

1. **AN ANALYSIS OF METEOROLOGICAL DROUGHT TRENDS IN NORTHERN KENYA**

Ahmed, A, Kroll, CN. Departments of Environmental Science and Environmental Resources and Forest Engineering, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Droughts in Northern Kenya have devastating and lasting effect. For example, the 1991/92 drought in the arid districts of Kenya led to livestock losses of up to 70%, and unprecedented high rates of child malnutrition. During this drought, 1.5 million people in 17 arid and semi-arid districts of 4 provinces received relief food assistance. There has also been the impression that drought magnitude, frequency, and severity is increasing in this region, though there have been few studies to support or contradict this assertion. Using 38 years of precipitation records at 9 stations in Northern Kenya, an analysis of trends in meteorologic drought is undertaken. Various precipitation series representing the magnitude, frequency, and severity of meteorologic drought were develop, and a non-parametric regional Mann-Kendall trend test was applied to these series. Due to the cross-correlation of these data series, critical values of the Mann-Kendall trend test were obtained via a bootstrap resampling procedure. Results indicate no significant trends in any of the precipitation series examined, indicating the worsening drought conditions are either unfounded or due to other drought causing mechanisms such as increased water use or increased evapotranspiration in the region.

2. **GREEN DESIGN: SUSTAINABLY POWERED MODERN LIVING, POMPEY, NY**

Altieri MD, Collins EW, Gleason CJ, Magloire M, Daley, DJ. Department of Environmental Resources and Forest Engineering, State University of New York College of Environmental Science and Forestry. 1 Forestry Drive, Syracuse, New York, 13210

This project focuses on the design and evaluation of renewable energy resources to meet the residential energy requirements of a household in Pompey, NY. The homeowner has expressed that their new home should be built to be “green.” We are focusing on renewable energy to satisfy part of this green objective because it affords a constant standard of living and is considered sustainable based on emissions and fuel source. We assess existing technologies that utilize solar and wind resources for onsite power generation, and compare them to buying power from a renewable source through a grid connection. We created an economic decision analysis model to determine the annual worth of the alternative solutions. This analysis, combined with a sensitivity analysis of various inputs into the economic model, provide an economic basis for choosing renewable energy systems. Other decision criteria include site compatibility, fuel source availability, and aesthetic appeal and standard of living as defined by the clients. Once these analyses have been performed, an integrated system will be presented to the clients.

3. INVESTIGATION OF RECENT AQUEOUS CHANNEL FLOW ON MARS USING HIGH RESOLUTION IMAGERY

Altieri MD, Barres FD, Song PM, Turk NJ, Wachob LA, and Hassett, JM. Department of Environmental Resources and Forest Engineering, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

High resolution imagery (1 m per pixel) from Mars suggests recent (<20 million years ago) episodes of water flow. We used 2008 HRISE (High Resolution Imagery Science Experiment) data to derive a digital elevation model for a small (~240 m long) gully in the Hellas Montanes region (96°E, 38°S) of Mars. We derived channel widths of 13 to 44 m and channel slope as approximately 0.22. We assumed a depth of flow at the most downstream section and calculated depths, flows and velocities for each of 16 upstream sections. Volumetric flow-rate ranged from 174 m³/s (downstream) to 94 m³/s (most upstream section), with a minimum velocity of 8.8 m/s calculated at the uppermost cross-section. The minimum velocity was determined to be sufficient for the transport of sediment based on a particle sizes derived from other data sources. We show that the gully we studied could be the result of recent aqueous discharge and thus support the idea of recent surface water flows on Mars.

4. RURAL GREEN HOME SYSTEMS

Barres FD, Geartz TM, Gutliph ME, Vooris DA, Daley DJ. Department of Environmental Resources and Forest Engineering, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Based on the rising costs of power and the increase of availability of solar or wind power, homeowners today are looking for alternative ways to power their home but also maintain their current life style. The systems that were included in this study include an electrical system powered by either solar or wind, a solar hot water heater, a geothermal heating and cooling system, and a grey water treatment system. Our design is based on a four family home using national averages for power consumption. We have been able to design a power generation system based on a combined wind and solar power system which will feed the home the necessary power, with any over flow being sold back to the grid. In an effort to reduce the power load on the solar and wind power system we are designing a system that will also utilize a solar hot water heater and utilize geothermal technologies to heat and cool the home. We are also analyzing a grey water treatment system to generate clean water that can be reused in an irrigation system, which will reduce water waste and reduce the waste of power to pump water for irrigation.

5. **CUTICULAR HYDROCARBONS AS MATE-RECOGNITION IN THE ASIAN LONGHORN BEETLE (*Anoplophora glabripennis*)**

Blank CE. Department of Environmental Science. College of Environmental Science and Forestry, Syracuse, NY 13210

The Asian Longhorn Beetle (ALB), *Anoplophora glabripennis*, is a concern for deciduous hardwood management. Native to Asia, the beetle was first discovered in the US in 1996. It is now classified as an invasive pest, and despite numerous successful eradication programs, still poses a threat to hardwood species. Mate-recognition in *A. glabripennis* is facilitated by cuticular hydrocarbons used as contact pheromones. Previous research has indicated differences in the composition of these hydrocarbons among the beetles, varying by gender, mating status and age. The purpose of this study was to investigate male ALB responses to these hydrocarbons in bioassays. Full-body extracts were applied to a variety of objects; glass rods, ceramic ALB models, and freezer-killed beetles. The extracts were stripped from beetles via the aliquot method, reduced to a few microliters, and applied with micro-pipettes. The extracts applied were from Newly Eclosed Males, Newly Eclosed Females, Young Virgin Females, Young Virgin Males, Old Virgin Females, Old Mated Females, and Old Mated Males, with blank controls run as parallel assays. Bioassays were conducted in Petri dishes, in a laboratory setting. Time to copulation, and sequential mating steps were also observed and recorded. Results indicate a strong male response to the pheromones of Young Virgin Females, with weaker responses to Newly Eclosed Beetles, and much weaker responses to males (other than Newly Eclosed). Comparisons to the glass rods and ceramic models also indicate an important visual component. The results of this experiment may be useful in protecting North-American hardwood species from future infestations.

6. **TRANSDISCIPLINARY APPROACHES TO UNDERSTAND AND MANAGE SPREADING IMPERVIOUS SURFACE AREAS, PART II: MODELING THE IMPACTS ON STREAMFLOW AND WATER QUALITY**

Hong B¹, Hyde K¹, Hall MH¹, Limburg KE¹, Groffman PM², Kelly V², Luo LL¹, Mountrakis G¹ ¹SUNY College of Environmental Science and Forestry, Syracuse, NY
²Cary Institute of Ecosystem Studies, Millbrook, NY

We present the second part of our integrated assessment linking county-level economic activities, spread of impervious surface, and changes in hydrology and water quality. A hydrology and nutrient loading model (ReNuMa) was applied to subcatchments of the Onondaga and Wappinger Creek watersheds to understand how the spread of impervious surface area affects streamflow and nitrogen export. Adding impervious areas to the model introduced "spikiness" (relatively rapid rise and fall of flow levels in response to precipitation events) to the simulated daily streamflow. Calibration analysis suggested that the observed spikiness would be best represented when the impervious cells of the impervious surface grid map were assumed to have 20% of the actual impervious area fraction (alternative estimation based on the Bayesian analysis resulted in 35% impervious fraction with the standard deviation of 23%). Comparing the local weather data (from ESF's Willow Project station in Tully) to the regional data (from the Hancock Airport weather station), the temperature data were in close agreement, whereas the precipitation data showed considerable discrepancy. The streamflow simulation improved in some years by running the model with the local precipitation data instead of the regional data. Using the precipitation data and the map of topographic index (also called wetness index), the model created a probability map of soil saturation, locating areas of high runoff risk.

7. **THE EVALUATION OF THE BIOCOMPATIBILITY OF MESOPOROUS SILICA NANOPARTICLES FOR USE IN THE TREATMENT OF RHEUMATOID ARTHRITIS**

Boucher AM,¹ Bader RA². Department of Chemistry¹, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210, Department of Bioengineering², Syracuse University, Syracuse, NY 13244

Mesoporous silica nanoparticles are small, solid honeycomb like materials, which are currently being investigated by researchers as drug delivery systems to transport drugs to various targeted sites. One unique characteristic that makes them suitable for drug delivery is the potential for attachment of various functional groups to the surface. This gives them the ability to have molecular markers and drugs attached on to their surfaces to aid in their carrying capacity and ability to locate to specific tissues. In addition, therapeutic molecules can be entrapped within their porous structure. In order to understand if they will function as effective drug delivery vehicles in the treatment of rheumatoid arthritis, we have evaluated the biocompatibility of non-functionalized and functionalized sterilized and non-sterilized mesoporous silica MCM-41 nanoparticles with human monocytic U937 cells and rheumatoid arthritis synovial fibroblast. Using the standard elution and direct contact tests with these cells, our results showed that a small percentage of cell death was obtained from the sterile non-functionalized MCM-41 particles and that the amine-functionalized particles are more biocompatible than the thiol functionalized particles under both sterile and non-sterile conditions. As the cell death percentage for the amine functionalized particles was relatively low in comparison to that of the cells apoptosis ability, we have concluded that amine functionalized MCM-41 are biocompatible with the cells of rheumatic joints. These results give insight into the effectiveness of mesoporous silican nanoparticles as drug delivery systems for the treatment of rheumatoid arthritis.

8. **BUTTRESSING OF TREES ACTING AS MICROSITES IN CYPRESS-TUPELO SWAMPS**

Brincka MP. Department of Forest and Natural Resource Management, State of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Cypress-Tupelo swamps are classified as a deep-water forested wetland, in which the land is characterized as saturated, with a frequent inundation of water, 30cm (12in) deep. Buttressing, or the enlargement of tree bases, of water exposed trunks is a common adaptation of bald cypress (*Taxodium distichum*) and water tupelo (*Nyssa aquatic*); the main canopy cover of cypress-tupelo swamps. This buttressing acts as a microsite and provides a habitat for a variety of species that would otherwise not survive in the extreme conditions associated with deep water swamps. These buttresses not only create an unsaturated medium directly on the tree itself, but it alters hydrologic flow and increases sediment deposition at the base of the tree, increasing ground elevation. With this increased ground elevation, seeds of cypress, tupelo and other trees are allowed to sprout during periods of drought; in comparison to the rest of the swamp being covered in water, void of growth.

9. PLANT COMMUNITY AND MICROCLIMATE CHANGES ACROSS FOREST EDGES CREATED BY CLEAR-CUTTING

Brown J, and Dovčiak M. Department of Environmental and Forest Biology, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Forest management creates landscape mosaics of forest patches differing in time-since-harvest and successional age. Microclimate and plant communities exhibit gradients across the anthropogenic edges between mature forests and adjacent clear-cut patches, but little is known about the temporal variability of edge effects. We quantified edge effects across edges differing in age (5 vs. 15 years old), that were created by patch clear-cutting in a maple-beech-birch forest in the Adirondack Mountains, NY. We sampled microclimate and plant community characteristics across four edges (2 per age) along twelve 60 m long transects (3 per edge). At increasing distances from each edge (0, 5, 10, 20, 30 m; within forest or clear-cut), we measured hourly air temperature during the peak weeks of the growing season and cover of ground-layer plants on three 1 × 1 m plots. Microclimate and plant cover exhibited steep gradients across the 5 year old edges, but did not change across 15 year old edges. Species richness showed no gradient across either edge type, but was highest in 5 year old clear-cuts, intermediate in mature forest, and lowest in 15 year old clear-cuts. Mature forest adjacent to 5 year old clear-cuts was more species rich than mature forest adjacent to 15 year old clear-cuts. Thus, edge-related gradients in microclimate and plant cover appear to be transient and obscured by forest regrowth within clear-cuts 15 years after timber harvest. In spite of this, species richness remains affected by time since harvest and the successional age of adjacent stands.

10. HISTORICAL AIR QUALITY IN NEW YORK STATE

Buckley SM, Mitchell MJ. Department of Environmental and Forest Biology, College of Environmental Science and Forestry, Syracuse, NY 13210

Air quality levels vary over areas due to meteorological factors, proximity to sources, and local conditions (i.e. geography). The Northeast U.S. is subjected to a double dose of pollution inputs from local sources and those from the Midwest that are transported by prevailing meteorological patterns. With the passage of the Clean Air Act in 1970, and the establishment of the National Ambient Air Quality Standards (NAAQS), national levels of air pollutants have declined significantly. This study compared air quality trends between five of the six largest cities within New York State (NYS; Albany, Buffalo, Manhattan, Rochester and Syracuse) and statewide averages to national trends. Data were received from the NYS Department of Environmental Conservation (DEC) Bureau of Air Quality Surveillance on the six criteria pollutants: carbon monoxide (CO), sulfur dioxide (SO₂), nitrogen dioxide (NO₂), ozone (O₃), lead, and particulate matter (PM) based on NAAQS sample averaging times. Statewide averages show a reduction of aggregate pollution levels by ~50% from 1980 to 2007. CO, SO₂ and Lead showed the greatest improvement, averaging statewide reductions in concentration of 76%, 78%, and 86% respectively. O₃ and PM showed smaller reductions of 6% and 14.5% respectively, while on average across the state, NO₂ concentrations increased 18%. Generally, Upstate cities experienced a greater decrease in pollution concentration than downstate, with Buffalo, Rochester, and Albany showing air quality improvements larger than the state and national averages (reduction in concentration by 62%, 53%, and 51% respectively).

11. THREE STEPS TO SUCCESS: FROM STUDENTS TO SCIENTISTS

Buckley S, Bowman K, Cray L, Graves M, Landis C, Patterson N, Rivera Y, Stewart A, Werner N, Leopold DJ, Beal R, Spuches C, Raynal DJ, Majanen T. SUNY-College of Environmental Science and Forestry, Syracuse, NY 13210

SUNY College of Environmental Science and Forestry project goals (ESF) are to enhance high school student science learning and engagement and teacher and graduate student professional development. This project builds upon a well-established school-college partnership program, *ESF in the High School*. Through this dual enrollment program, high school students across New York receive college credit for *The Global Environment*, an ESF course that engages students in the scientific process while addressing a range of environmental and social issues. Our project enriches this program by partnering nine graduate Fellows, who form the Science Corps, with high school teachers at “home” schools in urban, rural and indigenous communities throughout central New York. At “home” schools Fellows serve as scientists in residence, facilitating learning experiences and, in return, learn to better communicate their own research. Fellows use their graduate research experience to mentor students as they develop independent research projects. High school students present their projects at the *Environmental Summit*, a science symposium held on the ESF campus and attended by high school students, teachers, graduate students and faculty. In addition, Fellows visit other participating high schools and lead inquiry- and research-based activities called “road shows.” In school year 2008-2009, Fellows mentored 146 high school student researchers, and engaged over 420 students through 38 “road show” presentations. Ultimately, SUNY-ESF’s GK12 project enables students to be scientifically literate, well-informed young adults who possess the skills required to meet society’s immediate and future challenges.

12. GREEN BUILDING DESIGN FOR EMERALD ESTATES

Calandra L, Rose L, Nodine D, Schuyler C. Department of Environmental Resources and Forest Engineering, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

With increasing admissions at Syracuse University and SUNY ESF, additional housing is imperative. The Emerald Estates Green Building Design for SUNY-ESF is located on Oakland Street in Syracuse, NY. The building is designed to house 300 students in a combination of two- and six-person split dorm rooms. The residence hall will occupy a space of 36,666.7 square feet plus the parking area on the designated lot, which is within the allotted 110,000 square feet of the site land area. The client requires this residence hall to use no greater than 600,000 kWh over the course of a nine-month-long academic year over a design-life of 25 years. Emerald Estates has a target energy consumption of 2000 kWh per capita-year. This is to be accomplished by employing sustainable technologies such as solar power systems, rainwater recirculation, and radiant heat flooring. We are incorporating Leadership in Energy and Environmental Design (LEED) practices into the design aspects building characteristics such as windows, insulation materials, and lighting. . Though most LEED certified buildings have an estimated increase in total cost of between 5-15%, a cost-benefit ratio analysis will be completed to choose the most cost-effective and energy-efficient option in the researched areas.

13. PREPARATION AND CHARACTERIZATION OF CELLULOSE NANOCRYSTALS FROM *ACER SACCHARUM*

Cheng K, Winter WT. Department of Chemistry, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Cellulose nanocrystals (CNC) was considered to be the next big Nano-thing. We prepared CNC from a hardwood species, *Acer saccharum* (Sugar maple), wood chips and pulps produced by three different pulping processes, using acid hydrolysis method. ^{13}C CP/MAS solid-state nuclear magnetic resonance (NMR) analysis was employed to track the change of morphology of cellulose during the whole process. Principal component analysis (PCA) was applied to estimate the composition of cellulose polymorphs, which detected the existence of cellulose I_β , cellulose II. This means that the method used for cellulose isolation from sugar maple wood chips results in recrystallization of cellulose crystal domain. CNC from sugar maple wood chips have characteristics very similar to regenerated cellulose (cellulose II). X-ray diffraction was used to support the result from solid state NMR analysis. The transmission electron microscope (TEM) images of cellulose nanocrystals showed that the size of cellulose nanocrystals depends on the sources, which also indicated the reactivity difference of the sources. In addition, the thermal properties of the products were characterized by thermogravimetric analysis (TGA).

14. THE INFLUENCE OF CARBOXYMETHYLATION CONDITIONS ON THE SEPARATION OF WOOD POLYMERS

Chien SN, Lai Y., Department of Paper and Bioprocess Engineering, 425 Walters Hall, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210.

The carboxymethyl cellulose (CMC) polymer is widely used as an additive in many industrial applications ranging from food, to pharmaceutical, paper products, and oil drilling fluids. This water-soluble polymer is generally synthesized from a pure cellulose substrate. This study has pursued a concept to separate wood substrates in situ by carboxymethylation (CM) into the CMC and the carboxymethyl derivatives of hemicelluloses and lignin for practical utilization. This hypothesis is based on the distinct variation of wood polymers in chemical and physical structures. A typical CM of wood meal sample was conducted in 2-propanol in the presence of monochloroacetic acid (MCA) and alkalis at 50°C for 4h, which resulted in the formation of water-soluble materials (30-45%). The yield of this water-soluble fraction from aspen was significantly higher than that of spruce wood. These soluble materials were derived mainly from the polysaccharide components and contained less than 10% of lignin. The bulk of wood lignin remained in the water-insoluble fraction, which also contained significant amounts of the polysaccharide components. The overall CM process was shown being considerably affected by the reaction conditions especially the type of solvent used and the charges of the alkalis and MCA reagents. A further improved CM process is needed for a clean separation of the wood polymers.

