

***TRANSACTIONS OF THE ILLINOIS
STATE ACADEMY OF SCIENCE***

Supplement to Volume 101



**100th Annual Meeting
4-5 April 2008**

**Illinois Natural History Survey
Celebrating its 150th Anniversary
&
University of Illinois at Urbana-Champaign**

**Illinois State Academy of Science
Founded 1907
Affiliated with the Illinois State Museum, Springfield**

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Schedule for the 100th Annual Meeting of the Illinois State Academy of Science

Friday, 4 April 2008-INHS venue, 1816 S Oak St. (see map & directions)

- 11am-1pm Council Meeting, Room 1005
- 11am-4pm Registration
- 2-4 pm Poster Session (posters may be hung beginning at 1 pm and we request they remain in place until the end of the mixer)
- 4:30-7:30pm Mixer (heavy appetizers, 1 drink included, cash bar afterwards)

Saturday, 5 April 2008-UIUC venues, Levis Faculty Center

- 8am-10am Registration & Continental Breakfast
- 8am-11am Oral Presentations, Division Business
- 11-11:45am Keynote Speaker, Dr. Michael Jeffords, loosely “The Illinois Natural History Survey, 150 Years of Science in Illinois”
- 12noon-1pm Deli style luncheon. Pre-made sandwiches, salads, desserts, drinks.
- 1-1:30pm ISAS Business Mtg.
- **Greetings and Acknowledgments**
 - **Awards & Honors**
 - **ISAS Accomplishments in 2007**
 - **Future of ISAS**
 - **Future Annual Meetings**
- 1:30-5pm Oral Presentations, Division Business
- 3pm Break with snacks & drinks
- 5 pm Adjourn

Keynote Speaker Dr. Michael Jeffords

Title of his address: “The Illinois Natural History Survey, 150 Years of Science in Illinois”

Dr. Michael R. Jeffords is a Senior Professional Scientist at the Illinois Natural History Survey (INHS) and Associate Professor at the UI. Currently he functions as the education/outreach director for the Survey. Dr. Jeffords is an entomologist, free-lance photographer, writer, and



educator focused primarily on the issue of biodiversity. Michael is the staff photographer for the *Illinois Steward* magazine and has co-authored *Illinois Wilds*, a coffee table book about the natural habitats of Illinois. Michael also functions as the director (with Susan Post) for the Illinois of Wilds Institute for Nature (IWIN), a program from INHS that offers field courses to the public on various aspects of Illinois biology. Education: B.A., Biology, Murray State University, 1972; M.S., Entomology, University of Illinois, 1976; Ph.D., Entomology, University of Illinois, 1978.

Mike climbing a Mayan pyramid.

Do not let the title fool you; Mike knows how to make science exciting and relevant to all. His photographs are superb and his wit is sharp! We all look forward to a great presentation.

POSTER PRESENTATION TITLES

All posters are presented on 4 April in the first and second floor lobbies of the Illinois Natural History Survey from 2-4 pm. They may be hung beginning at 1 pm. Those students who are competing for awards should be at their posters 3-4 pm to answer judges' questions. * **Indicates presenter eligible for Student Presentation Award.**

Division: Botany

***1. New patterns of ploidy in eastern *Dodecatheon* (Dicot: Primulaceae) inferred from range-wide pollen size distributions**

Rogenski, Christina¹; Eder, S N¹; Esselman, Elizabeth¹; and Oberle, Brad². ¹Southern Illinois University-Edwardsville; ²Washington University.

***2. Seasonal changes in chlorophyll concentration in redbud (*Cercis canadensis*), silver maple (*Acer saccharinum*), and soybean (*Glycine max*) leaves**

Ali, Iffat, A¹; and Mustafa, Munia, M². ¹Lake Land College; ²Mattoon High School.

***3. Morphological and germination characteristics of *Schoenoplectus hallii* (Monocot: Cyperaceae), a rare plant species**

Jacquot, Jacqueline, E; Smith, Marian and Barry, Kelly. Southern Illinois University-Edwardsville.

***4. *Guaiacum officinale* and *Guaiacum sanctum* in (Dicot: Zygophyllaceae) Guánica, Puerto Rico**

Davis, Diana, U; and Ribbens, Eric. Western Illinois University.

***5. Examining evolutionary relationships between *Dodecatheon frenchii* and *Dodecatheon media* (Dicot: Primulaceae) on the basis of seed production**

Martinez-Singh, Anjoli¹; Oberle, Brad²; Eder, S N¹; and Esselman, Elizabeth¹. ¹Southern Illinois University Edwardsville, ²Washington University.

6. Environmental and reproductive factors influencing population size of the Illinois endangered species *Camassia angusta* (Wild Hyacinth)

Franken, Kevin, M¹; Coons, Janice, M¹; Owen, Henry, R¹; Smith, Eric, L²; and Ebinger, John, E¹. ¹Eastern Illinois University, ²Illinois Department of Natural Resources.

***7. Effects of gibberellin and a gibberellin biosynthesis inhibitor on spore germination in the liverwort *Fossombronia crassifolia* Spruce**

Shanle, Erin K; Crandall-Stotler, Barbara J; and Anterola, Aldwin. Southern Illinois University-Carbondale.

***8. Perianth anatomy of *Maxillaria* and related genera (Orchidaceae)**

Tate, Anthony S and Carlsward, Barbara S. Eastern Illinois University.

***9. Effect of auxin on root development using cuttings of six prairie species**

Holsapple, Brittany; Coons, Janice M and Coutant, Nancy E. Eastern Illinois University.

***10. Inter- and intraspecific variation in invasive Amur and “bella” hybrid honeysuckles**

Harroun, David; Schulz, Kurt E; Delap, Amy R and Kohn, Luci Ann P. Southern Illinois University Edwardsville.

11. Status of *Carex aureolensis* Steudel (Cyperaceae), a newly recognized species for Illinois

Marcum, Paul B and Hill, Steven R. Illinois Natural History Survey.

***12. Factors affecting seed germination of bluecurls (*Trichostema setaceum*)**

Klaus, Isaac T; McGuire, Benjamin M; Michel, Emily M; Minol, Joshua C; Hughes, Michael T; Ervin, Stefanie L; Coons, Janice M and Coutant, Nancy E. Eastern Illinois University.

***13. Establishment of monitoring plots to evaluate bottomland forest restoration in the Two Rivers National Wildlife Refuge, Illinois**

Hanley, Steven M and Minchin, Peter R. Southern Illinois University Edwardsville..

***14. Invasion potential of introduced tree species in oak-hickory forest at the Mississippi Sanctuary, Godfrey, Illinois**

Choudhury, Jessica L; Minchin, Peter R; and Retzlaff, William A. Southern Illinois University Edwardsville.

***15. Influence of cold-moist stratification on germination of seeds of prairie plants**

Herold, Jamie M; Baumhardt, Patrice E and Anderson, Roger C. Illinois State University.

16. Composition and structure of the upland forest at Green Wing Environmental Laboratory, Lee County, Illinois

Dziadyk, Bohdan¹ and Andress, Amber J². ¹Augustana College; ²Pizzo & Associates, LTD.

***16A. A conceptual model of exotic community change across a chronosequence of restored bottomland forests.**

McLane, Craig, R and Battaglia, Loretta L. Southern Illinois University Carbondale.

Division: Cellular, Molecular, Developmental Biology

***17. PCR-Based Detection of Genes Responsible for Oxalate Detoxification in Probiotic Microorganisms**

Baluka, Alexandra E C and Daniel, Steven L. Eastern Illinois University.

18. A novel method for sperm DNA analysis and quantification in the tephritid fly, *Anastrepha suspensa

Dhakal, Preeti and Fritz, Ann. Eastern Illinois University.

***19. Genome wide analysis of gene silencing in mammalian cell hybrids**

Hickman, Sharon and Bulla, Gary, A. Eastern Illinois State University.

***20. Tracking intersectin (ITSN) protein and intersectin (ITSN) mRNA in *Gallus gallus domesticus* (Aves: Phasianidae) and *Xenopus laevis* (Amphibia: Pipidae)**

Smith, Amanda A; Burch, Martha A and Thorn, Judith M. Knox College.

***21. Analysis of transcription factor promoter binding in rat hepatoma/fibroblast hybrids**
Angle, Jordan C. Eastern Illinois University.

***22. Amino acid swaps between lipopeptide pheromones of the mushroom fungus *Schizophyllum commune* (Basidiomycetes: Schizophyllaceae) identify a critical tyrosine residue**

Basso, Douglas, K; Neal, Charla, A; Tichy, Sarah, A and Fowler, Thomas, J. Southern Illinois University Edwardsville.

***23. Identification of a mutant with a partial mating deficiency in the mushroom fungus *Schizophyllum commune* (Basidiomycetes: Schizophyllaceae)**

*Wilson, Margaret, E; Griffith, James, R and Fowler, Thomas, J. Southern Illinois University Edwardsville.

***24. Location of scooter transposons relative to the THN1 gene and characterization of several THN1 null alleles of the mushroom fungus *Schizophyllum commune* (Basidiomycetes: Schizophyllaceae)**

Meier, Stephanie, L; Sierman, Audrey, R and Fowler, Thomas, J. Southern Illinois University Edwardsville.

25. Changes in membrane fluidity during apoptosis

Banas, Tim, B; Shaw, Michael J and Wanda, Paul E. Southern Illinois University.

***26. Pharmacological characterization of acetylcholine receptors in the gut of the earthworm *Lumbricus terrestris* (Oligochaeta: Lumbricidae)**

Onyango, Esther and Krajniak, Kevin G. Southern Illinois University Edwardsville.

27. Investigation of integrins during pedal lacerate development in the cnidarian *Aiptasia pulchella* (Anthozoa: Aiptasiidae)

Avery, Tiffany and Sawyer, Sara. Southern Illinois University Edwardsville.

***28. Regulation of integrin signaling in the cnidarian *Hydra vulgaris* (Hydrozoa: Hydridae) bud formation**

Sallee, Andrea and Sawyer, Sara. Southern Illinois University Edwardsville.

Division: Chemistry

***29. Comparative analysis of tailpipe exhaust emissions from biodiesel-petro-diesel blends**

Weremijewicz, Joanna; Bachman, Maria; Schmeling, Martina; Geddes, Pamela and Berthold, Laura. Loyola University Chicago.

30. Design and characterization of transmembrane proteins

Gotkowski, Eric S.; Denos, Sharlene and Gruebele, Martin. University of Illinois.

***31. Phosphodiester identification in the muscle of the freeze-tolerant Wood Frog (*Rana sylvatica*) (Amphibia: Ranidae)**

Szczesniak, Christoph; Marjanovic, Marina and Lawrence, Barbara. Eastern Illinois University.

Environmental Science

32. Sustainability from the institution to the individual: a case study

Ringholm, Elisa and Eames, James Marshall. Loyola University Chicago.

33. Illinois Department of Natural Resources owned, managed, and leased properties project

Tweddale, Tari; Jarvis, Janet; Greer, Diane and Hickman, Chad. Illinois Natural History Survey.

34. Early 1800's land cover in Illinois

Szafoni, Diane; Greer, Diane and Cordle, Liane. Illinois Natural History Survey.

35. Lead analysis of the tissues of the white-footed mouse (*Peromyscus leucopus*) (Rodentia: Muridae)

Patil, Shruti; Kohn, Luci Ann; Brugam, Richard; Lin, Zhi-Qing, and Retzlaff, William. Southern Illinois University Edwardsville.

36. Occurrence of the tick *Ixodes scapularis* (Acari: Ixodidae) and Lyme disease among small mammals in four habitat types in Robert Allerton Park

Buhnerkempe, Michael G¹; Rydzewski, Jennifer M¹; Rao, Sangeeta²; Mateus-Pinilla, Nohra E^{1,2}; Warner, Richard E² and Hamer, Sarah A³. ¹Illinois Natural History Survey, Urbana-Champaign; ²University of Illinois Champaign-Urbana; ³Michigan State University.

37. Distribution of cats (Mammalia: Felidae) in Robert Allerton Park using scent stations and motion detection cameras

Fredebaugh, Shannon L¹; Wangen, Kimberly L¹; Mateus-Pinilla, Nohra E^{1,2}; Rao, Sangeeta¹ and Jewell, Emily E¹. ¹University of Illinois Urbana-Champaign; ²Illinois Natural History Survey.

38. Evaluating storm water runoff quality from green roofs

Alsup, Sarah¹; Ebbs, Stephen¹; Battaglia, Loretta¹; Woods, Emily²; Luckett, Kelly³ and Retzlaff, Bill². ¹Southern Illinois University at Carbondale; ²Southern Illinois University Edwardsville; ³Green Roof Blocks.

39. Sedimentary record of change in a southwestern Illinois reservoir

Williams, Phillip D.; Redpath, Louis and Brugam, Richard B. Southern Illinois University Edwardsville.

40. Can a lake remove nitrogen pollution from water?

Wilson, Matthew J. and Brugam, Richard, B., Southern Illinois University Edwardsville.

41. Evaluation of mixed *Sedum* species (Dicot: Crassulaceae) plugs on a green roof system

Richter, Lane¹; Retzlaff, Bill¹; Morgan, S¹; Jost, Vic² and Luckett, Kelly³. ¹Southern Illinois University at Edwardsville; ²Jost Greenhouses, ³Green Roof Blocks.

42. Can constructed wetlands replace natural wetlands? A study into microbial community structure and function in constructed vs. natural wetlands

Flanagan, Diana Najla¹; Matthews, Jeffrey² and Kent, Angela D¹. ¹University of Illinois Urbana-Champaign; ²Illinois Natural History Survey.

43. Addressing climate change at the site level: a pilot project at Nachusa Grasslands

Zercher, Deanna; Herkert, James and Thompson, Josh. The Nature Conservancy in Illinois.

***44. Wetland mitigation bank assessment from a soil microbial ecology perspective**

Peralta, Ariane L¹; Matthews, Jeffrey W² and Kent, Angela, D¹. ¹University of Illinois at Urbana-Champaign; ²Illinois Natural History Survey.

45. Evaluation of techniques for extracting algal oil for biofuels

Miceli, David P. Loyola University Chicago.

***46. Cancelled.**

***47. Evaluating the thermal performance of green wall systems**

Middleton, Zach¹; Woolbright, Mark²; Morgan, S¹; Jost, Vic³; Lockett, Kelly⁴ and Retzlaff, Bill¹.
¹Southern Illinois University at Edwardsville; ²Green Wall Ventures LLC; ³Jost Greenhouses;
⁴Green Roof Blocks.

***48. Impact of growth media, species, and fertilizer selection on green roof performance**

Swearingin, Lauren¹; Morgan, S¹; Jost, Vic²; Lin, Zhi-qing¹; Lockett, Kelly³ and Retzlaff, Bill¹.
¹Southern Illinois University at Edwardsville; ²Jost Greenhouses; ³Green Roof Blocks

49. Air quality studies in Chicago

Bezener, Martin; Goldblatt, David and Schmeling, Martina. Loyola University.

Division: Health Sciences

***50. Several macrolide antibacterial antibiotics effect murine immune response**

Bradstreet, Tara R; Jethi, Gaurav K; Bush, Deborah; Najafpour, Elham; Panahipour, Saman and Kitz, Dennis J. Southern Illinois University Edwardsville.

***51. The effects of new antifungals on murine immune response**

Blaki, Sarah M; Aiyeomoni, Babatunde O; Lesko, Jennifer L; Cook, Rachelle N; Khazaeli, Sadegh and Kitz, Dennis J. Southern Illinois University Edwardsville.

***52. The trials and tribulations of housing experimental animals at a iia institution.**

McCracken, Vance J; McCommas, Steven A; Krajniak, Kevin G; Skelton, Linda L and Kitz, Dennis J. Southern Illinois University Edwardsville.

***53. Imidazole effects on murine immune response**

Barton, Jennifer L; Purlee, Sami J; Orasco, Michael L; Volkman, Christina M; Farley, Norah C and Kitz, Dennis J. Southern Illinois University Edwardsville.

***54. Further studies on ketolide effects on murine immune response.**

Freed, Lydia R; Lesko, Jennifer L; Blaki, Sarah M; Gooch, Melanie; Bone, Robert and Kitz, Dennis J. Southern Illinois University Edwardsville.

***55. Respiratory effects of 1-propylxanthine in neonatal rats**

Hance, Amanda L T and McGilliard, Kip L, Eastern Illinois University.

Division: Microbiology

56. Isolation of an *Escherichia coli* mutant which grows faster than wildtype on galactose
McCommas, Steven A and Patel, Shaival. Southern Illinois University at Edwardsville.

***57. Strain resistance to *Eimeria falciformis* (Eukaryota: Apicomplexa) in mice**

Seager, Renee, E and McQuiston, Thomas E. Millikin University.

***58. A mutant *Escherichia coli* strain, selected for resistance to IPTG, uses galactose more efficiently than wildtype**

Kruse, Joel R and McCommas, Steven A. Southern Illinois University at Edwardsville.

***59. An *Escherichia coli* mutant metabolizes galactose more efficiently than wildtype**

Kelley, Melissa and McCommas, Steven A. Southern Illinois University at Edwardsville.

***60. Resolving the nutritional requirements of *Clostridium scindens*, a bile acid-metabolizing gut bacterium**

Inboden, Ashley M and Daniel, Steven L. Eastern Illinois University.

***61. Cold stress exacerbates neonatal *Helicobacter felis* (Bacteria) infections in mice**

Malvin, Nicole P and McCracken, Vance J. Southern Illinois University Edwardsville.

***62. Intestinal *Helicobacter* (Bacteria) associated with Canada geese on the SIUE campus**

Wolf, Kyle J and McCracken, Vance J. Southern Illinois University Edwardsville.

Division: Science, Mathematics & Technology Education

***63. Neuroscience in High School Biology Classrooms: A Year-Long NSF GK-12 Intervention**

Whalen, Christopher J¹, Kirkpatrick, Matthew². ¹University of Illinois, Urbana-Champaign; ²Nequa Valley High School.

64. Assessing the effectiveness of laboratory simulations in biology education

Drake, Jane and Barry, Kelly. Southern Illinois University Edwardsville.

***65. The development of a curriculum for middle-school science students visiting Millikin University in Decatur, Illinois**

Christ, Meghan O; Coleman, Amanda G; Zange, Jessica R and Horn, David J. Millikin University.

Division: Zoology

***66. Home range, habitat use, and survival of free-ranging domestic cats**

Horn, Jeff A¹; Warner, Richard E. ¹ and Mateus-Pinilla, Nohra². ¹University of Illinois; ²Illinois Natural History Survey.

67. A two-year mist-netting survey for bats in northeastern Illinois

Hofmann, Joyce E; Merritt, Joseph F; Mengelkoch, Jean M and Carpenter, Samantha K. Illinois Natural History Survey.

68. A baseline study of bird communities related to floodplain forest succession at Emiquon National Wildlife Refuge, Illinois

Lerczak, Thomas V. Emiquon Audubon Society-Illinois Nature Preserves Commission.

***69. Effects of habitat degradation on leech parasitism in aquatic turtles**

Readel, Anne M; Phillips, Christopher A and Wetzel, Mark J. Illinois Natural History Survey.

***70. Effects of habitat on condition and microgeographic distribution of two closely related topminnow (Fundulidae) species**

Gerstenecker, Patricia Ann¹; Schaefer, Jacob F²; Brunkow, Paul E¹ and Duvernell, David D¹. ¹Southern Illinois University Edwardsville, ²University of Southern Mississippi.

***71. Interspecific competition and the effect of density on individual growth rate and condition between two topminnow (Fundulidae) species**

Miller, Mallory M¹; Schaefer, Jacob F²; Brunkow, Paul E¹ and Duvernell, David D¹. ¹Southern Illinois University at Edwardsville; ²University of Southern Mississippi.

***72. PROJECT WILDBIRD - Food and feeder preferences of wild birds in the United States and Canada**

Shonkwiler, Stacey M and Horn, David J. Millikin University.

73. West Nile Virus: A serosurvey of ranid frogs (Amphibia: Ranidae) in selective sites in Illinois

Danner, Bradley, A and Phillips, Christopher A. Illinois Natural History Survey.

***74. Bird-window collisions and factors influencing their frequency at Millikin University in Decatur, Illinois**

Collins, Kathleen A and Horn, David J. Millikin University.

***75. PROJECT PREVENT COLLISION: A study of bird-window collisions in residential neighborhoods in Illinois**

Weiss, Rachel E and Horn, David J. Millikin University.

76. From days of oar: preliminary results of a survey of the water bugs of Illinois (Insecta: Heteroptera: Nepomorpha)

Tinerella, Paul P and Taylor, Steven J. Illinois Natural History Survey.

***77. Cancelled.**

***78. Developing a technique to evaluate mucus production by single, freshwater snails (Gastropoda)**

Riseman, Lauren and Brunkow, Paul. Southern Illinois University Edwardsville.

***79. Relationship between tenacity and shell and foot size in a stream-dwelling snail (Gastropoda)**

Vredenburgh, Tom and Brunkow, Paul. Southern Illinois University Edwardsville.

***80. Mechanisms of seed preferences in wild birds that use feeders**

Shonkwiler, Stacey M and Horn, David J. Millikin University.

***81. Comparison of an additional ribosomal DNA fragment (28s rDNA d2-3 region) contributing to a molecular phylogeny of the water boatmen (Insecta: Heteroptera: Corixoidea)**

Fleener, Christine and Tinerella, Paul P. Illinois Natural History Survey.

***82. Dietary analysis of a northeastern Illinois turtle community**

Menzel, Evan J and Kuhns, Andrew R. Illinois Natural History Survey and Berger, Andrew J, Lake County Forest Preserve District.

***83. We're gonna need more traps: sampling multiple aquatic habitat types to avoid erroneous estimates of turtle community structure**

Berger, Andrew J¹ and Kuhns, Andrew R² and Menzel, Evan J². ¹Lake County Forest Preserve District; ²Illinois Natural History Survey.

***84. The birds of Green Wing Environmental Laboratory in northcentral Illinois**

McKay, Kelly J¹ and Hager, Stephen B². ¹BioEco Research and Monitoring Center, Hampton; ²Augustana College.

***85. Breeding birds and nest productivity at Green Wing Environmental Laboratory, northcentral, Illinois**

Hager, Stephen B; Bertram, Christopher R and Derner, Katie R. Augustana College.

***86. Fluctuating asymmetry in Tamarin (Primates: *Saguinus*) Postcranial Morphology**

Schonert, Kallie and Kohn, Luci Ann, Southern Illinois University Edwardsville.

***87. Morphometric analyses of coyote (*Canis latrans*) and Gray Fox (*Urocyon cinereoargenteus*) crania**

Alderman, Kaitlin and Kohn, Luci Ann. Southern Illinois University Edwardsville.

***88. Morphometric analysis of dental and cranial morphology in red and grey Foxes (*Vulpes vulpes* and *Urocyon cinereoargenteus*)**

Rickelman, Aaron and Kohn, Luci Ann. Southern Illinois University Edwardsville.

***89. Heritability of dermatoglyphic patterns**

Sido, Jessica; Kohn, Luci Ann and Rehg, Jennifer. Southern Illinois University Edwardsville.

***90. Effect of phosphodiesterases (PDEs) on the neuromuscular activity in the freeze-tolerant frog (*Rana sylvatica*)**

France, Megan; Lawrence, Barbara and Marjanovic, Marina. Eastern Illinois University.

***91. Evaluating prairie health based on an auchenorrhynchous Homoptera index of biotic integrity (AH-IBI)**

Wallner, Adam, M¹; Dietrich, Christopher H² and Molano-Flores, Brenda². ¹University of Illinois at Urbana-Champaign; Illinois Natural History Survey.

92. Laboratory behavior and husbandry in the Rocky Mountain tailed frog, *Ascaphus montanus

Suffian, Daniel J; Essner, Richard L; Jansen, Jody A; Gerstenecker, Patricia A; Roberts, Kandace K and Brunkow, Paul E. Southern Illinois University Edwardsville.

93. Mating bias in the red imported fire ant.

Fritz, Gary N. and Carroll, Kendra. Eastern Illinois University.

94. Overwintering mosquitoes in Illinois stormwater tunnels & caves

Taylor, Steven J. and Richard L. Lampman. Illinois Natural History Survey.

***95. Ontogenesis of the coracoid in the marsupial short-tailed Opossum (*Monodelphis domestica*).**

J. E. Peters, M. J. Hubler and K. E. Sears. University of Illinois Champaign-Urbana.

***96. The effects of food deprivation on agonistic behavior in the crayfish *Procambarus clarkii* (Decapoda: Cambaridae)**

Patel, James K; Forker, Nathan J and Robertson, Marianne. Millikin University.

***97. Effects of starvation in bullfrog tadpoles, *Rana catesbeiana* (Amphibia: Ranidae), ability to evade their natural predator, the dragon fly nymph, Anisoptera (Insecta: Odonata)**

Tegethoff, Amy L; Gibbs, Shawn K and Robertson, Marianne W. Millikin University.

ORAL PRESENTATION TITLES

*Indicates presenter eligible for Student Presentation Award.

Division: Botany

1st Floor Reading Room Levis Center

Session Moderator: Brenda Molano-Flores, Illinois Natural History Survey

- 8:45 **98. Occurrence of black knot disease on cherries in a post-fire forest regrowth in the Adirondack Wilderness, New York**
Beck, Hans, T and Conway, Joseph. Aurora University.
- 9:00 **99. Composition, structure, and diversity in Kyrgyz steppes**
Taft, John B. Illinois Natural History Survey.
- 9:15 ***100. Leaf and photosynthetic characteristics of *Trillium flexipes* (bent trillium) and *Trillium recurvatum* (purple trillium)**
Bragg, Rachel; Smith, Frances M and Minchin, Peter R. Southern Illinois University-Edwardsville.
- 9:30 **101. Effects of storage temperature on germination and viability of *Boltonia decurrens***
Smith, Marian and Mertens, Rachel. Southern Illinois University-Edwardsville.
- 9:45 ***102. In vitro seed germination and development of the federally endangered Hawaiian endemic, *Platanthera holochila* (Orchidaceae) - an update**
Turnquist, Rebecca L¹; Kirk, Anna K¹; Morrison, Amanda R¹; Perlman, Steve² and Zettler, Lawrence W¹. ¹Illinois College, ²National Tropical Botanical Garden.
- 10:00 ***103. Development of the endangered *Physaria ludoviciana* (silvery bladderpod; Brassicaceae) when affected by light intensity**
Jernegan, Marissa C and Coons, Janice M. Eastern Illinois University.
- 10:15 ***104. Substrate preferences of epiphytic orchids (seedlings, juveniles, mature plants) within the Florida Panther National Wildlife Refuge**
Massey, Emily E¹; Hamilton, Kabrina²; Stewart, Scott L³; Richardson, Larry W⁴ and Zettler, Lawrence W¹. ¹Illinois College, ²Western Kentucky University, ³Phytotechnology Laboratories, ⁴U.S. Fish & Wildlife Service.
- 105. Cancelled.**
- 10:30 **106. Size class structure and spatial distributions of invasive *Lonicera maackii* populations in southwestern Illinois**
Schulz, Kurt E; Hoover, Audra and Ecology of Plants Students. Southern Illinois University Edwardsville.

