2007 Spotlight on Student Research & Outreach

April 20th, Nifkin Lounge - Marshall Hall

State University of New York
College of Environmental Science & Forestry

Sponsored by Faculty Governance & Office of Research Programs

2007 Spotlight on Student Research & Outreach

Nifkin Lounge, Marshall Hall
Friday 12 pm – 3 pm, April 20, 2007

SUNY ESF, Syracuse, NY 13210 USA
www.esf.edu/ric/spotlight

An Earth Day Celebration

Acknowledgments:

SUNY ESF Students
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Graduate Student Association
Instructional Technology Service
Committee on Research

Spotlight on Student Research & Outreach
Nifkin Lounge in Marshall Hall, SUNY ESF Syracuse Campus

April 20, 2007

Schedule of Events

10:30 - 11:50 pm Poster Setup

12:00 - 12:10 pm Welcoming Comments from the Committee on Research

Announcement of the ESF *Exemplary Researcher Award*
- Presented by ***Dr. Neil Ringler***, Dean of Research Programs
- Awarded to ***Dr. David J. Kieber***, Professor of Chemistry

12:10 - 12:35 pm Keynote Speaker, ***Dr. Gregory L. Boyer***, Professor of Chemistry & Executive Director, Great Lakes Research Consortium.

Title: *"Harmful Algal Research in a Multidisciplinary World"*

12:30 - 1:30 pm Guided Viewing of Posters by Student Researchers

1:30 - 3:00 pm Self-Guided Viewing of Posters

3:00 - 3:30 pm Poster Removal

Listing of Spotlight Posters by Faculty / Program to Help Guide Your Viewing

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Environmental Resources & Forest Engineering	6
Environmental Studies	3
Chemistry	13
Forest & Natural Resources Management	14
Graduate Program in Environmental Science	3
Landscape Architecture	2
Paper & Bioprocess Engineering	2

A proceedings of abstracts is available for viewing at the entrance of Nifkin Lounge, and also online at the Spotlight website (http://www.esf.edu/ric/spotlight/2007/).

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SUNY ESF, Syracuse, NY 13210 USA
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Teresa Boettrich, W.A Powell, Department of Environmental Forest Biology 319 Illick Hall, State University of New York College of Environmental Science and Forestry, Syracuse, NY 13210-2788.

POLYHYDROXYALKANOATE (PHA) PRODUCTION AND COMPOSITION OF *PSEUDOMONAS PUTIDA* KT2440 UTILIZING GLYCEROL AS A SOLE CARBON SOURCE, WHILE NITROGEN IS LIMITED
G.D. Boyd, M. Martino and C.T.Nomura, Department of Chemistry, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

HYDROGEN PRODUCTION BY *RHODOPSEUDOMONAS PALUSTRIS*
C.A. Edwards, J.A. Perrotta, and J.P. Nakas, Department of Environmental & Forest Biology, SUNY College of Environmental Science and Forestry, Syracuse, NY

THE EFFECTS OF INDUSTRIAL CONTAMINATED SOIL IN TRANSGENIC HYBRID POPLARS (*POPULUS X EURAMERICANA*
D. Napelitano-Fairbank and W. Powell, Department of Environmental and Forest Biology, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

ROOTING IN TRANSGENIC AMERICAN CHESTNUT PLANTS WITH COBALT CHLORIDE
D. Grainger, N. Kaczmar and W. Powell, Department of Environmental and Forest Biology, SUNY College of Environmental Science and Forestry, Syracuse,NY 13210

GROWTH AND ETHANOL PRODUCTION FROM YEAST AND BACTERIA STRAINS GROWN ON ESF WOOD HYDROLYSATE
R.A. Livingston and T.M. Keenan, Department of Environmental and Forest Biology, 121 Illick Hall, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

COMPOSITIONAL CHARACTERIZATION OF HARDWOOD HEMICELLULOSIC HYDROLYSATES FOR USE IN BIOFUEL AND BIOPRODUCT PRODUCTION
G. Nickerson, R. Randall and T. Keenan, Department of Environmental and Forest Biology, SUNY College of Environmental Science and Forestry, Syracuse, NY, 13210

PHYLOGENETIC ANALYSIS OF WILLOW SPECIES BASED ON *matK* DNA SEQUENCE

I. Sade, L. Chen, K. E. Leopold and L. B. Smart, Department of Environmental and Forest Biology, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

TRITERPENOID CONTENT AMONG LATEX PRODUCING EUPHORBIA SPECIES

J.P. Zangari and J.L. Giner, Organic Chemistry of Natural Products, 416 Jahn Laboratory, SUNY College of Environmental Sciences and Forestry, Syracuse, New York, 13210.

EFB (Environmental &Forest Biology)

THE INFLUENCE OF FOREST FLOOR MOSS COVER ON ECTOMYCORRHIZAL ABUNDANCE IN DOUGLAS-FIR FORESTS OF THE CENTRAL-WESTERN OREGON CASCADES

J.E. Cappellazzi, T.R. Horton and R.W. Kimmerer, Department of Environmental and Forest Biology, 242 Illick Hall, SUNY-College of Environmental Science and Forestry, Syracuse, NY 13210

COMPLEX INTERACTIONS BETWEEN SNOW, SOIL FREEZING AND MOOSE IN A NORTHERN HARDWOOD FOREST

L.M. Christenson[1&2], M.J. Mitchell[1], P.M. Groffman[2] and G.M. Lovett[2] [1]Department of Environmental and Forest Biology, Illick Hall, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210 [2]Institute of Ecosystem Studies, Millbrook, NY 12545

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C.E. DeJesus, Department of Environmental and Forest Biology, 426 Illick Hall, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

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M.A. Domser, M.J. Mitchell, K.M. Roy, N.L. Houck and P.J. McHale, Department of Environmental & Forest Biology, 204 Illick Hall, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

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A.S. Eallonardo Jr. and D.J. Leopold, Department of Environmental and Forest Biology, 401 Illick Hall, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

SCIENCE TRAILS: CONNECTING CLASSROOMS TO NATURE

S.M. Fox and D.A. Saunders, Department of Environmental and Forest Biology, 356 Illick Hall, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

CONSERVING BIOLOGICAL DIVERSITY IN AGRICULTURAL LANDSCAPES: THE EFFECTS OF LIVESTOCK GRAZING ON FEN WETLAND PLANT COMMUNITIES

K. L. Hajek and D. J. Leopold, Department of Environmental and Forest Biology, 401 Illick Hall, SUNY-College of Environmental Science and Forestry, Syracuse, NY 13210

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L.A. Heath, A.S. Eallonardo, Jr. and D.J. Leopold, Department of Environmental and Forest Biology, SUNY-College of Environmental Science and Forestry, Syracuse, NY 13210

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L.M. Huber[1] and M.A. Teece[2]
[1]Department of Environmental and Forest Biology, [2]Department of Chemistry, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

INITIAL RIPARIAN RESTORATION ALONG AN URBAN STREAM, **ONONDAGA CREEK, NY**

C.L. Landis and D.J. Leopold, Department of Environmental and Forest Biology, 241 Illick Hall, SUNY-College of Environmental Science and Forestry, Syracuse, NY, 13210

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J.D. Lopez and S. McNulty, Department of Environmental Forest Biology, SUNY-College of Environmental Science and Forestry, Syracuse, NY 13210

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G.R. Miles and M.J. Mitchell, Department of Environmental and Forest Biology, SUNY-College of Environmental Science and Forestry, Syracuse, NY 13210

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B. E. Murphy and D. J. Leopold, Department of Environmental and Forest Biology, 512 Illick Hall, SUNY-College of Environmental Science and Forestry, Syracuse, NY 13210

UNDERSTANDING LAND USE CHANGE AS A FUNCTION OF ECOLOGICAL / ECONOMIC GRADIENTS IN THE CONNECTICUT HIGHLANDS

S. J. Myers and M. H. Hall, Environmental and Forest Biology, 302 Illick Hall, SUNY-College of Environmental Science and Forestry, Syracuse, NY 13210.

GENETIC VARIATION IN EASTERN COYOTES AND THEIR POTENTIAL HYBRIDIZATION WITH EASTERN GRAY WOLVES

A.B. Partch, A.E. Newhouse and J.L. Frair, Department of Environmental and Forest Biology, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

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K.M. Pitcher, K.D. Cameron and L.B. Smart, Department of Environmental and Forest Biology, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

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D.V. Popescu and J.P. Gibbs, Department of Environmental and Forest Biology, 305 Illick Hall, SUNY College of Environmental Science and Forestry, 1 Forestry Drive, Syracuse, NY 13210

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S.A. Quinn and A.S. Eallonardo, Department of Environmental and Forest Biology, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

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C.D. Schirmer and D.J. Leopold, Department of Environmental and Forest Biology, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

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K. T. Shoemaker, Department of Environmental & Forest Biology, 305 Illick Hall, SUNY-College of Environmental Science and Forestry, Syracuse, NY 13210

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J.L. Smith[1], K.L. Schulz[1] and G.L. Boyer[2]
[1] Department of Environmental and Forest Biology, [2] Department of Chemistry, SUNY College of Environmental Science and Forestry, Syracuse NY 13210

PARASITISM OF THE NATIVE SILK MOTH *ANTHERAEA POLYPHEMUS* BY THE EXOTIC TACHINID *COMPSILURA CONCINNATA* (DIPTERA) IN NEW YORK

G.M Tuttle and D. Parry, Department of Environmental and Forest Biology, 109 Illick Hall, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

ERFEG (Environmental Resources & Forest Engineering)

DOES SULFATE (SO_4^{2-}) REMOVAL DURING SAMPLE PREPARATION FOR ION CHROMATOGRAPHY IMPACT DETECTION OF NITRATE (NO_3^-)?

K.D. Berler[1], L.K. Lautz[2] and K. Hubbard[2]
[1]Department of Environmental Resources and Forest Engineering, [2]Department of Forest and Natural Resources Management, SUNY-College of Environmental Science and Forestry, Syracuse, NY 13210

THE ANALYSIS OF A CONTINUOUS FRYER OIL TO BIODIESEL SYSTEM

J.M. Boettger and D.J. Daley, Department of Environmental Resources and Forest Engineering, SUNY-College of Environmental Science and Forestry, Syracuse, NY 13210

GROUNDWATER RESTORATION OF ONONDAGA CREEK

V.B. Collins and T.E. Endreny Faculty of Environmental Resources and Forest Engineering, 208 Marshall Hall, 1 Forestry Drive, Syracuse, NY 13210

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J. K. Crispell and Dr. T. Endreny, Faculty of Environmental and Resource Engineering, 312 Bray Hall, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

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Nana E. Imbeah and Dr. Theodore Endreny, Faculty of Environmental Resources & Forest Engineering, SUNY - College of Environmental Science and Forestry, Syracuse, NY 13210.

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A. Lee, D. Nowak, J. Wang, T. Endreny, Faculty of Environmental Resources & Forest Engineering, 310 Baker Lab, SUNY-College of Environmental Science and Forestry, Syracuse, NY 13210.

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G.A. Brown[1] and E.L. Buckles[2] [1]Department of Environmental Studies, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210 [2]Department of Biomedical Sciences College of Veterinary Medicine, T4-018 Veterinary Research Tower, Cornell University, Ithaca, NY 14853

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A. Garlock[1], S. Kuwagaki[2], B. Schwabenbauer[3], X. Montano-Sorian[4], R. Smardon[1] and A. Drew[2] [1]Department of Environmental Studies, [2]Department of Forestry and Natural Resources Management, [3]Graduate Program in Environmental Sciences, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210; [4]Syracuse University

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C.E. Johnson, Department of Environmental Studies, 107 Marshall Hall, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

FCH (Chemistry)

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J.C. Brinkley and D.J. Kieber, Department of Chemistry, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

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J. Brooks, J. Mueller, S.J. Anderson, and J.-L. Giner, **Department of Chemistry, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210**

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E. Elacqua[1], A. Flach[1], X. Wang[1], C. Mittelsteadt[2], and I. Cabasso[1] [1]Department of Chemistry, Michael Swarc Polymer Research Institute, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210 [2]Giner Electrochemical Systems, LLC, 89 Rumford Ave, Newton, MA 02466

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S.M. FitzPatrick and M.A. Teece, Department of Chemistry, 340 Jahn Laboratory, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

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A.M. Hotto, M.F. Satchwell and G.L. Boyer, Department of Chemistry, 341 Jahn Lab, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

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K.L. Howard and G.L. Boyer, Department of Chemistry, 121 Jahn Lab, SUNY-College of Environmental Science and Forestry, Syracuse, NY 13210

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K.C. Jeffrey[1], M. Teece[1] and K. Schulz[2] [1]Department of Chemistry, [2]Department of Environmental and Forest Biology, SUNY College of Environmental Science and Forestry Syracuse, NY 13210

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J.A. Liberatore and G.L. Boyer, Department of Chemistry, 121 Jahn Laboratory, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

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J.P. Milea and M.A. Teece, Department of Chemistry, 340 Jahn Laboratory, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

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M.M. Pavlac and G.L. Boyer, Department of Chemistry, 121 Jahn Lab, SUNY College of Environmental Science and Forestry, Syracuse, NY, 13210

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N. Qin, X. Wang, S. Li and I. Cabasso, Department of Chemistry, The Michael M. Szwarc Polymer Research Institute, SUNY College of Environmental Science and Forestry, Syracuse, NY, 13210

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C. E. Spiese and D. J. Kieber, Faculty of Chemistry, 437 Jahn Lab, SUNY-College of Environmental Science and Forestry, Syracuse NY 13210

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E. M. White[1], D.J. Kieber[1], and K. Mopper[2] [1]Department of Chemistry, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210 [2]Department of Chemistry and Biochemistry, Old Dominion University, Norfolk, VA 23529

FNRM (Forest & Natural Resources Management)

DETERMINATION OF RAND TRACT NET CARBON STORAGE AND SEQUESTRATION FOR 2001

J.S. Brown[1], O.J. Deluca[1], E. L. Vaughan[2], K. Cheng[1,] R. Smardon[3] and A.P. Drew[1] [1]Department of Forest and Natural Resources Management, [2]Graduate Program in Environmental Sciences, [3]Department of Environmental Studies, SUNY College of Environmental Science and Forestry, Syracuse, New York, 13210

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S.W. Bueno and E. Bevilacqua. Faculty of Forest and Natural Resources Management. 320 Bray Hall. 1 Forestry Drive, Syracuse, N.Y. 13210.

