



# Adirondack Research Consortium

*Better Information for Better Decisions*

## 20<sup>th</sup> Annual Conference on the Adirondacks

### Select Abstracts and Program Summaries from Concurrent Sessions

#### Concurrent Session 1.1 - Climate Change, Community Impacts, and Adaptation Methodologies Case Studies of Preparing for and Responding to Extreme Events

##### Post-Flood Emergency Stream Intervention – Lessons Learned and Future Guidance

**Joshua Thiel** is the Aquatic Habitat Protection Program Manager for the NYS Dept. of Environmental Conservation. He manages the Protection of Waters Program which deals with the regulatory protection of streams and lakes, as well as being involved in other initiatives to protect these resources.

Following Tropical Storms Irene & Lee there was a great deal of in-stream construction work, some of which was performed in an environmentally insensitive manner. This presentation will focus on an evaluation of sites where this occurred and will highlight the types of stream construction activities that should be avoided. Drawing from these events, the DEC has developed and is sponsoring Post-Flood Emergency Stream Intervention Training to be better prepared and better equipped to handle flooding events in the future.

##### Priority locations where improved culverts can help natural and human communities adapt to a changing climate. Collaborative efforts, implementation projects, and opportunities to improve the resilience of infrastructure

**Corrie Miller** is the Director of the Ausable River Association (AsRA), a community supported organization that works to identify, conserve, and restore the Ausable River watershed's natural and recreational resources for their ecological value and benefit of human communities. Jessica Levine works for the Adirondack Chapter of The Nature Conservancy (TNC) on climate change adaptation, freshwater and transportation. In recent years, several extreme weather events have resulted in substantial and costly damage to road infrastructure in the Adirondacks. As part of a larger collaboration, AsRA and TNC are working to identify priority locations where improved culverts can help natural and human communities adapt to a changing climate. This presentation will focus on our collaborative efforts and resulting implementation projects, as well as opportunities for communities across the region to improve the resilience of their infrastructure.

For the last decade, **Corrie Miller** has used her background in ecology and land management at the grassroots level to educate people about the place they live and to engage communities in visioning their future and planning for the conservation of the resources they value. She also has experience in non-profit management, specifically regarding strategic planning, development, and communications. Corrie has a MS from University of Vermont in Plant Sciences, a Certificate of Environmental Education from University of Minnesota, and BS in Biology from Vanderbilt University.

**Jessica Levine** has over fifteen years of professional experience in environmental analysis and planning, and she has worked in the nonprofit, government, and academic sectors in the U.S., Canada, and Latin America. Before joining The Nature Conservancy, Jessica worked for four years with the Commission for Environmental Cooperation of North America and for two years at McGill University's Centre for

Biodiversity Science. She has worked extensively on watershed and water resources management, planning and policy. Jessica has an MS in Energy and Resources as well as an MCP in City and Regional Planning from UC Berkeley, and a BA in Human Biology from Stanford University.

### **Streams Behaving Badly - Nature or Nurture?**

Martha Naley is a Biologist for the U.S. Fish and Wildlife Service. She is originally from Virginia and has worked in California and in the Fish and Wildlife Service Headquarters in Arlington, Virginia. She has worked on a variety of issues including endangered species conservation, Federal projects mitigation reports, and Farm Bill regulations and guidance with a particular focus on the Wetlands Reserve Program. Martha was the Branch Chief in headquarters for the Partners for Fish and Wildlife Program and Coastal Program which focuses funds and resources on voluntary habitat restoration projects across the country. With a strong interest in stream restoration, Martha moved to western Massachusetts to work hands-on with new techniques and approaches to natural stream channel design that emphasizes working with stream processes rather than against them when we attempt to combine human activities, such as infrastructure and farming, with stream health and flood resiliency.

As more and more people utilized the power and water supplies of streams, the nation attempted to defy physics and put streams in more convenient locations and shapes. We are beginning to recognize the financial and ecological value of healthy streams and to acknowledge the damage that can be caused when we don't consider the power of water and sediment transport when we build infrastructure. As a nation of communities we have started to "manage" streams in a more sustainable and flood resilient way. The presentation will briefly discuss stream dynamics and stability and show multiple examples of restoration techniques used to restore streams to their ecologically functioning and sustainable form.

### **Concurrent Session 1.2 - Biomass Heating and Advances in Wood Boiler Technologies**

#### **Development of a new emissions test method aimed at advanced wood gasification boilers**

**Christopher Brown** is a mechanical engineer at Brookhaven National Laboratory in the Sustainable Energy Technologies Division and has been working with the Energy Conversion Group for four years. Chris's efforts in the Energy Conversion Group encompass a broad range of research projects including the development of biodiesel from waste sources, direct combustion of viscous fuels, thermal efficiency evaluation of commercial & residential combustion systems, as well as particulate matter emissions sampling and thermal efficiency of wood gasification combustion systems. Chris also works with the Department of National Security and Nuclear Nonproliferation as a design engineer for various projects. Chris received his undergraduate degree in Mechanical Engineering from Clarkson University and has earned an MS in Mechanical Engineering from Stony Brook University.

**Abstract:** With increasing costs of petroleum fuels, wood is becoming a popular fuel source for space heating requirements within the residential sector. Wood fired appliances range from free standing space heating stoves to fully integrated hydronic heating systems which also supply domestic hot water. Currently, wood combustion accounts for 80% of the renewable energy within the residential sector in New York State. Additionally, 2.4 million US homes utilize wood as a primary source of fuel for space heating. With this high demand for wood combustion the effluent emissions are of concern, specifically particulate emissions. With new advanced wood gasification technology, it is possible to reduce particulate emissions substantially. Brookhaven National Lab is conducting research which will study the integration of thermal storage and the optimization of controls in advanced boilers to tailor emissions. This work will support the development of a new emissions test method aimed at advanced wood gasification boilers.