- 10:45 **107. Vascular flora and community mapping of Funks Grove Illinois Natural Areas Inventory Site, Mclean County, Illinois**
 Marcum, Paul B; Phillippe, Loy R; Busemeyer, Daniel T; Larimore, Richard L and Murphy, Michael J.C. Illinois Natural History Survey.
- 1:30 ***108. Ecology of terrestrial macrofungi in old-growth prairie groves**
 Hustad, Vincent P; Methven, Andrew S; Pederson, Charles L and Meiners, Scott J. Eastern Illinois University.
- 1:45 ***109. Effects of timed mowing for control of *Taeniatherum caput-medusae* (Monocot: Poaceae) in an annual grassland: a community perspective in invasive species management**
 Reed, L. Southern Illinois University Carbondale.
- 2:00 ***110. Effects of arbuscular mycorrhizal fungi on productivity and soil nutrients of cultivar and non-cultivar warm-season prairie grasses**
 Campbell, Ryan E and Baer, Sara G. Southern Illinois University-Carbondale.
- 2:15 ***111. Fire suppression effects on a coastal floating marsh ecosystem**
 Makweche, Plaxedes T and Battaglia, Loretta L. Southern Illinois University Carbondale.
- 2:30 **112. Response of natal grass (*Melinis repens*), an invasive species in Florida scrub vegetation, to supplemental additions of nitrogen and phosphorus**
 Anderson, Roger C¹ and Menges, Eric S². ¹Illinois State University, ²Archbold Biological Station.
- 2:45 ***113. Effect of aspect on woody plant species composition and richness in an arid trans-Himalayan landscape, Nepal**
 Paudel, Shishir¹ and Vetaas, Ole R². ¹Southern Illinois University-Carbondale, ²UNIFOB - Global, University of Bergen.
- 3:00 PM Break
- 3:15 PM ***114. Extant vegetation and soil seed bank community structure in a sand prairie in northwestern Illinois**
 McNicoll, Molly B¹; Augspurger, Carol K¹ and Edwards, Adrienne L². ¹University of Illinois Urbana-Champaign, ²California State University Chico.
- 3:30 PM ***115. Expression of inbreeding depression on the self-compatible invasive plant, garlic mustard (*Alliaria petiolata*)**
 Mullarkey, Alicia A; Anderson, Roger C and Byers, Diane L. Illinois State University.
- 3:45 PM 116. On the importance of standardization by species in the exploratory analysis of community data
 Minchin, Peter R. Southern Illinois University Edwardsville.
- 4:00 PM **117. Vegetation Changes in Illinois Forests 1997-2006**
 Carroll-Cunningham, Connie; Ellis, James and Spyreas, Greg. Illinois Natural History Survey.
- 4:15 PM **118. Illinois¹ Threatened, Endangered & Extirpated Native Flora.**
 Murphy, Michael J C¹; Ebinger, John E² and Phillippe, Loy R. ¹Illinois Natural History Survey, ²Eastern Illinois University.
- 4:30 PM **119. Recovery and restoration of *Bouteloua gracilis* (Monocot: Poaceae) at the Savanna Army Depot**
 Nyboer, Randy W. Illinois Natural History Survey.
- 4:45 PM **Division Business Meeting**

Division: Cell, Molecular, and Developmental Biology

402 & 403 Levis Faculty Center

Moderator: Sara Sawyer, Southern Illinois University Edwardsville

- 9:00 AM **120. Microarray analysis of the polymorphic ciliate, *Tetrahymena vorax* (Ciliophora: Tetrahymenidae)**
Subei, Obada; Hunt, Christin; Kosalka, Malgorzata; Martin, Ashley and Buhse Jr., Howard E, University of Illinois at Chicago; and Werlin, Rebecca; Hamilton, Eileen and Orias, Eduardo, University of California at Santa Barbara.
- 9:15 AM ***121. Subcellular centrin localization within distinct compartments of *Vorticella convallaria*'s (Ciliophora: Vorticellidae) contractile organelles.**
Konior, Katarzyna; McCutcheon, Suzanne M and Buhse Jr., Howard E. University of Illinois at Chicago.
- 9:30 AM ***122. The effect of calpain cleaved tau on filament formation and tubulin assembly *in vitro***
Monsivais, Diana; Quaye, Laura and Abraha, Aida. Chicago State University.
- 9:45 AM **Division Business Meeting, use lobby of 1st, 2nd, or 4th floor.**

Division: Chemistry

Second Floor Semi-private Space, Levis Faculty Center

Moderator: Dean J. Campbell, Bradley University.

- 1:30 PM ***123. Effects of threonine on the morphology of noble metal colloids**
Korte, Kylee E; Hanerhoff, Brittney and Campbell, Dean J. Bradley University.
- 1:45 PM ***124. Characterization of the yeast *Pichia pastoris* (Saccharomycetaceae) vac8 protein association with the vacuolar membrane**
Boehmer, Brian T; Hoeflerlin, Katie and Fry, Michelle R. Bradley University.
- 2:00 PM ***125. Development of a green chemistry protocol for oxidative cleavage of alkenes**
Johnson, Jeffery D. and Vinod, Thottumkara K. Western Illinois University.
- 2:15 PM ***126. Design and development of a pedagogically significant undergraduate experiment**
Reed, Jill and Vinod, Thottumkara K. Western Illinois University.
- 2:30 PM ***127. Synthesis of tri-(4-pyridyl)-s-triazine and its use as a ligand**
Flint, Edward B. and Morrison, Paul J. Bradley University.
- 2:45 PM ***128. Optimization of the reaction conditions for the synthesis of 5-aryl-3-oxo- δ -lactones**
Nguyen, Elizabeth; Gereg, Jessica and Andersh, Brad. Bradley University.
- 3:00 PM **Break**
- 3:15 PM ***129. Utilization of 5-aryl-3-oxo- δ -lactones as cyclooxygenase inhibitors**
Deweese, Kara; Hollandsworth, Lauren and Andersh, Brad. Bradley University.
- 3:30 PM **Division Business Meeting.**

Division: Environmental Science

2nd Floor (Not Private) Levis Faculty Center

Moderator: Nicholas P. Guehlstorf, Southern Illinois University Edwardsville.

- 8:00 AM ***130. Spatial characterization of methylmercury in the Piasa Creek watershed**
Vermillion, Brian¹, Huff, Daniel² and Hudson, Robert¹. ¹University of Illinois at Urbana-Champaign; ²Southern Illinois University Edwardsville.
- 8:15 AM ***131. Phenotypic variability in orange-spotted sunfish (*Lepomis humilis*) (Centrarchidae)**
Bland, Thomas J, University of Illinois Urbana-Champaign and Retzer, Mike E, Illinois Natural History Survey.
- 8:45 AM ***132. Evaluating storm water runoff from green roof blocks with six different growth mediums**
Gaffney, Debbie¹; Morgan, S¹; Jost, Vic²; Luckett, Kelly³ and Retzlaff, Bill¹.
¹Southern Illinois University at Edwardsville; ²Jost Greenhouses; ³Green Roof Blocks.
- 9:00 AM ***133. Evaluating green paks green roof systems**
Lucas, Ray¹; Jost, Vic²; Luckett, Kelly³; Curry, Mike⁴; Kohler, Grace⁵ and Retzlaff, Bill¹. ¹Southern Illinois University at Edwardsville; ²Jost Greenhouses; ³Green Roof Blocks; ⁴Midwest Trading Horticultural Supplies; ⁵Midwest Groundcovers.
- 9:15 AM ***134. Conservation toxicology: DNA damage and oxidative stress in endangered gopher tortoises, *Gopherus polyphemus*, on a military base**
Theodorakis, Christopher W¹ and Adams, S. Marshall². ¹Southern Illinois University Edwardsville; ²Oak Ridge National Laboratory.
- 9:45 AM ***135. Uptake and speciation of Selenium in different chemical forms by pearl oyster mushroom, *Pleurotus ostreatus***
Meyer, David; Anakor, Izu and Lin, Z.-Q., Southern Illinois University Edwardsville.
- 10:00 AM ***136. Evaluation of storm water runoff from green roof systems**
Woods, Emily¹; Jost, Vic²; Luckett, Kelly³; Morgan, S¹ and Retzlaff, Bill¹.
¹Southern Illinois University Edwardsville; ²Jost Greenhouses; ³Green Roof Blocks.
- 10:15 AM ***137. Geographic distribution of lead and lead isotopes in southwestern Illinois soils and lake sediment suggests sources of contamination**
Brugam, Richard B; Lin, Zhi-Qing; Williams, Phillip D and Richter, Lane. Southern Illinois University Edwardsville.
- 10:30 PM **138. Trajectories in floristic quality indicators over time in compensatory mitigation wetlands**
Matthews, Jeffrey W, Illinois Natural History Survey and Endress, Anton G, University of Illinois Urbana-Champaign.
- 10:45 PM ***139. Evaluation of the thermal benefits of green roof systems**
Sidwell, Abby¹; Luckett, Kelly²; Morgan, S¹; Yan, Terry¹; Noble, Brad¹ and Retzlaff, Bill¹. ¹Southern Illinois University Edwardsville; ²Green Roof Blocks.
- PM **Arrange for business meeting in 1st, 2nd, or 4th floor lobby**

Division: Health Science

Room 402&403, Levis Faculty Center

Moderator: Cathy Santanello, Southern Illinois University Edwardsville.

- 10:00 AM ***140. First and second generation glycopeptide antibiotics effects on murine immune responses**
Bone, Robert; Ousley, Omara D; Anderson, Sharitha E; Lesko, Jennifer L; Khazaeli, Sadegh and Kitz, Dennis J. Southern Illinois University Edwardsville.
- 10:15 AM ***141. TRPM8R-agonist mediated hypoxic-ischemic neuroprotection**
Munoz, Mark L¹; Penick, Esther¹; Dybas, Linda¹ and Barks, John². ¹Knox College; ²University of Michigan.
- 10:30 AM ***142. Creation of high surface area orthopedic surgical bone clamp for the proximal tibia**
Snell, Christopher M¹; Potaczek, Steven² and Thorn, Judith M¹. ¹Knox College; ²Galesburg Clinic.
- 10:45 AM **Business meeting**

Division: Science, Mathematics & Technology Education

Room 402&403, Levis Faculty Center

Moderator: Sue Post, Illinois Natural History Survey?

- 1:30 PM ***143. Here's how you prove stuff: an approach to introducing high school students to mathematical proof techniques using basic computability theory**
Cummins, Desmond. University of Illinois Urbana-Champaign.
- 1:45 PM ***144. A content analysis of research methodology experience found in biology course descriptions of St. Louis area community colleges and universities**
Miller, Katherine M and AbuSharbain, Elaine M. Southern IL University Edwardsville.
- 2:00 PM ***145. Demonstrating how abiotic factors influence the distribution of animals**
Richardson, Matthew L. University of Illinois Urbana-Champaign.
- 2:15 PM ***146. Molecular Visualization in High School Biology: "My Favorite Protein"**
Denos, Sharlene M¹, Kirkpatrick, Matthew²; Barker, Shelley³. ¹University of Illinois Urbana-Champaign; ²Neuqua Valley High School; ³Danville High School.

Division: Zoology

Second Floor Music Room, Levis Faculty Center

Moderator: Steve Hager, Augustana College

- 9:00 AM **147. Geography of periodical cicadas in DuPage County, Illinois**
Strang, Carl A and Velat, Tom C. Forest Preserve District of DuPage County
- 9:15 AM **148. Geographic variation of *Parauchenoglanis ngamensis* (Boulenger 1991), (Pisces; Claroteidae; Auchenoglaninae), an African catfish.**
Retzer, Mike. Illinois Natural History Survey.

- 9:30 AM ***149. Mate discrimination as a form of reproductive isolation in the topminnows *Fundulus notatus* and *F. olivaceus* (Fundulidae)**
Schoeneck, Brian D and Duvernell, David D. Southern Illinois University Edwardsville.
- 9:45 AM **150. Hybridization between silver (*Hypophthalmichthys molitrix*) and bighead carp (*H. nobilis*) in the Mississippi and Illinois rivers**
Lamer, James T¹; Dolan, Chad R²; Peterson, Jessica L³; Chick, John, H⁴ and Epifanio, John, M⁴. ¹Western Illinois University; ²Iowa Department of Natural Resources; ³University of California Davis; ⁴Illinois Natural History Survey
- 10:00 AM **151. Limb differentiation in the American alligator, *Alligator mississippiensis***
Livingston, Victoria J and Bonnan, Matthew F. Western Illinois University.
- 10:15 AM **152. Documentation of turtle mortality along the east edge of Beatty's Pond at Big Sand Mound Nature Preserve**
McKay, Kelly J¹ and Hager, Stephen B². ¹BioEco Research and Monitoring Center; ²Augustana College.
- 10:30 AM **153. Abundance, richness, and diversity of frogs and toads at big sand mound nature preserve**
Hager, Stephen, B¹ and McKay, Kelly, J². ¹Augustana College; ¹BioEco Research and Monitoring Center.
- 10:45 AM **154. Birdlife of the upper Mississippi River: a field adventure on the Port Louisa National Wildlife Refuge**
McKay, Kelly J¹ and Blevins, Brian L¹. and Harvey, Karen D². ¹BioEco Research and Monitoring Center; ²U.S. Fish and Wildlife Service.
- 1:30 PM **155. Results of the 2005-2008 Milan Bottoms Bald Eagle Night Roost Survey Project**
McKay, Kelly J; Monson, Cathleen D; Bryant, Robert R; Zuurdeeg, Walter M; Ritter, Brian P and Blevins, Brian L. BioEco Research and Monitoring Center.
- 1:45 PM **156. Bats and rabies in Illinois**
Hofmann, Joyce E¹; Mengelkoch, Jean M¹; Austin, Connie² and Amundsen, Steven, B¹, ¹Illinois Natural History Survey; ²Illinois Department of Public Health.
- 2:00 PM **157. The chronicles of Mollusca – four short stories about mollusk related projects in Illinois**
Tiemann, Jeremy S. Illinois Natural History Survey.
- 2:15 PM ***158. Movement of a bacterial plant pathogen through the gut of its beetle vector**
Mitchell, Robert F and Hanks, Lawrence M. University of Illinois Urbana-Champaign.
- 2:30 PM ***159. Arm regeneration in the Pacific octopus *Octopus bimaculoides***
Ossler, Julia and Bennett, Heather. Illinois College.
- 2:45 PM ***160. Cause of injury in raptors admitted to the Illinois Raptor Center, 1995-2006**
Neese, Mallory¹ and Horn, David J². ¹University of Illinois at Urbana-Champaign; Millikin University.
- 3:00 PM Break
- 3:15 PM ***161. Do local and landscape-level habitat characteristics influence pond occupancy by painted turtles (*Chrysemys picta*)?**
Cosentino, Bradley, J¹; Phillips, Christopher A²; Schooley, Robert, L¹. ¹University of Illinois Urbana-Champaign; ²Illinois Natural History Survey

- 3:30 PM ***162. Historical population structure of two communities in Madison County, Illinois in 1860.**
Berger, Elise and Kohn, Luci Ann. Southern Illinois University Edwardsville.
- 3:45 PM **163. The effect of epiphyseal cartilage loss in the appendicular skeleton of the American Alligator, *Alligator mississippiensis***
Sandrik, Jennifer L. and Bonnan, Matthew F.
Department of Biological Sciences, Western Illinois University.
- 4:00 PM **Zoology Business Mtg.**

POSTER PRESENTATION ABSTRACTS

***Indicates presenter eligible for Student Presentation Award.**

Division: Botany

***1. New patterns of ploidy in eastern *Dodecatheon* (Dicot: Primulaceae) inferred from range-wide pollen size distributions**

Rogenski, Christina¹; Eder, S N¹; Esselman, Elizabeth¹ and Oberle, Brad². ¹Southern Illinois University-Edwardsville, Edwardsville, IL, ²Washington University, St Louis, MO.

Ploidy level plays a major role in plant evolution and taxonomy. In the genus *Dodecatheon*, chromosome counts vary within and among species. Previous cytological research has suggested that a rare diploid with unusual meiosis, *Dodecatheon frenchii* is evolutionarily derived from a widespread tetraploid *Dodecatheon meadia*. This unconventional conclusion was based on material collected in a limited geographical area. The purpose of this study was to survey a correlate of ploidy level-pollen morphology-from across the range of these species. Mean pollen diameter did not differ between species, but among plants from different populations. Pollen diameters from 8 populations of *D. meadia* in 6 states were strongly bimodal. The difference between small and large pollen was similar to reported differences in diameter between other diploid and polyploid *Dodecatheon* species. Pollen diameters from 7 populations of *D. frenchii* in 4 states had no clear mode and the mean was intermediate between the two modes observed in *D. meadia*. Contrary to previous studies, these data suggest that *D. meadia* consists of both diploid and tetraploid populations, and that *D. frenchii* is not a conventional diploid. However, the broad range of pollen diameters in *D. frenchii*, spanning diploid and tetraploid sizes, may reflect abundant aneuploid pollen. This is consistent with the previous identification of abnormal meiosis in this unusual species.

***2. Seasonal changes in chlorophyll concentration in redbud (*Cercis canadensis*), silver maple (*Acer saccharinum*), and soybean (*Glycine max*) leaves**

Ali, Iffat A¹ and Mustafa, Munia M². ¹Lake Land College, Mattoon, IL, ²Mattoon High School, Mattoon, IL.

When seasons change from spring to summer to fall many plants display color change in their leaves. The effect of seasonal change on chlorophyll concentration (responsible for green color) in the leaves of redbud (*Cercis canadensis*), silver maple (*Acer saccharinum*), and soybean (*Glycine max*) was studied. Chlorophylls were quantified spectrophotometrically (at 645 and 663 nm) after extraction with 80% acetone-deionized water solution. Samples were collected and analyzed at 1-2 week intervals for 29 weeks (mid spring through late fall 2007). Silver maple leaves showed a faster rate of attainment of the maximum total chlorophyll concentration of 4.1 mg/g leaf tissue followed by a slower decline compared to those of redbud. In redbud leaves, total chlorophyll concentration was held at a steady high plateau for a longer period of time with the highest at 3.7 mg/g leaf. Soybean leaves kept a relatively high plateau of chlorophyll concentration with a maximum of 3.4 mg/g leaf, though the entire span was much shorter than the other two plants. All high range values (2-4 mg/g leaf) of chlorophyll concentration occurred near relatively high temperature range (average 22-27 C) and percent relative humidity range (average 58-83%) in the seasons. Season dependent changes in chlorophyll concentration were observed in all plants which agree with the qualitative visual observations.

***3. Morphological and germination characteristics of *Schoenoplectus hallii* (Monocot: Cyperaceae), a rare plant species**

Jacquot, Jacqueline E; Smith, Marian and Barry, Kelly. Southern Illinois University-Edwardsville, Edwardsville, IL.

Schoenoplectus hallii is a rare wetland plant in jeopardy of extinction. Over the past few years, populations have declined in number. *S. hallii* is an amphicarpic species that produces morphologically distinct aerial and basal seeds. The aerial seeds of *S. hallii* have been suitably researched; however, the life cycle of its basal seeds is unknown. For *S. hallii* to gain federal protection, information must be obtained about the life history of its basal seeds. These data are essential for the establishment of new populations and the preservation of existing ones. Presently, no other studies have been conducted to determine the characteristics of the basal seeds. Results of this study indicate that basal seedlings are larger and produce more numerous and longer stems and roots than those of aerial seedlings. Germination requirements for the basal seeds were found to be identical to the requirements for aerial seeds: both require a larger concentration of seeds to initiate germination. This suggests that basal seeds, like aerial seeds, require ethylene as a cue for germination. The results of this study will be used to provide the missing link in the life history of *S. hallii*.

***4. *Guaiacum officinale* and *Guaiacum sanctum* in (Dicot: Zygophyllaceae) Guánica, Puerto Rico**

Davis, Diana U; and Ribbens, Eric. Western Illinois University, Macomb, IL.

Guaiacum officinale and *Guaiacum sanctum* are two species of Neotropical trees, thought to invest in survival mechanisms instead of rapid growth. The highly commercially valued trees are slow growing and have been over-harvested, leading to their placement on the CITES endangered species list. Both species are found in the dry forests of Guánica, Puerto Rico. *Guaiacum officinale* is abundant while *Guaiacum sanctum* is less numerous. The average size *Guaiacum officinale* tree was from 12-24 cm in diameter while *Guaiacum sanctum* trees were generally smaller, from 8-13 cm in diameter. Seedlings and reproducing adults were both found throughout the area. We investigated methods to promote seed germination, growth rates, and amounts of herbivory damage. *Guaiacum officinale* seeds germinated best when soaked in gibberellic acid solutions, and did not germinate when scarified. We analyzed one cross section of *Guaiacum officinale* wood 21.6 cm in diameter, and found 63 rings were counted, for an average ring width of 3.4 mm. Herbivory was significantly higher on *Guaiacum officinale* leaves than *Guaiacum sanctum* leaves, although some damage was found on leaves of both species. Higher herbivory damage to *Guaiacum officinale* may be due to the migratory butterfly *Kricogonia* or moth *Melipotis* whose larva feed on *Guaiacum* leaves at night and hide under its bark during daylight. The high rate of herbivory on *Guaiacum officinale* contradicts biochemical and slow growth rate evidence for heavily investing in defensive chemicals, and should be further investigated.

***5. Examining evolutionary relationships between *Dodecatheon frenchii* and *Dodecatheon meadia* (Dicot: Primulaceae) on the basis of seed production**

Martinez-Singh, Anjoli¹; Oberle, Brad²; Eder, S N¹ and Esselman, Elizabeth¹. ¹Southern Illinois University-Edwardsville, Edwardsville, IL, ²Washington University, St. Louis, MO.

Dodecatheon meadia, a widespread upland species, and *D. frenchii*, a rare sandstone rockhouse endemic, grow in close proximity in Southern Illinois. Cytological work has shown that *D.*

frenchii is a diploid ($n = 22$) while *D. meadia* is tetraploid ($n = 44$) (Olah and DeFillip, 1969). Despite the differences in ploidy, plants with intermediate morphology sometimes grow in between typical populations of these species. The intermediate plants may be low-fitness hybrids that result from secondary contact between reproductively isolated parents, or they may represent a bridge in the ongoing evolutionary divergence between these taxa. The purpose of our study was to test these alternative scenarios by comparing the fitness of intermediate plants to both parents. We found that, contrary to the expectations of the hybrid scenario, the intermediate plants had the fewest empty fruits and just as many seeds per fruit as *D. frenchii*. These results suggest that intermediate plants play an important role in an evolutionarily dynamic relationship between *D. meadia* and *D. frenchii*.

6. Environmental and reproductive factors influencing population size of the Illinois endangered species *Camassia angusta* (Wild Hyacinth)

Franken, Kevin M¹; Coons, Janice M¹; Owen, Henry R¹; Smith, Eric L²; and Ebinger, John E¹.
¹Eastern Illinois University, Charleston, IL, ²Illinois Department of Natural Resources, Gibson City, IL.

Wild hyacinth (*Camassia angusta*) [(Engelm. & A. Gray) Blank.] is a perennial species native to mesic prairies of the midwestern and south central United States. In Illinois, the only extant population of this endangered species is in a small section of degraded black soil prairie along a railroad track right-of-way south of Elwin, Macon County. The objectives of this research were to determine the population status, seed production, and germination requirements of *C. angusta* of this population. The population was surveyed in June from 1990 to 2007 by counting the number of flowering wild hyacinth plants. A survey of other plant species present was conducted in 1999 to assess its quality. Seed production of *C. angusta* was estimated, and germination trials for seeds from the site were conducted. The population of *C. angusta* fluctuated significantly from 1990 to 2007 (28 to 169 plants). The site consisted of approximately 75% native and 25% introduced species. Prescribed spring burns and a construction equipment disturbance may be partially responsible for these fluctuations. A large percentage of undeveloped fruit, resulting in low seed production (< 3000), may be responsible for the inability of this population to increase consistently. In the laboratory, germination of wild hyacinth seeds was very low (8%). Future research efforts should take into account the results from this study in order to develop additional management strategies.

***7. Effects of gibberellin and a gibberellin biosynthesis inhibitor on spore germination in the liverwort *Fossombronia crassifolia* Spruce**

Shanle, Erin K; Crandall-Stotler, Barbara J; and Anterola, Aldwin. Southern Illinois University-Carbondale, Carbondale, IL.

Gibberellins (GAs) are important phytohormones that regulate stem elongation, seed germination, and floral development in angiosperms. GAs were first isolated from fungi and the evolutionary development of such compounds is not well understood. In ferns GAs are involved in antheridia formation and spore germination, but the role of GAs in the growth and development of bryophytes is still unclear. In mosses, a recent study showed that germination rates are reduced by AMO-1618, a compound that inhibits the production of ent-kaurene, a common precursor to GAs. The effect is less pronounced when ent-kaurene is also present in the growth media. GAs, however, did not promote spore germination or reduce the inhibitory affect of AMO-1618. In this experiment, the effects of GA and AMO-1618 on spore germination in the liverwort *Fossombronia crassifolia* were investigated. Unlike mosses, neither AMO-1618 nor

GA inhibited spore germination in *Fossombronina crassifolia*. Though the presence of such compounds did not affect germination rates, both GA and AMO-1618 did inhibit or delay the formation of gametophores in the germinated spores. These findings suggest that further study into the potential role of GAs in the growth and development of liverworts is warranted.

***8. Perianth anatomy of *Maxillaria* and related genera (Orchidaceae)**

Tate, Anthony S and Carlsward, Barbara S. Eastern Illinois University, Charleston, IL.

Maxillaria is a large orchid genus commonly found throughout the American tropics and subtropics. Recent molecular evidence suggests that *Maxillaria* and several segregate genera (including *Cryptocentrum*, *Mormolyca*, and *Trigonidium*) are not monophyletic, while other genera of Maxillariinae do form clades (including *Brasiliorchis*, *Camaridium*, and *Heterotaxis*). The focus of our study was to find structural features in the perianth that could be used to diagnose clades currently based on molecular data. Perianth anatomy for 26 species of *Maxillaria* and related genera within Maxillariinae was examined using light microscopy. In transverse section, all sepals of *Maxillaria* sensu stricto contained fiber bundles, making their presence a diagnosable feature of the clade. Other distinct anatomical features found in Maxillariinae were scattered, sclerified idioblasts and mucilage-containing ground tissue. Sclerified idioblasts were abundant in *Heterotaxis* and several species of *Maxillaria*. *Camaridium*, *Trigonidium*, and some species of *Maxillaria* sensu stricto possessed ground tissue cells with large amounts of mucilage. In *Maxillaria*, these mucilage-containing cells were restricted to a few adaxial layers just below the epidermis. From the anatomical features found in our study, fiber bundles seem to be the most useful in diagnosing the genera of Maxillariinae.

***9. Effect of auxin on root development using cuttings of six prairie species**

Holsapple, Brittany; Coons, Janice M and Coutant, Nancy E. Eastern Illinois University, Charleston, IL.

Interest in using native plants for landscaping is increasing. Many landscape plants are propagated vegetatively to maintain desirable horticultural traits. Yet very little is reported on vegetative propagation of native plants. Our objective was to determine how auxin affects root development using cuttings of six native prairie species. Leaf-bud cuttings were taken in September from plants grown in the field (*Amorpha canescens*, *Aster laevis*, *Ceanothus americanus* and *Lobelia siphilitica*) or in greenhouses (*Coreopsis tripteris* and *Pycnanthemum virginianum*). Half the 18 cuttings were dusted with Bontone® rooting powder (0.1 % indole-3-butyric acid, i.e. Auxin), and each cutting was placed in vermiculite in an individual cell (4 x 4 x 6 cm) with a clear plastic dome over trays containing cells. Trays were placed into a growth chamber at 25°C with constant light at 24 µmol/m²/sec, and sprayed with water mist on a daily basis. Root development was scored after three to six weeks using a scale from 0 (no callus or roots) to 5 (multiple roots/also shoots). No roots developed for *C. americanus*, and only one cutting produced a single small root for *A. canescens*, although numerous roots did develop for the other four species. Auxin significantly increased root production for *C. tripteris*, *L. siphilitica*, and *P. virginianum* on some sampling dates. For *P. virginianum*, shoots also developed. Although further studies are needed, propagation via leaf-bud cuttings was feasible for four of these species, and auxin was beneficial for most.

***10. Inter- and intraspecific variation in invasive Amur and “bella” hybrid honeysuckles**

Harroun, David; Schulz, Kurt E; Delap, Amy R and Kohn, Luci Ann P. Southern Illinois University-Edwardsville, Edwardsville, IL.

In the Midwest, Amur honeysuckle (*Lonicera maackii*) and a hybrid complex of Tartarian and Morrow’s honeysuckle ($L. \times bella = L. tatarica \times L. morrowii$) are widespread exotic invaders of forest habitats. Amur honeysuckle is seemingly more abundant in southern IL and the hybrid more common further north. Hybrid origin suggests higher levels of genetic diversity in the hybrid than in Amur honeysuckle. This might be manifested as hybrid vigor or genetically based differences in phenotypic plasticity (G x E). For each taxon, progeny of eight maternal genotypes are being grown in a greenhouse study to compare species level ecological differences and the extent of G x E plasticity in response to shade. Seed germination rates differed greatly between the species (Amur 55%, hybrid 72%), with much greater variability among maternal genotypes in Amur honeysuckle (CV = 41% vs. 24%). Seedling heights 40 days after planting were significantly greater (230%) for Amur honeysuckle, which remained taller (180%) at 80 days. Relative growth rate did not differ in the 40-80 day growth period. For height at 40 days, hybrid honeysuckle showed a large significant variance component for maternal genotype (44%). These results suggest that both honeysuckle taxa contain considerable genetic variation in germination behavior, and genetic differences persist in the early growth of the hybrid. Amur honeysuckle seedlings seemingly have a greater capacity to capitalize on favorable habitats through rapid growth.