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J. Callan[1], A. Gupta[2], P. King[3], Tim Porter[1], A. Drew[1] and R. Smardon[3] [1]Department of Forestry and Natural Resources Management, [2]Graduate Program in Environmental Sciences, [3]Department of Environmental Studies

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C. Franco and V.A. Luzadis, Department of Forest and Natural Resources Management, 402 Bray Hall, SUNY College of Environmental Science and Forestry, Syracuse, NY

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M.A. Holdsworth, L.K. Lautz and T.R. Sesto, Department of Forest and Natural Resources Management, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

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E.B. Lema, C.A. Nowak; Faculty of Forest and Natural Resources Management, 218 Marshall Hall, SUNY-College of Environmental Science and Forestry, Syracuse, NY 13210

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D.M.G. Lowe[1], R.D. Briggs[1] and J.P.Nakas[2] [1]Department of Forest and Natural Resources Management,[2]Department of Environmental and Forest Biology, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

USE OF LANDSCAPE VISUALIZATION SOFTWARE (LVS) TO AID IN VIEWSHED MANAGEMENT AT THE HOME OF FRANKLIN D. ROOSEVELT NATIONAL HISTORIC SITE

R.A. McGuire[1], C.A. Nowak[1], G.W. Curry[2], R. E. Hoffman[2], D. Hayes[2], J. Auwaerter[2] and R.D. Briggs[1] [1]Department of Forest and Natural Resources Management, [2]Department of Landscape Architecture, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

LATE GROWING SEASON SAP FLOW OF THREE SHRUB WILLOW VARIETIES IN UPSTATE NEW YORK

J. Mirck and T.A. Volk, Department of Forest and Natural Resources Management, 241 Illick Hall, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

VEGETATION AND SITE CONDITIONS AT THE 1993 BARE MOUNTAIN LANDSLIDE

C.F. Norris[1], R.D. Briggs[1] and W.M. Kappel[2] [1]Department of Forest and Natural Resources Management, 358 Illick Hall, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210 [2]W.M. Kappel, US Geological Survey, 30 Brown Road, Ithaca, NY 14850

ANALYSIS OF SURFACE WATER CHEMISTRY AND GROUND WATER FLOW IN THE CARMANS RIVER WATERSHED, LONG ISLAND, NY

T.M. O'Malley, L.P. Herrington and L.K. Lautz, Department of Forest and Natural Resources Management, 320 Bray Hall, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

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S.M. Pradhanang and R.D. Briggs, Faculty of Forest and Natural Resource Management, 338 Illick Hall, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

EFFECTIVENESS OF AGRICULTURAL BEST MANAGEMENT PRACTICES IN THE SKANEATELES LAKE WATERSHED, NY

C.G. Schmidt and R.D. Briggs, Forest and Natural Resources Management, 338 Illick, SUNY-College of Environmental Science and Forestry, Syracuse, NY 13210.

IDENTIFYING INDICATORS OF SUSTAINABILITY IN THE TUG HILL REGION: COMPARING PERCEPTIONS OF LOCAL RESIDENTS AND ELECTED OFFICIALS

M.A. Young and V.A. Luzadis, Department of Forest and Natural Resources Management, SUNY College of Environmental Science and Forestry, Syracuse, NY, 13210

GPES (Graduate Program in Environmental Science)

SPRAWL WITHOUT GROWTH: RELATING LAND USE CHANGE AND URBAN HEAT ISLAND (UHI) EFFECT IN THE ONONDAGA CREEK WATERSHED, NY

K.Y. Hyde, M.H.P. Hall, and K.E. Limburg, Graduate Program of Environmental Sciences, 301 Illick Hall, SUNY College of Environmental Science and Forestry, Syracuse, New York, 13210

ABOVE AND BELOW GROUND CHARACTERISTICS OF REMNANT AND RESTORED WETLANDS OF CENTRAL NEW YORK

E.L. Page[1], T.R. Horton[2], R.S. Smardon[1], R.D. Briggs[3] and S.V. Stehman[3 1]Graduate Program in Environmental Sciences, [2]Department of Environmental and Forest Biology, [3] Department of Forest and Natural Resources Management, 458 Illick Hall, SUNY College of Environmental Science and Forestry, Syracuse NY 13210

QUANTIFYING WATER QUALITY FROM SPATIALLY-DERIVED LANDSCAPE CHARACTERISTICS IN THE CATSKILL DELAWARE WATESHEDS OF NEW YORK CITY WATER SUPPLY

P.K. Panday, M.H. Hall, and C.A.S. Hall, Graduate Program in Environmental Sciences, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

LSA (Landscape Architecture)

CULTURAL LANDSCAPES: FLOYD BENNETT FIELD, BATTERY WEED AND THE APPALACHIAN TRAIL

S.K. Cody, J.B. Gleisner, K.E. Cowperthwaite, Department of Landscape Architecture, 331 Marshall Hall, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

THE ROLE OF CONSTITUENT PERCEPTION IN THE QUANTIFICATION OF RURAL LANDSCAPE QUALITY

P. M. Harris, Jr., Department of Landscape Architecture, 331 Marshall Hall, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

PBE (Paper & Bioprocess Engineering)

EFFECTS OF ACID TREATMENTS ON THE DELIGNIFICATION OF KRAFT PULPS

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

PRODUCTION OF BIODIESEL FROM TALL OIL

S. Marda, S. Omori, S.G. Chatterjee, and S. Shastri, Department of Paper and Bioprocess Engineering, 406 Walters Hall, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

Full Abstracts

(Grouped by Faculty or Program Unit)

BTC (Biotechnology)

OXALATE OXIDASE/OXALIC ACID AS A SELECTABLE MARKER SYSTEM FOR USE IN TRANSFORMATION OF *ARABIDOPSIS THALIANA*.

Teresa Boettrich, W.A Powell, Department of Environmental Forest Biology 319 Illick Hall, State University of New York College of Environmental Science and Forestry, Syracuse, NY 13210-2788.

Oxalate oxidase (OxO) is a 224 amino acid enzyme that cleaves oxalic acid (OA) to hydrogen peroxide and carbon dioxide. The gene encoding this enzyme, OxO was cloned from wheat. When expressed transgenically, cells with active OxO are able to detoxify OA. This experiment is designed to show that OxO in combination with OA is effective as a selective system during the production of transgenic *Arabidopsis thaliana*. Transgenic *A. thaliana* seeds were generated and tested with this selection method using *Agrobacterium*-mediated gene transfer. These seeds were grown in the presence of OA under stringent conditions. Growth rates of nontransformed/transformed *A. thaliana* seeds on dilutions of OA using tissue culture methods revealed that a 2.0 mM concentration of OA may serve as an effective standard concentration in this system. The rates of death and growth of transgenic, non-transgenic and mixed populations were compared to selection rates of known markers *nptII* and *bar* genes located on the same plasmid. Selective marker systems such as this one are in high demand due to widespread concern when considering current trends in the use of antibiotic resistance as selective markers.

POLYHYDROXYALKANOATE (PHA) PRODUCTION AND COMPOSITION OF *PSEUDOMONAS PUTIDA* KT2440 UTILIZING GLYCEROL AS A SOLE CARBON SOURCE, WHILE NITROGEN IS LIMITED

G.D. Boyd, M. Martino and C.T.Nomura, Department of Chemistry, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210

As biodiesel production throughout the world increases, so does the need to find an economically viable solution to deal with the excess of glycerol produced as a byproduct. USP grade glycerol as well as crude glycerol from the transesterification reaction of triacylglycerol to biodiesel was tested for the production of PHAs by *Pseudomonas putida* KT2440. The naturally occurring soil bacterium was grown in a Mineral Salts media with limited nitrogen ($1.35x10^{-3}$ M) and various concentrations of glycerol (20 mM and 40 mM) as the sole carbon source. Cells were grown for up to 72 hours and harvested in 24 hour intervals with dry weights, optical density readings, PHA ratios and PHA as a % of cell dry weight recorded. The monomer compositions 3HB (C4), 3HHx (C6), 3HO (C8), 3HD (C10), and 3HDD (C12) of polymer samples were recorded every 24 h for three intervals. It was observed that the compositions of the polymers were dependent on the harvest time. The highest concentration of polymer: cell dry weight was at time 72 h consisting of 44.64% ± 0.04. The species *Pseudomonas putida* KT2440 is able to utilize glycerol as a sole carbon source to make biodegradable plastics (PHAs), and in time degrade these polymers as the carbon source was exhausted.

HYDROGEN PRODUCTION BY *RHODOPSEUDOMONAS PALUSTRIS*

C.A. Edwards, J.A. Perrotta, and J.P. Nakas, Department of Environmental & Forest Biology, SUNY College of Environmental Science and Forestry, Syracuse, NY

When grown anaerobically, the purple non-sulfur bacterium *Rhodopseudomonas palustris* is known to convert excess substrate (that not used for biomass production) into hydrogen. We experimented with growing *R. palustris* with acetic acid generated as a byproduct from a novel method of preparing wood chips for paper production (developed by the Paper Science & Engineering Department at SUNY-ESF). This acetic acid hydrolysate (HAA) also contains a methanol byproduct, so we tested *R. palustris* growth on varying concentrations of methanol. We grew the bacteria on photosynthetic medium, and when it was grown under dinitrogen-fixing conditions, $(NH_4)_2SO_4$ was replaced by Na_2SO_4. We performed spectrophotometric analysis of culture conditions and the contents of the acetic acid faction of the wood hydroylsate, and hydrogen was detected using a CP-4900 Micro-Gas Chromatograph. *R. palustris* was able to utilize 10% to 40% HAA for both growth and the generation of hydrogen when grown under dinitrogen-fixing conditions (optimally at about 30% HAA). The bacteria tolerate methanol concentrations up to 5%, with no appreciable differences from 0 – 3%. This production of hydrogen can be used as an environmentally-friendly alternative fuel source, because it is created from waste products.

THE EFFECTS OF INDUSTRIAL CONTAMINATED SOIL IN TRANSGENIC HYBRID POPLARS (*POPULUS X EURAMERICANA*

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Previous studies of the cDNA clone of oxalate oxidase gene expressed in hybrid poplar, *Populus x euramericana* ('Ogy') has been shown to have an increased resistance to disease and pathogens. In order to study the response of this wheat oxalate oxidase gene in woody plants when under stress, two species of transgenic 'Ogy' were grown in different concentrations of contaminated soil from the Solvay waste beds in Syracuse, New York and compared with a non-transformed control. The enzyme activity was visualized by histochemical assays of the leave and root tissue. In addition, biomass wet and dry weights were taken to determine differences in water contained within the vascular tissue. The plant tissue was then dried, ground, digested and analyzed by Inductively Coupled Plasma Optical Emission Spectrometry. Detection of oxalate oxidase activity was found in both types of OxO transformed leaf disks and minimal activity was found in the roots while none was found in the control. The water capacity was greater in transformed plants than the control when soil conditions consisted of 50% contaminated soil.

ROOTING IN TRANSGENIC AMERICAN CHESTNUT PLANTS WITH COBALT CHLORIDE

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The primary purpose of this study was to test if the use of Cobalt Chloride in the medium would increase rooting in the American chestnut tissue culture shoots. This experiment was also designed to produce potted transgenic American chestnut plants. Cobalt chloride is a metal salt that is a known ethylene production inhibitor. The two strains of clones for which these effects were evaluated were the WB 275-27/LP-28 and P1-1/LP-38. Three types of media were made: Chestnut Multiplication Medium, Pre-rooting Medium, and Rooting Medium. Both the Pre-rooting Medium and the Rooting Medium existed in three different concentrations,0µM $CoCl_2$,5µM $CoCl_2$, and 25µM. The WB 275-27/LP-28 strain had a rooting efficiency of 31.25%:

31.25%: and 6.25% respectively to the previously listed concentrations. The P1-1/Lp-38 strain had a rooting efficiency of 18.75%:0%:0% in accordance with the concentrations/ The addition of $CoCl_2$ to the Pre-rooting and Rooting Media did not show signs of improvement to the rooting efficiency in American Chestnut Tissue Culture Shoots.

GROWTH AND ETHANOL PRODUCTION FROM YEAST AND BACTERIA STRAINS GROWN ON ESF WOOD HYDROLYSATE

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When yeast's and certain bacteria are grown under anaerobic conditions, with a carbon source, they will produce ethanol. The carbon source is most often a hexose, or 6 carbon sugar. We grew the yeast up on the ESF hydrolysate which contained pentoses, or 5 carbon sugar rings. Our hypothesis was that we would get upwards of 20 grams per liter production of ethanol. We grew 5 different yeast strains, as well as a *Thermobacter* strain, up on the hydrolysate, using 6 different treatments of the hydrolysate. The hydrolysate was batched up in the department of Paper Science at SUNY- ESF. Our treatments consisted of Dia-Filtration only, treatment with activated carbon, and a full detoxification which consisted of over liming as well as the activated carbon treatment. Each of these treatments were split into 2, either with xylanase added or not, giving a total of 6 treatments. Our results showed that the highest production of ethanol was the strain NRRL- y- 7124 *Pichia Stipitis*, which produced about 7 g/L of ethanol, on the activated carbon treatment with xylanase. The concentration of ethanol was obtained using gas chromatography by the chemistry department. In conclusion, even though the yield was lower than anticipated at first, this study produced one strain that can be used in further studies to maximize ethanol production.

COMPOSITIONAL CHARACTERIZATION OF HARDWOOD HEMICELLULOSIC HYDROLYSATES FOR USE IN BIOFUEL AND BIOPRODUCT PRODUCTION

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The concentrations of fermentable carbohydrates as well as the fermentation inhibitors (furfurals and phenolics) as a function of various detoxification methodologies were determined for ESF hydrolysate. Of the 14 various detoxification methods, post-dialfiltration only with xylanase filtered (treatment 6) and post-dialfiltration autoclaved with xylanase (treatment 5) contained the highest reducing sugar concentrations (58g/L). Treatment 12 consisted of $Ca(OH)_2$, H_2SO_4, Na_2SO_3, activated carbon and filtration and contained the least inhibitors (acetic acid , phenolics and furfuals). Determining the exact compostion of each ESF hydrolysate treatment will allow further development of cost effective pretreatments that will result in the most efficient and "green" production of biofuel and bioproducts such as Polyhydroxyalkanoates (PHAs), a biopolymer alternative to conventional plastics.

