19th Annual Conference on the Adirondacks

Entrepreneurship, Sustainability, and the Environment

May 16-17, 2012, High Peaks Resort, Lake Placid, NY

2012 Student Juried Paper Program – Undergraduate & Graduate

Sponsored by the Glenn and Carol Pearsall Adirondack Foundation

The Mission of the Glenn and Carol Pearsall Adirondack Foundation is to "improve the quality of life for year-round residents of the Adirondack Park." Our emphasis to date has been to support not-for-profit 501 (c) 3 organizations located within the "Blue Line" of the Park that primarily serves the needs of the year-round residents within the Park.

2012 Honorary Chair
Dr. James "Jake" Liszka
Provost/Vice President for Academic Affairs at SUNY Plattsburgh

Prior to assuming his position at SUNY Plattsburgh in June of 2011, Dr. James Liszka, was the dean of the College of Arts and Sciences at the University of Alaska, Anchorage, the largest in the University of Alaska system. As dean, Dr. Liszka has been a visiting professor at the China Youth University for Political Sciences in Beijing and has worked to establish cooperative relations with Chinese universities. He worked to increase educational opportunities for Alaska Native students, strengthened the Alaska Native Studies program and instituted an Alaska Native arts emphasis in UAA's fine arts program. During his tenure as dean, the College of Arts and Sciences saw revenues increase bringing its budget out of a deficit situation and saw an increase in freshmen retention rates.

Schedule of Presentations
May 16th, 2012

Session 1	**1:30 p.m. - Iroquois Meeting Room – Undergraduate Presentations**		
	Michael Hall	Paul Smith's College	Eurasian Watermilfoil – Apical Influences
	Andrew Skaggs	St. Lawrence University	The Adirondack Club and Resort
	Matthias Nevins	St. Lawrence University	Property Rights and Regional Ecosystem Management

Session 2	**3:15 p.m. - Iroquois Meeting Room – Graduate and Undergraduate Presentations**		
	Kristel Guimara (G)	Green Mountain College	Effects of Black Carbon on Snowpack
	Katherine McKissick(U)	SUNY ESF	Amphibian Reproduction in Adirondack Vernal Pools

Recognition Luncheon
May 17th, 2012, 12:15 p.m.

•Recognition of Participating Students and Topics

•Award for Outstanding Graduate and Undergraduate Papers

201 Paolozzi Center, Paul Smith's College Campus, *P.O. Box 96, Paul Smiths, NY 12970*
info@adkresearch.org, 518-327-6276

Comparative growth study of Eurasian watermilfoil (*Myriophyllum spicatum*) and Northern watermilfoil (*Myriophyllum sibiricum*): a look at apical influence

By: Michael Hall
Fisheries and Wildlife Sciences, Paul Smith's College, May 2012 Graduate
Mentor: Professor Celia Evans, Paul Smith's College

