The Spruce Moose

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Shotguns and Satellites

Give Insights into the Functioning of Adirondack Forests

By Brenden McNeil

I didn't grow up hunting. In fact, I never picked up a shotgun until the summer of 2003. Since then, I've shot well over 6,000 rounds. That's 300 ammunition boxes of 12-gauge, #2 steel shot in 3-inch shells with a 1 1/2-ounce load.

I shot all that ammo straight up in the air and never hit an animal. I did get a sore back.

This might sound ludicrous, but some people say I've become a pretty good shot. Yep, I guess I'm quite a pro at "tree-hunting," a new research method adapted from standard U.S. Forest Service protocol and applied at Huntington Wildlife Forest and throughout the Adirondack Park to gain insights into the biogeochemical cycling of nitrogen, carbon, and recently, mercury.

Apart from the unavoidable noise, the shotgun provides the safest and most ecologically friendly method (using steel shot instead of lead, and retrieving all shells and wadding) for obtaining the fresh leaf material necessary to study plant-based biogeochemical processes. Once collected, the leaf samples are dried, ground, and analyzed in the laboratory for their nitrogen, carbon or mercury content. These laboratory measurements also provide information needed to map foliar nitrogen across large landscapes. I was able to relate my measurements to spectral information obtained from NASA's satellite-based Hyperion hyperspectral remote sensing instrument, and create a map of foliar nitrogen that stretches across the Adirondack Park (See page 5).

With the cooperation — however unwitting — of more than 1,000 trees (some shot repeatedly) and one satellite, I recently completed my Ph.D. dissertation on foliar nitrogen. My objective was to use relationships among the spatial patterns of foliar nitrogen and its controlling factors (temperature, atmospheric nitrogen deposition, species composition, bedrock geology, soil moisture availability, and disturbance history) to draw conclusions about the ecological processes that control foliar nitrogen variability. This variability is important to many ecologists because foliar nitrogen is closely tied to a plant's ability to carry out its primary purpose: photosynthetic production.

The results of my study forced me to "see the trees for the forest." For example, my analysis of foliar nitrogen maps indicated that forest species composition controls up to 93 percent of the spatial pattern of foliar nitrogen. This implies that the spatial patterns of primary production, carbon sequestration and soil nitrogen cycling are largely determined by the relative abundance of species in the canopy.

When I looked at spatial patterns within individual species, it was most surprising that gradients of human influence were the dominant controls on foliar nitrogen within the "forever wild" forests I studied in the Adirondack Park. Despite these forests having not been logged for more than 100 years, there was still a striking pattern related to logging and fire disturbance history. While this disturbance legacy will likely diminish with time, humans have an ongoing effect on foliar nitrogen though continuing emissions from fossil fuel

– Continued on page 5

At the AEC, We're Wireless in the Woods

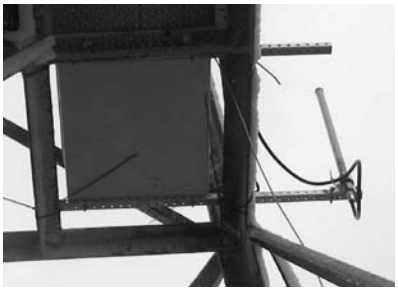
by Patrick McHale

It is widely known that Archer and Anna Huntington donated the property that is now known as the Huntington Wildlife Forest (HWF) in hopes that it would be used for wildlife and forestry research. In the early days of research at the HWF, approximately 1930 to 1940, most research first involved inventorying and characterizing the various plant and animal species within the HWF. The earliest aquatic chemistry measurements included simple physical and chemical measurements of water in the various lakes. These data were recorded by pencil and paper. A researcher's database was limited to what he or she could produce by these relatively simple measurement and recording devices.

Fast forward 40 years…

Dr. Myron Mitchell and other researchers, including Dr. Dudley Raynal, began conducting biogeochemical and hydrological research at the HWF in the late 1970s. This research has continued up to the present, including such topics as sulfur cycling, acid rain, climate change and nitrogen cycling.

During the last quarter century of research at the HWF, advances in technology have made it possible to make more sophisticated measurements of ecosystem parameters over much larger areas and with greater sampling frequency. The process of collecting data has also changed dramatically over the years.



Goodnow Mountain fire tower with the antenna installed.

In the 1980s, Dr. Mitchell's field techniques began to employ electronics as a research tool. Dataloggers with attached sensors were able to measure meteorological, water and soil parameters and store the data electronically. One of the first studies that employed datalogger technology was the Integrated Forest Study (Mitchell et al., 1990). Subsequently, dataloggers and sensors were installed at the inlet and outlet streams on Arbutus Lake. These installations have produced long-term hydrological and biogeochemical databases for Arbutus Lake. On a weekly basis, staff members at the Adirondack Ecological Center visit the Arbutus inlet and outlet sites in order to manually collect water samples and to download data from the dataloggers. Collecting data in this manner, although fairly sophisticated, has its limits.

In 2004, Mitchell and myself were awarded a National Science Foundation grant to enhance the monitoring instrumentation and implement a wireless data transmission network. This network will allow near real-time access to data collected within the Arbutus Lake watershed. To enhance monitoring capabilities, new discharge monitoring stations (weirs) have been installed on two streams in the upper reaches of the Arbutus Lake watershed. Meteor-ological, ground water and near-surface soil moisture measurements will also be conducted in the same area, and instrumentation is being replaced at both the Arbutus Lake inlet and outlet sites.