15. DEVELOPING A BASELINE: A BIODIVERSITY AND CULTURAL ASSESSMENT OF HONDURAN CLOUD FOREST FUNGI

Conrad AO, Horton TR. Department of Environmental and Forest Biology, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

The goal of this study was to establish a biodiversity baseline of fungi in the cloud forest of Cusuco National Park, Honduras, and to determine if edible fungi are present that are suitable for low impact secondary forest products for the local economy. Fruiting bodies were collected and morphologically identified in late June 2008 on various trails around the Base Camp run by Operation Wallacea, near the village of Buenos Aires. The forest is dominated by *Pinus oocarpa* Schiede ex Schtdl. and *Liquidambar styraciflua* L. in one of the southern most native pine stands in the world. Dried specimens were returned to Syracuse, NY where they were identified using molecular techniques (DNA extraction, PCR, RFLP, direct sequencing of the nrDNA ITS region). Of the 31 specimens collected, 26 were identified with BLAST searches of the ITS sequences in GenBank (25 to species). Three of the 31 species are known to be edible (*Boletus edulis* group or porcini and *Auricularia* or tree ears). Discussions with local residents with picture keys as a guide suggest the women are harvesting *Pleurotus* sp. or oyster mushrooms and *Cantherellus* sp. or chanterelles (local name = *choras*) for the kitchen. Porcini will be explored as a possible cash crop for sustainable economic development. The data collected will serve as a baseline for future studies on fungal biodiversity in Honduras, part of a larger biodiversity assessment by Operation Wallacea and as a source of information for future development of a sustainable edible fungi industry.

16. THE EFFECT OF SOIL pH ON THE DISTRIBUTION OF THREE SALAMANDER SPECIES AT HUNTINGTON WILDLIFE FOREST IN THE ADIRONDACKS

Davies, AT. Department of Environmental and Forest Biology, State of New York, College of Environmental Science and Forestry.

Salamanders play an important role in the ecosystem. They as regulators of the nutrient cycle in the forest Disturbances to salamander populations could have effects on the ecosystems they inhabit. Salamanders are sensitive to moisture and pH levels because they have to rely on external factors to balance their internal body chemistry. The goal for this study is to find out how pH effects salamander population distribution, and health in the Adirondacks. To do this the objective is to compare salamander abundance with pH readings from different sites at Huntington Wildlife forest. This study will look at *Plethodon cinereus*, *Desmognathus ocrophaeus*, and *Desmognathus fuscus*. All of the regressions show that there is no significant relationship between soil pH and salamander population density, weight or length on upland and lowland streamside sites. There was also no correlation found between soil pH and salamander weight or length in any of the regressions carried out for both upland and lowland streamside sites. Soil pH would appear to have little or no effect on *Plethodon cinereus*, *Desmognathus ocrophaeus*, and *Desmognathus fuscus* abundance weight, and length. This is most likely due to the wide variation of soil pH as well as salamander adaptation to soil pH. In addition to this error and salamander pH played a role in the results. More study looking into how soil pH effects salamanders need to be carried out.

17. MOLECULAR ANALYSIS OF GENES RELATED TO ARSENIC UPTAKE AND DETOXIFICATION IN SENSITIVE AND TOLERANT VARIETIES OF SHRUB WILLOW (*SALIX* SPP.)

DeLeon AM, Pulley EP, Smart LB. Department of Environmental and Forest Biology, State University of New York, College of Environmental Science and Forestry, Illick Hall, Syracuse, NY 13210.

As a fast-growing perennial, shrub willow (*Salix* spp.) is a strong candidate for the remediation of arsenic-contaminated soils in temperate climates. Arsenate (AsO_4^{3-}) is physiologically similar to phosphate (PO_4^{3-}) and is thought to enter cells via high-affinity phosphate transporters (encoded by *PHT1* genes). Arsenic detoxification may be mediated by phytochelatin, whose glutathione precursors are synthesized by γ -glutamylcysteine synthetase (encoded by γ -*ECS*). Upon exposure to 250 μM AsO_4^{3-} , an As-sensitive clone (*Salix eriocephala*; clone ID 00X-026-082) and an As-tolerant clone (*S. viminalis* x *S. miyabeana*; clone ID 99202-011) wilt within 24 h and 6 d, respectively. The goal of this study was to determine whether As tolerance is related to the expression of *PHT1*;4/7 and/or γ -*ECS*. Both clones were treated with +P/-As, -P/-As, +P/+As, and -P/+As solutions for 48 h (following 3-weeks of growth from cuttings in either +P or -P hydroponic culture). Mean transpiration rates were highest for the +P/-As plants, followed by the -P/-As, +P/+As, and -P/+As plants, respectively. This trend suggests that the effects of AsO_4^{3-} are more dramatic in the absence of PO_4^{3-} . Root samples were harvested at 0, 4, 12, and 48 h, and RNA was isolated via a hot borate method. Semi-quantitative RT-PCR indicated that 99202-011 *PHT1*;4/7 expression did not vary by treatment. γ -*ECS* expression appeared to be upregulated in the 4 h and 12 h -P/+As treatments, suggesting that this gene may play a role in 99202-011 As tolerance.

18. FACTORS AFFECTING DISTRIBUTION AND ABUNDANCE OF SOLITARY BEES AND WASPS IN CENTRAL NEW YORK

Dillon AM¹, Hager B² ¹Department of Environmental Forest Biology State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210 ²Division of Environmental Biology, Cazenovia College, Cazenovia NY 13035

Bees and wasps occupy an irreplaceable role in the environment by pollinating 75% of the world's angiosperms. However, habitat loss and fragmentation continue to threaten the world's pollinators. This study sought to assess biodiversity of native hymenoptera belonging to the subgroup Apoidea in three habitats with the ultimate goal of identifying a particular habitat type that, if fostered, would encourage high native bee and wasp abundance and richness. Habitats sampled included vegetation areas surrounding ponds, old fields consisting mainly of grasses and herbs, and right-of-ways. Three types of sampling methods were used to determine local biodiversity, trap-nests, pan traps and sweep-netting. Trap-nests, left out for the duration of the study, allowed determination of what species were nesting in the different habitats while pan-trapping and sweep-netting revealed which species were foraging in the area. In addition to collection of bee and wasp specimens, vegetative sampling was conducted to quantify flowering plant density and diversity between sites. Preliminary results suggest a significant difference between habitats in terms of bee and wasp abundance as well as in flowering diversity and abundance. Analyses, however, do not indicate that flower diversity or abundance had a significant effect on bee and wasp abundance and richness so it apparently is not the factor driving differences in Apoid distributions. Further research into additional factors affecting native bee and wasp distribution and abundance, will be conducted in the future, e.g., annual to perennial flower ratio, available nesting sites.

19. **POT TYPE AND ITS EFFECTS ON AMERICAN CHESTNUT (*CASTANEA DENTATA*) SEEDLING GROWTH IN A GROWTH CHAMBER COMPARED TO A GREENHOUSE**

Dudley TB, McGuigan LD, and Maynard CA. Department of Forest and Natural Resource Management, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

The growth of American chestnut from tissue culture can be correlated to the growth of a seedling, and the factors that effect one will effect the other similarly. Seedlings grown in growth chambers both with and without supplemental CO₂ were compared to seedlings grown in a greenhouse. They were also grown in pots of different sizes and shapes. CO₂ was added to the growth chamber to maintain a concentration of 1200 PPM compared to the ambient concentration of CO₂, which is about 450 PPM. There was no significant difference in the growth of seedlings in the growth chamber treated with supplemental CO₂ compared with growth in air, but the growth chamber plants were significantly different from those grown in the greenhouse. The seedlings grown in the greenhouse were smaller as measured by dry weights of the roots, leaves, and stem. There was no significant difference in growth based on different pot types, other than seedlings not germinating in some because there was no room. The growth chambers are a very effective way to grow American chestnuts from seed, as well as from shoots rooted in tissue culture. For those tested, the pot size is not important for initial seedling or plantlet growth, but does impact space and soil requirements and may effect field survival.

20. **OPTIMAL SAMPLING FOR *SIREX NOCTILIO* (HYMENOPTERA: SIRICIDAE) AND ITS HYMENOPTERAN PARASITIDS**

Eager PT, Allen DC, Fierke MK. Department of Environmental and Forest Biology, 106 Illick Hall, State University of New York College of Environmental Science and Forestry, Syracuse, NY 13210.

Sirex noctilio, an invasive wood-boring wasp native to Europe and Asia was detected in Fulton, New York in 2004, and has since spread throughout the state. In its native range *S. noctilio* is considered a minor pest, but in areas of introduction it has caused significant economic damage to pine plantations. A suite of parasitic wasps native to North America have been used successfully as biocontrol agents in other areas of *S. noctilio* introduction, but affects of these parasitoids here in the United States are relatively unknown. Sampling forests for *S. noctilio* and its parasitoids is an intensive process involving felling, transporting and monitoring entire trees for adult emergence. Our goal was to determine if certain sections of infested trees could be used to estimate within-tree densities of *S. noctilio* and its parasitoids. Eighteen pines were felled, cut into half-meter bolts and dissected to determine within-tree distributions. Regression was used to determine which combinations of 2, 3, 4, and 5 bolts were the best predictors of within-tree species densities. For all species, three bolts were selected as the optimal number of bolts necessary to extrapolate to whole-tree values. Use of this optimal sampling method will drastically reduce the amount of tree material needed for determinations of species densities and will allow for more extensive sampling efforts which are currently hampered by time and space constraints.

21. **A NEW GREAT LAKES VIRUS (VHSV) IN ST. LAWRENCE RIVER SPORTFISH:
MONITORING LESSONS AND LINKAGES TO AN INVASIVE SPECIES**

Eckerlin GE¹, Farrell JM¹, Casey RN², Hope KM², Bowser PR², Casey J² and Groocock GH². 1.Department of Environmental and Forest Biology, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210 2.Aquatic Animal Health Program, Department of Microbiology and Immunology, College of Veterinary Medicine, Cornell University, Ithaca, NY 14853-6401

We assessed the recently introduced Great Lakes viral hemorrhagic septicemia virus (VHSV genotype IVb) among smallmouth bass (*Micropterus dolomieu*) in the St. Lawrence River using a quantitative reverse transcription polymerase chain reaction (qRT-PCR). We characterized the distribution and prevalence of this virus through an annual cycle. Because we hypothesized life history changes dictating behavioral shifts would affect variable viral exposures, we also described viral load across demographic groups (sex and maturity). Strong temporal variation in viral prevalence was evident through the annual cycle, with peaks corresponding to the smallmouth bass spawning period and a water temperature range of 10-14°C. Viral prevalence was markedly higher among subadult fish. We described the observed correlation of round goby (*Apollonia melanostomus*) density and VHSV prevalence in associated smallmouth bass, taken as evidence of the invasive species' potentially high reservoir competence and potential role as a reservoir host for VHSV. Further investigation of the role of round goby as a reservoir host for VHSV is planned because reservoir control can be an effective means of disease management. Given the strong temporal trend in VHSV prevalence, we recommend monitoring resources be focused on spring spawning periods, when water temperatures are within the aforementioned range and when fish are experiencing contemporary immunosuppression from long periods of exposure to cold temperatures (winter) compounded by the physiological expenses of spawning which also reduce immune competence.

22. CHANGES IN HYDRAULIC GRADIENT, HYPORHEIC EXCHANGE, AND PATTERNS OF NUTRIENT CONCENTRATION BETWEEN DRY AND WET SEASON FLOWS FOR A TROPICAL MOUNTAIN STREAM

Fabian MW¹, Endreny TA¹, Lautz LK², Siegel DI². ¹Department of Environmental Resources and Forest Engineering, 402 Baker Labs, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210; ²Department of Earth Sciences, 204 Heroy Geology Lab, Syracuse University, Syracuse, NY 13244

Mountain streams are a common source in Central America for community water supplies (CWS). During the dry season, the CWS could potentially impact hydraulic gradients, hyporheic exchange flow, terrestrial-aquatic linkages, and nutrient dynamics. In this study, a mountain stream in Buena Vista, Honduras was instrumented and manipulated to measure impacts of a CWS. Piezometric head and stream water levels were taken at 7 cross-sections along 30 m of step-pool stream, and water quality samples were retrieved from 48 pairs of riparian and stream piezometers and wells. We computed vertical hydraulic gradients, zones of hyporheic flux, nutrient patterns, and their change with streamflow. Streamflow ranged from 30 L/s in the wet-season to 2 L/s in the dry-season, and was dewatered to about 1 L/s. A HEC-RAS water-surface profile model was calibrated to observed stages to establish gradients along the entire reach, and water levels were inputted into a MODFLOW groundwater model to examine patterns of hyporheic exchange. Changes in hydraulic gradients and fluxes are compared with baseline conditions during dry season without dewatering. Noticeable changes in hydraulic gradient occurred between high and low flows, but changes in low flow to dewatered flow were negligible. Lengths and location of hyporheic upwelling and downwelling zones shifted slightly with changes in flow, but again dewatering had a minor impact. Concentrations of nitrate, sulfate, chloride, fluoride and dissolved oxygen were detected in the hyporheic zone, stream water, and adjacent ground water, and we are exploring mixing models to detect patterns in nutrient distribution and movement.

23. **TRIGLOCHIN MARITIMA FACILITATED MICROTOPOGRAPHY IN NEW ENGLAND TIDAL SALT MARSHES**

Farrell ML Department of Environmental and Forest Biology, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210.

Mesoscale topographic variability, including stream channels, elevated banks, and depressional interior marshes, are known to be dominant spatial features in tidal salt marshes. These features, driven by predictable tidal fluctuations, result in distinct zones of vegetation commonly referred to as upper, middle, and lower marsh vegetation zones. Excluding the upper zone, tidal marshes are considered hydrologically open due to daily influxes of oxygenated water. However, tide waters do not frequently reach interior portions of the marsh and therefore these regions exhibit far lower redox potentials and higher concentrations of reduced substances such as ammonium and hydrogen sulfide. These conditions increase the stress placed on plant species and in response, resident species, such as *Triglochin maritima* engineer hummock-hollow microtopography. A study regarding microtopography in salt marshes by Fogel *et al.* [1] suggests strategic habitat modifications, such as hummock formation facilitated by *Triglochin maritima*, results in positive species interactions that are inherently linked to the structure, organization and diversity of plant communities in physically harsh environments. Multiple studies have also addressed the importance of spatial and temporal heterogeneity within an ecosystem in the maintenance of community structure and function. Therefore, understanding the role of habitat heterogeneity as facilitated by ecosystem engineers such as *Triglochin maritima* is essential for effective conservation and management of salt marsh communities.

[1] Fogel, B.N., Crain, C.M., and Bertness, M.D. 2004. Community level engineering *Triglochin maritima* (seaside arrowgrass) in a salt marsh in northern New England, USA. *Journal of Ecology* 92:589-597.

24. **NUTRIENT RECOVERY THROUGH ECOLOGICAL TREATMENT OF ANAEROBIC DIGESTER EFFLUENT**

Forstner AA, Hill LT, Huchzermeier MP, Lin H, Volpi HM, Daley DJ, Diemont SAW. Department of Environmental Resources and Forest Engineering, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Energy can be extracted from biogas produced through anaerobic digestion of food waste. Anaerobically digested solids are considered 'stabilized' and can be used as compost. Liquid digester effluent contains high nutrient loads (N, P), biochemical oxygen demand (BOD) and total suspended solids (TSS). Our goal is to design an ecological treatment system (ETS) that will remove BOD and TSS, while maintaining adequate nutrient (N, P) loads to grow algae in a photo-bioreactor. The ETS will include a vermifilter and an aerobic reactor. The vermifilter will remove suspended solids using conventional sand filtration process; the accumulated solids will be converted by vermiculture (earthworm) processes to high-nutrient fertilizer. A vegetated aerobic reactor will remove BOD. The treated effluent will be used as a high-nutrient liquid fertilizer for algae production. The designed ETS will simultaneously produce value added products: high-nutrient fertilizer can be harvested from the vermifilter; vegetables and/or other value-added plants can be harvested from the vegetated aerobic reactor. Following algae production, effluent from the photo-bioreactor can safely be discharged directly to the environment. Our ETS design promotes increased energy recovery from food waste while improving water quality.

25. CHARACTERIZING THE EFFECT OF WASTEWATER BIOSOLIDS ON PERCOLATION RATES

Frazell AT¹, Osypian ML¹, Daley DJ¹, Kiernan DH². ¹Department of Environmental Resources and Forest Engineering; ²Department of Forest and Natural Resources Management, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Organic soil amendments are used to improve moisture retention and provide nutrients for plants. As percolation from the root zone can be affected by compaction, porosity, organic content and texture, as well as root uptake, we examined the effect of adding biosolids to a soil-like waste on percolation rate. A project at the Solvay wastebeds in Camillus, NY is investigating changes in the water budget that result from modifying Solvay process waste with wastewater biosolids at different rates and then planting the waste with several varieties of willow. The four 2.5-acre soil treatments included mixing Solvay waste with a yard waste/biosolids blend from either the Anheuser-Busch® or Onondaga County wastewater treatment plants. Five pan lysimeters were used to measure the flux of water in each of four soil treatments from July to December 2008. No significant difference ($\alpha < 0.05$) was found amongst treatments, while mean flux rates varied from 0.00 mm/day to 6.61 mm/day. As vegetation biomass was sparse during this first growing season (i.e., low transpiration rates), percolation is most likely determined by soil characteristics and climate factors, including precipitation, solar radiation, wind speed, soil moisture, and soil and air temperature.