## **Pellet, chip, and cord wood boiler systems and sustainable harvesting at the North Country School**

Since 2005, **John Culpepper** has directed campus operations and maintenance efforts, renovation, new capital construction, and sustainability initiatives for North Country School, Inc., a middle, independent boarding school and summer camp. NCS has a long history of engaging children and adults in environmental/sustainability issues. Recently, NCS, Inc. has committed significant resources toward becoming a leader in the realm of environmental stewardship. Some of the accomplishments during Culpepper's tenure include incorporating the institution's forest resources under Forest Stewardship Council sustainable forestry certification, installing 18,000 watts of photovoltaic electric production capacity, overseeing the construction of an 8,000 square foot, energy net zero student/staff residence, installing several wood gasification boilers and thereby reducing the school's use of oil by over 20,000 gallons per year, and purchasing an all-electric maintenance truck. Under Culpepper's leadership, the institution has dramatically decreased its carbon footprint, and developed a path toward campus-wide, energy net zero status.

Three years ago North Country School, Inc. was consuming an annual average of 27,000 gallons of #2 fuel oil for space and domestic hot water. Through an aggressive commitment to reduce both our operating costs and our carbon footprint, we have installed four different types of high efficiency biomass systems, reducing our oil consumption by approximately 85%, and saving a significant amount of money. This year alone we expect to reduce our fuel bill by approximately \$60,000. A brief overview will be given of the different types of biomass systems, and our emerging sustainable forestry program which is generating a significant amount of biomass from our campus and neighboring lands, from low quality timber, harvested with low impact equipment.

## **Perspectives on high-efficiency pellet heating market opportunities**

**David Dungate** is President and co-founder of ACT Bioenergy, a New York-based manufacturer of award winning, high-efficiency, commercial-scale biomass boiler systems. These state-of-the-art, gasification-type biomass boilers are exceptionally clean-burning and are helping New York replace the \$8 billion/yr spent on heating oil with a locally-available, renewable energy source. ACT Bioenergy's customers include: US Army, Clarkson University, SUNY-ESF, Cornell University, The Natural History Museum of the Adirondacks, and various schools and private customers throughout the U.S. David has worked both in the U.S. and overseas in the field of renewable energy and sustainable development for the last 20 years. He is currently on the Board of Directors of the New York State Biomass Energy Alliance and is the Chair of the Biomass Thermal Energy Council's Technical Advisory Committee. David has a Masters Degree in Environmental Engineering from Hokkaido University and a Bachelors Degree in Resource Management from the University of British Columbia.

Abstract: David will present his perspective on high-efficiency pellet heating market opportunities from his perspective as a manufacturer and an energy service provider.

## **An overview of carbon monoxide in bulk pellet storage facilities**

**Alan Rossner** is the Director of Environmental Health Science Program & Policy undergraduate program at Clarkson University. He is also Associate Director of Clarkson's Institute for a Sustainable Environment. Dr. Rossner is an environmental epidemiologist and certified industrial hygienist. His current research includes developing air sampling methodologies, exposure assessment strategies, and contaminant monitoring.

Abstract: There have been recent reports of high levels of carbon monoxide (CO) in large pellet storage facilities in Europe that have resulted in fatal exposures. Scientists in European countries and Canada have been working to determine the extent of the problem and the chemical reaction mechanism(s) that are involved. Clarkson University has initiated a study to monitor CO in bulk pellet storage facilities in the North Country and to perform laboratory experiments to evaluate the chemical reaction mechanism. An overview of the project will be presented.

### **Concurrent Session 1.3 - Economic Impacts of Tourism**

#### **North Creek Revitalization Project**

**Jim Martin** is a Senior Planner and Economic Development Specialist with The LA Group in Saratoga Springs, NY. He has worked extensively in developing projects in North Creek including the Ski Bowl Project. Jim will set the context for this discussion on the economic impacts of tourism and moderate this panel.

#### **Iowa Pacific Railroad's Adirondack Revitalization**

**David Simpson** and **Sterling Goodspeed** of the Iowa Pacific Railroad will discuss the economic impact of the railroad revitalization that is both green and a part of the community's heritage. The presentation is on the economic impact of the train in North Creek. Emphasis will be placed on the impact to the business community, the inter relationship between Gore and ORDA, and the train as an economic stimulus that is both green and a part of the community's heritage.

#### **Attributes and Economic Impact of Visitors to The Wild Center**

*presented by **Tim Holmes** of The Wild Center, and **Chris Shrope**, a student at St Lawrence University*

An intercept questionnaire survey developed by PlaceMaking group was administered to approximately 300 visitor parties at The Wild Center between August 2011 and July 2012. The topics addressed include place of residence, reasons for visiting, length of stay, lodging, and expenditures. The survey findings were extrapolated to the activities and expenditures of 14,365 smaller visitor parties (7 people or less) that visited The Wild Center from out of the area in 2011. Nearly seven out of eight visitors (86%) indicated that The Wild Center was an "extremely important" or "important" reason for traveling to the Tupper Lake area. The vast majority (nearly 85%) were from outside of the North Country region and more than half (54%) stated that they would stay overnight in the area.

#### **Economic Impact of Tourism in the Adirondacks**

*presented by **Kim Rielly** of the Regional Office of Sustainable Tourism (ROOST)*

It is generally accepted that tourism is one of the greatest contributors to the economy in the Adirondack Park. The Regional Office of Sustainable Tourism is the destination marketing organization responsible for promoting Essex County, New York, which represents a large section of the Park that includes the tourism hub of Lake Placid. Annual reports, such as the Statewide Tourism Economics study conducted by Oxford Economics for Empire State Development, provide economic impact analysis, broken out for each county, for all of New York State. In addition to the Tourism Economics results, ROOST monitors Essex County occupancy tax collection numbers, which are an indicator of tourism activity, and garners additional data from over 8 years of annual leisure travel information studies and robust website analytics. By analyzing these resources, ROOST is able to identify trends in demographic and behavioral data that informs their destination marketing strategies.