Wireless networking infrastructure includes the installation of two 80-foot towers at the Arbutus inlet site and the Ackerman Clearing site (completed summer 2006) in the upper Arbutus watershed. Existing towers will also be utilized for the wireless network relay, including one near the Arbutus Lake outlet site, as well as the Goodnow Mountain fire tower. A system of 900 MHz radios with antennas will be used to transmit data from research sites, through relay towers, and down to the Adirondack Ecological Center. From there, data will be sent to the SUNY-ESF campus in Syracuse over the Internet. Some data and even pictures will be available for "real-time" viewing at a website accessible to researchers, educators, Adirondack communities, and anyone with access to the Web.

This availability will not only enhance our research capabilities in the Adirondacks, but also serve as a new vehicle for showing some of the environmental research at the Huntington Wildlife Forest. The wireless network at the HWF should be operational by next summer. ■

Patrick McHale is an instructional support specialist in the Department of Environmental and Forest Biology at ESF, where he also received his master's degree.

Transitions

The AEC has undergone some personnel transitions this fall, beginning with the departure of Ray Masters who concluded a 38-year career in September. Ray has taken up residence in another range of mountains in Montana where he plans to ski and snowboard at least as often as he did in the Adirondacks. Ray is greatly missed around Huntington Forest and throughout the College as both a professional and a friend. In his absence, the AEC staff has temporarily taken on some of his responsibilities, including coordination of the Huntington Lecture Series, equipment logistics, water sampling and singing Christmas carols year-round. Thanks, Ray, and "Think Snow!"

Marianne Patinelli-Dubay was recently promoted to instructional support assistant and joins the AEC program staff in its mission to increase the scientific understanding and conservation literacy of policy makers; resource managers; educators; primary, secondary, and post-secondary students; and the general public. Marianne continues to be the AEC contact for administrative affairs and in the interim, she will continue to provide housing and logistics for visitors to HWF.

In her new role, Marianne has begun to design an educational curriculum for the Huntington Salon Series, which will include subjects ranging from environmental and research ethics to the philosophy of science. The Salon Series is modeled after the spirit of European salons of the 17th and 18th centuries where people of varied perspectives and mutual interests gathered to discuss topics including literature, poetry, philosophy, art and science. The first salon, Introduction to the Philosophy of Science, is scheduled to take place in the spring semester. We look forward to vigorous participation from students, community members and professionals. Watch for the announcement.

Stacy McNulty was awarded permanent appointment to ESF as research associate after serving the AEC and the College for more than six years. She has thoroughly enjoyed serving ESF as an educator, researcher and representative, and welcomes the opportunity to continue to do so. ■

Building for the Future, Again

"...we will invest nearly $1 million in new infrastructure at HWF this year."

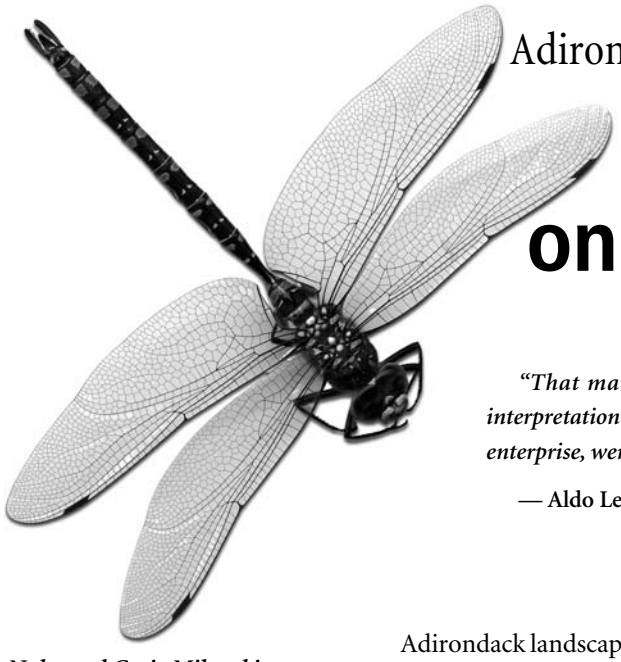
New bunkhouses are part of the upgraded facilities at Huntington Wildlife Forest. Increased activity at the forest helps ESF contribute to the local economy.

by William Porter, AEC Director

In 1990, the College of Environmental Science and Forestry made an investment in Huntington Wildlife Forest through the construction of new facilities. The College persuaded the National Science Foundation to invest in a dining center, successfully arguing that it and associated housing would spur growth. The College was required to provide matching funds and financial conditions throughout SUNY were tight. The risk was committing precious funds for construction and some wondered if it was a risk worth taking. While there was elation at winning a large award from the NSF, I well remember the words of the administration when the conversation turned to the matching funds: "This is not a good year to ask for that." Yet the Rich Lake Dining Center and bunkhouses opened in 1992.

The payoff has been a level of research and education activity unlike anything ever seen in the Adirondacks. Today there are 50 research programs underway through the AEC. We partner with 90 organizations, annually serve more than 200 researchers and 600 students, and contact more than 30,000 people with our science. The knowledge gained is contributing directly to some of New York's most pressing challenges, such as acid rain and chronic wasting disease. The educational experience is putting ESF alumni in positions of leadership from bureau chief for a state wildlife agency to landscape ecologist for a major international conservation organization. The growth in programs at HWF has resulted in seven new staff members at the AEC, and brought energetic young professionals and their families to the central Adirondacks. Over the past five years, the College has contributed more than $3.25 million to the local economy.