11. Status of *Carex aureolensis* Steudel (Cyperaceae), a newly recognized species for Illinois

Marcum, Paul B and Hill, Steven R. Illinois Natural History Survey, Champaign, IL.

Carex aureolensis Steudel, golden cattail sedge, was originally named new to science in 1855. However, it failed to achieve proper recognition as a separate species due to its superficial similarity to the more common and previously described *Carex frankii* Kunth, bristly cattail sedge. Recent taxonomic interest in the genus *Carex* has once again brought this species to the light. The Flora of North America recognizes *C. aureolensis* as a distinct species, in the Section *Squarrosae*, based on its staminate and pistillate scale morphology, its rhizomatous growth habit and its distribution. Preliminary studies of this species, in Illinois, show these distinctions to be consistent with our material. *C. frankii* specimens at the Illinois Natural History Survey (ILLS) and Southern Illinois University (SIU) herbaria have been checked in an attempt to provide an understanding of the status of *C. aureolensis* in Illinois. In addition, field searches for this species have been conducted over the course of the last five years. This species is currently listed as endangered in our neighboring state, Indiana. The distribution, in Illinois, appears to be limited to the southern one-third of the state, from the Southern Till Plain Natural Division south to the Coastal Plain Natural Division. Twenty-two herbarium records have been observed from 11 Illinois counties. Additional searches, in the appropriate habitats, will likely expand the range of this infrequent to uncommon species. *C. aureolensis* appears to be too common to warrant any special protection in Illinois.

***12. Factors affecting seed germination of bluecurls (*Trichostema setaceum*)**

Klaus, Isaac T; McGuire, Benjamin M; Michel, Emily M; Minol, Joshua C; Hughes, Michael T; Ervin, Stefanie L; Coons, Janice M and Coutant, Nancy E. Eastern Illinois University, Charleston, IL.

Bluecurls (*Trichostema setaceum* Houtt.) Is a sand prairie species found in southeastern United States. Little is known about germination requirements for bluecurls, although other *Trichostema*

species require smoke. The purpose of this study was to investigate factors that may affect seed germination of bluecurls including viability, mold contamination, water uptake, and liquid smoke. For viability, imbibed seeds were cut in half, soaked in 2, 3, 5-triphenyl tetrazolium chloride, and scored for pink color. For these seeds, 72% were viable. For mold contamination, seeds were treated with 70% ethanol (1 minute), 20% bleach (15 minutes), ethanol then bleach, 3 g/l Captan (30 seconds) or were untreated before placing in petri dishes on moist filter paper. Molded seeds were counted. Bleach alone or Captan controlled mold best with contamination < 50% compared to > 75% with other treatments. For water uptake, seeds (rubbed with sandpaper or not) were weighed, imbibed, and reweighed. All seeds imbibed water whether scarified or not, indicating seed coats did not prevent water uptake. For liquid smoke, seeds were placed in petri dishes moistened with smoke solutions (Figaro Mesquite Liquid Smoke at 0, 1:1000, 1:500, 1:100 or 1:10 concentrations), and germinated seeds were counted. Liquid smoke did not affect germination. In summary, seed germination of bluecurls was not limited by viability or by water uptake, and mold contamination could be reduced. Further studies need to consider how to break dormancy since Figaro liquid smoke had no effect in this preliminary study.

***13. Establishment of monitoring plots to evaluate bottomland forest restoration in the Two Rivers National Wildlife Refuge, Illinois**

Hanley, Steven M and Minchin, Peter R. Southern Illinois University-Edwardsville, Edwardsville, IL.

We set up permanent plots to evaluate bottomland hardwood forest (BLH) restorations in Two Rivers National Wildlife Refuge, Illinois, where abandoned fields have been planted to a mix of bottomland oaks (*Quercus* spp.) and pecan (*Carya illinoensis*), using root production method (RPM) trees. RPM produces a fibrous root system that may result in higher growth rates and better survival. Seventy-four circular 600-m² plots were randomly located on two sites: Pohlman Slough (25 ha; planted 2002 and 2004) and Gilbert lake (8 ha; planted 2004). Each planted tree and natural recruits above 1 m high were tagged and their species, diameters and heights recorded. Cover of herbaceous species and counts of woody species less than 1 m high were recorded in twenty 1-m² quadrats. At Pohlman Slough, total dominance was 0.105 m²/ha, mainly comprised of *Q. palustris* (71%), *C. illinoensis* (12%), *Q. bicolor* (7%), and *Populus deltoides* (6%). Mean tree height was 175 cm. At Gilbert Lake no natural recruits were observed and total dominance was 0.016 m²/ha, made up of *Q. palustris* (30%), *Q. bicolor* (28%), *Q. macrocarpa* (27%), and *C. illinoensis* (15%). Mean tree height was 136 cm. Major herbaceous species at both sites were the planted cover grasses, *Elymus virginicus* and *Agrostis gigantea*. Tree species richness was higher at Pohlman Slough (9) than Gilbert Lake (4), due to natural recruitment. Continued monitoring of the established plots will provide essential data to guide adaptive management, ensuring the development of BLH with a structure and diversity comparable to regional reference sites.

***14. Invasion potential of introduced tree species in oak-hickory forest at the Mississippi Sanctuary, Godfrey, Illinois**

Choudhury, Jessica L; Minchin, Peter R; and Retzlaff, William A. Southern Illinois University-Edwardsville, Edwardsville, IL.

We investigated the invasion potential of two tree species in oak-hickory forest on the bluffs of the Mississippi River near Godfrey, Illinois. *Koelreuteria paniculata* (golden rain tree) is native to Asia and *Aesculus pavia* (red buckeye) is native to the United States but not to this region of Illinois. Both were planted in an arboretum on the site in the early 1960s. Planted trees and

recruits were accurately mapped and their basal diameters measured. All recruits of *K. paniculata* and a random sample of 25% of *A. pavia* were cut near ground level and a stem section was aged by counting annual rings. Linear regressions of diameter on age were fitted for each species. The *A. pavia* regression was used to estimate the age of uncut individuals. For each recruit, distance to its closest potential parent was calculated. Frequency histograms by year of establishment and distance to parent were constructed. Diameter growth rate of *K. paniculata* varied from 0.30 cm/yr in an area with no forest canopy to 0.13 cm/yr in the forest. Establishment rate increased exponentially from the mid-1960s, peaking in the mid-1980s and declining thereafter, possibly due to increased mortality from prescribed management fires. Most recruits were within 20 m of a potential parent, with a maximum distance of 40.5 m. *A. pavia* had a mean growth rate of 0.18 cm/yr. It showed a lag in establishment until the late-1970s, then increased exponentially. Distance to parent was bimodal, with most recruits within 10 m of a parent, but a substantial number at 20-45 m, probably reflecting dispersal by squirrels. We conclude that both species are invasive in oak-hickory forest.

***15. Influence of cold-moist stratification on germination of seeds of prairie plants**

Herold, Jamie M; Baumhardt, Patrice E and Anderson, Roger C. Illinois State University, Normal, IL.

We evaluated germination of seeds of 16 prairie plants stored at room temperature for a year. Circular blotter paper was placed in Petri dishes and the dishes and paper were sterilized in an autoclave. Twenty-five seeds of each species were placed on the sterilized blotter paper in each of 12 Petri dishes. For each species, seeds in 4 replicate Petri dishes were given 0, 4 or 8 weeks of cold-moist stratification at 4.4 degrees Celsius. Seeds were germinated in a growth chamber with 16 hours (Light) at 30 degrees Celsius and 8 hours (Dark) at 20 degrees Celsius. Seed germination was recorded daily for 27 days and germinated seeds were removed. Seven of the 16 species had significantly increased germination with cold-moist stratification, although there were no significant differences between the 4 and 8 week stratification treatments. A second group of 8 species had earlier germination but no increase in total germination following cold-moist stratification. Only 3 species (*Rudbeckia hirta*, *Solidago speciosa*, and *Veronicastrum virginicum*) did not have earlier germination following cold-moist stratification.

16. Composition and structure of the upland forest at Green Wing Environmental Laboratory, Lee County, Illinois

Dziadyk, Bohdan¹ and Andress, Amber J². ¹Augustana College, Rock Island, IL, ²Pizzo & Associates, LTD. Leland, IL.

The floristic composition and ecological structure of a remnant upland forest was analyzed at a biological field station owned by Augustana College. Green Wing Environmental Laboratory is a 170 ha mosaic of woodland, wetland and grassland remnants located in central Lee County, northern Illinois. The site is wholly surrounded by cropped fields and a trailer park in which little or no native vegetation persists. We used the point-centered quarter method to determine density, frequency and dominance (basal cover) and their respective relative values plus importance values for each species. A total of 39 species of trees, shrubs and woody vines was recorded from sample points. Nine species yielded importance values above 5% and the rest were below that value. Black oak had the greatest relative density (27%) followed by wild cherry (25%) and common buckthorn in the understory (7%). The other six species (bur oak, red pine, white pine, box elder, black walnut and silver maple) had relative density values less than 6%. The greatest relative cover values, however, were for white pine (8%) and red pine (6%). These coniferous

species are restricted to two major groves that were planted after 1950, and though the pines are less dense than the major hardwoods they are larger in diameter.

***16A. A conceptual model of exotic community change across a chronosequence of restored bottomland forests**

McLane, Craig R and Battaglia, Loretta L. Southern Illinois University-Carbondale, Carbondale, IL.

The once vast bottomland hardwood forests that occupied floodplains throughout the southeastern and south-central United States have been radically reduced in extent by conversion to agriculture and urban development. These losses have prompted massive restoration efforts aimed at rapidly restoring cover of dominant bottomland forest species to abandoned farm fields. Despite the expense of restoration and the ecological imperative for success, few studies have focused on identifying obstacles to meeting long-term restoration goals. Non-native agricultural weeds are commonly reported in recently abandoned fields and in new restorations. The hope that exotic species decline over time with canopy closure and restoration age may be optimistic given the legacy of disturbance and wide range of non-native species in this landscape. We hypothesize that a progression of exotic communities will occur with time since restoration and parallel changes in the native assemblages. We propose a conceptual model of exotic community change in which weedy, non-native annuals (e.g., *Bromus tectorum* and *Trifolium campestre*) dominate young restorations and are gradually replaced by shade intolerant non-native perennials (e.g., *Lespedeza cuneata* and *Poa pretensis*). In mature restorations, we expect to find a shade-tolerant assemblage (e.g., *Lonicera japonica* and *Rosa multiflora*) that may persist indefinitely. This model is being tested across a chronosequence of restored bottomland and mature second growth forests in the Cache River Basin.

Division: Cellular, Molecular, Developmental Biology

***17. PCR-Based Detection of Genes Responsible for Oxalate Detoxification in Probiotic Microorganisms**

Baluka, Alexandra E C and Daniel, Steven L. Eastern Illinois University, Charleston, IL.

Oxalyl coenzyme A (CoA) decarboxylase (Oxc) is involved in bacterial oxalate metabolism, catalyzing oxalyl-CoA decarboxylation to formyl-CoA, leading to oxalate detoxification. Oxalate is important due to its involvement in kidney stone formation. *Oxalobacter formigenes*, which uses oxalate as its sole energy substrate, contains the *oxc* gene. Some probiotic bacteria also consume oxalate, suggesting they may also contain the *oxc* gene. In this study, primers for *oxc* detection in *O. formigenes* (416-bp amplicon), *Lactobacillus acidophilus* NCFM (1, 771-bp amplicon) and *Bifidobacterium lactis* Bl-07 (640-bp amplicon) were used to detect the *oxc* gene in probiotic bacteria (*L. acidophilus* NCFM, *L. acidophilus* LA-14, *B. lactis* Bl-07, *B. lactis* Bl-04, *Lactococcus lactis* LL-23, *L. brevis* LBR-35, *L. rhamnosus* LR-32, *B. longum* BL-05, *B. breve* BB-03, *L. paracasei* LPC-37, *Streptococcus thermophilus* ST-21, *L. salivarius* LS33, *L. plantarum* LP-115, *L. bulgaricus* Lb-64, *L. casei* LC-11, *Pediococcus acidilactici* P751, and *L. helveticus* Lh-138). *B. lactis* Bl-07-specific primers yielded a 640-bp amplicon from *B. lactis* Bl-04, *B. longum* BL-05, and *B. breve* BB-03 whereas *L. acidophilus* NCFM-specific primers yielded a 1, 771-bp amplicon from *L. salivarius* LS33 and *L. acidophilus* LA-14. *O. formigenes*-specific primers did not produce a significant 416-bp amplicon from any of the probiotic bacteria

tested. Since the presence of the *oxc* gene did not always coincide with oxalate consumption, further research is necessary to reveal the significance of this gene in probiotic bacteria.

18. A novel method for sperm DNA analysis and quantification in the tephritid fly, *Anastrepha suspensa

Dhakal, Preeti and Fritz, Ann. Eastern Illinois University, Charleston, Illinois.

Anastrepha suspensa females have four different sites of sperm storage in their reproductive tract, may mate with more than one male, and store sperm in differing amounts in each organ after copulation. In order to study the dynamics of sperm storage patterns and subsequent paternity outcomes, a method was developed for both genotyping and quantifying sperm in the spermathecae. Spermathecae are isolated and sonicated to remove maternal cells, and subsequently crushed between two micro-slides to release sperm from the capsule. After DNA isolation, microsatellite loci can be amplified by PCR for fragment analysis. Sperm from two different male genotypes can then be identified and quantified by measuring peak height and peak area using a CEQ200XL Beckman Coulter TM Sequencer. A standard curve of peak area and height for different quantities of DNA amplified by PCR for a given microsatellite locus is used to estimate unknowns. Preliminary data is presented on sperm storage patterns for doubly-mated females, and on correlations of the duration of first copulations versus second copulations.

***19. Genome wide analysis of gene silencing in mammalian cell hybrids**

Hickman, Sharon and Bulla, Gary, A. Eastern Illinois State University, Charleston, Illinois.

For about 40 years it has been known that the fusion of mammalian cells of distinct origin produce hybrid cells that result in global loss of tissue-specific gene expression. Despite a great deal of research on this phenomenon, the mechanism of this process remains elusive. Due to recent advancements in microarray technology, it is possible to monitor gene expression of entire genomes in cell fusion experiments. We utilized microarray analysis to observe whole rat genome expression in rat hepatoma cells, rat fibroblast cells, and rat hepatoma x fibroblast hybrid cells. We used Rat Genome 230 2.0 array chips from Affymetrix which were incubated with labeled cDNA molecules derived from RNA extracted from each cell type using a Qiagen RNeasy kit, and then samples read on a chip reader. Preliminary results suggest that, in agreement with previous data, a large number of liver-enriched genes are moderately (5-10 fold) to strongly (>10 fold) repressed (194 and 300 genes, respectively) in the cell hybrids. A nearly equal number of fibroblast-specific genes were also repressed in the hybrid cells. Furthermore, 35 genes were activated >5 fold in the cell hybrids compared to either parental cell line. Thus, gene silencing in cell hybrids is bi-directional and affects a large portion of parental genomes. Also, a number of previously silent genes are activated in cell hybrids, some of which may be involved in the extensive gene silencing phenotype observed in cell hybrids.

***20. Tracking intersectin (ITSN) protein and intersectin (ITSN) mRNA in *Gallus gallus domesticus* (Aves: Phasianidae) and *Xenopus laevis* (Amphibia: Pipidae)**

Smith, Amanda A; Burch, Martha A and Thorn, Judith M. Knox College, Galesburg, IL.

Intersectin (ITSN), a protein involved in clathrin mediated endocytosis and mitogenesis, becomes localized to the nucleus after the mid-blastula transition in *Xenopus laevis* embryos. It was predicted ITSN would follow the same pattern in chick as seen in frog; nuclear localization would occur after mid blastula transition, chick H&H stage 10. Immunostaining experiments performed with an anti-*Xenopus* ITSN antibody using equivalently staged chick embryos (H & H

stages 12-14) failed to detect ITSN nuclear localization. In situ hybridizations were conducted using the ITSN-L neural specific probe prepared from *X. laevis* cDNA. High levels of ITSN-L mRNA expression were observed in the neural folds of stage 13, 17 and 21 *X. laevis* embryos. Stages 23 and 27 indicate staining in the neural tube and head. Expression levels remain high in the brain in later stages as well. When used to examine the localization of ITSN in chick embryos, the *Xenopus* ITSN-L probe failed to detect ITSN mRNA in chick embryos.

***21. Analysis of transcription factor promoter binding in rat hepatoma/fibroblast hybrids**

Angle, Jordan C. Eastern Illinois University, Charleston, IL.

It is known that when somatic cell hybrids are generated from fibroblast and hepatoma cells, genome-wide hepatic gene expression is silenced. The mechanism for this cessation, however, is unknown. Specifically, it is unknown whether the binding of transcription factors to the promoter regions of these genes is prevented or that binding of these factors occurs but recruitment of the RNA polII initiation complex is prevented. The use of the chromatin immunoprecipitation assay has provided a means to evaluate the binding ability of transcription factors and cofactors to bind to promoter sequences. Using this assay to analyze a variety of parental and hybrid cell lines, a better overall picture of gene expression regulation can be realized. In hepatic genes such as albumin, HNF1a is a transcription factor known to drive expression. In a normally functioning rat hepatoma cell, HNF1a is bound to the promoter region along with other cofactors. Preliminary testing via the ChIP assay on FTO2B, a hepatoma cell, has supported this notion by producing an amplified copy of the promoter region. Further testing involving hybrids have also supported the notion that the albumin gene is inactive due to the lack of HNF1a-promoter binding. Forcing expression of HNF1a in cell hybrids suggests that HNF1a is able to bind the albumin gene promoter, but unable to activate albumin gene expression.

***22. Amino acid swaps between lipopeptide pheromones of the mushroom fungus *Schizophyllum commune* (Basidiomycetes: Schizophyllaceae) identify a critical tyrosine residue**

*Basso, Douglas, K; Neal, Charla, A; Tichy, Sarah, A and Fowler, Thomas, J. Southern Illinois University Edwardsville, Edwardsville, IL.

Mate recognition in *Schizophyllum commune* is controlled in part by G-protein coupled receptors and short lipopeptide pheromones. These molecules were functionally expressed in the yeast *Saccharomyces cerevisiae* for molecular study. *S. commune* pheromones Bap1(3) and Bap2(3) are very similar in primary sequence. Bap2(3) [EKPGGSLTYAWC] activates G-protein coupled pheromone receptors Bar1 and Bar3. Bap1(3) [ERPGGSNCTAWC] activates receptor Bar3, but not Bar1. Site-directed mutagenesis focused on three amino acid positions (bolded) in these two pheromones and their contributions to Bar1 and Bar3 activation. Single, double, and triple amino acid swaps between the pheromones were accomplished. A triple mutant pheromone, Bap2(3)NCT [EKPGGSNCTAWC], activates receptor Bar3 but not Bar1. With single and double mutants, the tyrosine (Y) residue at position C-3 of Bap2(3) was identified as critical for activation of Bar1, but not activation of Bar3. Positions C-4 and C-5 appear to have subtle influences on pheromone activity toward Bar1. Bar3 activation was unaffected by any of the interchanges that were made between the pheromones. We predict that replacement of threonine with tyrosine at the C-3 position of Bap1(3) [ERPGGSNCTAWC] will lead to a pheromone that activates receptor Bar1, and confirm the importance of a tyrosine residue for activation of receptor Bar1.

***23. Identification of a mutant with a partial mating deficiency in the mushroom fungus *Schizophyllum commune* (Basidiomycetes: Schizophyllaceae)**

*Wilson, Margaret, E; Griffith, James, R and Fowler, Thomas, J. Southern Illinois University Edwardsville, Edwardsville, IL.

Schizophyllum commune is a filamentous wood-rotting fungus belonging to the subclass Homobasidiomycetes, or mushroom fungi. Like many Homobasidiomycetes, *S. commune* is known to have multiple mating types, which are determined, in part, by pheromone and G protein-coupled receptor interactions. A presumed signaling cascade is initiated by a G protein when a non-self pheromone binds to a compatible receptor, and this signaling leads to competence for sexual reproduction. Much information is known about the compatible combinations of various pheromones and receptors, but very little is known about the downstream signaling. A transgenic, tryptophan-auxotrophic strain of *S. commune*, F591-2, with constitutively-activated mating signaling was generated. By virtue of two transgenes, F591-2 mimics a sexually-competent mated individual without ever having mated. Mutagenesis of this strain was accomplished by random integration of a plasmid containing a functional *trp1* gene into the chromosomal DNA. 668 tryptophan-producing transformants were selected. Several *trp1* transformants exhibited phenotypes that would be expected if signaling through the pheromone receptor were interrupted. We followed the signaling defect and tryptophan prototrophy through one cross. All tryptophan-producing progeny were signaling-defective and all tryptophan auxotrophic progeny were signaling-competent, suggesting the signaling and tryptophan phenotypes are very tightly linked. The signaling defect prevents the mutant fungus from accepting fertilizing nuclei from a compatible strain, but it is able to donate fertilizing nuclei to a compatible mate. This is typical mating behavior for a defect in the signaling pathway activated by the pheromone receptor, but not for a defect in pheromone production. This potentially tagged mutant is under investigation at the molecular level to determine the affected gene.

***24. Location of scooter transposons relative to the THN1 gene and characterization of several THN1 null alleles of the mushroom fungus *Schizophyllum commune* (Basidiomycetes: Schizophyllaceae)**

Meier, Stephanie, L; Sierman, Audrey, R and Fowler, Thomas, J. Southern Illinois University Edwardsville, Edwardsville, IL.

Schizophyllum commune is a wood-decaying mushroom fungus. Mutants of *S. commune* called 'thin' exhibit accelerated hyphal growth in the radial direction compared to wild-type hyphae, and a subset of these thin mutants grow in a corkscrew pattern in agar. One corkscrew thin mutant that was previously characterized is caused by disruption of a regulatory gene, THN1, by Scooter, a DNA transposon of Type II (hAT family). Scooter creates 8-bp target site duplications and has 32-bp inverted repeats (TIRs). Informal observations suggest spontaneous corkscrew thin mutants arise frequently. We hypothesized that an active copy of Scooter resides in close proximity to the thin gene and often hits the *thn1* gene when it moves, leading to a high frequency of *thn1* mutations when Scooter is active. A crude bioinformatics search of the *S. commune* genome at 4X coverage found approximately 20 copies of the Scooter element with nearly perfect TIRs. Two of these elements are located within 500 kb of the *thn1* gene. Several *thn1* alleles from other corkscrew thin mutants have been cloned to determine whether Scooter can also be implicated as the cause of their dysfunction. This has not proven to be the case to date in a small sample of thin strains. Other insertions and a deletion have been identified in these alleles.

25. Changes in membrane fluidity during apoptosis

Banas, Tim, B; Shaw, Michael J and Wanda, Paul E. Southern Illinois University, Edwardsville, Illinois.

Human erythroleukemic (HL60) were spin-labeled with 5-deoxylstearic acid, induced to apoptosis by ultraviolet light irradiation (UVB 302nm), and studied by Electron Spin Resonance (ESR) spectroscopy. Comparison of apoptotic spectral line-widths with those from a healthy control cell sample reveals that during apoptosis, the fluidity of the cell membrane increases. In these experiments, spin label concentrations were kept constant so spectral line broadening due to increased interactions of spin labels with each other is the result of a decrease in membrane viscosity.

***26. Pharmacological characterization of acetylcholine receptors in the gut of the earthworm *Lumbricus terrestris* (Oligochaeta: Lumbricidae)**

Onyango, Esther and Krajniak, Kevin G. Southern Illinois University at Edwardsville, Edwardsville, IL.

Previous work has shown that the earthworm gut is very similar in nature to the mammalian gut and both can be modified by several different neurotransmitters and peptides including acetylcholine. The objective of the study was to examine the effect of acetylcholine and various other cholinergic agonists in an attempt to pharmacologically characterize the receptors involved in mediating acetylcholine action in the gut of the earthworm, *Lumbricus terrestris*. The isolated crop-gizzard and smooth muscle rings cut from the gizzard were exposed to acetylcholine and several different muscarinic and nicotinic agonists. Agonists tested were muscarine and McN-A-343 (muscarinic) and nicotine and epibatidine (nicotinic). The effect of the nonselective neurotransmitter carbachol was also tested. Acetylcholine had a biphasic effect on amplitude, with excitation at low concentrations and inhibition at high concentrations. All agonists tested also showed the same biphasic effect. Overall, the muscarinic agonists seemed to have more of an effect on the earthworm gut however, the nicotinic neurotransmitters also had an effect, although reduced compared to the muscarinic agonists. This leads us to conclude that the cholinergic receptors found on the gut of *L. terrestris* may not fit into the mammalian classification of nicotinic and muscarinic and more research would be needed in order to identify the specific receptor type mediating cholinergic action.

27. Investigation of integrins during pedal lacerate development in the cnidarian *Aiptasia pulchella* (Anthozoa: Aiptasiidae)

Avery, Tiffany and Sawyer, Sara. Southern Illinois University, Edwardsville, Illinois.

Integrins are cell surface receptors that play a vital role in cell attachment and are important signaling molecules in cell growth and tissue formation. These proteins have been identified in all animals including cnidarians. Although their presence is well known in these animals, their distribution and regulatory properties have yet to be determined. This study is an investigation into the functional role of integrins during pedal laceration in the cnidarian, *Aiptasia pulchella*. During pedal laceration, small portions of the pedal disc are shed and reorganize to form a complete sea anemone. Pedal lacerates are capable of rapid development, reorganizing into a small anemone in 48-72 hours. This process must involve cell detachment and rearrangement and so makes it an optimal model for studying integrin signaling pathways. Through methods in immunocytochemistry and use of pharmacological agents which disrupt functional integrin-signaling pathways, we are studying the function of integrins during pedal laceration. We have

developed a technique to stain the integrins of the pedal lacerates and are now looking at how disrupting integrin signaling pathways affects the integrin staining and pedal lacerate development.

***28. Regulation of integrin signaling in the cnidarian *Hydra vulgaris* (Hydrozoa: Hydridae) bud formation**

Sallee, Andrea and Sawyer, Sara. Southern Illinois University, Edwardsville, Illinois.

Integrins are known principally as cell adhesion receptors, but they also play a critical role in signaling pathways which regulate a variety of cell events. We are investigating the role of integrins in bud formation in *Hydra vulgaris*. Phosphatidylinositol-3 kinase (PI3K) is a key intermediate in an integrin signaling pathway which plays an important role in the regulation of budding, specifically in head formation. The PI3K inhibitor LY294002 inhibits budding in *Hydra*, yet the effect it has directly on integrins is unknown. Using an anti-integrin antibody made against a cnidarian integrin, we stained *Hydra* that had been treated with 6 μ M LY294002 to determine the effect of the PI3K pathway on integrin distribution during budding. Control animals showed a diffuse staining, while animals treated with LY294002 have a distinct striation in the body column. We also investigated the effect of activating the PI3K pathway on budding and integrin distribution using the PI3K activator SC3036, at a concentration of 6 μ M. This agent induced budding and also affected integrin localization. Treated animals produced a unique striation pattern throughout the body column when stained. These results show that integrin signaling through the PI3K pathway is important during budding. In the future, we will investigate the role of the MAPK pathway in integrin distribution using the inhibitor PD98059.

Division: Chemistry

***29. Comparative analysis of tailpipe exhaust emissions from biodiesel-petro-diesel blends**

Weremijewicz, Joanna; Bachman, Maria; Schmeling, Martina; Geddes, Pamela and Berthold, Laura. Loyola University Chicago, Chicago, IL.