PHYLOGENETIC ANALYSIS OF WILLOW SPECIES BASED ON *matK* DNA SEQUENCE

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The degree of similarity between willow species renders their identification based on morphological characteristics problematic. This study assesses the lineage of 10 willow species by comparing the sequences of the chloroplast gene matK. Two questions are addressed: are chloroplast gene mutations a reliable indicator of speciation, and what is the relationship between

these willows according to this method. The beginning of the matK chloroplast gene was sequenced for ten species, and compared to the published sequences for *Salix purpurea* and S. *eriocephala*. Nucleotide differences were compared for each sample, and phylogenetic analysis was performed. We discovered that two species were very similar to each other and to *S. eriocephala*, while the DNA sequence of others showed the same sequence as *S. purpurea* for the first portion of the matK gene. We conclude that chloroplast matK sequence is a reliable way of distinguishing willow species, but that the whole gene should be compared for better results.

TRITERPENOID CONTENT AMONG LATEX PRODUCING EUPHORBIA SPECIES

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Differences in chemical composition of latex in Euphorbia species can provide a basis for a taxonomic classification based on chemical makeup. Triterpenoid content of two phenotypically different groups of Euphorbia species were analyzed for comparison. Latex from several species of Euphorbia cacti was extracted from the plants. Triterpenoids were isolated and purified from the latex by preparatory TLC followed by reverse phase HPLC. The samples obtained from HPLC were analyzed by NMR for identification. Percentages of composition in the triterpenoid make-up of the latex were compared among species. The different species showed significant variance in the chemical make-up of the latex. More closely related species had more similarities in triterpenoid content as well as percentage of composition. It seems that the chemical makeup of an organism can be useful in determining its taxonomic classification.

EFB (Environmental &Forest Biology)

THE INFLUENCE OF FOREST FLOOR MOSS COVER ON ECTOMYCORRHIZAL ABUNDANCE IN DOUGLAS-FIR FORESTS OF THE CENTRAL-WESTERN OREGON CASCADES

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While mycorrhizal associations have never been observed in bryophytes (mosses), forest floor moss cover may influence ectomycorrhizal fungal communities on tracheophyte roots, especially those of the dominant Douglas-fir. An *in situ* study conducted near the HJ Andrews Experimental Forest (LTER) in Blue River, Oregon, examined whether forest floor moss cover influenced the abundance of ectomycorrhizae. A total of 80 plots at five sites (16 each) were established, each naturally moss covered. An initial soil core was taken from each plot, followed by the random removal of entire moss mats from half of the plots. The soil cores were analyzed for abundance of live ectomycorrhizal root tips. A second soil core was taken from each of the plots, one year later, to assess the influence of forest floor moss removal on ectomycorrhizal abundance. There was a significant decline in the number of live ectomycorrhizal root tips from plots that were subjected to moss mat removal the previous year, while those plots left untouched showed a significant increase in the number of live tips. This indicates that although conditions were more favorable for ectomycorrhizal proliferation during the second sampling season, the removal of forest floor moss did have a negative effect on the ectomycorrhizal fungi on tracheophyte roots.

COMPLEX INTERACTIONS BETWEEN SNOW, SOIL FREEZING AND MOOSE IN A NORTHERN HARDWOOD FOREST

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An interesting and perhaps not so obvious outcome of global climate change is an increased occurrence of soil freezing events in northeastern North America due to delays in snow pack development. Researchers have linked soil freeze events to increased root mortality, NO_3^- loss and N_2O flux from northeastern forests. Decreases in snow depth also increase moose forage availability (ie. saplings not covered in snow). This project investigates how snow influences soil freezing, moose browsing behaviour, and moose/plant interactions. Forty-eight, $2m^2$ plots, located at the Hubbard Brook Experimental Forest in New Hampshire contain 3 saplings each of *Acer saccharum*, *Abies balsamea* or *Viburnum alnifolium*. Treatments include mechanical clipping of saplings simulating moose browsing, ^{15}N labeled moose fecal pellet additions and snow removal. Six transects (1x15m) with *A. saccharum*, *A. balsamea* or *V. alnifolium* saplings were established to test snow depth effects on browsing behaviour. Three transects had snow maintained at a 0.5 m depth during winter 2004/2005. Fir plots with soil freezing disturbance had increased NO_3^- concentrations in lysimeter solution while fecal additions increased soil extractable N pools. This may indicate a positive interaction where fecal N counters browse damage while soil freezing exports N. Viburnum-dominated plots had increased microbial biomass N in clipped plots with fecal additions, suggesting accelerated N cycling in moose-affected stands. Soil freezing increased soil extractable N pools in Viburnum-dominated plots. Transect data indicate moose significantly browse fir and viburnum when snow depth is low. Surprisingly, sugar maple showed no response to any of the experimental manipulations.

THE EFFECTS OF LIFE CYCLE, STRESS AND CWD INFECTION ON VOLE (*MICROTUS PENNSYLVANICUS, CLETHRIOMYS GAPPERI*) WEIGHT TRAJECTORIES.

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Chronic Wasting Disease (CWD) is a transmissible spongiform encephalopathy (TSE) like scrapie and Mad Cow disease. It is a lethal and uncontrollable diseases affecting the deer family (*Cervidae*). Once considered to be solely contained within Colorado, the disease has spread to several areas in eastern North America. Transmission dynamics of CWD is unclear as is the putative species barrier. While previous studies show that transgenic mice are reliable tools for determining cross-species resistance, little is known about the susceptibility of wild rodents. In this study, two species of vole were challenged with the disease. Infected voles underwent four treatments, oral challenges, oral shams, intra-cerebral challenges, and intra-cerebral shams. The oral shams and challenges were accomplished by feeding non-infected and infected brain tissue to the voles. Intra-cerebral inoculations and shams were done by injecting CWD brain homogenate in phosphate buffered saline. The purpose of this experiment was to analyze the weight trajectories, behaviors, and health of infected voles (i.e., challenged and sham treated) and control voles (i.e., untreated). Weight trajectories of most voles were greatly affected by external stressors (i.e., handling and construction noise), with the infected voles tending to lose more weight than control voles. The experiment was unable to separate disease exposure from experimental treatment, however. The impacts of stressors on laboratory animals has implications on similar TSE projects in avoiding stressors that could have negative effects on their test subjects.

BIOGEOCHEMISTRY AND HYDROLOGY OF AN ADIRONDACK WATERSHED: A COMPARATIVE APPROACH

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The current study compared data for the Arbutus Lake outlet analyzed by the Adirondack Lake Survey Corporation (ALSC) against measurements taken by the Biogeochemical Laboratory at SUNY-ESF in Syracuse, NY. Complete hydrology and chemistry data sets were available for the Biogeochemical and ALSC Laboratories for the period from January 1, 1995 through December 31, 2002. Solute concentrations were compared using ALTM (monthly) and SUNY ESF (weekly) measurements. The greatest percentage differences for mean solute concentrations between the two laboratories for the entire study period were found for H^+ (15%), NH_4^+ (7%), NO_3^- (6%) and total Al (6%) with all other solutes showing mean differences of <3%. Average annual discharge concentrations at the outlet were generally strongly correlated ($r>0.85$) for most solutes with the weakest correlations ($r<0.80$) being found for H^+, NH_4^+, K^+, total Al, and NO_3^-. Average monthly solute concentrations calculated using measured (monthly and weekly) and extrapolated (daily) values were similar but varied for maxima/minima values. The most notable differences occurred between January and May (with the exception of February) that corresponded to those months with the highest discharges. These results demonstrate how sampling frequency affects estimates of solute fluxes especially during periods of high discharge. It is expected that climate change will have a marked influence on both the amount and timing of discharge. Future sampling and analyses strategies need to accommodate these expected changes in climatic conditions.

RESTORATION OF INLAND SALT MARSH COMMUNITIES ON THE SOLVAY WASTE BEDS, SYRACUSE, NY

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Inland salt marsh is a globally threatened plant community that was once prevalent along the shores of Onondaga Lake in Syracuse, NY. Besides their rarity, these communities are important because they represent the geological heritage underlying Syracuse, the Salt City. Salt production drove the early growth of this city and from 1881 to 1986, Allied Chemical Corporation was a significant industry utilizing local salt and limestone deposits for the creation of soda ash. This industry resulted in the waste beds: a 600 ha Superfund sub-site that overlays historical locations of inland salt marsh and that generates leachate with electrical conductivities up to 80 dS/m (approximately 50 ppt NaCl). These conditions are of public health concern due to mixing of leachate with freshwater and erosion of barren, saline substrates. Therefore, our objectives were to utilize these saline conditions for the restoration of inland salt marsh, and, in doing so, reduce leachate volumes and erosion by vegetating areas affected by leachate. Twelve species representing inland salt marsh and associated (dune) communities were tested for survivorship and productivity along hydrologic and edaphic gradients. Optimal conditions for plant performance were soil conductivities less than 35 dS/m, and mean growing season water depths maintained between 20 cm above and 40 cm below the soil surface. Plant compatibility trials are currently being explored with no obvious pattern in over-yielding combinations. Future research will further explore this phenomenon.

SCIENCE TRAILS: CONNECTING CLASSROOMS TO NATURE

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The *Science Trail* concept, an original derivative of the *Stalking Science* workshops, gives students of all ages an alternative to traditional teaching methods by inviting them to walk in the shoes of conservation and wildlife scientists. Established stops along the trail engage students in the process of science to investigate the contemporary issues from climate change to habitat fragmentation. By collecting data and drawing conclusions, students can compare their studies with ongoing and published research. Teachers from disciplines other than science, e.g. art, history, and literature, may easily adapt their class exercises to take advantage of trail features as well.

Students are not the only benefactors of this novel approach. Other trail users such as parents and the visiting public have an opportunity to observe firsthand the approaches teachers are adopting in their classrooms. Illustrated self-guiding trail booklets reveal *Science Trail* tasks and concepts for all audiences. Other benefits include providing nature reserve managers the means to revitalize existing nature trail themes and renew their connections with patrons and donors.

Science Trails have been completed at Corcoran High School in Syracuse, NY; Centers for Nature Education at Baltimore Woods in Marcellus, NY; Beaver Lake Nature Center in Baldwinsville, NY; and the APA VIC in Newcomb, NY. Teacher workshops to educate teachers on Science Trails were conducted and received positive and encouraging feedback. It is our hope that these trails will engage students in the process of science and persuade more students to pursue future science professions.

CONSERVING BIOLOGICAL DIVERSITY IN AGRICULTURAL LANDSCAPES: THE EFFECTS OF LIVESTOCK GRAZING ON FEN WETLAND PLANT COMMUNITIES

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Fens are spring-fed, mineral-rich wetlands dominated by sedges, grasses, and mosses that occupy a small percentage of the North American landscape, yet harbor high plant diversity and rarity. Degradation due to woody and non-native plant invasion threatens this diversity at many sites. We are investigating the effects of moderate livestock grazing on plant community composition and diversity in New York fens in order to evaluate its usefulness in conservation. Fens of New York State are commonly located within agricultural landscapes and often are grazed intentionally. In addition, grazing is currently being used as a management tool in New York fens to improve bog turtle (*Glyptemys muhlenbergii* Schoepff) habitat. Preliminary data suggest that grazed fens have higher plant diversity than ungrazed fens. We have surveyed plant communities in grazed and ungrazed fens, and established livestock exclosures in twelve grazed sites. We are also conducting a field experiment to individually assess the impact of two components of grazing, trampling and herbivory, on fen plant communities. The results of this study will add to the body of ecological knowledge relating to controls of biological diversity, and also will assist several management, conservation and research groups in the conservation of rare wetland plants and animals.

UNDERSTORY PLANT COMMUNITY RESPONSE TO NITROGEN AND DOLOMITE APPLICATIONS IN A NORTHERN HARDWOOD FOREST OF THE CATSKILL MOUNTAINS, NY

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The Catskill Mountains of New York are subject to one of the highest rates of nitrogen deposition in the United States (12-15 kg N ha^{-1} yr^{-1}). Consequences of chronic nitrogen inputs to forested systems include aluminum immobilization, base cation leaching, phosphorus immobilization and ultimately nitrogen saturation. The purpose of this study is to assess nutrient limitations in understory vegetation by monitoring changes in percent cover in permanent plots following application of one of four treatments (control, 25 kg N ha^{-1} yr^{-1} ammonium nitrate (NH_4NO_3), 9 tons ha^{-1} dolomite ($CaMg(CO_3)_2$) or dolomite plus ammonium nitrate). Three years following treatment application (2006), there were no treatment responses of total understory biomass or *Dryopteris intermedia* biomass over time. However, *Oxalis acetosella* exhibited higher relative growth rates in the dolomite and dolomite plus nitrogen treatments as compared to the control, which corresponded to higher concentrations of foliar calcium and magnesium. *Acer saccharum* exhibited higher germination and survival rates in the dolomite treatments during the first two years following treatment application (2004 and 2005), as compared to the control, that corresponded to higher foliar calcium and magnesium concentrations. However, *Acer saccharum* biomass returned to pre-treatment levels in 2006, which corresponded to higher concentrations of foliar aluminum as compared to the control. The results of this study indicate that the summer-green understory vegetation at this site within the Catskill Mountains are potentially nitrogen saturated, as none of the dominant species exhibited any response to nitrogen addition.

ESSENTIAL FATTY ACID COMPOSITION IN MIGRATORY FOOD SOURCES OF *CALINDRIS CANUTUS RUFA*: EFFECTS OF OVERHARVESTING ON POPULATION

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Decline of *Calidris canutus rufa* (common Red Knot) has been linked to overharvesting of their supposed primary migratory food source *Limulus polyphemus* (Horseshoe crabs.) The essential fatty acid (EFA) content of various possible food sources was measured to demonstrate the importance of horseshoe crabs in the common red knot diet. Samples of marine organisms such as mussels, clams, and crabs were collected from known migratory staging areas. Essential fatty acid content was measured using gas chromatography. It was found that the horseshoe crab eggs have the highest ESSENTIAL FATTY ACID content at 84 mg g^{-1}. This, along with the efficiency of digestion, suggests they would be the most crucial and abundantly used food source. Red knot decline can be linked to the lessening of this food source in the staging areas of their migratory paths.