We are again building for the future. Through 2006 and 2007, we will invest nearly $1 million in new infrastructure at HWF. Two new bunkhouses are taking shape and a wireless environmental monitoring system is nearing completion. Browse the AEC Web site for a look at Arbutus Lake via remote camera. We expect to have renovations of Huntington Lodge and construction of additional kitchen space underway this spring. Plans now on the drawing boards include more than $5 million to be invested in the next several years. So, without doubt, it was worth the risk. ■



Adirondack All-Taxa Biodiversity Inventory:

Counting Life on Six Million Acres

"That man is, in fact, only a member of a biotic team is shown by an ecological interpretation of history. Many historical events, hitherto explained solely in terms of human enterprise, were actually biotic interactions between people and land."

— **Aldo Leopold** (1949) *A Sand County Almanac*

by Stacy McNulty and Craig Milewski

How many species are there in the Adirondacks? Where are populations of each species across the region? How will the Adirondack ecosystem function in the face of climate change, invasive species and other threats?

For the past two years, the Adirondack Ecological Center has been a leader in establishing an inventory to answer questions such as these. Acknowledging that the biodiversity of the Adirondacks is both locally and globally significant, several public, private, academic, and governmental individuals and groups have come together to form the Adirondack All-Taxa Biodiversity Inventory (ATBI).

An ATBI is a biological information-gathering process led by scientists with the participation of citizens. The mission of the Adirondack ATBI is to survey the diversity of life and connect people to the natural world through participation in biological inventories and related activities in the Adirondack Park. The ATBI will combine exciting scientific inquiry with citizen participation and education, including appreciation of the arts and culture of the region's human community. The ATBI acknowledges the interdependence between all stakeholders and the biological community within which they live, work, and recreate. The Adirondack ATBI encompasses the entire Adirondack Park – both public and private land. ATBI outcomes include maps, a spatially-referenced database, and other products that describe the biology of the Adirondack landscape, as well as celebrations of biodiversity through the arts and other cultural events.

The ATBI will benefit the Adirondack region in many ways: connecting people to the environment by engaging in science, deriving inspiration from the beauty of nature, increasing public support for wise land stewardship, and increasing the potential for economically beneficial discoveries. A similar effort in the Great Smoky Mountains National Park identified, in less than 10 years, 651 species new to science and 4,666 species previously not known to inhabit the Smokies. In comparison, Adirondack researchers recently identified three new species of mites (see Summer 2006 *Spruce Moose*), and discovered new locations of several stoneflies and a rare dragonfly, the ebony boghaunter. Imagine how many species the Adirondacks, 12 times larger than the Smokies, might harbor!

The AEC, Paul Smith's College, and a host of other organizations are committing scientific expertise, technology, and a variety of resources to the ATBI. The ATBI submitted a proposal to the National Science Foundation to support formation of taxonomic working groups (TWIGs), as well as the organizational structure to hold bioblitzes (short-term, intense, multi-species sampling of a specific area), and educational and cultural activities.

In 2006, odonates (dragonflies and damselflies) were chosen as the first TWIG subject. TWIGs lead scientific collection and identification for each group of organisms. Public "Discover Dragonflies" events during the past summer introduced citizens to the world of the dragonfly and included sampling, hands-on demonstrations, natural history, and DNA testing. The Girl Scouts of the North Country developed and led numerous arts and crafts activities to celebrate the beauty and variety of dragonflies.

There are three key activities for the ATBI in the next year: developing new TWIGs; encouraging scientists, schoolchildren, landowners, park visitors, and others to participate; and preparing for the first bioblitz at Paul Smiths Visitor Interpretive Center July 20 and 21. The ATBI is a huge project and needs your energy to become a viable, useful and long-standing community endeavor. For more information, see http://library.paulsmiths.edu/ATBI/Index.htm. ■

Stacy McNulty is a research associate at the AEC. Craig Milewski is a fishery biologist at Paul Smith's College.

Sharon Curtis & Jose Lopez are ready to capture dragonflies.

Soup to Nuts: Beech Mast and Forest Change

A group of students gets valuable hands-on experience

by Sarah Nystrom

In September, a group of undergraduate and graduate students from ESF came to Huntington Wildlife Forest to help Stacy McNulty set up a beech nut survey. Fall is a beautiful time to experience the Adirondacks. Cool temperatures, no black flies and the stunning display of fall foliage make spending a weekend doing field work a delight instead of a duty. As students, we often miss opportunities to experience field research first hand. Rather, we spend a majority of our time in the classroom or holed up in the library, studying for the next test or writing that lab report. As members of the student chapter of The Wildlife Society, we try to seek out opportunities to get firsthand experience and learn new research techniques.

At the AEC, we were able to put our skills to the test, working with Stacy to set up collection buckets for beech nuts. Navigating through Adirondack forests isn't always a walk in the park. We tromped through the hummocks and hollows, climbing over rocks and through large woody debris to find our treasure: marked beech trees, some sampled periodically since 1988. At each tree we set up three buckets under the midpoint of the crown cover. We tied the buckets above the ground in order to collect beech nuts while keeping small mammals out of our hoard. We refreshed our compass skills, measuring crown cover to the north, south, east and west. Some of us discovered that we shouldn't pin our hopes on a fall-back career as a sailor, as our string simply refused to stay tied. But above all, we were able to spend a beautiful morning out in the woods – enjoying the weather while it lasted and finding plenty of wildlife, including the fattest spring peeper I've ever seen.

As we walked out of the woods that day, we left behind a network of buckets, hovering in the air, just waiting for the first beech nuts to fall. In addition, we helped to create something more lasting – a record of mast production in an area where beech trees are plagued by beech bark disease. In the central Adirondacks, wildlife depend on beech trees to supply a majority of the energy available to them. The annual record of mast production will allow the AEC ecologists to link this data to the health of the forest as well as fluctuations in small mammal and other local wildlife populations. In addition, we were able to gain the valuable experience of learning and doing field work in an Adirondack forest. ■

Above: Zak Danks hangs buckets to catch falling beech nuts.