26. THE USE OF CLICK CHEMISTRY IN THE SYNTHESIS OF NEW SILVER ACETATE COMPLEXES AND THEIR POTENTIAL AS ANTIBACTERIAL AGENTS

Freeman ME, Sgroi DJ, Donaghy KJ. Department of Chemistry, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

It is well established that silver possesses significant antibacterial properties. Research has shown that various silver complexes greatly inhibit the growth of bacteria and that N-heterocyclic carbenes form silver complexes that allow for the slow release of silver ions into an infection site. The synthesis of new N-heterocyclic carbene silver complexes via click chemistry, a green method for forming new substances by joining small units together, offers a promising way to create several new complexes quickly and at low cost. Caffeine and 5-bromo-1-methyl-1H-imidazole were methylated via two separate reactions utilizing methyl iodide and dimethyl sulfate. The methylated products were obtained in much higher yield and purity when synthesized from dimethyl sulfate. The products were characterized via proton NMR (300 MHz). The 4 methyl peaks in the methylated caffeine were observed between 3.4 and 4.3 ppm, while the single proton peak was observed around 9.5 ppm. The two methyl peaks in our other target, the imidazole, were observed at 3.753 ppm and 3.822 ppm. The peak corresponding to the proton attached to the carbocation was seen at 9.184 ppm. The other proton peak was observed at 7.969 ppm. These results and the results from the silver complex synthesis will be discussed.

27. STATUS OF AMERICAN HART'S-TONGUE FERN IN NEW YORK STATE AND CURRENT THREATS TO POPULATIONS

Gawronski-Salerno JA, Leopold MF, Leopold DJ. Department of Environmental and Forest Biology, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

More than 90% of the US population of the federally-listed (Threatened) American hart's-tongue fern (AHTF; *Asplenium scolopendrium* var. *americana*) occurs in 16 populations in Onondaga and Madison counties in New York State. The number of individual AHTF in NYS has been monitored through periodic (generally every five years) censuses since 1916. AHTF abundance has generally increased over time, but a ~52% decrease in individuals was observed in the 2002 census. The objectives of this work were 1) to determine the current status of AHTF populations, and 2) to evaluate current threats to each NY population. We censused 15 populations in summer 2008 and evaluated them for threats from industry, development, and invasive species encroachment. Overall AHTF abundance increased 86% over 2002 levels. Abundance in nine protected NY State Parks populations increased 101%, however a decline of 37% was observed in six populations outside of the Parks. Anthropogenic impacts (pollution, trash, habitat destruction) were evident in unprotected populations but not in NY State Parks populations. All populations, including those in State Parks, were impacted to varying degrees by invasive plants, in particular European swallow-wort (*Cynanchum rossicum*). The spatial extent of AHTF in two NY State Parks populations appeared to have shifted as a result of swallow-wort encroachment. AHTF appears to be highly threatened in all of its populations, despite increased abundance in "protected" areas. We recommend that conservation efforts focus on aggressive control of invasive plants encroachment in all habitats.

28. MEASURING THE PROGRESS AND EFFICACY OF COMMUNITY FORESTRY PROGRAMS IN INDIA

Ghosh C, Germain RH. Department of Forest and Natural Resources Management, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Although India has only 2.5 % of world's geographic area, it holds 16% of the world's population and 19% of the world's livestock. The forest condition has been degrading due to the consequent and ever-increasing demand for fuel-wood, fodder and timber. In order to reverse this trend, the Indian government made a statutory commitment to community-based forest management under the National Forest Policy of 1988. The policy shifted the focus from commercial exploitation to conservation and preservation of forest involving the local communities. Though it has been nearly two decades since the implementation of the 1988 forest policy, there has been a dearth of research on its progress and efficacy. The goal of this study is to create a predictive model to determine what variables contribute to sustainable forest management. We propose to investigate three Forest Divisions from the state of Uttarakhand. From each Division we will select three Ranges randomly. Within each Range, we will randomly select five Communities. We will combine stakeholder interviews with an assessment of forest conditions using external data gathered from the Forest Department of the particular division and supplemental field plots. The expected outcomes include identifying those independent variables contributing to successful community forestry programs, sharing of success stories, highlighting issues of the local communities and developing a generic step by step protocol to improving community forestry programs. These outcomes are targeted to foresters, villagers, traditional leaders, state and federal policy makers.

29. **WHAT IS IN THE FISH YOU EAT? OPTIMIZING AN EXTRACTION PROCEDURE FOR COVALENTLY BOUND MICROCYSTINS IN TISSUE**

Gibson JL¹, Satchwell MF¹, Smith JL², Boyer GL¹ ¹Department of Chemistry, SUNY College of Environmental Science and Forestry, 341 Jahn, Syracuse NY, 13210, ²Woods Hole Oceanographic Institution Coastal Ocean Institute

Microcystins are naturally occurring heptapeptide hepatotoxins that are produced by many cyanobacterial species. These toxins bind to protein phosphatases and have caused both animal and human deaths. The most likely exposure is through drinking water but there is increasing concern about consumption of fish. In tissue, microcystins can be found in both the free form and bound to the protein phosphatase. The free microcystins form reversible hydrogen bonds between the ADDA amino acid of the molecule and its target. The bound structure forms an irreversible covalent bond between the methyl side chain of the methyl-dehydroalanine amino acid and the active site of the protein phosphatase. This bound form is resistant to solvent extraction. To measure this covalently-bound form, we have developed a technique that oxidizes microcystins and converts the ADDA portion of the microcystin molecule to 2-methyl-3-methoxy-4-phenylbutyric acid (MMPB). An internal standard, 4-phenyl-2-methyl-butanoic acid (PMBA), is used to determine extraction efficiency and yield. These two molecules are then measured using liquid chromatography coupled with mass spectrometry. This technique will be used to determine if microcystins can be transferred to higher trophic levels, and to estimate the risk from toxins to consumers eating exposed fish. This information will be used to establish guidelines for human safety.

30. **SPATIAL DYNAMICS AND EFFECTS OF BEECH BARK DISEASE ON AN ADIRONDACK FOREST**

Giencke LM, Dovciak M, Mitchell MJ. Department of Environmental and Forest Biology, State University of New York College of Environmental Science and Forestry, Syracuse, NY 13210

American beech (*Fagus grandifolia*), a major forest tree species in the Northeastern U.S., has been increasingly infected throughout its range by beech bark disease (BBD), which is caused by a non-native insect scale (*Cryptococcus fagisuga*) and fungal pathogens (non-native *Neonectria coccinea* var. *faginata* or native *N. galligena*). Although BBD can considerably affect forest ecosystem structure and function, our understanding of disease spatial dynamics in infected stands and its effects on tree recruitment is rudimentary. We studied spatial patterns of insect scale, canker and tree recruitment using historical stem maps from a ~2 ha plot in a mature northern hardwood forest in the central Adirondacks. Species, diameter at breast height (DBH) and spatial location of all trees (with DBH > 5 cm) in the plot were recorded in 1985 and 2000. Percentage of each beech stem infected by scale and canker was recorded in 2000. We analyzed spatial patterns of infected beech trees and tree recruitment using Ripley's K-function. Almost 80% of small beech trees (DBH < 10 cm) were not infected by canker but about half were already attacked by scale in a spatially patchy fashion. The majority of larger beech trees were attacked by scale and canker; attack severity appeared correlated to distance from a heavily infested stand section. Despite increased mortality, beech abundance increased from 1985 to 2000; dead beech trees were positively associated with live beech recruits (but negatively with uncankered recruits). Thus, BBD can lead to continuous presence of low quality beech stands.

31. ASYMMETRICAL CHANGES IN HYDRAULIC GRADIENT ALONG VALLEY AND RIVER TRANSECTS DURING MEANDER CUTOFF EVOLUTION

Bangshuai H, Endreny TA. Department of Environmental Resources and Forest Engineering, State University of New York, College of Environmental Science and Forestry, Syracuse, NY, 13210

This work is motivated by the uncertainty about the presence and rate of steepening in river and valley hydraulic gradients bounding meander bends during meander cutoff, and how these gradients may affect river restoration designs. Our science question is whether the river and valley hydraulic gradients are equal and unchanging during meander cutoff. Laboratory investigations are underway prior to field experiments and model simulations. The laboratory physical model is a 2.1m x 0.9m EmRiver Process Simulator, running approximately 20-min per simulation, using particulate matter with a specific gravity of 1.6, a flow rate of 45ml/s, an initial river cross-section averaging 24cm², and a range of radius of curvature from 15cm to 18cm. We calculated gradient using river water surface and valley watertable measurements, and their separation along a fixed orientation parallel to the valley slope, not along the thalweg. Measurements were taken with auto level, rod, and tape, and orthoimagery was captured to refine estimates of channel geometry. The ERDAS Leica Photogrammetry Suite processes digital images to generate digital elevation models (DEM) of the system. Initial results have confirmed a steepening of the river hydraulic gradient, from 4% to 5.5% for initial radius of curvature of 15cm, and from 7.7% to 10.9% for curvature of 18cm. The valley watertable gradient has a slight reduction or flattening of about 0.4%. Changes in channel geometry during cutoff include adjustments to cross-sectional area and increasing meander wavelength and sinuosity.

32. A CONCEPTUAL MODEL OF LANDSCAPE-SCALE RESPONSES OF RIPARIAN FOREST ECOSYSTEMS TO BEAVER (*CASTOR CANADENSIS*) PRESENCE IN THE ADRIONDACKS

Harrison AM, Stella JC, McNulty S, Nyland RD. Department of Forest and Natural Resources Management, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210.

The widespread reforestation of the Northeastern United States has been accompanied by a resurgence of beaver (*Castor canadensis*) throughout the region, resulting in massive changes to stream and meadow ecosystems. A dynamic relationship exists between habitat site selection by beavers and the effects beaver occupancy has on landscapes over time. Beaver site selection and occupancy are driven by topography, hydrology and vegetation present in the landscape. In return, these landscape features are altered by beaver presence. In this research, we propose a conceptual model integrating a three-part approach to landscape analysis of beaver impacts: (1) GIS analysis of landscape slopes and associated lengths of beaver occupancy, (2) comparison of occupancy rates and dam site efficiency, a ratio of dam volume and area inundated above impoundment, and (3) forest vegetation analysis from areas with various occupancy rates and lengths. Forest composition and structure surrounding beaver created ecosystems is driven by three variables within the study site at Huntington Wildlife Forest (HWF): (1) temporal variables related to beaver presence, (2) gradients upland from the stream, and (3) disturbance (beaver, fire, and logging). Long term monitoring of beaver presence within HWF (30 years of occupancy data) allows for analysis of current forest structure in relation to various rates and stages of beaver occupancy. We are currently collecting field data to test predictions of this conceptual model. This research will help to better understand effects of beaver occupancy and responses of the landscape, specifically forest structure, to varying levels of beaver impacts.

33. RESURRECTING THE AMERICAN CHESTNUT: THE SEARCH FOR THE RESISTANCE GENE

Harris J, Loranger D, Baier K, and Powell W. Department of Environmental and Forest Biology, SUNY College of Environmental Science and Forestry, 319 Illick Hall, Syracuse, NY 13210

The American chestnut (*Castanea dentata*) was once a dominant member of the forests of the Eastern United States. At the beginning of the 20th century a new pathogen, *Cryphonectria parasitica*, was introduced to the forest ecosystem and wreaked havoc on the chestnut in a short amount of time, eliminating the majority of the population. The Chinese chestnut (*Castanea mollissima*) evolved in the presence of the pathogen and therefore has developed a resistance to it. The goal of the ongoing research is to find the gene(s) that provide the resistance and then to transform the American chestnut with the gene(s), so that it too can grow in the presence of the pathogen. I studied the beta-1,3-glucanase gene. To determine if this gene coded for resistance I designed PCR primers, amplified the gene sequence from Chinese chestnut genomic DNA, designed a probe based on that PCR product, and then performed a hybridization to see if the probe bound to a fragment of the American chestnut DNA. One attempted hybridization did not show any binding of the probe, perhaps because of an error in the film development process. Further attempts to hybridize the Chinese chestnut beta-1,3-glucanase gene fragment with American chestnut genomic DNA may reveal the presence of this gene.

34. A CASE STUDY: MUSKRAT (*ONDATRA ZIBETHICUS*) CONTRIBUTIONS TO FRESHWATER MARSH HETEROGENEITY.

Harrison AM. Department of Forest and Natural Resources Management, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210.

Muskrat occupation in freshwater marshes results in microtopographic variation that allows for increased heterogeneity within the marsh. Muskrats influence microtopography through the creation of lodges within the inundated areas of the marsh for their homes. Once a lodge is abandoned, it begins to settle into the marsh. An elevated mound of emergent vegetation results and it acts as an aerobic terrestrial island within the inundated marsh. Analyses in a Michigan freshwater marsh looked at this small scale variation in topography created by muskrats, which resulted in the following: (1) increased microbial density and decomposition and (2) increase in species richness and biomass of minor marsh species. My project will synthesize the research reported thus far and create a model of how this change to microtopography affects the hydrology, biogeochemistry and community dynamics of freshwater marshes.

35. A COMPONENT-BASED UFORE-D DEVELOPMENT AND SENSITIVITY ANALYSES

Hirabayashi, S, Kroll, CN. Department of Environmental Resources and Forest Engineering, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

The Urban Forest Effects-Deposition model (UFORE-D) was developed with a component-based modeling approach. Functions of the model were separated into components that are responsible for user interface, data input/output, and core model functions. Taking advantage of the component-based approach, three UFORE-D applications are developed: a base application to estimate dry deposition at an hourly time step, and two sensitivity analyses based on Monte Carlo simulations with a Latin hypercube resampling (LHS-MC) and a Morris one-at-a-time (MOAT) sensitivity test. With the base application, dry deposition of CO, NO₂, O₃, PM10, and SO₂ in the city of Baltimore as estimated during 2005. The sensitivity applications were performed to examine UFORE-D model parameter sensitivity. In general, dry deposition rates were most sensitive to temperature, leaf area index (LAI), photosynthetic active radiation (PAR), and wind speed. Temperature had an impact on all constituents, while LAI was most important to NO₂ deposition with a nearly linear effect. PAR and wind speed had effects on dry deposition of all constituents, but the model sensitivity to these parameters were less than for temperature and LAI.

36. TRANSDISCIPLINARY APPROACHES TO UNDERSTAND AND MANAGE SPREADING IMPERVIOUS SURFACE AREAS, PART II: MODELING THE IMPACTS ON STREAMFLOW AND WATER QUALITY

Hong B, Hyde K, Hall MH, Limburg KE, Groffman PM, Kelly V, Luo LL, Mountrakis G

We present the second part of our integrated assessment linking county-level economic activities, spread of impervious surface, and changes in hydrology and water quality. A hydrology and nutrient loading model (ReNuMa) was applied to subcatchments of the Onondaga and Wappinger Creek watersheds to understand how the spread of impervious surface area affects streamflow and nitrogen export. Adding impervious areas to the model introduced "spikiness" (relatively rapid rise and fall of flow levels in response to precipitation events) to the simulated daily streamflow. Calibration analysis suggested that the observed spikiness would be best represented when the impervious cells of the impervious surface grid map were assumed to have 20% of the actual impervious area fraction (alternative estimation based on the Bayesian analysis resulted in 35% impervious fraction with the standard deviation of 23%). Comparing the local weather data (from ESF's Willow Project station in Tully) to the regional data (from the Hancock Airport weather station), the temperature data were in close agreement, whereas the precipitation data showed considerable discrepancy. The streamflow simulation improved in some years by running the model with the local precipitation data instead of the regional data. Using the precipitation data and the map of topographic index (also called wetness index), the model created a probability map of soil saturation, locating areas of high runoff risk.

37. MICROTOPOGRAPHY IN CONSTRUCTED TREATMENT WETLANDS: A SYNTHESIS

Hurteau CA. Graduate Program in Environmental Science, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

The construction of wetlands has become a common practice in the United States for compensation of wetland area and for improvement of water quality. The effectiveness of constructed treatment wetlands in comparison to natural wetlands can vary greatly, and can be driven by several factors including microtopography. Often, created wetlands are flat in comparison to their natural counterparts, lacking the important microscale variations in elevation that both increase surface area, and provide a variety of suitable habitats to promote species diversity in local flora. The increased species diversity may lead to greater ecosystem functionality, and increasing the efficiency of removing nutrients from water. However, this relationship can become confounded if wetland managers actively select for specific species for removal of nutrients, despite relatively low species diversity. It is well documented that some of the most productive systems are dominated by only a few species, and similarly, the productivity of a diverse community is driven by the dominant species, rather than the richness of species. Therefore, to maximize the nutrient uptake of a treatment wetland, the site would best be designed with little variation in topography, to maximize homogeneity of nutrients, and create specific conditions for a selected species that efficiently remove nutrients, such as *Typha*, *Spartina*, *Phragmites*, and *Eichhornia*.

38. TRANSDISCIPLINARY APPROACHES TO UNDERSTAND AND MANAGE SPREADING IMPERVIOUS SURFACE AREAS, PART I: ASSESSING THE CAUSES OF SPRAWL

Hyde K¹, Hall MH¹, Hong B¹, Luo LL¹, Limburg KE¹, Mountrakis G¹, Groffman PM², Myers SJ¹ ¹SUNY College of Environmental Science and Forestry, Syracuse, NY
²Cary Institute of Ecosystem Studies, Millbrook, NY

Abstract: We present the first part of our integrated assessment linking county-level economic activities, spread of impervious surface, and changes in hydrology and water quality. Within the Onondaga Creek watershed (320 km²) in Onondaga County, NY and Wappinger Creek watershed (525 km²) in Dutchess County, NY, the impervious surface areas were increased by 2.4% and 10.5% each year, respectively. Economic analysis suggested that the creation of new impervious surface may have been driven by different economic factors in these watersheds, with the annual housing permits explained as a function of increasing economic growth variables (such as GDP and population) in the Wappinger watershed, and of increasing federal aid and decreasing interest earnings in the Onondaga watershed. Higher rates of impervious surface creation were associated with decreasing elevation, slope, and distance to roads. The distance to roads was the most important variable explaining the spatial pattern of new impervious surface. Using this relationship, we created a suitability map showing the relative likelihood of new impervious surface creation, and linked to our economic analysis to project new impervious areas to 2011 under various economic scenarios.

