory, midstory, shrub, and ground cover; presence of conifer species; tree basal area; tree species composition; leaf litter, rock, and slash cover; tree canopy height; volume of coarse woody debris; and the availability of water. Breeding birds were sampled using standardized point-counts and amphibians were sampled using time-constrained, area searches. Preliminary, first-year results indicate significant relationships between tree harvest intensity and the species richness and abundance of breeding birds and amphibians. In addition, densities of individual species of interest, such as the Black-throated Blue

Warbler, varied significantly with post-harvest habitat characteristics, suggesting that an opportunity exists to tailor private forest management to benefit these species. Plans for disseminating results and management recommendations to landowners, foresters, and loggers will be discussed.

Burkett, Kenneth (Carnegie Museum of Natural History, Pittsburgh, PA 15213)

Trailing the Late Woodland at Fishbasket

Early Late Woodland period populations inhabiting the upland tributaries of the middle Allegheny River Valley occupied locally isolated upland villages positioned at major fords of known historic and presumed prehistoric Indian paths. From 1977 through 1999 extensive archaeological excavations at the Fishbasket locale have uncovered a locally unique series of intense multi-occupations that share a blend of cultural traits expressing interaction with neighboring populations, yet remaining distinctive to this central section of western Pennsylvania. This paper will present a detailed examination of the varied settlement patterns and artifact assemblages associated with these villages, while introducing regional cultural comparisons.

Cadwell, Donald H. (New York State Museum, Research and Collections Unit, Albany, NY 12230), **Ernest H. Muller** (Syracuse University, Department of Earth Sciences, Syracuse, NY 13244), and **P. Jay Fleisher** (State University of New York College at Oneonta, Earth Science Department, Oneonta, NY 13820)

Geomorphic History of New York State

New York landscapes developed through millions of years as rivers and glaciers eroded the bedrock structure. Diverse physiographic provinces from the Atlantic Coastal Lowlands to the rugged Adirondack Highlands reflect these interactions. Deeply-incised Appalachian Plateau strata merge with resistant sandstone and conglomerate of the Catskills, whereas the Mohawk and Hudson Valleys and Ontario Lowlands reflect less erosional resistance of shale. Multiple glaciations disrupted preglacial stream patterns, scoured and deepened existing valleys, and smoothed uplands. Remnants of early deposits survive in gullies transverse to Laurentide Ice Sheet flow. Final retreat from Long Islands Ronkonkoma Terminal Moraine was punctuated by readvances, one of which built the prominent Valley Heads Moraine in the Finger Lakes region before withdrawing from New York about 11,500 years ago. In postglacial time, the changed hydrologic regime renewed stream incision and floodplain deposition, shaping the stage for man's arrival.

Carlson, Douglas M. (New York State Department Environmental Conservation, Watertown, NY 13601)

Northern New York Rivers Compared with Species Richness Metrics and Fish

Fish records are good indicators of conditions and changes in riverine environments. Because of difficulty in sampling these waters, there are few thorough surveys and sometimes interpretations of the catch should go no further than species presence. To determine the usefulness of these types of information, I analyzed fish surveys on nine rivers in northern New York using biomonitoring criteria, and compared them to each other and to a larger set of records for those same rivers, 1960–90. Several of these northern rivers appear to be without major environmental degradation and have uncommonly high species richness.

Inhabitants commonly included fishes known to be intolerant to change, like muskellunge, sand darters and rosyface shiners. Low-gradient habitats predominated with sand, boulders and clay banks. Metrics of fish species richness and composition were devised for both the recent and for the earlier, more diverse data sets. Together, they became two simplified versions of Indices of Biotic Integrity, using only five metrics: species richness and percentage sensitive species, tolerant species, omnivore and benthic insectivore species. The purpose of the comparisons was to rank the rivers with the highest and lowest ecological health. Waters with the highest values included the Grasse and St. Regis Rivers, and the lowest was West Branch Oswegatchie River. Both data sets showed a similar ranking. Validation of this technique was tested by adding three other streams from central and western NY with more obvious degradation and by comparing these rankings to other assessments of quality. These findings would be able to guide planners for conducting other necessary surveys in order to protect the most highly valued of our waters.

Carter, Maureen E., and E. Richard **Hoebeke** (Cornell University, Department of Entomology, Ithaca, NY 14853)

The Bionomics and Ovipositional Adaptations of *Elasmotherus atricornis*, with Reference to other Stinkbugs in the Family Acanthosomatidae

The stinkbug family Acanthosomatidae, characterized by two-segmented tarsi and a median carina on the abdominal mesosternum, are closely related to the Pentatomidae. The family comprises 45 genera and 180 species distributed worldwide. All are phytophagous, feeding on primarily mid-late successional plants, with an emphasis on plants in one of the oldest angiosperm subclasses, Hamamelidae. The genus *Elasmotherus* contains seven species, three in North America. *Elasmotherus atricornis* feeds only on spikenard, *Aralia racemosa*, found in glens on rocky outcroppings overlooking creeks and waterfalls. Oviposition by *E. atricornis* and some other species in the family is characterized by a distinct behavior. After each egg is laid, the female taps it several times with the inner hind tarsi followed by brushing each tarsus alternatively against depressed, setose areas on the 6th and sometimes 7th ventral abdominal segments. The functions of these depressed, setose areas, named Pendergrast organs, have not been fully investigated. SEM and histological studies were carried out to look for a secretory function. Three other genera in the family lack Pendergrast organs but the species exhibit maternal care of eggs and early instar nymphs. It has been suggested that in the Hemiptera maternal care is an ancestral condition, subsequently lost in all but a few taxa that have semelparous reproduction. However, a recent cladistic analysis of the family suggests the Pendergrast organs have been secondarily lost in those species that exhibit maternal care.

Chandler, Mark (New England Aquarium, Boston, MA 02110)

Acidification, Exotic Species, Habitat Alteration and Loss of the Bridle Shiner

The bridle shiner, *Notropis bifrenatus*, is a small minnow that used to be a very common feature of lakes and slower stretches of rivers and streams along most of the Atlantic coastal watersheds. The species has suffered declines across most of its range and is listed for protection by many different states. In order to investigate whether the bridle shiner was similarly threatened in Massachusetts, a systematic study was undertaken to revisit locations with historical records of the species. It was found that bridle shiners were absent from over 66 % of ponds they had been found in previously. Other data were collected to test which of several potential factors may be causing the decline in this species. It was tested whether the loss of bridle shiners could be attributed to: a) lake trophic status, b) lake acidification; c) introduced species; d) change in land use, e) catastrophic water quality event (e.g., rotenone). No single factor could account for the loss of the species across the state. Instead, a combination of these factors seems to be in play.

Chilton, Elizabeth S. (Harvard University, Department of Anthropology, Cambridge, MA 02138)

“Towns They Have None”: Flexible Subsistence and Settlement Strategies in Late Prehistoric New England

While New England archaeologists agree that maize horticulture was practiced in the region by 1000 A.D., researchers have long debated the relative importance of maize for both coastal and inland Algonquian groups during the Late Woodland period (1000–1500 A.D.). These debates have often resulted in the use of dichotomous models of subsistence and settlement (i.e. inland vs. coastal, and staple vs. supplement). While it is clear that maize was not a dietary staple on the coast, many researchers assert that inland peoples were intensive maize horticulturists. The latter proposal is derived, in part, from social evolutionary models that proffer horticulture as inevitably accompanied by an increase in sedentism and a decrease in the diversity of settlement systems. The available archaeological and seventeenth-century documentary evidence does not support these social evolutionary models. Instead, the model presented here emphasizes flexibility, diversity, and cultural choice in the economies of New England peoples, who appear to have been both mobile farmers and hunter-gatherers throughout the Late Woodland period.

Cordeiro, James (Jay) R. (American Museum of Natural History, Division of Invertebrate Zoology, New York, NY 10024)

A Giant Squid in Manhattan

On June 10, 1998, the American Museum of Natural History (AMNH) acquired its first specimen of giant squid, *Architeuthis kirki* Robson, 1887, in its 130-year history. The eight meter, ca 250 kg, specimen was incidentally caught by commercial fishermen in December of 1997 off the Chatham Rise in New Zealand and graciously donated by the New Zealand National Institute of Water and Atmospheric Research (NIWA). Prior to transport preparations were set in motion for the arrival of the specimen. Accession paperwork and import/export permits were completed with cooperation from government agencies. A 1500-liter stainless steel storage tank was hastily secured for fixation, preservation, and ultimate storage. Upon arrival in Los Angeles, the squid carton was delayed on the runway for several hours before boarding a second plane to New York. After delivery in a refrigerated truck, the squid was lifted by freight elevator to the Exhibits Preparation area. Fresh tissue samples were removed as were the beak and radula. The specimen was injected and fixed in a bath of 10% saline formalin solution buffered ultimately with sodium bicarbonate for two weeks. After repeated fresh water baths for five days, the specimen was transferred to 75% ethyl alcohol and stored in the steel tank until a proper exhibit tank could be built. After a few mishaps with inferior designs, a team of designers developed a fiberglass exhibit tank with glass viewing panel in the front fitted with fiberoptic lighting above and filled with ethyl alcohol. Access panels in the top of the tank allow for manipulation and access to the specimen by research scientists. The specimen will be displayed to the public for a few years upon which it will be returned to collections storage in the new Division of Invertebrate Zoology.

Corey, Michael E. (Route 28N, P.O. Box 921, Minerva, NY 12851)

Controlling Japanese Knotweed, a Pesky Invasive Plant

Japanese knotweed (*Polygonum cuspidatum* Sieb. & Zucc.), a large member of the buckwheat family, is a fairly well established invasive exotic pest in New York State. This Asian native has made inroads through much of the State and is now recognized as a troublesome weed in the Adirondacks. According to a report produced by the Adirondack Nature Conservancy regarding its 1998 invasive plant survey, Japanese knotweed was the second most common invasive species observed within the survey area. An informal control effort was conducted from late spring to late summer of 1999 on a small parcel of land owned by the Town of Minerva in the hamlet of Olmstedville, Essex County. The property, which is less than an acre in size, is home to five or six mostly discrete patches of knotweed. Several of these patches were manipulated over a four-month period using stem pulling, root grubbing, and cutting methods. Background information on biological and habitat characteristics of knotweed will be presented. In addition, there will be discussion of preliminary results of the years control activities and general observations as well as recommendations for its control. The year 1999 was the first of what will be a several year study. There are plans to expand the control efforts in 2000 with an eye toward involving community volunteers in the study.

Crawford, Gary W., and Joseph R. Desloges (University of Toronto at Mississauga, Department of Anthropology, Mississauga, Ontario, L5L 1C6, Canada)

Princess Point and Fluvial Geomorphology on the Lower Grand River, Ontario

Research on the earliest agriculture/horticulture in Ontario is focussing on the riverine context of Princess Point sites in the lower Grand River Valley. A series of floodplain and terrace sites provides insights on settlement location choice and land use patterns as well as local environmental history. Geomorphological research is combined with archaeological exploration at several scales of resolution that include site, site group and watershed scales. Initial through late Princess Point occupations are often found in palaeosols in floodplains. No prehistoric occupations post-dating Princess Point have been found on the area's floodplains. Later prehistoric use of the lower Grand River watershed seems confined to upland terraces. Post-contact use of floodplains is quite common, however, and associated with a fundamental change in flooding and sediment load. Floodplain evolution is likely a factor in this changing land use pattern.

Creemens, David L. (GAI Consultants, Inc., Monroeville, PA 15146)

Geoarchaeology of Upland Soils on Stable Geomorphic Surfaces: Mature Soil Model

The pedological environments that evolve on stable upland geomorphic surfaces are characterized by mature soil profiles and a strong degree of horizon expression and differentiation. The time-diagnostic development of these horizons, together with the timing of prehistoric occupation episodes, influences the post-occupation distribution of cultural remains. A mature-soil artifact distribution model is developed to distinguish between soil forming processes that affect artifact distribution and depositional processes involving sedimentation and burial. The model emphasizes the development of subsoil B horizons in mature soils, and the concentration of artifacts at the top of the B horizon.

Creemens, David L. (GAI Consultants, Inc., Monroeville, PA 15146), and John P. **Hart** (New York State Museum, Research and Collections Unit, Albany, NY 12230)

Current Topics in Northeast Geoarchaeology: Glaciated Landscapes

Formerly glaciated terrains of northeastern North America present a wide variety of landscapes that effected the location, formation, and preservation of prehistoric archaeological sites. Many of these landscapes, such as simple till-covered uplands, have been little altered since the terminal stages of the Pleistocene. Other landscapes are more complex, for example, glaciofluvial and glaciolacustrine valley floor environments that have undergone significant modification through Holocene alluvial and colluvial processes. This symposium is organized to address current geoarchaeological work in these glaciated landscapes. It will be presented in four sections. The first will present regional overviews of the geomorphology, paleoecology and prehistory of northeastern North America. The second will present geoarchaeological case studies in upland settings. The third will present geoarchaeological case studies in valley floor settings. The final section will consist of a panel discussion on the effects of changing post-Pleistocene landscapes on prehistoric settlement and archaeological site formation and preservation.

Curran, Kathryn (University of Massachusetts, Department of Anthropology, Amherst, MA 01003)

Geochronology from Archaeology: An Example from the Connecticut River Valley

In Gill, Massachusetts, just above Turner's Falls a series of successive glacial surfaces include alluvial terraces that formed as the proto Connecticut River carved a channel through former Glacial Lake Hitchcock delta deposits. Associated archaeological sites contribute to a chronology for the formation of Connecticut River channels and terraces. The unique location of these surfaces also provides detail concerning the abandonment of an initial Connecticut River channel just downstream from the falls. Upstream from the terraces sit two now relict waterfalls that are dated using cultural data. The fine scale of archaeological chronology permits accurate timing of geomorphic processes.

Czech, Jerry (515 Whiting Road, Webster, NY 14580), and Alvin R **Breisch** (New York Department of Environmental Conservation, Division of Fish, Wildlife and Marine Resources, Delmar, NY 12054)

The Creation and Success of an Artificial Turtle Nesting Site

Study of an upstate New York site during the 1980s and early 1990s indicated that several problems were endangering the survival of resident spiny softshell (*Apalone spinifera*) and common map turtle (*Graptemys geographica*) populations. Lack of adequate safe nesting habitat emerged as a primary concern after the flooding in 1993 destroyed several of the few remaining sites. In late August 1993, biologists decided that active management was needed to improve nesting success. In 1994, a local marina owner allowed the New York Department of Environmental Conservation (DEC) to construct a 7 × 12 m artificial turtle nesting site within the marina boundary. Construction of the sand nesting mound, surrounded on three sides by cyclone fencing with the open side facing the water, took place in the fall of 1995. By mid-June 1996, female turtles had begun nesting in this newly created habitat. Hatching began in late August. Hatched nests were located by finding emergence holes in the sand through which hatchlings escaped. Each nest was then dug up and empty shells, infertile eggs, and remaining hatchlings were counted. When hatching began, plastic netting was suspended over the nesting site to protect the hatchlings from gulls and herons until the turtles reached water. During the four years since its construction, nearly 2000 turtle eggs

laid by four species have hatched at the site. Over 1900 have been spiny softshells. Yearly maintenance of the site has involved control of invading vegetation on the sandy mound. In addition to improving reproductive success, this study has quantified clutch size, dates of egg laying, and dates of hatchling emergence.

Dieterman, Frank (University of Toronto at Mississauga, Burlington, Ontario, L7L 3Z4, Canada)

The View from Here: Modeling Woodland Era (A.D. 500–1100) Site Selection Criteria in Southern Ontario

The cultural significance assigned to space and place is documented by examining the change in settlement locale amongst site clusters representative of Middle Woodland, Initial Late Woodland, and Early Ontario Iroquoian cultures in southern Ontario, spanning the period A.D. 500 to A.D. 1100. Decisions linked to settlement and subsistence practices are reflected in multiscalar GIS modeling of sites for each culture group. Analyses of site viewsheds and viewshapes reveal cultural preferences in site selection criteria. Significant is the placement of the Initial Late Woodland (Princess Point) sites as contrasted with the Middle Woodland (Saugeen) and Early Ontario Iroquoian (Glen Meyer) locales. The demonstrated view orientation of Princess Point sites is unique to the time period and, when analyzed in association with the initiation of horticultural practices in this region of northeastern North America, provides evidence for site orientation as an instrument for documenting settlement and subsistence change.

Dincauze, Dena F. (University of Massachusetts/Amherst, Department of Anthropology, Amherst, MA 01003)

Northeastern Paleoindian Travel Routes

The central Great Lakes stylistic seriation for fluted points, combined with new evidence from petrology, geochronology, and geomorphology, enables revision and redating of models for initial Paleoindian entry into the deglaciated Northeast. The longstanding notion of people following river valleys eastward into New England from the Hudson Valley area is replaced with a route leading people northeastward along periglacial lakes, thence turning south from northern New Hampshire and central Maine into early post-glacial peninsular New England. Multidisciplinary research results support vigorous new models of resource strategies, population distributions, chronology and spatial relationships for early occupation of the area.

Dirig, Robert (Cornell University, Bailey Hortorium Herbarium, Ithaca, NY 14853)

Celebrating New York's "Butterflies of Passage"

The movements of migratory insects are often mysterious. Although the Monarch's dramatic yearly migration is well known, seasonal movements of several other butterflies were not properly interpreted until recently. These now familiar annual migrants include the Red Admiral, American and Cosmopolitan Painted Ladies, Questionmark, Comma, and Alfalfa Butterfly. In upstate New York, immigrants begin to appear early in May, produce 2–3 generations with us, and their offspring return south in autumn. This movement pattern allows migrant species to exploit abundant summer food resources that lie north of where they can survive the winter. Their larval hosts include milkweeds, elms, thistles, everlastings, nettles, mallows, and legumes. Several of these plants prefer limy soils, which often concentrate in stream corridors and lake

basins. Such naturally open havens also support abundant nectar flowers and mudflats for adult feeding, and serve as major migration routes. Migratory butterflies are versatile generalists, except for the relatively specialized eastern Monarchs that must reach their Mexican enclaves to survive the winter. A dozen additional butterflies that inhabit the Southeast (including Buckeye, Cloudless Sulphur, and Variegated Fritillary) regularly straggle into New York in late summer, but do not return before frost. Mourning Cloaks migrate south in autumn, but their reappearance in spring is not well understood. Milbert and Compton Tortoiseshells undergo more mysterious movements. Five of the seven recognized annual migrants listed above may successfully overwinter in the slightly warmer climate of the lower Hudson valley and Atlantic Coastal Plain.

Dirig, Robert (Cornell University, Bailey Hortorium Herbarium, Ithaca, NY 14853)

A Gallery of Familiar and Interesting New York State Lichens

Lichens are easily recognized by many people, but learning their names can be challenging because popular guides are unavailable. Outdoor photographs illustrate thirty distinctive New York lichens that anyone can know. Among CRUSTOSE (crust-like) species, the Yellow Bead Lichen, Map Lichen, and Pearl Button Lichen grow on rocks, the Green Smear Lichen on dead conifer stumps, and the Mealy Stubble Lichen on shaded roots of upturned swamp trees. The FRUTICOSE (shrub-like) Pink Earth Lichen and British Soldiers spread over open soil, while Common and Alpine Reindeer Lichens and the Thorn Lichen prefer pine woods or barrens on rocky and sandy substrates. Sprawling Reindeer Lichen and "Iceland Moss" thrive on humid coastal dunes, but Oakmoss and Old Man's Beard festoon trees in cooler bogs. Among FOLIOSE (leafy) species, the Wrinkled, Rough, and Furrowed Shield Lichens are common on roadside trees; Boulder Lichens grow on stone fences and bedrock; Lungwort lives in pristine alpine sites; Oakes' and Puffed Shield Lichens, Sprout Lichen, and Pine Lichen occupy bogs; and the Saucer Lichen spreads in large colonies on disturbed sand. Familiar UMBILICATE species (with a single attachment to substrate) include Smooth, Muhlenberg's, and Pennsylvania Rock Tripes and the Toadskin Lichen on cliffs and boulders. The tiny Oyster Lichen of conifer bark and the Twisted Lichen of hot, dry sites are examples of SQUAMULOSE (scaly) species. A forthcoming guide by Irwin M. Brodo will illustrate ca. 700 lichen species with exquisite color photographs, and should catalyze much interest in these beautiful symbiotic organisms.

Ducey, Peter K., John Sternfeld, and Kevin A. Douglass (State University of New York at Cortland, Department of Biological Sciences, Cortland, NY 13045)

Amphibian Distributions and Embryonic Development within an Urban Wetland Ecosystem

Increasing human impacts on habitats around the world necessitate greater research efforts on the dynamics of these new ecosystems. Onondaga Lake (Syracuse, New York) is considered among the country's most polluted lakes, with toxic conditions in the water column, sediments, and tributaries that have resulted in greatly altered biological communities. We have been investigating the herpetofaunal distributions in and around the lake using a spectrum of field survey methods and have begun laboratory investigations examining toxicity of lake waters to amphibian development. We are examining toxicity to embryos of both native frogs and, using a standardized FETAX protocol, *Xenopus laevis*. Our field surveys have shown that amphibians do not occur in Onondaga Lake or its connected wetlands. However, they are able to live and breed within wetlands adjacent to, but not directly connected with, the lake. In laboratory studies we found that embryos developing in Onondaga Lake waters suffered significantly greater mortality and somewhat elevated levels of morphological abnormalities in comparison to controls.

Feinberg, Jeremy (Hofstra University, Department of Biology, Hempstead, NY 11549)

Nest Predation and Ecology of Northern Diamondback Terrapins, *Malaclemys terrapin terrapin*, at Gateway National Recreation Area

Northern diamondback terrapin (*Malaclemys terrapin terrapin*) populations currently inhabit several areas in Gateway National Recreation Area. I conducted a two-year study on these turtles, with special attention given to those found in the Jamaica Bay Wildlife Refuge, located in the Jamaica Bay, Long Island, New York. There has been little previous research conducted on terrapins at this location. Until the mid-1980s, there were no major mammalian predators inhabiting the island, which resulted in extremely low nest predation rates as well as extremely high overall hatchling survivorship rates. Permanent raccoon populations appear to have become established in the late 1980s and early 1990s. Since that time, population levels have increased while overall hatchling survivorship has decreased. I counted 1,319 depredated nests at the refuge in 1998 and 1,822 in 1999. I also found 30 dead adult females during the study period, some of which appeared to have been attacked by raccoons. Predation rates were calculated by marking and following the progress of 77 nests. The shift from low nest predation to high nest predation over the last 10–15 years has brought the long-term sustainability of this terrapin population into question. The long-term implications of such predation pressures, both on nests and adults is still unclear.

Finton, Andrew D. (New York Natural Heritage Program, Latham, NY 12110)

Ecological Communities of the Hudson River Valley

The New York Natural Heritage Program is conducting an inventory of rare plants and animals, and rare and exemplary ecological communities, within the 14 counties bordering the Hudson River estuary. New York State Department of Environmental Conservation provided funding for this project from the Environmental Protection Fund through the Hudson River Estuary Program. This presentation discusses ecological community inventories. Survey sites are determined by reviewing existing Heritage Program data and literature, interviewing local naturalists and scientists, and analyzing aerial photography and geology and soil maps. Communities are surveyed using standard methodologies developed by The Nature Conservancy and the NY Heritage Program.

Occupying 4.2 million acres (one sixth of NY state) the diverse study area contains at least 50 of the 106 terrestrial and palustrine communities found statewide. Globally rare communities include pitch pine-scrub oak barrens, Serpentine barrens, and inland Atlantic white cedar swamps. Numerous rich fens and swamps, important state-rare communities, are found in calcareous valleys. The chestnut oak forests of the Hudson Highlands are the largest in the state. Embedded within these are exemplary pitch pine-oak-heath and red cedar rocky summits. The slopes and summits of the Catskills contain outstanding beech-maple, hemlock, spruce, and fir dominated forests. The Rensselaer Plateau contains boreal communities such as inland poor fens, dwarf shrub bogs, spruce flats, spruce-fir swamps, and sedge meadows that are more typical of the Adirondack Mountains. The Hudson Valley also contains numerous examples of floodplain forests and red maple-hardwood swamps. There are excellent maple-basswood forests, calcareous cliffs, and calcareous talus slope woodlands along the Helderberg escarpment.

All significant community occurrences are entered into the Natural Heritage database and occurrence boundaries are mapped and digitized. Data from this project are utilized for conservation planning, protection, monitoring, and management efforts and for environmental review.

Frink, Douglas, and Allen **Hathaway** (Archaeology Consulting Team, Inc., 57 River Road, Suite 1020, Essex Junction, VT 05452)

Behavioral Continuity on a Changing Landscape: Late Pleistocene-Early Holocene Landscapes in the Champlain Valley of Vermont

For the past 20 years, the dominant locational model for early sites in the Champlain Basin has focused on the margins of the Champlain Sea. This model is based on several assumptions:

- 1) post glacial weather patterns underwent a slowly moderating evolution between 14,000 to 9,000 ybp.
- 2) the margins of the Champlain Sea provided open terrain for hunting large ungulates, and proximity to estuarine resources.
- 3) the Champlain Sea constituted the dominant geomorphologic feature during earliest human colonization.

Recent research on paleoclimates, colonization of the western hemisphere, and geomorphology of the Champlain Basin challenge these assumptions, and suggest an alternative model demonstrating continuity between early and later Native American site locations.

Frolich, Karen L. (New York State Biodiversity Research Institute, New York State Museum, Albany, NY 12230, and University at Albany, State University of New York, Department of Biological Sciences, Albany, NY 12222), and George R. **Robinson** (University at Albany, State University of New York, Department of Biological Sciences, Albany, NY 12222)

Acid Deposition and Community Structure of Larval Odonata (Dragonflies and Damselflies) in Eastern New York State

Larval odonates are aquatic generalist predators in the littoral zones of lakes and ponds. Many species can occur in the same body of water, and the species assemblage present in a given pond may reflect a variety of factors, including anthropogenic influences such as acid deposition. We used a collection of benthic macroinvertebrates with associated water chemistry databases from the Adirondack and lower Hudson regions, collected by the Adirondack Lakes Survey Corporation, to examine invertebrate community structure with emphasis on the role of anthropogenic inputs. Larval Odonata were removed from benthic macroinvertebrate samples of 460 ponds from the Mohawk-Hudson, St. Lawrence and Lower Hudson watersheds in New York State. Principal components analysis (PCA) of the water chemistry and other selected environmental factors indicate that the water bodies sampled can be grouped on the basis of acidity and, to a lesser extent, nutrient enrichment. However, although frequency distributions of pH values were similar in Adirondack and lower Hudson water bodies, acid neutralizing capacity (ANC) was greater on average in lower Hudson samples. Odonate communities determined from Adirondack samples appeared to be strongly differentiated in relation to water properties associated with acidification. In part, this appears to be an indirect interaction, mediated by insectivorous fish. In contrast, analyses of the lower Hudson samples showed less evidence of odonate community structuring, with the exception of a significant relationship between habitat heterogeneity (macrophyte structural diversity) and species diversity. These results indicate a potential effect of acid deposition that has not been previously identified.

