The Spruce Moose

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A Moose Tale: The Saga of Alice

by Ray Masters

Those who received past alumni newsletters may recall news of "Alice," the young cow moose released on HWF. The 700-pound cow was reported to the NYS Department of Environmental Conservation in June 1998 wandering in western New York through Oswego and Wayne counties. When she reached Monroe County near Webster, a suburb of Rochester, the DEC decided to relocate her before she got into trouble. She was captured, ear-tagged, fitted with a radio-transmitter collar and transported to HWF where she was released July 16, 1998, near Adjidaumo Flow. Her movements were monitored by radio-telemetry and she remained in the immediate area for some time. Jeremy Inglis of the Ontario Ministry of Natural Resources (OMNR), a guest speaker at the Huntington Lecture Series, accompanied me on a telemetry check of Alice in July.

In September 1998, Alice was observed with a young bull near Rich Lake by HWF forester Mike Gooden. The pair stayed together until early winter, when the bull apparently moved east toward the Santanoni Preserve and Alice settled down north of Adjidaumo Flow. We hoped for a calf or twins in the spring. Despite Alice remaining close to HWF roads, she was only observed three times. We did track her down with the AEC's winter mammalian ecology class so students could get a brief, though memorable glimpse of an Adirondack moose.

In mid-April 1999, Alice surprised us by moving off HWF. She was later observed swimming across the north end of Long Lake. She was subsequently radio-tracked to Sabattis, then Cranberry Lake, and by September Alice had reached Star Lake. No sign of a calf had ever been seen. She apparently traveled near or through Fort Drum to winter on a peninsula near Alexandria Bay on the St. Lawrence River. It was there she was monitored by the DEC in January and February 2000. She had another surprise in store for us: Alice crossed the St. Lawrence and was spotted by a fisherman in Ontario in May 2000. This is quite remarkable when you consider the task of swimming across the river and then crossing one of Canada's busiest four-lane highways, Route 401. Alice continued to travel northwest to Snow Road Station in June and reached a location near the Ottawa River just west of Renfrew in July 2000. During the winter of 2000 she was located by an OMNR biologist who was tracking elk about 10 miles south of Renfrew.

Things were quiet for some time, so I phoned Mike Wilton, a former Algonquin Park biologist who heads up Algonquin Ecowatch. Mike owns an airplane and, with a borrowed telemetry receiver, flew over Algonquin Park in search of Alice. On Aug. 29, 2001, Mike received a signal that he narrowed down to the park's east end. Unfortunately, the signal was transmitting in mortality mode (the transmitter pulse rate doubles when the collar has not been moved recently). A crew from OMNR was dispatched which included Jeremy Inglis who had radio-tracked Alice at HWF back in 1998. They located Alice's remains near Bringham Lake on the Baron River. Bones were scattered about and it was estimated she died there some time ago, perhaps the previous winter, so the cause of death could not be determined. Her age was estimated by tooth wear at 3-4 years. The approximate straight-line distance from HWF to her remains is 220 miles. I will check the literature to see if this is a record. Usually bull moose travel the longest distances.

Alice's journey underscores the importance of the corridor between the Adirondacks and Algonquin Park. The Adirondack to Algonquin Conservation Initiative (A2A) seeks to preserve the ecological integrity of the corridor between these two parks.

DEC moose specialist Al Hicks has promised to bring another moose so I hope to have more moose news in the future.

Researching the Effects of Air Pollution on Forest, Water Ecosystems

by Dr. Myron Mitchell

The health of forests and waters in the Adirondacks has had considerable attention due to well-known effects of "acid rain." Many waters of the Adirondacks have become acidified due to atmospheric pollutants. This acidification has resulted in a decline of fisheries in some lakes and may be linked with some deleterious impacts on forests.

Understanding the influence of air pollutants on forest health and water quality has been the focus of a major research effort at the Huntington Wildlife Forest (HWF). Because HWF is in the center of the Adirondacks, it is an ideal location for research on this region. This research includes a multifaceted approach that evaluates a variety of factors related to the Adirondack landscape's environmental health which is characterized by a wide range of ecosystems including upland coniferous and deciduous forests, wetlands, streams and lakes. Each of these ecosystems has distinctive biotic assemblages that exhibit different responses to environmental disturbances. In addition, these landscape components have important linkages to each other. Quantifying the interactions among these different landscape features is needed for understanding and evaluating the function and structure of Adirondack ecosystems.