Advancements in technology have allowed the distant corners of the planet to become interconnected. With people and products being transported all around the world it allows for the movement of thousands of plants and animals. As a result, plants and animals are introduced into new areas where they have the ability to outcompete and displace the native species and thus are considered invasive. One highly invasive aquatic plant that has infested lakes across North America is Eurasian watermilfoil (*Myriophyllum spicatum* L.) (EWM). EWM grows rapidly to form a dense canopy and outcompetes other species for light through shading. Northern watermilfoil (*Myriophyllum sibiricum* Komarov) (NWM) is a native, non-invasive, milfoil which occupies similar habitats as EWM. Little research has been done comparing fragment growth in these two species. Spread by fragmentation has been suggested as the main source of dispersal for EWM. Fragmentation in EWM can occur naturally through auto-fragmentation, wind and wave action, or through physical disturbance such as recreational boating. There is a high potential risk that these fragments may infect other lakes, so a greater understanding of fragment growth is necessary. Growth at the tops of these plants, the apical tip end, has been shown to be dominant over lateral bud growth, thus the role of apical dominance in both species is worth investigating. This study compared fragment growth of EWM to NWM to better understand the invasiveness of EWM. The study took place at the Adirondack Watershed Institute at Paul Smith's College during the summer of 2011 over a period of 6 weeks. Plant strands were collected from local lakes. EWM strands were collected from Second Pond in the Saranac Lake Chain and NWM strands were collected from the outlet of Lower St. Regis Lake. There were 4 treatments of 10 replicates each, totaling 40 fragments. The four treatments included EWM with and without an apical tip and NWM with and without an apical tip. Strands for no apical tip treatments were cut into fragments of 10 nodes. Strands cut for apical tip attached treatments consisted of the bottom 10 focal nodes in addition to the apical tip end, which varied in length and numbers of nodes. The 10 focal nodes were used for data analysis. Fragments of both species with and without an apical tip were allowed to grow in laboratory conditions for a duration of 6 weeks. Data were collected weekly on lateral bud growth, rootlet growth, and apical growth. The results of this study found that on average EWM and NWM developed a similar number of lateral buds, but EWM had longer lateral buds. EWM also had fewer rootlets and longer average apical tip growth than NWM. Apical tip presence had a significant influence on lateral bud growth ($p=.0033$). Fragments with an apical tip attached had values that varied greatly between EWM & NWM, with EWM having a much larger value for total lateral bud length. There was a significant affect of apical tip dominance in both milfoil species on lateral bud growth ($p=.005$). Fragments of EWM & NWM had similar values for average number of viable rootlets per strand with no apical attached, but with an apical tip attached EWM had a reduced number of rootlets while NWM had an increased number of rootlets. There was a slight influence of species on average total number of viable rootlets per strand ($p=.0765$). At the conclusion of the 6 week study average apical tip length in EWM was approximately double that of NWM. In natural settings the physiology of EWM may allow it to allocate resources to apical and lateral growth in order to build up a dense canopy and outcompete native plants for light. Apical dominance occurs strongly in both EWM & NWM. The presence of an apical tip led to less lateral bud growth on both species in this study. Apical dominance has been also demonstrated in curly-leaf pondweed (*Potamogeton crispus L.*) and in American/Canadian waterweed (*Elodea canadensis Michx.*), where fragments with apical tips produced fewer lateral shoots than fragments without an apical tip. This study further validates that the competitiveness of EWM is directly linked to its ability to form a dense canopy. As EWM stems reach the surface of the water they begin to branch and form a canopy, which diminishes the amount of light that is available for other native species, such as NWM. Shading by EWM and other invasive species, such as hydrilla (*Hydrilla verticilata*) and inflated bladderwort (*Utricularia inflata*), is a principle mechanism used to displace native species. As illustrated in this study, EWM is able to grow out its apical quickly and, with the apical attached, grow out relatively large lateral buds. Further, this study showed that EWM allocated less energy towards rootlets, and dedicated more growing effort towards the growth of a longer apical.

The Adirondack Club And Resort And The Great Adirondack Debate

Andrew Skaggs, Matthias Nevins, and Andy Sargrad, St. Lawrence University

Abstract: The recent permit approval of the Adirondack Club and Resort (ACR) by the Adirondack Park Agency (APA) provides a fascinating case study for numerous environmental, economic, and governmental reasons. Through an extensive interview process with various stakeholders (government representatives, Adirondack residents, developers, and third party interest groups) we obtained important information regarding the APA's regulatory process, detrimental environmental impact of the 6300 acre development, and the long term economic viability of the ACR. We found that the "functional wildlife assessment" completed by the LA group and the lack of adequate planning on natural resource management lands (RM) was inconsistent with current APA guidelines. Also the economic impact of this project would create employment opportunities; however the majority will be low-paying jobs contracted outside the park. Additionally the overall scale of project, stagnant real-estate market, and lofty financial projections are disconcerting and unrealistic. The ACR will undoubtedly set precedence for future development in the Adirondack State Park. Therefore we recommend that specific APA guidelines must be amended to ensure that a similar development would never be approved without sufficient ecological and economic assessment.