## **Concurrent Session 1.4 - Perspectives on Land**

### **Glennon, Michale J.1**

How Much Is Enough? Or... Where Stuff Is

One of the enduring debates in the Adirondacks concerns how much protected land we need, and how we balance development and environmental protection. I try here to provide information to contribute to this discussion. The recent Northeast Terrestrial Habitat Classification System (NETHCS) and associated map provides a consistent habitat classification for the entire Northeast, and digital data available for GIS analyses. I examined the spatial distribution of habitats in the Adirondacks, as well as their relationship to vertebrates. I find that there are some habitats well represented on Forest Preserve and easement lands, others disproportionately represented on private lands, and some well represented on both. This suggests that the public and private lands in the Park do not protect the same features, and has important implications for wildlife. Given climate change and intense recreational pressures in some areas, we cannot be certain that state or easement protection is always adequate for protecting biodiversity, nor can we assume that private ownership always equates to a lack of protection. Private lands are home to several rare habitats that are potentially used by numerous species. Many of these exist in small patches scattered over large areas, making Forest Preserve or easement protections on them challenging. Rather than focusing on how much is enough, we may be better served to focus on how and where we (state agencies, local communities, landowners, conservation and community organizations, recreationists, land use planners) can best steward the unique habitats on both public and private lands so that we avoid impacts to those most critical.

1Wildlife Conservation Society, Adirondack Program

### **Backlund, Erik1**

The effects of community participation and satisfaction on evaluating out migration among Adirondack residents.

Population loss across the Adirondacks is a significant concern for policy-makers at the state and local level. Causal mechanisms for these declines are complex and diverse. At the individual level, out migration is often associated with dissatisfaction with community life. In this research, I examine the relationships between community participation, community satisfaction, and residents' evaluation of migrating out of their community at and individual and community level. Data come from a random household survey in Harrietstown, Lake George, Tupper Lake, Warrensburg, and Webb. Questionnaires were mailed to 1389 households and 540 were returned for an adjusted response rate of 40%. Results show that residents in the five towns are relatively satisfied, although residents of Tupper Lake may be slightly less satisfied than residents of the other towns. Fifty- five percent of the respondents indicated that they were not very active or not at all active in their communities and the community activities residents were most likely to participate were community events and voting in local elections. A large majority (83%) indicated that they would be sorry to leave their community. Residents who were more active in their communities were both more satisfied with their communities and more likely to be sorry to leave. Communities with less active residents also showed less community satisfaction and less sorrow

for leaving. These findings suggest that there could be value in increasing opportunities and capacity for community level interactions among park residents in terms of both increase community satisfaction and building social networks that facilitate community development.

1 Environmental Studies Department, St. Lawrence University.

**Visual Harmony: The Relationship Between the Built and Natural Environments From the User’s Perspective**

**Nina L. Caruso**

M.S. in Historic Preservation Candidate

Thesis Advisor: Jeremy Wells, Ph.D., Assistant Professor of Historic Preservation

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Architects and landscape architects of the nineteenth and twentieth centuries considered the importance of visual harmony, which is defined as a congruency between the built and natural environments, and designed their “rustic architecture” to be in harmony with the surrounding landscape. The ways in which these designers intended their work to be perceived by users of their buildings is well known, but we do not know what visual harmony actually is from the perspective of the sites’ users or even if it is similar to the designers’ intents. There is a general lack of knowledge from the users’ perspective, and the field of cultural landscape preservation is at risk of losing the intangible meaning (what is important, what is meaningful from the user) in an effort to categorize, simplify, and standardized meanings in preservation practice.

This thesis used Camp Santanoni, a historic site that epitomizes the designers’ concepts of visual harmony, as the case study to answer this question through the meanings and perceptions of the users of this camp. Camp Santanoni was designed by Robert H. Robertson and completed in 1893. These individuals’ perceptions of historical rustic architecture in natural environments is critical to determining and describing how users perceive and interpret the visual harmony of this type of design in context with natural environments. The general purpose of this research study attempts to discover how people actually perceive and interpret the harmony between historical rustic architectural design and the natural environment, and therefore if these users agree or disagree with the designer’s intent.

The researcher established a timeline for the history of developments concerning the integration of rustic architecture with the site to achieve harmony. This was necessary to establish a chart identifying specific building element concepts that designers of the past have indicated make a building harmonious with the natural landscape. For the purposes of this study, material written before the completion of Camp Santanoni in 1893 was used to identify the building elements concepts (Table 1).

**Table 1: Building Element Concepts**

	<b>Building Element Concept</b> To make a building harmonious with the site	<b>Citation</b>
<b>1</b>	Site Selection: A site should be chosen for views, naturally beauty and grandeur	Downing, 1850 Olmsted, 1875 Wicks, 1889
<b>2</b>	Structure Materials: A structure shall use native materials; wood, bark, rocks,	Downing, 1844 Downing, 1850 Wicks, 1889

3	Merging Building and Natural Material: The building should be outgrowth of, and harmonize with the site	Olmsted, 1875 Wicks, 1889
4	Views: The building will be oriented in a way allows for the maximum amount of views looking out.	Olmsted, 1875 Wicks, 1889
5	Water: If water is present the building will be built in such a way, that it can be viewed from a number of vantage points.	Olmsted, 1875 Wicks, 1889
6	Screening: Buildings will be positioned behind existing vegetation	Downing, 1844

The researcher used a qualitative interview methodology to answer the research question, supplemented by a photo-sort task. The purpose of using a photo-sort was for the informant to be able to visually see the concepts being discussed, and to express his/her interpretation of a harmonious relationship between the built and natural environments. For the photo-sort task, a focus group was used to select the top five photographs for each category, which best represented the building element concepts. The top five photographs selected by the focus group were used to understand what the user perceives to be a harmonious relationship between the building and the natural environment. The researcher asked the informants to sort the photos with the top photo most representing the building element concept, and the bottom photo least representing the concept. The researcher then recorded the photo-sort orders for each informant. An open-ended interview was conducted after the photo-sort to allow the informant to express why he/she chose the top two images to best represent the building element concept identified by the researcher. In addition, the researcher asked the informant if he/she agreed or disagreed with the designer’s intent.