Top photo: Annie Woods sets up a bucket.

Sarah Nystrom is a graduate student in the Faculty of Environmental and Forest Biology and is advised by Dr. Brian Underwood.

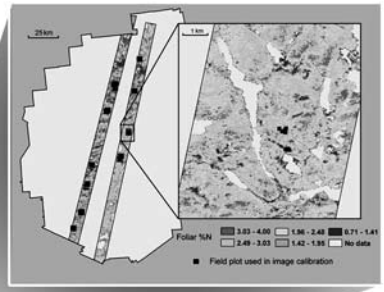
Shotguns and Satellites

(Continued from page 1)

combustion in power plants and transportation sources and the resulting high rates of atmospheric deposition of nitrogen onto Adirondack forests. Barring future broad-scale forest clearing, the strong influence of atmospheric deposition on foliar nitrogen suggests that emissions control policies are likely to be the most important factor affecting this issue in the future.

My tree-hunting days are over, but I'm still working with many collaborators on follow-up questions from my time at Syracuse and the AEC. In fact, encouraging results with hyperspectral imagery indicate that we might be able to use satellite instruments to detect foliar nitrogen without having to shoot at trees. That would make my sore back very happy. ■

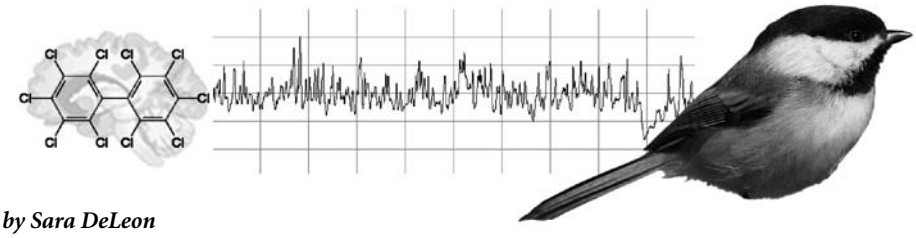
Brenden McNeil at works in 2003 on a tall, old-growth hemlock tree near Chub Lake in the southern Adirondack Park.



NASA's satellite-based Hyperion hyperspectral remote sensing instrument was used in creating a map of foliar nitrogen that stretches across the Adirondack Park.

Brenden McNeil completed his Ph.D. in the Department of Geography at Syracuse University and is currently at the Department of Forest Ecology and Management at the University of Madison, Wisconsin. He can be contacted at bmcneil@wisc.edu.

PCBs and the Black-capped Chickadee What's the Link?



by Sara DeLeon

Black-capped chickadees (*Poecile atricapillus*) are a familiar sight year-round in New York. Their gregarious nature and acrobatic foraging make them an entertaining bird to watch. Likewise, their *chick-a-dee* call is familiar sound throughout the year, while their *fee-bee* song is commonly heard in the spring and summer months. Yet this simple *fee-bee* song is not just background noise to other chickadees, as it may be for many humans. The *fee-bee* song communicates distinct information between males and females as they form pairs early in the season, and as they nest and raise their brood during the following months.

The female has been shown to pay careful attention to the ratio of the frequencies between the two notes in the *fee-bee* song, the interval ratio. She preferentially chooses males that are able to consistently sing this ratio, even if they shift the entire song up and down a frequency spectrum.

What if the *fee-bee* song of chickadees in certain populations was affected by a human disturbance? What type of disturbance would have an effect, and could the chickadees successfully evolve to communicate in spite of that disturbance?

Recently, evidence has shown that polychlorinated biphenyls (PCBs) shrink the song centers in the avian brain. So, in areas of high PCBs, like the Hudson River, it is possible that songbirds are singing differently.

To test whether chickadees were singing differently in areas of high PCBs, I set out to investigate whether chickadees along the Hudson River sing differently than chickadees in other locations. I recorded 686 *fee-bee* songs from chickadees along the Hudson; and in the Adirondacks, 337 from chickadees in the Huntington Wildlife Forest. My preliminary results show that chickadees from areas along the Hudson that have high concentrations of PCBs do sing differently. Their interval ratio is significantly different from chickadees recorded from areas with low PCB concentrations along the Hudson. Furthermore, in contrast to these differences in interval ratios from birds along the Hudson, chickadees from the Adirondacks all sang a very conserved interval ratio, as was expected.

These preliminary results have important implications. They indicate that chickadees may be experiencing distorted communication because of PCB pollution. If males are not able to correctly communicate with females during the breeding season, reproductive success may be affected.

I plan to continue looking at this issue of chemical pollution and bird song, and hope to investigate further how PCBs may be affecting bird song. In the future I hope to explore whether the song irregularity is due to abnormal song learning, or abnormal song production. ■

Sara DeLeon is an ecology and evolutionary biology Ph.D. student at Cornell University, working with André Dhondt at the Cornell Lab of Ornithology. She is in her second year. This research was funded by the Kieckhefer-Adirondack Fellowship and Tibor T. Polgar Fellowship.