Gage, Stuart H. (Michigan State University, Department of Entomology, East Lansing, MI, 48824), Scott A. **Isard** (University of Illinois, Urbana, IL), and Manuel **Colunga-G.** (Michigan State University, East Lansing, MI, 48824)

Ecological Scaling of Aerobiological Dispersal Processes

A variety of organisms change their geographic locations during their life history, and many use the atmosphere to accomplish this shift. As these organisms move, they experience meteorological and ecological conditions that occur at a wide range of spatial and temporal scales. We present an ecological scaling approach that integrates concepts and elements of spatial and temporal scaling to understanding aerobiology and provide examples of the ecological scales important to the long-distance aerial movement of organisms and associated biological events and processes. An operational framework for ecological scaling of long distance biota movement is achieved by linking spatially-static ecoregion classification systems with temporally-dynamic measures of vegetation phenology. The ecoregions provide ecological boundaries for the phenological dynamics of plants. We argue that the correlation of the life histories of species, especially the timing of take-off, to ecosystem phenology through meteorological-based variables and indices (e.g., degree days and moisture indices), allows for dynamic characterization of source ecosystems and can be used to parameterize atmospheric models to forecast the flow of biota in the air.

Gall, Wayne K., and Marc C. **Potzler** (Buffalo Museum of Science, Division of Invertebrate Zoology, Buffalo, NY 14211)

McLean Bogs Revisited: Changes in the Caddisfly (Trichoptera) Community, 1924–1998/99

In 1924, Charles K. Sibley conducted what was likely the first biodiversity survey of caddisflies in North America, at a site in Tompkins County, NY, now known as McLean Bogs Nature Preserve. The 100-acre preserve harbors a diversity of aquatic habitats including a fen meadow, sphagnum bog, minerotrophic pond, and woodland streams fed by calcareous springs. The objective of the present study was to determine if the composition of caddisfly species has changed at this site over a 65-year period, during which it was maintained in a wild state. Sibley (1926) reported approximately 70 species of caddisflies in 18 families, when interpreted on the basis of modern (2000) nomenclature. The most diverse family was the Limnephilidae, represented by 20 species. The collecting methods employed by Sibley were hand-picking, nets, tent traps, light traps, and rearing cages. In the present study, adults were collected using mercury vapor and ultraviolet lights at five locations during 32 nightly visits between May 1998, and September 1999. Preliminary results indicate that a great majority of the species reported by Sibley are extant at McLean Bogs. Although Sibley reported taking large series of *Leptophylax gracilis* Banks at light in 1924, we did not observe this elusive and enigmatic limnephilid during our study.

Gauthreaux, Jr., Sid A. (Clemson University, Clemson, SC 29634)

Bird Migration: Animal Behavior at Large Spatial Scales

Traditionally studies of animal behavior have concentrated on relatively small-scale aspects of behavior (e.g., territories and home ranges) and neglected the large-scale spatial and temporal patterns of behavior. Likewise studies have focused on the individual or a relatively small group of individuals with few studies devoted to large assemblages of the same species or mixtures of different species. In this lecture

I stress the usefulness of the nonexperimental, macroscopic approach to the study of animal behavior. Few studies have attempted to analyze bird migration patterns on a regional or continent-wide scale. With the use of 164 new doppler weather surveillance radars in the United States, I have been able to examine the large-scale temporal and spatial scales of bird migration with reference to timing, duration, and direction. Atmospheric processes play an important role in shaping these patterns. As James H. Brown (1995, *Macroecology*, Chicago) has stressed the macroscopic approach “can give insights into the processes that produce these patterns that cannot be obtained from controlled manipulative experiments.”

Gibbs, James P. (College of Environmental Science and Forestry, State University of New York, Syracuse, NY 13210), and Alvin R. **Breisch** (New York State Department of Environmental Conservation, Division of Fish and Wildlife, Delmar, NY 12054)

Climate Warming and Calling Phenology of Frogs near Ithaca, New York, 1900–1999

Temperature strongly influences reproduction of frogs, particularly the dates of emergence, initiation of calling, and spawning. Between 1900–1998 maximum monthly temperatures near Ithaca, New York, have increased by 25% during March, 15% during April, 7% during May, and 3% during June, the primary months of amphibian breeding activity. Earliest dates for calling frogs were compared between those recorded by A.H. Wright from 1900–1912 near Ithaca and those recorded from 1995–1999 by the New York State Amphibian and Reptile Atlas Project for Tompkins, Cortland, and Schuyler Counties. Spring peepers are now calling about 16 days earlier, wood frogs 11 days earlier, and gray treefrogs 11 days earlier than in 1900–1912, whereas first calling dates of American toads, green frogs, leopard frogs, and bullfrogs are unchanged. These data indicate that the spring and early summer climate has warmed substantially in central New York State during this century and that the onset of calling period for some frog species has been affected. In that not all species were affected in the same manner suggests that calling may not be initiated by temperature for all species. Temperature change may have other significant effects on wildlife that have not yet been recognized.

Goldman, Douglas H. (University of Texas, Section of Integrative Biology, Austin, TX 78712), Mark W. **Chase**, Michael F. **Fay**, (Royal Botanic Gardens, Jodrell Laboratory, Molecular Systematics Section, Kew, Richmond, Surrey, TW9 3DS, England), and Robert K. **Jansen** (University of Texas, Section of Integrative Biology, Austin, TX 78712)

Post-glacial Gene Flow in *Calopogon tuberosus* (Orchidaceae)

Calopogon tuberosus is a terrestrial orchid species native to bogs, fens, moist savannas and prairies throughout eastern North America. Numerous populations were sampled throughout the range of this species, and were used in two DNA studies. Chloroplast restriction fragment length polymorphisms (RFLPs) and nuclear amplified fragment length polymorphisms (AFLPs) were used to detect genetic variation in *C. tuberosus*. RFLP changes were mapped geographically, and neighbor joining distances were calculated for AFLPs. Patterns of possible gene flow are indicated by these data, suggesting certain migration routes following the last glaciation, these routes being correlated with dominant weather patterns. Furthermore, these data suggest that more than one glacial refugium was present for *C. tuberosus*.

Gregory, Shari K., and Anna M. **Stalter** (Cornell University, Department of Natural Resources, Ithaca, NY 14853), Milo E. **Richmond**, Charles R. **Smith** (Cornell University, NY Cooperative Fish and Wildlife Research Unit, Department of Natural Resources, Ithaca, NY 14853), Magdeline **Laba**, Stephen D. **DeGloria**, Stephen D. **Smith**, Danielle E. **Ogurcak** (Cornell University, Cornell Institute for Resource Information Systems, Center for the Environment, Ithaca, NY 14853), Jeff **Fiore**, Jennie L. **Braden**, and Elizabeth A. **Hill** (Cornell University, Department of Natural Resources, Ithaca, NY 14853)

A Recent Assessment of Land Cover and Vegetation Classification for New York State

The NY Gap Analysis Project recently produced a digital land cover map for NYS including 31 vegetation and land-use classes. We present the map, the classification used to prepare the map, and summary statistics from the map. The map, created as a step in conducting Gap Analysis for NYS, can be used for a variety of natural history investigations. For example, small intensively studied areas can be compared with surrounding areas, and questions regarding habitat fragmentation and other spatial relationships of floral and faunal distributions can be explored.

The map was classified using a set of vegetation/land use classes we developed by incorporating a variety of classifications currently available for NYS. We modified descriptions of plant communities in the Natural Heritage Program/New York State Department of Environmental Conservation publication *Ecological Communities of New York State*. These changes were necessary due to the geographical scale at which we mapped the state (4 ha. MMU), our ability to distinguish cover types using Landsat-5 Thematic Mapper satellite imagery, and field data. We also incorporated classes for water, cultivated, barren and urban categories. The resulting classification system follows the physiognomic hierarchy of the National Vegetation Classification System (NVCS). This global system, adopted in 1973 by UNESCO, has been modified for application to the US. The Nature Conservancy and the Natural Heritage Network have been working to refine the NVCS system in recent years with partial funding supplied by Gap. We describe the hierarchy of the NVCS system and how we used it. The NVCS is intended to provide a consistent classification hierarchy that will allow independent land cover classifications to be combined and contrasted more easily. The NY Gap classification is designed to blend with existing and future vegetation classifications in NYS and in neighboring states.

Halliwell, David (Maine Department of Environmental Protection, Division of Environmental Assessment, Augusta, ME 04333)

Fish Assemblages in Maine TMDL Lakes: Rich Lake—Poor Lake?

Maine has over 5,000 lakes—which naturally vary according to trophic state, color, size, depth, and elevation. A small percent of these lakes are culturally-induced nutrient enriched waters, and are included on US-EPA's 303(d) listing of the Clean Water Act. By definition, these waters do not attain state defined water quality standards and require the development of Total Maximum Daily Loads (TMDLs) for total phosphorus. Within TMDL lakes—and based on historical Maine Department of Inland Fisheries and Wildlife fishery accounts—total non-salmonid fish species richness ranges from 10 to 17, with a mean of 13 total fish species per lake. Endemic native fish species richness, exclusive of introduced (natives and exotics) and transient fish species, is much less (50% or less). TMDL lakes typically support a diverse assemblage of five to seven native warmwater species, including—pumpkinseed, yellow perch, brown bullhead, white sucker, and chain pickerel—sometimes in association with redbreast sunfish and/or banded killifish (50–60%). TMDL lakes also usually support an assemblage of three to four introduced predatory

fish species, including smallmouth and largemouth black bass and white perch—and in a few cases, black crappie—often in association with stocked forage fish species (i.e., landlocked rainbow smelt and alewife). The transient American eel is also commonly listed as a resident of Maine's TMDL lakes. With the exception of golden shiner (widely introduced as a baitfish species) and blacknose dace (primary stream species), native minnows were generally absent from most TMDL lakes studied. Fallfish, common shiner, and creek chub occur in less than 20% of Maine's TMDL lakes. Preliminary analysis of comparable non-TMDL lakes indicate similar total fish species richness, but with: (1) a greater diversity of coldwater fishes (salmonids, sculpin, burbot, longnose sucker) and minnow species; and (2) an overall reduction in the proportion of predatory fish species present, both native and introduced.

Hallock, John L. (College of Environmental Science and Forestry, State University of New York, Syracuse, NY 13210)

Watershed Characteristics as Indicators of Stream Macroinvertebrate Community Structure

Substantial research has indicated how stream macroinvertebrate communities vary with changes in environmental conditions such as velocity, substrate size-class, insolation, presence of leaves and organic matter, etc. These factors are determined by the watershed—its slope, geology, land use, vegetation type, and climate. Thus, macroinvertebrate community structure and production should be just as characteristic of the watershed as its trees, slopes and soils. While traditional benthic invertebrate surveys yield very useful information on system productivity and health, they can be time consuming and require trained taxonomists. I am researching the feasibility of using relatively easily measured watershed parameters as indicators of benthic community structure and production in lower-order NY streams. To do this, I am analyzing couplets of stream reaches that are similar with the exception of the watershed feature whose effect I am testing. The tested features include stream “flashiness” (frequency, duration and magnitude of peak flows), position relative to a top-release reservoir, dominant forest type, soil thickness and permeability, and slope. These features can all be determined from maps, digital data, USGS gage records, and/or brief visits. At each site I collect invertebrates and benthic organic matter from riffles using a Surber sampler, and data on water velocity, substrate, linear density of detritus-retaining structures (e.g. debris dams, snags), and water quality. Analysis involves identification of specimens to genus, assignment of functional feeding groups (FFG), and measurement of ash-free-dry weight of FFGs and benthic organic matter. For watersheds differing in only one key feature, differences in community structure and biomass should indicate the effect of the differing watershed feature. Preliminary results will be available for the conference.

Hamilton, Nathan D. (University of Southern Maine, Department of Geography-Anthropology, Gorham, ME 04038), and **John P. Mosher** (Archaeology Research Consultants, Inc., Ellsworth, ME 04605)

Late Woodland Subsistence in Western Maine

Excavation of coastal sites in Casco Bay, Maine have isolated several Late Woodland components with diverse subsistence remains and diagnostic ceramics and lithics. Utilizing faunal and floral analyses, eight Late Woodland components are described and discussed in terms of species utilization and seasonal scheduling within the bay. Subsistence in island, stream inlets, and estuary inlet habitats are compared for various ceramic periods. External correlations for the coastal assemblage give detailed coverage of adjacent lowland and upland riverine settings in the Western Gulf of Maine.

Harper, Lee H. (St. Lawrence Bird Observatory, Massena, New York 13662), and D. V. Chip **Weseloh** (Canadian Wildlife Service, Downsview, Ontario M3H 5T4, Canada)

Colonial Waterbirds of Lake Ontario and the St. Lawrence River: Population Trends and Competition for Nest Sites

Colonial waterbird populations have changed dramatically on Lake Ontario and the St. Lawrence River in the last few decades. In the last 20 years on Lake Ontario alone, ring-billed gulls increased from 68,132 to 211,514 nests, herring gulls increased from 448 to 1,496 nests, great black-backed gulls increased from 0 to 33 nests, and Caspian terns increased from 52 to 2,212 nests. Increasing gull populations caused a decline of almost 90% in the populations of common tern which fell from approximately 18,000 to 2,000 nesting pairs in the last 40 years. Gulls forced terns from nesting on natural islands to man-made sites in the early 1980's on the St. Lawrence River and in the 1990's on Lake Ontario. On the St. Lawrence River, tern productivity averages 1.7 to 1.9 chicks per pair on artificial sites and 0.0 to 0.3 chicks per pair on unmanaged natural sites. From 1982 to 1999, the proportion of total nests on artificial sites increased from 37% to 80% and these sites fledged approximately 95% of all chicks produced. Recent Lake Ontario and St. Lawrence River census data (1998–1999) indicate populations of the threatened common tern are dependent on man-made nesting sites and the total number of breeding pairs continues to decline. The creation of artificial nesting islands and the use of floating tern nesting rafts may help reduce additional population declines in common terns.

Hart, John P., and Christina B. **Rieth** (New York State Museum, Research and Collections Unit, Albany, NY 12230)

Early Late Prehistoric (A.D. 700–1300) Subsistence and Settlement Change in the Northeast

The period from A.D. 700–1300 is often characterized in the literature as one of major changes in subsistence and settlement systems throughout the Northeast. Recent research suggests that these changes were not uniformly distributed either spatially or temporally and that their causes were varied. Of particular importance is the documentation of intra-regional variation. This symposium is designed to highlight recent theoretical and empirical developments in the study of Northeast settlement systems and subsistence economies as well as provide a forum in which the diverse practices of these prehistoric populations can be discussed.

Hecht, Jack H., and Donald H. **Henshaw** (Lawler Matusky and Skelly Engineers LLP, Pearl River, NY 10965)

In-field Surgical Procedures for Smallmouth Bass Radiotelemetry Studies

Few published accounts of radiotelemetry studies provide complete descriptions of the procedures used to surgically implant radio-transmitters in smallmouth bass. We describe in-field surgical procedures used to implant radio-transmitters (14–15 g) into the abdominal cavity of sixty Hudson River estuary smallmouth bass (> 350 mm, TL; > 510 g) during October 1999. Fish were collected by electrofishing and anaesthetized prior to surgery using a 104 mg/l solution of clove oil. When completely sedated (5–10 minutes), fish were placed dorsal side down on a portable surgical table. A water bath and small submersible pump was used to immerse fish without exposing surgical incisions to water, while providing continuous

water to gills. Scales were removed and a topical antiseptic applied along the length of the planned incision. A longitudinal incision (25 mm in length) through the skin was made posterior to the ventral fin, approximately 30 mm above the ventral axis, using a No. 21 scalpel blade. The incision was held open using forceps and a No. 10 scalpel blade was used to cut the muscle and penetrate the peritoneum. A hollow-stemmed needle (1.25 mm ID) was then used to create a small circular opening approximately 40 mm posterior to the ventral incision. The wire antennae was threaded through the incision (and needle) and out the abdominal cavity. The hollow-stemmed needle was shielded using teflon tubing (3.17 mm ID) to avoid piercing vital organs. Four to six simple interrupted sutures were made using absorbable (Vicryl) or non-absorbable (nylon) suture material to close and secure the incision. A cyanoacrylate adhesive was applied over both incisions and allowed to dry. Surgery lasted 12–20 minutes and fish were released immediately. Post-operative tracking observations indicated that 58 of the 60 tagged fish were believed alive five months following surgery.

Hecht, Jack H. (Lawler, Matusky & Skelly Engineers LLP, Pearl River, NY 10965), Alvin R. **Breisch** (New York State Department of Environmental Conservation, Division of Fish, Wildlife and Marine Resources, Delmar, NY 12054), and Rosalind **Dickinson** (Mohonk Preserve, New Paltz, NY 12561)

Seasonal Activity and Upland Movements of the Northern Cricket Frog

The northern cricket frog, *Acris c. crepitans*, has long been considered a species restricted to wetland habitats. Survey efforts since 1989 have documented seasonal activity patterns that include observations that suggest there is an upland component to their habitat requirements. Breeding season, as defined by the period when males are heard chorusing, begins in late April and continues until mid July. Larval forms were found from late June through September, and newly metamorphosed juveniles are found during September and October. There appears to be staging areas where some northern cricket frogs congregate along shorelines in early September before migrating to upland sites from mid September to early October. Incidental observations since 1995 have identified movement corridors at four of New York's largest populations. Northern cricket frog have been observed moving along woods roads, stream corridors, and overland towards and away from known breeding sites during spring and fall. Movements appear to be unidirectional, towards wetlands in the spring and away from wetlands in the fall. This suggests that at least a portion of the population may be overwintering at upland sites. Movements greater than 150 m from wetland borders have been observed. The implications of these movements to the protection of an endangered species (listed as endangered in December 1999, previously listed as threatened) are discussed. Documenting these movements is essential in defining critical habitats and high use corridors as well as understanding the effects of proposed developments.

Hoffman, Curtiss, and David **Goncalves** (Bridgewater State College, Department of Sociology and Anthropology, Bridgewater, MA 02325)

Digging in the Field of Dreams: Archeology at the Middleborough Little League Site

The Middleborough Little League site is located in glaciated southeastern Massachusetts, on a kame terrace overlooking the Nemasket River, a major thoroughfare between the Taunton River and the Lakeville Ponds. Soils are defined as Gloucester Stony Sandy Loam and are extremely rocky. Glacial action deposited vast quantities of unsorted till derived primarily from the Boston Basin, including volcanics (rhyolite and porphyry), argillite, hornfels, quartz, and quartzite. There are also numerous spalls of local bedrock,

a coarse-grained arkose. Field testing and statistical modeling show that pre-European inhabitants of the site relied very heavily upon these materials rather than engaging in long-distance direct procurement or trade. Trade items are almost exclusively related to ceremonialism: paintstones, biterminated quartz crystals, etc. This research suggests that archaeologists working in glaciated areas should carefully observe the distribution of lithics present in the glacial drift at the site before formulating hypotheses of medium to long-distance trade.

Hunsinger, Todd W. (New York State Museum, Research and Collections Unit, Albany, NY 12230)

The Herpetological Contributions of Sherman Bishop to New York State

Sherman Chauncey Bishop (1887 to 1951) served as Zoologist at the New York State Museum from 1916 to 1928 and as Professor of Biology at the University of Rochester from 1928 to 1951. He was arguably the most influential herpetologist who worked in New York during the first half of the twentieth century. His list of publications on the herpetofauna of New York included three museum bulletins, one handbook, and no fewer than eleven journal articles. His legacy as a herpetologist is based on his exhaustive research of salamanders. This knowledge led to the publication of *The Salamanders of New York* (1941) and *Handbook of Salamanders* (1943). If circumstances had been different, the list of publications would have been much larger and extended his legacy beyond this single group to include field guides of Amphibians and Reptiles for New York and North America. Bishop was considered to be a very knowledgeable naturalist, publishing more than 100 papers on spiders as well as working on the New York Watershed Surveys for seven summers. Bishop was also a very vocal conservationist. In publications and private letters he expressed concerns about the destruction of habitats and the decline of species. He was also a very active member of the Bergen Swamp Preservation Society.

Hunsinger, Todd W. (New York State Museum, Research and Collections Unit, Albany, NY 12230)

Herpetology at the New York State Museum, the first 100 years (1840 to 1940)

Many significant contributions and publications concerning the species native to New York, their distribution, and life histories came out of the New York State Museum during the first 100 years of existence (1840s to 1940s). The New York State Museum or Zoologists of the Museum produced five major and fifteen minor publications on the herpetofauna of the state during this time. Three individuals and their contributions figure prominently during this period, James Dekay (1792–1851), Spencer Baird (1823–1887), and Sherman Bishop (1887–1951). The physician and naturalist James Dekay was commissioned by the New York legislator in 1837 to conduct the zoological portion of the state natural history survey. His 1842 publication was the first and, to date, only composite account of the herpetofauna of the State based on original work. Baird, who served as the first Assistant Secretary of the Smithsonian Institution, made frequent trips to New York beginning in 1847. He published *The Serpents of New York* (1854) as well as adding the Redbelly Snake (*Storeria occipitomaculata*) to the herpetofauna of the State. Sherman Bishop served as Zoologist at the State Museum from 1916 to 1928. During that time he published or conducted the research for publication of three major and six minor publications on the herpetofauna of New York. His work focused on the development, life history and distribution of salamanders common to New York. Other publications of the State Museum include John Gebhard's additions of the Massasauga (*Sistrurus catenatus*) and Mudpuppy (*Necturus maculosus*) to the state list, Eckel and Paulmier's (1902) *Catalogue of New York Reptiles and Batrachians* and Wallace's (1904) *Snakes of Rockland County*.

Hunt, David M. (New York Natural Heritage Program, Latham, NY 12110)

Applying Quantitative Heritage Methodology to New York Aquatic Communities

Standardized quantitative natural heritage methodology has been applied to description and comparison of terrestrial and palustrine natural communities by the New York Natural Heritage Program (NYNHP) since the early 1990s. In recent years these methods are being increasingly applied by NYNHP to aquatic communities, in response to greater awareness of threats to aquatic systems. Quantitative methods standardized nationally throughout the heritage network include detailed plots and abbreviated observation points describing the composition and structure of flora and fauna and physical features including soil, hydrology and geology. NYNHP has applied these methods to aquatic communities in several ecological systems including lacustrine, riverine, marine and estuarine systems. Lacustrine efforts have been focused on Lake George. Methods were applied to littoral portions of the lake, with dominant species groups including submergent vascular plants, algae, molluscs and fish. Recent projects in the lake include the classification of 9 littoral associations throughout the lake and mapping of these associations in 7 bays. Association maps, created with GPS assistance, are being used to predict the distribution of rare species and serve as baseline data to monitor impacts from lake eutrophication, exotic plant invasion, and application of the aquatic herbicide SONAR. Riverine efforts have been focused on rocky headwater streams on Tug Hill. Methods were applied to riffle, run and pool microhabitats. Dominant species groups include bryophytes, algae, fish and freshwater macroinvertebrates. Marine and estuarine efforts have been focused on marine eelgrass meadows and tidal creeks in Peconic Bay. Dominant biota include eelgrass, widgeon grass, marine algae, fish, crabs and molluscs.

Hunter, John C. (State University of New York College at Brockport, Department of Biological Sciences, Brockport, NY 14420)

The Spread of Exotics into Forest Remnants in Brockport, NY

During the last sixty-one years, exotic species have become substantially more widespread in the forest remnants of Monroe County, New York. In 1938, all patches of forest in the County were described and, for each forest, a list of woody species was compiled. In 1999, I re-surveyed all of these forests that were in the vicinity of Brockport, New York ($N = 31$). Sixteen exotic species of woody plants were present in these forests in 1938. However, only four of these species were present in more than 10% of the forests. As a consequence, a forest contained, on average, only two exotic species. In 1999, there were still sixteen species of woody exotics. However, ten species were now in over 10% of the forests. This expansion of the local distribution of exotic species raised the richness of the exotic flora in individual forests: On average, a forest contained five species of woody exotics in 1999, over twice the 1938 average. Currently, exotics do not dominate the understory of most forests. In only three out of thirty one forests did exotics have greater than 10% cover in the understory. However, several exotic species frequently dominated patches .01 to .1 ha in area. Because these exotics have recently become more widespread in these forest understories, and are capable of dominating understory habitats, they may come to occupy substantially larger areas of habitat in the near future.

Joachim, Andrew G. (Freelance Mammal Ecologist, 29 Jon Ridge Road, Lake Placid, NY 12946), and Lisa **Kniffin** (Bethlehem Central High School, Science Department, Delmar, NY 12054)

Observing Mammals in Roadside Habitats of Albany County, New York

To find native species of mammals or identify their habitat in the wild, it becomes necessary to increase the probability of observing them. This can be for educational reasons, distributing oral vaccines or other purposes. As a regular survey, this study collected data on mammal sightings as well as roadside habitats, weather, elevation and temporal information. The survey followed a specific route in southern Albany County, New York, on a nearly weekly basis from November 1990 to December 1996. It involved mainly afternoons and evenings but included other times of the day. Habitat data concentrated on successional seres and plants in communities that the animals frequented. Mapping and statistical analysis of findings leads to improved probabilities for observation and habitat identification. Identifications included fifteen mammals to species, three to genus (*Peromyscus*) and bats to order (Chiroptera) in their normal habitats.