Preliminary results suggest that the user agrees with the designer’s intent for all six categories. Sixteen informants were interviewed and only two informants disagreed with the designer’s intent for one category (separate categories) out of six categories. Furthermore, the data table shows the informants consistently chose the same top two images to most represent the building element concept. They either had the exact same order or swapped the top two.

This research is expected to raise awareness about the historic use of the term “harmony” and the history of visual harmony—a design history of which many are unaware and a history important to the influence and development of structures in our National Parks.

This new body of knowledge has the potential to impact the reasons and justifications for a range of preservation actions performed by historic preservationists and cultural landscape preservation experts by taking into account users’ perspectives. Moreover, this research is applicable to the Adirondack Park region. Informants, acting as a kind of “teachers” contribute to the understanding of the research problem, but also reveal new meanings to the researcher. Many of the informants expressed the need to educate people about these design principles and their applicability to new construction in the Adirondacks. It is hoped that these design principles can contribute to the sustainable development dialogue in the Adirondack Park.

References for the citations listed in the table:

Downing, A. J. (1844). *A Treatise on the Theory and Practice of Landscape Gardening*. New York: Wiley and Putnam.

Olmsted, F. L. (1875). Park. In G. Ripley, & C. A. Dana, *The American Cyclopaedia: A Popular Dictionary of General Knowledge*. New York: D. Appleton and Company.

Downing, A. J. (1850). *The Architecture of Country Houses*. New York: D. Appleton and CO.

Wicks, W. S. (1889). *Log Cabins: How to Build and Furnish Them*. New York: Forest and Stream Publishing Company.

### **Concurrent Session 2.1 - Acid Deposition and the Impacts of Mercury on Birds and the Food Web and the Food Web**

**Habibollah Fakhraei**<sup>1\*</sup>, Charles Driscoll<sup>1</sup>, Pranesh Selvendiran<sup>2</sup>, Joseph DePinto<sup>2</sup>, Jay Bloomfield<sup>3</sup>, and Scott Quinn<sup>3</sup>

How much must acid deposition decrease to restore acid-impaired lakes in the Adirondacks?

Fossil fuel combustion and agricultural activities have increased atmospheric deposition of sulfur and nitrogen to the Adirondack region of New York. Deposition of sulfur and nitrogen has acidified soil and surface waters, resulting in the leaching of toxic dissolved aluminum into surface waters. Studies have associated fishery declines in Adirondack lakes with elevated concentration of aluminum and low pH. 128 lakes in the Adirondacks have been classified as “impaired” by New York State due to elevated acidity. The extent to which atmospheric deposition can alter the acid-base status of lake-watersheds depends on biogeochemical processes and interactions among vegetation, soil and water. These processes can be depicted in computer models. We used a dynamic biogeochemical model, PnET-BGC, to develop total maximum daily loads (TMDLs) of acidity for impaired Adirondack lakes. Several scenarios of decreases in atmospheric sulfur and nitrogen deposition were applied to quantify recovery of the 128 acid-impaired lakes in the Adirondacks. We used two endpoints of acid neutralizing capacity (ANC) to characterize the recovery of acid impaired Adirondack lakes, 11 and 20  $\mu\text{eq L}^{-1}$ . Of the 128 acid-impaired lakes, 97 currently have ANC values below the target value of 20  $\mu\text{eq L}^{-1}$  and 83 have values below 11  $\mu\text{eq L}^{-1}$ . A 60 percent decrease from the current sulfur atmospheric load is projected to increase the ANC of 28 percent of these acid-impaired lakes to above 20  $\mu\text{eq L}^{-1}$  by year 2050, and 60 percent by year 2200. Fifty-three percent of the lakes with current ANC below 11  $\mu\text{eq L}^{-1}$  are projected be restored to a target ANC of greater than 11  $\mu\text{eq L}^{-1}$  by 2050 with a 60 percent decrease in atmospheric deposition. The total maximum daily load (TMDL) of acidity corresponding to the 60 percent decrease in atmospheric sulfur deposition is 9.6 meq S  $\text{m}^{-2} \text{yr}^{-1}$ .

\*Presenter

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<sup>3</sup>New York State Department of Environmental Conservation, Albany, NY

**Douglas A. Burns**<sup>1\*</sup>, Karen Riva-Murray<sup>1</sup>, Paul M. Bradley<sup>2</sup>, George R. Aiken<sup>3</sup>, and Mark E. Brigham<sup>4</sup>

Measures of Geomorphology and Organic Carbon Help Identify Mercury Contamination Risk in Adirondack Aquatic Ecosystems

Mercury (Hg) is a neurotoxin that bioaccumulates in food webs as methylmercury (MeHg). Hg contamination of aquatic ecosystems is widespread in the Adirondacks and across the US. Atmospheric deposition is the principal Hg source to most ecosystems, and is transformed to MeHg in the environment. Identifying aquatic Hg contamination risk is an important objective for land managers and environmental regulators; however, risk is not readily predicted based solely on atmospheric Hg deposition levels. Additional factors critical in risk assessment include the: transport of Hg to surface waters, conversion to MeHg, and uptake/ biomagnification in food webs. Surface water Hg concentrations

are often strongly correlated with dissolved organic carbon (DOC) concentrations and wetland area, and therefore, these measures can serve as surrogates to identify the risk of Hg contamination of surface waters. We sampled 27 sites for Hg and related constituents to explore the factors that control spatial variation across the upper Hudson River basin. Wetland area and DOC concentrations were well correlated with Hg concentrations, but better predictions were achieved by multiple regression models based on additional landscape and chemical variables. Basin slope, open water area, and specific ultra-violet absorbance were key predictors that together accounted for 70% to 90% of the variation in total Hg and MeHg concentrations across these sites. Measures that reflect watershed geomorphology and the character of aquatic organic matter can improve our ability to identify Hg risk in forested, mountainous regions such as the Adirondacks, and can form the basis of improved predictive Hg models.