Biodiesel is a cleaner alternative to petroleum-diesel fuel. It is made from pure or waste vegetable oil in the process of esterification. Biodiesel is a safe, renewable, and biodegradable energy source. As an oxygenated fuel, it reduces incomplete combustion and the production of many harmful air pollutants including particulate matter, carbon monoxide, and hydrocarbons. In a study conducted by the National Renewable Energy Laboratory, it was found that when using 100% biodiesel particulate matter decreases by more than half, carbon monoxide decreases by a little over 40%, and no sulfur dioxide emissions are present. The purpose of the emissions study was to collect and analyze tailpipe emission samples of petro-diesel and Loyola University Chicago biodiesel-petro-diesel blends of 50% biodiesel (B50) and 75% biodiesel (B75). Furthermore, the study sought to quantify the differences in emissions between the different fuels and to measure the compounds of carbon dioxide, polycyclic aromatic hydrocarbons, and particulate matter. Upon completion, the data provided information on the differences in emissions between diesel and the various biodiesel blends in order to verify if biodiesel has less of an impact on air pollution.

30. Design and characterization of transmembrane proteins

Gotkowski, Eric S.; Denos, Sharlene and Gruebele, Martin. University of Illinois, Champaign, IL.

A large majority of vital cellular functions are performed by transmembrane proteins (TM). Large TM proteins are difficult to study. A small library of these helices was obtained, handpicking them from literature and characterizing them in our lab. A first step in these studies is identifying TM peptides that are both soluble in water and in the vesicle membrane. A few such helices have been identified in the literature and characterized in our lab, we need a faster way to identify and engineer water soluble TM peptides. We have developed sequence-based algorithms which predict solubility and binding. This was first based on the hydrophobic and amphipathic properties calculated from each peptide's sequence. This algorithm optimally separated the small library of TM peptides. A total of 40 TM segments were produced. Five were chosen to be synthesized, but only 1 was able to survive the intense aqueous purification phase. Next, a learning algorithm sorted sequences based on their dot product with a separation plane. Only sequences with positive dot products were chosen. Four were chosen and 2 were synthesized under the aqueous purification. The samples chosen through the learning algorithm were incredibly soluble. Finally the solution from the learning algorithm was used to further engineering efforts through a mutation program.

***31. Phosphodiester identification in the muscle of the freeze-tolerant Wood Frog (*Rana sylvatica*) (Amphibia: Ranidae)**

Szczesniak, Christoph; Marjanovic, Marina and Lawrence, Barbara. Eastern Illinois University, Charleston, IL.

The wood frog (*Rana sylvatica*) is able to undergo freezing during the winter months and recover fully during the springtime when it thaws. Previous experiments in our group using Nuclear Magnetic Resonance (NMR) Spectroscopy have shown higher levels of phosphodiester (PDEs) in *R. sylvatica* after cold acclimatization, compared to frogs that are not able to withstand freezing. We hypothesize that these PDEs play a role in the freeze tolerance in the wood frog. We are attempting to determine the chemical nature of these PDEs by using PCA extractions (to dissolve the muscle tissue) and lipid extractions (to separate the PCA extracts by type of molecule), followed by NMR spectroscopy. Using commercially available PDEs (phosphatidylcholine and glycerophosphorylcholine) we are creating standard curves for quantitative analysis, as well as running these compounds through the PCA and lipid extractions to test the procedures. After the PCA extractions PDE's appear in all NMR spectra. After the lipid extraction, all compounds appear in the aqueous layer, an unexpected result for phosphatidylcholine that is currently being investigated. In order to determine if these compounds help the frogs to withstand freezing, we are injecting the frogs with these compounds and observing the results in their leg muscles with phosphorus-31 NMR spectroscopy.

Environmental Science

32. Sustainability from the institution to the individual: a case study

Ringholm, Elisa and Eames, James Marshall. Loyola University Chicago. Chicago, IL.

Institutions of higher education have a central role reshaping the relationship between human activities and the environment. Ideas and practices regarding this relationship between the

institutions of higher education and ecological systems have focused on sustainability. As more colleges and universities begin to incorporate environmentally sustainable practices into the fabric of their everyday workings, it becomes important to evaluate. This research is a case study of several sustainability initiatives that have recently been implemented at Loyola. With the use of survey methodology, this project provides data on the level of awareness, knowledge, involvement, and participation of individual members in each initiative. It will assess this knowledge and involvement based on the initiative's approach, such as grassroots or top-down, and the background of the student, such on-campus or off-campus housing. It will define how levels of awareness are concentrated in certain academic fields and explore how professors perceive their role in a sustainable institution. This project will also explore student's perception of their own responsibility versus an institution's responsibility. It also provides an analysis of the successes and failures of different forms of communication. The results of this case study will provide useful information about individual's perspectives on their relationship with sustainability and will demonstrate to other universities and institutions alike both successes and challenges associated with implementation of these initiatives.

33. Illinois Department of Natural Resources owned, managed, and leased properties project

Tweddale, Tari; Jarvis, Janet; Greer, Diane and Hickman, Chad. Illinois Natural History Survey, Champaign, IL.

Development and enhancement of key data sets is vital to efficiently direct efforts to protect, conserve and manage natural resources and to effectively evaluate the success of those efforts. In Illinois, 96.9% of the land is privately owned. Illinois Department of Natural Resources (IDNR) lands provide a critical opportunity to directly protect, manage, sustain, and enhance the state's remaining natural lands and waters and the plants and animals they support. Comprehensive, reliable, and accessible information regarding the land holdings of IDNR (which total approximately 417,000 acres) is vital for planning, implementation, and assessment of the long-term conservation strategy for the state as outlined by the Illinois Wildlife Action Plan. The GIS staff at the Illinois Natural History Survey is developing a spatial database of locational data and descriptive information (i.e. ownership; funding source; management goals and activities; and restrictions) for conservation related properties owned, managed, or leased (OMLP) by IDNR. Utilization of the OMLP database in a GIS environment allows access to descriptive tabular information in a single database, visual display of information on maps, and the capability to conduct spatial analyses with a variety of other databases (i.e. wildlife species distributions, areas of high biodiversity, land cover, surrounding land use, surrounding land ownership) and at a variety of scales, providing scientific and technological information to meet ecosystem based management and protection goals.

34. Early 1800's land cover in Illinois

Szafoni, Diane; Greer, Diane and Cordle, Liane. Illinois Natural History Survey, Champaign, IL.

Illinois was surveyed between 1804 and 1856. The surveyors kept field notebooks and sketches of the area. This information was used by cartographers at the General Land Office (GLO) office in St. Louis, Missouri to create maps. We scanned these plat maps from microfilm onto a laptop computer, using Adobe Photoshop software and a Canon MS400 microfilm scanner, saving them as tiff files. The images were georectified, or spatially-referenced against U.S. Geological Survey

Digital Raster Graphic (DRG) images (scanned USGS 7.5 minute topographic quadrangle maps) by matching the township and section corners on GLO images to the corresponding points on the DRG. This process allowed us to digitized or trace the line work on the plat map using Geographic Information System (GIS) software (ESRI Arc/Info). The scanned, georectified images of each township are now a permanent archive of the GLO maps. This will allow users to view the original plat maps. The separate digitized version of the maps is a statewide GIS coverage, which can be used on its own or as a layer in GIS analysis at a statewide or regional scale. The “Land Cover of Illinois from the early 1800’s” data will provide valuable information in reconstructing a picture of Illinois natural history and lead to informed decisions concerning habitat restoration.

35. Lead analysis of the tissues of the white-footed mouse (*Peromyscus leucopus*) (Rodentia: Muridae)

Patil, Shruti; Kohn, Luci Ann; Brugam, Richard; Lin, Zhi-Qing, and Retzlaff, William. Southern Illinois University Edwardsville, Edwardsville, Illinois.

Lead poisoning has been a widely publicized issue leading to increased research on its effects on the body. Although it is now a rarer occurrence, lead poisoning has not been completely eliminated, and people are still affected by past contamination and continued exposure. Lead toxicity is well known for creating physiological and mental deficits in children. The vast amount of research conducted in the field of lead poisoning has been highly concerned with the metal’s affect on mental development, and it has fallen short with the influences lead has on the body’s tissues. Recent studies are found that lead is incorporated into bone tissue as well as other organs associated that are associated with calcium metabolism, including the kidneys and muscles. The test the consequences of lead exposure on the structural morphology of the white-footed mouse (*Peromyscus leucopus*). The mice from areas with high soil lead content were tested for lead content in bone, muscle, kidney, liver heart, and intestinal tissues. These results serve as a model for the effects of lead exposure on people living in areas with increased lead exposure.

36. Occurrence of the tick *Ixodes scapularis* (Acari: Ixodidae) and Lyme disease among small mammals in four habitat types in Robert Allerton Park

Buhnerkempe, Michael G¹; Rydzewski, Jennifer M¹; Rao, Sangeeta²; Mateus-Pinilla, Nohra E^{1,2}; Warner, Richard E² and Hamer, Sarah A³. ¹Illinois Natural History Survey, Urbana-Champaign, IL; ²University of Illinois Champaign-Urbana, Illinois; ³Michigan State University, East Lansing, MI.

Lyme disease is the most common vector borne disease of humans in the U.S. It is caused by the spirochete, *Borrelia burgdorferi*, and transmitted to humans by the blacklegged tick (*Ixodes scapularis*) in the Midwest. Increasing populations of white-tailed deer (*Odocoileus virginianus*) infested with adult *I. scapularis* have spread the ticks to east-central Illinois via riparian corridors. Infected small mammal hosts transmit *B. burgdorferi* to the larval and nymphal stages of *I. scapularis* when the ticks feed. This study focuses on small mammals as sentinels of Lyme disease in Robert Allerton Park based on their importance as primary hosts of the blacklegged tick. In 2005, mammals were trapped in four representative habitats of the park: prairie, young successional forest, old successional forest, and flood plain. Trapped mammals were identified, weighed, sexed, and ear tagged. Ticks and ear punches were removed for identification and screening for *B. burgdorferi*. The young successional forest had the highest significant density and prevalence of ticks, with tick pools collected from nine mice testing positive for *B.*

burgdorferi. The flood plain showed the lowest prevalence of ticks but the highest abundance of small mammals including one infected *Zapus hudsonius*. The next step is to determine the distribution of *I. scapularis* and the prevalence of *B. burgdorferi* throughout Illinois to focus preventive measures in high-risk areas.

37. Distribution of cats (Mammalia: Felidae) in Robert Allerton Park using scent stations and motion detection cameras

Fredebaugh, Shannon L¹; Wangen, Kimberly L¹; Mateus-Pinilla, Nohra E^{1,2}; Rao, Sangeeta¹ and Jewell, Emily E¹. ¹University of Illinois at Urbana-Champaign, Champaign, IL; ²Illinois Natural History Survey, Champaign, IL.

A 1-year field study was conducted in Robert Allerton Park (RAP), Piatt County, Illinois to determine whether feral cats (*Felis silvestris*), domestic cats (*Felis catus*), and bobcats (*Lynx rufus*) were present in urban-influenced habitats within the park. A total of 10 scent stations of sand mixed with mineral oil and fatty acid scent disks and motion-sensor cameras were set and checked once a week. 2007 baseline park employee surveys indicated that cats and bobcats were present in these natural and urbanized habitats. The hypotheses tested were that bobcats and cats utilize these natural habitats and that cat population numbers are related to the proximity of human-populated sites. Results showed a significant association between use of the old forest and floodplain habitats among raccoons. To date we cannot confirm the presence of bobcats in RAP, but the old forest had the most visitations and species variety, while the floodplain had the least variety. Results of this study indicate that domestic cats prefer natural areas in proximity to urban influenced sites. Cat preference for natural areas close to urban influenced sites could have significant implications on public and ecosystem health. In addition to their impact on native species, cats are definitive hosts for toxoplasmosis a disease caused by the protozoan parasite. Further studies are needed to fully understand this significance, however.

38. Evaluating storm water runoff quality from green roofs

Alsup, Sarah¹; Ebbs, Stephen¹; Battaglia, Loretta¹; Woods, Emily²; Lockett, Kelly³ and Retzlaff, Bill². ¹Southern Illinois University at Carbondale, Carbondale, Illinois; ²Southern Illinois University at Edwardsville, Edwardsville, Illinois; ³Green Roof Blocks, Hazelwood, MO.

Water retention properties of green roofs reduce drainage of storm water. What remains unclear is whether or not potentially toxic elements from rainfall and green roof growth media are being retained or whether they are passing into runoff from these systems. This study evaluates water quality from select green roof systems. Green roof models in this study contain the facultative CAM plant, *Sedum 'immergrauch'* with growth media in varying depths or composition. Since May 2007, metal concentrations in storm water runoff from green roof systems and models has been quantified and compared to the Illinois Environmental Protection Agency's effluent standards to determine if green roof designs harbor any risks to the environment. With the exception of elevated Fe levels in both planted and un-planted glass media, results indicate that concentrations for Mn, Ni, Cu, Pb, Zn, Cr, and Cd in all blocks and models fall well below IEPA effluent standards.

39. Sedimentary record of change in a southwestern Illinois reservoir

Williams, Phillip D.; Redpath, Louis and Brugam, Richard B. Southern Illinois University Edwardsville, Edwardsville, IL.

Stable isotopes of carbon and nitrogen and, phosphorus and lead concentrations were examined in a sediment core from Cougar Lake on the SIUE campus to reconstruct the history of eutrophication and heavy metal contamination in the lake. Phosphorus is a limiting nutrient for lake primary production. Stable isotopes are used as indicators of eutrophic conditions because $\delta^{13}\text{C}$ of phytoplankton increases with eutrophication. High $\delta^{15}\text{N}$ indicates sewage contamination. Lead concentration indicates heavy metal pollution from local smelters. Our $\delta^{13}\text{C}$ results indicate little to no change from the bottom of the core to the top. $\delta^{15}\text{N}$ increases from the bottom of the core to the top indicating an increase of sewage contamination over time. Phosphorus concentrations do not change throughout the core. Lead analysis indicates an overall decrease in lead from the bottom of the core to the top. Our results suggest that trophic status of the lake has not changed much with time although sewage contamination has increased. Heavy metal contamination has decreased.

40. Can a lake remove nitrogen pollution from water?

Wilson, Matthew J. and Brugam, Richard, B., Southern Illinois University Edwardsville, Edwardsville, IL.

Cougar Lake on the Southern Illinois University Edwardsville campus receives the treated effluent from the campus sewage treatment plant. Samples were collected twice a month at one meter intervals between the surface and 11 meters. Nitrate was measured in all samples by reduction with bacterial nitrate reductase followed by spectrophotometric analysis of the resulting nitrite. Seston was sampled at the 0 and 10 meter intervals and sent for isotopic analyzes at Cornell Isotope Labs. Seston analysis shows that much of the nitrogen in the lake biota comes from the sewage effluent. The results of nitrate analysis show that when the lake is stratified that the hypolimnion does remove nitrate from the water column. But when the lake mixes in fall there is a increased amount of nitrate in the water column, possibly caused by the nitrification of the ammonia present in the hypolimnion of Cougar lake . Our results suggest that the lake does remove added nitrated from the sewage effluent in summer, but that this loss is overwhelmed by nitrification of ammonium in fall.

41. Evaluation of mixed *Sedum* species (Dicot: Crassulaceae) plugs on a green roof system

Richter, Lane¹; Retzlaff, Bill¹; Morgan, S¹; Jost, Vic² and Luckett, Kelly³. ¹Southern Illinois University at Edwardsville, Edwardsville, IL; ²Jost Greenhouses, Des Peres, MO, ³Green Roof Blocks, Hazelwood, MO.

Green roof technology is increasingly used to aid in reducing urban storm water runoff in the United States. Research is needed to evaluate plant species ability to achieve complete coverage in a short time span. Plant species that cover an extensive green roof quickly will reduce the number needed in the initial planting and aid in the reduction of urban storm water runoff. My research includes twelve Green Roof Blocks and twenty-four Green Paks located on the SIUE Engineering Building roof in Edwardsville, Illinois. Green Roof Blocks and Green Paks were placed in a randomized design with three replicates and planted May 2007. In this project, I am evaluating plant coverage of mixed species plugs in four growth media types. Plant coverage was measured monthly from June 2007 to November 2007. Green Roof Blocks plant coverage was greatest in the Midwest Mix growing media, and Green Paks plant coverage was greatest in MidwestMix and Lava growing media.

42. Can constructed wetlands replace natural wetlands? A study into microbial community structure and function in constructed vs. natural wetlands

Flanagan, Diana Najla¹; Matthews, Jeffrey² and Kent, Angela D¹. ¹University of Illinois Urbana-Champaign, Urbana, IL; ²Illinois Natural History Survey, Champaign, IL.

Restoring and creating wetlands has become an important issue for mitigating nitrate pollution in surface waters and decreasing eutrophication of coastal ecosystems. This study examined the microbial community and denitrification activity of 6 restored/created wetlands paired with 6 natural wetlands across northern and central Illinois to determine if microbial community structure and function in restored wetlands are similar to natural wetlands. Microbial community composition was determined by DNA community fingerprint analysis (terminal restriction fragment length polymorphism). The relationship between the microbial community composition of the natural wetlands and the restored wetlands were analyzed using canonical correspondence analysis. The results of this study showed that the microbial community composition of the natural wetlands were significantly different than the microbial community composition of the restored wetlands ($p=0.0020$). We hypothesize that this is one of the reasons that the denitrification activity was also found to be significantly higher in the natural wetlands than in the restored wetlands ($p=0.03$). To further explain differences found in the microbial community composition and denitrification activity, 13 environmental variables and the plant community composition are being examined. Further analyses will also include examining the diversity and abundance of denitrifiers in each type of wetland.

43. Addressing climate change at the site level: a pilot project at Nachusa Grasslands

Zercher, Deanna; Herkert, James and Thompson, Josh. The Nature Conservancy in Illinois, Peoria, Illinois.

Climate change, such as drier, warmer conditions; seasonal changes in precipitation; and a longer growing season, could negatively influence Midwest ecosystems, especially in a highly fragmented landscape. The Nature Conservancy is investigating adaptation strategies that help biodiversity persist through climate change. One approach is to ensure the diverse representation of microclimates related to topographic slope and aspect within preserves. The goals of this project were (1) to develop a site-level monitoring program of climate-sensitive species, and (2) to use GIS to evaluate the diversity of microclimates available as refugia for plants and animals at Nachusa Grasslands. Nachusa, located in north-central Illinois, is a 2,600-acre prairie and savanna mosaic with many high quality remnant habitats and over 70 prairie, savanna, and wetland restorations. For the monitoring program, we developed a list of characteristics that may increase a species' chance of being affected by climate change, such as species that are peripheral at a site. Six species were identified as potential monitoring candidates at Nach . We used Spatial Analyst to evaluate the topographic heterogeneity of Nachusa Grasslands and surrounding area, which indicated a fairly even distribution of aspects of slope. The next steps for this project are to determine the topographic curvature to further evaluate microclimates, and develop a process to select which species are the best to monitor as climate indicators.

***44. Wetland mitigation bank assessment from a soil microbial ecology perspective**

Peralta, Ariane L¹; Matthews, Jeffrey W² and Kent, Angela, D¹. ¹University of Illinois at Urbana-Champaign, Urbana, Illinois; ²Illinois Natural History Survey, Champaign, IL.

Changing patterns of land use over the last 200 years have resulted in the loss of 90% of wetlands in Illinois. Creation of wetland mitigation banks has been viewed as a cost-effective

and ecologically viable option for compensatory wetland establishment. Enhancing denitrification through wetland restoration has been proposed as a regional goal to mitigate nitrate pollution. To evaluate wetlands for their capacity to perform important water quality functions (e.g. denitrification), we must have a better understanding of the microbial communities responsible for this function. In addition to measuring plant and soil attributes, we have evaluated denitrification potential and microbial community composition using molecular community DNA “fingerprint” analyses. We plan to carry out molecular analyses based on the bacterial *nosZ* gene to examine the diversity of microbial denitrifiers. In the present study, we demonstrate that microbial community composition and denitrification potential differs significantly among natural and restored wetland sites at the Morris Mitigation Bank (Morris, IL). We show that restored wetland sites considered similar in soil type and hydrology harbor microbial communities that differ in structure and function compared to natural sites. The legacy of prior land use can have a broader impact on wetland mitigation bank projects compared to individual projects due the larger area and heterogeneity of the site. Soil factors and microbial community composition and function are important considerations when assessing wetland restoration projects.

45. Evaluation of techniques for extracting algal oil for biofuels

Miceli, David P. Loyola University Chicago, Chicago, Illinois.

Over the last thirty years, the idea of growing algae for fuel has become a subject of increasing research. Newer technology and current scientific knowledge have made it relatively easy to grow oil-yielding algal species at both the small and large scale; however, oil extraction has not been well developed. Current extraction methods involve techniques used by the food industry but have been shown to be inefficient for algal oil and dangerous to operator health (Nagle and Lemke 1989, Wakelyn & Adair 1997). I have conducted preliminary extractions on ambient algal populations from the Chicago River using hexane and ethanol. I will conduct extraction experiments with two species of green algae, *Neochloris oleoabundans* and *Scenedesmus quadricauda*, using 1-butanol and ethanol. To determine tangible extraction options for small scale algal oil producers, I will compare solvents and mechanical methods of cell disruption with consideration of species, yield, safety and cost. The results will be compiled into a table that will allow potential algae producers to decide which option is best, since there may be tradeoffs between extraction techniques.

46. Cancelled.

***47. Evaluating the thermal performance of green wall systems**

Middleton, Zach¹; Woolbright, Mark²; Morgan, S¹; Jost, Vic³; Lockett, Kelly⁴ and Retzlaff, Bill¹.
¹Southern Illinois University at Edwardsville, Edwardsville, IL; ²Green Wall Ventures LLC, St. Louis, Missouri; ³Jost Greenhouses, Des Peres, Missouri; ⁴Green Roof Blocks, Hazelwood, MO.

Eighteen circular (7-foot diameter) green walls (donated by Hercules Manufacturing of St. Louis) have been located on the SIUE campus. The project is designed to evaluate the plant growth and thermal performance of five *Sedum* species (Crassulaceae) and one unplanted wall on north, south, east, and west wall aspects. The temperature of the wall, growing medium, and plant surfaces have been monitored on the same north, south, east, and west wall aspects. We found in the first 6 months of the study that one of the *Sedum* species ('Bertrum Anderson') does not grow well on the south wall aspect. After one winter, we have lost 100% of the 'Bertrum Anderson' in the wall systems. Further, plant surface temperatures are less than wall block surface temperatures while the growing medium (Ameren Bottom Ash) has the greatest surface temperature. North and east wall aspects have the lowest afternoon surface temperatures - more than 25°F lower than west and south aspects. Our data so far indicates that living wall systems have the potential to reduce the urban heat flux.

***48. Impact of growth media, species, and fertilizer selection on green roof performance**

Swearingin, Lauren¹; Morgan, S¹; Jost, Vic²; Lin, Zhi-qing¹; Lockett, Kelly³ and Retzlaff, Bill¹.
¹Southern Illinois University at Edwardsville, Edwardsville, IL; ²Jost Greenhouses, Des Peres, Missouri; ³Green Roof Blocks, Hazelwood, Missouri.

Two attributes of urban sprawl are an increase in impervious surface area and the urban heat island effect. As a result, forests and grasslands are being replaced with impervious surfaces such as buildings and parking lots which causes an increase in storm water runoff. In addition, hard surfaces absorb and hold heat longer than green spaces, therefore causing an increase in the temperature of the surrounding atmosphere. Consequently, air conditioning use increases in communities, and so do energy costs. Green roofs are a possible remedy to these problems, however many variables determine whether a green roof system is successful. My hypothesis was that growth media, species and fertilizer selection will affect green roof performance. I evaluated the above characteristics during the 2007 growing season. I found that growth media, species and fertilizer affected roof coverage. For example, roof coverage (52%) in pumice growth media was greater than in all other growth media. In addition, roof coverage was also affected by choice of fertilizer and *Sedum* species (Crassulaceae). Thus far, results support my hypothesis that growth media, species and fertilizer selection do affect green roof performance.

49. Air quality studies in Chicago

Bezener, Martin; Goldblatt, David and Schmeling, Martina. Loyola University, Chicago, IL.

Long-term exposure to poor air quality is linked to a number of health conditions, including lung disease, asthma, and damage to the breathing vessels. Recent studies have begun linking long-term exposure to air pollution to many more serious ailments, such as nerve degeneration, birth defects, and even cardiovascular disease. Our research focuses on measuring air pollution in Chicago and combining our data with interactive maps showing pollution sources as well as statistical health data of Chicago residents. To measure air pollution in Chicago, we established the Loyola University Chicago Air Station (LUCAS I) at Loyola's Lake Shore Campus. The station measures the reactive trace gases NO_x and ozone, particulate matter (ionic and elemental species) and records weather data. The first goal of the project presented here was to locate the largest sources of pollution in the Chicago region. Using EPA data from the toxic release inventory (TRI) and the Geographic Information System (GIS) software, we have pinpointed the largest pollutant sources and generated a map representing these pollution sources. Our second goal focuses on the relationship between pollutant concentrations and environmental variables such as temperature, wind direction, and weather. To identify significant correlations between these parameters, we are currently running statistical analyses on the data collected at LUCAS I over the last 5 years. A third goal consists of linking air pollution sources and population statistics. One of the major questions in this category is: are certain socioeconomic or eth

Division: Health Science

***50. Several macrolide antibacterial antibiotics effect murine immune response**

Bradstreet, Tara R; Jethi, Gaurav K; Bush, Deborah; Najafpour, Elham; Panahipour, Saman and Kitz, Dennis J. Southern Illinois University at Edwardsville, Edwardsville, IL.

The macrolide family of antibiotics are used to treat upper respiratory tract as well as other sites for bacterial infections. In this study we investigated the ability of azithromycin Pfizer and troleandomycin Pfizer to effect murine phagocytic cell fungicidal activity for candidal targets; DTH response to DNFB Sigma and organ clearance of intravenously administered yeasts from spleen, liver and kidneys. Both drugs boosted DTH and phagocytic cell function, with an upward trend in clearance for organs in drug-treated animals. Such immune enhancement may help to explain the clinical efficacy of these two drugs. This work was supported in part by the Max Baer Heart Fund, Fraternal Order of Eagles (Granite City) and the NSF-funded LS-AMP Research Scholar's Program.

***51. The effects of new antifungals on murine immune response**

Blaki, Sarah M; Aiyeomoni, Babatunde O; Lesko, Jennifer L; Cook, Rachelle N; Khazaeli, Sadegh and Kitz, Dennis J. Southern Illinois University at Edwardsville, Edwardsville, IL

We have recently obtained Eraxis Vicuron-Pfizer and Posaconazole Sherring-Plough, two antifungal molecules. Eraxis (an echinocandin) acts on fungal cell wall synthesis; while posaconazole (an imidazole) acts on fungal membrane sterols. Previous studies with amphotericin B Squibb, fluconazole Pfizer and voriconazole Pfizer, have shown that all of them can effect murine immune response, especially DTH as measured by an ear-thickness assay. We have examined the ability of Eraxis and Posaconazole to effect DTH response in mice, using an

ear-thickness assay. This included varying drug dosages and time frames for administering these drugs relative to chemical sensitization. Such drug immune system interactions may help explain the therapeutic efficacy in clinical settings. This work was funded in part by the NSF-funded, Illinois LS-AMP Research Scholar's Program.

***52. The trials and tribulations of housing experimental animals at a iia institution.**

McCracken, Vance J; McCommas, Steven A; Krajniak, Kevin G; Skelton, Linda L and Kitz, Dennis J. Southern Illinois University at Edwardsville, Edwardsville, IL.

Many investigators are familiar with the environment surrounding animal research at large, IA institutions and often their affiliated medical schools with large well-supported animal facilities. We at SIUE, a primarily undergraduate teaching university, have successfully faced the challenges of providing an environment in which animal research can prosper, albeit on a smaller scale. To do so requires meeting all of the government regulations; establishing an Institutional Animal Care and Use Committee (IACUC); providing periodic training for the IACUC, faculty and students; employing the services of a veterinarian; garnering administrative support for record keeping and for the facility itself; preparation of and then processing and judgement of husbandry and research protocols; and semi-annual and surprise inspections and maintenance of the facilities. Additional challenges begin when animals are actually present. Our facility primarily houses mice, but also fish, amphibians, reptiles, rats and squirrels. Providing a stable environment can be a huge challenge as temperatures fluctuate and a/c units fail. Having university support personnel promptly respond for repairs as needed is critical. You also need to establish sources for food and bedding, provide for regular cleaning and odor control, and for waste and carcass removal. Only at this point can the actual research begin.