An important goal of scientists working at the HWF has been obtaining knowledge on how various environmental perturbations, including atmospheric pollutants and climatic changes, influence the Adirondacks. Air pollution research has included measurements of "acidic deposition" and other atmospheric pollutants including ozone, sulfur dioxide and nitrogen oxides.

The HWF has been part of the National Atmospheric Deposition Program (NADP) and the National Trends Network (NTN) since Oct. 31, 1978, and is one of the oldest operating sites within this network. Dr. Dudley J. Raynal, ESF distinguished teaching professor, was instrumental in developing this site and maintaining its operation. Most recently (2000), a mercury deposition collector has been added to the NADP site under the direction of Dr. Charles T. Driscoll, distinguished professor at Syracuse University.

There are major concerns related to mercury accumulation in fish of the region. Most mercury in fish originates from atmospheric contaminants produced from the combustion of fossil fuels.

Arbutus Lake: Site of intensive watershed research

Adjacent to HWF's Arbutus Watershed is a 38-m walk-up tower equipped with meteorological instrumentation and filter packs for sampling air chemistry that is monitored by NOAA's Dr. Tilden Meyers, Oak Ridge, Tenn. Using micrometeorological techniques, measurements of ozone and sulfur dioxide fluxes have been made using the tower.

To evaluate how pollutants are affecting forested watersheds the "small watershed approach" combined with studies on forest stands is being used. This work includes investigations on fundamental studies of the hydrology and biogeochemistry of forested and aquatic ecosystems as well as research questions directed at environmental issues such as the effects of acid rain. This effort has been led by Dr. Myron J. Mitchell, professor and director of the Council on Hydrologic Systems Science. The Arbutus Lake Watershed has been gauged at the lake outlet since October 1991 with a V-notch weir. The 135-ha Archer Creek Catchment drains into Arbutus Lake. This catchment has been monitored since 1994 using a H-flume equipped with an automated system for measuring stream discharge logging and collecting samples during storms. Weekly water chemistry samples are taken by Ray Masters of the Adirondack Ecological Center. Detailed stream and wetland maps have been produced, and this information is part of a geographical information system (GIS) database.

The watershed includes a wide range of sampling devices that are used for measuring snow, soil and groundwater chemistry. There is more information on the biogeochemistry and hydrology of this watershed than for any other site in the Adirondacks. The

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combination of this hydrobiogeochemical data and other information available from HWF results in a comprehensive picture of various ecosystem attributes of this region. However, major issues still need to be addressed including how changes in vegetation and climate will affect water quality.

The HWF has been a site in various regional and international biogeochemical studies including the Integrated Forest Study, the Adirondack Manipulation and Modeling Project, and the Adirondack Long-Term Monitoring Lake Project. The HWF was also the site of a soil warming experiment using buried heating cables the results of which have also been compared with other sites with similar experiments. This soil warming project was part of the graduate work of Patrick McHale, ESF instructional support specialist. The HWF is part of the Northeastern Ecosystem Research Cooperative.

Much of the research on Adirondack hydrology and biogeochemistry has been centered at the HWF including research not only on the forests, wetlands, streams and lakes within the HWF, but also at sites throughout the entire Adirondack Park. The current research includes collaboration with ESF faculty members Dr. Elizabeth W. Boyer, Dr. Russell D. Briggs, Dr. Donald J. Leopold, Dr. Ruth D. Yanai and individuals throughout North America who have expertise on wetlands, isotopic geochemistry, modeling and hydrology.

There have also been a number of graduate students and postdoctoral associates involved with this research effort. The support of the AEC has been important for this effort through providing staff support and facilities. For further details on the research related to biogeochemistry and hydrology, consult the following Web pages: *http://www.esf.edu/hss/Biogeo1.htm*.

Further information can be obtained from Dr. Myron J. Mitchell (e-mail: *mitchell@syr.edu*) as well as the other HWF investigators.

New Member of AEC Staff

Benjamin Tabor has joined the staff of the AEC as a research specialist in May 2001. Ben is an ESF graduate and received his bachelor of science degree in environmental and forest biology. Previously, he attended Paul Smith's College and received his associate's degree in urban forestry. Ben hails from Poland, N.Y., and has wanted to become a biologist "forever."