39. INFLUENCES ON UNDERSTORY PLANT COMMUNITY COMPOSITION IN VERNAL POOLS OF THE NORTHEASTERN UNITED STATES

Jones JB. Department of Environmental and Forest Biology. State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Vernal pools are small, isolated, ephemeral wetlands that fill seasonally, contain water for at least two months, and experience complete drawdown periodically, thereby preventing fish establishment. Because vernal pool plants must all be adapted to regular, extreme hydrologic fluctuations, there is overlap in species composition among northeastern pools. Still, floral diversity among pools is relatively high since each pool differs in morphometry, hydroperiod, biogeochemical conditions, and light availability. The goal of this study was to design a qualitative model to predict which plant life history groups would occur in a given vernal pool based on its unique combination of environmental variables. Research suggests that hydroperiod may be predicted by morphometric characteristics such as pool volume, depth, and perimeter-to-area ratio, as well as interaction with groundwater. In turn, hydroperiod influences soil organic matter content, redox potential, pH, and oxygen content. These parameters change along a small-scale elevation gradient as water drawdown occurs, and vary within a single pool according to its basin profile. Degree of canopy closure and type of canopy (evergreen versus deciduous) affect spatial and temporal patterns of light availability. The combination of these physical characteristics largely determines plant community composition by acting as an environmental sieve, predictably filtering out certain functional groups and allowing others to emerge and persist. The qualitative model produced here indicates the life history groups likely to occur in vernal pools with various environmental characteristics, and may be useful in future vernal pool restoration and mitigation efforts.

40. THE EFFICACY OF LOW ENERGY ELECTRON BEAMS TO DECONTAMINATE CHEMICAL WARFARE SURROGATES

Katzoff SJ, Driscoll MS. Department of Chemistry, State University of New York, College of Environmental Science and Forestry, Syracuse, NY, 13210.

Decontamination of chemical warfare agents is vital on the battlefield as well as in laboratories, pilot plants, chemical agent production, storage, and destruction sites. Previous literature suggests neat samples represent the worse case scenarios, while chemical compounds in hydrated form tend to require significantly lower dose levels for comparable neutralization results. There is almost no quantitative data in literature on the destruction of organic compounds adsorbed onto surfaces. In this study chemical warfare surrogates are used due to the toxicity of the real agents and usage restrictions. The objective of this research is to determine if a 125 KEV portable low energy electron beam radiation unit can efficiently decontaminate chemical warfare surrogates. Three different chemical agent surrogates malathion, dimethyl methyl phosphonate and 2-chloroethyl ethyl sulfide will be tested under very controlled conditions to determine the effectiveness of the electron beams degradation. Using a high resolution GC-mass spectrometry a dose response curve for each surrogate compound has been determined. Some degradation products have also been identified.

41. PROGRESS TOWARDS THE SYNTHESIS OF MACROMOLECULES WITH PENDANT 1,2-DICARBORANE GROUPS

Knapp CK, Donaghy KJ. Department of Chemistry, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Polymers containing pendant carborane units may be used for Boron Neutron Capture Therapy. Utilizing the recent advancements in the synthesis of 1,2-dicarborene compounds via ionic liquids, we have made progress in the synthesis of molecules using a modified 1,3-dipolar cycloaddition reaction, also known as a “click reaction”. A “click” reaction is one that involves an extremely favorable (energetically) product so as to drive the reaction to completion with high yields. The reaction should also use reactants that are relatively simple and easy to obtain. The solvent and any side products should be non-toxic and easily separated from the product. Initial research has led to the synthesis of a carborane molecule with an attached acetylene group. The carborane molecule will later be “clicked” to a polymer backbone. Our research has also found that the S_N2 reaction of the azide with the organohalogen will most likely need to be performed in situ as the products are not stable enough to be isolated. Current research results will be presented.

42. MICROTOPOGRAPHY AND VENUS FLY TRAPS AT THE EDGES OF CAROLINA BAYS IN THE US COASTAL PLAINS

Knowlton SA. Department of Environmental and Forest Biology, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Carolina bays are a type of shallow depression wetland located on the eastern US coastal plain from New Jersey to northern Florida. The bays, ranging in size from 3,600 hectares to less than one hectare, are characterized by their elliptical shapes, sand rims and southeasterly orientations. Carolina bays vary from being permanently flooded to occasionally flooded, and they receive most of their water input from precipitation, although some research has shown that some have recharge/discharge connections with groundwater. Their seasonally fluctuating hydrology and varying biogeochemical features create a diverse range of soil conditions and community composition and dynamics. This case study will focus on shrub bays in North and South Carolina that border on pine savannahs. At the ecotone between these two ecosystems, the interaction between the local fire regime, microtopographic hummocks and hollows, hydrology and *Sphagnum* moss cover has created ideal habitat for the threatened Venus fly trap (*Dionaea muscipula*). Recognizing the bays’ roles in such complicated interactions—beyond the boundaries officially designated by the US Army Corps of Engineers—may be important in protecting and restoring remaining Carolina bays, as well as threatened species such as the Venus fly trap, since a 2001 Supreme Court ruling exempted the bays from protection under the Clean Water Act.

43. **AN EVALUATION OF THREE NONINVASIVE HAIR SNARE DEVICES FOR *URSUS AMERICANUS* (NORTH AMERICAN BLACK BEAR) IN THE ADIRONDACK PARK**

Kosonen JL, Frair J. Department of Environmental and Forest Biology, State University of New York College of Environmental Science and Forestry, Syracuse, NY 13210

Population monitoring can be problematic and costly when dealing with species such as the North American black bear (*Ursus americanus*), which have large home ranges and can be difficult to observe in the field. Currently noninvasive sampling techniques are successfully being employed by wildlife researchers across the country. DNA samples collected from both hair and fecal samples provide information on population size, sex ratios, kinship relationships as well as levels of genetic diversity within a population. This study was conducted on black bears in the Huntington Wildlife Forest in the Adirondack Park. The goal of this study was to evaluate three unique noninvasive hair snare designs which were chosen based on prior field success. The success of each design, which was based on ability of the snare design to collect hairs, as well as the feasibility of noninvasive snare sampling methods in the Adirondack Park were determined. Of the three designs tested only one was successful; design three. Design three was a standard barbed wire box enclosure replicated from Woods et al 1999 [1]. Out of 170 trap nights design three exhibited a 94% success rate. By utilizing design three for estimating black bear populations in the Adirondack park region the NYSDEC may be able to come up with more accurate population estimates as well as minimize costs of monitoring.

[1] Woods, John, David Paetkau, David Lewis, Bruce N. McLellan, Michael Proctor, and Curtis Stroebeck . "Genetic Tagging of Free-Ranging Black and Brown Bears." *Wildlife Society Bulletin*. 27(1999): 616-627.

44. **USE OF A SATURATED/UNSATURATED ZONE GROUNDWATER MODEL TO INVESTIGATE SOIL-WATER DYNAMICS IN ON-SITE WASTEWATER TREATMENT SYSTEMS**

Koumai, OT and Hassett JM. Department of Environmental Resources and Forest Engineering, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

Wastewater flow dynamics in subsurface wastewater disposal systems (SWISs) have been investigated using the VS2DTI, a graphical two dimensional software package. First, generic models were created for two systems, one raised trench and one conventional, and used to study the effect of flow rate, soil textural class, soil layers and site slope on the water table response to wastewater disposal. Second, unsaturated/ variably saturated wastewater flow in three SWISs in New York City's Catskill/ Delaware drinking water supply watershed were simulated to understand and interpret the occurrence of breakout, seeping, unusual grass growth patterns and soil saturation within these systems. The change in pressure head (water table mounding) was found to be linearly correlated to the wastewater application rate in a typical SWIS. Similar results showed the soil texture class and layer stratification also play very important roles in pressure head change and can determine whether a system succeeds or fails. The occurrence of breakout and thus system failure on system M4 was found to be related to flow patterns between the native soil and the fill material in sloped sites. Seeping was attributed to the close proximity of the water table to the surface down slope of the system. Grass growth patterns observed on site S2 was due to increased moisture content around the perforate pipes and the consistent saturation for site C2 was attributed to lack of provision of minimum of 4 feet of usable soil at time of installation.

45. URBAN STREAM DESIGN: A TRADITIONAL ENGINEERING APPROACH

Kreider TA, Newsome JB, Song PM, Daley DJ. Department of Environmental Resources and Forest Engineering, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

An urban stream channel in Schenectady, NY will be heavily disturbed due to environmental site remediation, requiring a replacement design of the stream channel. The site, bisected by 1100ft of the stream, is used for equipment storage and administrative purposes. The client desires an increase in parking area as well as a low maintenance design that is integrated with current buildings on the property. Currently the stream exhibits low ecological value as the site provides little habitat area and limited vegetation. The stream is channelized along the site, including culverts at both the inlet and outlet. The contributing watershed is 4.9 mi², using ArcMAP watershed delineation, and is 60% residential, 32 % open space, 5 % roadway, and 3% commercial. The 9-acre site (mostly impervious area) does not contribute directly to the flow, as onsite runoff is diverted offsite. For a 25-year, 24-hour, design storm of 320 cfs, calculated using the TR-55 method, a box culvert was designed to NYS DOT specifications. The final design, picked from several alternative solutions, addresses client needs, while minimizing cost and maintenance. We are using this as the basis to compare performance, ecological value and cost against an ecologically engineered system.

46. CONSTRAINTS ON TITAN'S METHANE CYCLE DERIVED FROM FLUID FLOW AND SEDIMENT TRANSPORT CALCULATIONS

Gutliph ME, Huchzermeier MP, Kreider TA, Newsome JB, Schlossnagle TH, and JM Hassett. Department of Environmental Resources and Forest Engineering, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

The 2005 Huygens Probe returned imagery from Titan, Saturn's largest moon, which revealed a dendritic channel network. The imagery and other data suggest a methane cycle analogous to Earth's hydrologic cycle. The channel network was most likely caused by mechanical erosion associated with surface runoff. We propose a model based on open channel flow and sediment transport calculations to establish a minimum channel depth, flow velocity, and precipitation rate required for sediment mobilization. We use data established from imagery and previous literature to parameterize a drainage area of 0.8 km² at an average slope of 0.05, channel widths ranging from 1 – 30 m, and grain diameters ranging from 1 – 150 mm. Based on these parameters, we report a range of minimum values for channel depth, flow velocity, and precipitation rates required to mobilize sediment and thus create the channel network. Our calculations provide important constraints as Titan's methane cycle is further investigated.

47. SNOWMELT: THE PHYSICAL AND CHEMICAL HYDROLOGICAL RESPONSE ON A SPATIAL AND TEMPORAL SCALE

Kurian LM, Lautz LK. Department of Forest and Natural Resources Management, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210 and Department of Earth Sciences, Syracuse University, Syracuse, NY 13210

Winter has traditionally been considered a dormant season with little influence on biogeochemical processes. As a result, winter physical processes have not been intensively researched, particularly in conjunction with nitrate dynamics. A large portion of nitrate export from watersheds occurs during winter and spring snowmelt and the meteorological and hydrological parameters controlling winter nitrate export are not well understood. To study linkages between physical hydrology and water geochemistry during the winter, we intensely sampled physical properties (snow depth, soil temperature, soil frost depth, groundwater level, and stream flow) and soil, ground and stream water chemistry throughout the winter, specifically during snowmelt events, in two adjacent subwatersheds within the Huntington Wildlife Forest during the 2007-2008 winter season. Snow cover was consistently 0.28 m or greater between December 1st and the onset of spring snowmelt in April, showing no major mid-winter melt events. The soils did not freeze during the winter due to the insulating effect of snow cover, but the soil temperature decreased in response to minor snowmelt events. Soil nitrate concentrations were not responsive to these minor snowmelt events except for the final spring melt. Physical hydrologic processes, such as changes in soil temperature and freezing, were not clearly linked to changes in soil water geochemistry mid-winter. Rather, soil nitrate varies temporally and spatially in response to changes in nitrate sources and sinks. Our high temporal resolution soil temperature and geochemistry data during the winter exceeds that provided in previous studies and provides insight into winter hydrological and biogeochemical processes.

48. ANTHROPOGENIC INFLUENCES ON HEALTH OF OYSTER REEF ECOSYSTEMS: A COMARISON OF LIVE AND DEAD ASSEMBLAGES

Lambert JG¹, Dietl GP², Kelley PH³, Gibbs JP¹, Alphin TD³, Vissagi CC³. 1. Department of Environmental and Forest Biology, State University of New York, College of Environmental Science and Forestry, 1 Forestry Drive, Syracuse, NY 13210, 2. Paleontological Research Institution, 1259 Trumansburg Road, Ithaca, NY 14850-1398, 3. University of North Carolina Wilmington, 601 South College Road, Wilmington, NC 28403-5944

Over the last half-century *Crassostrea virginica* oyster reef systems have shown marked decline. Estuaries subject to a high degree of anthropogenic eutrophication have poorer live-dead assemblage fidelity than those less impacted by human influence. I examine the impact of long-term human influences (sedimentation and eutrophication) on the health of *C. virginica* oyster reefs located along the southeastern North Carolina coast. We analyze the fidelity of live-death assemblages to test the hypothesis that that increased nutrient deposition and accretion due to sedimentation from runoff has led to change in rank order abundance, species richness and diversity in oyster reef fauna. We also hypothesize that live-dead assemblage data will be more concordant in less disturbed environments than in environments with greater anthropogenic influence. Although *C. virginica* dominates both live-death assemblages, community samples from the uppermost centimeters of sediment were dominated by *C. virginica* with few other species present (*Mercenaria*, barnacles, *Crepidula*, mussels). Samples from deeper excavated communities, contained greater species richness and diversity than live assemblages. I conclude that use of live/dead agreement as a method of environmental assessment of oyster reefs may be highly imperfect, with impacted sites showing considerable overlap with pristine sites. However, live/dead discordance, specifically in diversity assessments, indicate that further study of these communities and the environment they live in is needed.

49. INITIAL RIPARIAN RESTORATION ALONG AN URBAN STREAM GRADIENT, ONONDAGA CREEK, NEW YORK

Landis, CL. and Leopold, DJ. Department of Environmental and Forest Biology, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210.

The purpose of this study was to investigate riparian plant establishment along an urban stream, with the ultimate goal of restoring self-perpetuating native riparian plant communities. Three sites were selected along a rural to urban gradient on Onondaga Creek, near Syracuse, New York, U.S. Plant communities at these sites were dominated by grasses and forbs. Numbers of species of alien plants increased at more urban sites. The riparian seed bank also showed disproportionate dominance by herbaceous plants at all locations surveyed. Seedlings of native riparian trees nonetheless germinated at all sites along the rural to urban gradient. Recruitment of native riparian species (especially *Populus deltoides*, *Fraxinus pennsylvanica*, and *Acer negundo*) exceeded non-native and invasive ones. While the data in this study do not address survival of seedlings over the long term, they nonetheless suggest system resilience that could be engaged to promote riparian plant restoration.

50. UTILIZATION OF BIODEGRADABLE POLYMERS FOR REMOVAL OF POLYCYCLIC AROMATIC HYDROCARBONS FROM AQUEOUS SOLUTION

J. Lu and C. T. Nomura. Department of Chemistry, 336 Jahn Laboratory, State University of New York College of Environmental Science and Forestry, Syracuse, NY 13210

Polycyclic aromatic hydrocarbons (PAHs) represent one of the most widespread organic pollutants and are known human carcinogens. Composed of fused aromatic rings, PAHs form primarily through the incomplete combustion of organic matter. PAHs have been detected in soil, oil contaminated sediments and both industrial and urban wastewaters. Removal of PAHs from the environment has been a subject of intense research in recent years. In this study, we used a novel method for concentrating and/or removing PAHs from aqueous environment using a polyhydroxyalkanoate (PHA) biodegradable polymer produced by microbes. Gas chromatography-mass spectrometry (GC/MS) was used to profile and determine the concentration of PAHs present in samples both before and after polymer treatment. This study shows that poly-3-hydroxybutyrate (P[3HB]) polymer fibers and films produced by *Escherichia coli* can efficiently concentrate and/or remove naphthalene or phenanthrene from aqueous solutions. PHAs can also be used to detect naphthalene or phenanthrene concentrations at levels as low as 0.001 ppm without using large solvent volumes.

51. IMPERVIOUS SURFACE AREA DETECTION IN THE ONONDAGA CREEK WATERSHED USING SATELLITE IMAGERY

Li Luo¹, Giorgos Mountrakis¹. ¹SUNY College of Environmental Science and Forestry, Syracuse, NY

Urbanization and sprawl rank among the most serious threats to watershed ecosystems, water quality, and biotic integrity. In this poster we present our progress in developing a state-of-the-art remote sensing monitoring method that detects land use change using satellite imagery. We focus on impervious surfaces (man-made structures such as buildings, roads, and parking lots) adjacent to the Onondaga Creek watershed. We use as training data information from high resolution imagery and we detect impervious surface areas using Landsat satellite scenes from 1991 and 2001. We also tie together remote sensing products with advanced uncertainty metrics to facilitate better usage of our classification results by non-experts in remote sensing analysis (e.g. biologists, hydrologists).

52. THE DELIGNIFICATION OF KRAFT PULPS BY SULFITE TREATMENTS

Mahmud S, Lai YZ. Graduate, Faculty, Department of Paper and Bioprocess Engineering, SUNY-College of Environmental Science and Forestry, Syracuse, NY 13210

The residual kraft pulp lignin is well known for its resistance to alkaline delignification and this has been generally attributed to the presence of lignin-carbohydrate complex (LCC). However, we observed that the acidic treatments of commercial kraft pulp samples intended to cleavage those LCC under ideal conditions (in aqueous dioxane solution at 100°C) could only removed 65-70% of the residual kraft pulp lignin. Since the kraft pulp lignin is known to contain a significant amount of phenolic hydroxyl group, the extent to which the sulfonation of these phenolic units may lead to the delignification was the purpose of this study. The sulfite treatments of kraft pulps from both hardwood and softwood were conducted at pH 4.12 and 7.5 at 140 and 150°C. Both sulfite treatments resulted in a significant removal of the residual pulp lignin especially with the sodium bisulfite. The percent lignin removal was comparable for both softwood and hardwood pulps and was slightly higher for the O₂-delignified samples. Since the sulfite treatments at pH 7.5 are not expected to cleave the LCC, the lignin sulfonation appears to play an important role in assisting the delignification of kraft pulps.