***53. Imidazole effects on murine immune response**

Barton, Jennifer L; Purlee, Sami J; Orasco, Michael L; Volkman, Christina M; Farley, Norah C and Kitz, Dennis J. Southern Illinois University at Edwardsville, Edwardsville, IL.

Antifungal molecules such as amphotericin B (Fungizone) Squibb are known to have profound effects on host immune response. Our laboratory has extended such study to two imidazole antifungal molecules; Diflucan (Fluconazole) Pfizer and a derivative molecule Vfend (voriconazole) Pfizer. Both of these azole drugs inhibit cytochrome P450 and 14a-demethylase, an enzyme acting on fungal membrane sterols. Using a contact sensitizing assay to measure T cell and macrophage function, the effect of both drugs on DTH were determined. Diflucan enhanced DTH in mice at dosages of up to 6.0 mg total. Diflucan drugs and time points for sensitization as related to DTH response were determined. Diflucan was also found to reverse tolerization in mice to DNFB elicited by intravenous injection of DNBSO₃ Kodak. Studies on Vfend's effect on DTH response are in progress and seem to parallel much of the work with Diflucan. This work was supported in part by the Max Baer Heart Fund, Fraternal Order of Eagles (Granite City).

***54. Further studies on ketolide effects on murine immune response.**

Freed, Lydia R; Lesko, Jennifer L; Blaki, Sarah M; Gooch, Melanie; Bone, Robert and Kitz, Dennis J. Southern Illinois University Edwardsville, Edwardsville, IL.

Telithromycin Sanofi-Aventis is a molecule in the ketolide class and marketed as Ketek, a semi-synthetic antibacterial antibiotic structurally related to the macrolides. In spite of ketek having been suggested to cause liver problems and liver failure in some human beings, it is widely

prescribed for drug-resistant intracellular respiratory bacterial pathogens. Ketek is known to be intracellularly concentrated by phagocytic cells, and our observations find that this correlates with enhancement of immune responses as seen with other drugs we have studied such as azithromycin, clindamycin and tygecycline. Regarding ketek's effects on murine phagocytic cells studied, macrophage cidal activity for yeast targets was significantly enhanced while neutrophil cidal activity for yeasts was depressed. In addition, *in vivo* exposure of peritoneal elicited macrophages to Ketek also boosted *in vitro* killing of yeasts. Using an ear-thickness assay to measure DTH response to the contact sensitizing chemical DNFB, Ketek significantly enhanced DTH response at 4.0 mg total dosage, while organ clearance of candidal yeasts administered i.v. was not different between drug-treated and control animals. Our results strongly suggest that drug-treated enhancement of macrophages and T cells may enhance Ketek efficacy in patient therapy. This work was supported in part by the Max Baer Heart Fund and Fraternal Order of Eagles (Granite City).

***55. Respiratory effects of 1-propylxanthine in neonatal rats**

Hance, Amanda L T and McGilliard, Kip L, Eastern Illinois University, Charleston, IL.

Neonatal apnea is commonly treated by methylxanthines like caffeine or theophylline, but these drugs have the potential to cause serious side effects. As an alternative, a new xanthine analog, 1-propylxanthine (1-PX), was recently synthesized at Eastern Illinois University. The respiratory effects of 1-PX were investigated in 4- to 7-day-old rats to determine if 1-PX could be a respiratory stimulant. Each rat was placed in a heated body plethysmograph and its respiratory rate and volume were measured using a flow transducer, pneumotachograph, and PowerLab data acquisition system. After a 10-min control period, the rat was given a s.c. dose of 1-PX (10, 20, 40, or 80 mg/kg) or saline. Respiration was then recorded for one hour. Dose-related increases were observed in respiratory rate and minute ventilation, while there were highly variable changes in tidal volume and a small increase in mean inspiratory flow. The 80 mg/kg dose elicited a 32% increase in respiratory rate and an 8% increase in minute ventilation. The results indicate that 1-PX is slightly less potent than theophylline and approximately equal in potency to 1-methylxanthine as a respiratory stimulant.

Division: Microbiology

56. Isolation of an *Escherichia coli* mutant which grows faster than wildtype on galactose

McCommas, Steven A and Patel, Shaival. Southern Illinois University at Edwardsville, Edwardsville, IL.

Dietary soluble fiber may reduce the risk of colon cancer by binding to lectins (mitogenic proteins), thus preventing them from binding to epithelial cells. We are investigating the possibility that bacteria mutants in the colon could be selected to utilize soluble fiber polysaccharides more efficiently than wild-type and thus lower their protective effect. We are developing a model system with *Escherichia coli* (Bacteria) representing the gut microflora, and galactose as a novel carbohydrate source. We need a mutant strain which can utilize galactose more efficiently than can wildtype, and selected for such a mutant based on the observation by Buttin that wildtype *E. coli* has difficulty using galactose in the presence of IPTG. Using this selection scheme, we have isolated a mutant strain called RDF3. When grown together with a wildtype strain, and given only galactose as carbon source, RDF3 grows more rapidly and

displaces the wild-type. We interpret this as indicating that the mutant strain is indeed utilizing galactose more efficiently.

***57. Strain resistance to *Eimeria falciformis* (Eukaryota: Apicomplexa) in mice**

Seager, Renee, E and McQuiston, Thomas E. Millikin University, Decatur, IL.

Four strains of twelve-week old mice were inoculated with 1000 oocysts of the coccidian parasite *Eimeria falciformis* (Eukaryota: Apicomplexa) to compare host resistance to the parasite. Their resistance was monitored by oocyst production and mortality over a 13 day period post-inoculation. The ICR outbred control group had the lowest mortality (27%) and the second lowest oocyst production. The C57BL/6 and CBA/J groups had moderately high oocyst production and high mortality (45% and 54% respectively). However, the DBA/101 group had a high mortality (54%) but the lowest oocyst production. Although oocyst production has been used as an indicator of strain resistance in a host infected with coccidian parasites, the data in this study suggests that mortality may be a better indicator of host resistance to coccidian infections. In turn, mortality and morbidity can considerably affect oocyst production, especially in highly pathogenic strains of coccidia.

***58. A mutant *Escherichia coli* strain, selected for resistance to IPTG, uses galactose more efficiently than wildtype**

Kruse, Joel R and McCommas, Steven A. Southern Illinois University at Edwardsville, Edwardsville, IL.

Our research deals broadly with colorectal cancer. Many epidemiological studies have shown that fiber in the diet can lower a person's risk of developing colon cancer. However, a mechanism for such an effect remains obscure. There is evidence that this protective effect is mediated by soluble fiber in the diet binding to lectins. Lectins we ingest come from a variety of food sources, are resistant to digestion, and are a possible cause of colorectal cancer. They bind to cell surface receptor proteins and become mitogenic, causing the cell to begin to divide more rapidly. This binding of lectins to the colon epithelium cells could start them on a pathway to becoming cancerous. Sugar residues in the polysaccharides that compose soluble fiber could bind to these lectins, thereby preventing them from binding to the colon epithelium cells. We are modeling a possible way that mutant gut bacteria might lower this protective effect by utilizing dietary fiber more efficiently than wildtype. Our research shows that over just a few generations it is feasible for a mutant *Escherichia coli* which we have found, KR11, to outcompete the isogenic wildtype for galactose when the two strains are grown together and given only galactose as a carbon source.

***59. An *Escherichia coli* mutant metabolizes galactose more efficiently than wildtype**

Kelley, Melissa and McCommas, Steven A. Southern Illinois University at Edwardsville, Edwardsville, IL.

Colon cancer is the second most common cause of cancer related deaths with 782, 000 people being diagnosed each year. Fiber is thought to protect against colon cancer through inference with lectins. The natural flora in the colon also utilizes the fiber as a food source. Over a person's lifetime it might be possible that bacteria are evolving to digest the fiber more efficiently, and reducing its protective effects. To test this hypothesis, we used an *Escherichia coli* (Bacteria) wildtype (MG1655) and a mutant (CH6) differing from the wildtype by a single point mutation, with galactose as a model for fiber. A competition experiment was run to discover whether the

mutant utilizes the galactose more efficiently than the wildtype. It was found that the mutant greatly outcompeted the wildtype, becoming the only strain in the culture. We conclude this is due to its ability to metabolize galactose more efficiently than its ancestral strain.

***60. Resolving the nutritional requirements of *Clostridium scindens*, a bile acid-metabolizing gut bacterium**

Inboden, Ashley M and Daniel, Steven L. Eastern Illinois University, Charleston, IL.

Biotransformation of cholate (a primary bile acid) in the gut results in the production of deoxycholate. Increased deoxycholate levels have been correlated with an increased risk for high cholesterol, gallstone disease, and colon cancer. In the gut, the obligate anaerobe *Clostridium scindens* is actively involved in the conversion of cholate to deoxycholate. Thus, *C. scindens* is important to human health, and our goals were to define the nutritional requirements of this key gut bacterium. *C. scindens* VPI 12708 was grown anaerobically in an undefined broth medium (UBM; minerals, metals, bicarbonate, 100% CO₂ gas phase, cysteine [reducing agent], 0.1% yeast extract, and 20 mM glucose) at 37°C. When transferred from UBM to a defined broth medium (DBM; UBM lacking yeast extract), *C. scindens* did not grow. However, growth was supported when DBM was supplemented with both a vitamin mix (p-aminobenzoate, biotin, cyanocobalamin, folate, lipoate, nicotinate, Ca-D-pantothenate, pyridoxal, riboflavin, thiamine) and an amino acid mix (alanine, arginine, asparagine, aspartate, cystine, glutamate, glutamine, glycine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, proline, serine, threonine, tryptophan, tyrosine, valine). Deletion of individual vitamins from the mix indicated that biotin, lipoate, riboflavin, and Ca-D-pantothenate were required by *C. scindens* for growth. This is the first report of the vitamin requirements of *C. scindens*. Studies are currently underway to determine the amino acid requirements of *C. scindens*.

***61. Cold stress exacerbates neonatal *Helicobacter felis* (Bacteria) infections in mice**

Malvin, Nicole P and McCracken, Vance J. Southern Illinois University Edwardsville, Edwardsville, IL.

Over 50% of humans become infected with the gastric pathogen *Helicobacter pylori* (Bacteria), with most infections beginning in childhood. However, only 10-20% of infected individuals develop severe disease later in life; reasons for the differences in outcome remain unclear. *Helicobacter felis* infection of adult mice results in gastritis and cancer similar to that observed in humans infected with *H. pylori*. We have previously shown that *H. felis*-infected mice can also serve as a model for neonatal infection. Mice infected at young ages develop less severe inflammation, with decreased expression of Th1 cytokines, relative to mice infected as adults for a similar duration of time. Neonatal and adult mice were infected with *H. felis* or mock infected for 8 weeks (adult-infected mice) or 12 weeks (for neonatally infected mice; 8 weeks post-weaning). Before the neonatally infected pups were weaned, the heating system failed in the animal room, exposing mice to temperatures below 15° C for several days. Several pups (mock and infected) died during this event. Unlike our previous studies, surviving mice infected as neonates developed gastric inflammation similar to that seen for infected adults (6.5 on 9 point scale) and expressed high levels of gastric IFN- γ mRNA (>100 fold increase) compared to mock infected mice for each age group following cold stress. Although this cold stress was accidental, other environmental stressors affecting the outcome of *Helicobacter* infection could be assessed using this model.

***62. Intestinal *Helicobacter* (Bacteria) associated with Canada geese on the SIUE campus**
Wolf, Kyle J and McCracken, Vance J. Southern Illinois University Edwardsville, Edwardsville, IL.

Following the discovery that *Helicobacter pylori* (Bacteria) is the causative agent in gastritis and stomach cancer, many other *Helicobacter* species have been found in the stomach and other regions of the gastrointestinal tract of various mammalian and avian species. Canada geese are often infected with different intestinal *Helicobacter* species, including *Helicobacter canadensis*, *H. winghamensis*, *H. brantae*, *H. anseris*, and other as yet unidentified species. Because of the potential for some of these *Helicobacter* species to pose zoonotic risk and the large Canada goose population on the Southern Illinois University Edwardsville campus, we have undertaken studies to characterize *Helicobacter* populations in local geese. Fresh fecal samples were taken from individual geese and processed for cultivation of bacteria or DNA isolation. Attempts to isolate bacteria on TSA agar + 5% blood, with or without the addition of *Helicobacter*-selective antimicrobials (trimethoprim, vancomycin, fungizone) were unsuccessful. DNA isolation followed by PCR using *Helicobacter*-genus specific PCR primers indicated the presence of *Helicobacter* in the feces of 6 of 11 different geese. Attempts to identify the *Helicobacter* species by sequencing, as well as isolation of the *Helicobacter* by culture, are underway.

Division: Science, Mathematics, and Technology Education

***63. Neuroscience in High School Biology Classrooms: A Year-Long NSF GK-12 Intervention**

Whalen, Christopher J¹, Kirkpatrick, Matthew². ¹University of Illinois, Urbana-Champaign, Urbana, IL; ²Nequa Valley High School, Naperville, IL.

Neuroscience is currently one of the fastest growing scientific field. At the level of higher education, research accelerates and breakthrough experiments occur almost daily. However, as is often the case in fields of rapid development, news and instruction at the K-12 level lags considerably behind. Here, we describe one instance of how the NSF GK-12 program, which pairs graduate students with K-12 educators, acted as a gateway providing a direct channel between the highest levels of academia and the public classroom. Together, we, a University of Illinois neuroscience graduate student and a Nequa Valley High School biology teacher, established a ‘neuroscience framework’ for the biology classroom. The framework consisted of neuroscience lessons and activities that were integrated into the curriculum in nearly every major classroom unit. The goal was two-fold: (1) introduce neuroscience to young minds and (2) provide an in-depth look at one major biological system. As such we used one model system, neuroscience, as a platform to simultaneously link biology between the molecular, microscopic, and macroscopic levels. By incorporating several dynamic and student-centered lessons throughout the year, we aimed to engage students’ curiosity and excite them about the latest research. We describe the lessons, materials, and methods of the work that has been done to bring the latest neuroscience into the K-12 arena in a way that is both fun and palpable.

64. Assessing the effectiveness of laboratory simulations in biology education

Drake, Jane and Barry, Kelly. Southern Illinois University at Edwardsville, Edwardsville, IL.

Polymerase Chain Reaction (PCR) can be a valuable tool in secondary science education for inquiry based learning in molecular biology. The precise nature of the technique, however, can make it extremely challenging in the inexperienced hands of high school students. The number of steps involved, lack of proper sterile technique, and the handling of very small quantities of components all make this technology cumbersome in secondary school classrooms. Additionally, science laboratories in secondary schools demand nontoxic, noncarcinogenic, inexpensive components. PCR products are typically visualized using gel electrophoresis with ethidium bromide. The noncarcinogenic electrophoresis stains used in secondary schools provide inferior visualization for analysis. Even if teachers have the resources to utilize PCR, the ambiguous results are a deterrent. Most teachers are also hindered by expense and the time required for PCR reactions to run, electrophoresis, staining/destaining, and analysis. In an effort to encourage more widespread use of this technology in secondary classrooms, we are developing curriculum for a PCR simulation to be used in its place. The PCR simulation is designed to yield clear and consistent results using minimal manipulations at minimal expense. The PCR simulation was taught side by side to conventional PCR in two classes of college students for both science majors and non-majors. Students were given pre and post assessments to determine the impact of the PCR simulation in relation to conventional PCR.

***65. The development of a curriculum for middle-school science students visiting Millikin University in Decatur, Illinois**

Christ, Meghan O; Coleman, Amanda G; Zange, Jessica R and Horn, David J. Millikin University, Decatur, IL.

In recent years, there has been an increasing disconnect between children and the natural world. Simultaneously, a child's access to nature through schools is decreasing. In fall 2007, we developed and implemented a curriculum for middle-school science students that meets state education standards while providing experiential learning. The curriculum is based on an Illinois State Goal, and introduces concepts of macroevolution, adaptations, and diversity of life, as well as population growth, interactions between species, and food webs. The curriculum is designed for students in grades 6-8, and takes place at Millikin University in Decatur, Illinois. It includes activities using the university's natural history museum, dissection in the laboratory, and a short hike to a local natural area. During fall 2007, over 100 students from Taylorville Middle School and Decatur Christian School participated in our curriculum. Another important aspect of this project was the involvement of Millikin University undergraduates in all phases. By participating, undergraduates may gain important skills and grow personally by taking ownership of all aspects of the middle-school curriculum.

Division: Zoology

***66. Home range, habitat use, and survival of free-ranging domestic cats**

Horn, Jeff A¹; Warner, Richard E. ¹ and Mateus-Pinilla, Nohra². ¹University of Illinois, Urbana, IL; ²Illinois Natural History Survey, Champaign, IL.

A radio telemetry study was conducted on free-ranging domestic cats on the University of Illinois south farms and adjacent areas. Owned cats were tracked for 11 months and unowned cats for 6 months during 2007. The objectives were to compare owned and unowned cats relative to: (1) seasonal home range; (2) habitat use; and (3) survival. Twenty-two cats were radio-collared and home range size was determined using minimum convex polygon (MCP). Mean home range size was found to be greater for males than females. The survival rates of owned and unowned cats were similar. Cats preferred to use residential and farm areas. The findings underscore the ecological importance of cats in such ecosystems.

67. A two-year mist-netting survey for bats in northeastern Illinois

Hofmann, Joyce E; Merritt, Joseph F; Mengelkoch, Jean M and Carpenter, Samantha K. Illinois Natural History Survey, Champaign, IL.

We conducted a mist-netting survey of bats from 15 May to 15 August 2006 and 2007 to determine if the federally endangered *Myotis sodalis* (Indiana bat) occurs in northeastern Illinois. Survey areas (n=20) were established in Cook, DuPage, Kane, Kankakee, Lake, McHenry, and Will counties. Within these areas, 43 sites were selected based upon the presence of potential *M. sodalis* roost trees. Two black nylon mist nets, spaced at least 30 m apart, were placed at each site and monitored for 5 hours on each of 2 nights. Mist netting was conducted for a total of 87 nights (176 net-nights). Our survey resulted in 227 captures of 8 species at 37 sites. Captures represented all species of bats potentially occurring in northern Illinois except *M. sodalis*. Species captured were *Eptesicus fuscus*, *Lasionycteris noctivagans*, *Lasiurus borealis*, *Lasiurus cinereus*, *Myotis lucifugus*, *Myotis septentrionalis*, *Nycticeius humeralis*, and *Pipistrellus subflavus*. The 3 most frequently encountered species were *E. fuscus* (132 captures), *M. septentrionalis* (54 captures), and *L. borealis* (27 captures).

68. A baseline study of bird communities related to floodplain forest succession at Emiquon National Wildlife Refuge, Illinois

Lerczak, Thomas V. Emiquon Audubon Society-Illinois Nature Preserves Commission, Havana, IL.

Retired agricultural fields are being restored to floodplain forests at the 2,114-acre Emiquon National Wildlife Refuge in Fulton County, near the Spoon and Illinois river confluence. Bird communities were studied at old fields (2 sites), early successional forests (3 sites), and mature forests (2 sites) to establish a baseline for tracking bird community changes as fields planted to trees mature. Birds were recorded in 2004, 2005, 2006, and 2007 within and outside of 50-meter-diameter circles using 10-minute point counts (3 per site during the breeding season) and recorded monthly as encountered along standardized routes. For the entire project, 154 species of birds were recorded representing 43 families. Sixty-five species were recorded during all point counts to an unlimited distance, ranging from 29 to 38 per count date. Of these, 41 were recorded within the count circles, where mean species richness increased with successional stage, from 4.4 (old fields) to 8.7 (mature forest). Most species in forested habitats were those not very sensitive

to fragmentation (e.g., eastern wood-pewee [*Contopus virens*]) or those that thrive in edge habitats (e.g., American robin [*Turdus migratorius*]). As forest fragmentation decreases, the number of area-sensitive species should increase.

***69. Effects of habitat degradation on leech parasitism in aquatic turtles**

Readel, Anne M; Phillips, Christopher A and Wetzel, Mark J. Illinois Natural History Survey, Champaign, IL.

Turtles are experiencing global declines, primarily due to habitat degradation. While the impacts of habitat degradation on turtle demographics and behavior have been investigated, comparably little is known about the impacts on turtle health. The aim of this investigation was to use a turtle assemblage to examine how terrestrial habitat degradation (agriculture) and pond type (natural/man-made) alter parasite infection dynamics, using leeches (*Placobdella* sp.) as a study system. Leech prevalence and intensity on turtles was higher in natural ponds compared to man-made ponds, but did not vary from agricultural development adjacent to ponds or with any other pond characteristics. Leech loads varied among turtle species with *Chelydra serpentina* (snapping turtle) and *Chrysemys picta* (painted turtle) being the most parasitized and *Apalone spinifera* (spiny softshell turtle) being the least parasitized. There were no differences in leech loads between sexes or reproductive stages (mature/immature) but when turtles were parasitized, larger turtles had more leeches. Finally, leech loads on turtles also varied throughout the season, peaking in July. These results demonstrate that pond type appears more important than terrestrial habitat degradation in determining leech infections, but other host and environmental characteristics also influence leech dynamics. Because health is generally a major determinant of fitness, incorporating health-related outcomes into studies of turtle conservation should improve population management efforts.

***70. Effects of habitat on condition and microgeographic distribution of two closely related topminnow (Fundulidae) species**

Gerstenecker, Patricia Ann¹; Schaefer, Jacob F²; Brunkow, Paul E¹ and Duvernell, David D¹.
¹Southern Illinois University at Edwardsville, Edwardsville, IL, ²University of Southern Mississippi, Hattiesburg, MS.

Fundulus notatus and *F. olivaceus* are two closely related species of topminnows that occupy similar niches but distinct habitats. The two species occasionally co-occur where their habitats intersect. In this experiment, we investigated the effect of habitat on species distribution and individual condition in a contact zone to gain an understanding of the mechanisms that determine species distributions. Population samples were collected at sites within less than 200 m upstream and downstream of the confluence of a high gradient spring fed creek (Sexton Creek) and a low gradient tributary of the Mississippi River (Clear Creek) in southern Illinois. Diagnostic molecular markers were employed to assign individuals to species and hybrid classes and length and weight were used to assess individual condition. We found that the two species were non-randomly distributed among sites and that hybrids were rare (one F1 hybrid out of 64 individuals). We hypothesized that each species would exhibit higher mean condition at the site where it was numerically dominant. However, an analysis of variance did not reveal an association between habitat, species and condition for either sex.

***71. Interspecific competition and the effect of density on individual growth rate and condition between two topminnow (*Fundulidae*) species**

Miller, Mallory M¹; Schaefer, Jacob F²; Brunkow, Paul E¹ and Duvernell, David D¹. ¹Southern Illinois University at Edwardsville, Edwardsville, IL, ²University of Southern Mississippi, Hattiesburg, MS.

The black-striped topminnow *Fundulus notatus* and the black-spotted topminnow *Fundulus olivaceus* are two closely related killifish species found in similar ecological environments throughout the midwestern United States. Although they differ only slightly in habitat preferences, they are only occasionally found together in narrow contact zones and it has been suggested that their distributions are maintained through competitive exclusion. This project uses artificial competition pools to study the effect of density on the growth rate and condition of individuals of each species over a six month period. Two week-old juvenile fish were introduced into pools at densities ranging from 8 to 32 individuals in combinations that included either one or both species. Individuals were weighed and measured at two month intervals and the average mass and condition were determined for each species in each pool. A repeated measures ANOVA revealed both a significant species and density effect on mass, as both species grew faster at lower densities and *F. olivaceus* grew faster than *F. notatus* at all densities. In contrast, there was no significant density or species effect on condition. There were no significant interactions between the two species for either mass or condition. The results indicate that while condition was not affected, growth rates of both species are impacted by density (i.e., competition) proportionally, showing no significant difference between the species.

***72. PROJECT WILDBIRD - Food and feeder preferences of wild birds in the United States and Canada**

Shonkwiler, Stacey M and Horn, David J. Millikin University, Decatur, IL.

The abundance of wild birds at feeders may be the result of several factors including the seed present, feeder type, geographic region, and season. PROJECT WILDBIRD is being conducted to examine seed and feeder preferences of wild birds in the United States and Canada. During the first two years of this three-year study, 129 citizen scientists from 33 states and 2 Canadian provinces monitored four feeders for 45-minutes 32 times each season for one year. From winter 2005-summer 2007, participants recorded 411,617 bird visits of 94 species during 22,347 45-minute observations at feeders. Bird abundance was greatest at feeders filled with black-oil sunflower, white proso millet, fine sunflower chips, medium sunflower chips, and Nyjer. Bird abundance was also greatest at tube feeders, within the eastern region, and during winter. Results will allow us to gain a better understanding of how to attract birds to feeders, and ultimately the underlying mechanisms of choice.

73. West Nile Virus: A serosurvey of ranid frogs (*Amphibia: Ranidae*) in selective sites in Illinois

Danner, Bradley, A and Phillips, Christopher A. Illinois Natural History Survey, Champaign, IL.

West Nile virus (WNV) has been isolated in many amphibian feeding species of mosquitoes. Based on this evidence, this study sought to evaluate if amphibians and reptiles, in addition to birds and mammals, play a role in the transmission of West Nile virus (WNV). Bullfrogs, Leopard frogs, and Green frogs were collected from selected sites across the state of Illinois. Blood, and in some individuals tissue, was collected from all individuals (n=239) and tested for the presence of WNV antibodies using epitope-blocking enzyme-linked immunosorbent assay

(ELISA). No WNV antibody positive frogs were found of the 239 tested. This suggests that frogs may not build up immunity to the virus. However, the results of this study do not address whether frogs die or become refractory from exposure to the virus, indicating that further research is needed to address the role amphibians play in the WNV transmission cycle.

***74. Bird-window collisions and factors influencing their frequency at Millikin University in Decatur, Illinois**

Collins, Kathleen A and Horn, David J. Millikin University, Decatur, IL.

As many as one billion birds in North America die annually during collisions with windows. We studied bird-window collisions at Millikin University to determine the number of collisions that were occurring and factors influencing their frequency. From October 2005-October 2007, students at Millikin University searched the perimeters of eleven buildings for dead birds. Estimates of scavenging rates and searcher efficiency were also made to obtain better estimates of collisions. In addition, we collected data on the surface area and number of windows on each side of the buildings, the presence of architectural features such as windowed corridors and alcoves, and landscape features such as ground cover, and the number of trees and shrubs. One hundred thirty-four birds of at least 38 species were found. The majority of collisions occurred during spring and fall migration, with warblers being most susceptible to collisions. By combining the observed scavenging rate and searcher efficiency with the number of bird collisions, we estimate between 7-8 fatal collisions per building annually. Two features of buildings positively influenced the number of bird-window collisions: total surface area of windows and the number of large windows. We conclude that our refined estimates are consistent with previously published estimates, and certain features of buildings are more likely to result in greater numbers of collisions. New buildings should be designed to minimize the number of bird deaths that occur.

***75. PROJECT PREVENT COLLISION: A study of bird-window collisions in residential neighborhoods in Illinois**

Weiss, Rachel E and Horn, David J. Millikin University, Decatur, IL.

The number of fatal bird-window collisions in North America is estimated between 100 million–1 billion annually. However, there is little information about bird-window collisions and factors influencing their frequency in residential neighborhoods. We developed and distributed PROJECT PREVENT COLLISION, a comprehensive homeowners survey that asks individuals information about architectural features of the house, the landscape surrounding the house and neighborhoods, as well as descriptions of birds that collided with windows in the past and during a four-week search. Two hundred forty-two individuals in Illinois participated in the study between spring 2006–fall 2007. Ninety-nine individuals recorded birds colliding with windows at their house in the past, and 22 individuals reported collisions during the four-week period of searches. Results from this study can be used by architects, landscape architects, and homeowners to create bird-safe homes.

76. From days of oar: preliminary results of a survey of the water bugs of Illinois (Insecta: Heteroptera: Nepomorpha)

Tinerella, Paul P and Taylor, Steven J. Illinois Natural History Survey, Champaign, IL.