\*Presenter

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**Amy K. Sauer**<sup>1\*</sup>, Charles Driscoll<sup>2</sup>, David Evers<sup>3</sup>, Carrie Osborne<sup>3</sup>, and Allyson Jackson<sup>3</sup>

Mercury Bioaccumulation within Terrestrial Foodwebs in the Northeastern United States

A potent neurotoxin, mercury has been shown to impact the behavior, growth and reproductive success of wildlife through bioaccumulation within foodwebs. The detrimental effects of mercury contamination have been extensively documented in aquatic ecosystems, but it is equally important to understand the impacts that mercury deposition may have on biota within the adjacent, surrounding landscape. Relatively few studies have focused on the mechanisms of mercury bioaccumulation in terrestrial ecosystems. This presentation will highlight the results of regional studies that have been conducted in the Northeastern United States by Biodiversity Research Institute as well as intensive, case studies conducted in the Adirondack Mountains to trace the movement of mercury through sensitive terrestrial foodwebs using songbird species as biological indicators of ecological health.

\*Presenter

<sup>1</sup>Biodiversity Research Institute & Syracuse University

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**Concurrent Session 2.2 - Native/Invasive Species**

**Meeting the Invasive Species Challenge**

**Hilary Smith**, Director, Adirondack Park Invasive Plant Program, The Nature Conservancy – Adirondack Chapter, PO Box 65, Keene Valley, New York 12943; email: hsmith@tnc.org

**Abstract**

The Adirondack Park holds some of the most ecologically intact lakes, rivers and forests in the United States. Most of the park remains relatively free of invasive species, which presents an exciting opportunity in conservation at a scale rarely seen throughout the country. In 1998, governmental and nongovernmental organizations formed a regional partnership, the Adirondack Park Invasive Plant Program (APIPP), to leverage this opportunity and work with local communities to develop programs in prevention and management. Since then, APIPP has become a leader in regional invasive species programming in New York, recognized by the state Department of Environmental Conservation and winning four national conservation awards. APIPP's 15 year history demonstrates consistency, solidarity and tenacity: its strength is in its partnerships and coordinated approach. What started as a grass-roots

effort with a big idea among a few partners in 1998 is now a robust program with more than 30 cooperating organizations and over 500 volunteers. The invasive species challenge motivated previously disparate groups to rally around and enact innovative invasive species solutions. Both the Adirondacks and New York State have come a long way in the last two decades, but the present time holds an uneasy combination of uncertainty and opportunity that is dependent on political will, social perceptions and human behavior. The challenge ahead will be sustaining momentum and support for key programming, innovative policies and adequate funding, particularly in light of competing needs, diminishing resources, a ticking clock and a changing climate. What species and solutions will prevail in the next two decades? The road map of where we have been and where we are going to prevent and control invasive species will be discussed.

**Nathan Reigner**, PhD. Student, Park Studies Laboratory, Rubenstein School of Environment and Natural Resources, University of Vermont

Over the past few years a body of interesting and innovative research has been directed at northeastern mountain summit recreation. Cascade Mountain is among the sites studied. The research integrates social science and ecology to monitor and evaluate the impacts of mountain summit recreation and study perceptions and attitudes of recreationists about ecological impacts and their management. It is a product of collaboration among St. Lawrence Univ., Univ. Vermont, Virginia Tech, Utah St. Univ., and others. With funding from the NSRC the program of research will be continued this summer, focusing on evaluating the efficacy of a range of management strategies for reducing the impacts of recreation. This research is of interest to a diverse audience including natural, biological and social scientists, resource managers and policy makers, and recreationists and user groups.

### **Concurrent Session 2.3 – Lakes, Fish, and Wildlife**

Lee Ann Sporn<sup>1\*</sup>, Curt Stager<sup>1</sup>, Ryan Deibler<sup>1</sup>, Sean Regalado<sup>1</sup>, and Joshua Dzikowski<sup>1</sup>

#### **Are yellow perch native to the Adirondacks? The DNA evidence**

DNA was purified from samples of a 135 cm lake sediment core taken from Lower St. Regis Lake, Franklin County, NY. Yellow perch DNA was detected in sediment samples taken throughout the core, including the deepest sediments using polymerase chain reaction and targeting the DNA barcode gene (mitochondrial cytochrome oxidase subunit 1). Cloning and sequencing of this DNA verified its authenticity. To control for the possibility that yellow perch DNA is ubiquitous in the environment and not an indicator of presence of organisms, sediment DNA from Wolf Lake (believed not to contain yellow perch), several ephemeral pools in Franklin County, NY, and African lakes were analyzed. All such samples tested negative for presence of yellow perch DNA. This evidence suggests that yellow perch are native to upland lakes in the Adirondack Park.

<sup>1</sup> Paul Smith's College, Paul Smiths, NY 12970

#### **Acidification, biological recovery, and climate warming: A 150-year paleolimnological perspective on aquatic species change in the Adirondacks**

***Kristina M. A. Arseneau<sup>\*1</sup>, Charles T. Driscoll<sup>2</sup>, Cassandra M. Cummings<sup>1</sup>, Brian F. Cumming<sup>1</sup>***

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Lakes in the Adirondacks and elsewhere across North America have been significantly impacted by acidification. Since the implementation of the US Clean Air Act Amendments, some lakes have begun to undergo chemical recovery from acidification. While it is expected that chemical recovery will lead to biological recovery from acidification, researchers studying biological recovery are faced with unique methodological issues. First, there is a general lack of long-term monitoring data, especially data from pre-disturbance conditions. Without such data, it is difficult to assess the effectiveness of mitigation strategies and identify whether or not acidified lakes are returning to their pre-acidification state. Second, lakes across North America are becoming increasingly impacted by multiple environmental stressors. Watershed disturbance, invasive species introductions, and climate warming can all have a significant influence on aquatic species assemblages. Researchers attempting to identify biological recovery must be able to differentiate species responses to acidification and subsequent recovery from responses to other environmental stressors.