Johnson, Anne M. (Colorado State University, CEMML, Fort Collins, CO 80523), and Paul G. **Zang** (Natural Resources, Environmental Division, Fort Drum, NY 13602)

Ecological Communities of Fort Drum

Restricted access to military lands and tight control over land use has resulted in the preservation and maintenance of some unique community types across the country. Fort Drum, a 107,000-acre military installation in northern New York, contains some ecological community types of special interest. Extensive open areas (originally hayfields) on the clay soil along the western boundary of the post support robust populations of grassland birds. Grasslands on sands deposited where the Black River poured into Glacial Lake Iroquois also support grassland bird species, and a primarily native plant component. Maple basswood rich mesic forests are present in the central and northeastern portions, and dwarf shrub bogs, northern white cedar swamps, and fens are found scattered throughout the post. Pre-settlement land characteristics taken from original land survey notes give an indication of the historic plant communities and landscape. Fort Drum was heavily forested at the end of the 18th century, and subsequent management practices (logging, fires, and farming) resulted in the current landscape, including the unique successional northern sandplains grassland community. Military use has maintained these grasslands and their associated oak savanna type woodlands. Natural and cultural resources personnel at Fort Drum support a diverse and intensive program, from bat and bird surveys to vegetation analysis, wetland construction, and forest management; all in a cooperative spirit with the military mission.

Jones, Brian D. (Pequot Museum and Research Center, Mashantucket, CT 06339)

Life in a Post-glacial Landscape Settlement-subsistence Change during the Pleistocene-Holocene Transition in Southern New England

Two recently discovered sites on the Mashantucket Pequot Reservation have changed the way archaeologists understand the effects of the Pleistocene-Holocene transition on the region's early hunter-gatherer population. The sites lie within 100 meters of one another along the margins of a glacial lake basin that today holds the Great Cedar Swamp. The first site, Hidden Creek, is a small, short-term Late Paleoindian

hunting camp occupied at end of the Younger Dryas about 10,200 radiocarbon years ago. The second, Sandy Hill, is a large Early Archaic seasonal camp repeatedly occupied between 9,100 and 8,500 years ago. The millennium separating the use of these two adjacent sites was marked by dramatic changes in both climate and the environment. During this period the Great Cedar Swamp was shifting from a shallow, open water body to a diverse wetland that included forested, marshy and open microhabitats. Evidence from the sites indicates that these changes had a profound effect on the lives of people living at Mashantucket and adjacent Southern New England at this time. In particular, adaptation to the developing post-glacial landscape appears to have resulted in changes in patterns of site re-use, duration of occupation, group size, residential mobility, and prey choice.

Juli, Harold D. (Connecticut College, Department of Anthropology, New London, CT 06320)

Subsistence, Settlement, and Social Organization in Southern New England, A.D. 700–1300

This paper reviews the evidence of prehistoric subsistence, settlement, and social organization in Southern New England from A.D. 700–1300. In Southern New England this periodicity bridges the late Middle Woodland and early Late Woodland stages, eras where local groups were beginning to undergo changes leading to the complexity of economic and social forms encountered by Europeans in coastal regions during Final Woodland and contact times. Recent studies of economy, early domesticates, site attributes, and local habitats are reviewed. These data are then compared to models of social organization, focusing especially on the evolution of chiefdom-level complexity recently suggested for Late Woodland societies in this region.

Karrmann, David E. (American Museum of Natural History, Education Department, New York, NY 10024)

Snakes of Ward Pound Ridge Reservation—Human and Successional Impacts

Ward Pound Ridge Reservation, in northeastern Westchester County, encompasses 4700 acres rich in habitat diversity, and plant and animal communities. Historically the Reservation has been home to approximately fourteen species of snake. A fortuitous combination of forests, fields, high rocky ridges with the necessary southern and western exposures, plentiful riparian habitat, glacial sand deposits, and abundant ephemeral pools, provide for healthy populations of Northern Black Racers, Black Rat, Eastern Garter, Eastern Hognose, Eastern Worm, Northern Copperhead, Northern Ringneck, and Northern Water snakes. Eastern Milk, Eastern Ribbon (locally endangered), and Northern Brown Snakes are also present. Historical populations of Eastern Smooth Green and Timber Rattlesnakes are now absent. Though reported, the historical presence of the Northern Redbelly is in doubt. Combinations of human impacts and successional events have, and continue to, alter population dynamics. The most serious threat to the park's environmental integrity comes from poachers who collect plants and animals for personal gratification or profit. Though the indiscriminate spraying of pyrethroids to combat mosquitoes, now resurrects the specter of the extensive damage caused by DDT and SEVIN in the past. The diverse and in many cases, abundant, populations of snakes, offer the potential for many studies into the behavioral and successional ecology of these animals and their ability to coexist in relative proximity to increasingly urbanized human populations. The protected status of the parkland and the presence of county conservation staff suggests the feasibility of establishing long term population studies using a combination of radio telemetry and PIT (Passive Integrated Transponder) tagging. Careful stewardship and balanced habitat preservation may aid the recovery of depressed populations.

Kelley, Alice R. (University of Maine, Department of Geological Sciences, Orono, ME 04469), and **David Sanger**, (University of Maine, Department of Anthropology and Institute for Quaternary Studies, Orono, ME 04469)

Post-glacial Development of the Penobscot River Valley: Implications for Geoarchaeology

After glaciation, landscapes and human societies developed in a dynamic environment. Environmental forces that shaped the region influenced human decisions relating to resources, shelter, and travel. Geological factors influenced site formation and preservation, shaping and potentially biasing the archaeological record. For this reason, an understanding of the post-glacial development of an area is vital to reconstructing prehistoric lifeways. The Penobscot River drainage, the largest in Maine, evolved rapidly following deglaciation, and experienced geomorphic changes associated with isostatic adjustment. Changes in relative sea level influenced river gradients. Differential tilting of the land surface altered the size of the river's drainage basin through time by altering the outlet of Moosehead Lake, Maine's largest lake. Water balance and pollen records indicate changes in annual precipitation and vegetation shaped the Late Pleistocene and Holocene environment of the region.

Kennen, Jonathan G., and Mark A. **Ayers** (U.S. Geological Survey, West Trenton, NJ 08628)

Relation of Landscape and Environmental Characteristics to Impairment of Fish Communities in New Jersey Streams along an Urban Land-use Gradient

Data on fish communities in 36 New Jersey streams were integrated with approximately 400 environmental variables to assess the effects of human alterations of the landscape on water quality. Streams were chosen to represent an urban land-use gradient, which ranged from 3 to 95 percent. Previous analyses indicated that aquatic community impairment was related to the proximity of controlling factors such as land use, population, and point sources. Weighting of newly available digital landscape characteristics such as topography, roads, and soils improved the predictive ability of the controlling factors by more accurately representing the effects of landscape position relative to hydrologic processes along land and stream pathways. Principal components analysis in combination with collinearity analysis was used to reduce the number of environmental variables. Partial indirect gradient analysis was used to restrict the effects of variability along natural gradients (e.g., climate, latitude, and drainage area). Results of multiple linear regression analyses that describe the relation between first axes scores (i.e., the hypothesized urban gradient) and landscape variables were highly significant. Results of partial constrained ordination indicated that increasing fish community impairment was related to urban-gradient variables—population density, impervious surface area/waste-water discharge, and flow/nutrient-related changes resulting from human activities. Findings from this study will help define the environmental factors that are most responsible for driving fish community response in urban settings and better identify thresholds of rapid change in fish community condition. These findings are also applicable to the TMDL process.

Knapp, Timothy D. (State University of New York at Binghamton, Department of Anthropology, Binghamton, NY 13902)

Variation in Upper Susquehanna Valley Early Late Woodland Subsistence and Settlement: A Comparison from the Chemung and Chenango Valleys of South-Central New York

Classification, one of the most basic of archaeological tools, divides time and space in a way that emphasizes homogeneity within periods and across regions. Archaeologists must avoid conflating micro-variation into an over-simplified view of the past. By probing temporal and regional diversity a more dynamic and complex Late Woodland history emerges. This paper explores early Late Woodland variability by comparing subsistence-settlement systems from two upper Susquehanna River valleys. Thomas-Luckey, an early Late Woodland village on the Chemung River floodplain, contains two longhouses and over 150 pit features. Broome Tech, a lower Chenango Valley multi-component site, contains an artifact-rich early Late Woodland midden and associated features. Comparisons will include artifacts, features, structures, and botanical remains. This paper explores functional, sub-regional and temporal processes that may account for variation between these sites. This research is one step toward understanding a dynamic Late Woodland Period.

Kosnicki, Ely (University of Connecticut, Department of Natural Resources, Storrs, CT 06269)

The Life History of the Mayfly *Siphonurus typicus* (Ephemeroptera: Siphonuridae)

Weekly samples of *Siphonurus typicus* nymphs were collected from two temporary autumnal ponds in two different watersheds in eastern Connecticut, from March to June in 1999. Individuals were graded into 11 arbitrary age classes, based on species specific developmental morphologies, as a means for displaying growth rates. Individuals attaining age class VI to XI were separated by sex. Head capsule widths were recorded to determine the change in body size as individuals passed through each age class. Nymphs hatched from January to May. Results indicate that early hatching nymphs achieve a bigger adult size than nymphs that hatch latter. Adult emergence and mating occurred from mid May to mid June. Male and female imagos were sampled, observed, and photographed during their mating ritual. Males swarm over water bodies at sunset with females entering these leks sporadically. Copulated pairs exit the swarm to complete mating, perched on nearby branches. After mating, males resume swarming while females pause for about one minute before flying to a nearby water body to oviposit. After swarming, some males dip their abdomen in the water before returning to the trees to rest until the next night. Egg bundles aestivate until winter precipitation fills the ponds.

Krebs, Robin E. (State University of New York College at Brockport, Department of Biology, Brockport, NY 14420)

Breeding Ecology of Henslow's Sparrow, *Ammodramus henslowii*, at Ft. Drum, New York

The Henslow's Sparrow lives in one of the fastest declining habitats in North America, the tall grass prairie. Concurrently, the *A. henslowii* population has declined over 68% between 1966–1991. Conservation of Henslow's Sparrows requires in-depth research into its breeding ecology, habitat selection, and how humans impact the species. For the past two years I have studied Henslow's Sparrow breeding ecology at Fort Drum, New York, an active army base supporting 10,000 troops and part of the largest breeding

population of the species in the Northeast. Abundance of Henslow's Sparrows is estimated at 37 pairs, based on forty-eight 100m, circular point count plots and four 7–12 ha study plots. Study plots were utilized to intensely monitor breeding behavior through banding, territory monitoring, nest searching, and habitat analysis. I have mist-netted and color banded 58 individuals, including 39 males, nine females, and ten juveniles. Adult site fidelity based on return rates is low, only 18.5%. In addition, only 20% of territorial males successfully fledge young. During the 1999 field season two nests were located, however only one nest survived. Discriminate function analysis and paired *t*-test suggests Henslow's Sparrows select habitat based on low shrub count and a deep litter layer. Principal component analysis suggests an inverse relationship between military impact and shrub growth. Fieldwork will continue in the spring and summer of 2000.

Kudish, Michael (Paul Smith's College, Division of Forestry, Paul Smith's, NY 12970)

8990 Years of Catskills Forests

Small, high-elevation, shallow-to-till peat bogs of the Catskills have been sampled, examined for plant macrofossils, and radiocarbon-dated for the first time. The 24 radiocarbon dates from bog bottoms range from 240 to 8990 years B.P. with a median of 3020. Such shallow depth and great age indicate a very slow peat accumulation rate, ranging from 1000 to 13000 years, averaging 6000 years, per meter. The oldest bogs are not necessarily the deepest nor are the youngest bogs the shallowest. Macrofossils of wood, twigs, bark, needles, fruits, and cones have yielded diverse floras among the bogs. In three older bogs in the western Catskills, balsam fir probably arrived shortly after deglaciation and has persisted through the present. Yet only a few kilometers further west, no record of balsam fir occurs in any of nine bogs up to 8990 years old, suggesting that this conifer had been eliminated at an early date. Red spruce was already present in the southern Catskills as early as 4960 years B.P., more than twice as long as estimated for the Adirondacks; there is no evidence that red spruce ever migrated into the western Catskills. Eastern hemlock was already present in four western Catskills bogs as long as 8990 years ago. In two bogs, hemlock disappeared sometime between 5000 and 4000 years, confirming the general "crash" in the northeastern United States. However, in the other two bogs, hemlock has been present continuously for up to 8990 years, suggesting local refugia. Yellow birch was already in existence in the Catskills at 7700 years and has continued to the present in most of the bogs.

Lee, Chang Seok, George R. Robinson, and Ingrid P. Robinson (University at Albany, State University of New York, Department of Biological Sciences, Albany, NY 12222)

Restoration Ecological Diagnosis for Conservation of the Albany Pine Bush

We analyzed vegetation structure, species composition, and population structure of dominant species in pitch pine (*Pinus rigida*) stands with different histories in the Albany Pine Bush. We also explored safe site requirements for regeneration of pitch pine. Study sites represented newly-burned stands plus stands of 4, 18, and 31 years post-fire. Reference sites were undisturbed pitch pine and aspen stands on dune tops and in ravines. Species composition was similar regardless of fire history, however structural changes in vegetation were closely correlated to post-fire duration, as vertical and horizontal growth of scrub oaks led to complex stratification. Size distribution of pitch pine showed normal distribution where seedlings and saplings were rare. In contrast, size distributions of scrub oak (*Quercus ilicifolia*) were bimodal, split into small and large individuals, the former ones were derived from old root systems. Density of pitch pine seedlings was positively correlated with blueberry (*Vaccinium*) cover and negatively correlated with cover and height of scrub oak. Change of vegetation structure, rather than species composition, appears to inhibit pitch pine stand regeneration in the absence of disturbance.

Lindberg, Allan J. (Nassau County Department of Recreation and Parks, Division of Museum Services, Muttontown Preserve, Muttontown Lane, East Norwich, NY 11732), and Lois A. **Lindberg** (Nassau County Department of Recreation and Parks, Division of Museum Services, Sands Point Preserve, Port Washington, NY 11050)

Flagg Meadow Restoration at Tiffany Creek Preserve—A Success Story

The Flagg Meadow at Tiffany Creek Preserve, Oyster Bay Cove, NY, is a high-quality example of a wet meadow community that has all but disappeared from Nassau County. Acquired by the County of Nassau with the assistance of the Long Island Chapter of The Nature Conservancy, the meadow community was rapidly being threatened by the processes of ecological succession, as woody shrubs and trees moved in. In addition, a rapidly expanding population of common reed (*Phragmites australis*), and to a lesser degree, purple loosestrife (*Lythrum salicaria*), had invaded the meadow. In 1994, a habitat restoration and management program was put into place in an effort to reverse to succession process and to control the *Phragmites* and *Lythrum* populations. During this ongoing restoration, a number of management techniques have been employed, the applications of which are discussed. Six years of management work have resulted in the restoration of the meadow to its former six-acre size. Areas once lost to ecological succession and invasives are being recolonized by native wildflowers and ferns of the wet meadow plant community. In sections of the meadow that were once dense *Phragmites* stands, Long Island rarities are reoccurring. In the spring of 1999 a population of *Platanthera flava* var. *herbiola*, an orchid species that had not been seen on Long Island since 1927 was discovered to the amazement of researchers. The *Phragmites* population which in 1997 had reduced from 390 to 75 stems per square meter, has further diminished to 0 to 8 stems per square meter in 85% of the stand. The high count is now only 18 stems per square meter in 15% of the stand. *Lythrum* control continues in spot treatments.

Lindner, Christopher (Bard College and Hudsonia, Ltd., Annandale-on-Hudson, NY 12504)

Impacts of Historical Floods on Archaeological Sites in the Schoharie Valley of New York

Drawing on Butzer's geomorphological models of accelerated soil erosion and alluvial modifications, this doctoral research draws on landscape history, flood records, and folklore. It predicts major effects on bottomland sites: unusually deep burial and site displacement, as reflected in abnormally thick overburden above relatively recent surfaces and inverse stratification, with older artifacts overlying younger items. Two sites each illustrate these impacts, including a deep Bushkill phase habitation and Castle Creek phase hearth area and colonial sites displaced or buried beneath sediments that contain prehistoric artifacts. The archaeological evidence supports evaluation of a catastrophic upset of the Schoharie's flood regime in the mid-19th century, due to changes in land use. Geoarchaeology thereby offers an explanation, in flood data and land use description, for the collapse of the New York State Thruway bridge over Schoharie Creek, which occasioned assessment of hundreds of stream crossings nationwide.

Main, Charles E. (North Carolina State University, Department of Plant Pathology, Raleigh, NC 27695), **E. Levetin** (The University of Tulsa, Faculty of Biological Science, Tulsa, OK 74104), **Z. T. Keever**, J.A. **Thurman**, and **J. M. Davis** (North Carolina State University, Raleigh, NC 27695)

Internet-based Forecasting of Spore and Pollen Dispersal

The long distance transport of plant pathogens and allergenic pollen has been documented by a number of researchers since the 1920s. Recent advances in dispersion modeling have facilitated the development of reliable forecasts to predict the long distance dispersal of bioaerosols. Internet forecasts of the continental US transport of plant pathogenic fungal spores and allergenic mountain cedar pollen are issued on a regular basis from the North American Plant Disease Forecast Center, Raleigh, N.C. for fungal spores and The University of Tulsa for mountain cedar pollen. Via a network of agricultural ground observers and Burkard samplers, bioaerosol particle release is monitored and reported. Using NOAA Air Resources Laboratory generated trajectory models (HY-SPLIT), and a new 3-dimensional particle distribution model (MASS model, Meso, Inc.), 48-hr. trajectories and their associated climatologies are analyzed and posted on forecasting homepages. Research is being conducted to better predict the maturation, quantity and timing of *Juniperus ashei* pollen released from a large area source region in Central Texas.

McCabe, Timothy (New York State Museum, Research and Collections Unit, Albany, NY 12230)

One Hundred Years on the Pine Bush

The Lepidoptera of Albany's Pine Bush was intensively studied in the 1880s by an active group of entomologists. Via a trolley, these early Lepidopterists had ready access to a station in the heart of the Pine Bush. This station was Centre, subsequently known as Karner. Intensive collecting from 1976 to the present has pushed the Pine Bush's total documented species of macrolepidoptera to 1,030. Fifty species have disappeared in the past 100 years. In recent years, 50 additional species have appeared. Of the 50 species that have been extirpated, 20 still occur to the north and 20 still occur to the south, and 8 still occur along the Atlantic coast. Two are believed extinct. A host of factors drive this change.

McMahon, Ann M. (University at Albany, State University of New York, Department of Biological Sciences, Albany, NY 12222, and Castleton State College, Castleton, VT 05735)

Jefferson's Salamander Larvae do not Affect Spotted Salamander Larvae Activity

Spotted salamander (*Ambystoma maculatum*) larvae co-occur with Jefferson's salamander (*Ambystoma jeffersonianum*) larvae in ephemeral ponds in upstate New York and Vermont. Jefferson's salamander larvae hatch earlier, grow faster and are larger than spotted salamander larvae in pond where they coexist. Jefferson's salamander larvae are intraguild predators of spotted salamander larvae. Predators have been found to affect activity levels and habitat use in larvae of some other amphibian species. This study tested for the effects of an intraguild predator on its congener. Since the presence of a predator has been found to reduce activity, particularly foraging activity, in prey species, it was predicted that spotted salamander larvae would exhibit similar alterations in behavior in the presence of Jefferson's salamander larvae. Spotted salamander larvae were set up individually and in groups in aquaria and their microhabitat positions (positions within aquaria), activity level (number of movements) and foraging behaviors (number of prey captured, time of first prey capture) were recorded for ten minutes in the presence and absence of two

caged Jefferson's salamander larvae. Groups of larvae were also tested in the presence and absence of uncaged Jefferson's salamander larvae. Spotted salamander larvae did not change their position in their aquaria, eat fewer prey, take longer to respond to prey or move less when Jefferson's salamander larvae were present. Results of this study suggest that spotted salamander larvae do not avoid Jefferson's salamander larvae and do not reduce activity in the presence of Jefferson's salamander larvae. In other larval amphibian species, reducing activity makes them less susceptible to predation, but a consequence of reduced foraging activity is decreased growth. The larval period is a critical time for growth for amphibian species and the demand for food intake in this species may outweigh any benefits from reduced exposure to predation.

Means, Bernard K. (Alexandria Archaeology Museum, Alexandria, VA 22314)

“...to reconstruct these houses of men who lived in a stone age”: Modeling Late Prehistoric Monongahela Community Organization Using Data from the Somerset County Relief Excavations

A significant accomplishment of the 1934 to 1940 Somerset County (Pennsylvania) Relief Excavations is that they completely revealed the community plans of several Late Prehistoric (A.D. 900 to A.D. 1400s) Monongahela village sites. However, the few publications resulting from these excavations were brief and largely descriptive. Their authors speculated little about the people who left behind evidence of their past lives in a myriad of post holes and pit features. This presentation will model Monongahela community organization using the differential distribution of archaeologically-recovered elements—notably traces of architectural remains and non-architectural features—from village sites excavated by the Somerset County Relief Excavations. The model will be tested using unpublished field data from the Fort Hill Village site, which consists of two overlapping, but structurally distinct, village occupations.

Merritt, Jason A, and Kenton M. Stewart (State University of New York at Buffalo, Department of Biological Sciences, NY 14260)

Population Dynamics of Mosquitoes in the Township of Amherst, New York

The Township of Amherst, located just northeast of Buffalo, NY, contains areas of wetland ecotypes with standing water. This area has traditionally supported a mosquito population represented by up to 23 species. As urbanization expanded into this area, the Town established a Mosquito Control Program and trapping data were obtained for the summer periods from 1974 through 1999. Although many genera and species of mosquitoes were collected over the 26-year period, the mosquito community was often dominated by species of the *Aedes* genus, particularly *A. stimulans*, *A. vexans*, and *A. canadensis*. The goal of our studies was to examine the fluctuating abundance of mosquitoes: (1) in relationship to natural variations in precipitation and air temperature, and (2) to efforts of the town at mosquito control. An examination of the entire database has not been done before. The analyses are ongoing but complex because, in addition to huge natural variations in abundance (easily influenced by precipitation), the timing of controls (usually by spraying with various pesticides) can make a large difference in the trap data. However, we feel that the results will be helpful in predicting future mosquito populations and provide an aid in the mosquito control protocol.

Messere, Michael T. (University at Albany, State University of New York, Department of Biological Sciences, Albany, NY 12222)

Impact of Forest Gaps on Northern Redback Salamander Abundance

Timber management practices vary in their intensity and spatial extent. Some practices have been shown to negatively impact salamander populations after creating gaps in forests that alter forest floor microclimate in ways that can significantly reduce salamander habitat quality. This study focuses on the response of salamander abundance and 11 forest microenvironmental factors to forest gaps created by selective cutting. I searched forest gaps of three different size classes (small = 80–113 m², medium = 368–751 m², large = 827–2355 m²) and reference plots of uncut forest for *Plethodon cinereus* in three harvested forests in eastern New York State. A total of 104 salamanders were found. Salamander abundance was highest within small forest gaps (0.38 individuals / m²) and lowest within large gaps (0.09 individuals / m²); however, variance was high rendering these differences insignificant. Exploratory analysis revealed that cover object availability (leaf litter and rocks) strongly influenced salamander abundance, apart from forest gap size. I then separated the effect of cover object availability by using a combined cover variable (included all leaf litter and rock measurements) as a random factor in a two-way analysis of variance in a second analysis. A significant difference in salamander abundance among the forest gap size categories was detected. In conclusion, the availability of cover (litter and rocks) can lessen the effect of forest gaps on salamander abundance.

Miller, Norton G. (New York State Museum, Research and Collections Unit, Albany, NY 12230)

The European Moss *Pseudoscleropodium purum* Naturalized in New York State: A Potential Meso-scale Invasive

To stations in the Pacific Northwest, Michigan, and Newfoundland, where *Pseudoscleropodium purum* is known from one or many populations, can now be added 22 new localities discovered since 1996 in eastern, central, and western New York. This large feather moss was first identified in the Northeast by N. Trigoboff from collections he made in the City of Cortland. All other stations in New York are in cemeteries that have these characteristics: shade from large trees of *Picea abies* and/or *Thuja occidentalis*, clayey soil, and periodic mowing. How and when this central and western European moss became established at these stations in New York is not known, but it is likely that mowing results in its localized dispersal and perhaps also its spread from cemetery to cemetery. Some New York populations are male; others are female. So far, nowhere in New York have male and female plants been found growing together. Therefore, sporophytes are unknown in this region or in fact elsewhere in North America. The geographic separation of male and female plants suggests that this dioicous moss was recently introduced. The potential for sporophyte formation (sexual reproduction) at some time in the future provides a way to learn the rate of dispersal from known sources. Posted on the New York State Museum web site at <http://www.nysm.nysed.gov/bio/ppurum/> is a status report of our searches for *P. purum* in New York and a request for others to join us in documenting where this new member of the flora occurs throughout the Northeast. Instructions for participants are provided. Further documentation of the distribution of this moss and the scope of its potential for further and perhaps rapid dispersal at the onset of sexual reproduction (and spore formation) may be of great ecological interest.

Miroff, Laurie E. (State University of New York at Binghamton, Department of Anthropology, Binghamton, NY 13902)

Villages without Limits: Community Patterning during the Owasco Period of the Late Woodland

A household level of analysis is vital to understanding social relations which accompanied a shift in subsistence and settlement during the Late Woodland Period in the Northeast. However, not all activities related to a household take place within the house or, for that matter, within the village. The Late Woodland Owasco period Thomas/Luckey site, located in New York's Chemung Valley, provides baseline data for examining social relations, including those associated with household production and consumption. Preliminary analysis identified artifact clusters in association with structures and features. Examining artifact patterns within and around two completely exposed longhouses offers a starting point for studying village structure. To move beyond the village proper, activities identified within the village will be compared to those identified at non-village, camp sites in the Chemung and adjacent valleys. Emphasizing a local level approach, this paper will outline the merits of looking beyond the village and offers a preliminary model of Owasco period village structure.

Molloy, Daniel P. (New York State Museum, Research and Collections Unit, Albany, NY 12230), **Timothy J. Sinnott** (New York State Department of Environmental Conservation, Division of Fish, Wildlife, and Marine Resources, Albany, NY 12233), and **Danielle M. Crosier** (New York State Museum, Research and Collections Unit, Albany, NY 12230)

Alien Organisms in New York State's Aquatic Habitats: How Do We Raise Public Awareness?