The results of an ongoing statewide survey of aquatic true bugs (Heteroptera: Nepomorpha) are presented. No such published investigation exists, although Lauck in 1959 reported on the state's

water bug fauna in an unpublished Master's thesis. Aquatic bugs are common in a wide variety of habitats throughout Illinois and form an integral component of aquatic ecosystems. Eight families, represented by 16 genera and 40 species have been recorded from Illinois. Herein we report several additional species and assess the distribution of Nepomorpha in Illinois, as well as the potential for additional taxa from ongoing intensive survey efforts directed at the state's water bug fauna.

***77. Cancelled.**

***78. Developing a technique to evaluate mucus production by single, freshwater snails (Gastropoda)**

Riseman, Lauren and Brunkow, Paul. Southern Illinois University Edwardsville, Edwardsville, IL.

Snails move through the wave-like contractions of a single, muscular foot gliding over a thin film of mucus secreted by the animal. In terms of energy expenditure, this form of locomotion is among the most expensive in the animal kingdom. Snail mucus composition has been characterized in terrestrial, marine and freshwater snails; however, measuring production of mucus by snails has been limited to either large individuals of marine species or large numbers of individuals of freshwater species. We are developing a technique to qualitatively evaluate mucus production by single snails using vital stains. Snails were allowed to adhere to glass slides and were then either physically disturbed or subjected to flowing water, both of which induce a defensive contraction of the foot. Subsequent staining of resulting mucus trails on the slides revealed that such contraction results in a correlated increase in the intensity of staining with periodic acid and Schiff's reagent. Crystal violet, toluidine blue, and alcian blue also stained trail components, but not as clearly or reliably as PAS. Evaluating mucus production by single snails in response to physical disturbance or hydrodynamic drag will aid in understanding the energetic budgets of these ecologically important species.

***79. Relationship between tenacity and shell and foot size in a stream-dwelling snail (Gastropoda)**

Vredenburgh, Tom and Brunkow, Paul. Southern Illinois University Edwardsville, Edwardsville, IL.

Elimia potosiensis, a stream-dwelling snail common to the Missouri Ozark mountains, is subject to the constant challenge of high levels of hydrodynamic drag. Dislodgement due to flow disturbance is a common risk faced by this species, and this risk may differentially affect large and small snails depending on the relationship between tenacity (the ability to grip the substrate) and shell and foot size. We evaluated this relationship by testing snail tenacity in a recirculating flume. Snails were allowed to adhere to a transparent acrylic substrate; then, while facing upstream, snails were subject to water flow that increased smoothly up to 1.6 m/s. Snails were videotaped from below during each trial up to the point where adhesion failed and the snail was swept from the flume; digitized frames from videotapes allowed measuring foot and shell size. There was a significant relationship between foot area as measured immediately before dislodgement and shell size, but no significant linear relationship between foot attachment area and dislodgement velocity. The relationship appeared to be U-shaped, however, suggesting that small snails may resist dislodgement due to low drag on smaller shells, whereas large snails may resist dislodgement due to a stronger foot attachment. We plan to augment this dataset by measuring drag coefficient of snail shells across a range of sizes.

***80. Mechanisms of seed preferences in wild birds that use feeders**

Shonkwiler, Stacey M and Horn, David J. Millikin University, Decatur, IL.

The seed preferences of wild birds may be a result of bill morphology, seed size, nutritional content of the seed, and foraging behavior of the bird. We examined factors influencing seed choice of 12 species of birds in Illinois that use bird feeders. Measures of bill shape were based on 454 museum specimens with 6 measurements taken per specimen. Measures of seed size were based on 3 measures on each of 40 seeds of 10 different types. Nutritional content and seed preferences were derived from data collected in PROJECT WILDBIRD, a U.S. and Canada-wide study of seed and feeder preferences. Fat was the most important nutritional component influencing seed choice with six species choosing seed types with higher fat levels. Birds were also influenced by the shape of the seed with three species each preferring seeds of lesser depth or greater width. Results from the study help us understand why birds that use feeders prefer the seeds they do, and ultimately, may influence the variety of seeds planted for bird food.

***81. Comparison of an additional ribosomal DNA fragment (28s rDNA d2-3 region) contributing to a molecular phylogeny of the water boatmen (Insecta: Heteroptera: Corixoidea)**

Fleener, Christine and Tinerella, Paul P. Illinois Natural History Survey, Champaign, IL.

Results of a comparative analysis on the addition of a ribosomal DNA fragment (28SrDNA d2-d3 region) and its contribution to an ongoing investigation of phylogenetic relationships of the water boatmen (Insecta: Heteroptera: Corixoidea) are presented. To date, no quantitative phylogenetic analysis of the water boatmen has been published. A preliminary phylogenetic analysis of the Corixoidea was presented by Tinerella et al. (in press), utilizing two ribosomal genes (16s rDNA and 28s rDNA d-1 region). That investigation presented the first hypotheses of corixoid relationships with results supporting the monophyly of the water boatmen. In this research, an additional ribosomal DNA fragment (28s rDNA d2-3 region) is added to the existing

data matrix and analyzed. The contribution ('phylogenetic signal') of this gene fragment to the total evidence analysis of all available molecular data is analyzed and discussed in the context of water boatmen and aquatic bug (Nepomorpha) phylogenetic relationships.

***82. Dietary analysis of a northeastern Illinois turtle community**

Menzel, Evan J and Kuhns, Andrew R. Illinois Natural History Survey, Champaign, IL and Berger, Andrew J, Lake County Forest Preserve District, Grayslake, IL.

Dietary analysis at the community level provides insight into prey utilization and ecology of a suite of species. We investigated the diet of a turtle community [Blanding's Turtle (*Emydoidea blandingii*), Painted Turtle (*Chrysemys picta*), Snapping Turtle (*Chelydra serpentina*)] by identifying prey taxa from fecal samples. We calculated Shannon's diversity index (SDI), evenness, and dietary overlap to test for both interspecies dietary differences and intraspecies ontogenetic dietary differences. The taxa with the highest frequency of occurrence were Coleoptera (67.95%), Decapoda (47.06%), and Mollusca (52.94%) for *E. blandingii*, *C. serpentina* and *C. picta*, respectively. Of the three species, *E. blandingii* had the highest SDI at 3.69, where as *C. picta* had a value of 3.51 and *C. serpentina* was lowest at 3.35. *Emydoidea blandingii* and *C. picta* showed ontogenetic dietary overlap at 0.61 and 0.69, whereas *C. serpentina* appeared to shift their diet as they grow (0.06). This shift in the diet of *C. serpentina* juveniles to adults appears to be from a decrease in the frequency of occurrence of Coleoptera and Mollusca and an increase in frequency of Decapoda and plant material. Evenness values were low, indicating that none of the three turtle species preyed predominantly on one taxon.

***83. We're gonna need more traps: sampling multiple aquatic habitat types to avoid erroneous estimates of turtle community structure**

Berger, Andrew J¹ and Kuhns, Andrew R² and Menzel, Evan J². ¹Lake County Forest Preserve District, Grayslake, IL; ²Illinois Natural History Survey, Champaign, IL.

We analyzed 1,717 trap captures from a three year study on a turtle community in northeast Illinois to determine the effect of aquatic habitat type on trapping success for Painted Turtles (*Chrysemys picta*), Snapping Turtles (*Chelydra serpentina*), and Blanding's Turtles (*Emydoidea blandingii*). We sampled seven aquatic habitat types using double-throated hoop traps baited with canned sardines. We calculated catch per hour for each species and habitat type by year and overall. Capture rates over all habitat types were highest for *C. picta* (0.003917), followed by *E. blandingii* (0.002499) and *C. serpentina* (0.001867). When looking at specific habitat types, *C. picta* capture rates were highest in retention ponds (0.01135). *Chelydra serpentina* were captured most frequently in cattail marsh (0.00276) and marsh ditch (0.00239) habitats. Overall capture rates for *Emydoidea blandingii* were similar for mixed marsh (0.00330), wet meadow (0.00315), cattail marsh (0.00298), and retention pond (0.00288) habitats, although the majority of Blanding's Turtles captured in retention ponds occurred during the fall drought of 2005 at a time when all other aquatic habitats were dry. Our results indicate that care must be taken to sample all aquatic habitat types to avoid erroneous estimates of species relative abundance and overall community structure.

***84. The birds of Green Wing Environmental Laboratory in northcentral Illinois**

McKay, Kelly J¹ and Hager, Stephen B². ¹BioEco Research and Monitoring Center, Hampton, IL; ²Augustana College, Rock Island, IL.

Green Wing Environmental Laboratory (GWEL), a biological field station in the Prairie Peninsula Physiographic Area of northcentral Illinois, contains 170 ha of forest fragments, edge, wetlands, and grasslands. Our objective was to assemble a cumulative list and summarize baseline ecological information for the avifauna of GWEL based on field studies from 2001-2007. During this time we observed 188 species within 17 orders and 47 families. Abundant summer breeders included Red-winged Blackbird (*Agelaius phoeniceus*), Song Sparrow (*Melospiza melodia*), and Gray Catbird (*Dumetella carolinensis*). During fall and spring migration, Lesser Yellowlegs (*Tringa flavipes*), Golden-crowned Kinglet (*Regulus satrapa*), and Yellow-rumped Warbler (*Dendroica coronata*) were abundant. In winter, abundant species included the American Crow (*Corvus brachyrhynchos*), Dark-eyed Junco (*Junco hyemalis*), and Blue Jay (*Cyanocitta cristata*). We observed many species of conservation concern, such as Golden-winged Warbler (*Vermivora chrysoptera*), Common Yellowthroat (*Geothlypis trichas*), Wood Thrush (*Hylocichla mustelina*), and Whip-poor-will (*Caprimulgus vociferus*). Edge nesting species, such as Red-winged Blackbird and Gray Catbird, experience high reproductive success. However, limited observations of breeders in interior-edge habitat suggest that these birds, e.g., Red-eyed Vireo (*Vireo olivaceus*) and Veery (*Catharus fuscescens*), may suffer from high rates of nest depredation and parasitism by the Brown-headed Cowbird (*Molothrus ater*). A more complete understanding of the birds of GWEL would come from additional estimates of abundance and richness for all seasons and studies of nest productivity in all habitats.

***85. Breeding birds and nest productivity at Green Wing Environmental Laboratory, northcentral, Illinois**

Hager, Stephen B; Bertram, Christopher R and Derner, Katie R. Augustana College, Rock Island, IL.

Green Wing Environmental Laboratory (GWEL) is a 170 ha biological field station in northcentral Illinois that is composed of small woodlots, edge habitat, and wetlands, and is found in a landscape dominated by agriculture and fragmented ecosystems. Birds breeding in small habitat patches at this site may experience low reproductive success due to high predation and parasitism at nests. We conducted three studies aimed at assessing the breeding birds of GWEL. Study 1 assigned breeding status using the methodology of the Breeding Bird Atlas. We observed 124 species, 97 of which showed evidence of breeding: 66 confirmed, 14 probable, and 17 possible. In Study 2, we estimated abundance of summer birds and found that the Red-winged Blackbird (*Agelaius phoeniceus*), Song Sparrow (*Melospiza melodia*), and Gray Catbird (*Dumetella carolinensis*) were present in the highest numbers. In Study 3, an analysis of nest productivity, daily nest survival (DNS) was high and we found no evidence of Brown-headed Cowbird (*Molothrus ater*) parasitism for two species, Red-winged Blackbird (DNS = 0.92 ± 0.016) and Gray Catbird (DNS = 0.96 ± 0.01), reported to reproduce in edge habitat. These studies suggest that edge species are common at GWEL and experience high reproductive success. Future work should examine nest productivity of confirmed breeders characterized as forest nesting, e.g., Wood Thrush (*Hylocichla mustelina*) and Ovenbird (*Seiurus aurocapilla*), and species of conservation concern, e.g., Field Sparrow (*Spizella pusilla*).

***86. Fluctuating asymmetry in Tamarin (Primates: *Saguinus*) Postcranial Morphology**

Schonert, Kallie and Kohn, Luci Ann, Southern Illinois University Edwardsville, Edwardsville, IL.

Fluctuating asymmetry (FA), small directionally random differences from symmetry in bilaterally symmetrical structures, has been suggested to be an indicator of developmental

stability. It is thought that FA increases with genetic or environmental stress. We examined the association between genetic heterozygosity and fluctuating asymmetry. Our sample includes three subspecies of saddle-back tamarins, including *Saguinus fuscicollis illiger*, *S. f. leucogenys*, *S. f. nigrifrons*, and their first generation hybrids. All specimens were derived from the Oak Ridge Associated University Marmoset Research Center. Bilateral measurements were recorded on 22 postcranial elements representing dimensions of the upper and lower extremities. Fluctuating asymmetry was estimated using analysis of variance. There were significant differences between subspecies and hybrids for their magnitude of fluctuating asymmetry, supporting the use of fluctuating asymmetry to estimate stress associated with levels of genetic heterozygosity.

***87. Morphometric analyses of coyote (*Canis latrans*) and Gray Fox (*Urocyon cinereoargenteus*) crania**

Alderman, Kaitlin and Kohn, Luci Ann. Southern Illinois University Edwardsville, Edwardsville, IL.

The gray fox (*Urocyon cinereoargenteus*) and the coyote (*Canis latrans*) are closely related species within the family Canidae. Few skeletal studies of canids have focused on morphological differences between these taxa. In this study we tested for significant differences in facial morphology between *Urocyon cinereoargenteus* and *Canis latrans* skeletal samples from the Illinois State Museum and Michigan State Museum. We tested for differences in the facial, dental and brain case regions. Locations of 31 landmarks on the right and left sides were recorded with a three-dimensional digitizer on 17 gray fox and coyote skulls. Thirty-nine linear distances between landmarks in the regions of the face and cranial vault were calculated, and. We tested dimensions within each region for within species differences due to differences in gender and between species. Studies between closely related taxa help us to understand some of the evolutionary forces associated with their coevolution. By species differences in functionally or developmentally related areas, we gain a better understanding of the evolution of these the two groups

***88. Morphometric analysis of dental and cranial morphology in red and grey Foxes (*Vulpes vulpes* and *Urocyon cinereoargenteus*)**

Rickelman, Aaron and Kohn, Luci Ann. Southern Illinois University Edwardsville, Edwardsville, IL

Skeletal and dental morphology can be used to study morphological similarities between many closely related taxa. Functional differences in the design of Canid dentition may be expected to result when compared amongst related taxa. Dental and cranial morphology were studied in the 21 red fox (*Vulpes vulpes*) and 16 grey fox (*Urocyon cinereoargenteus*) skulls. In general, red and grey foxes are widely distributed across the United States as well as on other continents and are found living in a variety of different environmental biomes. Through living in these differing biomes, each of these species must adapt themselves to the available food sources of that area. We tested for within species (due to sexual dimorphism) and between species differences in dental and cranial morphology. Tooth length and breadth measurements were recorded among ten teeth in the maxillary region of the canid skull. Sex measurements representing maxillary and overall skull dimensions were also recorded. There was not significant sexual dimorphism within either species. Between species differences were limited in dental dimensions, but there were significant differences between species for cranial dimensions. These results suggest that

dental dimensions may be the result of similar environmental adaptations to diet. Evolutionary forces associated with the evolution of these two species are more evident in cranial dimensions.

***89. Heritability of dermatoglyphic patterns**

Sido, Jessica; Kohn, Luci Ann and Rehg, Jennifer. Southern Illinois University Edwardsville, Edwardsville, IL.

Dermatoglyphs are dermal ridges (e.g., fingerprints) which are found on the hands and feet. They are formed between 12 and 18 weeks after conception. Dermatoglyphs vary uniquely among individuals in specific pattern and ridge density (number per area). Since there is a limited period of time during which fingerprints can be affected by environmental factors, their expression may be largely genetically based. We examined fingerprints from 100 individuals representing multiple relationships (full sibling, parent – offspring, grandparent – grandchild) and unrelated individuals to determine if fingerprint ridge counts are significantly heritable. All ten fingers of each individual were printed using standard techniques, and a total ridge count (TRC) was determined for each individual. TRC is the number of ridges between the delta and the center of the pattern on each finger summed across all ten fingers. Maximum-likelihood methods that use all available relationships were used to estimate TRC heritability. Heritability of TRC in this sample was 0.95, supporting theory that fingerprints are primarily due to genetic effects. The information gained from research such as this is necessary and important due to a lack of data from extended family groups. This research also ties together important aspects of dermatoglyphic studies, including TRC and pattern frequencies, in one study.

***90. Effect of phosphodiesterases (PDEs) on the neuromuscular activity in the freeze-tolerant frog (*Rana sylvatica*)**

France, Megan; Lawrence, Barbara and Marjanovic, Marina. Eastern Illinois University, Charleston, IL.

Previous study showed that the freeze-tolerant wood frog (*Rana sylvatica*) has a higher level of phosphodiesterases (PDEs) in the skeletal muscle after cold-acclimation than the freeze-sensitive leopard frog (*Rana pipiens*). The increased concentration of these compounds in the wood frog before the freezing could have a positive effect on the frog's ability to recover its neuromuscular functions after thawing. The untreated wood frogs are tested for the righting reflex, the protraction reflex, swim speed and jump distance. The results were used to indicate the pre-freeze abilities of the frog in regard to reflex responses. The concentration of phosphodiesterases was experimentally increased in the frogs before they were frozen in accordance with the conditions of their natural freezing. After 48 hr in the frozen state, the same tests were repeated after their thawing and the results compared with pre-freeze values. The results show the effectiveness of phosphodiesterases as cryoprotectants in the wood frog.

***91. Evaluating prairie health based on an auchenorrhynchous Homoptera index of biotic integrity (AH-IBI)**

Wallner, Adam, M¹; Dietrich, Christopher H² and Molano-Flores, Brenda². ¹University of Illinois at Urbana-Champaign, Urbana, IL; Illinois Natural History Survey, Champaign, IL.

Leafhoppers and their relatives represent some of the most diverse groups of herbivorous insects in the prairie and respond differently to disturbance than other groups of prairie organisms. Despite their potential importance in reflecting an alternative measure of prairie health only a dearth of studies have used these insects for this purpose. The focus of this project is to develop

an index based on life history and biodiversity information of leafhoppers and related groups (auchenorrhynchous Homoptera (AH)) that is repeatable, and offers some utility for land managers in measuring and conserving prairie health. The robustness of this index will also be tested. The AH-IBI is calculated by taking the sum of six life history parameters for each AH species encountered, producing a coefficient of conservatism (CC) score for each species. For each sampled site a mean coefficient of conservatism (CCmean) is calculated by averaging coefficients over all species encountered. This is combined with other variables such as relative abundance to produce an AH-IBI. To test the robustness of this index, I sampled on four prairie remnants in Illinois. Six 40 m-linear transects and six 5x5 m plots were setup on each site. Sweep and vacuum methods were used to collect insects. Preliminary results suggest that index values were significantly higher in vacuum than in sweeps samples ($P=0.003$). But this trend only occurred when I sampled along transects that were located within wet prairies. The dense vegetation associated with wet prairies may have prevented the sweep net from collecting more.

92. Laboratory behavior and husbandry in the Rocky Mountain tailed frog, *Ascaphus montanus

Suffian, Daniel J; Essner, Richard L; Jansen, Jody A; Gerstenecker, Patricia A; Roberts, Kandace K and Brunkow, Paul E. Southern Illinois University Edwardsville, Edwardsville, IL.

The tailed frog, *Ascaphus montanus*, is a small, semi-aquatic frog found in cold, fast-moving, mountain streams of the Pacific Northwest. Tailed frogs are the most basal living frogs and are of conservation concern due to their stringent habitat requirements and sensitivity to logging. We collected adult frogs ($n = 16$) and tadpoles ($n = 20$) from streams in central Idaho and maintained them in the laboratory with an aquarium setup designed to mimic their natural environment. Key features included granite substrates, flowing water, cold temperatures ($\sim 48^{\circ}\text{F}$), and reduced pH (~ 6.0). Adults and tadpoles were housed in separate tanks that emptied into a common reservoir. Tadpoles were fed a diet of living diatoms and desmids; whereas, adults were fed 1.0-1.5 cm crickets. Adult activity patterns were quantified by recording behavior between 1800 and 0600 h with a Sony Hi-8 camcorder. Peak activity occurred between 2100-2200 h and gradually declined to a minimum level between 0500 and 0600 h. Mating behavior (i.e., copulexus) was observed on five occasions, with each event occurring over multiple days (2-3 day duration), and involving different pairs of individuals.

93. Mating bias in the red imported fire ant.

Fritz, Gary N. and Carroll, Kendra. Eastern Illinois University, Charleston, IL

The breeding system of the Red Imported Fire Ant was examined by genotyping newly-mated queens and their stored sperm for a gene (the *Gp-9* locus) believed to code for a pheromone-binding protein affecting complex social behavior. Newly-mated queens were collected from a site in Florida with sympatric monogyne (single-queen) and polygyne (multiple-queens) colonies. Sperm storage patterns suggest female alates mate disproportionately with males of their own social form. Of those queens unambiguously originating from polygyne colonies (Bb and bb queens), approximately 85% were inseminated by males of their own social form. Similarly, queens originating primarily from monogyne colonies (BB queens) were significantly more likely to have sperm of the B genotype only. No pattern was observed for the quantity of sperm contained in the spermathecae of queens from both social forms. Previous studies have proposed that gene flow between both social forms is unidirectional and limited to the frequent copulation of monogyne males to polygyne queens. Our study suggests that even this avenue of gene flow may be under selection and further supports the incipient species status of this taxon.

The apparent mating bias reported here, whatever its basis, further underscores the varied effects of one or a few closely linked genes on the breeding system of the Red Imported Fire Ant.

94. Overwintering mosquitoes in Illinois stormwater tunnels & caves

Steven J. Taylor and Richard L. Lampman. Illinois Natural History Survey, Champaign, IL

Mosquitoes in temperate areas of North America typically survive the winter in either a facultative reproductive diapause in the adult stage (*Culex*, *Culiseta*, *Uranotaenia*, and *Anopheles* species) or as dormant, desiccation resistant eggs (*Aedes*, *Ochlerotatus*, and *Psorophora*). Pathogens like West Nile virus may utilize the winter behavior of the mosquito as a means of surviving in an area; that is, maintain itself in the over-wintering vector and re-emerge the following season. Adult mosquitoes require areas that remain above freezing and have high relative humidities, such as natural caves. Our goal is to survey various winter hibernacula for mosquitoes to determine which species are found in different types of natural and anthropogenic structures. We collected mosquitoes from several natural caves and found *Culex erraticus*, *Cx. pipiens* complex species, *Anopheles* species, and *Uranotaenia sapphirina*. All of these species have been reported in some state as associated with West Nile virus. Interestingly, humans create hibernacula for some vector species by building vast underground stormwater systems that mimic a large, interconnected underground system. Our data compare mosquitoes in natural caves to storm water tunnels.

***95. Ontogenesis of the coracoid in the marsupial short-tailed Opossum (*Monodelphis domestica*).**

J. E. Peters, M. J. Hubler and K. E. Sears. Department of Animal Biology, University of Illinois Champaign-Urbana

In contrast to eutherian mammals, marsupials give birth to highly altricial newborns that crawl to the teat where they attach and complete their development. During the crawl, an extensive cartilaginous shoulder girdle provides skeletal support, anchoring the forelimbs to the axial skeleton. Integral to the function of this shoulder girdle complex are large coracoids, which extend from the scapula to the sternum. At a time-point near birth, the coracoids are reduced until the adult (eutherian-like) form is obtained. In this study, we characterize the reduction of the coracoid in the short-tailed opossum (*Monodelphis domestica*). Broom (1899) suggested that the reduction of the coracoids occurs via a “process of degeneration, beginning near the middle portion of the fetal coracoid. This progresses in each direction, completely destroying the sternal half, but only incompletely destroying the scapular half, leaving the well-known rudimentary coracoid process of the adult attached to the anterior side of the neck of the scapula.” To test this hypothesis, embryos of various ages were cleared and stained to reveal the gross morphology of coracoid degeneration. Additionally, embryos at stage 31 (12.2 days), 32 (13.4 days) and 33 (13.75 days) were sectioned and the reduction was characterized at the cellular level. Preliminary results suggest that the coracoids do degenerate as Broom hypothesized. Going beyond Broom’s hypothesis, we also examine the cellular mechanisms behind this degeneration. We hypothesize that programmed cell death (apoptosis), the mechanism responsible for freeing the digits of most amniotes from embryonic webbing, is also responsible for the reduction of the marsupial coracoids. To test this hypothesis, coracoid sections were assayed for apoptotic activity using TUNEL *in situ* as well as antibodies for apoptotic pathway proteins such as Caspase-3. These assays are ongoing.

***96. The effects of food deprivation on agonistic behavior in the crayfish *Procambarus clarkii* (Decapoda: Cambaridae)**

Patel, James K; Forker, Nathan J and Robertson, Marianne. Millikin University, Decatur, IL.

In crayfish, as with most members of the animal kingdom, agonistic or aggressive behavior is used to develop dominance hierarchies. There are many factors, both intrinsic and extrinsic, that affect agonistic behavior. Here, we showed how food deprivation affects the agonistic displays of crayfish *Procambarus clarkii*. A control group of 20 *P. clarkii*, was fed on a daily basis for the 10-day duration. We withheld food from an experimental group of 20 *P. clarkii* for 10 days. Upon completion of the 10-day period, one control organism or one experimental organism were randomly placed in an arena with a well-nourished conspecific so that agonistic displays could be observed. The data were quantified in concordance with an already defined agonistic behavior intensity scale ranging from -2 to +5 (where -2 and -1 are subordinate, 0 is neutral, and 1 through 5 are dominant behaviors). There was a significant difference exhibited between the control and experimental *P. clarkii* at the intensity level of +5. However, both the control and experimental organisms showed no other statistically significant differences with regard to intensity levels -2 to +4. There was also a significant difference between the control and experimental groups in dominant behaviors, where the control performed dominant behaviors more frequently than the experimental group. Confidence intervals showed that within both groups there was a significant difference at the level 3. However, there was also a significant difference at -2 for the control group and +5 for the experimental group.

***97. Effects of starvation in bullfrog tadpoles, *Rana catesbeiana* (Amphibia: Ranidae), ability to evade their natural predator, the dragon fly nymph, Anisoptera (Insecta: Odonata)**

Tegethoff, Amy L; Gibbs, Shawn K and Robertson, Marianne W. Millikin University, Decatur, Illinois.

American bullfrog tadpoles, *Rana catesbeiana*, have a specific behavior that is presented in the presence of a predator to incur the best fitness for the individuals. Proper nutrition allows them to perform the specific predator evasion behaviors, which are moving slowly away from the predator and remaining at the bottom of the tank. This paper looks at the effect of starvation on bullfrog tadpoles, *R. catesbeiana* ability to evade its natural predator the dragonfly nymph, anisoptera. This experiment attempts to show that when tadpoles, *R. catesbeiana*, are starved they will not perform normal predator evasion behavior. Tadpoles, *R. catesbeiana*, that were fed sufficient nutrition and insufficient nutrition, were exposed to a dragonfly nymph predator, Anisoptera. Average rate of movement was calculated using a standard t-test and statistical analysis. The t-tests that were run were used to determine whether or not the control and experimental groups moved toward or away from the predator. The conclusions that were reached were that the starvation has no significant effect on *R. catesbeiana*'s ability to evade the predator Anisoptera.

ORAL PRESENTATION ABSTRACTS

Division: Botany

98. Occurrence of black knot disease on cherries in a post-fire forest regrowth in the Adirondack Wilderness, New York

Beck, Hans, T and Conway, Joseph. Aurora University, Aurora, IL.

An infection of a fire cherry (*Prunus pensylvanica*, Rosaceae) population by black knot (*Apiosporina morbosa*, Ascomycota) is recorded for a recently burned wilderness site in the Adirondack Mountains High Peaks Wilderness, northern New York state. The tree species is not normally common in the High Peaks region, and the extensive infection of the population is quite remarkable. The infection density was high (Mean = 21 stems/m²) in this severely-disturbed, previously-climax forest habitat. Epidemic infections such as this have not been recorded before in forest wilderness sites recovering from catastrophic fire, and black knot infections of fire cherry have only seldom been anecdotally documented for natural, non-cultivated areas. This quantitative survey of black knot incidence indicates that a wild population of *Prunus* in a remote location can have a very high inoculum density. The knowledge that black knot is dispersed into natural wilderness areas may be helpful in developing a selective disease management protocol for cultivated populations of *Prunus*.