This presentation will highlight the findings of a multi-year paleolimnological project in the Adirondacks examining biological recovery from acidification. Paleolimnological studies reconstruct the environmental histories of lakes by studying biological ‘signals’ preserved in lake sediments. Many aquatic organisms leave fossilized remains in lake sediments. Based on what is known about their present-day ecologies (i.e., their preferred pH or temperature ranges), paleolimnologists can use changes in fossil assemblages to infer how the aquatic environment has changed over time. Using paleolimnological techniques, researchers can identify the onset of acidification in a lake, subsequent biological recovery, and species responses to regional stressors such as climate warming.

This paleolimnological project has worked at both local and regional scales in the Adirondack Park to develop an understanding of 1) whether or not biological recovery from acidification is progressing in Adirondack lakes and 2) what influence, if any, climate warming is having on recovering species assemblages. In the first part of the project, high-resolution paleolimnological reconstructions of the past 150-200 years were created for three acidified and three non-acidified (reference) lakes. The key questions examined in the investigation were 1) whether or not biological recovery was progressing in the acidified lakes and 2) whether or not they were returning to their pre-acidification state. In the second part of the project, low-resolution reconstructions of the past ~150 years were created for a set of 32 reference lakes across the Adirondack Park. Using a set of stringent selection criteria, the lakes were identified from the 1469 lakes in the ALS database as lakes minimally disturbed by: acidification, watershed disturbance, road salt application, and piscivore introductions. In both studies, the reference lakes serve to identify if regional warming is influencing Adirondack species assemblages independent of acidification and recovery.

This project’s findings suggest that modest biological recovery, characterized by a recent decline in acid-tolerant algal taxa, and, in some cases, increases in more acid-sensitive species, has occurred since the 1995 implementation of the US Acid Rain Program. However, a majority of the lakes studied did not appear to be moving towards their pre-acidification state. Rather, the acidified lakes appeared to be moving towards a novel species composition, a trajectory noted in a majority of the reference lakes as well. For example, increases in warm-water species and increases in large-colonial algae that benefit from shorter ice-covered seasons were noted in both the acidified and reference lakes. Similar species changes have been identified in lakes across North America and have been attributed to an effect of recent climate warming. Thus, we conclude that while modest biological recovery from acidification is occurring, lakes in the Adirondacks are unlikely to return to their pre-acidification state due to regional warming. Moreover, this investigation demonstrates that even minimally-disturbed Adirondack lakes have undergone a pronounced shift in species composition over the past 150-years. The impacts of these changes in species composition are difficult to predict but serve to highlight the pronounced effect that regional warming is having on lakes in the Adirondack Park.

**Title:** Assessing the impact of North American porcupine (*Erethizon dorsatum*) foraging on forest composition and structure in northern New York

**Author:** Erin Siracusa, Undergraduate Student, St. Lawrence University (Graduated on May, 20 2012)

**Advisor:** Dr. Erika Barthelmess, Associate Professor of Biology, St. Lawrence University

**Abstract:**

Herbivores, as major constituents of most ecosystems, have the potential to affect vegetation development and productivity, causing shifts in abundance and distribution of plant species. Foraging behavior of the North American porcupine (*Erethizon dorsatum*) is of considerable interest because winter feeding strategies, namely bark stripping, may cause sublethal or lethal damage to trees. During the winter months foraging around den sites is also fairly localized and high in intensity, exacerbating the potential effects of porcupine herbivory. Few studies have sought to explore the ecological significance of porcupine foraging and its potential effects on the composition of forest communities. Although browsing pressure alone has the potential to significantly affect the vertical complexity of forest stands by creating canopy gaps and introducing structural diversity into otherwise homogenous stands, preferential feeding may further influence plant community composition. By selectively feeding on certain species, porcupines may allow for the competitive release of sub-dominant species within the forest community, potentially enhancing the diversity and species richness of a given stand.

This study assessed the impact of winter foraging behavior of porcupines on forest composition and structure. Between October 2011 and February 2012, I established four survey plots; two den plots and two random plots within Glenmeal State Forest in Canton, New York to assess the effect of winter-feeding behavior of porcupines on northern hardwood forests. In each plot I identified all trees to species, measured their diameter at breast height (dbh), and classified each as an adult (dbh > 5.0cm), sapling (dbh ≤ 5.0cm), or snag (standing dead tree). Since the frequency and distribution of scars that develop in response to porcupine feeding on the bark of woody plants provide an indication of winter food preferences, I assigned each tree a wound score between 0 and 4 to quantify damage from porcupine feeding.

Forest composition appeared very different between den and random plots. Den plots had a lower density of adult trees and a higher density of saplings and snags than random plots. The densities of two subdominant species, eastern hophornbeam and striped maple, were also much higher at den than random plots. The top five species with the highest importance value (relative density x relative dominance) for den sites were eastern hophornbeam, striped maple, red maple, sugar maple, and eastern hemlock, while the top five species with the highest importance value for random sites were sugar maple, eastern hemlock, eastern white cedar, yellow birch, and blue beech American hornbeam, providing strong evidence to show that den communities and random forest communities are quite different in composition, and suggesting a link between porcupine herbivory and change in forest community structure. Although observational studies have suggested that porcupines structure communities through preferential feeding, data from this study suggests that porcupine selection of tree species tends toward more generalist feeding behavior, facilitating the growth of multiple species and potentially increasing the diversity of forest communities at den sites over time.

Porcupine foraging exerts considerable influence on the structure of forest communities by creating patches of small-scale disturbance that facilitate succession and new growth. Much of the prevailing sentiment around porcupines deigns them a nuisance species whose bark gnawing incurs considerable commercial costs to both personal property and the lumber industry. However, porcupine foraging appears to be more beneficial than detrimental to forest communities. No commercially important species, such as sugar maple, appear to be functionally eliminated by feeding behavior, and the diversity of forest

stands is enhanced through intermediate levels of disturbance. Furthermore, by mortally wounding trees, porcupines appear to facilitate the creation of snags which are key habitat for numerous species of birds that use standing dead trees for breeding, roosting and foraging sites. Understanding the benefits of such browsing behavior is essential to altering misconstrued views of the porcupine and perhaps limiting the bounty-hunting and poisoning programs that occur as a result of such misunderstandings. Further studies will be needed to help confirm these trends and to further our understanding of the extent to which porcupines serve as agents of disturbance and renewal in the hardwood forests of northern New York.