INITIAL RIPARIAN RESTORATION ALONG AN URBAN STREAM, ONONDAGA CREEK, NY

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This study examines the potential for natural regeneration of native plants along an urban waterway, Onondaga Creek. It includes a series of experiments that focus on plant establishment under various conditions, including scarification and the presence of woody plants that could serve as facilitators. The study also looks at propagule or seed arrival at sites along the stream, as well as conditions potentially relating to plant establishment. Three research sites were established along a rural to urban gradient, and 5 treatments were replicated at each site within a split plot design. A master list of 100 vascular plant species was compiled across all treatment plots for all three sites. Results after the first field season show a decrease in wetland indicator species (OBL, FACW, and FAC) and an increase in ruderal plants in urban areas, for existing plant communities. A total of 39 species established themselves in the scarified treatment plots. Initial results show riparian species such as *Populus deltoides* seeding in along urbanized as well as more rural reaches. Seed arrival counts were limited to a single site due to loss of sampling equipment during high flows at the other sites. At the remaining site the seeds included a mix of upland, wetland, horticultural, and ruderal species deposited by air and water. These preliminary results suggest potential for natural regeneration of some native riparian plants in urban areas, but more time is needed to follow the fate of those individuals and collect additional data over several growing seasons.

INFLUENCE OF FOREST TYPE, PHYSICAL CHARACTERISTICS AND LAND USE HYSTORY ON THE DISTRIBUTION OF FOUR SALAMANDER SPECIES AT HUNTINGTON WILDLIFE FOREST, NY.

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Salamanders are among the most abundant vertebrates in temperate forests in North America; however they are very susceptible to anthropogenic environmental change, which is causing a worldwide decline of salamander populations. The purpose of this research is to determine if forest history and type among soil pH, soil moisture and air temperature affects the distribution of four salamander species at Huntington Wildlife Forest, NY. Salamander populations were surveyed twice during the summer of 2006 at 32 sites. The populations were sampled by checking for salamander presence beneath cover objects. Soil pH, soil moisture, soil temperature, air temperature and humidity were measured at each of the cover object sites. Long term data from an ongoing cover object study on salamander populations at HWF was also used. More salamanders were found in hardwood forest than any other forest type. Also more salamanders were found at soil pH levels between 3.5-5, soil moisture levels between 50 and 80% and soil temperatures between 16-18°C. These results indicate that salamander distribution is influenced by forest type and history. The results also show that this influence varies between different salamander species. Soil pH and soil temperature also had a significant influence on salamander distribution. These results show that anthropogenic changes in the physical and chemical characteristics of forests can affect salamander distribution, and that these changes may cause further declines in salamander populations. More studies must be done to measure how different physical and chemical forest characteristics affect the biology and ecology of salamanders.

LONG-TERM ANALYSIS OF HUBBARD BROOK SULFATE IN PRECIPITATION AND STREAMWATER USING STABLE ISOTOPES

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An understanding of the long-term recovery of forested ecosystems from acidification is important environmental and ecological issue. Many forested watersheds in the northeastern U.S. are experiencing a sulfur mass imbalance, caused by release from an internal sulfur source. To investigate this source, this study samples $\delta^{34}S_{SO4}$ and $\delta^{18}O_{SO4}$ in precipitation and streamwater from 3 watersheds of the Hubbard Brook Experimental Forest (White Mountains, New Hampshire). Archived precipitation and streamwater samples were subsampled and composited into 4 seasonal samples per year (1968-2004). Seasonal samples were analyzed for $[SO_4^{2-}]$ (ion chromatography), $\delta^{18}O_{SO4}$ and $\delta^{34}S_{SO4}$ (stable isotope ratio mass spectrometry). T-tests show differences in $[SO_4^{2-}]$ and $\delta^{18}O_{SO4}$ ($p<0.0001$) between precipitation and streamwater. Seasonal variation in $[SO_4^{2-}]$ exists. ANOVA analyses and pairwise comparisons found winter precipitation $\delta^{18}O_{SO4}$ significantly different from other seasons ($p<0.0001$). A whole tree harvested watershed (W5) was statistically significantly different from the biogeochemical reference watershed (W6) in $[SO_4^{2-}]$ and $\delta^{18}O_{SO4}$ in all seasons, and $\delta^{34}S_{SO4}$ in winter ($p<0.0001$). Long-term trends in most parameters were supported by the Seasonal Kendall test. Seasonal differences in $[SO_4^{2-}]$ of both precipitation and streamwater likely influence stable isotope ratios ($\delta^{34}S_{SO4}$ and $\delta^{18}O_{SO4}$). A major finding of the long-term dataset is the decline of precipitation $\delta^{18}O_{SO4}$ and increase of streamwater $\delta^{34}S_{SO4}$ overtime. This is likely related to changes in sulfur emissions, $\delta^{18}O_{H2O}$ involved in sulfate formation, and biogeochemical cycling. Further analysis may help to better delineate the source of the mass balance discrepancy of sulfur at HBEF.

PLANTING *SPARTINA PATENS* ON THE SOLVAY WASTE BEDS NEAR ONONDAGA LAKE TO ESTABLISH VEGETATION IN SEEP AREAS AND BARREN WASTE AREAS

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The Solvay waste beds were constructed around Onondaga Lake as settling basins for the byproducts of the chlor-alkali industrial process. The waste can have high concentrations of chloride, calcium, and carbonate, creating conditions of high soil electrical conductivity (EC) and forming leachate with high EC. Leachate in some seep areas can have EC values greater than seawater. The high EC is a particular problem for vegetation, with the worst seepage areas having no vegetative cover. There are also areas of exposed waste that have not been vegetated since waste deposition ceased in the 1980's. The lack of vegetation makes both of these areas more susceptible to erosion. Onondaga Lake's shore once supported significant areas of inland salt marsh communities. These communities and most of these salt marsh species have been lost or reduced to isolated populations. Some of these salt marsh plants normally grow in conditions similar to those found at the waste beds, and so their introduction onto the waste beds could help vegetate seep and waste areas. One such salt marsh species, *Spartina patens,* was planted in May 2006 at waste bed sites across a range of EC levels. So far, *S. patens* has shown good survivorship with 93% of all the plugs alive after the first growing season.

UNDERSTANDING LAND USE CHANGE AS A FUNCTION OF ECOLOGICAL / ECONOMIC GRADIENTS IN THE CONNECTICUT HIGHLANDS

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The US Congress has allocated $2 million to help protect the farms and forest lands of the CT, NY, NJ and PA Highlands. These areas, due to their proximity to expanding urban centers of the NE, and their natural attractiveness to people willing to drive farther and farther to work, are under threat or already in the process, of being converted to malls, housing developments, and personal green space. In order to guide conservation strategies for local communities we are funded to model future development pressure and land use change patterns in the CT portion of the Highlands. We have employed two different land-use change models that allow us to project likely development scenarios to year 2020 based on calibration using past rate and patterns of land-use change derived from satellite imagery. The first model, GEOMOD (Clark Labs, IDRISI Andes), utilizes multi-criteria evaluation to project development based upon biophysical and economic drivers of development. The second model utilizes logistic regression combined with simulation modeling to project development based upon the relationship between past development patterns and biophysical and economic drivers of development. We found the following variables to be strong drivers of land-use change using both models tested: slope, elevation, distance from roads, patch size, distance from development, and land cover class. We have validated both models using several methods that compare model projections to an independent data set of known 2001 development patterns. We will report which method provides a more accurate model.

GENETIC VARIATION IN EASTERN COYOTES AND THEIR POTENTIAL HYBRIDIZATION WITH EASTERN GRAY WOLVES

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Eastern coyotes (*Canis latrans*) tend to be larger than their western counterparts. Whether larger body sizes result from a more diverse and reliable source of food or hybridization with the eastern gray wolf (*Canis lupus lycaon*) remains unknown. In New York State, we hypothesized that an influx of wolf DNA from the north (along the Canadian border) combined with an influx of western coyote DNA from the south would create spatially distinct populations of coyotes within the state despite their recent colonization (since the 1930s). We tested whether geographic variation in NY coyote populations exists, and whether we could detect if that variation was due in part to hybridization with wolves. We used 10 microsatellite loci to evaluate the degree of genetic divergence among coyotes sampled from five disparate ecoregions of the state. Samples of coyotes from the state of Wyoming, where coyote-wolf hybridization is not thought to have occurred, served as an adaptive baseline for comparison. Within our eastern coyote samples, we tested animals from the northern and southern-most areas of the state to investigate whether a matrilineal introgression of gray wolf has occurred using a mitochondrial DNA (mtDNA) restriction site analysis. This test looked for a wolf-specific restriction site in coyotes that would occur via matrilineal introgression. Hybridization has been studied in depth from the wolf perspective while the implications for coyotes have not been a research priority. This study provides important information regarding potential hybridization impacts on the ecology of coyotes in the eastern United States.

CHARACTERIZATION OF PHENOLIC GLYCOSIDES IN FAST-GROWING VARIETIES OF SHRUB WILLOW WITH VARYING RESISTANCE TO *MELAMPSORA* RUST DISEASE

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Melampsora rust can have a great affect on the productivity of *Salix* biomass crops. Infection can cause premature defoliation, which can reduce yield dramatically. Rust also predisposes infected plants to secondary pathogens that can lead to plant death. Research has shown that phenolic glycosides and other secondary metabolites may inhibit fungal growth and infection on numerous plant species. The first objective of this experiment was to determine if a correlation exists between the presence of phenolic glycosides in leaves and rust resistance of *Salix* species. *Salix miyabeana, S. dasyclados,* and *S. sachalinensis* are resistant to rust, while *S. discolor, S. purpurea,* and *S. eriocephala* varieties are more or less susceptible. The second objective was to determine if there is a difference in the phenolic glycoside content of *Salix* clones of the same species with differing degrees of susceptibility. Four clones of *S. eriocephala* and four clones of *S. purpurea* were ranked for degree of susceptibility to rust based on field surveys. The last objective of this experiment was to determine if there is a difference in the phenolic glycoside content of young leaves compared to older mature leaves. It is apparent that young leaves are more susceptible to rust than older leaves. All of the clones were grown from cuttings in a greenhouse. HPLC was used to identify the phenolic glycosides salicortin, salicin, tremulacin, and (+)-catechin in leaf tissue extract. Results will be presented. The determination of the presence or absence of phenolic glycosides in the varieties will contribute to our understanding of plant defense mechanisms.

INTERACTING EFFECTS OF CLIMATE CHANGE AND LOCAL AND LANDSCAPE ENVIRONMENTAL FEATURES ON OCCURRENCE OF A COLD-ADAPTED AMPHIBIAN

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Amphibian populations are declining worldwide due to synergic effects of local, regional and global factors. Amongst these factors, climate change plays a major role by augmenting population extinctions and shifting species distributions. In this study we examined the influence of multiple scale variables and climate change on pond occupancy by a cold adapted anuran with a restricted range in northern New York State, the mink frog (*Rana septentrionalis*). We used repeated night calling surveys and the North American Amphibian Monitoring Program methodology to collect presence/absence data and program PRESENCE to obtain estimates of pond occupancy probability while accounting for imperfect detection. We adopted an information theoretic approach and performed model averaging. The greatest number of detections occurred at least 4 hours after sunset, between15th July and 15th August. We found that the distribution of mink frogs was strongly and positively influenced by pond scale variables: size (> 1.5 ha) and the presence of beaver disturbance, while the landscape scale variable percent pasture within 1000 m from the pond had only a weak positive effect. A critical finding was the strong negative correlation of site occupancy with a climate index of breeding season temperature, the mean July temperature. At temperatures <19.5°C pond occupancy decreased drastically, fact validated by contrasting the predictions against all documented mink frog occurrences in the State. Altogether, our results suggest that the predicted climate warming will negatively affect the mink frog distribution in New York State and that beaver management could potentially alleviate these effects.

A SURVEY OF THE HERPETOFAUNA COMMUNITY ALONG A SALINITY GRADIENT AT THE SOLVAY WASTEBEDS, NY

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I completed a field survey of the herpetofauna community at the Solvay Wastebeds in Onondaga County, New York. The Wastebeds is a superfund sub-site in Geddes and Camillus, NY covering about 2.7 km^2 on the western shore of Onondaga Lake and adjacent upland areas. I hypothesized that both herpetile species diversity and abundance would decrease with increasing salinity, as characterized by Electrical Conductivity (EC). To test this hypothesis, I performed timed searches from July to September 2006 at seven sites along a predetermined salinity gradient. Site salinity ranged from freshwater (0.002-0.8 dS/m) to brackish water (0.8 - 49.7 dS/m). I encountered six species among my sampling sites, all of which are generalists common to Central New York. As hypothesized, both herpetile species diversity and abundance of individuals were greatest in the least saline sites. Sixty-eight of the 140 total individuals recorded were found in the least saline site (0.55 dS/m). Species diversity was also greatest in sites with low salinity: I encountered five species in Site 6 (1.19 dS/m) and Site 7 (0.59 dS/m). At the sites with an EC below about 3 dS/m, habitat appeared to be the major determining factor of species composition. No species were recorded in sites with an EC higher than 7.44 dS/m. In conclusion, it appears that the diversity and abundance of herpetiles in the Solvay Wastebeds are primarily dependent on habitat type, and that salinity only begins to limit the establishment of populations at EC levels above about 3 dS/m.

CHEMICAL AND PHYSICAL CHARACTERISTICS OF LAKE ONTARIO WETLANDS: RESULTS FROM THE NSF BIOCOMPLEXITY PROJECT

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Chemical and physical characteristics of eight wetlands adjacent to the southeastern and eastern portions of Lake Ontario were collected from 2001-2005. Sites were classified based on plant community type and their physical connection to Lake Ontario. With these groupings as a foundation, chemical and physical data were analyzed in order to better understand ecosystem function of the wetlands. All sites were determined to be phosphorus-limited based on N:P ratios, and all shared similar pH levels. Connectivity to the lake appeared to have no significant influence on wetland groundwater chemistry. Community types had significantly different levels of total nitrogen, calcium, magnesium and conductivity. Conductivity and magnesium were the only measured variables that showed significant differences based on wetland area. Wetland type (fen vs. marsh) appears to be the most important factor in explaining differences in groundwater chemistry among sites. Results from wetland analyses are being incorporated to data from research groups at Cornell and Syracuse Universities studying adjacent lake and upland sites.