In New York State, as well as throughout North America, newly introduced, non-native animal and plant species are increasingly occurring in our coastal and inland waters. In their native waters, these organisms may be relatively harmless, but following their arrival in our waterways, these alien species can cause serious problems. Non-indigenous aquatic nuisance species can disrupt recreational water-use activities such as boating, swimming, and fishing and disturb the ecological balance within our existing aquatic habitats. An exhibit to raise the public's awareness of these issues is presently being planned by the NYS Museum in conjunction with the NYS Department of Environmental Conservation. Scheduled to open in early 2001, zebra mussels (*Dreissena* spp.) will be used as the primary example of a harmful alien species. The exhibit, however, will also highlight three of New York's the most destructive invasive aquatic plants: water chestnut (*Trapa natans*), Eurasian watermilfoil (*Myriophyllum spicatum*), and purple loosestrife (*Lythrum salicaria*). Other primary themes of the exhibit are that: 1) not all alien aquatic species are undesirable, since some which were intentionally-introduced have proven to be far more beneficial than problematic; 2) unless strong preventative measures are implemented, other destructive alien species will soon colonize New York's waters; and, 3) the public has a very important role in limiting the spread of alien organisms. This last theme will be a major one. Successful alien invaders, especially major pest species, typically enter new habitats due to human activities. Ballast water on merchant ships is likely the most frequent transporter of aquatic aliens from overseas. However, actions taken by an informed public can be the most effective measures for preventing the further distribution of an invasive aquatic species into uninfested waters.

Moore, Donna L. (Hamilton College, Department of Biology, Clinton, NY 13323)

Sampling Protostelid Slime Molds from Nature

Protostelids are unicellular slime molds that are characterized as having amoebae that form into fruiting bodies comprised of a single acellular stalk and one to a few spores. A standardized technique allows for the enumeration of protostelid propagules from a variety of habitats and microhabitats. The method consists of using segments of sterilized wheat straws that are introduced into a particular microhabitat and then after a period of time are recollected and plated onto a weak agar medium. Protostelids have been effectively sampled from aerial and litter microhabitats of forests and grasslands from temperate ecosystems, tropical montane forests of Puerto Rico and Costa Rica, and boreal forest and tundra ecosystems in Alaska. This research has shown that protostelid communities are effectively sampled on these straws after only a few weeks of exposure, and that colonies can be enumerated in situ from them. This technique will be very valuable in the advancement of our understanding of protostelid distribution, both locally and globally, and at the micro- and macrohabitat levels. It can also be adapted to include food and competition studies, other microhabitats, including bark, soil, and dung, as well as more habitats, including deserts, boreal forests, and bogs. This research technique is also a simple method to use for student laboratories.

Norment, Christopher J. (State University of New York College at Brockport, Department of Biological Sciences, Brockport, NY 14420)

Grassland Bird Conservation in New York: A Temporal Perspective

Populations of many grassland bird species have declined significantly throughout much of North America, including New York, since 1966 when the United States Fish and Wildlife Service began collecting systematic data through the Breeding Bird Survey. These declines have generated much grassland-related research, management, and habitat acquisition in New York. However, palynological and early survey records suggest that most of the Northeast, including New York, was forested in pre-Columbian times, and probably supported relatively few grassland birds. Fluctuations in the abundance of grassland habitat and birds in the Northeast during the last 400 years illustrate the importance of “opening up the time series” and incorporating issues of temporal and spatial scale into conservation planning. In the case of grassland birds in the Northeast, accepting target dates of 1600, 1850, or 1966 would lead to very different conclusions about conservation goals for grassland birds in the region. Decisions about grassland bird management in the Northeast not only must consider temporal landscape dynamics, but also what is happening to grassland bird populations in other parts of the country. A strong rationale for promoting grassland bird populations in the region can be developed, but it must incorporate the principles of ecosystem management, and the realization that the region cannot be all things to all species.

Nye, Peter E. (New York State Department of Environmental Conservation, Wildlife Resources Center, Delmar, NY 12054), **Mark Martell**, **Matthew J. Solensky** (The University of Minnesota, The Raptor Center, St. Paul, MN 55108), and **Michael S. Scheibel** (The Nature Conservancy, Shelter Island, NY 11964)

Migration and Wintering Areas of Ospreys Breeding in New York State

Using satellite-monitored radio telemetry we determined migration departure dates, routes and overwintering areas of adult New York breeding ospreys. Between 1995–1999 26 adult osprey (18 females, 8 males) were captured at their nest sites, fitted with 30 gram satellite radio transmitters, and tracked via the NOAA/Argos system as they moved from and returned to their breeding areas. Four of these osprey were captured in multiple years; two breeding pairs were captured. Fall migration pathways followed the Atlantic coast, through Florida, Cuba, and Hispaniola, across the Caribbean to wintering areas in Brazil, Colombia, Cuba, Peru and Venezuela. The use of these routes did not differ by sex. Females typically departed on migration earlier than males, spent more days in migration, and traveled further than males. New York ospreys departed on their migration in August, following breeding, and spent an average of 165 days on the wintering grounds before returning north. Fidelity to both wintering areas and breeding areas was found to be high.

Olivero, Adele M. (New York Natural Heritage Program, Latham, NY 12110)

Calcareous Fens in New York

Calcareous fens are rare natural communities that support many rare species in New York including the globally imperiled Cryan's buckmoth (*Hemileuca* sp. 1), the federally threatened bog turtle (*Clemmys muhlenbergii*) and a number of state rare plants. Calcareous fens differ from other wetlands in that they are open peatlands associated with groundwater discharge areas and calcareous bedrock. They are highly variable in groundwater chemistry, landscape setting, species composition and species abundance. In order to focus conservation, The Nature Conservancy and the New York Natural Heritage Program initiated a project in 1998, funded by the New York State Biodiversity Research Institute, to map and consistently classify New York's calcareous fens. In the first two years of the project, fifty of the highest quality calcareous fens known in the state were surveyed and updated with current information. Analysis of plot data helps to confirm the classification of the fens. Preliminary findings of the project clarify differences in fen types and assist in applying and assessing specifications used to rank occurrences. The presentation will include a description of the New York Natural Heritage Program's fen classification with comparison to other palustrine communities and discuss the preliminary results of the project. In the upcoming year, leads for additional high quality calcareous fens will be surveyed and the scope of analysis will be broadened. The final report is expected in the spring of 2001 and will include a key to fen types, a crosswalk of the New York fen classification to The Nature Conservancy's national classification and exemplary examples of each fen type.

Parisio, Steven J. (Olive Natural Heritage Society, West Shokan, NY 12429)

The Catskill Flora Project: Methods and Preliminary Results

Two previous works characterize the vascular plants of the Catskill Region (Kudish, M. 1971, *Vegetational History of the Catskill High Peaks* and Brooks, K.L., 1984, *Catskill Flora and Economic Botany*). An unpublished inventory of Catskill plants (Brooks, 1984), lists 1242 species. After three seasons of fieldwork starting in 1997, we have compiled a database with over 5000 geo-referenced records of species observations at a total of 51 sites. These records are entered in a relational database and geographic information system. They are vouchered with over 1400 herbarium specimens. We have focused most of our work in the slope forests but have included mountaintops, wetlands, floodplains and disturbed areas. We have identified 650 species (approximately 53% of the total number of species listed by Brooks). It is possible at this stage to produce a fairly complete and reliable listing of the most common or representative plant species growing in the region. This preliminary list of common plants should be useful to develop a familiarity with a limited number of plant species most frequently encountered on a hike in the mountains or a drive through the area.

Pehek, Ellen, Susannah **Cox**, and Raphael **Mazor** (City of New York Department of Parks and Recreation, Natural Resources Group, New York, NY 10029)

Salamander Biomonitoring in New York City Streams

For decades aquatic ecologists have monitored benthic invertebrates in streams to evaluate water quality. Few have explored the use of amphibians in biomonitoring, despite evidence that they may be among the first indicators of polluted water. Stream salamanders are affected strongly by urbanization because of the cumulative effects of habitat loss and fragmentation, sedimentation and polluted runoff. Salamanders are abundant and relatively easy to locate and identify, making them excellent research organisms. The Natural Resources Group (NRG) of The City of New York City Department of Parks and Recreation (Parks) is currently assessing the impacts of sedimentation and water quality on the dusky (*Desmognathus fuscus*) and two-lined (*Eurycea bislineata*) salamanders and their potential as bio-indicators. NRG chose four stream segments on Staten Island that have historically supported populations of these species. We have begun measurements of physical and chemical variables including sedimentation rates, embeddedness and nitrate nitrogen. To measure sedimentation rates we install five sediment traps constructed of 2-1/2 quart buckets in each stream. We will digitize photographs of permanent 15cm square plots to measure embeddedness of the substrate, a variable crucial to stream invertebrates and salamanders. Each season and after rainfall we will monitor stream biota using belt transects (salamanders), leaf bags (invertebrates and larval salamanders) and a Hess sampler (invertebrates). We will calibrate salamander relative abundances to invertebrate indices of stream impairment. NRG hopes that by monitoring salamanders Parks can quickly identify new and ongoing impacts to stream watersheds.

Perrelli, Douglas (State University of New York at Buffalo, Archaeological Survey, Department of Anthropology, Buffalo, NY 14261)

Early Late Prehistoric (A.D. 700–1300) Subsistence and Settlement Change in the Northeast: A View from Southwestern New York

The Richard Anderson I site (UB 127, NYSM 10018) is located in Chautauqua County in southwestern New York. A data recovery project conducted in 1996 resulted in the identification of a pre-Iroquoian habitation site dating to the c. A.D. 1000–1300 time period. Material from this site and information from other sites in the region provides a brief description of the subsistence and settlement practices of these people. Portions of several different houses are identified. These appear to be small oval structures accommodating single families only. Paleobotanical analysis indicates seasonal occupation. Maize is present but does not appear to have been a major component in the diet. Other cultigens are absent. These and other data suggest that Iroquoian subsistence and settlement practices such as a reliance on corn horticulture and semi-permanent village life occurred late in the prehistoric cultural sequence in western New York.

Petersen, James B. (University of Vermont, Department of Anthropology, Burlington, VT 05405), and **Ellen R. Cowie** (University of Maine at Farmington, Archaeology Research Center, Farmington, ME 04938)

From Hunter-gatherer Camp to Horticultural Village: Middle to Late Woodland Subsistence and Settlement in Northern New England

Native American societies changed considerably in northern New England during the span of the Middle and Late Woodland periods, in correlation with the local transformation from hunter-gatherers to horticulturists. During the Middle Woodland period, ca. 200 B.C.–A.D. 1000, native hunter-gatherer societies lived in variably sized but typically small settlements generally referable to as camps. During the early portion of the Late Woodland period, overall ca. A.D. 1000–1600, native began to live longer, even permanently in larger settlements, namely villages based on horticulture. The first Europeans recorded such horticulturally based village societies across much of the broad region during the 1600s and 1700s. This paper presents the local evidence behind such a reconstruction, including recently obtained archaeological information from Maine, New Hampshire, and Vermont.

Phillips, Robert R. (State University of New York College at Oneonta, Department of Biology, Oneonta, NY 13820)

Winter Den Selection by Six Southern Flying Squirrels

Six southern flying squirrels were captured from the same artificial nest box during the winters of 1994–95 and 95–96. The squirrels were surgically implanted with radio transmitters and released in the same nest box from which they were taken. I then identified the den site occupied by each squirrel every day until the batteries in the transmitters failed. The data were analyzed to reveal (1) the day-to-day choice of den sites, (2) the number of dens each squirrel used, (3) the distance between the two most widely separated dens for each squirrel, (4) site fidelity, i.e., degree to which the most used den was inhabited, and (5) degree to which the 94–95 cohort co-inhabited dens. The results indicate that the squirrels used between

four and seven sites. The distance between the most widely separated sites for each squirrel ranged from 220 to 580 meters. Site fidelity was from 85% to 37%, with five of the six values above 53%. The four flying squirrels from 1994–95 all used the same den 57% of the time. These results suggest that southern flying squirrels tend to use one main den with brief occupancies of from three to six other dens. The fact that the four squirrels captured in the nest box co-inhabited that nest for 57% of the observation period suggests a continuity in aggregation behavior. This small sample did not reveal any gender differences in den related behavior.

Prezzano, Susan C. (Clarion University of Pennsylvania, Department of AGES, Clarion, PA 16214)

What Can the New Theories on Mississippian Cultural Developments Tell Us about the Late Woodland in the Northeast?

Several new discoveries deriving from Late Woodland and Mississippian sites in the Midwest and Southeast have led archaeologists to new understandings of subsistence, community, and settlement systems in these regions. These new interpretations have resulted in new theories on social and political change and the evolution of chiefdoms. Major advances include the importance of lineages in political developments, a new appreciation of the pace of socio-political change, and the relationship of lineage and the pace of change to intra- and inter-site patterning. In this paper, some of these new understandings are used to reinterpret archaeological evidence from Late Woodland Owasco and Iroquois (A.D. 900–1500) sites in upstate New York.

Quillen, Lori M. (University at Albany, State University of New York, Department of Biological Sciences, Albany, NY 12222)

Improving Pollinator Protection: Current Obstacles and Future Solutions

Over the past 6 years, declines in pollinator populations have received substantial coverage in both the primary and secondary scientific literature. Habitat fragmentation and pesticide poisoning are two of the most commonly cited reasons for native pollinator declines. Habitat loss can occur through chemically induced land fragmentation or visible physical land alterations. My research is centered on the chemical aspect of pollinator loss. Despite increased knowledge of the impact pesticides have on pollinators, few measures have been made to protect pollinators at the government level. After reviewing the primary literature and current pesticide regulations, I have isolated several changes needed to improve pollinator protection. These changes include: a clear definition of FIFRA's pesticide label protection measures, a comprehensive web-based pesticide monitoring program, and elimination of farming and pesticide use on National Wildlife Refuges. I will discuss these topics, as well as the importance of information exchange. Supporting literature will be available to the audience, as well as suggestions to help them become actively engaged in local pollinator protection.

Rieth, Christina B. (New York State Museum, Research and Collections Unit, Albany, NY 12230)

Early Late Woodland Subsistence and Settlement Diversity in the Southern Tier Region of New York

Early Late Woodland settlement and subsistence studies have largely extrapolated from data obtained from excavations in south-central New York. Such studies assume that by A.D. 1000, prehistoric groups were residing in semi-permanent settlements and had adopted a subsistence economy that was largely dependent upon maize agriculture. While such patterns undoubtedly characterize some populations in New York, recent research suggests that not all groups conformed to this general pattern. This paper will concentrate on a small cluster of sites located at the confluence of the Schenevus and Otego Creeks with the Susquehanna River. Analysis of these sites suggests that, unlike their Owasco neighbors living downstream, these Early Late Woodland groups tended to occupy smaller seasonally organized settlements and practiced a subsistence strategy that was heavily dependent upon hunting, fishing, and gathering. A comparison of the settlement and subsistence features of these sites is presented and possible explanations for these behaviors are explored.

Robinson, George R. (University at Albany, State University of New York, Department of Biological Sciences, Albany, NY 12222), and Richard S. **Mitchell** (New York State Museum, Research and Collections Unit, Albany, NY 12230)

Why is Over One-third of the New York State Flora Non-indigenous?

Current records indicate that 35.0% (1117/3195) of wild plant species in New York are not members of the historical native flora. In comparison, only 11% of the coterminous U.S. flora are non-native, and among other states, only Hawaii has a higher percentage of introduced plant species. We explore possible explanations for New York State's apparent proclivity for accumulating new species. First, a history of extensive international trade has brought a large number of potential recruits. Second, successful establishment by many taxa is enhanced by biogeographic factors, including broad E-W and N-S dimensions that incorporate geologic and climatic variability. Third, botanical exploration has probably been more comprehensive than in many other states, with detailed record keeping facilitated by a network of institutions and organizations that track changes in the flora. Fourth, the entry of a non-native taxon into the flora remains in part a matter of judgement, and it is possible for ephemeral escaped taxa to be treated as naturalized. Evidence for the latter explanation can be found in the relative extirpation rate of non-native species (22.8%) versus their native counterparts (3.9%) in the New York flora. A more conservative assessment could therefore yield a smaller percentage of introduced plant species. Furthermore, as floras of several other states are brought up to date, we anticipate that New York's current, rather ignominious status will be challenged.

Robinson, Guy, David A. Burney, and Lida Pigott Burney (Fordham University, Department of Biological Sciences, Bronx, NY 10458)

Megafaunal Fossil Sites of the Lower Hudson Valley Region

The recession of the Wisconsin ice sheet from the lower Hudson valley was followed by the migration of many large mammals into the region, attracted by the rich vegetation that had begun to colonize the exposed substrate. Most of these large mammals were probably extinct within a few millenia or less. This study makes use of these temporal constraints of the region to look more closely at the circumstances persisting at the time of megafaunal extinction in the Northeast. Sediments laid down in the proglacial lake that formed in the Wallkill River valley have been processed for fossil pollen, charcoal and plant microfossils. Sites under study include the Pumpkin Swamp mastodon and a recently discovered extinct stag moose (*Cervalces*), both in the "Black Dirt" farming region. In addition, we have data from the Otisville mastodon site, and a pond in Hyde Park which yielded a mastodon AMS 14C dated to 11480+/-60 BP on collagen extracted from a tusk fragment. Comparisons of the stratigraphic sections provide the framework for a regional chronology.

Rush, Laurie W., Steve Ahr, James Rapant, Carol Cady, Randy Amici, and Richard LeClerc (Fort Drum, Public Works, Environmental Division, Fort Drum, New York 13602)

Glacial Geology and Prehistoric Sensitivity Modeling, Fort Drum, NY

Archeologists and GIS analysts used a hillshade coverage and elevation contours to develop and test a prehistoric sensitivity model for Paleo occupations along the receding beaches of Glacial Lake Iroquois at Fort Drum, New York. The predictive model proved to be powerful in the field, yielding evidence of Paleo occupation along fossil shorelines and islands. Field testing also indicated an association between Archaic occupations and the sandy glacial shorelines. Many of the sites are in partially deflated sandy areas. Upper stratigraphic layers have been compromised during weathering, however, intact features do remain in the desert floor. Occupation levels are evident in soil layers adjacent to the deflated sites as well. Fort Drum is now developing context specific predictive models for the remainder of the installation using land forms, elevations, hydrology, soils, bedrock geology, winds, and attributes of known sites as variables.

Russell, Emily W.B. (Rutgers University, Department of Geological Sciences, Newark, NJ 07878)

Factors Contributing to Forest Diversity of Shawangunk Mountains

The rugged topography and varied substrates of the Shawangunk Mountains of southeastern New York favor a variety of plant communities. These conditions have also provided various resources for human use, from farming to harvest of blueberries and wintergreen. Field surveys confirm the impression that the forests of today are generally young, mostly less than a century old except on very extreme sites. Neither physical conditions nor land use alone, or even the most recent of a palimpsest of land uses, can explain the composition of most of these woodlands. Different land uses superimposed on the differing physical conditions have produced this landscape of strikingly varied forest communities, from pitch pine- to white oak-dominated stands. Understanding both the physical conditions and the history can help interpret the variations to help inform future management.

Sanger, David (University of Maine, Department of Anthropology and Institute for Quaternary Studies, Orono, ME, 04469), and Alice R. **Kelley** (University of Maine, Department of Geological Sciences, Orono, ME, 04469)

Geoarchaeology and Cultural Interpretation in the Lower Penobscot Valley, Maine

Early efforts at establishing relationships between key landforms and archaeological sites in the interior of Maine built on several assumptions. Foremost among these was a landscape little changed from today and cultural behavior mimicking that recorded in ethnographies. Only with the discovery of Early and Middle Archaic components deeply buried in alluvium and in close proximity to wetlands did we question seriously our earlier assumptions. In the Bangor-Old Town region of the Penobscot Valley we now have the entire cultural sequence from late Paleoindian to European Contact. This record causes us to rethink claims for population migrations to explain the aspects of the Laurentian Tradition in central and eastern Maine. The geoarchaeological perspective helps to explain site locations, including the rationale for site selection and eventual preservation.

Schmidt, Robert E. (Hudsonia Ltd., Bard College, Annandale, NY 12504), and Thomas R. **Lake** (New York State Department of Environmental Conservation Hudson River Estuary Program, Wappingers Falls, NY 12590)

Reproductive Biology of Alewives in Hudson River Tributaries

Anadromous alewives appear synchronously in Hudson River tributaries usually around mid-May. Alewives enter tributaries at high tides and secondarily may be more abundant at night than in the day. Males usually outnumber females in these tributary runs. Few individuals remain in tributaries at low tide and those that do are males. Examination of ovaries showed the presence of two sizes of eggs and ovaries fell into three categories by weight: females with ovaries > 20% of total body weight, 8–14% of body weight, and < 8% body weight. Few individuals in the first category are seen in tributaries. From these and other observations, we suggest that alewives are iteroparous in the Hudson estuary. Females spawn one set of eggs primarily in the main estuary and spawn their second set in the tributaries.

Schuldenrein, Joseph, and Donald **Thieme** (Geoarchaeology Research Associates, 5912 Spencer Ave, Bronx NY 10471), and Jamie **Mcintyre** (Pennsylvania Department of Transportation, District 4-0, Dunmore, PA 18512)

Modeling Site Formation and Preservation in Northeastern Pennsylvania: Examples from the Susquehanna and Delaware Valley Floodplains

Recent geoarchaeological work confirms systematic trends in archeological site preservation within floodplains and lower terraces of northeastern trunk streams. Recurrent “packages” of vertical and laterally stratified sediments, soils, and cultural horizons suggest extra-regional environmental and settlement trends. The latitudinal limits of such associations have now been pushed well into glacial terrain. This study draws on several case studies in the narrow glacial valleys of the Delaware and Susquehanna. Here deeply stratified Early Archaic occupations are preserved in lateral accretion deposits of streams that had not yet stabilized in their channels. In a downstream direction, these trends are amplified in generally thicker alluvial

packages beyond the glacial margins. Systematic models of site formation and preservation can now be extended to the Early Holocene. Such constructs were not possible as recently as a decade ago, when the only recurrent alluvial stratigraphies were overbank and vertical accretion successions preserving Late Archaic to Woodland period deposits.

Schulenberg, Janet (Pennsylvania State University, University Park, PA 16801)

Maize Horticulture and Settlement Change in the Western Finger Lakes

Stable carbon isotope ratio analyses of food residues encrusted on ceramic vessels from Point Peninsula and Owasco sites near Lake Cayuga are used to measure the adoption of maize horticulture. Residues from Point Peninsula and Owasco pots shed light on the nature of the transition to maize horticulture in the area historically inhabited by the Cayuga Iroquois. Comparison of the residue data with what is known about settlement changes in the area tests our assumptions about the adoption of maize horticulture and the development of Iroquoian-style nucleated settlements.

Sheviak, Charles J. (New York State Museum, Research and Collections Unit, Albany, NY 12230)

A Reappraisal of the Northeastern Members of the *Platanthera hyperborea* Complex (Orchidaceae)

The *Platanthera hyperborea* complex is inscrutable. For over 150 years it has been studied by some of the world's leading systematists, yet no taxonomic consensus has emerged. The number, delimitation, and, indeed, the nature of species in the group has remained elusive. In recent years progress has been made through a synthesis of information obtained from continent-wide field study, cultivation of representative samples, and search for new characters. These efforts have finally established the identity of the most common member of the group in New York, and shown a second to constitute a previously unrecognized species.

Shields, Elson J. (Cornell University, Department of Entomology, Ithaca, NY 14853)

Long Distance Spring and Fall Movement of Potato Leafhopper Utilizing Weather Systems as Transport Vehicles

Potato leafhoppers do not overwinter in the northern states. Adult leafhoppers which are 1/16 in length utilize storm fronts to move from their spring habitats in the south to their summer range in the northern tier of states and return to the southern states to overwinter. During the months of November–February, overwintering potato leafhopper can be collected on pine trees throughout the Gulf states. On the first warm days of late-February or early March, overwintering leafhoppers move off their overwintering hosts in mass onto their spring reproductive hosts which are primarily legumes growing along roads and levies.

As spring arrives in the northern tier of states the weather pattern changes, making the spring storm fronts excellent vehicles to transport insects long distances in a short time. This change in the weather coincides with the drying of spring reproductive sites in the south and the leafhoppers desire to find other

suitable host plants. The actual timing of the arrival and the magnitude of migration depends on spring reproductive conditions in the south, and the synchronous arrival of storm fronts with the presence of mature adult leafhoppers ready to migrate.

After a season of reproduction in the north on over 200 species of plants ranging from alfalfa to hickory and maple trees, potato leafhoppers return to the southern states in late summer and fall to overwinter. In 1998, several major fronts in September provided the transportation vehicles for the leafhoppers returning to the south. By October 1, most of the migrants have left the state headed south.

Sidell, Nancy Asch (Archaeobotanical Consultant, 46 Heath Street, Oakland, ME 04963)

Paleoethnobotanical Indicators of Subsistence and Settlement Change in the Northeast

Quantitative analysis of archaeological plant remains makes it possible to draw inferences about the degree of anthropogenic disturbance of plant communities in the vicinity of a site. Utilizing data from sites throughout the Northeast, various indicators are used to trace changes in plant assemblages from the Archaic through the Contact periods. This approach is essential to understanding the particular changes in plant communities and the related changes in subsistence-settlement patterns that are associated with the adoption of agriculture.

Smith, Charles R., Milo E. **Richmond** (Cornell University, New York Cooperative Fish and Wildlife Research Unit, Department of Natural Resources, Ithaca, NY 14853), Stephen D. **DeGloria**, Magdeline **Laba**, Stephen D. **Smith**, (Cornell University, Cornell Institute for Resources Information Systems, Center for the Environment, Ithaca, NY 14853), Shari K. **Gregory**, Danielle E. **Ogurcak** (Cornell University, Department of Natural Resources, Ithaca, NY 14853), Jennie L. **Braden**, and Elizabeth A. **Hill** (Department of Crop and Soil Sciences, Cornell University, Ithaca, NY 14853)

Facilitating Planning for Biodiversity Conservation in the Hudson River Valley

In the context of the Hudson River Estuary Management Program (New York State Department of Environmental Conservation) and the NY Gap Analysis Project, our work in the Hudson River Valley (HRV) focuses upon several biodiversity content and context questions, important for evaluating the contributions of the HRV to statewide biodiversity and relevant to planning for biodiversity conservation in the HRV. Among the questions we are addressing are the following: 1) How many and which terrestrial vertebrates and vegetative associations are found in the HRV? 2) What proportion of the “fine-filter” (i.e. species) and “coarse-filter” (i.e. vegetative associations) elements of NY biodiversity are represented in the HRV? 3) Are there any terrestrial vertebrate species or vegetative associations found only in the HRV and nowhere else in NY? 4) Where are the centers of high terrestrial vertebrate and vegetative diversity and where are they located relative to public lands? 5) Are there “gaps” where we have regions of high biodiversity in the absence of public land status? In addition, using geographic information systems and the NY gap analysis database, several comparisons among counties for elements of biodiversity represented within their boundaries are possible: 1) What is the ranking of counties in the HRV for elements of biodiversity represented within their boundaries at both fine-filter and coarse-filter levels, from most diverse to least diverse? 2) Which county has the most amphibian species? reptile species? bird species? mammal species? Such information can be useful to decision makers in setting biodiversity conservation priorities within and among counties in the HRV.