53. APPLYING HILLSLOPE-STORAGE MODELS TO SIMULATE LOW STREAMFLOW AT A WATERSHED SCALE

Matonse, AH, Kroll, CN. Department of Environmental Resources and Forest Engineering, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

In a recent study Matonse and Kroll (2009) applied a kinematic wave hillslope-storage (kw) and a hillslope-storage Boussinesq (hsB) model to M8, a small steep headwater catchment that is part of the Maimai watersheds in New Zealand to estimate low streamflow series and statistics at a watershed scale. Though hillslope partitions with variable parameters lead to improvements in model performance, the kw and hsB models performed similarly when applied to M8, as was expected given the steep slopes of this catchment. Their results were constrained by the amount of available input data and the size of the study area. The present paper extends this analysis for two larger North Carolina watersheds, the Linville River near Nebo (LRN) and Indian Creek near Laboratory (ICL). These watersheds are both located within the Piedmont physiographic region in North Carolina and have similar size, but their average slope is different. In addition, both watersheds are NWS MOPEX sites, and thus are rich and consistent in data quality and length. Six years of data were applied for model calibration while another thirty years were used for model verification. The models are compared based on a Scaled Root Mean Square Error (SRMSE) and on their ability to estimate low streamflow statistics. With both sites partitioned into 9 hillslopes the impact of varying average slope is explored. Our results confirm findings from previous studies that have indicated that for relatively steep hillslopes the kw and hsB models will perform similarly. For more shallow hillslopes the kw model represents a good approximation when the λ index, a ratio of rainfall accumulation to soil water drainage, remains less than 0.75. Calibration with the lower 20 and 50 percent of data resulted in models that better simulate low flow statistics.

54. **COMPARISON OF CHINESE AND AMERICAN CHESTNUT PPO RESPONSE TO OXALIC ACID AS A POTENTIAL MODE OF BLIGHT RESISTANCE**

McDowell S, Baier K. and Powell W. Department of Environmental Science and Forest Biology, SUNY College of Environmental Science and Forestry, One Forestry Dr., Syracuse, New York 13210-2788

This study was one of many attempting to elucidate the basis for the resistance of Chinese chestnut (*Castanea mollissima*) to chestnut blight, which is not found in American chestnut (*C. dentata*) and has decimated the population. Specifically, it had been observed that Chinese chestnut exhibits higher levels of polyphenol oxidase than American chestnut. The goal of this experiment was to develop a standardized assay for polyphenol oxidase and compare the activity of that enzyme in extracts from American and Chinese chestnut. The enzymes were first extracted in a MOPS buffer and diluted according to protein concentration. L-DOPA was used as the substrate for the enzymes and product formation was measured using a spectrophotometer. Overall the standardized enzyme assays showed no difference between American and Chinese chestnut polyphenol oxidase activity at the various concentrations of oxalic acid (0, 0.2, 1, 5, 25 mM). It can then be assumed there is no beneficial difference, with respect to activity in the presence of oxalic acid, between American and Chinese chestnut polyphenol oxidase enzymes. However there could be other functions of the PPO enzyme more highly expressed in the Chinese enzyme that could account for higher levels of resistance. Thus further research is necessary.

55. **TREE SPECIES AND ACID-BASE CHARACTERISTICS OF GRASS POND WATERSHED WITHIN THE ADIRONDACK MOUNTAINS OF NEW YORK.**

McEathron KM, Mitchell MJ. Department of Environmental and Forest Biology, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Grass Pond watershed, located within the southwestern Adirondack Mountain region of New York, receives some of the highest rates of acidic deposition in the country. This region is particularly sensitive to acidic inputs due to shallow depths and generally base-poor soils. Seven streams at the inlet to Grass Pond, exhibit substantially different acid-neutralizing capacities (ANC). The purpose of this study is to evaluate the relationships between stream acid-neutralizing capacity and sub-watershed vegetation and soil characteristics. Tree species basal area was calculated from 9-m radius plots covering 1% of each sub-watershed area. Forest floor and mineral soil samples were also collected within these vegetation plots. Stream grab samples were collected on a longitudinal gradient from each of the seven streams in October 2008. Results indicate that stream base cation surplus and Ca:Al is significantly ($p < 0.05$) positively correlated with upstream sugar maple basal area while black cherry basal area is significantly ($p < 0.05$) inversely correlated with stream base cation surplus, Ca:Al and calculated ANC. Conclusions from this study suggest that sugar maple and yellow birch basal areas are positively correlated with watershed characteristics associated with the neutralization of atmospheric acidic inputs. In contrast, black cherry, red spruce, eastern hemlock and American beech basal areas show opposite relationships.

56. **Cu₂O SOLAR CELLS: A LAB EXPLORING THE PROPERTIES OF PHOTOELECTROCHEMICAL FILMS**

McEnaney JM, Abrams NM. Department of Chemistry, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

The study of electrodeposition and photoelectrochemistry is important to increasing students' knowledge and interest towards renewable energy technologies while also giving further relevance to the chemistry lab experience. The electrodeposition of Cu₂O from a copper lactate solution is a non-toxic and useful procedure for teaching a variety of photoelectrochemical concepts. The goal of this research and subsequent laboratory experiment was to introduce an array of experimental options exploring photoelectrochemical films that can be used in laboratories with a variety of available resources. Electrochemical reduction of a copper (II) lactate solution was used to produce Cu₂O films on transparent fluorine-doped tin oxide glass (FTO). Copper (I) oxide is a known p-type semiconductor and, when exposed to light, produces a cathodic current that can be used in chemical reduction. Deposition is accomplished using a 3-electrode potentiostat or a more economical 2-electrode current source. After deposition, characterization methods include the photoelectrochemical reduction of O₂, crystal structure analysis using X-ray diffraction, optical light absorption, and gravimetric analysis. This laboratory experiment offers a unique hands-on experience to explore photoelectrochemistry using common elements, but also offers a rich set of analysis methods. A materials chemistry lab such as this enhances the laboratory experience by using authentic materials with an environmentally relevant topic. This will help spread the interest in photoelectrochemistry and materials chemistry, eventually leading to the development of more solar technologies and other related photoelectrochemical research.

57. **URBAN STREAM DESIGN: AN ECOLOGICAL ENGINEERING APPROACH.**

Metcalf LM, Newby RT, Turk NJ, Daley DJ. Department of Environmental Resources and Forest Engineering, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

We are creating a restoration design for an urban stream channel that will be heavily disturbed due to environmental remediation. As is typical of urban areas, the stream currently exhibits low ecological value (it provides minimal habitat area and has limited vegetation.) The stream is significantly channelized and culverted both upstream and downstream. The contributing watershed is approximately 4.4mi² and is 59.54% residential, 32.45% open space, 5.03% roadway, and 2.99% commercial. This watershed contributes directly to the flow through the 9 acre site that consists of predominately impervious surfaces (pavement and buildings.) The site is used for equipment maintenance and storage and is bisected by 1100ft of the stream. The restoration design will dedicate at least a portion of the stream as vegetated open channel, incorporating native materials (vegetation and stream bed lining) to provide wildlife habitat and prevent erosion. Additionally, the design will provide aesthetic value while having the capacity to handle the 25-year 24-hour peak storm flow of 320 cfs. In the final stages of the project, this ecological engineering design will be compared against a standard civil engineered solution prepared by a separate group to determine the benefits and drawbacks of each solution.

58. SIZE OF DISCOLORED HEARTS IN SUGAR MAPLE

Mishler AK, Yanai RD, Germain RH, Department of Forest and Natural Resource Management, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Sugar maple is one of the most important timber species throughout the northeastern U.S. The wood is most valuable when it is a creamy white color. However, dark heart is commonly found in sugar maple and large amounts of it can result in value losses. Foresters and other industry professionals believe some tree and landscape characteristics indicate dark heart in sugar maple, but no empirical studies have evaluated them. This study tested whether tree bark type, sugar maple component percentage, soil cation levels, and stand history are predictive of dark heart size in sugar maple. We also tested relationships of dbh, crown class, tree grade, landform index, terrain shape index, slope, and visible injury with heart size. Western and central New York trees had significantly smaller heart sizes than northern and eastern New York trees. We found that grade 1 trees and trees growing on less sheltered sites were likely to have smaller dark hearts. No other factors were related to heart size, contrary to what some foresters believe. A low percentage of grade 1 trees in our study (8%) would be reduced in log-grade following harvest due to dark heart compared to 50% in a Michigan study.

59. GLYCEROL METABOLISM ENHANCEMENT

Mueller AP, Nomura CT, Department of Chemistry State University of New York College of Environmental Science and Forestry.

Production of biodiesel yields glycerol as a waste side product. Waste glycerol could be converted into polyhydroxyalkanoates (PHAs), biodegradable polyesters. This would serve a two-fold purpose; it would potentially yield lower cost PHA production, making PHAs more competitive with petroleum based plastics, and provide a use for waste glycerol. The conversion of glycerol to PHAs in *Pseudomonas putida* KT2440 is slow, owing to long doubling time. This long doubling time is hypothesized to result from low expression and activity of key enzymes in glycerol metabolism. To test this, over-expression of glycerol uptake facilitator protein and a mutated glycerol kinase from *Escherichia coli* will be induced using an expression vector. Growth rate and polymer production are expected to increase.

60. **PRODUCTION OF POLYHYDROXYALKANOATES IN TRANSFORMED ESHERICHIA COLI USING GLYCEROL**

Murphy BM, Nomura CT. Department of Chemistry, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Polyhydroxyalkanoates are biodegradable polyesters produced in vitro that exhibit properties similar to commercially produced petroleum based plastics. Recombinant *E. coli* exhibit high cell densities allowing higher yields in PHA production. Previous studies have shown that recombinant *E. coli* strains containing plasmid pBBRSTQKAB, were capable of short chain length PHA production from glucose, a favorable carbon source for *E. coli*, which increased PHA production. The pBBRSTQKAB plasmid contains *phaA* *phaB* and an altered form of *phaC1* with point mutation of Ser to Thr and Gln to Lys at amino acid position 325 and 481 on PHA synthase respectively. This study utilized reagent grade glycerol and compared it to glucose as a carbon source. *E. coli* S17-1 containing pBBRSTQKAB grew to average cell dry weights of 1.6 g/L and 1.8 g/L after 48 hours, and had an average PHA % of 32.1% and 32% in glycerol or glucose respectively. This study shows that reagent grade glycerol functions as well as glucose for PHA production with the new recombinant strain of S17-1 *E. coli*.

61. **THEORY-BASED EXPANSION OF KINETICALLY MODELED VOC DEGRADATION BY ELECTRON BEAM IRRADIATION**

Murray DM, Dibble TS. Department of Chemistry, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Air pollution may one day be a thing of the past. Complete elimination of harmful exhaust gases may be possible with radiation chemistry. Past studies have shown that this method of emissions control has yet to be cost-effective. Kinetic modeling of the mechanisms involved in the electron beam irradiation of VOCs in exhaust gas streams may assist in optimizing performance and lead to a cost-effective irradiation protocol. A mechanism of approximately 840 reactions was created to model the electron beam irradiation of VOCs in humid air through Kintecus software. Variations of parameters such as humidity, radiation dose, and dose rate were applied to evaluate VOC elimination efficiency within the model. Preliminary results indicated an anomaly. Peroxynitrous acid (HOONO) was computed to be more prevalent than its more stable isomer, nitric acid (HNO₃). Based on reactions with HNO₃, proposed reactions with HOONO were developed to better represent the HOONO chemistry. Structural and mechanistic issues, as well as thermodynamic analysis, were used to determine the likely product sets from reactants interacting with HOONO. The model will be updated with the additional HOONO reactions and changes in the HOONO/HNO₃ ratio will be reported.

62. THE INFLUENCE OF INCOME ON CONSTRAINTS TO LAND DEVELOPMENT

Myers SJ¹, Hall MH². Department of Environmental and Forest Biology¹, Department of Environmental Studies², State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Urban sprawl is of concern to many as it leads to inefficient use of land leading to increased forest loss and fragmentation and development patterns that increase fuel use in transportation, among other concerns. It has been hypothesized that affluence leads to sprawl but little attention has been paid to how this affluence mollifies energetic constraints imposed by the land on human development. Humans decide upon locations for land development based in part upon a weighing of energetic costs and benefits, or energy return on energy invested (EROI). As a consequence, development tends to concentrate near areas of higher faunal or floral productivity due to good soils and away from areas of higher development energetic costs, such as steep slopes and saturated soils. If money is viewed as a certificate redeemable for energy in the marketplace then we hypothesize that in areas of greater total income more energy has been available to overcome the constraints of poor site conditions leading to development on sites deemed unsuitable by our ancestors. A spatial modeling analysis of the location of development within Connecticut between years 1985 and 2002 supports this hypothesis. Our results indicate that in areas of higher income, determined from Census data analysis, development, derived from time series satellite image classification, was less constrained by steeper topographic slopes ($p < 0.1$).

63. OPTIMIZED FERTILIZATION OF AMERICAN CHESTNUT SEEDLINGS USING LIQUID AND SLOW-RELEASE FERTILIZERS

Oakes AD, McGuigan L, Schirmer C, Briggs R, Maynard CA. Department of Forest and Natural Resources Management, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

As the goal of developing a blight-resistant transgenic American chestnut (*Castanea dentata*) is quickly becoming a reality, an immediate priority is to find the optimal greenhouse conditions for growing large numbers of seedlings and tissue culture plantlets. The relationship between American chestnut seedling growth and fertilizer application was tested using both standardized applications of six liquid fertilizers and graduated densities of Osmocote slow-release pellets. The chestnut seeds were planted in individual 500 mL tube containers filled with one of two commercial potting mixes; one half of the tubes had slow release pellets mixed into the soil prior to planting and were given only water, the other half were watered with one of six liquid fertilizers all standardized to 100 ppm nitrogen. After seedlings had been growing in a greenhouse for ten weeks, the height, root length, stem caliper, dry weight and foliar nutrient content of each plant was measured. One replicate was planted at the LaFayette Road Experiment Station to investigate field survival. While higher levels of fertilizer application reduced root development, the prolific foliage appeared to give certain treatments a clear advantage in field planting. On the basis of height growth and survival, the two most successful treatments at the end of the first growing season were the Peter's 20-20-20 liquid application and the Osmocote Plus slow-release pellets applied at a rate of 12 g for each 500 mL potting tube.

64. VERTICAL DISTRIBUTION AND SEASONAL VARIATION IN LEAF NITROGEN OF FOUR SHRUB WILLOW VARIETIES

Ofezu GJ, Briggs RD, Volk TA. Department of Forest and Natural Resources Management, State University of New York, College of Environmental Science and Forestry, 1 Forestry Dr., Syracuse, NY 13210

Foliar nitrogen (N) levels and distribution are an important aspect of plant nutrient economy. Foliar N is associated with photosynthetic capacity and plant productivity. Plant genotypes accumulate N in tissues at different rates on both temporal and spatial scales. This study investigates N distribution by testing the “sink strength” hypothesis and N allocation theory in four willow genotypes. The objectives were to: (1) quantify leaf N concentrations in three different portions of the canopy; (2) determine seasonal changes in leaf N; and (3) examine variability in leaf N among the genotypes. The study was conducted at Tully experimental station in upstate New York. Sampling was done monthly from June-October. Foliar N varied significantly from the upper leaf canopy to the lower leaf canopy ($p=0.0018$), ranging from 22.3–18.8 g kg⁻¹. N declined significantly from June to October ($p=0.0001$). N concentration was highest in June (25.6 g kg⁻¹) and lowest in October (14.9 g kg⁻¹). The genotypes varied significantly in leaf N ($p=0.0229$) with mean N concentration ranging from 17.1–23.0 g kg⁻¹. Mean N concentration was highest in *S. viminalis* x *miyabeana*, followed by *S. dasyclados*, *S. purpurea* x *purpurea* and *S. miyabeana*. Variation in N concentration coincided with the leaf phenology of willows and most temperate deciduous species in the region. Nitrogen allocation in leaves was strongly affected by the leaf position and significant amounts of N were retranslocated before leaf senescence. The results could provide important knowledge for nutrient recycling and supplements.

65. EFFECTS OF VARIABLE GROWTH CONDITIONS ON ALGAL LIPID PRODUCTION

Osborne PA, Thomas SP, Boyer GL. Department of Chemistry, State University of New York College of Environmental Science and Forestry, 1 Forestry Dr., Syracuse, NY 13210.

Algal cultures are increasingly being seen as viable economic resources for biodiesel production. However, the great amount of space and light required for growing algal cultures continues to limit the feasibility of this idea, especially on the small-scale. If ideal growing conditions to maximize lipid production can be determined, the ease at which algal biodiesel can be produced would increase. Cultures of *Chlorella vulgaris* were grown under a range of conditions with varying amounts of available nitrogen and in varying temperatures. Results on the overall biomass and lipid content for each growing condition will be presented.

66. IMPACT OF DISTURBANCE ON THE SOIL ORGANIC CARBON STOCKS IN PEATLANDS

Pacaldo RS. Department of Forest and Natural Resources Management, SUNY College of Environmental Science and Forestry, Syracuse, NY, 13210.

Microtopography plays an important role in organic C accumulation in peatland. However, human disturbance like afforestation and water drainage may impact organic C deposits. Because peatland is an important carbon sink, it is necessary to understand how disturbance of the microtopography may affect the soil organic C deposits, hydrology, biota, and soil properties in the peatland. Consequently, this literature review is designed to (1) describe how the microtopography affects hydrology, biota, and soil properties of the peatland, and (2) evaluate the impact of disturbance on the organic C stocks. Journals, books, and websites are the main sources that will be utilized to achieve the goals of this project. Literature revealed that hummocks influence the growth of bogs by driving the water flow downward and isolating the surface waters from influx of inorganic solutes derived from mineral soil. Hummocks are dominated by sphagnum moss, keep the soil wet and acidic, slowing decomposition rate, and enhancing organic C accumulation. Human disturbances have posed negative impacts on organic C. Artificial water drainage has increased CO₂ emissions, but decreased CH₄ production. Similarly, afforestation has decreased the amount of organic C deposits. Some studies have shown, however, that long term effects of disturbance results in both increase and decrease of organic C. These studies suggest that after the disturbance, the peatland became a net source of CO₂ instead of sink; but, it may recover through time.