BASKING-SITE ENHANCEMENT AS A VIABLE CONSERVATION STRATEGY FOR A THREATENED POPULATION OF MASSASAUGA RATTLESNAKES

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Woody plant succession may threaten reptile populations by reducing the amount of solar energy available for thermoregulation. Increasingly, vegetation management tools such as prescribed fire, mechanical brush clearing, and herbicide application are suggested for use in reptile habitat conservation; however, the need for reversing succession is rarely tested empirically. I evaluated the selection of basking habitat by eastern massasauga rattlesnakes (Sistrurus c. catenatus) in New York State, where this subspecies persists in two highly isolated and endangered population remnants -- one of which may be threatened by woody plant succession. Although basking massasaugas at the heavily vegetated location -- Cicero Swamp -- selected the warmest microhabitats available to them, the average daytime operative temperature at basking sites was substantially lower at Cicero Swamp than at an open-canopy reference location -- Bergen Swamp. Therefore, artificial enhancement of basking habitat will likely improve the conservation status of the massasauga rattlesnake at Cicero Swamp. Notably, massasaugas at the open-canopy reference site selected basking sites that afforded them low visibility relative to random sites, suggesting that "crypsis potential" may also be an important component of basking-site selection in massasaugas. Basking site management that strives to balance high operative temperatures with high crypsis potential may ultimately be more successful than those focused solely on eliminating canopy cover.

DEVELOPMENT OF AN INTERNAL STANDARD FOR THE MEASUREMENT OF FREE MICROCYSTINS IN FISH TISSUE AND SEDIMENTS.

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Microcystins (MCs) are a potent liver/hepatopancreatic toxin produced by numerous species of freshwater cyanobacteria and are well known for their toxigenic effects on aquatic organisms. As a result, much effort has been put forth over the last decade towards developing efficient extraction methods, clean-up steps, and quantification methods as a means to evaluate exposure

routes and accumulation of MCs in aquatic organisms. The recovery efficiency of MCs, however, varies greatly between studies due to the different extraction techniques that are utilized (e,g,. methanol vs. EDTA) and the matrix being extracted (e.g., fish tissue vs. sediment). This poses a problem when comparing results between studies. We developed a unique internal standard, with a mass different than any known MCs, which can be spiked into field samples and quantified via LC-MS along with natural MCs already present in the sample. The new compound, a derivative of microcystin-LR, has been modified at the Mdha residue (the site of covalent binding with target molecules), therefore providing an accurate measure of only free MCs, the form thought to be most bioavailable. The internal standard chromatographs along with microcystin-LR, suggesting the two compounds are similar in polarity. Control experiments demonstrated that the two compounds have the same recovery from clean field samples, suggesting they interact with the matrix in the same manner. Examples of the internal standard being used with both fish tissue and sediment field samples will be presented.

PARASITISM OF THE NATIVE SILK MOTH *ANTHERAEA POLYPHEMUS* BY THE EXOTIC TACHINID *COMPSILURA CONCINNATA* (DIPTERA) IN NEW YORK

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The dramatic decline of New England populations of some of the most spectacular moths in North America, the Saturniidae, have been attributed to parasitism by an exotic tachinid, *Compsilura concinnata*, originally introduced to control gypsy moth. In Massachusetts, this fly accounts for as much as 90% of the mortality in experimental silk moth populations. In New York, however, saturniid populations appear healthy, and limited data suggests that parasitism is much lower than in MA. Our study quantified parasitism of Polyphemus in three experimental populations in eastern and central New York. Laboratory reared caterpillars were deployed in the three sites, retrieved after seven days, and raised until pupation or death. Percent parasitism for each site was then determined by identifying parasitoids that emerged from the larvae. Parasitism was significantly lower in New York than in Massachusetts. Compsilura is a generalist and has been present in New York since at least 1940. It is not clear why it does not have the same impact here as in New England.

ERFEG (Environmental Resources & Forest Engineering)

DOES SULFATE (SO_4^{2-}) REMOVAL DURING SAMPLE PREPARATION FOR ION CHROMATOGRAPHY IMPACT DETECTION OF NITRATE (NO_3^-)?

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During chemical analysis of water samples using ion chromatography, ions present in high concentrations can mask the presence of other, lower concentration ions. In particular, it is difficult to achieve chromatographic separation of nitrate and sulfate in samples with very high sulfate (>100 mg/l) and very low nitrate (<1 mg/l) concentrations. Ion exchange pre-treatment filters can be used during sample preparation of solutions to remove the interfering sulfate, but the effect on nitrate has not been explored. A series of tests were completed to test the effects of pre-treatment filtration. Sixteen samples were prepared with varying concentrations of nitrate and sulfate, ranging from 1 mg/l to 250 mg/l and from 0.1 mg/l to 10 mg/l, respectively. Experimental results show that the sulfate filters do reduce the concentration of sulfate in highly concentrated samples (≥100 mg/l) to approximately 35 mg/l, regardless of the initial concentration. However, the filters significantly reduced the nitrate concentrations in those same samples. The effect of the pre-treatment filters on nitrate concentrations was a function of the sulfate concentration and not the nitrate concentration. When sulfate concentrations were greater than 100 mg/l, nitrate concentrations were reduced, even when initial nitrate concentrations were as low as 0.1 mg/l.

THE ANALYSIS OF A CONTINUOUS FRYER OIL TO BIODIESEL SYSTEM

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We report on a thermodynamic study and mathematical representation of an existing continuous process used to convert used fryer oil into biodiesel fuel. This transesterification of fryer oil is accomplished by mixing the oil with methanol and a caustic catalyst. Our thermodynamic study and mathematical analysis will support the implementation of this conversion process. Once the conversion is complete, the biodiesel can be used for many standard biodiesel engines and assist in curbing environmental impacts from use of geologically mined hydrocarbon fuels. This poster has been prepared as part of a NYSERDA grant to SUNY-ESF and Guptill Biodiesel.

GROUNDWATER RESTORATION OF ONONDAGA CREEK

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Urbanization has many devastating impacts on local water resources including increasing peak runoff, decreasing time to peak discharge, and river adjustment. The loss of recharge can reduce groundwater flow to surrounding water resources, including lakes, wetlands, and streams. Subsurface responses are often less noted, but are critical to the physical, biological and chemical integrity of the urban receiving waters. In this research, a groundwater model was developed for a portion of Onondaga Creek located in Syracuse, NY, that is designated for combined sewer overflow (CSO) separation. While the benefits of separation exist, infiltration through bioretention basins is another way to manage stormwater than CSO separation. Infiltration basins

were equally distributed throughout CSO 050 based on contributing impervious area. The infiltration of runoff was determined using the modified Green-Ampt equation through an amended soil matrix determined by NYS stormwater standards for bioretention basins. The water infiltrating through the amended soil matrix was then allowed to percolate to the groundwater table. The sizes of the infiltration installations were based on space availability, and were sized for a 1 year, 24-hour design storm. Historical rainfall values based on the past 10 years of data were applied to the modified stormwater system to recharge the groundwater. It was determined the groundwater table cannot be completely restored to historical levels using infiltration installations sized for the 1 year storm. However, groundwater levels can increase substantially with the use of innovative stormwater management, resulting in a larger flux of cool, clean baseflow to Onondaga Creek throughout the year.

THE EFFECTS OF THERMAL LOADING FROM IMPERVIOUS AREA RUNOFF ON STREAM TEMPERATURE DYNAMICS IN THE SCHOHARIE RESERVOIR BASIN, NY

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High stream temperatures are theorized to be the limiting factor affecting trout growth in the streams of the Schoharie Reservoir basin, in the Catskill Mountains of New York. Colder patches of water within streams, which are termed thermal refugia, may allow trout to survive when average stream temperatures rise above tolerable levels. Outfalls of storm drains collecting runoff from impervious surfaces such as roads and parking lots during the summer may heat stream habitat to temperatures above the levels tolerated by trout and other organisms. Geomorphic complexity within streams increases stream flow through streambed sediments, termed hyporheic flow, which may maintain thermal refugia and increase thermal heterogeneity within streams. My research will investigate the temperature effects of heated stormwater on the thermal dynamics of stream habitat at the pool and riffle scale. I hypothesize that 1) hyporheic zone and water column temperatures downstream of thermal loading stormwater outfalls will have temperature fluctuations that are significantly different than similar pool or riffle features upstream of the outfalls, and 2) reaches with greater geomorphic complexity, and therefore higher rates of hyporheic exchange flow, will lessen the effects of storm sewer outfalls described in hypothesis 1 above. I will test these hypotheses by continuously monitoring temperatures in the stream and hyporheic zone at several locations immediately upstream and downstream of storm sewer outfall sites. The sites will be chosen to minimize variability in substrate, stream order, and flow, and encompass many different degrees of geomorphic complexity. Additionally, air and groundwater temperature will be recorded at each site. Rain gages within the larger watershed will continuously monitor rainfall depth, intensity and temperature.

ESTIMATING INTENSITY DURATION FREQUENCY (IDF) VALUES FOR GHANA

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Maximum rainfall depths and intensities are necessary for engineering design of structures to prevent flooding and damage to life and property. Predicting these values requires going beyond observed rainfall records, and is often through the use of probability function based Intensity–duration–frequency (IDF) curves. IDF curves are based on fitting frequency distributions to observed data points, and predictions of future extremes taken as samples along the distribution, at a set of storm durations or time intervals. To improve the accuracy of these values, the new regional (Hosking) and global (Koutsoyiannis) frequency analysis theories have been proposed. In tropical areas such as Ghana, rainfall data records only exist for a small number of years,

possibly shorter than needed for such statistical analyses. The purpose of this research is to incorporate satellite-based NASA's Tropical Rainfall Measuring Mission (TRMM) rainfall data into deriving the IDFs, and determine advantages and disadvantages of the regional and global IDF approaches. Rainfall data obtained from ground gages Ghana for specified durations will be used to determine global and regional accuracies. We will then be able to tell which of these methods has higher bias and root-mean square errors when predicting high-frequency IDF values in the climatic regions within Ghana.

MODELING URBAN FOREST EFFECTS ON STORMWATER RUNOFF DURING DESIGN STORM EVENTS USING UFORE-HYDRO

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UFORE Hydro is part of the Urban FORest Effects model developed by the US Forest Service. It is a semi-distributed topographically-driven, watershed model that has been developed to aid urban forest researchers and managers in simulating and studying the effects of urban vegetation on runoff generation. The model is calibrated using an iterative auto-calibrator combined with manual calibration based on users' knowledge of the watershed. A calibrated model is then validated using three evaluation functions, one for peak flow, one for base flow, and one for combined flow. The inputs to the model are physical characteristics as well was time series meteorological data. The model outputs time-series flow and interception data. This study looks at four specific watersheds and concentrates on the effects of canopy and impervious cover on total runoff. Major storm events are introduced to the precipitation file to examine hydrograph response in relation to seasonality and canopy cover. The time series for the major storm events are designed using historical averages. The general findings of this study are that total runoff is directly related to impervious cover and inversely related to canopy cover, with impervious causing the greater effect. In relation to design storms, the effectiveness of canopy cover at reducing runoff decreases as storm totals increase. The effect of season on design storms is variable, but most often canopy has the greatest effect during late in-leaf season.

EST (Environmental Studies)

A COMPARISON OF PHYSIOLOGICAL RESPONSE TO INFECTIOUS BRONCHITIS VIRUS OF TWO CHICKEN HAPLOTYPES

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Major Histocompatability Complex (MHC) is a component of the immune system. This protein presents antigen to cells of the immune system, thus alerting them the presence of pathogens. Cornell University has two chicken flocks with different MHC haplotypes. MHC haplotype in chickens has been associated with different response to disease. In this study I used the two MHC haplotypes (resistant N and susceptible P) to see if haplotype affected susceptibility to Infectious Bronchitis Virus (IBV). Nine day old broiler chicken eggs were infected with 10000 EID 50 of the Mass 41 strain of IBV. The control group was inoculated with phosphate buffered saline solution (PBS). Embryos were harvested at 19 days and evaluated for the degree of stunting and histopathological changes. Degree of stunting between the haplotypes was compared using the t-test. Both infected groups were significantly stunted when compared to controls. However there was no difference between stunting in infected groups. Birds from the P group had significantly more necrosis in the lungs than did birds in the N group. In conclusion, haplotype did not have an effect on embryo size, yet necrosis in the lungs showed that there may be a difference in susceptibility.

HYDROLOGY OF THE RAND TRACT IN SYRACUSE, NY: DEMONSTRATING IMPACT ON MTIGATING RUNOFF VOLUME

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The adverse effects that runoff can have with impervious surfaces is widely known: picking up debris, and diverse pollutants which then enter into the storm sewer system to be discharged, untreated, into the local waterbodies. To help ameliorate this effect in Syracuse, NY; there are small urban forest areas, like the Rand Tract, which we believe has some hydrologic function such as reducing water pollution and mitigating runoff. The purpose of this work is to determine how much the Rand Tract helps the runoff and sedimentation attenuation, through computer simulations based on hydrology, and soil parameters. For estimating this, it will use two programs: first, HELP to estimate the infiltration in the Rand Tract, and second, RUSLE2 to estimate the runoff. HELP is a hydrologic model of water movement across, into, through and out of landfills or soil, considering the surface water balance. The Revised Universal Loss Equation Version 2(RUSLE2), is a hybrid empirical/process based model used to evaluate potential erosion rates at specific sites on upland areas that might become sediment yield in watersheds. Both programs need databases and other material for their application. We have to collect data parameters. The soil map has been obtained from NRCS and soil characteristics will be collected in preexisting tables in literature or in pre-existing research. Additionally, fieldwork will be made to measure, or estimate, all the features of streams, springs and soils necessary to accomplish our main goal. This includes estimating the amount of water entering the Rand Tract

and how much water is getting to Webster Pond, considered the end point for this small watershed.