Smith, David G., and Christopher M. **Watts** (University of Toronto, Erindale College, Department of Biology, Mississauga, Ontario L5L 1C6, Canada)

The Initial Late Woodland Period (ca. A.D. 500–1000) and Origins of Horticulture in Southwestern Ontario

Initial Late Woodland sites, dating to between ca. A.D. 500–1000 have been documented in several river drainage systems and along lake shorelines in southwestern Ontario. These sites are attributed to the Riviere au Vase phase of the Western Basin Tradition. The Riviere au Vase phase is the immediate western neighbor and contemporary of the Princess Point complex, the culture now associated with the earliest maize (ca A.D. 500) in southern Ontario. To date, however, no maize has been recovered from an unequivocally Riviere au Vase phase context. This anomaly is further compounded by reports of maize dating to as early ca. A.D. 650 from similar contexts (also known as Riviere au Vase) in southeastern Michigan. This paper summarizes what we know about Riviere au Vase phase groups, and discusses possible explanations for the lack of maize in southwestern Ontario.

Spada, Daniel M. (New York State Adirondack Park Agency, Ray Brook, NY 12977), William T. **Brown**, Nina **Schoch** (The Adirondack Nature Conservancy, Keene Valley, NY 12943), and John **Falge** (New York State Department of Transportation, Region 7, Watertown, NY 13601)

A Plan to Control Invasive Exotic Terrestrial Plant Species in the Adirondack Park

Invasive exotic plant species are causing ecological perturbations on varying scales throughout the United States. In the Adirondacks invasive plants are not yet predominant, but have high potential to spread. A roadside survey conducted in 1998 by The Nature Conservancy (TNC) identified 10 species present in the Adirondacks that may pose a threat to natural systems. These species include purple loosestrife (*Lythrum salicaria*), common reed (*Phragmites australis*), and Japanese knotweed (*Polygonum cuspidatum*). The TNC survey indicated that there is a core “conservation” area that shows low population numbers or few populations of exotic invasives. There is no indication that these species are colonizing backcountry habitat although several of them have that potential. A unique opportunity exists in the Adirondacks to work proactively to detect infestations of invasive plants before they become well established and to prevent their spread, thus maintaining a high quality natural landscape. A cooperative public/private effort, however, is required to address the threat of invasive plants over this large area. It was determined that a pilot weed management program should be developed for the core conservation area. The plan includes continued inventory to identify existing populations, data layer creation and maintenance in a GIS, species autecology research, control methods research, control activities, landowner and municipality education outreach, monitoring to determine effectiveness of control activity and surveillance to keep track of new invasives.

Stothers, David M. (University of Toledo, Lab of Ethnoarchaeology, Toledo, OH 43606), and Timothy J. **Abel** (University at Albany, State University of New York, Department of Anthropology, Albany, NY 12222)

The Intensification of Agriculture and Formation of Early Village Communities in the Southwestern Lake Erie Basin

The history of archaeological research pertaining to agricultural origins in the southwestern Lake Erie drainage sets the stage for a discussion of current understandings regarding the economic and social transformation involved in the intensification of agriculture. Three data sets, including floral remains, carbon isotope fractionation values, and settlement patterns are examined to formulate a model of the emergence and intensification of maize agriculture and settled village communities in this region. We suggest that maize was introduced into the lower Great Lakes when harvesting economies were already well established. As such, in opposition to earlier hypotheses favoring a swift agricultural “revolution” leading to population growth, sedentism, and endemic warfare, we suggest that maize was cultivated in the region long before these consequences are apparent in the southwestern Lake Erie region is perhaps better interpreted as an intensification of existing lifeways, and much less any sort of revolution.

Strayer, David L., and Heather M. **Malcom** (Institute of Ecosystem Studies, Millbrook, NY 12545)

Bivalve Dynamics During the Zebra Mussel Invasion of the Hudson River

The three families of bivalves that live together in the freshwater tidal Hudson River have different life cycles and showed different dynamics during the first decade of the zebra mussel invasion of the river. Zebra mussels, which have planktotrophic larvae and a life span of 3–5 years, appeared in the Hudson in 1991 and have dominated the ecosystem since fall 1992. They reduced phytoplankton biomass in the river by 80%. Because of strong adult-larval interactions, the zebra mussel population underwent large cycles with a 3–4 year period, the size and coherence of which appear to be diminishing. The native unionid mussels have parasitic larvae and live for more than 10 years. Formerly constituting more than half of zoobenthic biomass in the river, their populations have fallen by 80% and have not yet stabilized seven years after the invasion. The two unionid species (*Anodonta implicata* and *Leptodea ochracea*) that breed in late summer have disappeared, while the single species (*Elliptio complanata*) that breeds in spring still persists. The sphaeriids have direct development and an annual life cycle. Although we have the least information about this family, it appears that sphaeriid populations in the Hudson fell by 72% in the first two years after the zebra mussel invasion and have remained low. Because bivalve populations have slow demographic response times, it may take years to decades for the effect of a perturbation to be fully expressed.

Tessier, Jack T. (College of Environmental Science and Forestry, State University of New York, Syracuse, NY 13210)

Springtime Photosynthesis and Nutrient Retranslocation in *Dryopteris intermedia*

The value of preserving wintergreen fronds by forest understory species is an unsolved mystery. In this study, net photosynthetic rates and nitrogen and phosphorus pool sizes were monitored in a population of *Dryopteris intermedia* throughout a spring season to determine photosynthetic and retranslocative benefits

of the wintergreen fronds. Net photosynthetic rates provided enough fixed carbon to produce more than two sets of new fronds. Movement of fixed carbon from wintergreen fronds to the plant is undetermined and deserves future study. No net retranslocation of N or P from wintergreen fronds to the rest of the plant was evident. Maintenance of the wintergreen fronds may simply increase retention time and thus nutrient use efficiency of limiting nutrients. Other possible benefits of wintergreen fronds exist and should be investigated.

Thieme, Donald M. (Geoarchaeology Research Associates, 5912 Spencer Ave, Bronx NY 10471)

Archaeological Site Formation in Settings with Ice-contact and Meltwater-derived Deposits, Southern New York and New Jersey

Ice-contact and meltwater-derived deposits contribute significantly to the underlying topography and sedimentary matrices of prehistoric archaeological sites in glaciated eastern North America. A recessional morphosequence model seems to explain the age and distribution of late Pleistocene deposits in the lower Hudson estuary and the Hackensack and Passaic drainages, where recent excavations and borings have been conducted. Implications for possible human presence during the period of deglaciation from 21 to 10 ka are presented as well as a detailed analysis of the formation of a surprisingly complex and significant stratified alluvial site in the Passaic River valley.

Thorson, Robert M. (University of Connecticut, Department of Geology and Geophysics and Department of Anthropology, Storrs, CT 06269)

Bluff-top Sand Sheets in Northeastern Archaeology

Bluff-top sand sheets are widely present along river systems in the northeast. Ranging in age from modern to late glacial, they are low, stationary “dunes” that accumulate from suspension sedimentation in the zone of flow separation (ZFS) on terrace treads, and thus lack diagnostic eolian bedforms. The ZFS, often 10⁰–10² m in width, and extending from a point just downwind from the bluff edge to the point where flow re-attaches, is one of low air pressure, turbulent mixing, and enhanced surface roughness associated with vegetation. Bluff-top sand sheets (whose form mimics that of the top of an airplane wing) grow only during episodes of bluff erosion, which provides a sediment source and accelerates wind velocity on the exposed terrace scarp. In contrast, pedogenesis takes place when the scarp becomes vegetated. In settings where bluffs are being intermittently eroded upwind of terrace treads, discrete pulses of sedimentation will alternate with paleosols, helping to isolate temporally distinct archeological strata. Depending on the rate of bluff recession, proximal facies of the ZFS can overly distal ones. I speculate that the Neville Site at Amoskeag, New Hampshire, is an example of this depositional model.

Trull, Peter (Whale Research Center, Center for Coastal Studies, Provincetown, MA 06257), **Scott Hecker** (Massachusetts Audubon Society, Coastal Waterbird Program, Marshfield, MA 02050), **Maggie J. Watson** (University of Massachusetts at Boston, Department of Biology, Boston, MA 02125), and **Ian C. T. Nisbet** (ICT Nisbet and Co., North Falmouth, MA)

Staging of Roseate Terns (*Sterna dougallii*) in the Post-breeding Period around Cape Cod, Massachusetts

We conducted several studies of roseate terns, *Sterna dougallii*, around Cape Cod, Massachusetts, USA during the post-breeding (July–September) in 1990–1998. We also reviewed reports and estimates of numbers in regional publications. We identified 20 discrete sites where roseate terns and common terns, *S. hirundo*, staged (rested in flocks during daylight hours) between 24 July and 22 September. All sites were open beaches or sand flats, usually near the end of barrier islands or barrier beaches. Only one site was found where roseate terns were present in thousands, but three other such sites have been documented during the last 20 years. All of these major staging sites are on outer beaches of Cape Cod adjacent to cold Atlantic Ocean waters. Roseate terns appear to disperse throughout the breeding area in July and August, re-aggregating on outer Cape Cod in late August and September prior to southward migration in mid-September. Roseate terns ringed at eight colony sites throughout the breeding area in northeastern North America were identified at staging sites around Cape Cod. We found only two sites on Cape Cod where Roseate Terns roosted at night in 1998; one of these has been a major roost site for many years. The concentration of a large fraction of this endangered regional population into a small area during September makes it vulnerable to human disturbance (especially at night) and to North Atlantic hurricanes.

Van Nest, Julieann (New York State Museum, Research and Collections Unit, Albany, NY 12230)

Archaeological Implications of Soil Biomantle Formation Processes

Most archaeological sites occur in biomantles, the fine-grained upper soil layers formed as fauna and flora redistribute earth materials. Biomantle formation results in vertical size-sorting (and burial) of artifacts, and development of dark-colored A horizons. The kind of biomantle formed is related to vegetation cover, which controls the distribution of subsurface organic matter. Many prehistoric activities (e.g., opening of forest canopies, disposal of organic-rich refuse) affected these same variables, and thereby the expression of site biomantles. This paper sets forth a conceptual framework for exploring the problems and potential of biomantle processes for archaeology in the Northeast. Studies at Midwestern sites of varying ages in soils developed under forest and open woodland vegetation provide a comparative perspective. Regional research must identify important biomantle formation processes and how they are expressed in Northeastern soils. Initial review suggests that biomantle formation is involved in the generation of “stratified” sites, middens, and pitfills.

Versaggi, Nina M. (State University of New York at Binghamton, Public Archaeology Facility, Binghamton, NY 13902)

An Overview of Prehistoric Settlement Patterns and Landforms in the Northern Appalachians

The northern Appalachians encompass a diverse landscape that supported an equally diverse prehistoric land use system. Regional landforms include valley floors of major drainages, such as the Allegheny, Susquehanna, Delaware, and Hudson, associated valley walls and uplands, as well as the margins of former glacial features, the present-day Finger Lakes of New York. While most archaeological investigations have focused on residential sites associated with valley bottoms and lake inlets/outlets, other studies have identified land-use patterns associated with uplands, wetlands, and minor tributaries. This expansion of archaeological studies to a more representative cross-section of prehistoric landforms has enhanced models of prehistoric settlement patterns. These patterns vary within subregions and through time challenging researchers to reframe models of group organization and land use for hunter-gatherers as well as agriculturists. This paper offers a regional overview of differential land use strategies apparent from the archaeological record within a section of the northern Appalachians.

Vogel, Steven (Duke University, Zoology Department, Durham, NC 27708)

The Air Apparent: Large and Small Problems of Remaining Aloft

Airborne life is always much denser than air—nature builds no blimps—and most of it would sink rapidly in still air. What devices can keep particulates, living and non-living, from settling out? On a large scale, atmospheric inhomogeneities provide diverse possibilities. Velocity gradients, whether vertical or horizontal, can be used if an organism can move back and forth across the gradient; no actual upward air movement need be present. Many vortices, even ones that don't themselves rise, provide regions of air that rise relative to both the earth and to the vortices themselves; thus a sinking object may remain within a vortex for extended periods. On a small scale, viscosity permits large drag increases through manipulation of surface area, and circulation generated either by Magnus effect spinning or by airfoils can generate nearly enough lift to offset body weight. A description of possible devices provides a framework within which one can ask what a particular system does—using its structure and behavior to give further hints—and then ask about the practical consequences of using that device.

Weldy, Troy W. (New York Natural Heritage Program, Latham, NY 12011)

An Overview of the Rare Plants of the Hudson Valley

Over the past three years, the New York Natural Heritage Program has conducted surveys for rare plants, rare animals and significant ecological communities within the Hudson Valley (see Finton abstract). The specific goals of the rare plant study were to identify historical locations, search these historical locations for viable populations, update data from known populations and search for new occurrences where appropriate habitat occurred. As a result, the number of known rare plant occurrences within the Hudson Valley now represented within the Heritage database has increased 29% (378 pre-survey to 534 current) and the total number of occurrences (known plus historical) has increased 30% (924 pre-survey to 1328 current). Most of these rare plants are species commonly referred to as 'geographic rarities'. Geographic rarities are species common in the central portion of their range, but rare near the range perimeters. Most

of these geographic rarities are common in the southeastern Coastal Plain and southern Piedmont regions but reach their northern limit somewhere in the Hudson Valley (i.e. *Aristolochia serpentaria*). A few examples of globally rare species (rare throughout their range) were also documented, including *Pycnanthemum clinopodioides* (basil mountain mint) and *Malaxis bayardii* (Adder's mouth orchid). Many of these rare species are concentrated within distinct landscape units (i.e. Hudson Highlands, Staten Island Greenbelt). Areas with concentrations of rare plants, along with significant natural communities and rare animals, were used to delineate boundaries for biodiversity focus areas. The 1999 report to the New York State Department of Environmental Conservation and Cornell contains information on these focus areas as well as habitat and identification characteristics for the Hudson Valley's rarest plants. The Heritage Program will soon create a rare plant identification guide using data similar to this report. Examples of identifying characteristics for select rare plant species and preliminary web pages will be highlighted during this presentation.

Wells, Alan W. (Lawler, Matusky & Skelly Engineers, Pearl River, NY 10965), and **Della M. Wells** (Bear Mountain State Park, Trailside Museums and Wildlife Center, Bear Mountain League of Naturalists, Bear Mountain, NY 10911)

Fish Assemblages and Water Quality of the Upper Ramapo River

The Ramapo River in Orange and Rockland Counties is an important source of water for southern New York and northern New Jersey. Beginning in 1995, fish bio-integrity and water quality were studied at up to fifteen stations in the mainstem river from Monroe, NY to the New York-New Jersey border. In all, 19 species of fish were collected. Fish abundance, species richness, and diversity were greatest near the NY-NJ border and generally decreased in an upstream direction. Measures of fish community bio-integrity fell markedly upstream of Arden, NY. Typically, only 2–4 highly tolerant species (e.g., tessellated darter, bluegill, and eastern mudminnow) were found. Below Arden, to about the Kanawauke Drive crossing, tolerant species such as mudminnow, green sunfish, and yellow bullhead were prevalent, but more sensitive species such as smallmouth bass, pumpkinseed, and rock bass were also seen. There was a high incidence of black spot disease in blacknose dace in this region. Below Tuxedo, species numbers and diversity increased considerably. We found 9–12 species in the vicinity of Torne Brook and Stony Brook. During the low summer of 1999 river flows, high levels of specific conductance, nitrate, orthophosphate, and chlorine suggest that upstream wastewater treatment facilities may be implicated in the decreased measures of fish community bio-integrity.

Weseloh, D. V. Chip, and **Cynthia Pekarik** (Canadian Wildlife Service, Downsview, Ontario M3H 5T4, Canada)

Population and Contaminant Trends in Colonial Waterbirds from Lake Ontario

At least nine species of colonial waterbirds breed on Lake Ontario. I will report on population levels of Double-crested Cormorants (DCCOs), Great Black-backed Gulls (GBBGs) and Black-crowned Night-Herons (BCNHs) and on contaminant trends in Herring Gull eggs. Cormorants first breed on Lake Ontario at Scotch Bonnet Island in the 1930s. They increased gradually reaching a lake-wide peak of 200+ pairs in about 1950; populations declined through the early 1970s due primarily to DDE-induced eggshell thinning. Since the mid-1970s, cormorants have made a dramatic recovery and in 1999 there were over 20,000 pairs nested. GBBGs have only recently colonized Lake Ontario; the first nest located there was in 1962. Single nests occurred sporadically until 1981 when four nests were found on Little Galloo Island. Since that time,

nestings have gradually increased. In 1999 there were at least 33 GBBG nests located on Lake Ontario. BCNH records are poorly known; in 1991 there were just over 1,000 pairs nesting at 11 sites on Lake Ontario. They will be re-censused in 2000. The Canadian Wildlife Service has been monitoring contaminant levels in Herring Gull eggs annually since 1974. Between 1974 and 1999 concentrations of chemicals from Herring Gull eggs at two Lake Ontario sites have declined as indicated: DDE—90.6%; PCBs—92.2%; mirex—93.5%; 1976. HCB—97.0%; dieldrin—89.2%; TCDD (since 1984)—65.6%.

White, Bradley N., Sonya Grewal, Angela Granacki, Karmi Shami, Paul A. Wilson (Trent University, Wildlife Forensic DNA Laboratory, Department of Chemistry, Peterborough, Ontario K9J 7B8, Canada, and McMaster University, Department of Biology, Hamilton, Ontario L8S 4K1, Canada), **Robert C. Chambers** (College of Environmental Science and Forestry, State University of New York, Environmental and Forest Biology, Syracuse, NY 13210), **Paul Paquet** (University of Calgary, Departments of Biology and Environmental Design, Calgary, Alberta T2N 1N4, Canada), **John Theberge, Mary Theberge** (University of Waterloo, School of Urban and Regional Planning, Faculty of Environmental Studies, Waterloo, Ontario N2L 3G1, Canada), **Brian Kelley, William Waddell** (Alligator River National Wildlife Refuge, USFWS, Red Wolf Recovery Program, Manteo, NC 27954), and **M. Rutzmoser** (Harvard University, Museum of Comparative Zoology, Mammal Department, Cambridge, MA 02138)

DNA Evidence for the Origin of the Eastern Coyote by Hybridization between the Eastern Canadian Wolf (*Canis lycaon*) and the Western Coyote (*C. latrans*)

The eastern coyote has been described as a larger form of its western counterpart and there has been considerable debate over whether it originated from hybridization between western coyotes and wolves. The morphological and genetic data are consistent with the “Tweed wolves” in the Frontenac Axis of Ontario being hybrids between the eastern Canadian wolf (*Canis lycaon*) of Algonquin Provincial Park and western coyotes (*C. latrans*). We have analyzed two historic wolves: one killed in 1863 in Maine and the other killed in 1893 in the Adirondacks. Neither had gray wolf (*C. lupus*) mitochondrial DNA supporting the suggestion that the eastern Canadian wolf (red wolf) occupied much of eastern North America prior to European settlement. We have now assessed three eastern coyote populations, (Adirondacks, NY, Cortlandville, NY, and New Brunswick), using DNA profiles at 8 microsatellite loci and the mitochondrial control region. These data show that the animals in these populations are genetically similar to the “Tweed wolf”. We have also analyzed red wolf/coyote hybrids from the Alligator River Refuge red wolf re-introduction program. These animals also have similar genetic profiles to the “Tweed wolves” and eastern coyotes further supporting the hybrid origin hypothesis. The presence of coyote-eastern Canadian wolf hybrids in eastern North America has implications for canid management and the discussions concerning the re-introduction of wolves into northeastern US states.

Winters, Cris L. (University at Albany, State University of New York, Department of Biological Sciences, Albany, NY 12222)

Ecological Relationships between North American Birds and Invasive Plants

Plants such as common reed (*Phragmites australis*), purple loosestrife (*Lythrum salicaria*), tamarisk (*Tamarix* spp.), and leafy spurge (*Euphorbia esula*) are becoming increasingly common in wetlands, prairies, and woodlands. These invasive species, mostly non-natives, are assumed to threaten native plants and animals with reduction and/or extinction. However, little data is available to support the “common knowledge.”

To determine our current level of knowledge of the relationships between birds and invasive plants in North America, I examined all available research reports that have been published in standard journals as well as in smaller journals, newsletters, and the “gray” literature. I also collected anecdotal information from biologists and land managers on bird use of invasive plants. My talk will focus on the three invasive plant species for which the most research has been conducted on this topic: common reed, purple loosestrife, and tamarisk.

The results of my research indicate a wide range of effects of invasive plants on bird species, from positive to neutral to negative. I will summarize my findings and some implications for managing invasive plant species for maximum benefit to birds.

Abstracts for Posters

Adams, David J. (New York State Department of Environmental Conservation, New Paltz, NY 12561), and Bernd **Blossey** (Cornell University, Department of Natural Resources, Ithaca, NY 14853)

A Proposed Draft Purple Loosestrife Management Plan For The Lower Hudson River Valley—An Opportunity for Utilizing Community Involved Watershed Management

After decades of unsuccessful attempts to control *Lythrum salicaria* (purple loosestrife) using mechanical, physical, and chemical means, the successful development of biological control offers a new opportunity to better manage this serious exotic invasive species. After approval by federal and state regulatory agencies, two leaf beetles, *Galerucella californiensis* and *G. pusilla*, a root feeding weevil *Hylobius transversovittatus*, and a flower feeding weevil, *Nanophyes marmoratus*, have been released in New York State. This draft plan outlines goals, objectives and actions considered most appropriate to achieve long-term population reductions of purple loosestrife using a regional, area-wide management approach. The implementation of the draft management plan for the Lower Hudson River Valley will occur in three distinct phases.

Phase 1 (3–5 Year)

- Establish purple loosestrife biological control agents within each Town. Utilize partnerships whenever feasible.
- Continue long term on site monitoring to assess the efficiency of the bio-control agents.
- Assess the regional abundance and distribution of purple loosestrife utilizing remote sensing techniques.
- Develop and distribute educational materials targeting agencies, community organizations and private land-owners.
- Draft documentation required to initiate legislative action prohibiting the sale and distribution of purple loosestrife.

Phase 2 (3–5 Year)

- Review the establishment, spread, and impact of single and multiple species (bio-control agents) in suppression of purple loosestrife within different habitat types.
- Develop an economical landscape model for bio-control agent distribution and establishment.

Phase 3 (10–20 Year)

- Based on research results, plant distribution, insect life histories, insect availability and model recommendations, begin additional regional distribution and establishment of bio-control agents.
- Use a combination of monitoring techniques to assess the success of the purple loosestrife biological control program at different scales.
- Refine release procedures and assess the ecological value of restored wetland plant communities.

This project is funded in part by the NYS DEC Hudson River Estuary Management Program.

Barton, Rebecca D, and James M. Wolfe (Houghton College, Biology Department, Houghton, NY 14744)

Phosphorus and Chlorophyll Levels in Spring Lake, Allegany County, NY

Spring Lake, a small shallow kettle lake in Hume, NY was investigated for the interactions of phosphorus and chlorophyll during late summer stratification and fall turnover. The lake, home to a flock of Canada geese and ringed by livestock pastures and mature forest, showed an average secchi depth of 1.3 m during stratification and 1.1 m during fall turnover. Chlorophyll concentrations, ranging to 111 µg/L, were highest in the anoxic hypolimnion. Phosphorus concentrations during stratification were low (30 ppb) in the epilimnion but were nearly 300 ppb in the hypolimnion, presumably due to release from the anoxic sediments. During fall turnover, chlorophyll and phosphorus levels were more uniform and much lower. Periodic pulsing of phosphorus from the anoxic sediments as well as from geese feces may fuel seasonal blooms of cyanobacteria which gradually sink to the hypolimnion during late summer and die.

Blossey, Bernd, and Florian Eichner (Cornell University, Department of Natural Resources, Ithaca, NY 14853)

Common European Insects on *Phragmites australis* in New York

Phragmites australis is an invasive species in the Northeast that has very few native herbivores (an indication that the species did not evolve in North America). In contrast to the scarcity of specialized herbivores on *Phragmites* in North America, well over 100 species attack *Phragmites* in Europe, and at least 50 of these species are specialists with *Phragmites* as the only known host-plant. Over the last decades at least 18 different species of European herbivores have been accidentally introduced and some of these are fairly widespread and obvious in New York State. We will present reference material and sampling protocols and invite participation by scientists and amateurs to help develop a database on the distribution and spread of these organisms across the state.

Boesse, Cynthia A. (College of Environmental Science and Forestry, State University of New York, Environmental and Forest Biology Department, Syracuse, NY 13210)

The Naturalization of the Non-indigenous *Epipactis helleborine* (L.) Crantz (Orchidaceae): Links to Soil Characteristics, Nutrient Uptake and Mycorrhizal Associations

Members of the Orchidaceae typically require exacting habitat requirements and are rarely found beyond their native habitat. One orchid species, *Epipactis helleborine* (L.) Crantz, a terrestrial species native to Eurasia, has succeeded in becoming naturalized beyond its native habitat. *Epipactis helleborine* was first discovered in Syracuse, NY in 1879, and spread rapidly throughout the state and North American continent, with recent discoveries in California and New Mexico. This non-native species is more frequently encountered in New York than the approximately 55 species that are native to the state. *Epipactis helleborine* does not appear to have the specific habitat requirements similar to other terrestrial orchids. A variety of sites were sampled to determine if this species is dependent on resource availability or if it is a habitat generalist. Population size and reproductive success was also determined at each site. Analysis of plant material was used to determine if nutrient uptake and retention varies between sites. An experiment is being conducted to determine if specific mycorrhizae are responsible for the observed behavior of this non-indigenous species.