**Ohol, Kevin\***<sup>1</sup>, Johnson, Glenn<sup>3</sup>, Ross, Angelena<sup>2</sup>, VanHooreweghe, Kristen<sup>3</sup>.

Occupancy Modeling and Applications for Spruce Grouse (*Falciennis Canadensis*) in the Adirondacks.

Establishing effective methods of wildlife monitoring is a central concern for many resource agencies. Management decisions that involve threatened or endangered species require reliable estimates of species occurrence. Occupancy modeling generates statistical models that are capable of producing accurate estimates of a species' percent occupancy, and rates of colonization and extinction within sites. Spruce grouse (*Falciennis canadensis*) populations in the Adirondacks have been declining since monitoring began in the 1970's. Today they are listed as Endangered in New York State. I used presence/absence data for the years 2002 – 2006 to generate 16 occupancy models for spruce grouse in 56 Adirondack sites. My results show a percent occupancy of 0.6540, and a detection rate of 0.6331. I determined that habitat quality had the greatest influence on the rates of occupancy, as well as the rate of colonization and extinction for individual sites. Accounting for detection probabilities as well as site- and survey-specific covariates allow occupancy modeling to produce unbiased estimates of a species' occurrence and distribution. Comparing occupancy and detection values over time allows resource agencies to correlate changes in occupancy or detection rates with the effects of management, or lack there of. The flexibility and utility of occupancy modeling make it an appropriate tool in constructively monitoring spruce grouse in the Adirondacks, or other species in need of monitoring or protection.

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## Select Abstracts of Annual Conference Poster Presentations

**Wiley, Kathleen A.**<sup>1\*</sup>, and Eric **Holmlund**<sup>1</sup>.

### Overview of Paul Smith's College's Watershed Stewardship Program

Paul Smith's College's Watershed Stewardship Program (WSP) is the education and outreach aspect of Paul Smith's College's Adirondack Watershed Institute. The WSP began in 2000 as a local watershed-focused effort to interpret the environment, perform environmental service work, monitor ecological conditions and prevent the introduction of aquatic invasive species (AIS) into the St. Regis Lake chain, which is adjacent to Paul Smith's College. Throughout the 13 years of the program's existence, WSP staff has collaborated closely with The Nature Conservancy, the Adirondack Park Invasive Plant Program, the New York State Department of Environmental Conservation, the Lake Champlain Basin Program, the Lake George Association, numerous property owner associations and scientists at Paul Smith's College to guide the evolution of a program that serves the needs of local human and biotic communities. As a result,

the WSP now serves as a model across the state for AIS spread prevention and outreach. In 2012, stewards were stationed at 24 different boat launches across the Adirondack Park. The WSP's 26 Watershed Stewards kept busy inspecting a total of over 24,000 boats and imparting an invasive species awareness message to almost 50,000 people. Stewards inspected 489 boats in 2000, over a 40-fold increase to date. Over 88,000 boats have been inspected in the WSP's 13-year history.

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## **Detection of Trihalomethanes in Municipal Water Supplies Using Solid-Phase Microextraction and GC/MS**

**Murphy, Ryan L.**<sup>1\*</sup>

Faculty Mentor: Dr. Ning Gao

Trihalomethanes (THMs) may form in municipal water supplies during the chlorination process used to disinfect water. THMs form when chlorine reacts with organic matter in the water supply. The most common THMs that are present in treated water are chloroform (CHCl<sub>3</sub>), and bromoform (CHBr<sub>3</sub>). THMs have been found to be carcinogenic in animal studies and have been shown to decrease birth weights and lower gestational age for pregnant women. The EPA standard for THM presence in the water supply is 80 µg/L.

The most common method of identifying THMs in water supplies is the purge and trap procedure. This is time consuming, expensive, and does not test for iodo-trihalomethanes (I-THMs). The detection limit of this method is about 0.6 µg/L and I-THMs at the ng/L concentration level may pose harmful health effects. Headspace solid-phase microextraction (SPME), however, represents a less expensive alternative with detection limits low enough to identify THMs at the ng/L concentration. Headspace SPME is the sampling method by which water is heated with an SPME fiber above the water level in the headspace of a vial. The fiber adsorbs the THMs when the water is heated. The adsorbed THMs are then desorbed from the fiber when it is placed in the injection port of a GC/MS, separated in the column, and detected.

Analysis for THMs in treated water samples taken from many municipalities in the St. Lawrence Valley and the Adirondack Park has detected chloroform in most municipal water supplies while bromoform was found in a few.

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Lee Ann **Sporn**<sup>1,2\*</sup>, Anastasia **Dierna**<sup>1</sup>, Ryan **Deibler**<sup>1</sup>, Corey **Laxson**<sup>2</sup> and Daniel **Kelting**<sup>2</sup>

## **Environmental DNA based surveillance of aquatic invasives.**

Species-specific detection of environmental DNA was explored for its potential as a rapid, sensitive and economical surveillance method for invasive bivalves. Water samples taken from five of seven lakes in New York State reported to be infested tested positive for zebra mussel (*Dreissena polymorpha*) DNA, and water samples from four lakes within the Adirondack Park not previously known to be infested also tested positive. Further eDNA testing was conducted on these four lakes, including testing of littoral sediment and biofilms. Both sediment and biofilm

tested positive for zebra mussel eDNA in one such lake (Chateaugay Lake, Franklin County, NY), and in another such lake (Long Pond, Essex County, NY), four of six littoral sediment samples tested positive. The majority of lakes in the Adirondack Park are at risk for Asian clam (*Corbicula fluminea*) infestation based on water chemistry. We developed a species-specific eDNA test, and Asian clam eDNA was detected in littoral sediments from water bodies known to be infested. Sediment eDNA will be further explored as a consistent and reliable indicator of invasive bivalve presence in a water body.