ASSESSING THE EFFECTIVENESS OF THEORY BASED COMPARATIVE PUBLIC POLICY ANALYSIS: THE CASE OF THE CHESAPEAKE BAY CRITICAL AREA ACT

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Episodes of public policy making can be viewed in terms of a story that portrays a series of political events. These stories are constantly evolving and have lately been generating the calls for innovative reforms that have recently permeated the literature on environmental policy. Taking these facts in to account, this paper questions the current relevance of public policy theory, and also inquires into variables that could potentially affect levels of policy innovation, by looking at the example of Maryland's Chesapeake Bay Critical Area Act. Implementation of this law and related cases of controversy were extensively researched in two adjacent counties, and these two stories were qualitatively compared and contrasted with the expected outcomes of four public policy theories. In addition a brief quantitative analysis of demographic variables was done. My results suggest that theory, while useful in simplifying the unfolding of events, should not be used as a crutch in the analysis and understanding of public policy making and furthermore trends in population and communications technologies can render theories obsolete in their current forms. Indeed I found, without the use of complex models, that implementation of innovative county critical area programs was primarily influenced by the simple factors of size and resources. A number of interesting demographic factors related to growth trends also have a potential influence which leads to my recommendation of more research on Chesapeake Bay Critical Area Act case stories to better understand the myriad of variables that affect public policy innovations.

FCH (Chemistry)

DIMETHYL SULFOXIDE ANALYSIS THROUGH REDUCTION: A METHOD COMPARISON

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Dimethyl sulfoxide (DMSO) occurs naturally in marine waters and is an important compound in the marine cycling of dimethyl sulfide (DMS). DMS is the primary reduced sulfur species in the lower troposphere and plays a key role in cloud formation. Cloud cover affects the earth's albedo, influencing climate change. Non-volatile, DMSO is both a source and a sink for DMS through bacterial consumption and secondary photo-oxidation, respectively. Data have been published using three different analytical methods for the detection and quantification of DMSO in marine systems. Each of the three methods utilizes a different reducing agent: titanium chloride, cobalt-doped sodium borohydride, or DMSO reductase to reduce DMSO to DMS before separation and detection by gas chromatography. All three methods were compared and contrasted to determine differences resulting from analytical technique. Conditions of each method were optimized prior to evaluation. Standard curves were constructed and compared. Analyses of dissolved, particulate, and total DMSO were performed on several marine algal cultures.

TOWARD A BIOMIMETIC SYNTHESIS OF GOPHERENEDIOL

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A novel diterpenoid isolated from the roots of the gopherweed was found to repel herbivores and to inhibit the growth of cancer cells. A synthetic project was initiated to synthesize the proposed biosynthetic precursor to this compound. This precursor would be useful to attempt the biomimetic transformation into the more complex gopherenediol; to probe the biosynthesis; and as a standard to detect its presence in the plant. A convergent synthesis with three synthons was devised. The synthesis utilizes a Michael reaction to assemble the three components, and a coupling reaction of an allylic halide with an allylic sulfone to form the 10-membered ring.

SYNTHETIC STUDIES ON THE POLYMERIZATION OF PERFLUORO (4-METHYL - 3,6 – DIOXAOCT – 7 - ENE) SULFONYL FLUORIDE

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Fuel cells are attractive devices that directly convert chemical energy into electrical energy. Although research is being performed on various fuel cell systems, more effort is being concentrated on Polymer Electrolyte Membrane Fuel Cells (PEMFC). The key component of a PEMFC is the proton conducting membrane. Currently, Nafion®, a perfluorinated sulfonic acid (PFSA) polymer, is the most desirable membrane due to its high proton conductivity and thermal stability. Improvements to Nafion's structure are hard to come by, but novel approaches include synthesis of the corresponding phosphonic acid polymer, as well as targeting other PFSAs. Recently, a series of PFSA polymers

have been synthesized that feature a low equivalent weight (750-1000 g/mol H^{1+}), and the possibility of operation at higher temperatures. Structural characterization has been achieved with FTIR and NMR methodologies.

DETERMINING THE CAUSES OF ANOXIA IN ONONDAGA LAKE USING BIOMARKER FATTY ACIDS AND STEROLS

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Onondaga Lake, located in Syracuse, New York, has been considered one of the most polluted lakes in the world. One of the major problems due to excess nutrients and productivity is the development of an anoxic layer in the lower depths of the water column during the summer months. It is often thought that these low levels of oxygen are caused by sinking algal matter and other forms of particulate matter being degraded by bacteria. This study uses fatty acid and sterol biomarkers to determine specific algal classes present in the lake, and if this organic matter is sinking into the lower depths of the water column. Biomarkers indicate the presence of a diatom bloom in the spring of 2006 and a subsequent crash, and are accompanied by a decrease in oxygen concentrations but an increase in bacterial biomass. In comparing the shifting bacterial productivity and oxygen levels in each layer, it was concluded that the breakdown of sinking diatoms by bacteria plays a role in the setup of anoxia.

RELATIONSHIP BETWEEN MICROCYSTIN PRODUCTION AND POTENTIAL WITH ENVIRONMENTAL VARIABLES IN LAKES ACROSS NEW YORK STATE

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The concentration of microcystins and their genetic signatures were determined for 62 lake, reservoir and river sites across New York State (NYS) in 2000. Microcystin was detectable at 34 of the 62 sites, however, 70% of the time the concentration was well below 0.10 μg L^{-1}. Cyanobacterial (CYA, 77%) and *Microcystis* sp. (MIC, 40%) DNA sequences were identified state-wide using molecular probes. Three genes targeted within the microcystin synthetase (*mcyA*, *mcyB* and *mcyD*) cluster were detected at 50% of the sampling sites. These genes did not always co-occur (*mcyA* and *mcyD* - 42%), with *mcyB* (26%) being the least common. Toxin genes were generally found at lake sites with a higher trophic state (oligotrophic – 14%; eutrophic and hypertrophic – 80%) concentrated in southwestern and central NY sites. Principal component analysis indicated microcystin genes were common in smaller lakes (<20 m max depth), at a basic pH (8-9.5), and in conjunction with increasing microcystin concentration, biomass and total phosphorus. Chlorophyll-a was correlated with the appearance of cyanobacterial, *Microcystis* and microcystin toxin genes, whereas total phosphorus, lake depth and latitude were associated with chlorophyll-a production by logistic and linear regression analysis. These results suggested that shallow lakes with increased phosphorus are linked to lake productivity, and with higher biomass there is a greater potential for microcystin synthetase gene presence.

QUANTITATIVE MALDI-TOF ANALYSIS OF CYANOBACTERIAL TOXINS

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Cyanobacterial blooms are an escalating problem in waters around the world; they often produce toxins that exhibit acute and chronic effects on humans and wildlife. The most commonly

reported cyanotoxins are the microcystins, a family containing more than 90 congeners. Analysis of water samples for these toxins is a key component in the public health management of harmful algal blooms.

MALDI mass spectrometry is a rapid, sensitive technique that requires little sample handling, is tolerant of contaminants, and allows identification of toxin congeners. Spectrum quality was improved through elimination of alkali metal adducts, resulting in better detection and identification of toxins. Analytical results indicated that nodularin was preferred as an internal standard over [^{15}N]microcystin-YR, cyclosporin A, or angiotensin I. For microcystin-LR (MC-LR), a linear range of 0.11–5.0 μM (R^2 = 0.98) was achieved, with a method detection limit (MDL) of 0.015 μM. Matrix effects due to extracted cell components decreased the MC-LR linear range slightly to 0.19–5.0 μM (R^2 = 0.99), with MDL = 0.058 μM. The ionization efficiency and analyte-analyte suppression for four MCs of varying polarity are presented; the three polar congeners exhibited good ionization efficiency and acceptable levels of analyte-analyte suppression.

A simple, rapid technique for field collection of samples facilitated detection and quantitation of microcystins from samples containing as little as 0.5 μg/L. This level is well within the WHO advisory limit of 1 μg/L microcystin-LR in drinking water. The validated method was applied to field samples from several freshwater lakes and bays.

IMPACT OF SMALL DAMS ON ORGANIC CONTENT OF COASTAL STREAM SEDIMENTS

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Over 75,000 small dams dot the rivers and streams of the United States. As dam removal becomes an increasingly popular alternative to maintenance, with dam removal being up to 10 times cheaper than restoration, it is necessary to understand the effects these structures have on ecosystems they inhabit. The goal of this experiment was to establish models of the organic content of river sediments. Sediment cores from dammed and non-dammed, and protected and unprotected river systems provided comparison data for sediment total organic content levels and carbon to nitrogen ratios. Analysis showed a strong correlation between the dam position and sediment content observed. Sediments just upstream of the dam were found to contain higher organic content than samples taken just downstream. Carbon to nitrogen ratios did not show consistent variation relative to dam position. It is apparent from this study that dams do have a measurable effect on the content of river sediments.

APPLICATION OF A SURFACE PLASMON RESONANCE BIOSENSOR TO THE DETECTION OF BROWN TIDE ALGAE

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Surface plasmon resonance (SPR) is an optical technique commonly used to study biomolecular interactions. This phenomenon occurs when plane-polarized light strikes a thin gold film under conditions leading to total internal reflection. The resultant SPR curve is related to the refractive index of an overlying aqueous solution. Binding of an antigen to its antibody results in an increase in the refractive index that can be measured using SPR technology. In such an SPR biosensor, the antibody monolayer is immobilized on the gold film of the sensor and an aqueous

solution is pumped over the surface. This allows for rapid, real-time analysis of many potential target molecules with high sensitivity and specificity.

We plan to create an SPR biosensor to detect harmful algal blooms caused by the brown tide alga *Aureococcus anophagefferens.* This organism forms dense blooms in the Peconic and Great South Bay Estuaries and has decimated both the eelgrass and shellfish populations in selected Long Island and mid-Atlantic sites. Monitoring for this organism is difficult since it has few distinguishing features in the light microscope. However, *Aureococcus* is highly suitable for SPR detection. It is readily detected using antibodies against the cell surface antigens and its hazardous effects are only observed at cell concentrations well above typical SPR detection limits. Our current work is focused on the formation of F(ab) fragments from monoclonal *Aureococcus* antibodies and their attachment to the gold surface via a direct disulfide linkage.

FATTY ACID ANALYSIS OF FATHEAD MINNOWS *(Pimephales promelas)*; THE CASE FOR EICOSAPENTENOIC ACID'S (EPA) USE AS A FATTY ACID BIOMARKER

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Essential fatty acid (FA) sources within freshwater food webs can be numerous in origin, but are typically synthesized by primary producers. The uptake of these biochemicals into the diet occurs in herbivores and predators via consumption. We hypothesize that specific ω3 FA such as Eicosapentenoic Acid (EPA) may be conserved from food to consumer. This conservation facilitates the relative abundance of EPA to be used as biomarker tracer of diet. Interest in polyunsaturated FA is important not only because we hope our study will be able to fill in ecological food web information gaps but also because EPA has been implicated in many physiological processes involving both the phospholipids of biomembranes and hormone precursors such as neurological functioning in humans. To test our hypothesis, we fed Fathead minnows (FM) on a defined diet of flake fish food for 1 week, and then changed their feeding regime into two categories, one group of FM fed algae *(Scenedesmus)* and another group of FM fed *Scenedesmus* plus the addition of EPA (our FA biomarker). Fathead minnows fed *Scenedesmus* and *Scenedesmus* + EPA, were sacrificed and analyzed for FA composition over a three week span in order to determine whether or not EPA's relative abundance is conserved during predation and if EPA can be implemented as a biomarker with respect to trophic transfer.

APPLICATION OF SHIP-BOARD REAL-TIME FLUORESCENCE FOR THE DETECTION OF CYANOBACTERIA IN LAKE ERIE

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Lake Erie experiences toxic cyanobacterial blooms, and understanding the distribution of these blooms is necessary to implement protective strategies. Yet many monitoring techniques are both time and labor intensive while giving limited geographical coverage. A flow-through monitoring system composed of five commercial fluorometers (a Hydrolab, two Turner Designs 10AUs, a Turner Designs Algaewatch, and a Turner Designs Cyanowatch) was installed on board the CCGS Limnos to provide real-time data on potentially harmful algal blooms in Lake Erie on a broad geographical scale. Fluorescence data were compared to extracted pigment concentrations and used to map the algal distribution on Lake Erie in August 2006. The continuous real-time monitoring revealed that the cyanobacterial blooms were patchy. Factors such as calibration, stability, and accuracy of the different instruments will also be presented.

SYNTHESIS AND PROPERTIES OF ACTIVATED CARBON FROM LIGNIN

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High surface area carbon is one of the competent candidates for efficient hydrogen storage. A series of nanostructured carbons have been synthesized by carbonization and activation (creating pores). Carbonization was conducted by pyrolysis of lignin at high temperature in inert atmosphere. Carbons thus prepared were then activated using activation agent K_2CO_3, KOH, CO_2, or static air at high temperature (600~900ºC). Alternatively, carbonization and activation were accomplished together by heat treatment of the lignin/activation agent mixture to high temperature. The carbonization process was studied by thermogravimetric analysis (TGA), and Pyrolysis-Mass spectrometry (Py-Ms). The pore structure of nanostructured carbons was characterized by N_2 adsorption at 77K. Hydrogen storage capacity was evaluated by hydrogen uptake at 1 bar and 77K, and the effects of surface area and pore size on the hydrogen uptake were examined.

REDUCTION OF DIMETHYL SULFOXIDE BY MARINE PHYTOPLANKTON

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Dimethyl sulfide (DMS) is a critical component of the global sulfur cycle, especially in the marine environment. This compound comprises up to 90% of the ocean to atmosphere flux of reduced sulfur. Despite this large flux, the primary loss pathway of DMS in the ocean is often photolysis or microbial uptake to form, in part, dimethyl sulfoxide (DMSO). Although DMSO is usually the largest pool of reduced sulfur, little is known about its production and loss pathways. DMS and DMSO are also thought to be part of an antioxidant pathway in marine algae, owing to their ability to effectively scavenge reactive oxygen species such as the hydroxyl radical and superoxide. Recycling of DMSO by reduction to DMS would close the antioxidant cycle and allow for the recovery of sulfur from the DMSO pool. Biogenic reduction of DMSO to DMS has been documented in a number of organisms, most notably bacteria. Here, we present the first detailed study of DMSO reduction by marine phytoplankton. Reduction of DMSO has been observed in three classes of algae, with rates from 0.072±0.022 fmol cell^{-1} d^{-1} to 3.85±1.13 fmol cell^{-1} d^{-1} (24 h at 1 mM DMSO). Michaelis-Menton kinetic parameters (K_m and V_{max}) were estimated for three species, and the time course of DMSO reduction activity monitored. Enzyme affinities for DMSO, as measured by K_m, were low with values between 373-2360 μM. The ability of marine phytoplankton to reduce DMSO to DMS has important implications in how algae utilize cellular DMS, particularly as an antioxidant.