Bongaarts, Karina (Byram Hills High School, Science Research Program, Armonk, NY 10504), and **David E. Karrmann** (American Museum of Natural History, Education Department, New York, NY 10024)

Assessment of Eastern Painted Turtle Population in an Artificial Pond

A population of Eastern Painted Turtles (*Chrysemys picta*) has colonized a small (0.1-acre), 65-year-old artificial pond located in Ward Pound Ridge Reservation in Westchester County. Eutrophication has significantly reduced pond volume and size, while reforestation has decreased basking and nesting sites. Total population size, ratios of mature to immature members of each sex, and nesting/hatching success will be assessed to evaluate whether there is any significant trend to support the suggestion that these turtles are locally endangered. Preliminary work during the summer of 1999 utilized a combination of dip netting and floating traps set for 24–48 hour periods. Captured turtles were marked for future identification using a scute notching code. Recorded data consisted of: species ID; capture method; sex; estimated age; weight; carapace length, width, and height; results of egg palpation; microlocation of capture, air and water temperature, weather, and any distinguishing characteristics. A total of 15 individual turtles of two species, 4 Snapping Turtles (*Chelydra serpentina*) and 11 *C. picta*, were collected in 28 captures. The *C. picta* population was comprised of: 6 mature females (average mass = 386 g, average size = 140 × 103 × 52 mm), 4 mature males (average mass = 235 g, average size = 122 × 91 × 41 mm), and one hatchling (yearling). To develop a high degree of confidence in the estimated total population size, trapping will continue through the 2001 season.

Breisch, Alvin R. (New York State Department of Environmental Conservation, Division of Fish, Wildlife and Marine Resources, Delmar, NY 12054), **Kirstin L. Breisch**, and **Ariana N. Breisch** (SUNY College of Agriculture and Technology, Cobleskill, NY 12043)

Long-term Changes in an Old-growth Hemlock-hardwood Forest

Dome Island is a 15 acre forested island on Lake George. Vegetation studies completed in 1961 identified three major forest types on the island: hemlock at the northern end of the island; northern red oak-hemlock at the south end; and northern red oak-beech in the middle. The first survey encompassed 28 tenth-acre quadrats which were expanded in 1973 to a permanent grid of one hundred quadrats. All trees, 1.0" d.b.h. or greater, were measured and recorded for each of the quadrats. Twenty-six woody species were recorded with hemlock, beech and northern red oak comprising 80% of the forest trees. A re-survey of the 100 quadrats was completed in 1999. The total number of trees 4.0" d.b.h or greater has decreased about 6% while the total basal area has increased nearly 25%. The three dominant trees increased in basal area while only northern red oak declined in number of stems. Of the other major trees only basswood showed a significant decline both in number of stems and basal area. Beech, which was expected to decline from beech scale disease, increased in number of stems and basal area. Generally the average size of most species increased. The number of stems of early successional species including paper birch, shadbush and striped maple showed significant decreases as did the number of small hemlocks (1" to 6" size classes). Although earlier evaluations suggested that the forest on Dome Island represents a "virgin forest," the changes measured over the period 1973 to 1999 indicate that the forest is still maturing.

Breisch, Ariana N. (State University of New York College at Cobleskill, Cobleskill, NY 12043), and Alvin R. **Breisch** (New York State Department of Environmental Conservation, Division of Fish, Wildlife and Marine Resources, Delmar, NY 12054)

Predicting Biomass of Salamanders by Measuring Lengths

Salamanders have been reported to be the most abundant vertebrates in the northeastern forest and one of the best indicators of environmental disturbances. But what is the most meaningful method of measuring abundance? Generally, the number of salamanders per unit area is equated with abundance. Studies at Hubbard Brook Experimental Forest in New Hampshire also included measurements of total biomass contributed by salamanders to the ecosystem, but in most studies individual or total salamander weights are rarely recorded. Length is often recorded and is the standard measurements used to place salamanders in size or age classes. However length and biomass may increase many fold during growth from larvae to adult. This growth changes their ecological role both as predator and as prey. There are few published reports on salamander weight nor has anyone presented data for predicting biomass based on length. We collected, measured and weighed a variety of salamander species, selecting individuals from a range of size classes, in order to establish a relationship between length and biomass. Lengths were recorded on live salamanders to the nearest 1 mm and biomass to the nearest 0.1 g. Salamanders with tails that had obviously been broken were not included. We plotted weight against standard length and total length. These graphs can be used to predict weight of salamanders of known lengths. Separate analyses show that the length to weight ratio changed for some species as it grew. Additional studies of this sort may be able to quantify differences based on sex, time of year, food availability and water balance.

Carlson, Douglas M. (New York State Department Environmental Conservation, Watertown, NY 13601), John **Homa** Jr. (Ichthyological Associates, 50 Ludlowville Rd, Lansing, NY 14882), and Andrew J. **Carlson** (Cornell University, Fernow Hall, Ithaca, NY 14853)

Freshwater Fishes of New York: Historic Map Series by E. C. Raney

The distributions of freshwater fishes of New York State were mapped for a book on New York fishes, under preparation at Cornell University by Dr. Edward C. Raney. The book never came to fruition, but the maps were completed in 1951–53 by a student of Dr. Raney's, Albert G. Mehring. These maps for 131 species have become of interest, even 50 years later, because they include most of the collections from the 14 biological surveys of 1926–39 (6,400 sites), as well as all Cornell University Museum collections to 1953 and other early published records. Also of significance, it appears that about one fourth of the early field records (most of those from 1926–31) are no longer available to re-assemble that data. Two other books (Werner 1980, Smith 1985) and the Biological Survey reports, describe this same information source, but only a portion of the detail is shown in their distributional charts or maps. Valuable insights about changes in fish distribution for at least 23 species can be gained with these maps, beyond those described by Smith. Maps are displayed for these and for the other fish species. Additional maps are available for 73 marine species (from collections of the Biological Survey of 1938 and other sources) for that same intended book. Raney's maps can now be accessed from electronic files on a CD (for freshwater species only) or paper copies, available from the authors.

Comerro, Hope K., and George Briggs (State University of New York College at Geneseo, Department of Biological Sciences, Geneseo, NY 14454)

Effects of Leaflet Orientation on Transpiration Rates and Water Potentials of *Oxalis montana*

The leaflets of *Oxalis montana* (wood sorrel) show reversible leaflet movements in response to direct solar radiation. In the shade, the leaflets remain in a horizontal position; and upon exposure to direct sunlight, the leaflets move down into a vertical orientation. The effect of leaflet orientation on the water relations of *O. montana* was studied using lysimeter techniques and a pressure bomb. The transpiration rate of *O. montana* with vertical leaflets was found to be higher than the transpiration rate of plants with leaflets in a horizontal position. In addition, the water potential of leaves with leaflets horizontal was significantly higher than the water potential of leaves with vertical leaflets. These results do not indicate that leaflet movement is a mechanism to reduce water loss from the plant or that leaflet movement is in response to water loss. Instead, the response may be protective, reducing incident solar radiation to vertical leaflets.

Corey, Andrew C., William A. Pfitsch, and Ernest H. Williams. (Hamilton College, Department of Biology, Clinton, NY 13323)

Mammalian Herbivory and Compensatory Growth in *Aster novae-angliae*

The compensatory continuum hypothesis suggests that factors such as nutrient availability and timing of herbivory can influence the degree to which plants are able to compensate for tissue lost to herbivores. We recorded evidence of mammalian grazing on more than 80% of 158 marked individuals of *Aster novae-angliae* growing naturally in local old fields. Plants that were grazed were significantly shorter than individuals that were never grazed (on average 39 ± 1 versus 70 ± 5 cm). Plants grazed toward the end of the growing season did not produce flowers; plants grazed before mid-August had significantly fewer flower heads than ungrazed individuals (on average 2 ± 0.5 versus 19 ± 3 capitula). We also tested the effects of nutrient levels and timing of simulated herbivory on compensatory response of seedlings grown through the summer. Although nutrient level had a significant effect on nearly all parameters, there were no significant differences in performance of plants clipped in July and control plants in both high and low nutrient treatments. Therefore, *A. novae-angliae* could compensate for early season grazing and nutrient availability did not affect its compensatory ability. By contrast, timing of clipping did affect compensation: late season clipping resulted in significantly less total and flower mass than unclipped controls. A shorter growth chamber experiment confirmed the lack of nutrient effect on compensatory ability and suggested that increased allocation to shoot rather than root growth may enhance the compensatory growth response. Differences in compensation between field versus pot-grown plants may be related to differences in competitive environment or measurement techniques.

Cox, Susannah B., Raphael **Mazor**, Paul **Katzer**, and Ellen **Pehek** (City of New York Parks and Recreation, Natural Resources Group, New York, NY 10029)

Salamander Monitoring in New York City Parks

New York City, despite intense urban development, has retained a fairly diverse amphibian fauna. Of the eleven salamander species historically reported in New York City, six have been confirmed since 1994, and a seventh (*Hemidactylium scutatum*, the northern four-toed salamander) may persist in one locality on Staten Island. The Natural Resources Group (NRG) of New York City Parks is currently engaged in several projects that involve surveying and monitoring of salamanders. From 1994 to the present, NRG has been surveying parks and other natural areas for amphibians, focusing on species at risk including the spotted salamander (*Ambystoma maculatum*) and the northern dusky salamander (*Desmognathus fuscus fuscus*). In 1998, NRG began geocoding herpetological observations into a geographic information system (GIS) database. The GIS database is being compiled from NRG field notes, agency reports, and information from academic and other outside researchers. This database will make information more readily accessible to park managers and interpretive naturalists, and will identify gaps in information so that under-surveyed species or areas can be addressed. In the summer of 1999, NRG began preliminary fieldwork for a stream biomonitoring project. This study will assess the impact of sedimentation on stream salamanders (e.g., *Eurycea bislineata*, the northern two-lined salamander, and *D. f. fuscus*), and develop methods for using these species as indicators of habitat impairment. NRG is also developing methods to use salamander monitoring to assess the success of its wetland and forest restoration projects. In the spring of 2000, NRG plans to implement a volunteer-based terrestrial salamander monitoring program. Community members from the five boroughs of the City will be trained to survey terrestrial salamanders in the woodlands of the City focusing on *Plethodon cinereus*, the redback salamander.

Eichler, Lawrence W., Charles W. **Boylen**, and Eric A. **Howe** (Rensselaer Polytechnic Institute, Darrin Fresh Water Institute, Bolton Landing, NY 12814), and James W. **Sutherland** (New York State Department of Environmental Conservation, Bureau of Watershed Management, Albany, NY 12233)

Submersed Macrophyte Communities of Adirondack Lakes: Relationships between Community Structure, Acidity and DOC

The Adirondack Mountain region of upstate New York contains over 2700 lakes and ponds. Many of these now show considerable ecological stress due to gradual acidification from atmospheric deposition of sulfate and nitrate ions. A suite of 30 high altitude lakes representing a mixture of seepage, thin and medium till, and low and high DOC are being studied for chemistry and biota to address temporal shifts in the roles of factors important in acidification. Lake values of pH range from 6.9 to 4.6 and alkalinity from 136 to -28 $\mu\text{eq/L}$. The submersed and floating-leaved macrophyte communities of a subset of 16 lakes have been characterized via SCUBA diving along several transects laid in each lake. Plant communities have been delineated in terms of species present, percent cover, and percent frequency. When the data were analyzed along chemical and pH gradients, several shifts in species composition and abundance occurred. Fine-leaved and rosette forms displaced broad-leaf forms. Species richness and abundance declined with increasing acidity. These surveys have provided a foundation for future surveys of these plant communities to determine the effects of a changing sulfate and nitrate deposition profile to this region.

Evans, D.J. (New York Natural Heritage Program, Latham, NY 12110)

Biodiversity Inventories at State Parks and Historic Sites

The New York Natural Heritage Program (NYNHP) has completed its second year of a 5-year contract with the Office of Parks, Recreation and Historic Preservation (OPRHP) to conduct biodiversity inventories of state parks. There are over 200 parks and historic sites under the administration of OPRHP with an annual visitation rate of over 65 million people. In order to make informed land-use decisions, OPRHP needs ecological information on the natural communities, plant and animal species present in their parks. The goal of this inventory project is to collect some level of biodiversity information within all state parks that contain natural areas. The results of this inventory include the identification and documentation of habitats that support rare plant and animal species. Natural communities that are ecologically important, either because they are rare or high quality, will also be documented as part of this study. Species locations and ecologically important communities are being entered into a geographic information system and linked to site-specific information contained in The Nature Conservancy's Biological and Conservation Data System (BCD). In addition, digital natural community coverages will be produced for several select parks. Community coverages are created by screen digitizing in ArcView, using 1:12,000 Color Infrared Digital Orthophoto Quarter Quads. The first year of the project focused on three parks, Allegany State Park, the recently acquired Sterling Forest State Park and the Iona Island/Doodletown area of Bear Mountain State Park. Ecological community mapping and rare species surveys have been completed for each of these areas and 23 other parks across the state which were surveyed in 1999. During 2000, NYNHP staff will visit and survey 47 parks, focusing primarily on the Niagara, Taconic and Palisades Park Regions.

Fitzsimmons, Mark (Albany County Office of Natural Resources, Albany, NY 12207), and **Alvin R. Breisch** (New York State Department of Environmental Conservation, Division of Fish, Wildlife and Marine Resources, Delmar, NY 12054)

Design and Preliminary Observations of New York's First Amphibian Tunnel

Amphibian surveys conducted since the early 1980s have revealed unusually high species diversity at two sites in Albany County within an area of less than one square mile. The total of 12 salamander and 8 frog species recorded here rivals the total amphibian diversity of New England. However, this area experiences a high level of road mortality associated with movements between hibernating, breeding, and foraging sites. As a means of minimizing this impact and maintaining current species diversity levels, a tunnel and drift fence system was incorporated into a recent County highway reconstruction project. This system, the first of its kind to be implemented in the state, was designed to limit amphibian access onto the road surface while directing movement toward a tunnel under the highway. Construction was completed in October 1999. The system incorporates two concrete box culverts with a bottom surface of native soil. The tunnels' 0.5 m × 1.2 m openings are connected by 90± m of permanent drift fence on each side of the roadway. The system was placed in the area of highest amphibian activity where the topography would allow for tunnel placement. Observations made following project completion showed that amphibian movement was directed along the drift fence while precluding movement onto the road surface. In addition, observations of individuals of four species were observed entering the tunnels. Effectiveness of this design will be monitored as part of a long-term study with particular emphasis on amphibian use associated with spring breeding movements.

Fleszar, Aubrey (Siena College, Department of Biological Sciences, Loudonville, NY 12211), and Karen L. **Frolich** (New York State Biodiversity Research Institute, New York State Museum, Albany, NY 12230)

Rare *Enallagma* Damselflies in New York State Collections

Enallagma is one of the most diverse odonate genera in the Western Hemisphere, with 38 species found in North America. The Northeast is the center of distribution for this genus, with most speciation occurring after the most recent glaciation. Twenty-four species occur in New York and eight of these (*E. divigans*, *E. durum*, *E. laterale*, *E. minusculum*, *E. pictum*, *E. recurvatum*, *E. traviatum*, and *E. vernale*) are on the active or watch list for the New York Natural Heritage Program (NYNHP). We examined the New York State Museum (NYSM) and NYNHP adult and larvae odonate collections for these eight species to determine where in New York the rare *Enallagma* are represented in the NYSM collection. The distribution of the more common species was mapped by county and compared to reported New York county records. The collections had 199 specimens of the target species and only 22 of these were adults. All eight species were found in the collections, though the specimens of *E. minusculum* were collected only in Massachusetts. *E. pictum*, *E. recurvatum* and *E. laterale* were found only from Suffolk, County, Long Island and *E. durum* was found only from Dutchess County. We reported 18 new county records, two were based on adults, the remaining were from larvae. Distribution maps of *E. divigans*, *E. traviatum* and *E. vernale* showed that the collections had voucher specimens from most of the reported counties, with an obvious deficit in Central and western New York. The Museum should make an effort to obtain specimens from this region. Other NYS insect collections, particularly the Cornell Insect Collection may have specimens to shed more light on *Enallagma* distribution in New York.

Forgione, Helen M. (New York City Department of Environmental Protection, Valhalla, NY 10595)

Wetland Restoration and Invasive Species Management at a Southeastern New York Construction Site

New York City Department of Environmental Protection (NYC DEP) took an innovative approach to a federally required construction project in a forested wetland. Under the National Dam Safety Program, administered by the U.S. Army Corps of Engineers, NYC water supply dams were evaluated and found to be in need of alterations to protect downstream lives and property. One of the dams slated for rehabilitation was at the Amawalk Reservoir in northern Westchester County, New York. In order to reconstruct the earthen dam to include a flooding safety device, a three-acre site with a 1.5-acre forested wetland would have to be cleared. Instead of the 60,500-square foot concrete channel originally specified, DEP revised the plan to consist of an emergent wetland with a forested buffer zone. Standard construction methods were modified to allow for wetland plant salvage, wetland soil stockpiling, and native species planting. In the first summer after the construction was completed, DEP began a program to monitor the vegetation coverage and soil development. Two years (and a substantial drought) later, the reconstructed wetland is dominated by wetland vegetation. Sixty-three percent of the wetland plots contain greater than 100 percent obligate or facultative wetland plants, 23 percent had more than 80 percent coverage of wetland plants and only 13 percent were covered with less than 60 percent wetland plants. However, purple loosestrife (*Lythrum salicaria*), has invaded the wetland site as well and was found in 100 percent of the monitoring plots. To manage the invasive plant while there was still excellent wetland plant diversity, DEP began a biocontrol project in 1999 using *Galerucella californiensis* beetles, available from Cornell University. DEP will continue to monitor the site over the next ten years to gauge success and make recommendations for adoption of this methodology and construction specification.

Gardner, Geoffrey, C (University at Albany, State University of New York, Department of Biological Sciences, Albany, NY 12222)

Population Dynamics of the Beech scale insect (*Cryptococcus fagisuga*) in a New York State Forest

Pathogens and invasive pests are important mediators of ecological communities. The bark disease of American Beech (*Fagus grandifolia*) is an example of a disease invasion that has had a major impact on the forest community throughout New England in the past 50 years. The combined infestation of the European beech scale insect, *Cryptococcus fagisuga*, and the subsequent invasion of fungi (*Nectria* spp.), often kill more than 50% of beech trees greater than 10 inches in diameter in a forest. Because the scale must precede the fungus, it is the key component of disease spread. Despite this, very little work is done on its demography in North America. I have examined the life cycle and population dynamics of the beech scale on beech populations in continuous forest inventory plots within the Edmund Niles Huyck Preserve. Results indicate that the majority of insect population growth and dispersal can be attributed to select, highly susceptible, tree hosts. In addition, growth rates measured as the increase in density of scale colonies, indicate that (barring a massive genetic shift in beech populations) the disease will continue to strongly affect forests in Eastern New York.

Garrand, Jaime L., **Donald T. Rodbell** (Union College, Geology Department, Schenectady, NY, 12308), and **Norton G. Miller** (New York State Museum, Research and Collections Unit, Albany, NY 12230)

The Sedimentologic and Palynologic Record of the Last Deglaciation from Ballston Lake, New York

Pollen and sediment records developed from two ~8.5 meter-long cores provide the first continuous records of sediment influx and vegetation during the late glacial and Holocene from Ballston Lake, New York. Imbricated pebbles at the base of both cores in conjunction with the geomorphology of the lake document the presence of the Mohawk River in the Ballston Lake basin prior to ~12,497+100 cal. years BP. Basal radiocarbon dates reveal that Ballston Lake formed near the beginning of the Younger Dryas, which is much later than most lakes in the region. Basal rhythmite indicates that the Ballston Lake basin received melt-water during deglaciation until ~11,000 cal. years BP. A sharp decline in bulk density and magnetic susceptibility (MS) accompanied by a gradual increase in organic carbon ~10,094+200 calendar years BP may reflect warming in the early Holocene. After this sharp decline and subsequent increase in bulk density and MS at ~10,094+200 cal. years BP, bulk density and MS gradually decrease after ~9160+55 cal. years BP, which is accompanied by increasing organic carbon content. Mass MS measurements reveal that the influx of dense, magnetic particles, which are associated with deglaciation, ceased after ~9160+55 calendar years BP. The transition from clays to gyttja with low MS, low bulk density, and high organic carbon in both cores may reflect increasing productivity and a warming trend from ~10,094+200 cal. years BP into the early Holocene. Fluctuations in MS from ~5,000 cal. years BP to the present may indicate varying productivity of magnetite-producing bacteria in the lake. An ongoing palynologic investigation has revealed decreasing concentrations of pine pollen, increasing concentrations *Quercus*, *Acer*, and *Fagus* pollen during the middle Holocene followed by a rise in *Ambrosia* and other herbaceous species after 1290+20 cal. years BP.

Gibson, David H., and Thomas L. Cobb (The Association for the Protection of the Adirondacks, Schenectady, NY 12304)

Natural History, Article 14 and the Forest Preserve

The history and debate surrounding Article 14, Section 1, the *Forever Wild* Clause of the New York State Constitution that pertains to the Adirondack and Catskill Forest Preserve, is replete with references to the natural history of those regions. The original debate about the draft Article in September of 1894 refers to the *denizens of the forest* retreating before the locomotive. The debate about whether or not to retain this Article intact during the 20th century often focused on the biology and habitat preferences of the Adirondack white-tailed deer, and the desirability of creating more suitable habitat for this animal (and its human predators) by selectively logging in the Forest Preserve. Winter habitat for white-tailed deer again came under scrutiny during policy battles that eventually prevented 30 large power dams and their reservoirs from flooding Adirondack river valleys. Reintroduction efforts or studies concerning beaver, elk, lynx, moose and wolf throughout the 20th century have all referenced the state's constitutionally mandated policy of maintaining large tracts of mature forest as public wild lands in both the Adirondack and Catskill Park. In 1988, *20:20 Vision* Volume 1 by George D. Davis argued that all vegetative cover types extant in the Adirondack Park should be represented within the Adirondack Forest Preserve. Biological diversity conservation within the Parks became an additional public rationale for selective public land acquisition. The ecological aftermath of the July, 1995 wind storm on large tracts of abutting public and private lands in the Adirondacks was intensively investigated by public and private agencies. These historic intersections of natural history and public policy within the New York State Forest Preserve will be presented through books, text and photographs on loan from the Association's Adirondack Research Library.

Gifford, Neil (The Nature Conservancy Albany Pine Bush Preserve, Latham, NY 12110)

Karner Blue Butterfly Habitat Restoration in the Albany Pine Bush Preserve

Draft New York state and federal Karner blue butterfly recovery plans describe a recovery strategy that initially focuses on maintaining and expanding occupied Karner blue habitat. Since its inception in 1988, the Albany Pine Bush Preserve Commission has investigated a number of restoration tools for the maintenance and recovery of Karner blue habitat within the 2,600 acre Albany Pine Bush Preserve. Initially, the reintroduction of fire was believed to be the primary management needed to maintain and restore Karner blue habitat. While prescribed burning is highly effective at maintaining pitch pine-scrub oak barrens, other management techniques are proving effective to Karner blue habitat restoration. Currently a number of tools including prescribed fire, mechanical and chemical treatment of invasive species, mechanical soil disturbance, and the reintroduction of locally derived native plants are proving successful. At the site of a former three acre parking lot within the Preserve, for example, thousands of lupine and other nectar plants are now growing, and several Karner blues were observed at the site in 1999. The effective restoration of Karner blue habitat and the recovery of the Karner blues themselves will depend on the continual monitoring of restoration sites and the examination of the effectiveness of various restoration tools. Current research is focusing on understanding and reversing the deleterious effects of invasive species and past human disturbance.

Gill, Ronald J., and Karen L. **Frolich** (New York State Biodiversity Research Institute, New York State Museum, CEC 3140, Albany, NY 12230)

The 1999 Capital Region BioBlitz at Peebles Island State Park, Waterford, NY

One of the goals of the New York State Biodiversity Research Institute (NYS BRI) is to raise awareness of biodiversity in New York State. To help accomplish this goal, the NYS BRI organized the first annual Capital Region BioBlitz. The event was a 24-hour biological inventory of as many different species as scientists could identify. The BioBlitz was held on July 30–31, 1999 at Peebles Island State Park, which is located in Waterford, Saratoga County, New York, about 12 miles north of Albany. Situated at the confluence of the Mohawk and Hudson Rivers, this small (158 acre) state park has several habitat types, including wetlands, grasslands and upland hardwood forest. This site was chosen to demonstrate that there can be a high level of biological diversity within close vicinity of a heavily developed urban area. Another benefit of choosing this site was that there had not been any complete biological inventories done of the park. Over 50 scientists and volunteers were organized into 10 groups by taxa. A total of 637 species were identified during the 24-hour BioBlitz. Most of the species identified were vascular plants, with 276 species. Among the invertebrates, participants found 206 species of insects, seven species of mollusks, and two species of decapods. Among the vertebrates, 56 species of birds were identified, along with 18 species of fish, 16 species of mammals, four species of amphibians and four of reptiles. In addition, 39 species of bryophytes, nine species of lichens, and nine species of fungi were also found. We considered the event a success with extensive press coverage generating greater public awareness of biodiversity issues. In 2000, we are planning two BioBlitz events, one in the Capital Region (May) and the other in southeastern New York (June). Additional information on upcoming or previous BioBlitz events are available at <http://www.nysm.nysed.gov/bioblitz.html>.

Greller, Andrew M. (Queens College, CUNY, and Brooklyn Botanic Garden, Brooklyn, NY 11225), Allan J. **Lindberg** (Nassau County Department of Recreation and Parks, Division of Museum Services, Muttontown Preserve, East Norwich, NY 11732), and Lois **Lindberg** (Nassau County Department of Recreation and Parks, Division of Museum Services, Sands Point Preserve, Port Washington, NY 11050)

Magnolia acuminata in North Central Long Island—An Indicator of Climate Equability?