Benjamin Tabor

He has participated in research at Huntington Wildlife Forest since 1998, spending the summers of 1999 and 2000 sampling forests of various ages to identify patterns in the vegetation characteristics of old-growth stands. His current focus is on the globally important biogeochemistry research spearheaded by Dr. Myron Mitchell of the EFB faculty.

Ben's duties include sampling groundwater with wells and lysimeters, facilitating graduate student research, and assisting with the diverse projects being conducted in the Arbutus Lake watershed.

ESF Takes Wildlife Society Conference by Storm

by Michale Glennon

Huntington Wildlife Forest alumni had a strong showing at the annual conference of The Wildlife Society in Reno, Nev. Former ESFers who were unable to attend included Brian Underwood, Samara Trusso and George Bumann. Samara's poster was titled "Best Management Practices for Eastern Coyotes: Restraining Trap Selectivity, Efficiency, and Trap-related Injuries." Brian's paper, coauthored with Frank Verret and Linda Gormezano, was titled "Distance Sampling for Monitoring Composition and Abundance of Deer Populations in Parks." George's major professor at Virginia Tech, Dean Stauffer, gave George's research paper, "Scavenger Response to Ruffed Grouse Carcasses: Effects on Determining Cause-specific Mortality."

Other HWF alumni present gave interesting papers and posters. Anne Oyer gave her poster on "Localized Management of White-tailed Deer in the Central Adirondacks, New York." It was well received, and she discovered a researcher about to conduct a similar experiment in West Virginia.

ESF alumni who gave outstanding presentations included W. David Walter, who asked, "Does Immunocontraception Improve Physical Condition in Free-ranging Female White-tailed Deer?" This research was from his master's work, but David has moved on to bigger and better ungulates (Cervus elaphus) on a Ph.D. project at the University of Oklahoma.

Former ESF student Michael Wichrowski gave a great paper describing his master's work titled "Colonization Patterns of a Restored Elk Population in Appalachia." He is now working on a moose Ph.D. project at the University of New Hampshire.

Four other alumni were present: Josh Millspaugh, who gave a paper titled "Assessing Stress in Free-ranging Wildlife Using Non-invasive Techniques;" Gary Brundige, who was a coauthor with Josh Millspaugh and others on a paper titled "Ecological Correlates of Elk Home Range Size in South Dakota;" Cecily Costello, who presented "Impact of Variable Mast Production on New Mexico Black Bear Reproductive Success;" and George Mattfeld who was, as usual, a staunch supporter of critical small mammal research in the Adirondack Park. I gave a paper on "Effects of Land Use Management on Biodiversity in the Adirondack Park, New York."

It was great to see old friends and make new ones.

Spotlight on Research

AEC/HWF Research

ESF Grad Student Investigates Biological Diversity in Adirondacks

by Shawn Carter

Editor's note: Shawn Carter's article on his graduate research project is the first installment in a series dedicated to graduate research at HWF.

Forest ecosystems arguably contain the most diverse communities of life on earth. I am working with ESF conservation biologist James P. Gibbs to study the effect of a recent major northern Adirondack ice storm on ground spiders, ground beetles, amphibians and birds, which play an important part in the forest ecosystem. My research takes place in various portions of the Adirondacks, including HWF, and I am working with other scientists studying forest health, old growth forest structure, and populations of birds.

The goal of my research is to provide information to forest managers concerning how forest structure determines biological diversity within northeastern temperate forests, and particularly how ice storm damage influences these relationships. My work also examines whether some of the species they are studying would be useful indicators of biodiversity in the forest. I hypothesize that the woody debris deposited on the forest floor from trees damaged in the ice storm will increase the diversity of local wildlife populations, because the debris provides additional habitat and makes the forest structure more complex. This is important because each group of animals offers valuable services to the entire forest ecosystem. Species such as spiders and salamanders are abundant, which make them both important predators and prey for other animals. Burying beetles contribute to vital nutrient cycling by aiding decomposition. By preserving forest structure, we maintain the special habitats required by a broad spectrum of animals, thereby preserving the complex and delicate interactions between forest-dwelling animals we are only beginning to understand.