67. APPLICATION OF CONTINUOUS MONITORING IN THE LAKE ONTARIO NEARSHORE NUTRIENT SURVEY

Pavlac MM¹, Smith TT¹, Thomas SP¹, Boyer GL¹, Makarewicz JC², Lewis TW², Edwards WJ³, Pennuto CM⁴, Basiliro CP⁴, and Atkinson JF⁵. ¹Department of Chemistry, SUNY-College of Environmental Science and Forestry, Syracuse, NY; ²SUNY-Brockport, Brockport, NY; ³Niagara University, Lewiston, NY; ⁴Buffalo State University, Buffalo, NY; ⁵University at Buffalo, Buffalo, NY

The Lake Ontario Nearshore Nutrient Survey (LONNS) conducted in the summer of 2008 was designed to assess the effect of *Cladophora*, dreissenid mussels, and physical forces on the movement of nutrients entering the lake. As part of that survey, continuous real-time monitoring was employed in the nearshore areas of Oak Orchard, Rochester, and Mexico Bay in New York. The ferry box was equipped with sensors for chlorophyll, phycocyanin, CDOM, temperature, conductivity, turbidity, dissolved oxygen, and pH. Phytoplankton class abundance was estimated using the BBE FluoroProbe operated in continuous-flow mode. These data streams were geo-referenced and used to examine the spatial and temporal change of the different parameters relative to the riverine inputs. Initial results showing the variations in the distribution and composition of algal growth, as well as the physical data, will be presented.

68. COMPARISON OF FORESTED AND AGRICULTURAL SUBWATERSHEDS IN SKANEATELES, NY USING THE SWAT MODEL

Pendleton EM¹, Kroll, CN¹, Briggs, RD².¹Department of Environmental Resources and Forest Engineering, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210, ²Department of Forest and Natural Resources Management, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Grout Brook and Bear Swamp, subwatersheds of the larger Skaneateles Lake Watershed (SLW) in Central NY, are composed of primarily agriculture and forested lands. The Soil and Water Assessment Tool (SWAT) is a physically based watershed scale model developed by the EPA to evaluate the impacts of land use changes on water quality. Two SWAT models representing the Grout Brook and Bear Swamp subwatersheds were constructed using data available from national soil and land cover databases. Detailed land use information of crop and management practices on agricultural land within each subwatershed was applied. Using stream data from sampling sites in Bear Swamp and Grout Brook, SWAT models to evaluate the effectiveness of agricultural and forested subwatersheds were constructed and calibrated to observed flow, sediment, and nutrient data. Model calibration was performed using Parameter Solutions method (ParaSol). The results illustrate the impact of forested and agricultural land uses through the comparison of upstream and downstream sites within each subwatershed and each subwatershed outlet. The use of SWAT output will aid in predictions of agricultural and vegetation changes impacts on water quality from each subwatershed. We are exploring ways to scale our results to the entire SLW.

69. HAS ADAPTATION DRIVEN THE SPREAD OF THE INVASIVE GYPSY MOTH?

Phillips M, Parry D. Department of Environmental and Forest Biology, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210.

The role of evolution has historically been overlooked as a mechanism underlying the spread of invasive species. Traditionally, phenotypically plastic or all-purpose genotypes were postulated as characteristics of successful invasive species. Recently, rapid evolution and local adaptation have been recognized as important alternative mechanisms. Discerning which of these mechanisms is operating has important practical and applied implications. Predictive models of geographic range often rely on characteristics of a single population and generally do not incorporate adaptive change. The gypsy moth, *Lymantria dispar*, is one of the best-studied invasive species, offering an excellent model for assessing the importance of adaptation to its ongoing range expansion, particularly in areas that are climatically different from the purported source population (southern France) or its original 1868 introduction point (Medford, Massachusetts). Our study compared cold tolerances among 10 populations of gypsy moth across a latitudinal and longitudinal gradient spanning their current invasive range. The supercooling point (SCP) was quantified using ova from four egg masses in each population and compared among populations. A second experiment assessed the timing of hatch in response to simulated spring temperature regimes of 15°C or 20°C. The results of these experiments and future work will help us determine if adaptive evolution has played an active role in the range expansion of the gypsy moth into novel habitats.

70. TIGECYCLINE MINIMUM INHIBITORY CONCENTRATIONS (MICS) FOR SELECTED GRAM-POSITIVE AND GRAM-NEGATIVE ORGANISMS

Pietra JA, Kiska DL, Riddell SW. Department of Pathology, SUNY Upstate Medical University, 750 East Adams Street, Syracuse, NY 13210-2375

Antibiotics act on various bacterial targets with the purpose of hindering or stopping growth. The purpose of this study was to determine the effectiveness of tigecycline, a new member of the tetracycline family. Tigecycline is bacteriostatic; inhibiting protein synthesis by binding to the bacterial 30S ribosome in both gram-negative and gram-positive bacteria. It is structurally similar to minocycline, containing a four-ring carbocyclic skeleton, however, it has an additional substituent at the 9 position, which may contribute to the drug being active against tetracycline-resistant strains. In this study, MICs to 11 antibiotics, including tigecycline, were determined for clinical isolates of enterococci, *S. aureus*, *S. agalactiae*, *S. pneumoniae*, *Klebsiella spp.*, *P. aeruginosa*, *E. coli*, *Acinetobacter spp.*, *Enterobacter spp.*, and *Serratia marcescens*. In addition, tigecycline MICs were compared between methicillin-resistant (MRSA) and methicillin-susceptible *S. aureus* as well as strains of vancomycin-resistant (VRE) and vancomycin-susceptible enterococci. Tigecycline appears to be effective *in vitro* against MRSA and VRE. This confirms the utility of this drug against antibiotic resistant organisms.

71. ASSESSING THE HEALTH OF SUGAR MAPLE STANDS IN NEW YORK FOLLOWING DEFOLIATION BY FOREST TENT CATERPILLAR

Pitel NE, Yanai RD, Wood DM*. Department of Forest and Natural Resources Management, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210. * Former Graduate Student, SUNY-ESF, 2008.

Sugar maple (*Acer saccharum* Marsh.) is a keystone species of the northern hardwood forest type. A common stressor of sugar maple in the Northeast is forest tent caterpillar (*Malacosoma disstria* Hübner, FTC), an indigenous defoliator. The recent outbreak of FTC (2002-2007) affected millions of acres of forest in the northeastern U.S. and Canada. Defoliated trees can exhibit crown dieback and loss in vigor, which can lead to mortality. This research involved visiting and revisiting 17 new and previously monitored NAMP stands in New York to collect tree crown health data. Crown damage was assessed two ways: tree crown dieback (%) and mortality (%). Objectives were (1) to see how crown dieback in 2007 affected the amount of crown dieback in 2008 (2) to see if mortality within stands in 2008 could be predicted using the crown dieback percentage from 2007 and (3) to determine if sugar maple stands in New York appear to be recovering or declining following the FTC outbreak. Results showed that all but two stands had less crown dieback and appeared to be recovering. Recent mortality in 2008 was highest in the two stands that exhibited the highest amount of crown dieback in 2007. Trees dead in 2008 had significantly higher ($p = <0.001$) crown dieback in 2007 than trees still alive. Although results do show some relationships, further investigation and statistical analyses are needed. Future research will involve soil nutrition analyses as well as incorporating data from Vermont and Massachusetts.

72. **EFFECTS OF PHOSPHORUS DEPRIVATION ON BIOMASS AND PHOSPHATE TRANSPORTER GENE EXPRESSION IN SHRUB WILLOW (*SALIX* SPP.)**

Proulx DC, Serapiglia MJ, Smart LB. Department of Environmental and Forest Biology, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Phosphorus (P) is efficiently transported into plant cells as inorganic phosphate by way of high-affinity phosphate transporters and is critical in many pathways of primary metabolism. The objective of this project was to identify correlations between root morphology, biomass, and gene expression of the phosphate transporter gene *PHT1;12* in *Salix sachalinensis* 'SX61' and *S. miyabeana* 'SX64' under varying phosphorus concentrations. Plants were grown from 25 cm cuttings in hydroponic culture for seven weeks in five separate treatments consisting of 0.5X modified Hoagland's solution containing 1 mM PO_4^{3-} (complete), 0.3 mM PO_4^{3-} (30%), 0.1 mM PO_4^{3-} (10%), 0 mM PO_4^{3-} (0%), and ddH_2O . Root morphology in P deprived shrubs exhibited decreased tufting and increased root elongation in both varieties. There was an increase in leaf and stem biomass in both varieties as phosphate concentrations increased, but there was no statistical difference in root biomass between treatments. After harvest, one gram of tissue was used to isolate RNA using a modified hot borate method. Preliminary analysis of semi-quantitative PCR showed gradually increased expression of *PHT1;12* in root tissues as phosphorus availability decreased.

73. **HEAT TRACING OF GROUNDWATER DISCHARGE TO NINEMILE CREEK, NEW YORK**

Ribaldo RE¹, Lutz LK². ¹Department of Forest and Natural Resources Management, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210, ²Department of Earth Sciences, Syracuse University, Syracuse, NY 13210

Recent advances in methods for measuring and interpreting stream and streambed temperature records have enabled the use of heat as a tracer of surface water-groundwater interactions, which has numerous advantages over other methods. One advantage of heat tracing is the ability to quantify groundwater flux to streams at a high spatial resolution. We installed temperature data loggers in a 30-m reach of Ninemile Creek, New York, to determine minimum and maximum daily temperatures at multiple locations and depths. We then used an analytical heat transport model to directly calculate daily seepage velocities from temperature records. A rating curve was developed between the average daily seepage velocities and point-in-time streambed temperature measurements. We performed streambed temperature mapping in the study area and determined seepage velocities at a high spatial resolution by applying our rating curve to the streambed temperature measurements. We calculated a total groundwater discharge of $330 \text{ Lm}^{-2}\text{day}^{-1}$ to the 30-m study area. The rating curve representing the relationship between measured streambed temperatures and calculated seepage fluxes has a high correlation coefficient ($R^2 = 0.71$), indicating the relationship is valid and can be extrapolated to the point-in-time temperature measurements made at the 30-m study site. We found the groundwater discharge rates in our study area were highly variable in space, showing groundwater enters the creek in specific, well-defined locations. Our heat tracing method allowed for the characterization of groundwater discharge with a high spatial resolution (i.e., 3 m^2) of seepage flux rates over a small spatial area (i.e., 350 m^2).

74. MAIN FACTORS CAUSING SPATIAL VARIABILITY IN METHANE EMISSION RATES WITHIN NORTHERN PEATLANDS AT THE MICROTOPOGRAPHIC LEVEL

Rimbault JC. Graduate Program in Environmental Science, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210.

Methane emissions in wetland ecosystems are a product of methane production, consumption and transport. All factors that affect these three components influence the rate of emission. While it is known that methane emission rates vary even within ecologically similar wetlands, it is also becoming apparent that they vary at the microtopographic level within wetland types. A literature review of methane emission rates of northern peatlands at the microtopographic level indicates that methane fluxes vary greatly from hummocks to hollows and that the greatest influencing components are water table position and plant transport. Other factors directly influencing the processes of production, consumption and transport of CH₄ or interacting among each other are also important in explaining fluctuations at the microscale. A model showing the different contributing factors and their interaction demonstrates the complexity of assessing methane fluxes in northern peatlands, even at the microscale.

75. TREE COMPOSITION OF NEW YORK RIPARIAN FORESTS IN ADVANCE OF EMERALD ASH

Rockermann PJ, Landis CL, Fierke MK. Environmental and Forest Biology, Illick Hall, 1 Forestry Drive, Syracuse, NY 13210

Emerald ash borer (EAB) is an invasive wood-boring beetle originally discovered in Michigan in 2002 that specializes on ash (*Fraxinus* spp.) trees, resulting in 100% mortality. Having already killed tens of millions of trees in Michigan and Ohio, the insect's fast expanding range is encroaching on New York State. Vulnerability of New York's forests to EAB is unknown, as the ash component of these forests has not been well documented. In particular, ash may be especially important in riparian corridors where riparian forest health affects terrestrial and aquatic biota. This project provided the unique opportunity to study the pre-invasion composition of riparian forests and assess the degree of damage that EAB will have on New York's watersheds by quantifying riparian ash composition. In 2008, five 50m x 30m fixed area vegetation plots were installed along each of the five rivers studied: Cattaraugus Creek, Mohawk, Oswegatchie, Saranac and Susquehanna Rivers. In the 25 field plots 2,293 trees and 42 species were encountered. EAB vulnerable species included 3 white, 110 black and 388 green ash (*F. americana*, *F. nigra* and *F. pennsylvanica*, respectively). These data indicate that ash comprises 21.8% of riparian tree species in the rivers studied with a range of 6.5% to 47.9% by river. With 100% mortality of these trees, impacts are expected to be substantial for these unique and essential riparian habitats as well as ash dependent biota. These data will be useful in predicting riparian forest susceptibility and ensuing effects on water quality and ash dependent biota.

76. DETERMINING DIFFERENCES IN GROWTH PATTERNS AND WATER USE FOR FOUR WILLOW CLONES GROWN IN BELLEVILLE, NY AND TULLY, NY TO OPTIMIZE REVEGETATION ALONG ONONDAGA LAKE IN SYRACUSE, NY

Schifman LA, Stella JC, Volk TA, Teece MA. Department of Forest and Natural Resources Management, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Willows are hardy, fast-growing plants that are good potential candidates for revegetating brownfields. In the Solvay wastebeds the goal is to plant a willow variety that has high water use to evaporate groundwater that otherwise mobilizes industrial salts, leeching them into Onondaga Lake. Currently several willow varieties are planted at the Solvay wastebeds; these clones were also planted in two off-site yield trials (Tully and Belleville, NY) for use as woody biomass crops. Our project goal is to analyze willow stems from off-site yield trials to predict water use efficiency (WUE) in Solvay plants, therefore justifying their use in phytoremediation. Two clones, SX64 and SX61 yield greater biomass in Tully than in Belleville, whereas the reverse is true for SV1 and 9871-31. In a pilot study, we analyzed stable carbon isotope ratios ($\delta^{13}\text{C}$) of clone, SX64, to assess its relative WUE and degree of drought stress between the two sites. Preliminary data suggests that Tully is more water limiting than Belleville. To find the optimal clone for revegetating the Solvay wastebeds, future work will focus on comparing three factors: biomass production, carbon isotope ratios, and ring increment growth for all four clones. Overall, we want to determine which of the clones utilizes the most water under a range of field conditions, as determined by correlated metrics of the three factors mentioned above. Ultimately, this project is intended to refine efficiency of phytoremediation efforts along Onondaga Lake, thus improving water quality and recreational use of the lakeshore by the greater community.

77. USING THE FUNDAMENTAL EQUATION FOR TRAFFIC DESIGN TO CHARACTERIZE THE MAXIMUM SEDIMENT CARRYING CAPACITY OF RIVERS: A PRELIMINARY TEST OF A NEW HYPOTHESIS

Schlossnagle TH¹, Siegel DI². ¹Division of Environmental Science, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210. ²Department of Earth Sciences, Syracuse University, Syracuse NY, 13210

We present the results of preliminary research designed to test the hypothesis that the maximum sediment load carried by rivers may be empirically determined from the “Fundamental Equation” used to efficiently design traffic patterns on highways. The equation incorporates both the density of vehicles per unit length of highway and the velocity of traffic. It can be expressed graphically as a power-shaped plot having a rising limb reflecting average transport conditions, and maximum capacity of the transport system defined as the asymptote. By analogy, we can plot mass of suspended sediment passing a stream gage per time versus mass of sediment per unit cross sectional volume of stream. Data approaching an asymptote may suggest that maximum sediment carrying-capacity has been reached for those flow conditions for the river.

We tested this hypothesis by using sets of temporal data from the USGS National Stream Quality Accounting Network and National Water Quality Assessment Program data sets for six major rivers in the United States. Results show that sediment transport occurs under non-maximum capacity for all rivers, although some data suggest that maximum sediment load is reached during some flow regimes. Characterizing maximum sediment carrying capacity for rivers often is done through complex modeling. This new approach suggests that it may be characterized by a simple empirical approach derived from traffic engineering.

78. AN EXAMINATION OF ECOSYSTEM-BASED MANAGEMENT IN NEW YORK STATE

Schneider, JS, Boyer GL. Graduate Program in Environmental Science, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

The New York Department of State is preparing an official recommendation to the Governor to implement a new type of environmental management plan, Ecosystem-based Management (EBM). EBM is a response to the continued decline in the health of our ecosystems, despite conservation efforts. The most innovative aspect of EBM is the collaborative approach, which is prominent in every stage of the management plan. There are four main components of EBM; partnerships and citizen/stakeholder participation, a science-based approach, long-term view and emphasis on a comprehensive perspective. My study combines three main components. The first, a literature review, examines the progression of management plans from a species-based management approach, to an ecosystem-based approach, to adaptive management and finally to ecosystem-based management. Although EBM is new to New York, it has been successfully implemented elsewhere in the United States and overseas. This study will allow a comparative analysis of EBM implementation in New York and California. I will also develop a social survey tool aimed to gauge stakeholder support of EBM principles as well as examine the effect of place-attachment to preferred management strategies.

79. THE EFFECT OF TAMARIX INVASION ON RIPARIAN WETLAND MICROTOPOGRAPHY

Schneider JE Department of Environmental Science, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Tamarix species, notoriously aggressive invasive plants in North America, pose great threats to riparian wetland habitat. Tamarix disrupts the hydrogeomorphological processes, increases the surface area of the wetland topography, forms dense monotypic stands (reaching up to 80% of vegetation cover) and drastically decreases community diversity. This facultative phreatophyte, has an extensive root system that taps directly into and draws down the water table. The resulting large-scale habitat desiccation, coupled with the allelopathic effect of leaf salt-excretion, effectively prevents native plant establishment. This expansive root system produces incredibly high rates of evapotranspiration, one tree can absorb up to 760 liters of water per day and yearly transpiration rates of Tamarix stands vary between 1.2-4m³. Aboveground, this root system accumulates organic matter and stabilizes the banks, greatly constricting natural waterways on average up to 27%. Tamarisk also produces high amounts of dead vegetation and the dense leaf litter alters the wetland microtopography. The combination of desiccation from the high rates of evapotranspiration and the buildup of organic matter greatly increases the occurrence of fires.