Looking at American Beavers as Ecosystem Engineers

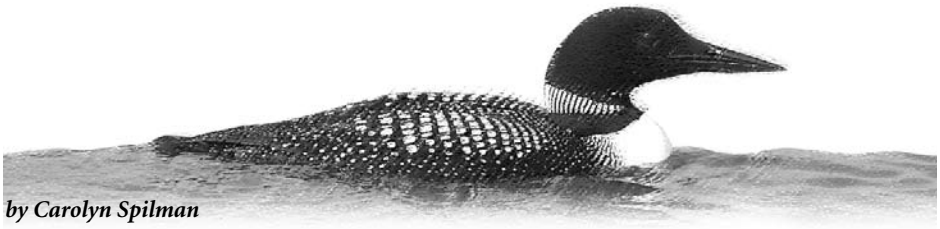
by Krista Capps

I am researching the role of an ecosystem engineer, the American beaver (*Castor canadensis*), in creating biogeochemical hotspots within the Adirondacks. As human activities continue to alter the world's nutrient-cycling processes, scientists are under more pressure to measure fluxes of nutrients into and out of the environment. Zones of concentrated biogeochemical activity, or hotspots, are of special importance for understanding nutrient cycling within a landscape context. By physically or chemically altering their environment, ecosystem engineers are potential drivers of nutrient cycling within a landscape. However, most studies have neglected to identify the mechanistic link between ecosystem engineers and the presence of biogeochemical hotspots.

I will collect water chemistry data and measure nutrient-cycling rates in several beaver-generated habitats within the HWF. I will use these data and GIS to map chemical-cycling rates and habitat succession to determine the impact of an ecosystem engineer on hotspots in the Adirondacks. ■

Krista Capps is a Ph.D. student in ecology and evolutionary biology with Dr. Alex Flecker at Cornell University. Her work was funded by the Kieckhefer Adirondack Fellowship Program

Lakeshore Development: How Much is Too Much for Loons?



by Carolyn Spilman

For those of us who have spent the warmer months at Huntington Wildlife Forest, the loon is a unique part of our Adirondack experience. To many, the loon symbolizes all that is wild and remote in an increasingly fast-paced world.

This may not always be the case, however, as humans continue to encroach on Adirondack lakes. Current zoning regulations in the park allow for the heaviest development along roadsides and lakeshores. This poses a threat to the future of the Adirondack loon population as shoreline available for nesting is lost to homes, camps, and boat ramps.

Increased development and the associated increase in human activity in loon breeding territories can lead to nest abandonment and decreased hatching success. In particular, lakeshore development negatively impacts loon breeding habitat through vegetation modification and removal; increased human activity; increased density of opportunistic predators associated with human populated areas (raccoon, skunk, and gulls); and decreased water clarity resulting from erosion and surface run-off.

I sought to examine the effects of lakeshore development on the nesting success of loons in the Adirondacks. I used the reproductive success of banded loon pairs monitored by the Adirondack Cooperative Loon Program as an indicator of breeding habitat quality.

To quantify levels of lakeshore development, I spent the 2004 and 2005 field seasons paddling the shorelines of 53 lakes across the Adirondacks. At each lake I counted the number of houses and measured the distance from each loon nest to the nearest shoreline alteration (house, campsite, boat ramp). Lakes varied in size (10 to 2832 hectares), degree of development (completely undeveloped to 97 percent developed) and number of nesting loon pairs (0 to 5). In my analysis, I compared loon productivity variables with lake development variables.

I found that loons who nest farther from developed areas have a better chance of successfully hatching one or more chicks. Also, an increased density of lakeshore development was related to decreased nesting success on small lakes (<50 hectares) but not on larger lakes (>50 hectares).

Why might development be an important factor contributing to nest loss on smaller lakes more than on larger ones? Perhaps loons are able to adapt to habitat alteration by choosing nest sites at as great a distance from development pressures as possible; this behavioral adaptation would be easier on larger lakes. Or perhaps loons are able to tolerate the pressures of development on their territories up to a certain level. We may already be seeing the effects of what happens once this threshold is reached on smaller Adirondack lakes. If this is the case, what will be the effects on the Adirondack loon population once this threshold is exceeded in a greater number of traditional loon territories? As long as humans and loons continue to compete for the same lakefront properties, we may ultimately answer the question of how much development is too much for loons. ■

Carolyn Spilman completed her master's degree in EFB with Dr. William Porter. She now works for the New York State Department of Environmental Conservation.

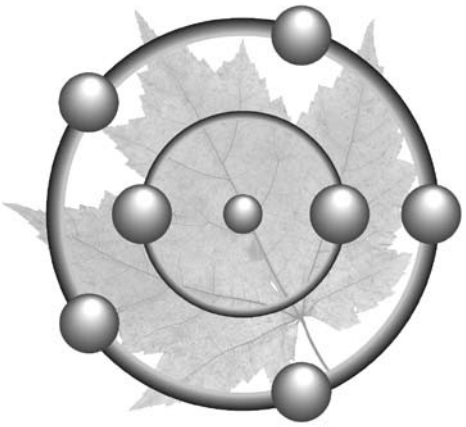
What Influences Behavior of Swarming Zooplankton?

by Jason Williams

I spent my summer at Huntington Wildlife Forest studying the behavior of zooplankton in Arbutus Lake. Zooplankton are tiny animals (most are crustaceans) that eat algae or other zooplankton and are preyed upon by juvenile fish. The species I studied, *Polyphemus pediculus*, is about 1 mm long and often forms swarms containing hundreds or thousands of individuals in the near-shore regions of lakes. My research was devoted to finding out how these swarms form. *Polyphemus* individuals produce a chemical, 1-heptadecene, which is present within swarms.

I used a series of behavioral experiments to test if 1-heptadecene could be a pheromone that causes swarm formation. Virtually all other zooplankton species alter their behavior in response to chemical cues from predators or members of the same species, so I expected that *Polyphemus* might as well. However, results suggested that neither this chemical, nor other chemicals associated with *Polyphemus* or its predators are involved in swarming behavior. Rather, results showed that Polyphemus uses visual cues to form swarms. ■

Jason Williams completed his master's in EFB. This research was aided by funding from Sigma Xi, the Society for Integrative and Comparative Biology, and the LeRoy C. Stegeman Award for Invertebrate Ecology at SUNY-ESF.