99. Composition, structure, and diversity in Kyrgyz steppes

Taft, John B. Illinois Natural History Survey, Champaign, IL.

Native grasslands throughout the world are threatened by conversion for cropland, habitat degradation, exotic species invasions, and woody encroachment. Among the most extensive temperate grasslands remaining are the steppes and semi-deserts of Central Asia. About 40% to 50% of the land area of the Kyrgyz Republic retains native grassland vegetation, including semi-savanna and desert habitats. With one of the highest population growth rates in Central Asia, agricultural and grazing pressures on the land are expected to grow thus increasing the urgency to document the biodiversity of the region. Three expeditions were conducted (1998-2000) to survey the floristic and arthropod diversity of Kyrgyz grasslands. This study reports the composition, structure, and diversity patterns of grasslands ranging from semi-deserts to high elevation steppes. A total of 682 species were recorded in 832 quadrats (0.5-m²) sampled along 43 transects throughout Kyrgyzstan. 50% of all species occurred in a single transect and only 30% occurred in more than two transects. The species accumulation curve has a continuously rising profile. Alpha diversity was 11.56 spp./quadrat and mean richness was 40.9 species/transect. Dominant species were: *Festuca valesiaca*, *Carex turkestanica*, *Artemisia* spp. (subgenus *Serifidium* [vegetative]), *Bothriochloa ischaemum*, *Stipa capillata*, *Poa bulbosa*, *Bromus oxydon*, *Artemisia scoparia*, *Artemisia persica*, and *Artemisia serotina*. These dominant species, six graminoids (five grasses and one sedge) and four sub-shrubs, accounted for 25.7% of importance among all species. Ten vegetation types forming three broad classes were identified in cluster analysis representative of a moisture gradient: desert/semidesert/semi-savanna, montane steppe/meadow steppe, and (sub)alpine meadow.

***100. Leaf and photosynthetic characteristics of *Trillium flexipes* (bent trillium) and *Trillium recurvatum* (purple trillium)**

Bragg, Rachel; Smith, Frances M and Minchin, Peter R. Southern Illinois University-Edwardsville, Edwardsville, IL.

Although *Trillium flexipes* Raf., commonly called Bent trillium, is widely distributed in the northeastern US, it is rare on the SIUE campus. It occurs at a single site in Sweet William woods in an area that is threatened by erosion from campus runoff. A closely related species, Purple trillium, which occurs at this site, is widely distributed throughout wooded areas on campus. No studies have been conducted on the ecophysiology or environmental requirements for *T. flexipes* or *T. recurvatum*. In this study, I determined the physiological responses to environmental conditions (light, soil moisture, slope gradient, relative humidity, soil type, and air and soil temperatures) for both species at this site throughout the growing season. Preliminary data suggested that *T. recurvatum* is more dependent upon high light for photosynthesis than *T. flexipes*; therefore, I hypothesized that the species have different physiological strategies in response to a changing canopy cover. To test this hypothesis, I measured stomatal density, leaf thickness, photosynthesis, and chlorophyll, which are parameters used to determine plant strategies in a changing environment. Photosynthesis in *T. flexipes* was less dependent upon high light, leaves were thinner, and chlorophyll (mg g⁻¹DWT) was greater than in *T. recurvatum*. These characteristics indicate that *T. flexipes* is tolerant of a shaded habitat, while *T. recurvatum* employs the escape strategy of a true spring ephemeral.

101. Effects of storage temperature on germination and viability of *Boltonia decurrens*

Smith, Marian and Mertens, Rachel. Southern Illinois University-Edwardsville, Edwardsville, IL.

Boltonia decurrens is a perennial species in the family Asteraceae that is restricted to the lower Illinois River floodplain and nearby areas in Missouri. In spite of its prolific achene production, population size and number fluctuate radically and often bring the species close to the edge of extinction. In order to preserve *B. decurrens* and its genetic diversity, conservation strategies should include the collection and storage of achenes from a variety of populations throughout its distribution. When populations flourish, mass achene collection is possible, and recent information indicates that achenes may remain viable for a number of years; however, viability varies depending upon storage conditions. The objective of this research was to compare viability and germination of achenes stored at 4°C with those stored at -70°C. Results indicate that there was no temperature effect on germination and viability of seeds stored less than 5 years; however, seeds stored for long periods had higher percent germination when kept at -70°C compared to 4°C.

***102. In vitro seed germination and development of the federally endangered Hawaiian endemic, *Platanthera holochila* (Orchidaceae) - an update**

Turnquist, Rebecca L¹; Kirk, Anna K¹; Morrison, Amanda R¹; Perlman, Steve² and Zettler, Lawrence W¹. ¹Illinois College, Jacksonville, IL, ²National Tropical Botanical Garden, Kalaheo, Kauai, HI.

Platanthera holochila (Hbd.) Krzl. (Orchidaceae) is endemic to the Hawaiian archipelago, and is one of North America's rarest orchids (U.S. Federally listed as C1; global rank G1). Fewer than 36 individuals remain within cool cloud forests of Kauai, Maui, and Molokai. Although protected, the species is threatened by feral pigs, habitat encroachment by exotic species, and

human activity, prompting a vigorous effort to cultivate the species from seed. The preferred technique of symbiotic seed germination has been applied to *P. holochila* resulting in leaf-bearing seedlings in vitro using a mycorrhizal fungus (*Epulorhiza repens*). However, because this fungus originated from Florida - not Hawaii - the act of releasing seedlings harboring this non-native, viable fungus could potentially alter the ecology of the orchid's habitat. Although fungi have subsequently been recovered from *P. holochila in situ*, the resulting strains have not been effective at prompting germination. Consequently, seed germination in the absence of a fungus (= asymbiotic germination) was explored and is the subject of this study. Seeds of *P. holochila* from six sources were sown on three different asymbiotic media: P723 (Phytotechnology Laboratories), Knudson C, and Murashige & Skoog. Seed germination commenced 44 days after sowing on all three media. After 15 months, a total of 20 leaf-bearing seedlings were obtained using P723. Efforts are underway to establish these seedlings ex vitro for eventual reintroduction.

***103. Development of the endangered *Physaria ludoviciana* (silvery bladderpod; Brassicaceae) when affected by light intensity**

Jernegan, Marissa C and Coons, Janice M. Eastern Illinois University, Charleston, IL.

Physaria ludoviciana (Nutt.) O'Kane & Al-Shehbaz (silvery bladderpod; Brassicaceae) is a state endangered species of Illinois sand prairies. Mason County has the only naturally occurring population in Illinois. *Physaria ludoviciana* grows on soils with low water holding capacity, frequent disturbances, full sunlight, and limited competition from other species. This environment, where few other species establish, appears to create an ideal niche for *P. ludoviciana*. If *P. ludoviciana* is an early succession plant, competition for light from increased vegetation might hinder its development. Understanding its light requirements would be useful in preservation efforts. Our objective was to determine how light intensity affects development of *P. ludoviciana*. Plants were started from seed in cone-tainers™ and placed in two growth chambers with a 16 hr/8 hr (light/dark) photoperiod at 25°C. Light intensity was either 584 ± 21 or 174 ± 2 $\mu\text{mol}/\text{m}^2/\text{sec}$. Development was quantified for 4 weeks by measuring diameters of plant rosettes, leaf areas, fresh and dry masses, and leaf numbers. Root branching also was compared. Plants grown at higher light intensity had significantly greater leaf areas, fresh and dry masses, leaf numbers and root branching than those at lower light intensity. Light intensity greatly affected the development of *P. ludoviciana*, stressing the importance of light competition from increased vegetation during establishment of plants.

***104. Substrate preferences of epiphytic orchids (seedlings, juveniles, mature plants) within the Florida Panther National Wildlife Refuge**

Massey, Emily E¹; Hamilton, Kabrina²; Stewart, Scott L³; Richardson, Larry W⁴ and Zettler, Lawrence W¹. ¹Illinois College, Jacksonville, IL, ²Western Kentucky University, Bowling Green, KY, ³Phytotechnology Laboratories, Shawnee Mission, KS, ⁴U.S. Fish & Wildlife Service, Naples, FL.

The Florida Panther National Wildlife Refuge (FPNWR; Collier Co., FL) contains ca. 27 orchid species spanning 17 genera, many of which are rare and/or endangered. During the past seven years, the FPNWR has served as a "hub" for ecological studies aimed at understanding orchids in situ within a protected ecosystem. Recent emphasis has been placed on propagating the epiphytic taxa from seed to augment conservation efforts. To succeed, seedlings obtained in vitro must ultimately survive in situ following reintroduction. Thus, the selection of a suitable substrate for seedling development represents a crucial, albeit poorly understood, aspect of epiphytic orchid

conservation. We report the substrate preferences of seedlings, juvenile, and mature plants of seven epiphytic orchid species: *Epidendrum amphistomum*, *E. rigidum*, *E. nocturnum*, *Encyclia tampensis*, *Harrisella porrecta*, *Polystachya concreta*, *Prosthechea cochleata* var. *triandra*. Of 272 seedlings and juveniles counted along transects, 239 (88%) were rooted in association with bryophytes (mosses), and 232 (85%) had colonized pop ash (*Fraxinus caroliniana*). Of the mature plants, 69 of 147 (47%) were oriented on bark facing N or NE. Of 400 juvenile and mature plants, half (50%) colonized an angled (45 degree) substrate compared to vertical (32%) or horizontal (18%) positions. This study suggests that orchid seedlings should be placed on moss substrates facing N/NE on pop ash.

105. Cancelled

106. Size class structure and spatial distributions of invasive *Lonicera maackii* populations in southwestern Illinois

Schulz, Kurt E; Hoover, Audra and Ecology of Plants Students. Southern Illinois University-Edwardsville, Edwardsville, IL.

In the eastern U.S., the shrub honeysuckle *Lonicera maackii* is a ubiquitous forest invader. It is easily the most abundant understory shrub in hardwood forest remnants on the SIUE Campus. Students enrolled in ecology classes mapped honeysuckle populations in 800-1000 m² plots to evaluate shrub population characteristics. Data from four mapped plots were analyzed by the senior author to infer temporal patterns of stand colonization, the role of founder individuals as colonization nuclei, and the shrub canopy structure of invaded understories. Colonization patterns were strikingly variable. In a 45 year-old old field succession recruitment has been essentially continuous, with the canopies of the largest individuals nearly 5 m in diameter. A nearby plot in a similar situation showed continuous recruitment, but the largest shrubs reached only 2.4 m diameter. A stand under a closed tree canopy showed evidence of a recent recruitment pulse (median canopy diameter 0.5, range 0.2-2.5 m), as did a second closed canopy stand (median canopy diameter 1.7, range 0.4-3.7 m). There was no evidence that juveniles tended to recruit around established adults. Honeysuckle canopies covered 12-40% of plots. Canopy cover was not dependent on shrub density, rather the size structure of the shrub population. These observations suggest that manipulations of tree canopy structure may offer an avenue to moderate honeysuckle invasion.

107. Vascular flora and community mapping of Funks Grove Illinois Natural Areas Inventory Site, Mclean County, Illinois

Marcum, Paul B; Phillippe, Loy R; Busemeyer, Daniel T; Larimore, Richard L and Murphy, Michael J.C. Illinois Natural History Survey, Champaign, IL.

The vascular flora of the Funks Grove Illinois Natural Areas Inventory (FGINAI) Site, a 436 ha (1076 ac) natural area in Mclean County, Illinois, was studied during the growing seasons of 2005 and 2006. A total of 498 taxa were found including 92 new county records. Fourteen community types were delineated within the natural area: mesic upland forest, wet floodplain forest, wet-mesic floodplain forest, marsh, sedge meadow, seep, eroding bluff and cultural communities (grazed forest, prairie restoration, savanna restoration, successional field, tree plantations, cropland and developed land). One hundred and seven non-native species, 21.4% of all taxa collected, were vouchered from FGINAI. Most of these species are uncommon within the natural area and were collected from disturbed areas, therefore, posing little threat to the natural communities. A handful of these non-native species, however, are of real concern to the

natural integrity of the INAI site. Species such as *Alliaria petiolata* (garlic mustard), *Humulus japonicus* (Japanese hops), *Lonicera maackii* (Amur honeysuckle), *L. morrowii* (Morrows honeysuckle), *Maclura pomifera* (hedge apple), *Morus alba/tatarica* (white/Russian mulberry), *Phalaris arundinacea* (reed canary grass) and *Rosa multiflora* (multiflora rose) appear to be the greatest threats to the natural communities within FGINAI. FGINAI is a fine example of the once common prairie groves of Illinois. Many large tracts of relatively undisturbed forest are still present creating ample habitat for native plant species as well as for area sensitive vertebrate species.

***108. Ecology of terrestrial macrofungi in old-growth prairie groves**

Hustad, Vincent P; Methven, Andrew S; Pederson, Charles L and Meiners, Scott J. Eastern Illinois University, Charleston, IL.

This study is investigating ecology of terrestrial macrofungi in Brownfield (26.1 ha) and Trelease Woods (24.5 ha), Champaign Co., Illinois. These woods are remnants of a larger, pre-settlement prairie grove now encircled by houses, fragmented forests, prairie and agricultural land. Although initially a virgin, deciduous upland forest dominated by oak, ash and maple with a high, closed canopy and fairly open (Brownfield Woods) to moderately dense (Trelease Woods) understory, sugar maple is rapidly becoming the dominant tree species. Beginning in Spring 2006, terrestrial macrofungi and macrofungi inhabiting wood fragments <15cm diameter at each forest site were surveyed along twenty separate 100m permanent transects. Over 90 genera of macrofungi were identified from Brownfield and Trelease Woods. Plant litter composition, soil structure, site precipitation, and relative dominance of tree species were characterized at each site and used to analyze macrofungal diversity. Macrofungal community composition was found to be significantly affected by seasonality and forest division between sites. This study represents the initial phases of a long-term study in which these data will be used as a baseline to characterize changes in macrofungal community composition over time as shade-tolerant sugar maple becomes more dominant.

***109. Effects of timed mowing for control of *Taeniatherum caput-medusae* (Monocot: Poaceae) in an annual grassland: a community perspective in invasive species management**
Reed, L. Southern Illinois University-Carbondale, Carbondale, IL.

Medusahead grass (*Taeniatherum caput-medusae* (L.) Nevski) has been introduced to grasslands in eight states in the US and has severely impacted biodiversity and rangeland productivity in affected areas. This species threatens biodiversity through direct competition with native species and alteration to ecosystem structure and function. Diverse grasslands have become near monocultures of *T. caput-medusae* following invasion. In a complete randomized block field experiment I evaluated the effectiveness of timed mowing in late spring, which targets seed development, in reducing this species' abundance and the effects of the treatment on the rest of the community. The results showed an interaction between year and cover ($p = 0.030$) due to a decline in *T. caput-medusae* cover across all treatments between year 1 and year 2 but a 65.1% greater decline in mowed plots. Several non-target species increased in mowed plots and overall diversity was higher in mowed plots ($p = 0.030$). These results suggest that timed mowing may be used as a selective management tool for grasslands invaded by *T. caput-medusae* with implications for range land productivity and conservation of biodiversity

***110. Effects of arbuscular mycorrhizal fungi on productivity and soil nutrients of cultivar and non-cultivar warm-season prairie grasses**

Campbell, Ryan E and Baer, Sara G. Southern Illinois University-Carbondale, Carbondale, IL.

In tallgrass prairie, arbuscular mycorrhizal fungi (AMF) facilitate the dominance of warm-season (C4) grasses. Because of the extensive loss of tallgrass prairie, restoration of this ecosystem is increasingly common and sources of C4 grass seed can include local, remnant-collected ecotypes and commercially-available, USDA-registered cultivars. Cultivars of C4 grasses have been selected for traits such as increased germination, forage quality, and drought tolerance. A greenhouse experiment was conducted to quantify whether the presence of AMF interacts with population sources (cultivar vs. non-cultivar) of dominant C4 grasses to affect net primary productivity (NPP), root architecture, and soil nutrient availability (inorganic N and P). Cultivar and non-cultivar population sources of *Andropogon gerardii* and *Sorghastrum nutans* were grown in the presence or absence of AMF through the application of a fungicide. We hypothesized that cultivars would have greater NPP than non-cultivars and all population sources would benefit from the presence of AMF, but cultivars would be less dependent on AMF for growth. Cultivars of *A. gerardii* had greater aboveground NPP ($P < 0.001$), belowground NPP ($P = 0.029$), and fine root length ($P = 0.0605$), and less available inorganic N ($P = 0.0324$) in the soil than non-cultivars. Across both sources, *A. gerardii* grown with AMF showed higher ANPP ($P = 0.025$), greater fine root length ($P = 0.0624$), and less available soil $\text{NH}_4\text{-N}$ ($P < 0.001$) and $\text{NO}_3\text{-N}$ ($P < 0.001$) relative to plants without AMF. Cultivars of *S. nutans* had greater NPP ($P = 0.043$) and fine root surface area ($P = 0.01$) than non-cultivars, in the presence of AMF but were not different without AMF. Furthermore, when grown with AMF, both sources of *S. nutans* had greater fine root biomass ($P = 0.003$) and fine root length ($P = 0.002$) than without AMF. Results for both species supported our initial hypothesis that cultivars and AMF will have highest productivity. In contrast, both species grown with AMF showed greater fine root biomass and length, opposite expected results given that C4 grasses are obligate mycotrophs. Therefore, population source and AMF influence the productivity of dominant, warm-season grasses commonly used in restoration, but cultivars do not appear to be less dependent on this mutualism.

***111. Fire suppression effects on a coastal floating marsh ecosystem**

Makweche, Plaxedes T and Battaglia, Loretta L. Southern Illinois University-Carbondale, Carbondale, IL.

Mississippi Delta floating marshes are characterized by emergent vegetation rooted in buoyant mats of peat that rise and fall with changing water levels. Herbaceous species build and maintain the mat. These marshes which provide critical wildlife habitat and buffer coastal areas from storms, are being degraded by sea level rise and fire suppression that favors woody species spread. The study site floating marsh at Jean Lafitte National Historical Park and Preserve New Orleans, has not been burned since park establishment in 1974. Areas formerly dominated by herbaceous marsh species now have dense shrubs. We hypothesized that mats invaded by woody species support less aboveground and belowground biomass and less peat because of suppression of the mat-building graminoids. In Fall 2007, we sampled the aboveground biomass in 50 1m² plots stratified across herbaceous and shrub marshes. We also took a mat core (10 cm diameter x 48.5 cm length) next to each of the plots. The live aboveground material was separated from wrack, dried and weighed. Live roots and peat were separated, dried and weighed. Preliminary results indicate significantly lower aboveground biomass of herbaceous species in shrub thickets versus open marsh but no differences in root biomass or peat. Research should assess long-term

effects of shrub expansion and evaluate the potential of prescribed fire to counter floating marsh woody encroachment.

112. Response of natal grass (*Melinis repens*), an invasive species in Florida scrub vegetation, to supplemental additions of nitrogen and phosphorus

Anderson, Roger C¹ and Menges, Eric S². ¹Illinois State University, Normal, IL, ²Archbold Biological Station, Lake Placid, FL.

Natal grass invades Florida scrub vegetation, which harbors many state and federally listed species. Our study site has disturbed scrub vegetation occurring on highly leached, nutrient-poor, sandy soil. We tested natal grass response to addition of N, P, and both nutrients combined (NP) in pot cultures containing our study site soil. Total amount of nutrients added in a solution over 4 applications was 12 µg/g of P and 20 µg/g of N to the P and N treatments, respectively. The NP treatment received the combined amounts of N and P treatments. A complementary field study had two treatments: deionized water, NP, and control plants (no supplemental water or NP). Nutrients were applied as a solution and 10 µg/g of N and 6 µg/g P were added in three applications (20 March, 21 April, and 19 May). Plant growth rates were monitored using an index based on stem numbers and size. Pot culture study plants were harvested after 60 days. In the pot culture study, addition of single nutrients alone did not significantly enhance plant growth rates or biomass production over that of the water control. However, NP treatment plants had significantly faster growth rates and higher biomass production than single nutrient treatments or control plants. Field study plants receiving N and P had significantly faster growth rates than plants receiving no supplemental nutrients or water. Nitrogen and phosphorus are limiting nutrients on our study site and availability of both nutrients must be increased to affect growth of Natal grass.

***113. Effect of aspect on woody plant species composition and richness in an arid trans-Himalayan landscape, Nepal**

Paudel, Shishir¹ and Vetaas, Ole R². ¹Southern Illinois University-Carbondale, Carbondale, IL, ²UNIFOB - Global, University of Bergen, Bergen, Norway.

Plant species are expected to have similar responses to environmental factors at regional and local scales. Water-energy dynamics, that explain plant species richness at regional scales, may explain species richness at local scales influencing compositional trends. We predicted that slopes with different aspects would have contrasting water-energy dynamics and that this would drive compositional changes in the community. We examined how water-energy dynamics explain variation in structure and richness of plant species in a trans-Himalayan valley, Nepal. Presence/absence of woody species and potential explanatory variables were recorded for 72 plots on north and south facing slopes. Non-metric multidimensional scaling ordination indicated minimal compositional overlap between the north- and south-facing slopes. Plots from the south-facing slopes had more species in common and low β-diversity compared to the north. The north-facing slopes had greater species richness and β-diversity. Species composition was significantly correlated with radiation index, aspect and altitude. Topographic factors affect species composition and richness through their influence on local climate, moisture and resource availability. However, land-use reduces the differences in species composition between plots on south-facing slopes, enhancing the differences between the aspects. Interactions between land-use and aspect increase differences in species composition and β-diversity between the south- and north - exposed slopes in this trans-Himalayan region.

***114. Extant vegetation and soil seed bank community structure in a sand prairie in northwestern Illinois**

McNicoll, Molly B¹; Augspurger, Carol K¹ and Edwards, Adrienne L². ¹University of Illinois Urbana, IL, ²California State University Chico, Chico, CA.

Seed banks provide means for species to regenerate; however, many species do not form a persistent seed bank and some species in the seed bank do not appear in the extant vegetation. Consequently, in many ecosystems, including prairies, the species composition of the extant vegetation and the seed bank differs. Assessment of the community structure of the extant vegetation and seed bank and their similarity provides an inclusive view of overall community structure and potential for regeneration. This information is important in historically disturbed sites where the relative importance of native and introduced species may be altered. In this study of a historically grazed sand prairie in northwestern Illinois, extant vegetation composition and cover were surveyed from 30 permanent plots. Species composition and density of the germinable seed bank were assessed in a greenhouse study from 30 replicate 6 cm depth soil samples extracted from plots adjacent to vegetation plots. The similarity between the seed bank and vegetation was moderate (45%, Jaccard index), which confirms prior grassland studies. At the site level, native species richness (vegetation: 42; seed bank: 27) was greater than introduced species richness (3; 3). At the plot level, this same pattern was reflected in mean species richness and measures of vegetative cover (native / introduced [mean + SE]): (143.5 + 5.3 / 4.7 + 1.5) and seed bank density (25.3 + 2.7 / 0.3 + 0.1). Overall, this site shows low invasion by introduced species in the extant and dormant communities. This study contributes baseline data for future management at this site, including information on the role of vegetation and seed bank contributions to native and introduced community structure.

***115. Expression of inbreeding depression on the self-compatible invasive plant, garlic mustard (*Alliaria petiolata*)**

Mullarkey, Alicia A; Anderson, Roger C and Byers, Diane L. Illinois State University, Normal, IL.

We examined the relative quality of progeny produced by self- and cross-fertilization in the highly invasive biennial, *Alliaria petiolata* (garlic mustard). A controlled pollination experiment was applied to plants from Central Illinois populations of *A. petiolata* to produce self- and cross-fertilized seeds with two between population outcrosses and one within population outcross. Overall, seed and seedling traits were significantly affected by cross-type. No significant differences for seed or seedling traits between progeny from within-population crosses and self-fertilization were detected; however, there were significant differences among progeny from between-population outcrosses when compared to self-fertilized progeny and within population outcross progeny. Seed mass and cotyledon length were greater and leaves emerged earlier for seeds produced via between-population crosses. Within population outcrosses produced progeny of the same relative quality as those produced via selfing for both seed and seedling traits, indicating that there is probably high genetic structure within the Central Illinois population we examined. Introduced *A. petiolata* populations are frequently founded by relatively few individuals that are typically isolated from the source population. Our results indicate that *A. petiolata* populations may be subject to founder effects and/or genetic drift, which have resulted in increased genetic load within populations and the subsequent expression of inbreeding depression in early life cycle traits of this species.

116. On the importance of standardization by species in the exploratory analysis of community data

Minchin, Peter R. Southern Illinois University-Edwardsville, Edwardsville, IL.

In the exploratory analysis of community data, standardization should be an important consideration. Many researchers simply accept the defaults provided in software, which may not be optimal to achieve efficient summarization of large, complex multivariate data sets and elucidate community trends that are related to ecological factors. A survey of published articles over the past ten years reveals that most authors use either no prior standardization or standardize by sampling unit (SU). Previous research using simulated community data with known structure suggests that standardization by species increases the rank correlation between dissimilarity measures and ecological distance and improves the performance of ordination methods in recovering community patterns. Practitioners who have explicitly considered standardizing by species, usually decide not to do so, arguing that there is a risk of giving too much weight to low-abundance, infrequent, uninformative (LIU) species. Using vegetation data from a variety of ecosystem types, I demonstrate that failure to standardize leads to results being overwhelmingly dominated by those few species that attain high abundances, with the less abundant species being effectively ignored. I then use simulated community data with increasing proportions of LIU species to test the effects of standardization by species on ordination performance. The results clearly support the routine use of standardization by species maximum in community analysis. Even with data containing a majority of LIU species, this standardization results in a more powerful consensus among species, improving the recovery of community patterns.

117. Vegetation Changes in Illinois Forests 1997-2006

Carroll-Cunningham, Connie; Ellis, James and Spyreas, Greg. Illinois Natural History Survey, Champaign, IL.

The Critical Trends Assessment Program (CTAP) was initiated to monitor changes in forests, wetlands, and grasslands across Illinois. Beginning in 1997, permanent plots were established in randomly selected areas in each habitat; repeat visits beginning in 2002. Focusing on CTAP forests, plots have been established in 154 areas across Illinois, 129 of which have been revisited. 23 additional sites were established in high quality forests as reference. Stand ages on CTAP random forests average an estimated 40-80 years, with most experiencing logging and grazing in the past 20-50 years. CTAP reference forests show little human disturbance prior to and since protection as high quality natural areas; most averaging between 100-200 or more years of age. In general, little change occurred in CTAP random forests between the two monitoring visits. Most sites were dominated by native species. Invasive species were recorded in 87% initial visits, while 91% of second visits contained invasive species. More significant differences were found between the random and reference forests. Random forests averaged greater species richness and diversity, while reference forests averaged slightly more sensitive or rare species. Average basal area on reference forests was significantly greater than that of random forests. Reference forests show an encroachment of *Acer saccharum* that is not evident on CTAP random forests where oaks and hickories occur in various size classes.

118. Illinois¹ Threatened, Endangered & Extirpated Native Flora.

Murphy, Michael J C¹; Ebinger, John E² and Phillippe, Loy R. ¹Illinois Natural History Survey, Champaign, IL, ²Eastern Illinois University, Charleston, IL.

In 1981 the first comprehensive list of Illinois' threatened and endangered plant species was published, which included 364 state listed species (312 endangered and 52 threatened), representing approximately 16.8% of the native flora. Additionally, between 40 and 50 species (1.8 - 2.3% of the native flora) were already presumed extirpated and received no protective status. Currently, 338 species are state listed (263 endangered and 75 threatened) representing 15.6% of the native flora, including 7 federally threatened and one federally endangered taxa. Additionally, approximately 80 – 90 species (3.7 - 4.2% of the native flora) are now believed extirpated, with one of these, *Thismia americana* N. E. Pfeiffer (American Thismia), likely extinct. Over the past twenty-seven years, extensive landscape alterations have further dramatically changed the Illinois landscape. These alterations, combined with a greatly increased understanding of our historic and present-day native flora, have lead to several revisions in the original threatened and endangered species list. The current presentation will highlight changes that have occurred in the protective status of the rarest members of our native flora, as well as habitat parameters and geographical distributions, with special emphasis on taxa that are now believed extirpated.