Post invasion, the riparian community diversity is greatly reduced due to shading of understory, increases in soil salinity and decreases in available water. Most importantly, the natural cycle of ecological succession is broken and native species are excluded from the system. The invasion success of Tamarisk can be attributed largely to quick recovery from environmental stresses and a tolerance for wide ranging ecological conditions.

80. **CROSS-LINKING AND DEGRADATION OF POLYHYDROXYALKANOATES (PHAs) USING A HIGH ENERGY ELECTRON BEAM**

Sgroi DJ, Zhu C, Mark DJ, Nomura CT, Nakas JP. Department of Chemistry, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Polyhydroxyalkanoates (PHAs) are a class of biologically produced aliphatic polyesters synthesized by numerous of bacterial species including, *Burkholderia cepacia* (*B. cepacia*) and recombinant *Escherichia coli* (*E.coli*). PHAs are also good candidates for use as biodegradable plastics. This research focuses on the interaction of PHAs under a high energy electron beam, which will cause the PHAs to either cross-link or degrade depending on the amount of radiation dosage added. When PHAs are irradiated, both cross-linking and degradation processes occur simultaneously with increase dosage. However, one process is going to predominate over the other. PHAs were extracted and precipitated out using chloroform and methanol and films were made for the high energy electron beam. Gel permeation chromatography (GPC) was then used to determine the molecular weight of the PHAs before and after irradiation. The molecular weight of PHAs extracted from *E. coli* was higher than *B. cepacia*. Irradiation of PHAs is expected to cross-link and degrade depending on the amount of dosage added to the polymer. If the PHAs cross-link, the polymer will be more durable and biodegradability will decrease. However, if a degradation reaction dominates under radiation, biodegradability will increase due to the lower molecular mass of the polymer. If this occurs, high energy electron beam treatment may be used as a technique for the rapid degradation of PHAs.

81. **ROLE OF ANT MOUNDS IN PEATLAND MICROTOPOGRAPHY**

Sirois AM. Department of Environmental and Forest Biology, State University of New York, College of Environmental Science and Forestry, Syracuse NY 13210

By altering hydrology and biogeochemistry, microtopography can play a significant role in determining biotic distribution in wetlands. North American peatlands have interesting and complex microtopography due to the presence of hummocks and hollows. Most hummocks are created and maintained by sphagnum mosses or tussock sedges. However, there are a number of species of ants that build large nests that create unique microtopography. These mounds can have soil chemistry that differs from hummocks built from vegetation. This case study will investigate how hummocks built by ants alter the biogeochemistry, hydrology, and patterns of vegetation in a Montana fen. Since there has been little other research investigating this specific relationship, results from the impacts of ant mounds in other habitats will be used to draw broader conclusions. A literature review of this topic was conducted and a qualitative model was developed. Both the ant species and the characteristics of the soil being used for construction play a large role in determining the nutrient availability and longevity of ant mounds. At least one characteristic that is found in almost all ant mounds are elevated levels of potassium. One ant species was found to play more of a role in cycling of microtopography, rather than just construction of it. Understanding the role that ant mounds play in biotic distribution of peatlands can play a critical role in both maintaining and restoring the high diversity of flora and fauna that are found in these wetlands.

82. ESF CARBON NEUTRAL

Carpenter MM¹, De Francesco CF², Foster JL³, Heavey JP⁴, Kulkarni SS⁵, Nayyar RA⁶, Petrie LM⁷, Rook SP⁸. 1 Environmental Studies – Communication and Culture, 2 Environmental Studies – Policy, 3 Environmental Studies – Policy, 4 Environmental Studies – Policy, 5 Environmental Science, 6 Environmental Science, 7 Environmental Studies – Policy, 8 Environmental Studies – Policy. State University of NY, College of Environmental Science and Forestry, Syracuse, NY 13210

In 2006 ESF President Cornelius B. Murphy signed the American Colleges and Universities Presidents Climate Commitment, "a high-visibility effort to address global warming by garnering institutional commitments to neutralize greenhouse gas emissions". ESF has chosen to set an aggressive carbon neutral date of 2015. The majority of CO₂ emissions at ESF are a result of direct campus electricity use. In 2007 electricity use at ESF was 10,828,100 kWh. This is equivalent to 3,880 metric tons of CO₂ emissions. Strategies to offset traditional sources of energy generation with low, or no carbon alternatives will be a key factor in achieving the goal of carbon neutrality. There are currently four major forms of offsets being considered at ESF; solar PV arrays, small wind turbines, biomass projects, and conservation/efficiency efforts. This research projects aims to determine the efficacy of each of these projects and evaluate them based on three major criteria: 1) Net energy offset measured in kWh 2) CO₂ equivalent measured in tons, and 3) Relative costs of each offset measured in dollars per metric ton of CO₂ offset. Further discussion includes the relative efficacy of each proposal and our recommendations for other options not examined here that may help ESF to achieve carbon neutrality in the near future.

83. LEED ANALYSIS OF THE ROSAMOND GIFFORD ZOO IN SYRACUSE, NY

Houde JM, O'Neill EE, Ahern MM, Chowdhury T, Pierce KA, Kelly JP, Sardon RC. Department of Environmental Studies, Department of Landscape Architecture, Department of Environmental Science, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

The energy auditing class of SUNY College of Environmental Science and Forestry is assisting the Rosamond Gifford Zoo in their efforts to achieve energy certification of the entire zoo. Their compliance with the energy and atmosphere pre-requisites towards LEED accreditation was analyzed by the class. This was accomplished using the ASHRAE Level 1, Walk through analysis, as defined in the "Procedures for commercial Building Energy Audits" (RP-669,SP-56). The walk through analysis required square footage of the building, copies of utility bills, completed energy performance summaries, derived target energy, demand and cost and comparison to other buildings with the lowest energy index, and the energy and cost savings for each fuel type. It was found that subsequent assessments and improvements are required of the zoo in order to meet the standards for LEED accreditation.

84. **DEGRADATION OF MICROCYSTINS IN FRESHWATERS BY LOW ENERGY ELECTRON BEAM RADIATION**

Snyder EB, Driscoll MS, Boyer GL, Satchwell MF

Department of Chemistry, SUNY College Environmental Science and Forestry, 1 Forestry Drive, Syracuse, N.Y. 13210

Microcystins are a hepatotoxin produced by *Microcystis* and *Anabaena* genus. They are produced within the cells of the cyanobacteria and when the cell lyses, the toxin is released. There are over 80 types of microcystins. Microcystin-LR (MCLR) is the most common and the most toxic type of microcystin. The World Health Organization has set up guidelines for the maximum amount of MCLR allowed in our drinking water to be 1.0 μ g/L. Current water treatment methods used to degrade MCLR carry restrictions on how effective they are while others are not effective at all. This study examines the degradation of MCLR by electron beam radiation and its effectiveness of reducing the cyanobacteria's toxicity. MCLR degradation was monitored using liquid chromatography with a mass spectrometer detector while the reduction in toxicity was determined using a protein phosphatase inhibitor assay. Dose response curves for both degradation of MCLR and the reduction of its toxicity have been produced. The toxicity and the concentration of MCLR decrease as the dose is increased from 0.25 kGy to 10 kGy.

85. **CASE STUDY: MICROTOPOGRAPHY IN SPHAGNUM BOGS BEFORE AND AFTER A FIRE DISTURBANCE**

Snyder CM. Department of Environmental Forest Biology, State University of New York College of Environmental Science and Forestry, Syracuse, NY 13210

Hydrology, biogeochemistry, and community dynamics influence the microtopography of a wetland. Bogs are ombrotrophic wetlands that accumulate peat due to climatic and geomorphologic factors. Limited flow of surface and ground waters often reduces nutrient exchange and cycling, while also producing acidic and anoxic conditions during extended flooding periods. Although production in these ecosystems is low, organic matter accumulates because of the lack of oxygen limiting microbial decomposition. Consequently, these harsh conditions restrict species inhabitation and allow opportunistic, acidophilic moss species such as *Sphagnum* become the dominant ecosystem engineer. *Sphagnum* colonies build the habitat on which they and other biota live; altering the exchange and flow of materials within the entire bog ecosystem. Hummocks and hollows are a typical bog microtopography created by *Sphagnum* and maintained by species' differences in decomposition rate and habitat specificity. Wildfire, an important occurrence in boreal bogs, can modify microtopography and subsequently change the physical and chemical environment. Combustion of biomass releases carbon storages into the atmosphere, while changing water movements and species composition within the bog. Moss species inhabiting hummocks and hollows differ in their abilities to establish depending factors such as fire intervals and severity, soil moisture, and microtopography. Re-colonization of moss species occurs sequentially after a fire event along a microtopographic gradient. These variables are important in understanding the role of fire within bogs, *Sphagnum* relationships as an ecosystem engineer, and ecological principles of succession.

86. DIMETHYL SULFIDE IN MARINE PHYTOPLANKTON

Spiese CE, Kieber DJ, Kiene RP. Department of Chemistry, State University of New York, College of Environmental Science and Forestry, Syracuse NY 13210, Dauphin Island Sea Lab, Dauphin Island AL

Dimethyl sulfide (DMS) is an important sulfur trace gas produced by a number of marine algal species. DMS is hypothesized to play a role in climate regulation, and therefore understanding the various factors that lead to its release into the water column and lower atmosphere are crucial to constraining its role in the formation of cloud condensation nuclei. We studied two pathways leading to the formation of DMS in marine algae, as well as making the first empirical estimates of intracellular DMS concentrations. For species producing the immediate precursor to DMS, dimethylsulfoniopropionate (DMSP), the intracellular DMS concentration was found to range from 1-10 mM, confirming earlier estimates. This DMS was shown to diffuse slowly out of the cell, leading to a long turnover via this pathway. Oxidation of DMSP was found to be one of two major formation pathways, particularly in DMSP-producing species. The reduction of dimethyl sulfoxide (DMSO) was also found to be an important production pathway in certain algal species. DMSO reduction is of special importance due to its apparent universality in marine algae, regardless of DMSP production. This implies that DMS production itself is a universal activity under certain circumstances. The role of DMS production in marine algae is still poorly understood, but by constraining the production and loss pathways, the factors controlling the intracellular DMS concentrations will be better understood.

87. MICROTOPOGRAPHY OF CALIFORNIA TIDAL SALT MARSHES

Stebbins ER. Department of Science Education, Syracuse University, Syracuse NY 13244

Microtopography is affected by various components of an ecosystem, including hydrology, biogeochemistry, and vegetation. Coastal salt marshes typically have open hydrology and undergo regular flushing of organic matter. The interior portions are more closed with less regular flushing, which results in lower soil redox potentials and higher concentrations of ammonium and hydrogen sulfide. The varying degrees of soil saturation and salinity influence the species composition, including those of invasive aliens. Understanding how the microtopography affects the growing conditions of plant species can help when developing management practices for salt marshes. It is not only mesotopographical features such as tidal creeks that are essential to include during restoration, but the microtopographical features such as shallow depressions that play a key role in natural salt marshes that should be considered as well.

88. THE SUITABILITY OF POLYMER FILMS FOR USE IN RADIATION DOSIMETRY

Stock LR, Driscoll MS, Department of Chemistry, SUNY- College of Environmental Science and Forestry, Syracuse, NY 13210

Commercially available dosimeters give an unreliable surface dose for low energy electron beams (80 to 200 KeV). The active depth of these dosimeters is too great to give an equal entrance, equal exit dose. Thus, there is a depth profile with the dose dropping as you go deeper into the dosimeter. While this gives an integrated dose, the surface dose is still unknown. The use of thin polymer films that show chemical and/or physical changes when exposed to ionizing radiation shows great promise as low energy electron beam dosimeters. Irradiation of polymer films generates rapidly decaying and relatively stable radiolysis products. These stable products absorb in the ultraviolet and visible region making them highly desirable dosimeters. We hypothesize that there will be a strong linear correlation between the dose administered by a low energy electron beam unit (125 KeV) and the appearance of absorption peaks. To test our hypothesis, we selected polyvinyl chloride, polyvinylidene fluoride, tetrafluoroethylene-per-fluoromethoxyethylene, tetrafluoroethylene-hexa-fluoropropylene, polytetrafluoroethylene, Tedlar and Halar films to be irradiated with 100 kGy of 125 KeV electrons. Absorbance peaks were detected for most films in the 220-260 nm range. Tedlar and Halar proved to have the strongest absorbance of all the films with absorbance peaks at 241nm and 251nm respectively. Dose absorbance curves were generated for both Tedlar and Halar from 10-100 kGy. Results show a linear correlation between absorbance and the administered dose. In conclusion, results suggest that both Tedlar and Halar are suitable surface dosimeters for low energy electron beams.

89. OPTICAL DISCRIMINATION OF ALGAL GENERA ON THE BASIS OF THEIR PIGMENT FINGERPRINTS.

Sullivan JM, Boyer GL. Department of Chemistry, State University of New York College of Environmental Science and Forestry, Syracuse, NY 13210.

Determination of algal bloom species in the past has required direct sampling of the bloom followed by identification by microscopy. Newer methods have been developed to identify algal groups based on their visible or fluorescent pigment signatures. Fluorescence signatures can divide algae into green, blue-green, diatoms, and other classes. Division into these higher level groupings may be useful, but fluorescent signatures are unlikely to differentiate species at the family or genus level. The development of the Optical Phytoplankton Discriminator (OPD) has potential to separate genera and species using the signatures of their pigments in the visible region. The OPD is a self-contained sampling apparatus which uses a liquid capillary waveguide flowcell to determine a spectrum from a whole-water sample. This spectrum is corrected for dissolved organic matter and compared to reference spectra in a database to identify the algae in the sample. Application of the OPD to distinguish harmful algal species, at the family and genus level, will be presented.

90. DOMINICAN REPUBLIC COMMUNITY SERVICE PROJECT AND DISCUSSION ON SUSTAINABILITY AND CONSERVATION ISSUES

Sumoski SE, Walker JA, Wahls JCE, Frisicano MR, Mahaney MD, Wyman SL, Freedman SK, Meeks BA, Weiss PJ, Brand MA, Haacker MA, Rodriguez LM, Stoutenburgh PR

During the winter break of 2008-2009, a group of ESF students travelled to the Dominican Republic to be part of a service project orchestrated through the Society for Conservation Biology- CNY and a community outreach organization, Sustainable Horizons. The objective of this outreach program was to build eco-stoves as an energy efficient alternative to cooking on open fires for less fortunate Dominican families. All students lived with host families amongst the small mountain community of Rio Grande, Abajo, for eight days. During this time period students were taught how to construct eco-stoves which the community peoples were accustomed to using, and then proceeded to provide the fiscal and physical support for the construction of sixteen stoves for families amongst the community. Following this community work, the service group spent time in a coastal city Sosua, experiencing the native culture and exploring coastal reefs. To further our knowledge and understanding of the history and culture of the Dominican Republic, a course at ESF was created dealing with issues in DR. The class has facilitated independent work groups to focus on a variety of topics dealing with conservation and sustainability. These topics include Fuel Sources, Energy issues, Waste Disposal, Eco-Tourism, Cacao production (chocolate), and Environmental Education. This joint trip was quite a community success for those residents of Rio Grande, Abajo, and an inspirational experience for all parties involved.

91. MODELING STREAMFLOW WITH THE REVISED GENERALIZED WATERSHED LOADING FUNCTION (GWLF) AT THE TROUT CREEK IN THE CANNONSVILLE BASIN, 1997-2007

Sun N, Hall M. Department of Environmental Studies, State University of New York, College of Environmental Science and Forestry, Syracuse, NY, 13210

Streamflow quantity is essential to predict flooding, and estimate nutrient and sediment discharges. I rewrote the GWLF runoff model in Fortran Language to simulate daily streamflow, estimated as a combination of surface runoff and groundwater discharge, of the Trout Creek watershed. This model comprises the NRCS runoff Curve Number and a lumped parameter water balance model on the saturated and unsaturated zones. Daily air temperature, precipitation, land use map, and soil characteristics were major inputs to simulate streamflow. Key parameters of the model, which were derived from literature, were calibrated based on the observed daily streamflow from 1997 to 2007 at Trout Creek. (The crop coefficient was revised from 0.5~1.5 to 1.2, groundflow recession from 0.96 to 1 and melt coefficient from 0.45 to 0.9). According to the validation results with revised parameters, the model provides reasonable estimates of monthly and annual streamflow, which were exhibited in terms of hydrograph plots. Also, Root Mean Square Error was reduced to 9.89 from 54.63 after calibration.

92. **WHO IS THERE NOW? A LOOK AT THE FUNGAL COMMUNITY ON *PINUS RESINOSA* PLANTED ON IRON MINE TAILINGS 20 YEARS AGO**

Sztecmiler E, Horton TR. Department of Environmental and Forest Biology, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Mycorrhizal fungi play key roles in the reestablishment of plant communities in severely disturbed and stressful systems, such as mine tailings. Taking advantage of this symbiosis makes sense in terms of land reclamation and community regeneration. Over 20 years ago *Pinus resinosa* seedlings inoculated with *Wilcoxina mikolae*, *Phialophora finlandia*, *Pisolithus tinctorius*, and *Suillus subluteus* were outplanted onto iron ore mine tailings in Star Lake, NY to investigate which fungi provided the greatest benefit to pine establishment. The purpose of my study was to return to these plots and determine whether the original mycorrhizal treatments were still present and whether any new ectomycorrhizal fungi had become established with the pines. Fruiting bodies and soil cores were collected within the original plots from June to August 2008. Ectomycorrhizal colonization of root tips was determined and analyzed using PCR, RFLP, and DNA sequencing. Sequences were subjected to Genbank BLAST search to determine order, family, genera, or species. Ten RFLP types were recovered, of these nine yielded sequence data. We detected the presence of *Inocybe (lacera)*, *Russula (cremoricolor)*, *Russula (red)*, *Rhizopogon sp.*, and *Thelephora sp.* from fruiting bodies and *Thelephora sp.*, *Tricholoma sp.*, *Cantharellales*, *Atheliaceae*, *Pezizales*, *Sistotrema sp.*, and *Cortinarius sp.* from root tips. None of the fungi used in the original study were recovered. These results indicate a successful restoration effort in which the introduced fungi contributed to seedling establishment but were replaced by local species adapted to the site.