Leaves could tell the story of nitrogen's effect on a forest

by Dena Vallano

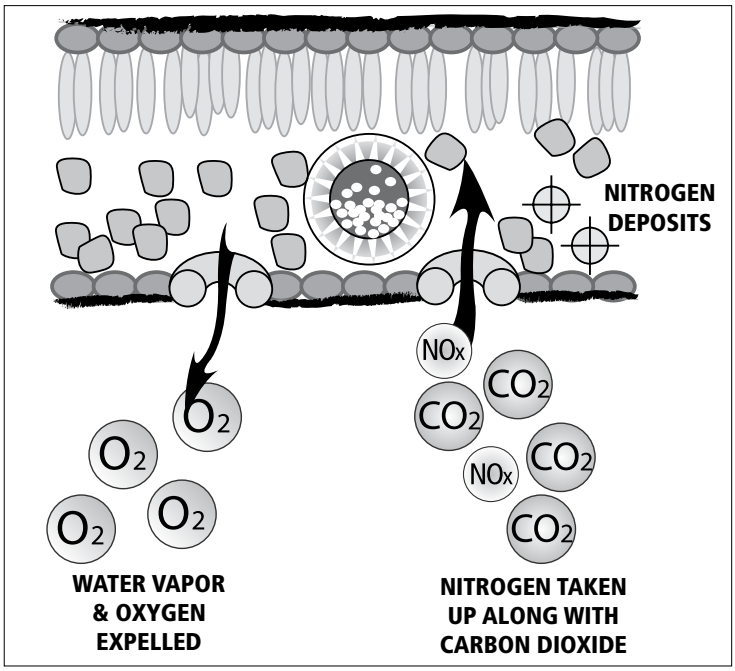
In recent years, we have seen a dramatic increase in the amount of nitrogen pollution in the atmosphere and the resulting deposition to forest ecosystems. Vegetation appears to be a significant sink for this pollution. Interestingly, the incorporation of atmospheric nitrogen pollution by leaves may represent a considerable nutrient source to forests.

At Huntington Wildlife Forest (HWF), I will use stable isotopes of nitrogen as a tool for tracing this important nitrogen flux. (Isotopes are different forms of an element. In this case, the stable isotopes of nitrogen have the same number of protons but a different number of neutrons. The chemical properties of the two forms are the same, but their atomic weight is different. "Stable" means they do not undergo radioactive decay.)

My primary goal is to examine the relationships among atmospheric nitrogen pollution, the presence of the isotope in leaves (known by its scientific shorthand name of 15N), and direct incorporation of nitrogen into leaves in several dominant hardwood tree species at HWF. I believe this issue is crucial in predicting how forest ecosystems will respond to increasing atmospheric nitrogen deposition.

This coming summer, I plan to measure the amount of atmospheric nitrogen pollution incorporated directly by leaves through the stomata — the breathing pores on a leaf's surface — into plant biomass and investigate how this response is influenced by nitrogen in the soil. I can use naturally occurring ratios of the rare and heavier stable isotope, 15N, in relation to the more abundant and lighter 14N as indicators of how atmospheric nitrogen pollution affects forests. Specifically, I will use ratios of the two isotopes to investigate the sources of nitrogen in trees. Since human sources like traffic emissions and fossil fuel combustion tend to have more positive 15N/14N ratios than natural sources of inorganic nitrogen, such as that resulting from soil processes, I predict that more positive ratios will reveal pollution inputs on the canopy.

In addition, I expect to see differences between soil and leaf isotope values in trees that incorporate a high level of pollution through the leaves. To test these predictions, I will intensively sample soil and leaves during leaf production. Finally, I will use the soil and leaf nitrogen isotope values to determine the amount of atmospheric nitrogen pollution that is incorporated directly by leaves.



A broadleaf that is photosynthesizing (absorbing CO2), transpiring (losing H2O), and assimilating nitrogen pollution (absorbing NOx). The flux of gaseous nitrogen into and out of the leaf is controlled by physical as well as biological factors.

This research project will make an important contribution to our knowledge regarding the impact of atmospheric nitrogen pollution on plants and provide a valuable tool for identifying the nitrogen sources to forest ecosystems. This will be one of the first studies to estimate the magnitude of leaf uptake of atmospheric nitrogen pollutants in natural systems. I hope results from this study will be useful in modeling efforts aimed at quantifying plant and ecosystem function over large spatial scales and in response to recent alterations to the global nitrogen cycle from human activities. ■

Dena Vallano is a Ph.D. Candidate in the lab of Dr. Jed Sparks at Cornell University. *She is funded by the Kieckhefer Adirondack Fellowship.*

Small Mammals Big Impacts

by Elizabeth Dowling

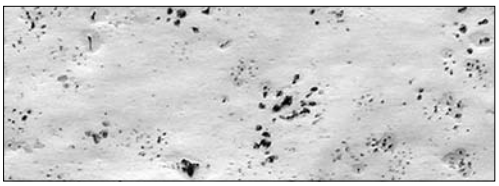
The Adirondack Park is often thought of as a model of sustainable development, with its mixture of public and private lands that meld human-influenced development and wilderness areas. We think of the park as a well-balanced ecosystem, including not only the plants and wildlife, but also the people who live there. The question is: How well balanced is it, really?