The previous eastern New York State record for *Magnolia acuminata* is from only one location, in Rensselaer County, recorded by John Torrey in 1843. This study presents data for the occurrence of *M. acuminata* farther east, at Tiffany Creek Preserve in Oyster Bay Cove, Long Island, NY. This stand occurs on a moist hillside, a part of the Oyster Bay Recessional Moraine. The soil type is Plymouth-Riverhead Complex of no greater than 15% slope. The *M. acuminata* population is located within a predominantly oak and red maple forest, a type that occurs scattered throughout north central Long Island. The range of *M. acuminata* is centered on the Appalachian Mountains, reaching its northern limit in northern New York State. It extends as far west as the Ozarks, and as far south as the Panhandle of Florida in a scattering of outlying colonies. In the New York City Metropolitan region, *M. acuminata* has been noted only in six scattered locations. Preliminary tree core data suggest that the largest *M. acuminata* in our stand was established in the decade of the 1930s, and the population has proliferated in the most recent two decades. An analysis of the climate of Central Park, NY shows that the 1930s had the warmest average January temperatures until the 1990s. We compared the Normals of Asheville, NC climate, in the core area of *M. acuminata* distribution, with that of Mineola, LI, NY, near the northeastern limit. We found that the winters (average January temperatures) on Long Island are colder and have a longer freezing period. Asheville, with a rating of “Temperate” has been more equable than Mineola which rated “Sub-temperate.” This suggests that the climate of Long Island is becoming more equable.

Harrison, James P. (Rensselaer Polytechnic Institute, Environmental Management and Policy, Troy, NY 12180), and Charles W. **Boyle**n (Rensselaer Polytechnic Institute, Darrin Fresh Water Institute, Bolton Landing, NY 12814)

Fish Distributions and Dissolved Oxygen Anomalies in Trout Lake, New York

Community interactions, composition, and niche have been extensively studied for many freshwater species. Such studies are complemented by extensive work for such diverse species as Arctic char, brown trout Atlantic salmon and rainbow trout, pelagic species such as lake trout and whitefish, and numerous littoral species. The wealth of these studies focuses on physical and chemical variables that affect the ability for a given freshwater ecosystem to support a specific fish community. The interactions of these variables, in conjuncture with species-specific requirements, determine their health and viability. Throughout the literature, a central theme prevails—each species has minimum requirements to sustain survival. This present study investigates a contention that rainbow trout exist in an Adirondack lake whose waters go anoxic during summer thermocline development. A monitoring system was employed from early September to late November, measuring water temperature, dissolved oxygen, and fish position in the water column. The findings revealed that a small but distinct pelagic community existed. This community exhibited diurnal movement, near or into metalimnetic waters, and its population remained below dissolved oxygen levels of less than 3 mg/L, with the majority of sightings occurring in waters below 1 mg/L. Although no direct identification of species has yet been made, stocking records and previous nettings make rainbow trout a potential candidate inhabiting the lower hypolimnion. Continued study and sampling are required to both determine the identity of this community and understand its preference for and survival within anoxic hypolimnetic waters.

Holden, Katie M., and Ernest H. **Williams** (Hamilton College, Department of Biology, Clinton, NY 13323)

A Comparison of Herbivory on Native and Exotic Herbaceous Perennials

The success of invasive exotic species may be due in part to their ability to avoid herbivory. In this study, we assessed whether the levels of insect herbivory differ between native and exotic herbaceous perennials growing in fields. We expected to find less overall herbivory on exotics. We also tested the hypothesis that growth in dense stands allows exotics to experience reduced herbivory. We chose to compare three species of exotics—*Lythrum salicaria*, *Centaurea* sp., and *Pastinaca sativa*—and three native species—*Solidago altissima*, *Aster novae-angliae*, and *Aster prenanthoides*. Plants were selected randomly in the field, and ten leaves chosen randomly from each stem. The leaves were photocopied and the images digitized for measurement of area using NIH Image Analysis software. Leaves that had experienced herbivory were then filled in to normal leaf margins to estimate the area that had been consumed, and, thus, the percent consumption of each leaf. The results indicate that the native species we chose for comparison were, in fact, fed upon more than the three exotics, with *Solidago altissima* receiving the most feeding damage. In addition, plants growing in dense stands received less average feeding than individuals of the same species that were more isolated. These results suggest that both less overall insect herbivory and growth in dense stands are factors that promote the spread of exotic plants.

Holmes, Carol E., Richard S. **Feldman** (Marist College, Department of Environmental Science, Poughkeepsie, NY 12601), and Jeff **Roche** (Dutchess Community College, Poughkeepsie, NY 12601)

Weeds of Farmland: A Herbarium Collection of Sedges, Grasses, and Wildflowers

“Weeds” is a collective term that includes species from many different plant families. We created a herbarium collection of weeds representative of vegetable farms of the mid-Hudson Valley. The study was carried out at Phillis Bridge Farm near New Paltz, Ulster County, a CSA (community supported agriculture) vegetable farm that was established five years ago. The land has not seen any herbicides for at least 20 years. Approximately seven acres are farmed and it is bordered on the north, south and east by conventional apple orchards. Sixty weed species were collected, representing 21 families. The most diverse families were Compositae, Poaceae, and Fabaceae. Several species are beneficial such as vetch and clovers that fix nitrogen, and smartweeds and purslane that can add organic matter to the soil. Pokeweed, horsenettle, and hairy nightshade are poisonous species. Canada thistle and hairy galinsoga are difficult to eliminate once they are established. Daisy fleabane damages hay crops and velvetleaf is a competitor of corn. There are many invasive species, such as chickweed, ground ivy, wild mint, yellow nutsedge, hedge bindweed, but by far the most destructive is leafy spurge. A few species developed large populations in certain areas of the farm. Species presence and distribution reveal to the farmer information regarding the soil, where troublesome insects or diseases may occur, and the type of invasive species present on the property. Because of these characteristics, many weed species represent an economic cost to farmers and a threat to human food production. Learning how to identify these species enables the farmer to control them or use them to some advantage.

Hunsinger, Kimberley C. (Cornell University Department of Natural Resources/NYSDEC, Wildlife Resources Center, Delmar, NY 12054), and John W. **Ozard** (New York State Department of Environmental Conservation, Delmar, NY 12054)

The Second New York State Breeding Bird Atlas

New York State began its second Breeding Bird Atlas Project on 1 January 2000. During the next five years, volunteers will systematically survey the state to determine the current distribution of breeding birds. This is being done to document suspected changes in the distribution of birds over the past two decades. Data from the first Breeding Bird Atlas has been widely used. Applications include revision of the State’s endangered and threatened species list, assisting land managers in establishing acquisition priorities, and establishing plans for public land management. Data is also used as a component of many public and private environmental assessments, including impact statements. Because these data were collected nearly 20 years ago, they may no longer accurately represent current species distribution. New data will be collected in a manner that will facilitate a direct comparison with data collected during the first breeding bird atlas (1980–1985), and published in “The Atlas of Breeding Birds of New York State” (Andrle and Carroll, 1988). Based upon anecdotal observations of birds over the past twenty years, we expect to see significant shifts in the distribution of several species. We will analyze these data in several ways. Maps will be produced using data from the first atlas for comparison with distribution maps prepared from the new atlas data. Also, using Gap Analysis Program (GAP) methodology and geographic information systems (GIS) technology, we will look for changes in habitat that may help to explain shifts in species distribution. The data will be published, as was done for the first atlas, and will be accessible for environmental analysis and scientific research in other formats such as on the world wide web. These two data sets will provide important baseline information that can be used in future analyses of bird distribution in New York State.

Hunsinger, Todd (New York State Museum, Research and Collections Unit, Albany, NY 12230), and Kimberley C. **Hunsinger** (Cornell University Department of Natural Resources/NYSDEC, Wildlife Resources Center, Delmar, NY 12054)

Type Specimens of Amphibians and Reptiles from New York State

New York State is recognized as the type locality for two species of turtles, three species of snakes, three species of salamanders, and three species of frogs. The descriptions of species based on New York specimens dates to Carolus Linnaeus' (1758) tenth edition of *Systema naturae*. Linnaeus' descriptions for the Snapping Turtle, Water Snake, and Timber Rattlesnake were each based on specimens from the vicinity of New York City. Chronologically, the Northern Leopard Frog from White Plains (Schreber 1782), Milk Snake from vicinity of New York City (Lacepede 1788), and Marbled Salamander (Gravenhorst 1807) were added next. The eccentric naturalist Constantine Rafinesque was responsible for adding two species of salamanders in 1820, the Northern Dusky Salamander from "the small streams of Northern New York" and the Eastern Newt from "Lake George and Lake Champlain." John LeConte was also responsible for adding three species, the Wood Frog (1825), Gray Treefrog (1825) and Wood Turtle (1830), all from the vicinity of New York City. Baird's (1850) discovery of the Mink Frog from Sackett's Harbor predates Minnesota specimens, but New York is recognized as the syntype locality due to Baird's error in identifying specimens from each location as belonging to the same species. The New York specimens were designated *Rana sinuata*, while the adapted name *R. septentrionalis* was given to Minnesota specimens.

Kautz, Marie (New York State Department of Environmental Conservation, Delmar, NY 12054), and Charles **Devan** (New York State Department of Environmental Conservation, Dexter, NY 13634)

A Re-evaluation of Bobcat Distribution in New York

Until recently the New York State Department of Environmental Conservation lacked information on the status of bobcats in those parts of New York that are not open to bobcat harvest. This includes central and western New York and the Mohawk River valley. We assumed the occasional reports of bobcats in these areas were either mistaken identifications or immigrants from eastern New York or Pennsylvania. This perception precluded any attempt to actively manage bobcat populations in these areas. In 1995 we initiated a three-year effort to better document distribution of this species. By soliciting and evaluating sighting reports, we documented what we believe is a sparse distribution in these areas. This information will help in planning future bobcat management efforts in New York.

Kiviat, Erik, and Gretchen **Stevens** (Hudsonia Ltd., Bard College Field Station, Annandale, NY 12504)

Local Biodiversity Conservation: A Manual for Citizens

Hudsonia's Biodiversity Assessment Manual for the Hudson River Corridor is a detailed, practical guidebook for the assessment of special habitats and rare species. This richly illustrated looseleaf guide contains detailed profiles of 40 habitats and 55 species of importance to Hudson Valley biological diversity. Habitat profiles cover: distribution and extent of the habitat in the Hudson River corridor, habitat characteristics, rare species associated with the habitat, particular sensitivities of the habitat, suggestions for conservation and management, and references to ecological literature. Species profiles cover: physical description, conservation status, global and regional distribution, habitats in the Hudson River corridor, and references.

The Biodiversity Assessment Manual is designed for use by conservationists, planners, regulators, land managers, educators, citizen activists, agency and organization staff, naturalists, and others. It can be used on sites targeted for development or preservation. It can also guide proactive surveys of whole towns, watersheds, or regions to inform land use planning.

This poster session will introduce potential users to the Biodiversity Assessment Manual for the Hudson River Corridor, outline the process of biodiversity assessment using the manual, and identify the steps involved in creating similar manuals for other regions.

Klotz, R. Lawrence, and Susan A. Linn (State University of New York College at Cortland, Department of Biological Sciences, Cortland, NY 13045)

Effect of Lake Drawdown on Phosphorus Release from Sediments

Phosphorus is generally considered to be the limiting nutrient in fresh waters, the element which controls the amount of plant and animal growth in lakes. Excessive amounts of phosphorus lead to cultural eutrophication problems, including abundant aquatic plants and algae and loss of water clarity. Internal phosphorus loading occurs by the release of phosphorus from lake sediments. One aquatic plant management practice, lake drawdown, was studied to determine if the practice influenced internal phosphorus loading. Studies were carried out on sediments of lakes in Cortland County to determine how drying and freezing, as would occur during drawdown, influence the release of phosphorus from the sediments. Phosphorus release from sediments increased as a result of drying in all ten lake sites studied, but the amount of phosphorus released varied significantly between sites. Phosphorus release ranged from 0.9 to 38.2 micrograms P/g dry weight sediment and the increase over wet controls ranged from 3 to 84 fold. The effect occurred within 4 days of drying in the laboratory. Freezing of sediments also resulted in increased phosphorus release, with 70 times more phosphorus released from frozen sediments compared to unfrozen controls. The full effect of freezing was realized within 3 days. The combined effect of drying then freezing did not increase the amount of phosphorus released above that of sediments that were frozen without prior drying. The results show that lake drawdown may significantly increase internal phosphorus loading to lakes of New York State.

Laba, Magdeline, Steve D. DeGloria, Steve D. Smith (Cornell University, Cornell Institute for Resource Information Systems, Center for the Environment, Ithaca, NY 14853), **Jennie L. Braden, Eric H. Fegraus, Jeff Fiore, Shari K. Gregory, Elizabeth A. Hill, Danielle E. Ogurcak, Anna M. Stalter, Joseph T. Weber** (Cornell University, Department of Natural Resources, Ithaca, NY 14853), **Gerald P. Rasmussen** (New York State Department of Environmental Conservation, Habitat Inventory Unit, Latham, NY 12110), **Milo E. Richmond, and Charles R. Smith** (Cornell University, NY Cooperative Fish and Wildlife Research Unit, Department of Natural Resources, Ithaca, NY 14853)

New York Gap Analysis—A Prerequisite for Conservation Planning

The Gap Analysis Program (GAP) is a nationwide effort under direction of the United States Geological Survey of the U.S. Department of the Interior. It is the first time in the history of the United States that a comprehensive effort has been made to inventory, computerize and display geographical distributions of species of plants and animals that contribute to our national biodiversity. GAP research is being done on a state by state basis and currently is underway in all 50 states. Using the methods of geographic

information systems, distributions of land cover classes and vertebrate species are mapped. These distributions are overlaid upon maps of protected public lands and other land holdings with management plans that provide for long-term conservation of biodiversity. Regions of high biodiversity that do not fall within such designated protected areas represent a gap in management efforts to ensure long term protection of biological diversity, hence the name “gap analysis.” Ultimately state boundaries will be edge-matched to produce a seamless landscape level map of national biodiversity. Samples of products from the ongoing New York Gap Analysis Project are provided.

Lauro, Brook (Department of Computer Science, Mathematics and Science, St. John’s University, Jamaica, NY 11439)

Examination of Predatory Pressures on Nesting Piping Plovers (*Charadrius melodus*)

Artificial nest experiments were conducted to assess potential risks of predation to piping plovers (*Charadrius melodus*) nesting at Breezy Point, Gateway National Recreation Area, New York. The factors influencing removal of quail eggs at artificial nests were complex and dependent upon the time during the breeding season and location relative to nesting seabirds and predators. Removal of eggs at artificial nests was high and for all experiments combined was 85%. The highest removal rates were early in the field season when nesting common terns (*Sterna hirundo*), who mob potential predators, had yet to arrive. Once terns arrived, rates of egg loss in their colony were significantly lower than that at other locations (e.g. beach, gull colony, interior). Thus, nesting common terns appeared to provide a protective effect for eggs placed in artificial nests. The two main predators based on visible footprints in sand were avian: crow and gull. Results suggested that crows predated significantly more eggs at artificial nests than gulls although crows were less numerous than gulls. Experimental results and survey data indicated that mammalian predation at this study site was less important. The implications of results to potential predation threats upon piping plovers are discussed.

Limburg, Karin E., Ian Blackburn (College of Environmental Science and Forestry, State University of New York, Syracuse, NY 13210), **Robert Schmidt, Thomas Lake** (Hudsonia Ltd, Annandale, NY 12504), **John J. Hasse** (New York State Department of Environmental Conservation, Utica, NY), **Mikael Elfman**, and **Per Kristiansson** (Lund University, Department of Nuclear Physics, Sweden)

Otolith Microchemistry Indicates Unexpected Patterns of Residency and Anadromy in Blueback Herring, *Alosa aestivalis*, in the Hudson and Mohawk Rivers

Blueback herring (*Alosa aestivalis*), an anadromous fish endemic in the Hudson River, has been observed in the Hudson’s main tributary, the Mohawk River, since the 1930s. Moving westward over time, individuals were collected in Lake Ontario in 1997. However, the actual status (resident or marine anadromous) of adults there or in the Mohawk has not been determined. We collected adult blueback herring in the spring 1999 spawning run and analyzed their otoliths’ elemental composition with both electron (WDS) and nuclear (mPIXE) microprobes. We measured strontium:calcium ratios along “life-history transects” (WDS) and mapped entire otoliths (mPIXE), providing a detailed time series of data on the Sr:Ca, and thus salinity history, of the fish. We also analyzed otoliths of Mohawk and Hudson River young-of-year (YOY).

The Sr:Ca ratios of Mohawk YOY are slightly but significantly higher than those of Hudson YOY. Life history transects for 51 adults show complex patterns of Sr:Ca, indicating that many of the fish move

into salt water at least for brief periods. However, many fish appear to spend extended parts of their post-YOY lives in fresh water, and at least two adults (caught in the Mohawk near Rome, NY) appear never to have changed habitats at all. This is thus the first demonstration of residency in Mohawk River herring.

Malcom, Heather M., Colleen **Lutz**, David L. **Strayer**, and Michael L. **Pace** (Institute of Ecosystem Studies, Millbrook, NY 12545)

Macroinvertebrate Response to Macrophytes, Tides, and Diel Cycles in the Hudson River

We investigated the invertebrate communities associated with vegetated habitats in the freshwater tidal Hudson River. Our goals were to: 1) describe the macroinvertebrate communities within macrophyte beds; 2) see if invertebrate communities vary with plant species or plant densities; 3) see if the benthic invertebrate communities vary from inside to the outside of the bed; 4) determine if the open-water macroinvertebrate community changes with diurnal or tidal cycles. We collected samples of benthic and plant-dwelling macroinvertebrates at eight sites within a macrophyte bed near Saugerties. Benthic and open-water macroinvertebrates were collected at four sites outside of the bed. Invertebrate community structure varied with habitat, tidal cycles, and time of day. Spatterdock and pickerelweed (605 dry mass g/m²) densities were higher than water celery (259 dry mass g/m²) densities. Because of the architecture of the macrophytes, water celery nonetheless probably presents more surface area for colonization by aquatic invertebrates than do spatterdock and pickerelweed. Densities of macroinvertebrates were vastly higher in the water celery (12473 ind/m²) than in the other plants (543 ind/m²). Common macroinvertebrates found within the macrophytes were chironomids, Cladocera, and gastropods. Amphipod densities were significantly higher in the water column between dusk (0.19 ind/L) and dawn (0.01 ind/L), which suggests movements of amphipods from one habitat to another. Tidal currents played a role in the distribution of open-water invertebrates as well. This study shows the importance of macrophytes in structuring invertebrate communities within and surrounding the macrophyte bed.

McMahon, Ann M., and David **Aitken** (University at Albany, State University of New York, Department of Biological Sciences, Albany, NY 12222, and Castleton State College, Castleton, VT 05735)

Overwintering Spotted Salamander Larvae in Southwestern Vermont

In southwestern Vermont, spotted salamanders (*Ambystoma maculatum*) typically breed in ephemeral bodies of water and pond drying stimulates the onset of metamorphosis. Here we report evidence of overwintering spotted salamander larvae in a small, spring-fed pond. Breeding occurs in this site at the same time as nearby ponds. Due to the lower water temperature of this pool, larvae hatch from eggs later (in July) and develop more slowly than they do in other local sites. Sampling from this site in July has consistently revealed two size classes of larvae that are markedly different in body size. The smaller size class consists of hatchlings and the larger size class has been suspected to be larvae from the previous year. Sampling from this pond this January revealed the existence of overwintering larvae. Body sizes (total length, snout-vent length, tail length, girth width, head width) of individuals measured in January were similar to body sizes at which spotted salamanders typically transform elsewhere. Body sizes of post-metamorphic individuals collected from this site in July (1997) were much larger than post-metamorphic spotted salamanders collected from local sites that do not permit overwintering. The body sizes of these spotted salamanders collected in July were more similar to the body sizes in which larval Jefferson's salamanders (*Ambystoma jeffersonianum*) transform in ponds nearby. Overwintering in this site provides an opportunity for spotted salamander larvae to attain larger body sizes at metamorphosis which may improve survival and enhance fecundity in adults.

Mund, Daniel E., and James M. **Wolfe** (Houghton College, Biology Department, Houghton, NY 14744)

A Comparison of Three Softwater Lakes in Eastern Connecticut

Bashan Lake, Pataganset Lake, and Amos Lake, all located in the eastern uplands geological formation of Connecticut (East Haddam, East Lyme, and Preston, respectively), were studied during the summer and fall of 1999. The lakes, with maximum depths of 15.3 m (Bashan), 10.2 m (Pataganset), and 14.5 m (Amos), were stratified from May to August. Bashan Lake had a mean conductivity reading of 64 $\mu\text{S}/\text{cm}$, mean alkalinity of 5 mg/L, mean hardness of 15 mg/L, and a mean secchi depth of 6.2 m. Pataganset Lake had a mean conductivity reading of 74 $\mu\text{S}/\text{cm}$, mean alkalinity of 11 mg/L, mean hardness of 16 mg/L, and a mean secchi depth of 2.9 m. Amos Lake had a mean conductivity of 128 $\mu\text{S}/\text{cm}$, mean alkalinity of 25 mg/L, mean hardness of 27 mg/L, and a mean secchi depth of 2.1 m. Aquatic plants were dense in Amos and Pataganset Lakes, dominated by white water lily, while Bashan Lake had limited areas with dense plant cover, mostly consisting of milfoil. Fecal coliform readings for all the lakes were low. Although Bashan Lake is oligotrophic, the mesotrophic status of Pataganset Lake and eutrophic status of Amos Lake may be due to cultural eutrophication from lakefront homes.

Munger, Krista L. (Hudsonia Ltd./AmeriCorps, Bard College Field Station, Annandale, NY 12504), and Erik **Kiviat** (Hudsonia Ltd., Bard College Field Station, Annandale, NY 12504)

Habitat Restoration for Blanding's Turtle in Dutchess County

Constructed wetlands and upland nesting areas were completed in May 1997 to replace habitats of the state-threatened Blanding's turtle (*Emydoidea blandingii*) lost to school expansion. Organic sediments and vegetation were salvaged and moved 200–700 m to create 1.4 ha of deep-flooding, shrubby, groundwater-fed wetlands interspersed with dry, coarse-textured, sparsely vegetated, upland soils. Deep pools were created for drought refuge, and a 1.5 km fence with one-way turtle gates was built between the restoration area and school. Turtle responses have been monitored for 3 years following construction. Adults used the constructed wetlands during nesting season and summer but little in winter and early spring, seasons of narrow habitat use. In the recent alternation of wet and dry summers, turtles responded to precipitation, partly obscuring post-construction trends. At least 6 females nested on the constructed areas in each year but hatchling production declined slightly. Turtles nested close to the barrier fence and in some cases found their way around it, moving offsite and into areas of high traffic. Nest sites had less vegetation cover and more gravelly soil compared to random sites. Hatchling size was correlated to soil moisture. Vegetational changes are currently under study. Because the longterm prognosis of this habitat restoration is uncertain, wetland and nesting area construction should be used to increase habitat for Blanding's turtle rather than to mitigate the planned destruction of wetlands.

Nadareski, Christopher A., and Michael **Usai** (New York City Department of Environmental Protection, Wildlife Studies, Valhalla, New York 10595)

Understanding the Relationship between Waterbird Populations and Fecal Coliform Bacteria on Several New York City Reservoirs

The New York City Department of Environmental Protection (DEP) is responsible for the management and implementation of a comprehensive watershed protection program for New York City's municipal water supply. DEP's Watershed Protection Program is mandated to identify and mitigate all sources of

pollution to its unfiltered water system. As a result, a year-around program to monitor waterbird populations as a source of fecal coliform bacteria pollution was implemented in 1992. Seasonal population increases from certain waterbird species have been recorded at the following reservoirs: Kensico Reservoir (Westchester County) West Branch Reservoir (Putnam County); Rondout Reservoir (Ulster and Sullivan County) and; Ashokan Reservoir (Ulster County). Fecal coliform bacteria data collected at bird roosting locations and water outflow structures are compared to waterbird numbers. Species richness and evenness and distances of waterbird roosting locations relative to water outflow structures greatly influence water quality results and the implementation of bird control measures.

Nelson, Richard T., and **Matthew Scott** (Student Association of the University at Albany, Camp Dippikill, Warrensburg, NY 12885), **Alvin R. Breisch** (New York State Department of Environmental Conservation, Division of Fish, Wildlife and Marine Resources, Delmar, NY 12054)

Long-term Changes in a Northern Hardwood Forest Managed for Sustained Yield

Logging plays a significant role in the ecology of the Adirondacks and in the life of Adirondack residents. Increased use of firewood in the early 1970s led us to begin a long-term study to monitor changes in forest composition of a northern hardwood forest woodlot. The objective was to develop a harvest schedule that could produce a sustained yield while maintaining the diversity of the tree stratum. An area to monitor was selected within the forests of Camp Dippikill, Warren County, owned by the Student Association of the University at Albany. Thirty-six 10 m × 10 m quadrats were positioned within a larger 500 acre woodlot which produces 50 to 70 cords per year. All stems 1" diameter breast height or greater were measured and the species recorded. Total basal area (BA) was plotted year by year. Since 1972, the woodlot has been harvested twice after the minimum stocking density for commercial thinning was exceeded (100 sq. ft/acre) with the next harvest scheduled for 2010. Selective harvesting was done with chainsaws and the downed trees were skidded out of the woodlot by horse. The two harvests removed 30% and 48% of the BA respectively. Yield in cords of firewood was calculated. A woodlot of this sort can produce 1 cord/acre/year with a harvest approximately every 20 to 30 years. Changes in species composition, size class of stems, and density will be discussed.

Nye, Peter E., and **Barbara Loucks** (New York State Department of Environmental Conservation, Wildlife Resources Center, Delmar, NY 12054), and **Chris Nadareski** (New York City Department of Environmental Protection, Valhalla, NY 10595)

The Resurrection and Current Status of Peregrine Falcons and Bald Eagles Along the Hudson River

As recently as 1987 for peregrine falcons and 1991 for bald eagles, neither of these species was known to be breeding along the Hudson River corridor (Albany to Tappan Zee Bridge), nor were prospects for this occurrence bright, despite extensive restoration projects conducted for each species during the late 1970s and 1980s. However, things changed dramatically for both species in subsequent years. During 1999, every bridge from the Tappan Zee to Albany was occupied by pairs of peregrines, and 17 young falcons were fledged that year from nine breeding pairs. A total of 65 young have now been fledged from Hudson River nesting peregrines since 1988. All but one of these pairs are on bridges; one pair is on the more traditional cliff nest site. A total of 10 eaglets have fledged from three bald eagle nest sites along the Hudson since the first breeding pair was discovered in 1992. The first nestling, however, was not confirmed until 1997. Where are these species finding safe-haven? What are they eating? What problems do they face as residents of the mighty Hudson? What are the prospects for their future? These and other issues will be explored.