93. **ECOLOGICAL EFFECTS OF A *PHALARIS ARUNDINACEA* INVASION ON SEDGE MEADOWS**

Talucci TD. Department of Forest and Natural Resources Management, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

There is much evidence to support the idea that the tussocks formed by *Carex stricta* (the tussock sedge) increase the biodiversity of plant life in sedge meadows and marshes. A tussock is a raised bed or mound that forms around the base of *Carex stricta* from the accumulation of sediment and dead plant material around the roots and rhizomes. The results of a study on Wisconsin wetlands show microtopography created by these tussocks offers a wide range of growing conditions due to heterogeneity in soil hydrology and biogeochemistry, supporting an array of plant species. A separate study by the same experimenter suggests the introduction of *Phalaris arundinacea* (reed canary grass) into a wetland can displace native species, including *Carex stricta*. This displacement occurs upon invasion due to dramatic changes in the hydrology, biogeochemistry, light availability and microtopography of the wetland. *Phalaris arundinacea* invasions destroy the microtopography created by *Carex stricta*, greatly reducing the biodiversity of sedge meadows. Often times, invasions lead to monospecific stands of *Phalaris arundinacea*. The objective of this activity was use the results of the research on this topic to better understand the invasion of *Phalaris arundinacea* and its effects on the microtopography created by *Carex stricta*.

94. DEVELOPING A LAND-BASED MONITORING STATION ON THE SAINT LAWRENCE RIVER

Thomas SP, Pavlac MM, Oakes RL, Hassett JP, Farrell JM, Boyer GL. State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Algal blooms in the Great Lakes have been a topic of study for the past 25 years. As the movement of these blooms is better understood, the need to develop a system that will accurately monitor them has developed. In this study, we focused on the development of a land-based system located approximately 16 miles down stream of the outlet of Lake Ontario on the St. Lawrence River. The system was installed at the Thousand Islands Biological Station on Governor's Island, which is one of SUNY ESF's field stations, in Clayton, NY. For the 2008 field year, we focused on the development of the system and troubleshooting problems as they arose. A Hach Hydrolab was used to collect basic water quality data (i.e. pH, temperature). This data assisted in determining the efficiency of the system. For 2009, we will be focusing more on data collection and making the information publicly available through the use of a web site which will be updated in real-time.

95. IMPLEMENTATION OF BEST MANAGEMENT PRACTICES AND FOREST MANAGEMENT PLANS ON NONINDUSTRIAL PRIVATE FORESTLAND IN DELAWARE COUNTY, NEW YORK

VanBrakle JD, Germain RH. Department of Forest and Natural Resources Management, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

New York City's water supply system supplies over 1.3 million gallons of water to over 9 billion people daily while operating under an Environmental Protection Agency filtration avoidance waiver. Ninety percent of this water comes from the Catskill/Delaware Watersheds, largely owned by private landowners holding small acreages. The Watershed Agricultural Council (WAC) Forestry Program assists these landowners in maintaining forest and water quality through forest management plans, cost sharing incentives, and promotion of Best Management Practices (BMPs). This study seeks to evaluate the efficacy of the program by comparing sustainable forest management practices of program participants with non-participants. The sample will consist of 60 recently harvested properties in Delaware County with at least 50 acres of forest. During the summer of 2009 we plan to conduct evaluations on 30 properties with WAC management plans and 30 without plans. All properties will be evaluated for BMP implementation by taking a census of each recently harvested site and comparing conditions to New York BMP guidelines. On management plan properties, plan implementation will be evaluated by measuring residual and pre-cut stand conditions through prism point and point-centered quarter sampling. These measurements will be compared with the management plan for each property. The results of this study will determine whether WAC management plans are actually followed and whether they contribute to better BMP implementation and silvicultural practices versus non-participants. In addition, this study may help WAC and similar organizations develop better incentives to promote BMPs and forest stewardship.

96. **ASSESSING HYDROLOGICAL PATTERNS TO ESTABLISH RATING CURVES IN TWO PAIRED SUBCATCHMENTS IN THE ARBUTUS LAKE WATERSHED IN THE ADIRONDACK PARK**

Villanueva M, Mitchell MJ. Undergraduate Mentoring in Environmental Biology Program, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Discharge and stage height values for two streams (S14 & S15) in the Arbutus Lake Watershed (Newcomb, NY) were monitored in order to develop experimental rating curves for the adjacent streams. Knowledge of stream patterns is essential to understand the biogeochemistry of small forested watersheds, and corresponding landscape attributes contribute to differences between their hydrological relationships. There is an increasing interest in the comparison of hydrological responses of these two adjacent subcatchments because of their strong similarities in structure but differences in chemistry and vegetation. At the Archer Creek Catchment, V-notch weirs have been previously installed (2006) in order to gauge streams 14 and 15 to accurately monitor stream discharge (Q) on a continual basis. The total capture method was employed to manually record discharge for both streams using a calibrated 10-liter bucket. The results of total capture data were compared to the standard rating curve for a 90-degree V-notch weir [$Q = 2.48 \cdot (\text{stage height})^{2.48}$]. Total capture measurements for Stream 15 showed higher rates of discharge compared to the standard rating curve compared to Stream 14. Groundwater well data was used to complement the patterns in discharge for the two streams. The monitoring of hydrologic responses of the two streams is an ongoing project in the Arbutus Lake Watershed in order to evaluate data for the entire hydrologic regime.

97. **LASER- INDUCED FLUORESCENCE SPECTRA OF 1-METHOXY-2-PROPYL RADICAL**

Wang J, Dibble TS. Department of Chemistry, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

The formation of ozone and organic aerosols in polluted air is controlled by the degradation of volatile organic compounds (VOCs). Alkoxy radicals (RO \cdot) are the intermediates in the degradation of most VOCs, and their fate influences ozone production in polluted air. Alkoxy radicals can react with O $_2$ or undergo decomposition and isomerization reactions in the atmosphere. Laser -induced fluorescence spectroscopy (LIF) can be used to monitor the disappearance of alkoxy radicals in kinetic studies. The LIF spectra of alkoxy radicals with hydrocarbon chains have been well established, however, no one has done any LIF experiments on alkoxy radicals with oxygenated functional groups. A convenient source of alkoxy radicals in experiment is photolysis of alkyl nitrites (RONO). Now we focus on the synthesis and purification of nitrites with ether groups, starting with 1-methoxy-2-propyl nitrite.

98. **MONITORING DIFFERENCES IN GENE EXPRESSION LEVELS OF
PSEUDOMONAS PUTIDA KT2440 GROWN ON DIFFERENT CARBON SOURCES**

Wang, Q, Nomura, CT. State University of New York, College of Environmental Science and Forestry (SUNY-ESF), Department of Chemistry, Syracuse, NY 13210

Polyhydroxyalkanoates (PHAs) are microbially produced, biodegradable polymers with a wide-range of applications. The strain *Pseudomonas putida* KT2440 is known to produce large amounts of medium-chain-length polyhydroxyalkanoates (MCL-PHAs). In addition the genome for this organism has been sequenced. Despite all of the genomic sequence available, there is still a dearth of information regarding the regulation of these pathways when the strain is grown in the presence of different carbon sources. In this study, *P. putida* KT2440 was grown on different carbon sources, such as glycerol, glucose, citrate and lauric acid. Total RNAs were purified and the expression levels of genes involved in glycerol metabolism, Entner-Doudoroff pathway, TCA cycle, β -oxidation and fatty acid biosynthesis were monitored by quantitative real-time PCR (Q-PCR). Comparison of the expression levels of these genes in *P. putida* when grown in the presence of different carbon sources, will improve our understanding of how the strain utilizes different carbon sources and how the genes encoding enzymes for various carbon utilization pathways are regulated. This research will also lead to metabolic pathway design to enhance the efficiency of utilization of different carbon sources which could effectively lower the cost of producing biodegradable polymers.

99. **ASSESSING NATIVE PARASITOID INFLUENCES ON AN INTRODUCED WOOD-BORING WASP, *SIREX NOCTILIO***

Werner NA, Parry D, Fierke MK, Allen DC. Department of Environmental and Forest Biology, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

The non-native European woodwasp, *Sirex noctilio*, was first detected in North America in Fulton, NY in 2004. Including New York, the current distribution spans Ontario, Pennsylvania, Michigan and Vermont. The woodwasp predominantly infests suppressed Scots and red pine, but has also been reported to attack white pine. *S. noctilio* has historically caused severe damage on North American pine species in southern hemisphere plantations. Three parasitoids, native to North America, have been successfully introduced as biological control agents of *S. noctilio* in those regions. Goals of this research are to investigate the importance of stand characteristics on native parasitoid dynamics in New York through experimental manipulation across stands with varying densities of *S. noctilio*. The spread of this insect to the west poses a threat to regions where red pine is of high value, including the Midwestern states of Michigan, Wisconsin and Minnesota. Economically important pine plantations of loblolly and slash pine to the south provide potential hosts for the insect. This work will provide insight on the influence native parasitoids have on *S. noctilio* populations in North America and aid management decisions in economically important pine plantations across the country.

100. **FIELD RESPONSE OF THE ASIAN LONGHORNED BEETLE, *ANOPLOPHORA GLABRIPENNIS* (MOTCHULSKY) TO HOST AND FEMALE VOLATILES**

Wickham JD, and Teale SA. Department of Environmental and Forest Biology, State University of New York, College of Environmental Science and Forestry, 1 Forestry Drive, Syracuse, NY 13210

ALB have complex cuticular hydrocarbon profiles that vary with sex, age, and mating status. Analysis of the cuticular hydrocarbon chemistry of virgin female ALB revealed many compounds that are structurally related to the five monounsaturated compounds identified as the contact sex pheromone by Zhang et al. [1], and are hypothesized to have multiple roles in the mating sequence of ALB as (1) contact sex pheromones, (2) trail pheromones, and (3) antecedents to long-range female sex pheromones. These compounds are produced in maximum abundance by virgin females which sharply reduce their production immediately after mating, and are the basis for formulating lures for testing in China. Lures containing female pheromone blends were tested in Ningxia, China during summers of 2006-2008 using flight-intercept panel traps. In July 2006, virgin female pheromone blends captured more beetles than mated female blends and single component lure, while in a second 2006 field experiment the full female blend plus plant volatiles and linalool oxide captured more beetles than controls. In July 2007, an experiment with more natural release rates, a three-component blend with plant volatiles and linalool oxide captured more beetles than controls and this treatment preferentially captured males. In July 2008, lures containing additional pheromone components plus plant volatiles and linalool oxide, again preferentially captured males. These results are the first field evidence of a female long-range pheromone in ALB, or any species of the subfamily Lamiinae.

[1] Zhang et al., 2003. Evidence for contact sex recognition pheromone of the Asian longhorned beetle, *Anoplophora glabripennis*. *Naturwissenschaften* 90:410-413

101. **GROUND-LEVEL VEGETATION RESPONSE TO MECHANICAL SITE PREPERATION**

Wightman MW, Nyland RD. Department of Forest and Natural Resources Management, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Site preparation by herbicide application has been utilized in the northern hardwood forest when American beech (*Fagus grandifolia*) and various fern species in the understory inhibit the regeneration of commercially desirable species. Public reaction regarding the perceived negative impacts of herbicides has been intense recently, which has resulted in the call for alternative methods. Mechanical methods effectively control beech and promote the regeneration of desirable woody species however the response of understory vegetation is not well documented. The goal of this study was to investigate the influence of mechanical site preparation on the abundance and diversity of ground-layer vegetation. Three treatment sites were established in 2000 within the Adirondack region in Essex and Hamilton counties. Treatment consisted of felling all understory hardwoods less than 14 cm dbh. 1 m² plots were sampled in 2008 on treated and control areas to investigate changes in understory vegetation. The percent cover of understory herbs was found to be significantly greater on treated plots than on untreated plots ($P < 0.01$). Treated sites had an average herb cover of 19% whereas untreated plots had an average herb cover of 6.3%. The number of herb species was also found to be significantly greater on treated plots. Eight of the thirty species sampled were only found on treated plots. The results of this study suggest that mechanical site preparation increases the cover and diversity of understory herbs and therefore may be a useful tool if a diverse and abundant herbaceous community is an objective of management.

102. **DENDROENTOMOLOGICAL EVIDENCE OF *SIREX NOCTILIO* INFESTATION**

Williams GM, Fierke MK Department of Environmental and Forest Biology, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Sirex noctilio F., an exotic wood-boring wasp, was identified in a flight intercept trap located near Fulton, New York in February, 2005. Since then the Siricid and its symbiotic fungus, *Amylosterum areolatum*, has been identified throughout New York State. The recent infestation has raised many questions about the dynamics of invasion of the wood wasp in the northeast and how it will affect native and planted *Pinus* species in the central New York region. A study was conducted to address the feasibility of using dendroentomology to determine if oviposition results in scars which can be identified and dated in the tree ring record. Five half-meter bolts of infested *Pinus sylvestris* were taken from Tully, New York and cut into half inch cookies. Cookies were arranged in order and larval galleries were traced back using chisels and microscopy. Origin of oviposition was identified by connecting proposed oviposition wounds in tree with the larval galleries. At this point, it does not appear that using oviposition scars is a feasible method for tracking the invasion of this insect. This is likely due to the short period of time that the insect has been infesting pines here in New York as well as their predilection for choosing suppressed trees that succumb quickly.

103. STABLE ISOTOPE STUDIES OF A CORAL REEF

¹Wurzel WW, ²Teece MA. ¹Department of Environmental Science, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210, ²Department of Chemistry, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Coral reefs are incredibly complex ecosystems found in a limited margin of the world's oceans. These reefs provide many extractable and intrinsic benefits to humanity that number well into the billions globally. The oceans are difficult to study, as such there is a lot humanity does not understand about marine ecosystems. In an effort to better understand these complicated systems, stable isotopes have been employed to analyze food web dynamics on two coral reefs in the Florida Keys. The reefs are south of Long Key in and around Hawk Channel. The Coral Gardens site is 3m deep, within Hawk Channel and relatively close to shore. The Transp 11 site is 6m deep, outside Hawk Channel and offshore. Samples collected in the summer of 2008 were freeze dried, ground into a powder and run through a Finnigan Elemental Analyzer connected to a Costech Mass Spectrometer. Preliminary results of primary producers and primary consumers show unknown members in the base of the food web. Values also indicate different nitrogen and carbon sources for the ecosystems. The carbonate chemistry of the water is also revealed in the values of primary producers. It is essential to understand the trophic dynamics of any ecosystem to comprehend its resiliency to external influences and to implement effective management strategies. Management of these systems extends beyond human use to the effects of global warming. How these ecosystems will react to the myriad consequences of global warming can have far reaching affects on humanity.

104. MODEL SIMULATION OF URBAN EVAPOTRANSPIRATION RATES GIVEN SPATIAL CHANGES IN LAND COVER AND ELEVATION

Yang Y, Endreny TA. Department of Environmental Resources and Forest Engineering, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Urban heat islands (UHI) emerge due to changes in albedo and imperviousness as compared with surrounding countryside, and UHI mitigation plans have focused on increasing urban tree cover. Trees can cool urban areas by direct shading and indirect evapotranspiration. Our goal is to create spatially distributed estimates of tree evapotranspiration during the growing season, to use in human thermal comfort models and other UHI simulations. We are modifying tree anatomy and growth functions in the USDA Forest Service Urban Forest Effects (UFORE) model. Modification represents the spatial variation of soil moisture and canopy radiation, which regulate evapotranspiration. Surface elevation derived topographic indices and land cover maps, including NLCD and aerial photographs, are used to adjust weather station estimates of radiation and soil moisture. Tree species and initial anatomy were selected from data gathered by the USDA Forest Service from plots in Syracuse, New York. Model estimates of evapotranspiration were generated for 30m by 30m pixels, and represented soil water and radiation constraints by modifying parameters in the Penman Monteith equations. Future work involves incorporating land cover and topographic data uncertainty into soil moisture and radiation constraints, which would be represented through Monte Carlo simulations. Applications of this research will be considered for the UFORE model in managing urban forest tree plantings to mitigate UHI impacts.

105. **MODEL SIMULATION OF IN-CHANNEL RESTORATION STRUCTURES AND THE DISRUPTION OF CROSS-STREAM CIRCULATION AND STREAMWISE VELOCITY PATTERNS IN MEANDER BENDS**

Zhou T, Endreny TA. Department of Environmental Resources and Forest Engineering, State University of New York, College of Environmental Science and Forestry, Syracuse, NY 13210

Channel restoration in developed areas often attempts to slow or stop lateral migration at meander bends by using in-channel restoration structures, such as vanes and j-hooks. Our modeling experiment examines how in-channel structures affect cross-stream circulation and streamwise velocity patterns, with the results guiding field monitoring campaigns. Simulations were conducted with the FLOW 3D computational fluid dynamics (CFD) package. Before modeling in-channel structures, the CFD model framework was verified using laboratory flume data generously provided by Ecole Polytechnique Federal in Lausanne, Switzerland. The flume was 1.3 m wide, had a 0.15 m boundary flow height, a straight inflow section sloped at 0.22%, a 190° meander bend, and a 1.7 m radius of curvature, and was used a rectangular and a sloping bed. The subsequent simulation included one or more in-channel structures in the meander bend, and changes in the cross-stream circulation strength and streamwise velocity patterns at meanders were recorded. The in-channel structures were able to reverse and stop cross-stream circulation along the in-channel structure, and disrupt the streamwise velocity core. The magnitude of these disruptions varied with changes in radius of curvature and inflow depth. Simulation results suggest radius of curvature and in-channel restoration structures could be jointly modified to maintain cross-stream circulation when needed for key point bar or cut-bank processes.