As the demand for second homes and recreational camps increases in the Adirondacks, I am studying how those land uses affect wildlife. My research assesses the impact houses have on small mammals, such as red squirrels, Eastern chipmunks, mice, voles, and shrews. Armed with this information, we can model future development impacts on wildlife and mitigate that impact.

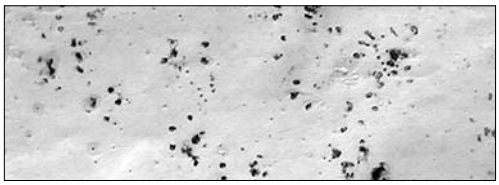
During the summer of 2006, I assessed populations of small mammals around homes throughout the park. I used track tubes to determine which species were found close to homes and along transects radiating into the forest. Track tubes allow identification of most species by their track patterns without capturing the animals. I was interested in knowing whether there are more generalists, such as Eastern chipmunks and deer mice, closer to homes, or fewer specialists, like some shrews and jumping mice, close to homes. This information can help us understand whether residential development is affecting small mammals in the surrounding forests.

If there is a difference in the small mammal community along the transects, we can extrapolate about other species that might be influenced. For example, American martens, hawks, owls, foxes, and weasels prey on small mammals, and their populations might fluctuate if small mammal populations increase or decrease. Changes in small mammal communities over time can be an indicator of forest ecosystem function as well. Once we measure the influence that residential development has on wildlife in surrounding forests, we can begin to make more effective land-use plans that minimize our impact on those forest inhabitants. ■

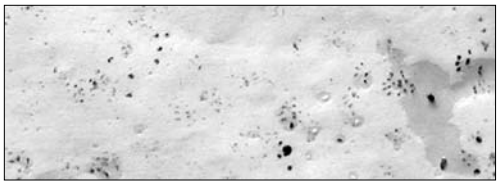
Elizabeth Dowling is a master's student in EFB working with Dr. William Porter.



Chipmunk

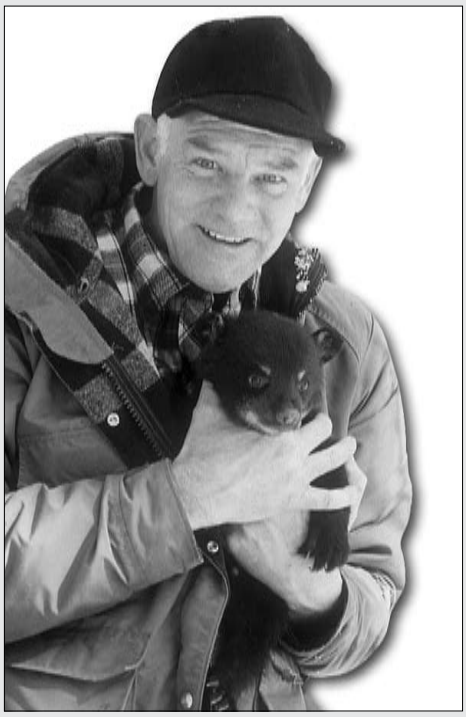


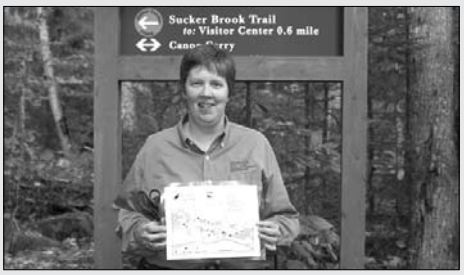
Deer Mouse



Shrew

Tracks and photos are not to scale; for representational purposes only.





New Trail Honors Old Friend

Newcomb VIC Opens R.W. Sage Jr. Memorial Trail

by Andy Flynn

NEWCOMB – The Adirondack Park Agency Visitor Interpretive Center (VIC) at Newcomb has officially opened the 1.1-mile R.W. Sage Jr. Memorial Trail in honor of the late Richard "Dick" Sage Jr., a researcher and manager at the Adirondack Ecological Center (AEC) who died in 2002.

Agency officials had announced plans for the trail dedication during a "Celebration of Life" ceremony for Sage in 2003. Since then, staff and inmates from the Moriah Correctional Facility have worked on constructing the loop off the 1-mile Sucker Brook Trail. The town of Newcomb donated sub-bark for the Sage Trail from trees cut down at the town's new nine-hole High Peaks Golf Course, which opened in 2005.

The trail begins off the Sucker Brook Trail, near the old logging dam on the Rich Lake outlet, and it loops to another section on the Sucker Brook Trail near where it crosses Little Sucker Brook. The bark-surfaced trail is rated easy and includes a few hills and two scenic platforms, with benches, along Belden Lake.

The new loop increases the Newcomb trail system to a total of 3.6 miles.

"It is appropriate, because this man gave so much to the town of Newcomb, that Dick give his name to a loop trail at the VIC," town of Newcomb Supervisor George Canon said when plans for the trail were announced.

Sage also gave a lot to the agency, working closely with staffers in Newcomb and Ray Brook. He was the liaison between the AEC and the VIC for environmental education programs such as Life in the Woods.

"Dick was always supportive of this facility, whether it was staffing, equipment or research," VIC Environmental Educator Rynda McCray said. "He is certainly missed in this building and around the entire community of Newcomb."

Moreover, naming the trail after Sage is a fitting tribute because he was the person who picked the location for the VIC. When the APA chose Newcomb as its preferred site for a single VIC in 1985, Sage maintained that the land's abundant natural features and wild forest made it ideal for showing outsiders the Adirondacks. Plans were later expanded to include two VICs, one in Newcomb and one about 65 miles north in Paul Smiths. The Newcomb VIC opened in 1990 and the property now consists of about 236 acres of land in the Huntington Wildlife Forest. The APA leases the land at both sites.