O'Brien, Kathleen M. (New York State Department of Environmental Conservation, Endangered Species Unit, Delmar, NY 12054)

An Introduction to New York State Listed Invertebrate Species of the Albany Pine Bush Preserve

The Albany Pine Bush Preserve is a globally rare inland pine barrens; an ecosystem of fire climax vegetation and adapted animal species. The most famous inhabitant of the Pine Bush, and a large part of the rationale to protect and manage the Preserve, is the endangered Karner blue butterfly (*Lycaeides melissa samuelis*), which feeds only on a characteristic pine barrens plant, wild blue lupine (*Lupinus perennis*). The barrens buckmoth (*Hemileuca maia*) is a lesser known Pine Bush species which has been listed as special concern for many years. The importance of protecting habitat in preserving the biodiversity of ecosystems and the particular importance of the unique Albany Pine Bush has been reinforced with the most recent revision to the New York State list of Endangered, Threatened and Special Concern Species. In 1999, five more species of invertebrates less familiar to most Capital District residents that are or have been a part of the Pine Bush fauna were placed on the list. Three more are considered status undetermined. The Persius duskywing (*Erynnis persius*) and the pine pinion moth (*Lithophane lepida lepida*) are now protected as Endangered species. The frosted elfin (*Callophrys irus*) is listed as a Threatened species. Henry's elfin (*Callophrys henrici*) and mottled duskywing (*Erynnis martialis*) are listed as Species of Special Concern. Albarufan dagger moth (*Arconicta albarufa*), broad-lined erastria (*Erastria coloraria*), and ringed boghaunter (*Williamsonia linteri*) are species about whom concerns have been raised. However, more information is needed to determine if they merit protective status.

Pardanani, Neeta, **Robert G. Means**, **Dennis J. White** (New York State Department of Health, Bureau of Communicable Disease Control, Albany, NY 12237), **JoAnne Oliver**, and **John J. Howard** (College of Environmental Science and Forestry, State University of New York, Syracuse, NY 13210)

Evaluation of the Kness Snap-E® Mousetrap in Capturing Small Mammals

As part of the vector ecology component of a three-year Lyme disease study funded by the Centers for Disease Control and Prevention, we collected small mammals from seven counties along a transect of New York State in 1998 for the purpose of testing ear tissue for the presence of the etiologic agent of Lyme disease, *Borrelia burgdorferi*. There is little published data evaluating snap-traps for this type of study, and many small mammal population ecology studies have utilized wooden-based Victor or Museum Special snap-traps. We examined the effectiveness of the uniquely designed plastic-based Kness Snap-E® trap in trapping and effectively killing target mammals, primarily white-footed mice and deer mice (*Peromyscus* species). A total of 7364 traps baited with peanuts were set between May and October, capturing 813 small mammals. Twenty-one of these animals were found alive in their traps and another 61 mammals had been preyed upon prior to trap retrieval. Four non-target animals (birds and amphibians) were captured. The Snap-E® trap was effective at capturing mostly *Peromyscus* species and short-tailed shrews but also captured a variety of rodents and insectivores, including jumping mice, flying squirrels, chipmunks, voles, and smaller shrews. Most small mammals captured were killed by the trap, however it is unclear if the animals were killed immediately upon entering the trap. We concluded that the Snap-E® trap is an effective, reusable field tool for capturing small mammals for the purpose of harvesting ear tissue for detection of *Borrelia burgdorferi* spirochetes.

Rana, Mohammed (Saint Joseph's College, Biology Department, Patchogue, NY 11772), Mark **Hessler** (Saint Joseph's College, History Department, Patchogue, NY 11772), Lindsey **Ryder**, and Severia **Clemens** (Saint Joseph's College, Lyceum Academy, Patchogue, NY 11772)

The Natural History of the Great South Bay

The Great South Bay is a bar estuary located between Mainland Long Island to the North and Fire Island to the south. It extends 40 kilometers from Amityville to Smithpoint. For the people of Long Island it has great biological, economical, and social value. It has served as a major producer of shellfish (clams and oyster) in the New York State, however, since 1980 there has been a decline in shellfish production. Field studies were conducted on the eastern part of Great South Bay near Smithpoint to understand the environmental factors responsible for the decline of shellfish.

We observed an increase in the salinity range to 16–33 per thousand, which is double the average, and a decrease in the leaf size of the aquatic Eelgrass angiosperm (*Zoostera* spp.) to 6–11 inches which is 75% less than what was previously reported. Increased salinity previously occurred during the hurricane of 1938 due to the breaching of the Fire Island beach, and was reported to destroy the oyster beds. It appears that high salinity causes severe stress to the shellfish youngsters and higher salinity may also attract starfish from the ocean, a natural predator of shellfish. The decrease in size of eelgrass may not be providing enough shelter for the shellfish. The reasons for the increase in salinity is not clear. Two inlets, Moriches to the east and Fire Island to the west, supply salt water to the bay while five inlets on the South east side of the bay are closed which makes the bay a “closed container”. It is possible that the evaporation factor is responsible for the increase of salt, therefore it is suggested that the inlets be opened. These open inlets will probably lower the concentration of salt and other pollutants.

Rapant, James E., and Carol A. **Cady** (CSU, Natural Resources Branch, Environmental Division, Fort Drum, NY 13602), and Paul G. **Zang** (US Army, Natural Resources Branch, Environmental Division, Fort Drum, NY 13602)

Changes in Forested Land on Fort Drum, NY, 1908–1995

We used a Geographic Information System (GIS) to examine historical changes in the amount of forested area on Fort Drum and surrounding counties. Maps made in 1908, 1945, and 1995 were digitized and electronically superimposed to identify the location and magnitude of temporal changes in forested area. A comparison of areas where the maps intersect suggests that forest area declined from 1908–1945 then increased substantially through 1995. The 1908–1945 decline was mainly attributed to extensive agricultural and logging activity. The prevention or control of these activities by the installation since 1940 largely explains the increase in forest area from 1945–1995.

Rice, Steven K., and Robert Federici (Union College, Department of Biological Sciences, Schenectady, NY 12308)

Fire and Site History Affect N-mineralization in Pitch Pine-Scrub Oak Communities

Anthropogenic and natural disturbances can alter nutrient cycles and have cascading effects on ecosystem and community dynamics. Within the nutrient poor, sandy soils of inland pitch pine-scrub oak communities in the Albany-Schenectady Pine Bush, nitrogen availability limits plant growth and is likely to be influenced by fire, post-fire succession, and disturbance history. Using a buried-bag field incubation technique (four week incubations, $n = 6$ per site), we evaluated nitrogen mineralization rates (i.e., sum of ammonification and nitrification) among sites that differed in fire, successional state, and disturbance history during the early growing season 1999. In incubations begun within two weeks of the April 27, 1999 fire, rates of ammonification were enhanced over 10-fold within a burned barrens community when compared with an unburned control. This contributed to a 5-fold increase in N-mineralization rates (0.022 versus 0.004 mg N g⁻¹ d⁻¹). However, in incubations initiated at seven weeks following fire, neither ammonification nor total N-mineralization rates differed between these sites. Forested, closed canopy communities had higher rates of total N-mineralization and ammonification when compared with either barrens or scrub communities. The largest treatment effect on N-mineralization rates was related to site differences. An area that was cleared prior to an unsuccessful development effort and allowed to regrow had a 35-fold higher N-mineralization rate (2.84 versus 0.008 mg N g⁻¹ d⁻¹) than a site without such disturbance. It is likely that invasion by black locust is responsible for increased nitrogen supply and subsequent increase in N-mineralization rates within these communities.

Rutley, Mary S., Amy J. Hollister, and Melinda Conger (State University of New York College at Potsdam, Biology Department, Potsdam, NY 13676)

The Variation of Overwintering Asiatic Lady Beetles, *Harmonia axyridis*

The lady beetles (Family: Coccinellidae) include thousands of species worldwide with many of those species in North America. The multicolored Asian lady beetle, *Harmonia axyridis* was among other species introduced to California in 1916 for use in biological control programs for aphids and other prey insects. This beetle overwinters in protected sites during an adult diapause. Throughout the 1960's, 1970's, and the early 1980's, lady beetles were imported from Asia to the United States in large quantities. These lady beetles are increasingly common throughout St. Lawrence County in northern New York where they frequently overwinter in houses and other buildings. *H. axyridis* is easily identified by a black marking on the pronotum in the shape of the letter "M". Members of this species can display considerable variation. To examine this variation, students collected specimens at different sites in St. Lawrence County over a period of two years. The aggregations of lady beetles in buildings provided easy collecting as they became more active on warm winter and spring days. At each site, a minimum of twenty specimens was collected. Three basic variations were noted in this study. Variation in body size was tabulated with measurements of length and width. Color variation was observed and beetles were classified according to the different nuance of color of the elytra that were noted. The spotting on the lady beetles was examined and although the typical adult *H. axyridis* has nineteen spots on the elytra, the number of spots fluctuated greatly. The variations observed are demonstrated in the data and presented with comparisons made of sample sites.

Schwob, Sarah A., and Ernest H. **Williams** (Hamilton College, Department of Biology, Clinton, NY 13323)

Growth of Pearl Crescent caterpillars on different *Aster* Species

The *Aster*-feeding Pearl Crescent butterfly, *Phyciodes tharos*, is reported to oviposit on at least 12 species in the genus *Aster*, but not all possible species serve as host plants. Furthermore, the butterflies may choose only one plant species in any single population. To better understand the patterns of host use, we have carried out larval feeding experiments to assess the quality of potential hosts as larval food. We expected to find reduced growth on older compared to newer leaves, on forest rather than field species, and on species known to have specialized phytochemistry. Second through fourth instar larvae, the offspring of field-caught adult females, were grown on freshly collected leaves for 48 hours (most experiments), and standard gravimetric measures of feeding efficiency were determined, including relative consumption and growth rates, approximate digestibility of the leaves, and efficiencies of conversion of ingested food. Among the common field species, *A. lanceolatus* was the highest ranked larval food, while *A. novae-angliae* and *A. prenanthoides* also produced significant growth. *A. lateriflorus* gave mixed results, depending on the source populations and age of the leaves, while *A. novae-belgii*, *A. umbellatus*, and the forest species *A. divaricatus* do not support larval growth. The differences in larval growth are explained in part by leaf age and known chemical differences among the species, while other factors require further study. In summary, only some of the *Aster* species in the same habitat are good food sources for *Phyciodes tharos* larvae.

Smith, Charles R., Joseph T. **Weber**, and Milo E. **Richmond** (Cornell University, Department of Natural Resources, Ithaca, NY 14853)

Science-based vs. Expert-opinion Approaches to Planning for Conservation of Birds

In September 1997, legislation became effective to create a New York State Bird Conservation Area (BCA) Program, “which shall consist of such state-owned waters, lands, or portions thereof as are necessary to safeguard and enhance populations of wild birds native to New York state and the habitats therein that birds are dependent upon for breeding, migration, shelter, and sustenance.” To be considered candidates for BCA designation, sites have to be identified as “important bird areas”, following procedures similar to those defined by the American Bird Conservancy and implemented by the National Audubon Society in NY and elsewhere. Initial identification of candidate important bird areas is accomplished through an expert-opinion approach. In general, the results of our analysis show that the expert-opinion approach was rather poor at identifying potential important bird areas on public lands. Of 234 sites supporting “exceptional diversity”, only 25 (10.7%) were identified as potential important bird area sites by Audubon’s expert-opinion approach. The expert-opinion approach did slightly better at identifying public lands that might protect endangered, threatened, or special concern species. Using the expert-opinion approach, experts identified 25 of 112 areas of public lands (22%) that included 3 to 8 state-listed breeding bird species. Conversely, the expert-opinion approach missed 296 of 346 public land areas (86%) identified as potential BCAs using a repeatable, science-based approach. The results of this study raise serious questions about the efficacy and value of an expert-opinion approach to identifying public lands that might be of conservation value for birds.

Sweeney, Kimberly J., and Peter K. Ducey (State University of New York at Cortland, Department of Biological Sciences, Cortland, NY 13045)

Cortland Herpetology Connection: Achievements and New Directions

The Cortland Herpetology Connection (CHC) is changing. Over the past two years, the CHC helped to increase high school participation in the NYS Department of Environmental Conservation's Amphibian and Reptile Atlas Project, which documented the geographic distribution of NY's herpetofauna. We contacted over 140 high school classes in the Great Lakes drainage and across New York, and provided many schools with educational packets. We gave presentations for students and teachers and hosted classes at SUNY Cortland. We maintained an active web site (www.cortland.edu/herp/) receiving over 350 visits per month, and created a museum exhibit viewed by thousands of students. Upon conclusion of the Atlas Project at the end of 1999, CHC continues to inform, support, and stimulate high school classes. We designed the CHC Challenge, which encourages students to ask questions and raise concerns about herpetological issues in their region. Sample projects include monitoring local populations, detecting new environmental problems, and stemming illegal trade in animals and animal products. The CHC works with the NYS Department of Environmental Conservation and is partially supported by the NYS Great Lakes Research Consortium and the NYS Great Lakes Protection Fund.

Tanny, Ava R., and Monica A. Raveret Richter (Skidmore College, Department of Biology, Saratoga Springs, NY 12866)

Land Use History in the Wilton Wildlife Preserve and Park

The landscape matrix comprising the Wilton Wildlife Preserve and Park, located in central Saratoga County, includes a network of habitat patches that contain or are potentially suitable for wild blue lupine *Lupinus perennis* (L.) (Fabaceae), the sole food plant of the Karner blue butterfly *Lycaeides melissa samuelis* (Nabokov) (Lepidoptera: Lycaenidae). This habitat network includes several sites with Karner blue butterflies, and has strong promise for maintaining a viable metapopulation of the endangered butterfly, along with the associated flora and fauna of the pine savannah community. During the summer of 1999, we interviewed long-term residents of the area, focusing on the history of land use, fires, and fire control practices. We also analyzed aerial photographs, maps, surveys and written documents to obtain data on the history of land use and land cover in Wilton. In the preserve, lupine occurs primarily on OaB (Oakville loamy fine sand, undulating) soils, with a few patches on Oakville soils with steeper slopes. Oakville soils are characterized by a water level depth of greater than 6 feet, which is deeper than that of most surrounding soils. In addition, current lupine populations tend to be located in areas with a history of past agricultural use, as well as along roadsides, railway corridors, and power line right-of-ways, where disturbance of various sorts may contribute to the persistence of this early successional plant. We will discuss how the information from our historical analysis might provide insights on how to select appropriate sites for the successful establishment of additional lupine populations in the preserve.

Terbush, Karen B. (New York State Parks, Recreation and Historic Preservation, Environmental Management Bureau, Albany, NY 12238)

Environmental Internship Program at New York State Parks

The Environmental Management Bureau (EMB) of State Parks has initiated an Environmental Internship Program with colleges and universities in the Albany Area. Working with interested students and their professors, EMB staff have developed a Project and Scope of work for each student that is tailored to the students interests and the research needs of the Agency. This exhibit will be a series of posters by 5 interns from SUNY Albany and Siena College who are currently working on various projects for the EMB in State Parks. Each poster will be prepared by the student summarizing the work they are doing and their findings, to date. The students will be available to answer questions about their research projects during the poster session.

The five internship programs are summarized below:

Bender, Brian (University at Albany, Department of Urban and Regional Planning, Albany, NY 12222)

Trail Environmental Assessment and Planning Schodack Island State Park

This project involves research on the siting and layout of trail networks to minimize impacts to the environment. The project will result in the development of a preliminary trail plan for the park and an environmental assessment of the potential effects of the proposed trail system.

Desautels, Ryan (Biology Department, Siena College, Loudonville, NY 12211)

Impacts of Invasive Plant Species on Biodiversity on Selected Locations in State Parks

Intern research will focus on actual examples of impacts of invasive plant species on biodiversity in the State Park System. Fieldwork will include studies at two or 3 park sites comparing biodiversity between areas impacted by invasive plant species and area that are not affected.

Kisby, Staci (University at Albany, Department of Geography, Albany, NY 12222)

Assessment of Recreational Impacts of Campgrounds and Trails at Moreau Lake State Park

The scientific literature will be reviewed for information on measurement and mitigation of impacts to the environment at camping areas and well as methods for restoration of these areas. Fieldwork will involve inspection and assessment of the campsites at Moreau Lake State Park, recommendations for restoration of campsites and guidelines for the location new campsites and trails. A pilot restoration program may also be undertaken at one or more sites.

Serra, Lauren (University at Albany, Department of Biological Sciences, Albany, NY 12222)

Development of Permanent Sample Plots for Monitoring Vegetation at Saratoga Spa and Moreau Lake State Parks

This project involves research of the literature and other sources to determine the best methods for development of permanent sample plots to measure long term changes in biodiversity within community types. The project involves the mapping of community types at Saratoga Spa and Moreau Lake State Parks, the identification of the best representative locations for permanent sample plots in each community type and field surveys of the vegetation in each sample plot.

Stanish, David (University at Albany, Department of Biological Sciences, Albany, NY 12222)

Protection Planning for *Emydoidea blandingii* (Blanding's Turtle)

This project involves the development of public information on the turtle for a kiosk at James Baird State Park, preparation of a habitat map of the park and field work which includes assisting in the implementation of a management plan for the Blandings Turtle at James Baird SP. Generic guidelines will also be prepared for the protection of Blanding's Turtle at Wellesley Island and Coles Creek State Parks in the Thousand Islands region of State Parks.

Vitale, Christine G. (Cornell University, New York Cooperative Fish and Wildlife Research Unit, Department of Natural Resources, Ithaca, NY 14853), **John W. Ozard** (New York State Department of Environmental Conservation, Delmar, NY 12054), and **Shari K. Gregory** (Cornell University, Department of Natural Resources, Ithaca, NY 14853)

Distribution of the Marbled Salamander in New York State

The marbled salamander, *Ambystoma opacum*, is a member of the Ambystomatidae family. The marbled salamander is fossorial in nature, but can be found above ground on rainy nights and during the breeding season. Unlike other ambystomid salamanders, marbled salamanders breed in the fall and females lay their eggs on land near vernal pools. The eggs will not hatch unless flooded and most females will guard the nest until the rains begin. Larvae continue to grow through the winter months and metamorphosis will take place during the summer.

The marbled salamander can be found in deciduous forests from southern New Hampshire to northern Florida and as far west as eastern Texas. In New York State this species is found in the lower Hudson Valley and on Long Island. Historically it was collected as far north as Coxsackie, Green County. Recent records indicate a northern limit in the vicinity of the Shawangunk Ridge, Ulster County.

The current distribution and the habitat preferences of the marbled salamander will be examined with the use of two important programs, The New York State Amphibian and Reptile Atlas Project, also known as the Herp Atlas, and The New York State Gap Analysis Project. The data collected for the Herp Atlas shows significant gaps in the distribution of marbled salamanders. Data reveals there are 105 unique locations for marbled salamanders occurring within 8 counties. Through the use of the Gap Analysis, the vegetative cover of these locations will be determined in order to better understand the land use preferences of the marbled salamander. Also, a comparison will be made between the GAP Analysis predicted distribution versus the known distribution of marbled salamanders. Knowledge gained will be critical for informed management decisions concerning habitat and species conservation.

Warnon, Jacques C.M., James H. **MacDonald**, Jr., and Russell H. **Waines** (State University of New York at New Paltz, Department of Geological Sciences, New Paltz, NY 12561)

Plagioclase Significance in a Taconian Arenite Sequence, Southeastern New York

Preliminary studies were made of a recently discovered 11,000 foot (3,400 m) allochthonous arenite sequence in eastern Ulster County. Petrographic investigations of these Middle Ordovician (Kirkfeldian) arenites seem to support interpretations of previous investigators (D. Kolata, et. al., 1996) (B. Bock, et. al., 1998) who suggested: 1) eastern locations for the source(s) of Ordovician K-bentonite distribution in eastern North America (some of these K-bentonite layers were deposited during the Kirkfeldian) and 2) Isotope distribution pointing to an eastern provenance for the per-Kirkfeldian Austin Glen Formation. Initial petrographic observations seem to indicate a significantly higher feldspar content than in the underlying Austin Glen. The plagioclase particles are detrital, subangular and range from fine sand to coarse silt size. Possibly, they formed from coarser volcanic detritus that the K-bentonites and, consequently, were deposited closer to the source. Published K-bentonite and Isotope studies indicate a non-oceanic lithic provenance to the east. Lacking any likely source of plagioclase to the west an eastern origin for the plagioclase appears more probable.

The marine Kirkfeldian fauna throughout the study sequence is typically eastern North American with one notable exception. A sometimes abundant exotic, the trilobite *Decoroproetus* with Welsh-English affinities may indicate deposition somewhat removed to the east. This investigation suggests detrital deposition of pyroclastic material in a back arc basin located east of the study area. Volcanoes penetrating marginal continental rocks in a foreland or island arc seem to be the sources of the detrital plagioclase.

Whittier, Thom (Dynamac/Environmental Protection Agency—Environmental Monitoring and Assessment Program, Corvallis, OR 97333), and David **Halliwell** (Maine Department of Environmental Protection, Augusta, ME 04333)

Regional Cyprinid Distributions in Northeast Lakes—Evidence of Loss of Minnow Biodiversity

Fish assemblage sampling was conducted in 195 randomly selected lakes in the Northeast USA during the summers of 1991–94 by the Environmental Monitoring and Assessment Program (EMAP). These fish samples show the greatest concentration of native cyprinids to occur in northern Maine, where most lakes had 3–7 minnow species comprising 40–80% of the species caught in each lake. In contrast, lakes in New Jersey, southern New York, and southern New England rarely had any minnows with the exception of the wide-ranging (introduced) golden shiner. We examined native minnow ranges and autecology, and evaluated fish species richness relative to the presence of littoral fish predators and human disturbance at the in-lake and watershed levels. Comparison of EMAP data with expected species richness suggest alteration in the minnow assemblage over much of the northeastern region. The most consistent factor related to cyprinid species richness was the absence/presence of littoral fish predators, including black basses, black crappie, pike and pickerel, white perch and American eels. Median number of minnow species in lakes lacking predators was two, and zero in lakes with predators. Non-native predators have been widely introduced throughout the Northeast; 63% of the sampled lakes have introduced predators. In the absence of predators, cyprinid species richness declined with increased human activity in the watershed and degree of shoreline development. Only in northern Maine, where lakes are generally undeveloped and littoral predators absent or few, do lake minnow assemblages appear relatively intact. At least three cyprinid (*Notropis*) species are apparently “at risk” in northeastern USA lakes.

Young, Stephen M. (New York Natural Heritage Program, Latham, NY 12110)

The Loss of the Onondaga Lake Inland Salt Marshes

In the mid-1600s European explorers and settlers began to document the occurrence of salt springs and associated inland salt marshes and ponds along the shores of Onondaga Lake north of Syracuse. The marshes ranged from Liverpool on the east around the south shore to the mouth of Ninemile Creek on the west. Ten state-rare plants and two globally-rare communities comprised this botanically-rich area. Beginning in the late 1700s the salt springs were exploited for a burgeoning salt industry that continued through 1925. Later, the operation of the Solvay process soda ash plant and the development of the Onondaga Parkway, MacArthur Stadium, regional market and Interstate 690 combined to eliminate the ecological communities and most of the rare plants by the late 1970s. Recent plant surveys have shown that a few of the salt-tolerant rare species manage to survive today in salt-influenced cultural settings.

Young, Stephen M. (New York Natural Heritage Program, Latham, NY 12110), **John Ozard**, and **Scott Crocoll** (New York State Department of Environmental Conservation, Bureau of Wildlife, Latham, NY 12110)

Shore Bird Protection and the Survival of Seabeach Amaranth

Seabeach amaranth, *Amaranthus pumilus*, a member of the amaranth family (Amaranthaceae), is federally-listed as threatened. It was historically known from barrier beaches along the Atlantic seaboard from Massachusetts to South Carolina but presently exists only in North and South Carolina, and Long Island, New York. This annual plant grows in front of the foredune and above the high tide line of barrier beaches, especially around inlets. Plant locations may change dramatically from one year to the next because wind and washovers from hurricanes and other large storms often move seeds around. On Long Island the plant is threatened by beach grooming, beach stabilization, foot and vehicle traffic. Seabeach amaranth occupies the same habitat as protected shore birds including piping plovers, common, roseate and least terns, and black skimmers. Since the late 1980s string fencing has been erected around shore bird sites to protect their breeding and feeding areas from the above mentioned threats. The absence of these threats within fenced areas has allowed seeds to germinate and plants to grow large enough to produce fruit and disseminate seeds. Even on heavily used beaches in the Borough of Queens that are devoid of vegetation seabeach amaranth plants appeared after string fencing was erected to protect piping plovers. There is often a dramatic difference between the number of plants within and outside of the fenced areas on heavily used beaches. String fencing for shore birds is probably the major reason why seabeach amaranth has made a strong comeback on Long Island beginning in 1990.

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Addendum

Tyler, Jeffrey A. (Worcester Polytechnic Institute, Biology and Biotechnology Department, Worcester, MA 01609), and Paul D. **Walline** (Kinneret Limnological Laboratory, Israel Oceanographic and Limnological Research, Tiberias, Israel 14102)

Seasonal Changes in Fish Abundance and Food Consumption in Lake Kinneret, Israel

Lake Kinneret, Israel is an unusual aquatic ecosystem with no appreciable piscivore population and with the commercially important St. Peter's fish (*Sarotherodon galilaeus*) being planktivorous. St. Peter's fish compete for zooplankton with lavnun (*Acanthobrama terraesanctae*), which are the dominant pelagic fish in Lake Kinneret, comprising greater than 50% of the fish biomass and greater than 80% of the total fish numbers in the lake. Collapse of the lavnun fishery in 1993 led to a subsidized program to remove small lavnun from Lake Kinneret. The aim of the removal program is to decrease predation on the zooplankton population, and thus increase lake water quality. We conducted monthly acoustic surveys of the pelagic fish population with a 120 kHz dual-beam echosounder to assess changes in the abundance, size, and spatial distribution of lavnun in Lake Kinneret. We use these data and water temperature measurements as inputs for spatially-explicit bioenergetics models for lavnun. Results of the sampling and modeling work show seasonal changes in the lavnun population and in their consumption of zooplankton.