PHOTOCHEMICAL REACTIVITY OF DISSOLVED ORGANIC MATTER ALONG AN ESTUARINE GRADIENT

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Estuaries serve as important sites for the biogeochemical transformation of terrestrial dissolved organic matter (DOM) as it transported to the ocean. Along an estuarine gradient, differences in DOM composition result from variations in source material and the extent of biological and photochemical degradation. In this study, the photochemical reactivity of DOM was investigated in the Delaware Estuary. Chromophoric DOM (CDOM), quantified by the absorption coefficient at 350 nm (a(350)), showed conservative behavior in the estuary. Values of a(350) were as high

as 6.5 m^{-1} in the Delaware River, dropped to 4.7 m^{-1} at the freshwater end member (salinity = 0.2), and reached 1.2 m^{-1} at the marine end member (salinity = 31). Specific absorption coefficients (a(350) normalized to dissolved organic carbon concentration) also decreased with increasing salinity, indicating a reduction in the fraction of CDOM within the DOM pool. Photochemical rates of DOM mineralization decreased from 0.74 μM h^{-1} at the river to 0.15 μM h^{-1} near the mouth of the bay. Based on these rates and CDOM concentrations, differences in photoreactivity can largely be explained by the dilution of riverine DOM. However, the efficiency of dissolved inorganic carbon and carbon monoxide photoproduction in the estuary was lower than in the river, reflecting differences in DOM character (i.e., average molecular weight and specific absorption).

FRNM (Forest & Natural Resources Management)

DETERMINATION OF RAND TRACT NET CARBON STORAGE AND SEQUESTRATION FOR 2001

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Our objective was to determine carbon sequestration, storage, and equivalent monetary value for the Rand Tract, a 198 acre piece of land in south Syracuse. Data collected from the Rand Tract (DBH, growth, LAI) in 2001 was input into the Urban Forest Effects (UFORE) model. The UFORE model yielded the net carbon sequestration and storage values. These values were then analyzed to determine future economic and environmental impacts. After evaluating the field data from the Rand Tract, a greenspace in south Syracuse, it has been approximated that there is a current net storage of 9.68 billion tons of carbon with a net carbon sequestration of 225.92 million tons in 2001. Future sequestration and storage quantities were projected for the next 100 years. The estimated carbon sequestration and storage values are equivalent to 15,113,323 dollars. The Rand Tract represents diverse potential value for the city of Syracuse. At 198 acres, it is the largest contiguous forest in Syracuse. This approach might be useful to other cities that have input their tree data into UFORE databases. The amount of carbon sequestered and stored by the Rand Tract makes it a significant commodity for the 2009 northeast carbon trading market. Based on the data collected in 2001, Rand Tract carbon sequestration and storage, and a regional emergence of marketable permits for greenhouse gases, the Rand Tract in southwest Syracuse will be a valuable resource to the city in 2009.

UNDERSTANDING AND MODELLING THE GROWTH AND YIELD OF *PINUS OCCIDENTALIS* IN "LA SIERRA", DOMINICAN REPUBLIC.

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Economically, *Pinus occidentalis* is an important timber species in the Dominican Republic, where timber harvests positively contribute to its gross domestic product. Harvesting activities generate millions of pesos through sales, create thousands of job opportunities in rural areas where more than 40% of the families live below the poverty index, and decrease the demand for and amount of imported wood. Despite its economic importance, *P. occidentalis* has never been the subject of serious growth and yield studies, making it difficult to estimate current inventory levels and to account for the amount of volume harvested. Due to exploitative harvesting practices, the resource may be in the process of depletion, threatening future timber supplies and limiting our ability to manage the resource on a sustainable basis. In order to evaluate different management alternatives and to maintain harvest intensities at a sustainable level, it is necessary to develop reliable estimates of current and future inventory levels. This research presents the development of volume growth models, using accurate taper and volume equations, necessary for accurately estimating the current and future volume of standing trees, as well as the volume of diverse wood products derived from the trees. The products from this research will potentially allow for the more efficient use of this renewable resource, thereby maximizing profits of timber sales.

SLOPING URBAN TREES, MICROCLIMATE AND AIR QUALITY: HOW DO ONONDAGA VALLEY AIRSHED DYNAMICS INTERACT WITH A DENSE URBAN STAND?

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Trees make positive contributions to human communities and environments on many levels. Experts find evidence that urban forests play an active role in mitigating, and improving local climatic conditions. Urban forests sequester and store local air pollution and greenhouse gases, also uniquely influence microclimates by retaining soil and moisture through the root structure, reducing extreme temperatures by shade, and reducing wind speeds with their canopy masses. A 200 acre unique mature urban forest, known locally as the Rand Tract, lies along Onondaga Valley's west slope on the southwest edge of Syracuse, NY. Interstate Highway 81 intersects the valley along north and south. Prevailing average wind currents carry offsite air emissions from Solvay to the northwest, potentially combining with the city's vehicular and heating emissions to pool in the city center. By simple experiment, we predict basic climate and emission dynamics surrounding the Rand Tract. We assume the valley's west side including the Rand Tract will have slightly different climate conditions than the east. Using existing climate data from NOAA, Onondaga County, and the U.S. Forest Service, we analyze average climatic conditions and predict the contribution of the forest. Although the results of this study have a limited applicability, the intent of the experiment is to begin an inquiry that could be elaborated on with appropriate climate recording equipment in future studies.

AN IMPROVED MEASURE OF WELL-BEING: UNDERSTANDING THE RELATIONSHIPS BETWEEN NATURAL RESOURCES, ECONOMIC GROWTH, AND WELL-BEING

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Sustainable development is the goal of most countries of the world; but it may not be achieved without further understanding of the critical relationships between natural resources, economic growth, and well-being. Economic growth-based policies, also known as neoliberal policies, have been implemented worldwide to increase well-being. But uncertainty exists regarding the extent to which well-being has actually been improved. Different measures have been proposed, but disagreement still exists. Today, the most used measure of well-being is the Human Development Index (HDI), even though it ignores the role of natural resources. To understand the relationship between economic growth policies and well being, we used the Dominican Republic as a case study and assessed how effective have been neoliberal policies in increasing well-being. We used the HDI as a proxy for well-being and compared trends in HDI before and after neoliberal policies were first implemented (1983). Since the HDI starts in 1990, we gathered the data and calculated the HDI from 1975-2004. For the same period of time, we reviewed the socio-economic-political history of the country and we measured other variables not included in the HDI (e.g. unemployment, inflation, poverty and inequality). Our results show that the HDI has been continuously increasing since the 1970s. But, the rate of change is greater before neoliberal policies were first implemented (0.002). Likewise, the other variables measured have not been much improved by these policies. Furthermore, when natural resource degradation is taken into account, increases in well-being might not be sustainable in the long run.

CHEMICAL RESPONSES TO ROAD SALT RUNOFF IN A SMALL URBAN STREAM

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Meadowbrook Stream is a small urban runoff channel located in Syracuse, and DeWitt, New York. The drainage system includes the Meadowbrook Retention Basin, which stores storm water during precipitation and snowmelt. In the winter, roads adjacent to the stream are heavily salted and storm runoff from these roads has a strong control on the stream chemistry. The objective of this ongoing study is to determine how water chemistry changes through different sections of the stream with different land use characteristics, ranging from urban to suburban/rural. Water samples were collected and dissolved oxygen, pH, and temperature were measured at twelve sites in the stream weekly between the months of January and April, 2007. Sampling sites were located approximately every 500 meters. Major and minor ion concentrations were measured in each water sample using ion chromatography and inductively coupled plasma emission spectroscopy. Chemistry data was then compared to meteorological data to find relationships between temperature and snow depth and stream chemistry. Chloride and sulfate concentrations were high (800 to 3600 mg/l and 450 to 650 mg/l respectively) in many sections of the stream. Relative concentrations of sodium and chloride indicate road salt is a major source of contamination to Meadowbrook Stream.

JAPANESE KNOTWEED CONTROL ALONG ROAD CORRIDORS IN BLUE MOUNTAIN LAKE, NEW YORK

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In the Adirondack State Park in New York, U.S.A., invasive plant communities are being operationally treated along road corridors by the New York State Department of Transportation (NYSDOT) and The Nature Conservancy (TNC). Monitoring data on the efficacy and effectiveness of these treatments has been generally qualitative and in many cases non-existent. In 2004, clumps of Japanese knotweed (*Polygonum cuspidatum*) were operationally treated using cut-stump (glyphosate) or foliar (glyphosate, imazapyr and metsulfuron-methyl) treatments along roadsides in the central Adirondack Hamlet of Blue Mountain Lake. SUNY-ESF was engaged by NYSDOT and TNC as a partner to retroactively develop a rigorous, empirical monitoring system so as to determine efficacy and effectiveness of herbicide treatments. One-milacre plots were established in treated and untreated knotweed clumps and the plant communities measured 1 and 2 years post-treatment. Associated environmental variables were measured as concomitant sources of variation. Neither cut-stump nor foliar treatments were 100% efficacious. Knotweed cover was reduced for both cut-stump and foliar treatments after 1-year, but only foliar maintained this reduction through year 2. Knotweed stem density was significantly greater in the cut-stump plots than the foliar, throughout both years. Future treatment of Japanese knotweed here and elsewhere should feature foliar herbicides to provide high levels of control, along with attendant monitoring to quantify community response and guide the type and timing of future treatments. Our partnership provides a model for other, similar vegetation management endeavors where new treatment methods are applied in operational programs.

BACTERIAL LEVELS FOLLOWING THE IMPLEMENTATION OF BEST MANAGEMENT PRACTICES (BMPS) WITHIN THE GROUT BROOK WATERSHED, SKANEATELES, NY

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Diffused sources lead to the impairment of water quality by sediments, nutrients and pathogens, are often difficult to assess and control. Solutions to the problem require a sound agricultural policy of sustainable farming systems cantered on best management practices (BMPs) as seen implemented in the Grout Brook watershed. In the case of bacterial loading to the stream, the primary sources of coliform bacteria include cattle crossings and runoffs from barnyards and manured fields. As of such, several BMPs were implemented to reduce these impacts. Subsequent to their implementation, this study was carried out to evaluate the changes in total coliform and *E. coli* (an indicator of the presence of fecal coliform) numbers. Biweekly grab samples and flow measurements were collected from nineteen sites along the stream from June to November 2006 and analyzed for these two pathogens using Colilert-18 Defined Substance Technology (Idexx ®) for the most probable numbers per 100ml of sample. Even though there was a general reduction in (colony forming units (cfu) from upper to lower reaches, the entire sampled reach was impaired by total and fecal coliform exceeding EPA's MCL limits for drinking and recreation waters. Lower cfu were measured for the tributaries to the main Grout Brook stream. The relationship between total coliform and *E. coli* varied monthly. R^2 *values* for the months of August and September were 0.5 and 0.8 respectively with significant p values ($p < 0.05$). R^2 values for the other months were very low and the resulting p values were not significant.

USE OF LANDSCAPE VISUALIZATION SOFTWARE (LVS) TO AID IN VIEWSHED MANAGEMENT AT THE HOME OF FRANKLIN D. ROOSEVELT NATIONAL HISTORIC SITE

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The Home of Franklin D. Roosevelt National Historic Site (HOFR) was donated by Franklin D. Roosevelt (FDR) to the National Park Service (NPS) in 1945, on his death. One of the provisions of the donation was that the view from Springwood, the FDR home, be maintained and preserved. The viewshed from Springwood extends to the southwest from the house toward the Hudson River to the Mid-Hudson Bridge in Poughkeepsie, NY (about 2 miles from the FDR home). A viewshed is the visible landscape from a particular location. Viewsheds are associated with emotional and aesthetic values. This view was deeply loved by FDR and his wife, Eleanor. In the years since the donation of the property, forest vegetation has obstructed this view. However, HOFR did not own all the properties containing the interfering vegetation. The adjacent properties were acquired in 2002, and efforts to restore the viewshed are currently underway. Faculty at SUNY-ESF have worked with the NPS at HOFR in cultural landscape management since 1999; this new project builds upon this long-standing partnership.

My proposed graduate thesis assesses stakeholder reaction to computerized 3D viewshed models produced using Geographical Information Systems (GIS) with a visualization software suite called Landscape Management Systems (LMS). These models will illustrate various silvicultural treatment options that may be used for management of interfering vegetation (tall trees). Stakeholder educational background and life experiences are expected to shape individual visual

perception. This project will assess reactions of stakeholders from various backgrounds having varying degrees of on-site information. Information on stakeholder backgrounds will be collected through surveys. Degrees of onsite information transfer will be specifically manipulated for each group. Stakeholder reactions to a variety of alternatives for controlling interfering vegetation in the viewshed will be provided to the NPS.

LATE GROWING SEASON SAP FLOW OF THREE SHRUB WILLOW VARIETIES IN UPSTATE NEW YORK

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To correctly estimate annual sap flow rates and their impact on the water budget at a site, data for the end of the growing season are needed. Sap flow was measured, on three shrub willow varieties (*Salix miyabeana* (SX64), *S. eriocephala* (S25) and *S. dasyclados* (SV1)) from mid October until mid November. Data were used to calculate the impact of the plants on the water budget at the end of the growing season. Maximum single-stem sap flow rates for stems between 10 and 35 mm in diameter were 0.8 L d^{-1} for SX64. Stand level sap flow rates, which ranged from 0.03 to 0.9 mm d^{-1}, decreased during this period. The lowest values were for SX64, despite its high single stem sap flow. Stand level sap flow rates were normalized by the reference crop evapotranspiration (E_{rc}), which resulted in transpiration ratios, or crop coefficients of 0.2-1.5 for S25, 0.2-1.4 for SV1 and 0.05-0.4 for SX64. Sap flow rates observed during the end of the growing season suggest that dense plantations of willow short rotation coppice lose their capacity to reduce percolation by the end of October, when K_c drops below 1.

VEGETATION AND SITE CONDITIONS AT THE 1993 BARE MOUNTAIN LANDSLIDE

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The site of the 1993 mudflow at Bare Mountain, Lafayette, NY, is a unique area. The mudflow transformed the previous landscape from a corn field with patches of trees to a barren surface of red clay devoid of vegetation, initiating primary succession. A variety of plant species have grown in the site during the past 14 years. Remnant portions of the original soil surface are sporadically distributed across the clay surface. Plant communities differ between these two broad soil groups. The mudflow altered hydrology, producing abundant sulfurous and saline springs largely displacing previous fresh water sources. The primary objective this project is to document current plant species composition and its relationship to soil and water conditions within the mudflow area. *Phragmites australis*, an invasive species, currently dominates the site. Current vegetation composition within the slide area will be mapped. Surficial soils will be described and sampled using sample pits for each vegetation class and infiltration rates will be measured. In the laboratory bulk density, total organic matter and electrical conductivity will be determined. The information will lead to an understanding of the relationship between site conditions and vegetative composition allowing it to be a natural model for restoration and stabilization of similarly disturbed sites.