The 58-year-old Sage, who died in August 2002 during a Whiteface Mountain field trip, was a forest ecologist for more than 30 years at the AEC. Sage first arrived at the AEC in 1964 as a student. In 1968, he was hired as a forestry and wildlife technician, and in 1980 he became a research associate and the center's associate director. Sage was much more than a teacher; he was the bridge that connected several Adirondack communities: scientists, foresters, preservationists and local citizens.

The two VICs serve as headquarters for Adirondack Park interpretation. They are open year-round from 9 a.m. to 5 p.m. daily except Christmas and Thanksgiving and offer an array of educational programs, miles of interpretive trails and visitor information services. Admission is free.

The Newcomb VIC is located 12 miles east of Long Lake on Route 28N. For more information, call (518) 582-2000 or visit the centers' Web site at www.adkvic.org. ■

Andy Flynn is Senior Public Information Specialist at the Adirondack Park Agency Visitor Interpretive Centers.

ESF's Richard W. Sage, Jr., shown at top, died in 2002. Smaller photos depict the opening of a trail named for him.

AEC HELPS Adirondack Residents Look to the Future






by Dr. William F. Porter

What are the most important issues facing the future of the Adirondacks? While the leaders of business, government and environmental advocacy organizations all have their own answers to this question, the AEC helped elicit the view of Adirondack residents and local town planners. When a hundred Adirondackers speak, they provide a lot of food for thought.

In late November, the AEC, in collaboration with the Adirondack Research Consortium and the Adirondack Park Agency, helped host the first in a series of meetings intended to connect researchers with those in the region who need better information. More than 50 town planners, business people, state agency staffers and university researchers met at the APA Visitor Interpretive Center in Newcomb. Their topic: Applied Information Needs of Adirondackers. The goal of this workshop was to bring regional and local decision makers together to identify practical, applied research questions, focus future research, and develop problem-solving tools. The daylong session produced a long list of issues related to energy, sustainable development, and public land management.

By coincidence, the Adirondack North Country Association hosted a meeting in Saranac Lake the following day with a similar agenda. Another 50 people gathered in Saranac Lake to discuss a final report of an 18-month focus-group project intended to provide a resident's perspective on the future of the Adirondacks. The project, titled Bottom Up Strategies for Bio-Regional Policy, was funded by the Northeastern States Research Cooperative. The research was conducted by Dr. Jon Erickson of the University of Vermont, Dr. Graham Cox of Audubon New York, and Anne Woods, an ESF graduate student.

The focus groups included people from many occupations: tourism, forestry, education, health, and government. Findings were surprising because although forest management and land-use regulation have dominated discussions in the past, the emerging issues now are related to quality of life. Residents view a strong rural character as crucial to their future. They value a diverse local economy and say that protection of the environment as the basis for improving quality of life is important.

Breakout groups discuss priority issues.

The similarity of the results of two, largely independent processes is remarkable and there may be a new consensus emerging on the issues that lie ahead. The discussion is no longer focused on promoting either the environment or the economy, but a recognition of the interdependency of the two. Perhaps equally striking, however, is the thoughtful tenor of the discussion. Adirondackers have sometimes been described as a group that would rather fight than win. These conversations suggest that a new philosophy is emerging. Perhaps we are seeing the coalescence of a broad-based constituency that can effectively advocate in Albany and Washington for the resources to address the issues. ■

Rustic Elegance

Prof's Paintings Depict AEC History

A bit of Adirondack history is headed for display at Huntington Lodge.

Three oil-on-canvas paintings by the late Dr. Justus F. Mueller, who taught at ESF during the 1930s and '40s, were recently given to AEC director William F. Porter. The paintings had been in storage at ESF's Syracuse campus until Ronald J. Giegerich, curator of the Roosevelt Wildlife Collection at ESF, transferred them to Porter.

"These paintings represent a wonderful treasure and we intend to hang them in Huntington Lodge when we complete the restoration of that building," Porter said. "The paintings will add to the rustic elegance we are seeking for the lodge."

Mueller was a physiologist and vertebrate ecologist. He left ESF to take a position at the faculty at what is now Upstate Medical University. He was a world traveler whose hand-written journals of trips to South America and Asia are still on file in Giegerich's office.

"He was a very unusual person," said Professor Emeritus Maurice Alexander, who was a student of Mueller's. "He had tremendous skills in many respects. He would go to the blackboard and draw a picture of some invertebrate, working with chalk in both hands. He would actually be drawing with both hands on the blackboard."

One of Mueller's paintings provides an image of the way part of Hungtington Wildlife Forest appeared in the early 1940s, when many areas in the forest were more open than they are today. This painting shows the cabin at Wolf Lake and a meadow that is now covered by forest.

Porter has photographs from the same area taken during the 1930s when a CCC camp was located nearby and they, too, show a lot of open land.

"The openings along Rich Lake were a result of clearing by settlers attempting to farm. The Wolf Lake Cabin painting is fascinating to me because the ecological change it illustrates was likely to have been natural," Porter said.

In addition to the Wolf Lake cabin painting, Porter has a painting Mueller did of Arbutus Lake and another of a winter scene of an unknown location. None are titled.

Porter hopes to have the paintings professionally restored and reframed before they are displayed at the lodge. Anyone who wishes to help support that effort can make a contribution toward restoration by sending a check, payable to ESF College Foundation, Inc., to 1 Forestry Drive, 214 Bray Hall, Syracuse, N.Y. 13210. A notation on the check of "Mueller paintings" will ensure the gift is appropriately directed. ■