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**Shrope, Christopher<sup>1</sup> and Pynchon, David<sup>2</sup>**

Adviser: Erik A. Backlund<sup>3</sup>

## **Resident evaluations of community satisfaction in five Adirondack towns.**

### **Introduction**

The purpose of this study was to examine community satisfaction in the Adirondacks. Community satisfaction is important because it is related to choice of residence. Research shows that those dissatisfied with their communities are more likely to move away. Retaining residents and ensuring a high quality of life is important across the Adirondacks when considering the concerns about out-migration and declining populations. In this study we examine differences in resident evaluations of community services, conditions, and overall community satisfaction in five Adirondack towns.

### **Methods**

Data come from a household survey of permanent park residents in Harrietstown, Lake George, Tupper Lake, Warrensburg, and Webb. Five hundred and forty five responses from 1389 randomly selected households were received for an adjusted response rate of 40%. Respondents first rated the importance of 16 community attributes on a five point Likert-type scale where 1 = "Very Unimportant" to 5 = "Very Important." They again rated each of the attributes on a scale ranging where 1="Completely Dissatisfied" to 5="Completely Satisfied." Finally, respondents rated their overall community satisfaction on a scale ranging from 1="Completely Dissatisfied" to 5="Completely Satisfied." Mean rating scores were calculated and differences across communities were assessed using ANOVA.

### **Results**

Overall, 77% of the respondents were "Satisfied" or "Completely Satisfied" with their community. Across the five communities there were no difference in the level of overall Satisfaction. The most important community attribute to residents overall were "Scenic Beauty" (m=4.25), "Clean Air" (m=4.25), and "Fresh Water/Water Quality" (m=4.25). The least important attributes were "Ability to live off the land" (m=2.91) and "Senior Citizen's Programs" (m=3.05). Importance was statistically different ( $p < .05$ ) across communities for six of the attributes including "Scenic Beauty," "Access to Recreation Opportunities," "Family and Friendship Ties," "Quality of Schools," "Youth Activities," and "Local Shopping Opportunities." Respondents were most satisfied with the attributes "Scenic Beauty" (m=4.39) and "Clean Air" (m=4.32). They were least satisfied with "Cost of Living" (m=3.11) and "Local Shopping Opportunities" (m=3.12). Satisfaction with five components was statistically different across towns, these included "Access to Recreation Opportunities," "Fresh Water/Water

Quality,” “Medical and Healthcare Services,” “Youth Activities,” and “Local Shopping Opportunities.” Overall satisfaction was most strongly associated with satisfaction with “Local Shopping Opportunities” ( $r = .427$ ) and “Rural Character of Your Community” ( $r = .414$ ). Quality of schools had no association with respondents’ overall satisfaction evaluations.

### **Discussion/Conclusions**

Results indicate that park residents are highly satisfied with the natural environment surrounding their communities but unsatisfied by the costs associated with living in the Park. The relationship between shopping opportunities and overall satisfaction suggests that the lack of shopping opportunities reduces peoples’ satisfaction with their communities. These findings suggest that there may be a contradiction inherent in living in the Adirondacks. Residents are most satisfied with community attributes that drive up the cost of living, the attribute with which they are least satisfied.

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### **Out with the Old, In with the New? Comparing the effectiveness and visitor attitudes between a digital trail guide and a traditional paper booklet for self-guided interpretive walks at the Adirondack Interpretive Center.**

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While the impact and use of technology in our everyday lives are significantly increasing, the impact of nature is in great decline. Society has become more interested in staying connected via smartphones and computers and less comfortable with or fascinated by the outdoors. This declining attention to the outdoors has led to a large disconnect between society nature and numerous human actions that threaten the wellbeing of our environment. These trends suggest a potential role technology can play in interpretive efforts to reestablish society’s connection with nature. To assess this possibility, a digital trail guide was constructed using a preexisting paper booklet created for self-guided interpretive walks along the Sucker Brook Trail at the Adirondack Interpretive Center (AIC) in Newcomb, NY. The goal of developing this digital guide was to compare its effectiveness and reception by visitors with that of the traditional paper booklet. Assessment of visitor experiences and attitudes were to be measured using post-experiences surveys of either form of the walk. The lack of wireless internet and cell phone service along AIC’s trails presented initial challenges in the development of the digital guide. The unforeseen challenge of inconsistent compatibilities of PDF Portfolios on computers and handheld devices delayed implementation of the digital trial booklet and the associated data collection. Despite this, this research project has important implications in interpretive product design and raises an interesting aspect in the debate among interpreters regarding the role technology should play in these fields. Further research and development of the digital trail guide will be essential in completion of this research project.

## **Enhancements to acid deposition monitoring in New York State**

Kevin L. **Civerolo**, H. Dirk **Felton**, Karen M. **Roy**, NYSDEC Div. of Air Resources; and Gregory G. **Lampman**, NYSERDA/EMEP

The NYSDEC Division of Air Resources (DAR) has been monitoring acid deposition across the state for over 25 years. Two recent developments will allow the impacts of emission reductions to be tracked efficiently, consistent with the ongoing National Atmospheric Deposition Program (NADP) efforts, and with a focus on sensitive regions in the state. With the support of NYSERDA, the DAR began to convert some of its own deposition samplers to NADP National Trends Network (NTN) samplers. Three sites in the Adirondack Mountains – Piseco Lake, Wanakena Ranger School, and Paul Smiths College – were upgraded in December 2012, with another three urban or suburban locations to transition to the NADP in 2013. At the same time the USEPA’s pilot monitoring program in the Adirondack Mountain region, to support and evaluate the proposed secondary national ambient air quality standards (NAAQS) for oxides of sulfur and nitrogen, was phased-in.