Preliminary results suggest fine woody debris boosts ground spider populations, because it provides the perfect place for them to forage and attach their webs. Deep leaf litter assists ground beetles by enabling them to hide from predators. Decayed coarse woody debris is an ideal environment for salamanders, because it enables these cold-blooded creatures to maintain both their physical temperature and moisture levels, which is necessary for their survival. Large numbers of standing dead trees attract birds.

My work will provide forest managers with guidelines on how much woody structure we need to maintain in the forest. By leaving some dead and dying trees, managers will be able to harvest the forest and still maintain these important species groups, thereby balancing economic interests and conservation needs.

Roosevelt Wild Life Station Research Projects at HWF

Roosevelt Wild Life Station Intern Debora Endriss

Summer 2001 was a busy time for undergraduate student research at HWF. After a strong competition between many great research ideas, nine ESF undergrads received grants to conduct research through the AEC. Each student developed a research question, designed and conducted a field study, and completed a report for ESF credit. A number of students focused on small mammal behavior, including Darlenea Copney who examined the behavioral response of the red squirrel to sound stimuli and distance of the observer. Shannon Kress Duerr investigated the response of several species to the presence of predator scent using an innovative web design for sampling. Joneve Murphy looked at the home range size of chipmunks at two sites, while Elizabeth Spieth investigated predator effects along a forest/field edge using coyote scent to determine the response of small mammals. Projects completed by Debora Endriss and Benjamin Klein focused on amphibians. Deb evaluated the monitoring program at HWF and Ben compared amphibian breeding success and physical characteristics of ephemeral or "vernal" pools.

Three Roosevelt interns worked on HWF's long-term white-tailed deer project. Stephanie Hauver and Jason Isabelle took a critical look at the movements and observations of white-tailed deer in the low-density area (the "void") created in 1994. John VanLaningham investigated the potential improvement in accuracy of telemetry with the use of Global Positioning System (GPS) Units. To learn more about these research projects and the Roosevelt Wild Life Station, see the Web site at *http://www.esf.edu/ResOrg/RooseveltWildlife/Research.htm.*

Graduate Research at AEC/HWF

Each year the variety of research projects associated with the AEC/HWF seems to grow. This year was no exception. Forty-one graduate projects used HWF during the year; here are a few of them:

Bruce Herforth (M.S. candidate in FOR with Dr. Eddie Bevilacqua) helped collect data at HWF this summer for a project that spans 30 years over ESF's four main forest properties —

the Continuous Forest Inventory (CFI). Though Bruce's project will be focused on analyzing the vast dataset, he joined the HWF inventory crew this summer to learn how the data are collected. The CFI project was designed to monitor the growth and mortality of forest vegetation on ESF's Warrensburg, Wanakena, Huntington Wildlife Forest, and Heiberg Memorial Forest properties.

Kevin Douglass (M.S. candidate in EFB with Dr. Brian Underwood) will look into the effects of supplemental feeding on white-tailed deer behavior and reproductive biology. Through his research Kevin hopes to determine which individuals are gaining the most access to the supplemental food resources by sex and age group. Additionally, Kevin will use nonforaging behavior to determine the reproductive status of female deer. Kevin began his project in the summer of 2001 with radio-telemetry work at his northern Adirondack study areas and will be observing feeding station behavior this winter.

Gabe McNett (Ph.D. candidate in ecology, behavior, and evolution at the University of California at San Diego) began research on signal evolution in warblers. His research addresses the use of color patterns in communication and their efficiency in disparate habitat types. Gabe's work entailed color measurements of live caught specimens, color measurements of ambient light and habitat materials, and behavioral observations of birds in the field. Ultimately, this work aims to enhance the understanding of how interactions between the physical environment, signal use, and color, drive the evolution of species divergence in animal color patterns.

Foresters Complete CFI Plot Measurement

The Forest Operations staff, with the assistance of the 2001 summer crew, re-measured the 288 Continuous Forest Inventory (CFI) permanent plots on HWF. The summer crew consisting of one recent ESF graduate, one ESF graduate student and four ESF undergraduates worked about 175-person days over an eight-week period to complete this project. At the end of this year's inventory, there are now 30 years of data (5 sets of measurements) on 171 plots and 15-25 years of data (3-4 sets of measurements) on the remaining 117 plots.