Key Words: Great Adirondack Debate, Adirondack Club and Resort (ACR), Preserve Associates, Land-Use and Development Plan, Tupper Lake, Adirondack Park

Property Rights and Regional Ecosystem Management: A comparative study of shifting land tenure in the Adirondack State Park, USA and the protected areas of Kenya

Matthias T. Nevins, St. Lawrence University

Abstract: The Adirondack Park represents one of the most hopeful models of ecosystem based conservation management globally. Despite the constant debate within the Park over the appropriate use and management of the constitutionally protected state lands and the highly regulated private property, a dynamic balance has been struck that is truly unique. The study of land tenure change has emerged as a primary research focus amongst conservation biologists in hopes of understanding regional and global environmental change. The Adirondack State Park requires an inclusive and participatory governing structure in order to meet the shifting demands of varied stakeholders within an evolving landscape of public and private interests. Through a comparative analysis of the regulation and expression of property rights within the Adirondack Park and protected areas in Kenya, we can begin to understand the successes and failures of conservation and development projects globally. As we seek to establish conservation measures that are successful and flexible in a full world context, the Adirondack model remains one of the most inspirational examples of collaborative ecosystem management.

Key word: Land tenure, property rights, Adirondack Park, Kenya, Article XIV, APLUDP, ecosystem management

The effects of Black Carbon on the absorption of sunlight in natural snowpack of the Adirondacks

KRISTEL GUIMARA, Masters Student, Green Mountain College, guimarak@greenmtn.edu

MR. RICHARD BRANDT, Advisor, Atmospheric Science Research Center Field Station of the State University of New at Albany, Wilmington NY. Email: brandt@atmos.washington.edu
DR. JOHN VAN HOESEN, Advisor, Green Mountain College, Poultney VT Email: vanhoesenj@greenmtn.edu

Introduction: For the past 2 years, I have been working with Mr. Richard Brandt a Research Scientist from the University of Washington, collecting measurements in the Adirondack snowpack to measure black carbon (BC) contamination. BC, also referred to as "soot," contains small-light absorbing particles produced by fossil fuels (diesel, petroleum and coal) and open biomass burning associated with wildfire or agriculture.

Since the start of the Industrial Revolution (18^{th} C.), humans have increased the amount of carbon dioxide (CO_2) gas released into the air through the burning of fossil fuels; the preliminary cause of current global warming. Both current measurements and projected models have demonstrated that soot can alter the amount of sunlight absorbed on the Earth's snow covered surface. Any given amount of BC, deposited over snow and sea ice, can increase the absorption of the sun's radiation resulting in a thinner snowpack due to enhanced melting and sublimation. The absorption of the sun's radiation warms the surrounding snow and underlying surface, and continues the snowmelt cycle. If snow and sea ice melt away earlier in the season, then the darker underlying surface is exposed earlier in the melt season, further increasing the Earth's absorption of solar radiation. This is the primary positive feedback in the Earth's climatic system.

Using new and recently collected data this research will examine the enhanced absorption of sunlight, by natural snow in the Adirondacks due to the presence of BC deposition. The Adirondacks is an ideal area to study because it is the largest intact temperate forest in the world, downwind of significant BC emissions and dependent on winter tourism for winter economy.

Methods

Study Area: Snow samples were taken on selected lakes, located in or near Saranac Lake New York, to be compared to snow samples collected throughout the Arctic Region. The samples collected in or near Saranac Lake, New York were chosen out of convenience and accessibility to gather samples during fresh snowfall.

Sampling Methods: Retrieving snow samples after each snowfall requires a certain timeframe due to the metamorphism and melting of snow. As a snow crystal falls, it slowly picks up particulates within the atmosphere. Once the crystal falls onto the landscape, it begins to breakdown. As the snow crystal breaks down, it becomes harder to make a proper judgment in the field in distinguishing between new and old snow. Therefore, each sample is gathered at the very top few centimeters, after each new snow fall, to ensure the collection of newly fallen snow. Each sample is collected in a Mason jar, drawn through a Nuclepore filter (0.4 microns) via a custom-built vacuum filtration system using a hand-operated pump, the melt water is measured in milliliters and the filter is air dried in a clear acrylic container which was then sent to the University of Washington to be looked under a spectrophotometer.

Once all the data returned, there had to be a way to plot and compare the data. Different methods in sampling of snow vary between researchers. In order to compare samples taken in the Arctic Region, a standard method had to be designed in order to rightfully compare these samples amongst each other. Therefore, a graph developed by Warren & Wiscombe (1985) and Clarke & Noone (1985) was used to apply a Delta Eddington radiative transfer model to show the amount of albedo reduction on each snow sample.