ANALYSIS OF SURFACE WATER CHEMISTRY AND GROUND WATER FLOW IN THE CARMANS RIVER WATERSHED, LONG ISLAND, NY

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Agriculture and urban development on Long Island, New York have caused many of its rivers and streams to become eutrophic, and have led to poor water quality in the Great South Bay. The Carmans River provides the largest discharge into the Great South Bay, and therefore may be a primary contributor of nitrate and other constituents. The objective of this investigation was to simulate ground water flow in the Carmans River watershed and relate sourcesheds, flow paths and residence times to surface water quality. A synoptic sampling of base flow was conducted along the Carmans River at 200 meter intervals and analyzed for major anions and cations. Ground water flow was simulated using a calibrated, steady-state groundwater flow model, and particle tracking was used to determine ground water flow paths. Chemistry results indicate that the dominant cation is sodium, the dominant anion is chloride, and the average nitrate concentration is 5.5 mg L^{-1}. Modeling results suggest that the area contributing ground water to the Carmans River is much larger than the topographically-defined watershed, and that ground water age can be over 200 years old. These results show that historical land use practices continue to impact base flow water quality on the Carmans River, and that measures to reduce solute loading must be applied to entire ground water sourcesheds.

UNDERSTANDING TURBIDITY AND SUSPENDED SEDIMENTS DYNAMICS ON STREAMS OF SKANEATELES LAKE WATERSHED, NY

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Skaneateles Lake is the drinking water supply for the Syracuse metropolitan area. This water supply is one of a limited number of lakes and reservoirs in New York that are not filtered before distribution to users. Any events that lead to elevated turbidity levels at the intake pipes are of concern. Therefore, continued maintenance of water quality is essential. Sediments entering a water body represent one of the most important components of agricultural pollution. If excess sediment is suspended in water, high turbidity levels may require the shutdown of municipal water intakes. The expenses of collection and analysis of sediment samples could be reduced if total suspended sediments (TSS) can be accurately estimated from measured turbidity. This poster presents TSS-turbidity correlations for four major streams of Skaneateles Lake. Grab samples collected at these sites from May 2006 through October 2006 were analyzed for turbidity and TSS in laboratory condition. Flow was estimated using velocity area method to develop rating curves which were subsequently used as data points to trigger automated stream samplers. Coefficients of determination (r^2) for linear regressions of TSS on turbidity exceeded 0.82 for the four sites analyzed. Regression equations were site specific and differed significantly among sites. Flow did not significantly affect turbidity and TSS. Differences observed among the four sites are attributed to watershed hydrologic response, soils, sediment characteristics and land use/cover.

EFFECTIVENESS OF AGRICULTURAL BEST MANAGEMENT PRACTICES IN THE SKANEATELES LAKE WATERSHED, NY

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Agricultural best management practices (BMPs) on farms within the Skaneateles Lake watershed were examined over two field seasons (April – November). A variety of BMPs were studied including: grassed and forested buffers, milk house waste water application to cropped fields and hardwood bark/chips bed filtration, and the use of cover crops. Porous cup tension lysimeters at 25 cm and 100 cm depth samples were used to collect soil solution; concentrations of N and P were measured. The BMPs were most effective when an adequate buffer separated the sources of N and P additions from surface waters. The grassed riparian buffer at Farm A significantly reduced NO_3^--N entering via diffuse flow from the adjacent cultivated field at 25 cm (3.36 mg L^{-1}) and 100 cm (8.08 mg L^{-1}) and NH_4^+-N at 25 cm (0.09 mg L^{-1}) over an average width of ~15m. At Farm C, high mean concentrations of NO_3^--N were observed in some cover types; and high concentrations of NH_4^+-N and PO_4^- were measured in the milk house waste water. Analysis of soil solution down gradient from the forested buffer and wetland showed N and P concentrations at near minimum detection limits. Grab samples from the tile drainage outlets following high intensity, short duration precipitation events often had relatively high concentrations of NO_3^--N and PO_4^-. Effectiveness of these measures was directly related to the ability of the landscape between the sources of N and P and surface waters to retain or cycle added nutrients.

IDENTIFYING INDICATORS OF SUSTAINABILITY IN THE TUG HILL REGION: COMPARING PERCEPTIONS OF LOCAL RESIDENTS AND ELECTED OFFICIALS

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Measuring sustainability at different scales is a dynamic endeavor. Much of the measurement of sustainability focuses at a national scale and often uses expert-led approaches. There is increasing interest in measuring sustainability of local communities. Locally-led approaches of measuring sustainability incorporate the values and perceptions of the people living within the community. The knowledge gained from individuals within a community is derived from their everyday experiences and may differ between local officials and residents, and their perceptions may differ with expert opinions. Semi-structured interviews were conducted to obtain data from a local residents and elected officials in the Tug Hill region of New York State. Expert opinion was summarized from academic and practitioner literature. The results illuminate important gaps in perceptions between local residents and officials of what to sustain and how well it is being sustained. Comparisons with expert opinion show differences between local level concerns and the current state of the scholarship of sustainability. The identification of the differences and similarities provide the foundation for the development of community dialogues to pursue local sustainability of the Tug Hill region of NYS.

GPES (Graduate Program in Environmental Science)

SPRAWL WITHOUT GROWTH: RELATING LAND USE CHANGE AND URBAN HEAT ISLAND (UHI) EFFECT IN THE ONONDAGA CREEK WATERSHED, NY

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Many cities in the Northeastern US are experiencing sprawl without population growth as city centers empty and forest and farm land is converted to residential and commercial development at the urban fringe. Important drivers for this change include increasing job opportunities in the suburbs; the relative ease of construction outside of the city limits and on previously undeveloped land; and archaic zoning regulations. The resulting increase in impervious surface can have long lasting impacts on local ecology and climate. We investigate the relationship between land use and UHI effect in the Syracuse region. UHI intensity positively correlates with impervious surface as a result of the altered thermal capacity of the urban fabric compared to natural land cover types. The UHI effect can both negatively impact human health and increase the energy demand for summer cooling. We are assessing the spread of UHI using local climate time-series data that we are collecting and analyzing via a fixed weather station network established along a rural to urban spatial gradient. Using classified satellite data to assess past land cover change, we will predict the likelihood of future land conversion based on our assessment of the factors that create both the demand for and the pattern of development including biophysical and socio-economic drivers. We will project the rate and spatial pattern of additional impervious surface and estimate the future energy budget in the region in terms of cooling degree days. Alternative scenarios will be compared including a 'business as usual', and an 'infill' scenario.

ABOVE AND BELOW GROUND CHARACTERISTICS OF REMNANT AND RESTORED WETLANDS OF CENTRAL NEW YORK

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There are several biotic and abiotic factors in wetland ecosystems that contribute to restoration success. The purposes of this study were to compare remnant and restoration wetlands in central New York with respect to a) native and non-native plant species richness, b) soil and water chemistry and c) degree of colonization of arbuscular mycorrhizal fungi (AMF). Fifty plots in 6 restored and 4 remnant wetlands were established on the basis of plant strata. Plant species richness differed significantly between wetland type with higher plant species richness in restoration sites ($p=0.04$, $df=6$). This is supported by evidence that there is higher non-native plant species richness in restoration sites ($p=0.098$, $df=5$). There were no significant differences in percent mycorrhizal colonization between remnant and restored plant populations. The 83 individual plants sampled consisted of 42 different plant species, of which only 3 were not colonized by AMF. The colonization rate of all plants with AMF was 12.21% (SE=1.43%, range 8-40%). The difference in plant species richness suggests that restored wetland sites remain different from remnant wetland plant populations for even the oldest sites.

QUANTIFYING WATER QUALITY FROM SPATIALLY-DERIVED LANDSCAPE CHARACTERISTICS IN THE CATSKILL DELAWARE WATESHEDS OF NEW YORK CITY WATER SUPPLY

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The focus of this research study is the Catskill-Delaware (Cat/Del) watershed located in New York State, which provides over a billion gallons of clean, unfiltered drinking water daily to 8 million residents of New York City. However, increasing trends of land use change in recent years have become a threat, not only to the sustainability of the current working landscape in the watershed but also to water quality. An assessment of how much of the land use as development can be attributed to water quality and if developed land use impacts dominate over agricultural impacts are critical to these catchments for maintenance of potable water quality. The objective was to quantify water quality using concentrations of seven chemical analytes (TP, TDP, TN, SRP, NO_3-NO_2, NH_4, and TSS) as a function of spatially-derived landscape characteristics in the Cat/Del watersheds. We used multiple regression analyses to analyze the landscape characteristics-water quality relation using the median 2001-2003 concentrations from the New York City Department of Environmental Protection (NYC DEP) 82-site water quality monitoring data set and the 2002 satellite-derived LULC, percent impervious surface, road, population, and parcel density, presence of waste water treatment plants, soil, and topographic factors. In the Catskill basins (average forest 79 %), most of the variation in TP, TDP, TN, NH_4, SRP, and TSS was explained individually by percent agriculture in the subbasins. In the less forested Delaware basins (average forest 76.5%), percent forest cover and percent agricultural land explained most of the variance in TP, TDP, TN, SRP, NO_3-NO_2, and TSS variances. Landscape characteristics as urbanization factors were mostly significant in explaining NH_4 and NO_3-NO_2 concentrations

LSA (Landscape Architecture)

CULTURAL LANDSCAPES: FLOYD BENNETT FIELD, BATTERY WEED AND THE APPALACHIAN TRAIL

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One of the first municipal airports and a waterfront fortress are the subjects of research and design concept development for the rehabilitation of Floyd Bennett Field, Brooklyn, NY and Battery Weed, Staten Island, NY, both part of the Gateway National Recreation Area. Each project will produce a Cultural Landscape Report which guides the National Park Service's (NPS) treatment and use of the cultural landscape in preserving, repairing, rehabilitating, and maintaining the historically significant features and setting of the landscape for future planning efforts. Floyd Bennett Field's research questions what balance could be found between preserving and displaying a landscape's history while still accommodating contemporary recreational uses. Battery Weed's design research will provide improved public safety and access to the waterfront site through linkages of major tourist destinations throughout the metropolitan area, via ferry and other modes of transportation. It also will provide for education and interpretation on site while protecting the national historic resource. SUNY-ESF's Northeast Summer Field School 2006 initiated the Cultural Landscape Inventory (CLI) of the Appalachian Trail, Shenandoah National Park, VA. CLI research will document, determine, and provide guidance for NPS staff as to whether the 20-foot wide corridor of the 101-mile park trail retains its landscape character which dates from its 1930s construction. The three SUNY-ESF Faculty of Landscape Architecture projects are in cooperation with the NPS Olmsted Center for Landscape Preservation.

THE ROLE OF CONSTITUENT PERCEPTION IN THE QUANTIFICATION OF RURAL LANDSCAPE QUALITY

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The visual quality of the rural landscape is a non-market resource that has yet to be fully integrated and standardized into participatory planning procedures. This integration and standardization is crucial for application in the context of holistic planning that requires a quantitative basis for decision-making. Readily available planning processes would benefit municipalities that lack funding and resources. A visual quality survey depicting various landscape scenes will be administered to residents of Fabius, NY, a rural municipality in Onondaga County. Survey design will be based on previous social science research in the areas of landscape perception and focused towards correlating quantitative perception data with real landscapes. The data will be statistically analyzed, and then geo-coded back onto the landscape. The result will be a *visual quality surface* in a GIS database. This surface will be integrated into a planning model, along with various other ecological variables. The result is a more comprehensive, GIS-based process that incorporates, scientifically, the non-market value of visual landscape quality as a real, quantifiable factor.

PBE (Paper & Bioprocess Engineering)

EFFECTS OF ACID TREATMENTS ON THE DELIGNIFICATION OF KRAFT PULPS

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The nature and reactivity of the residual pulp lignin remained after a typical kraft pulping is a subject of fundamental and practical interest, as it generally requires a multiple bleaching sequence for a complete removal as being practiced in the paper industry. Recent reports suggested that the bulk of residual lignin in softwood kraft pulps was presented in the form of lignin-carbohydrate complexes (LCC). This project was initiated to understand the reactivity of these LCC, and how they may be hydrolyzed with a minimal impact on the pulp property. Our initial study examined the extent that the residual kraft pulp lignin can be removed by acid treatments with 0.1 M HCL in dioxane-water (82:18) solution at 120°C for two softwood kaft (unbleached and O_2 -delignified) and two hardwood kraft (unbleached and O_2 -delignified). The results showed the kappa number (an indirect measure of lignin content) of the softwood kraft pulp was considerably reduced by the acid treatment, approximately 65% for the unbleached and 80% for the O_2 -delignified sample. For the hardwood kraft, the percent kappa reduction was about 70% for both the unbleached and O_2-delignified samples. These data support the contention that LCC is a key factor in affecting the reactivity of residual pulp lignin. Further studies will clarify why approximately 30% of the residual pulp lignin was resistant to acid hydrolysis.

PRODUCTION OF BIODIESEL FROM TALL OIL

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In this study, we have produced biodiesel from crude tall oil (CTO), which is a byproduct of the kraft pulping process. Biodiesel was produced by two methods, a novel acetyl chloride-methanol method and a sulfuric acid-methanol method. Initially, oleic acid, linoleic acid, palmitic acid, and stearic acid, which are the major compounds that constitute more than 95% of the fatty acid fraction of CTO, were used to optimize the process parameters. The acetyl chloride or sulfuric acid charge was reduced to 0.1 moles per mole of fatty acid from an initial molar ratio of 3 moles per mole of fatty acid. Biodiesel was then produced from both southern crude tall oil and northern crude tall oil using both of the above-mentioned methods and yields of approximately 60% and 35% were obtained. Finally, a few properties such as density, viscosity, and heating value of the biodiesels were measured. The composition of the produced biodiesels was determined in terms of different methyl esters using gas chromatography.

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