Mike Gooden, HWF forester, is working though the fall checking for measurement errors and addressing "problem trees," which were discovered after comparing this year's inventory to the previous measurements. Of the 5,100 trees measured this summer, about 4,200 had been measured previously and 900 were new ingrowth trees. Problem trees that Mike has to locate and check include 21 trees that seem to have changed species in the last 10 years and 32 trees which have smaller diameters than at the last measurement. (Since trees don't often get smaller or change species on their own, it's more than likely there are errors in the data!) Other checks are being made to ensure consistency in height measurements, and in judgments of merchantability classes, crown positions and vigor classifications.

Graduate student Gabe McNett with Black-throated Blue Warbler

Starting this year, graduate student Bruce Herforth will be analyzing the CFI measurement data for his master's research. Hopefully, the HWF data can be used to show trends in diameter growth, volume growth and mortality over the entire property and within general forest types (hardwood, hardwood-conifer and softwood). It is the hope of HWF Forest Operations staff that the HWF data will be used in conjunction with CFI data from the Wanakena and Warrensburg campuses to show Adirondack-wide trends.

HWF Joins Adirondack Lake Assessment Program

In May, all five major lakes on HWF were enrolled in the Adirondack Lake Assessment Program. This project is administered by researchers at Paul Smith's College and sponsored by the Resident's Committee to Protect the Adirondacks and the Adirondack Aquatic Institute under the direction of the New York State Department of Environmental Conservation. More than 50 lakes across the Adirondacks are enrolled. The program, begun in 1998, trains volunteers to monitor lakes by measuring transparency and collecting a 2-meter composite of lake water for chlorophyll processing and another composite for total phosphorous and other chemical analysis. AAI staff sample dissolved oxygen and collect temperature profiles in lakes. These data will be added to the Adirondack Long-term Ecological Monitoring Program at HWF. The inclusion of HWF lakes is a welcome addition as previous research indicates that some of our lakes are relatively pristine compared to others in the program.

Recent Publications Related to AEC/HWF

Below is a partial list of the 17 technical publications related to HWF that were published during the past year. Look for more 2001 publications in the next issue.

Quail, R.C. 2001. The importance of beaver ponds to vernal pool breeding amphibians. M.S. Thesis, SUNY-ESF.

Page, B.D. 2001. Assessing the effects of supplemental-winter deer feeding on the well-being of white-tailed deer in the Adirondacks. M.S. Thesis, SUNY-ESF, 98pp.

Bohn, K.K. 2001. Method for predicting American beech development in the understory of uneven-aged northern hardwood stands after cutting. M.S. Thesis, SUNY-ESF, 143pp.

Bischoff, J.M., P. Bukaveckas, K. Ohrui, and **M.J. Mitchell**. 2001. Nitrogen storage and cycling in vegetation of a forested wetland: Implications for watershed N processing. *Water, Air and Soil Pollution* 128:97-114.

Mitchell, M.J., P. J. McHale, S. Inamdar, and **D.J. Raynal**. 2001. Role of within lake processes and hydrobiogeochemical changes over 16 years in a watershed in the Adirondack Mountains of New York State, U.S.A. *Hydrological Processes* 15:1951-1965.

Goerlich, D.L., R.D. Nyland, L. Zhang, and **R.W. Sage**. 2001. Reserve strip method as an alternative for regenerating Eastern Hemlock. *Northern Journal of Applied Forestry* 18:69-73.

Haulton, S.M., B.A. Rudolph, and **W.F. Porter**. 2001. Evaluating four methods to capture white-tailed deer. *Wildlife Society Bulletin* 29:255-264.

Hurd, T.M., D.J. Raynal, and **C.R. Schwintzer**. 2001. Symbiotic N2-fixation of Alnus incana ssp. rugosa in shrub wetlands of the Adirondack Mountains, New York, U.S.A. *Oecologia* 126:94-103.

Ito, M., M.J. Mitchell, and **C.T. Driscoll**. 2001. Spatial patterns of precipitation quantity and chemistry and air temperature in the Adirondack Region of New York. *Atmospheric Environment* (in press).

Mitchell, M.J., and **C. Alewell**. 2001. Sulfur transformations and fluxes. *The Encyclopedia of Soil Science and Technology* (in press).

Muller-Schwarze, D., H. Brashear, R. Kinnel, K. Hintz, A. Lioubomirov, and **C. Skibo**. 2001. Food processing by animals: do beavers leach tree bark to improve palatability? *Journal of Chemical Ecology*, 27:1011-1028.

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