Conclusion: Soot concentration between local landscapes in or near Saranac Lake New York, were shown to be as low as 35 ppb to as high as 68 ppb. According to Warren and Wiscombe, 40 parts per billion can reduce the albedo on snow by about 1 to 3 percent. The average amount of soot concentration of the data collected in or near Saranac Lake New York suggests a reduction in albedo by about 1.5%. The amount of dark particles that may travel downwind is suggesting that enough soot impurities from incomplete combustion is darkening the snow, which could lead to faster snow melt.

The amount of soot concentration which influenced absorption of solar radiation in Adirondack natural snowpack suggested $4x10^{-8}$. When plotting this on a graph developed by Warren and Wiscombe (1985) and Clarke and Noone (1985), it suggests old snow melt of 3% and new snow of 1.5%. The decrease in the albedo of snow increases the amount of absorbed radiation. According to Hansen and Nazarenko (2004), the amount of albedo in new snow on land areas in the Northern Hemisphere is 3%. Therefore, the amount of soot concentration analyzed for local landscapes in or near Saranac Lake New York, suggests a lower amount of snow albedo reduction than what Hansen and Nazarenko found.

Literature Cited

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Habitat Characteristics and Amphibian Reproduction in Adirondack Vernal Pools: Is Wet Enough?

Authors: Katherine McKissick and Stacy McNulty
State University of New York College of Environmental Science and Forestry

Abstract: Northeastern vernal pools are seasonal bodies of water that support a variety of amphibians and invertebrates. *Lithobates sylvaticus* and *Ambystoma maculatum* are two amphibians widely known for their utilization of vernal pools as breeding sites. Since larvae develop within the vernal pools and breeding adults reside in the upland habitat, it is likely that both in-pool and upland habitat characteristics have an effect on amphibian reproduction.

The objective of this study was to examine the physical habitat within and surrounding vernal pools in order to determine the relationship, if any, to the reproductive success of *L. sylvaticus* and *A. maculatum*. In-pool habitat and upland habitat was assessed for a total of twenty-three vernal pools sampled from May 2010 through July 2010 in the Huntington Wildlife Forest within the Adirondack Region of New York. Upland habitat was assessed by sampling plots along transects 100m to the north, south, east, and west of each pool. In pool habitat was assessed using similar transects, starting from the center of the pool and sampling to the water's edge. Amphibian reproduction was monitored through egg mass counts, larval growth rate, and *L. sylvaticus* metamorph survival rate.

Amphibian reproduction differed between the 23 vernal pools monitored and linear regression was used to determine correlations to each of the habitat characteristics measured. A significant correlation was found between the number of *A. maculatum* and *L. sylvaticus* egg masses deposited in each pool. Additionally, 60% of the vernal pools which contained zero *L. sylvaticus* egg masses also contained zero *A. maculatum* egg masses. 88% of inactive pools were within 55 m of active pools, which suggests that amphibians had the opportunity to breed in either pool and

avoided certain pools on purpose. These data suggest that in-pool habitat characteristics play a role in amphibian selection of vernal pools for breeding.

In this study, *A. maculatum* tended to deposit their eggs in deeper pools. Deeper pools retain water longer than shallower pools, allowing larval salamanders to grow large enough to metamorphose at a size that ideally reduces predation on land and permits metamorphs to eat larger prey. We did not see a relationship between maximum pool depth and *L. sylvaticus* egg mass numbers most likely because *L. sylvaticus* metamorphs emerge from the pools earlier than salamanders, therefore pool drying is a more serious issue for *A. maculatum* larvae.
In addition, *L. sylvaticus* metamorph survival rate differed 30-fold among the five pools assessed using drift fences and pitfall traps. Despite this variation among pools, survival rate was not correlated with any of the in-pool or upland characteristics. In late June, a period of high temperatures and no precipitation caused many vernal pools to dry, resulting in the death of larvae within the pools. Although no relationships were found between maximum pool depth and survival rate, this high mortality rate speaks to the importance of pools with a longer hydroperiod.

These results suggest that not all vernal pools are equally ideal for amphibian reproduction and that habitat contributes to making an attractive breeding pool. From our data, the presence of large, deep ephemeral wetlands seems to be important to both *L. sylvaticus* and *A. maculatum* reproduction success. Areas for further research to better understand amphibian reproductive dynamics include studies regarding spatial relationships among vernal pools, microcosm experiments to limit variables, and repeating this experiment to include more pools in survival rate analysis.