119. Recovery and restoration of *Bouteloua gracilis* (Monocot: Poaceae) at the Savanna Army Depot

Nyboer, Randy W. Illinois Natural History Survey, Savanna, IL

Blue Grama (*Bouteloua gracilis*) is listed at State endangered in Illinois and the only known native population is found at the Savanna Army Depot. Henry Allan Gleason first found this grass in 1908 in the sand prairies here, ten years prior to the area becoming a military base. The mission of the U.S. Army at SAD is to manufacture, test and store munitions and other strategic resources. One of those strategic resources, manganese, was stockpiled in the prairie where the blue grama was rediscovered in 1995. Manganese concentrations ranged from 3740 mg/kg in the surface soil (0 to 0.5') to 8860 mg/kg in shallow subsurface soil (0.5 to 15') near the blue grama population. Manganese is a known growth inhibitor. The blue grama was rarely observed flowering and the plants were stunted. Techniques used to recover and restore this endangered grass will be discussed.

Division: Cell, Molecular and Developmental Biology

120. Microarray analysis of the polymorphic ciliate, *Tetrahymena vorax* (Ciliophora: Tetrahymenidae)

Subei, Obada; Hunt, Christin; Kosalka, Malgorzata; Martin, Ashley and Buhse Jr., Howard E, University of Illinois at Chicago, Chicago, Illinois and Werlin, Rebecca; Hamilton, Eileen and Orias, Eduardo, University of California at Santa Barbara, Santa Barbara, California.

The ciliate *Tetrahymena vorax* is a unicellular eukaryote that has the unusual ability to exist in two forms. In the microstomal form, *T. vorax* cells resemble those of other *Tetrahymena* species, but under defined conditions it differentiates into a large carnivorous cell, the macrostomal form, capable of ingesting smaller prey organisms. Stomatin, a substance produced

by potential prey, induces this transformation. Synchronous differentiation occurs within 6 hrs of stomatin treatment. The molecular events underpinning macrostomal differentiation occur between 135 and 195 min following stomatin treatment. To investigate which *T. vorax* genes are up- or down-regulated by stomatin treatment, RNA was extracted from a differentiating cell culture at 150 min post-stomatin treatment and also from untreated control microstome cells. cDNA was synthesized, labeled and hybridized to gene expression microarrays containing approximately 380,000 probes for nearly all the approximately 28,000 known or predicted genes in the genome sequence of the related species *T. thermophila*. We detected no genes that were highly induced by stomatin treatment, perhaps because the (unknown) average % sequence difference between the two species masks detection of the induction of the relevant genes. Unexpectedly, considering this evolutionary distance, many genes showed high levels of hybridization, regardless of stomatin treatment. We are investigating the basis of this interesting finding.

***121. Subcellular centrin localization within distinct compartments of *Vorticella convallaria*'s (Ciliophora: Vorticellidae) contractile organelles.**

Konior, Katarzyna; McCutcheon, Suzanne M and Buhse Jr., Howard E. University of Illinois at Chicago, Chicago, IL.

Vorticella convallaria, a stalked ciliated protozoan, displays a unique and rapid contractile behavior that differs from other eukaryotic motile systems. This contraction is due to the shortening of its contractile organelles in the cell body (myonemes) and the stalk (spasmoneme). The cell contracts in 2-4 msec to 20% of its original length by a calcium-triggered, ATP-independent mechanism due to the calcium-binding proteins, centrans and spasmin, associated with the contractile cytoskeleton. We have identified six centrans and one spasmin gene in *Vorticella*. Because we have identified a centrin multi-gene family in *Vorticella*, we hypothesize that each centrin/spasmin performs a different function within the cell. As a first step to test this hypothesis, we used antibodies to three different centrans and one anti-spasmin antibody to determine the subcellular localization of these proteins within the cell. At the light microscopy level, our data shows that each centrin/spasmin is localized to the contractile cytoskeleton. VcCen6 localizes to the cilia and the oral infundibulum. VcCen3 & 4 and VcSpasmin localize to the myonemes and the spasmoneme. However, at the ultrastructural level, using TEM immunolabeling, VcCen4 and VcSpasmin are further restricted in their localization to the suborganelle compartments (tubules and the fibrillar mass). VcSpasmin localizes almost exclusively to the fibrillar mass while VcCen4 localizes to both the tubules and the fibrillar mass. In the future, we are planning RNAi experiments to investigate the role of the centrin/spasmin genes in contraction.

122. The effect of calpain cleaved tau on filament formation and tubulin assembly *in vitro
Monsivais, Diana; Quayle, Laura and Abraha, Aida. Chicago State University, Chicago, IL.

Alzheimer's disease (AD) is partly characterized by the intracellular deposition of hyperphosphorylated and truncated tau filaments assembled into neurofibrillary tangles (NFTs). Under normal conditions, tau protein regulates and stabilizes microtubule assembly for proper axonal transport. Proteolytic cleavage of tau by calcium-activated cysteine proteases, calpain I and II, is implicated in the pathogenesis of AD. The activities of calpain I and II are up-regulated in AD brain and they also colocalize with NFTs. This study confirms that *in vitro* digestion of human recombinant tau protein with calpain II produces a 45kD tau fragment cleaved at Lysine 254, in addition to other fragments. Truncated tau proteins 1-254 and 255-441 were polymerized,

in vitro, using arachidonic acid, monitored for 5 hours using laser light scattering (LLS) and filament morphology was assessed by transmission electron microscopy (TEM). Kinetic analysis demonstrates that tau 255-441 polymerizes to a greater extent than both HT40 (longest tau isoform 441 residues) and tau protein 1-254. Conversely, LLS reveals that tau 1-254 polymerizes to a lesser degree than HT40. A turbidity assay (350 nm), shows increased turbidity of HT40-tubulin over tubulin alone. TEM results reveal that tubulin assembles into microtubules only in the presence of HT40. The increased extent of polymerization displayed by calpain-cleaved tau fragment 255-441 suggests that calpain II is involved in the pathogenic arrangement of tau proteins observed in NFTs.

Division: Chemistry

***123. Effects of threonine on the morphology of noble metal colloids**

Korte, Kylee E; Hanerhoff, Brittney and Campbell, Dean J. Bradley University, Peoria, IL.

The objectives of these experiments were to use the amino acid threonine to reduce tetrachloroaurate(III) ions and silver(I) ions in aqueous solutions to produce colloidal gold and silver particles. The physical morphologies of the particles (assessed by scanning electron microscopy) and their plasmon characteristics (assessed by their visible light absorption) appear to be affected by such factors as threonine concentration, metal precursor concentration, pH, time, temperature, and the presence or absence of light. Of particular interest are gold particles that have relatively sharp features, such as those having a “multipod” morphology.

***124. Characterization of the yeast *Pichia pastoris* (Saccharomycetaceae) vac8 protein association with the vacuolar membrane**

Boehmer, Brian T; Hoeflerlin, Katie and Fry, Michelle R. Bradley University, Peoria, IL.

PpVac8p, an armadillo repeat protein that contains putative fatty acylation consensus sites at the N-terminus, has been shown to be critical for vacuolar inheritance, protein trafficking in the cytoplasm-to-vacuole pathway, and autophagy in the yeast *Pichia pastoris*. We generated mutated forms of PpVac8p that lacked one or both fatty acylation consensus sites and demonstrated that they exhibited loss of function in microautophagy. Here we compare the location and membrane interactions of wild-type and N-terminal modified forms of PpVac8p using subcellular fractionation and Western blot analysis. These studies demonstrate that wild type Vac8p cosediments largely with 13,000 x g pellet which includes the vacuole, while forms of Vac8p lacking one or both fatty acylation consensus sites localized in both the 13,000 x g pellet and 13,000 x g supernatant. Secondly, we used differential extraction to determine the type of interactions displayed between PpVac8p and the vacuolar membrane. The PpVac8p is partially released from the vacuolar membrane by sodium carbonate, but is highly resistant to removal by NaCl and urea. Surprisingly, PpVac8p remained associated with the 13,000 x g pellet upon treatment with 1% Triton X 100 but seems to either form detergent-resistant aggregated structures of higher molecular mass or is structurally altered in the presence of Triton X 100 to retard mobility on electrophoresis.

***125. Development of a Green Chemistry Protocol for Oxidative Cleavage of Alkenes**

Johnson, Jeffery D. and Vinod, Thottumkara K. Western Illinois University, Macomb, IL

Oxidative cleavage of alkenes is one of the most important reactions in organic chemistry and this transformation can be operationally achieved via two different pathways. In one route, the alkene is initially converted into a 1,2-diol using a transition metal based reagent and the 1,2-diol obtained is subsequently cleaved resulting in the net cleavage of the alkene. This particular route suffers from the fact that one of the commonly used reagent for the formation of 1,2-diol is osmium tetroxide, an expensive reagent which is also highly toxic. The second route and one that is more commonly carried out is ozonolysis. Generation and handling of ozone is not a particularly attractive option for many synthetic chemists. As important as ozonolysis has proved to be in synthetic organic chemistry there are relatively few alternate reactions that duplicate the same transformation. In this talk we will highlight some of our preliminary results that show a cleaner route that employs an *in-situ* generated hypervalent iodine reagent from iodobenzene and Oxone® to accomplish the oxidative cleavage of alkenes. Our preliminary results also show that the new method has the potential for controlling the overall reaction to be stopped at the 1,2-diol stage, or the dialdehyde stage or at the diacid stage depending on the molar ratios of iodobenzene and Oxone® employed.

***126. Design and development of a pedagogically significant undergraduate experiment**

Reed, Jill and Vinod, Thottumkara K. Western Illinois University, Macomb, IL

Oxidative cleavage of alkenes is one of the most important reactions in organic chemistry and the transformation can be operationally achieved via two different pathways. In the first route, the alkene is initially converted into a 1,2-diol using either osmium tetroxide or potassium permanganate and the diol obtained is subsequently cleaved with periodic acid. This particular route suffers from the use of osmium tetroxide, an expensive and toxic reagent and the harsh reaction conditions occurring with the periodic acid treatment in the second step. The second route and one that is more commonly carried out is the ozonolysis. Generation and handling of ozone is not an attractive option for many synthetic chemists. Considering the toxicity of reagents and the inconvenience of the procedures involved, this important experiment is not a conducive one to be used for instructional purpose in an undergraduate laboratory. We have recently established that an equimolar mixture of iodobenzene and Oxone in aqueous acetonitrile generates an active hypervalent iodine species capable of oxidatively cleaving alkenes. This conveniently carried out procedure has been standardized for the cleavage of trans-anethole to give p-anisaldehyde in excellent yield in 1.5 hrs. Pedagogical benefits of this experiment such as instruction of reaction chemistry in laboratory, product isolation through extraction, analysis of product(s) by GCMS, IR and NMR spectroscopy will also be discussed.

***127. Synthesis of tri-(4-pyridyl)-s-triazine and its use as a ligand**

Flint, Edward B. and Morrison, Paul J. Bradley University, Peoria, IL.

The triangular, tri-coordinating ligand tri-(4-pyridyl)-s-triazine has been synthesized (by the method of Anderson et.al.) by refluxing 4-cyanopyridine in decalin with 18-crown-6 under argon. The X-Ray powder pattern of the as synthesized material does not match the predicted powder pattern from the Cambridge Structural Database, indicating that it adopts a different crystal structure. Reactions of this ligand in a 50/50 mixture of 1, 1, 2, 2-tetrachloroethane/methanol with various metal acetylacetonate complexes ($\text{Cu}(\text{acac})_2(\text{H}_2\text{O})_2$, $\text{Ni}(\text{acac})_2(\text{H}_2\text{O})_2$, and $\text{Co}(\text{acac})_2(\text{H}_2\text{O})_2$) results in color changes in the solutions and the precipitation of solid products. The physical and chemical properties of these products will be discussed.

***128. Optimization of the reaction conditions for the synthesis of 5-aryl-3-oxo- δ -lactones**
Nguyen, Elizabeth; Gereg, Jessica and Andersh, Brad. Bradley University, Peoria, IL.

5-Aryl-3-oxo- δ -lactones exhibit a wide variety of biological activities including antioxidant, antifungal, antiviral, and antinociceptive properties. Our method for synthesizing these biologically significant compounds is quite simple. The first step of the procedure is a potassium carbonate promoted condensation reaction between a substituted benzaldehyde and an acetoacetate ester in absolute ethanol or methanol. The second step of the procedure involves adding dilute HCl (*aq*). The objectives of my research were to determine whether the δ -lactone ring forms before or after HCl (*aq*) work up and to gain an understanding of the mechanism in order to optimize the reaction conditions for preparing these compounds. Results for the NMR mechanistic study indicates that the addition product does not cyclize until after the reaction mixture is acidified. Although attempts to isolate the initially formed aldol addition product have proven unsuccessful, it has led us to a new procedure which eliminates the need to do flash chromatography or crystallization to purify the 5-aryl-3-oxo- δ -lactones.

***129. Utilization of 5-aryl-3-oxo- δ -lactones as cyclooxygenase inhibitors**
Deweese, Kara; Hollandsworth, Lauren and Andersh, Brad. Bradley University, Peoria, IL.

Recently we discovered a new method for preparing 5-aryl-3-oxo- δ -lactones. This development is significant because it provides a simple method for preparing the fundamental ring system (3-oxo- δ -lactone) for a class of compounds that have a wide variety of biological activities. For example, 5-aryl-3-oxo- δ -lactones have been shown to have antioxidant activity, and they have been converted into antiviral agents. In addition, Eifler-Lima has reported that 3-oxo-5-phenyl- δ -lactone and 3-oxo-5-(4-fluorophenyl)- δ -lactone have antinociceptive (pain relieving) activity in mice. We have shown that these compounds inhibit cyclooxygenase enzymes, which may explain why these compounds exhibit antinociceptive activity.

Division: Environmental Science

***130. Spatial characterization of methylmercury in the Piasa Creek watershed**
Vermillion, Brian¹, Huff, Daniel² and Hudson, Robert¹. ¹University of Illinois at Urbana-Champaign, Urbana, Illinois; ²Southern Illinois University Edwardsville, Edwardsville, Illinois.

Methylmercury (MeHg) is the form of mercury that most readily bioaccumulates in organisms and biomagnifies in aquatic food webs. The purpose of this study is to characterize the spatial distribution of MeHg within Piasa Creek and its tributaries. Since June 2007 surface water samples have been collected monthly from 12 sites for MeHg analysis, and last summer several aquatic organisms – *Orconectes* sp. (Decapoda: Cambaridae, Crayfish), *Progomphus obscurus* (Odonata: Gomphidae, Dragonfly), *Etheostoma spectabile* (Percidae, orangethroat darter), and *Notropis stamineus* (Cyprinidae: sand shiner) – were also collected for analysis. MeHg analysis was performed using a new method developed at the University of Illinois: Hg/thiourea complex ion chromatography with on-line cold vapor atomic fluorescence spectrometry. Dissolved [MeHg] range from 0.019 - 0.611 ng L⁻¹ and are strongly correlated with DOC (R² = 0.804), while samples collected from the northern part of the watershed typically contain the greatest dissolved [MeHg] over time (> 0.2 ng L⁻¹). Crayfish, dragonfly nymphs, darters, and shiners consisted of 0.027 (n = 33), 0.016 (n = 17), 0.082 (n = 33), 0.122 (n = 27) ug g⁻¹ MeHg

respectively. Surprisingly, neither organism length nor time averaged surface water MeHg content appear to be good predictors of MeHg found within these species. However, by incorporating these data into the national descriptive statistical model of mercury in fish (NDMMF) developed by the USGS we can predict the MeHg content of non-sampled species that reside within Piasa Creek.

***131. Phenotypic variability in orange-spotted sunfish (*Lepomis humilis*) (Centrarchidae)**

Bland, Thomas J, University of Illinois, Champaign, Illinois, and Retzer, Mike E, Illinois Natural History Survey, Champaign, Illinois.

Within-species morphological variations in fishes are common when different members of that species occupy different niches. This has been documented in bluegill sunfish, pumpkinseed sunfish, and more recently, orange-spotted sunfish. Genetics plays some part in creating those differences, but phenotypic plasticity appears to play a larger part. In *Lepomis*, variations typically fall into a benthic and a pelagic phenotype. The benthic form is typically deeper bodied, and has a larger mouth than the pelagic form. Similar morphological changes in orange-spotted sunfish have been induced in a laboratory environment simply through changes in diet. It is unknown, however, if these two distinct phenotypes will be expressed in wild environments. Therefore I set out to determine if they are expressed, and if they are, what implications the differences could have in the life history and survivability in a lake environment. This will be accomplished by measuring both preserved and wild-caught specimens, and a series of stocking enclosures.

***132. Evaluating storm water runoff from green roof blocks with six different growth mediums**

Gaffney, Debbie¹; Morgan, S¹; Jost, Vic²; Luckett, Kelly³ and Retzlaff, Bill¹. ¹Southern Illinois University at Edwardsville, Edwardsville, IL; ²Jost Greenhouses, Des Peres, Missouri; ³Green Roof Blocks, Hazelwood, MO.

There is growing concern for the loss of green space due to increased urbanization. The result is a landscape of impervious surfaces, which increases storm water runoff as much as 90%. This poses a major problem for municipalities, especially due to the high degree of fluctuation in runoff volumes and increased risk of localized flooding. Increasingly, municipalities, urban planners and construction companies are looking to green roofs in response to Phase II Final Rule of the National Pollutant Discharge Elimination System (NPDES) Storm Water Program, which heightens the permit requirements for all storm water discharged. Current research shows that installing green roofs significantly decreases storm water runoff an average of 75% and once retained, slows the release of excess water over longer periods of time, thereby reducing the risk of localized flooding. Additionally, the installation of a green roof reclaims lost green space, since roofs account for 40-50% of impervious surfaces in urban areas. My study determines which of six green roof growth mediums retain the greatest volume of storm water in a completely randomized design of thirty Green Roof Blocks, with three planted and two unplanted per medium. After 16 months of study, results verify that all green roof growth media retain significantly more storm water than a control roof (~ 47% retained by green roofs with various growth media compared to 14% retention on the control roof).

***133. Evaluating green paks green roof systems**

Lucas, Ray¹; Jost, Vic²; Lockett, Kelly³; Curry, Mike⁴; Kohler, Grace⁵ and Retzlaff, Bill¹.

¹Southern Illinois University at Edwardsville, Edwardsville, Illinois; ²Jost Greenhouses, Des Peres, Missouri; ³Green Roof Blocks, Hazelwood, Missouri; ⁴Midwest Trading Horticultural Supplies, Maple Park, IL; ⁵Midwest Groundcovers, St. Charles, IL

My study evaluates whether the Green Paks green roof module will be a viable green roof system. I evaluated Green Paks containing a combination of four growing mediums (Arkalyte, Hadite, Midwest Mix and Lava), five *Sedum* species (*S. album*, *S. kamtchaticum*, *S. sexangulare*, *S. spurium*, and *S. lidakense*), and two planting densities – either 5 or 6 plants per Green Pak. Green Paks were arranged in a completely randomized design with three replications on the roof of the Engineering Building at Southern Illinois University Edwardsville. I have measured plant growth, plant performance, and roof coverage at monthly intervals since May 28, 2006. The initial goal for a newly established green roof is to attain good plant growth and 100% survival. During the 2007 growing season (May – November), roof coverage and growth of *S. spurium* in the Green Paks exceeded that of the other species and *S. lidakense* had significant mortality. Green Paks containing the Midwest Mix growth media have the best plant roof coverage. Planting density of six plants was the better of the two planting densities. Green Paks are a viable modular green roof system.

***134. Conservation toxicology: DNA damage and oxidative stress in endangered gopher tortoises, *Gopherus polyphemus*, on a military base**

Theodorakis, Christopher W¹ and Adams, S. Marshall². ¹Southern Illinois University Edwardsville, Edwardsville, IL; ²Oak Ridge National Laboratory, Oak Ridge, TN.

The land resources of the Department of Defense (DoD) are essential for military training and testing activities and for providing important habitat for more than 300 federally protected plant and animal species. Unfortunately, the effects of military pollutants on these species are unknown. Thus, this study will examine genotoxic and oxidative stress responses in gopher tortoises (*Gopherus polyphemus*) on Camp Shelby, a US Army training installation. These tortoises are exposed to chemicals from unexploded ordinance. Blood was collected from these tortoises to examine levels of glutathione, lipid peroxidation, and DNA damage at various sites throughout the base. Glutathione and lipid peroxidation was determined by fluorometric assays, while DNA damage was determined using flow cytometry and the comet assay. It was found that oxidative stress responses were generally higher at sites with higher levels of military activity. However, one site with low military activity showed high levels of DNA damage and oxidative stress responses, which may be related to habitat or other chemical contamination.

135. Uptake and speciation of Selenium in different chemical forms by pearl oyster mushroom, *Pleurotus ostreatus

Meyer, David; Anakor, Izu and Lin, Z.-Q., Southern Illinois University-Edwardsville, Edwardsville, IL.

Selenium (Se) contamination from agricultural drainage is one of the major environmental problems in the western United States. Phytoremediation of Se-polluted agricultural soil can be environmentally sustainable and cost-effective. However, the management or disposal of Se-laden plant materials produced from phytoremediation is challenging. Fungi as decomposers in biogeochemical cycling can utilize plant materials as an energy source, in which Se in the phytoremediation plant materials could be accumulated by fungi. Growing edible mushroom in

Se-laden plant materials provides a valuable source of Se supplement for humans. Hence, we selected Pearl oyster (*Pleurotus ostreatus*) in this study to determine the levels of bioaccumulation of Se from different chemical forms by the fungal species. The growth substrates were treated with Se in Na₂SeO₄ (selenate, VI), Na₂SeO₃ (selenite, IV), or C₅H₁₁NO₂Se (selenide, -II) at the concentration of 3 mg/kg. Preliminary results showed that the Se accumulation in oyster mushroom tissues was significantly affected by the chemical form, following the order of selenate>selenite>selenide. Speciation analysis determines the extent of chemical transformation of Se in the growth media and in mushroom tissues.

***136. Evaluation of storm water runoff from green roof systems**

Woods, Emily¹; Jost, Vic²; Luckett, Kelly³; Morgan, S¹ and Retzlaff, Bill¹. ¹Southern Illinois University at Edwardsville, Edwardsville, IL; ²Jost Greenhouses, Des Peres, MO, ³Green Roof Blocks, Hazelwood, MO.

In both urban and suburban locales, storm water runoff is a major environmental issue. Previous research has suggested that green roofs play an important role in vastly decreasing the quantity of storm water runoff released. My research further evaluates which planting medium depth will provide the greatest storm water retention after a plant species is considered established. Located at the SIUE Environmental Science Field Site in Edwardsville, Illinois, there are thirty-two green roof models and four Green Roof Blocks™, each with a covered gutter connected to a water collection container. In a completely randomized design, the green roof models include four replicates of each planting medium depth (5 cm, 10 cm, 15 cm, and 20 cm) and four control roofs (black EPDM membrane only). After each rainfall event, the storm water collected in each container was weighed to determine the volume of storm water passing through each green roof system. In this study period, April 1, 2007 to November 13, 2007, results indicate, in comparison to the control roofs, the planted green roof models retain more storm water. The 15 cm planted green roof systems retained the greatest percentage of storm water runoff (86.8%). Planted green roof systems retain more storm water than the not planted (growing medium only) green roof systems. Green Roof Blocks™ retained more storm water (64.1%) than the control roofs (17.1%), but less than the planted 10 cm green roof models (84.2%). It is apparent that green roof systems may function effectively in this geographic region to reduce the quanti

***137. Geographic distribution of lead and lead isotopes in southwestern Illinois soils and lake sediment suggests sources of contamination**

Brugam, Richard B; Lin, Zhi-Qing; Williams, Phillip D and Richter, Lane. Southern Illinois University Edwardsville, Edwardsville, IL.

Potential contamination of local environments is an important problem in Southwestern Illinois because this highly urbanized area was the site of several lead smelters and other industries. We conducted a survey of lead in soils along bike trails and in lake sediments in the area using a combination of lead concentrations and isotopic composition to map contamination and to reconstruct sources. Bike trails were used as sample sites because they radiate in a down-wind direction from the major smelter in the region. Concentrations of soil samples were analyzed using ICP and isotopic composition was determined using mass spectroscopy. We found that the sites with highest soil lead concentration also had lead isotopic compositions similar to ores from SE Missouri mines. Low concentration sites have an isotopic composition indicative of local loess soils. Our work suggests that lead in the most contaminated sites come from local smelters which used SE Missouri ores.

138. Trajectories in floristic quality indicators over time in compensatory mitigation wetlands

Matthews, Jeffrey W, Illinois Natural History Survey, Champaign, IL and Endress, Anton G, University of Illinois Urbana-Champaign, IL.

Federal policies mandate restoration of wetlands to compensate for wetlands damaged during development. Losses of natural wetlands are permitted with the assumption that replacement is attainable over a short time frame. Ecosystem attributes are assumed to increase monotonically over time, eventually reaching an asymptote representative of a reference ecosystem. We evaluated the validity of this assumption by tracking changes in indicators of floristic integrity over several years in 29 mitigation wetlands. Each indicator, in each wetland, in each year was expressed as a percentile relative to the distribution of that indicator among > 50 reference wetlands. Nonlinear regression was used to fit two alternative restoration trajectories to the observed data: an asymptotic increase in the indicator over time, and a peaked relationship. Depending on the particular indicator, 58% to 75% of sites displayed trends that were at least moderately well described ($R^2 > 0.5$) by one of the two models. Native species richness and Floristic Quality Index rapidly increased to asymptotes that exceeded levels in a majority of reference wetlands. Carex species richness, mean coefficient of conservatism, and proportion perennials increased over time in most restored sites, but often very slowly. Percent native species often increased initially, but then eventually declined. Thus, some indicators of restoration progress followed expected trajectories and achieved levels equivalent to high integrity reference sites within a short time frame, whereas others took much longer than the five

***139. Evaluation of the thermal benefits of green roof systems**

Sidwell, Abby¹; Luckett, Kelly²; Morgan, S¹; Yan, Terry¹; Noble, Brad¹ and Retzlaff, Bill¹.
¹Southern Illinois University at Edwardsville, Edwardsville, IL; ²Green Roof Blocks, Hazelwood, MO.

Green roofs shade and protect the roofing system while reducing the roof membrane's UV exposure and diminish extreme temperature fluctuations through the roofing system (U.S. Department of Energy, 2004). I have evaluated the thermal benefits of green roof systems in order to determine the *Sedum* species, growing medium, and fertilizer that provide optimum thermal benefits. On the Engineering Building roof on the campus of SIUE, the surface temperature and the temperature beneath the growing medium of Green Roof Blocks™ have been evaluated since November 2007. During warm periods, the growth media Hadite provides the least thermal benefits. Of the *Sedum* species I evaluated, ***Sedum kamchaticum*** provides the best thermal benefits.

Division: Health Science

***140. First and second generation glycopeptide antibiotics effects on murine immune responses**

Bone, Robert; Ousley, Omara D; Anderson, Sharitha E; Lesko, Jennifer L; Khazaeli, Sadegh and Kitz, Dennis J. Southern Illinois University at Edwardsville, Edwardsville, IL.

Vancomycin Eli Lilly is a tricyclic glycopeptide antibiotic that expresses bactericidal activity thru inhibition of cell wall biosynthesis, disruption of cell membrane permeability and blockage

of RNA synthesis. Vancomycin is primarily used to treat resistant *Staphylococcus aureus* and to treat intestinal overgrowth of *Clostridium difficile* leading to pseudomembranous enterocolitis. Dalbavancin Vicuron (now) Pfizer is a lipoglycopeptide derivative of the glycopeptide molecule and already approved for treating hospital-acquired infections in patients with skin and soft tissue infections including vancomycin-resistance. Vancomycin has little effect on phagocytic cells, only slightly enhancing cidal activity for yeasts by neutrophils. Both drugs enhanced the DTH response to DNFB Sigma. By April we will have done organ clearance assays, and we hope to obtain the third commercially available glycopeptide molecule, teicoplanin Moscan, and begin to determine its effects on immune response. These three drugs have become part of the last defenses against drug-resistant *S. aureus* and the enterococci, and perhaps this immune enhancement may contribute to their successful antimicrobial activity. This work was supported in part by the NSF-funded LS-AMP Research Scholar's Program.

***141. TRPM8R-agonist mediated hypoxic-ischemic neuroprotection**

Munoz, Mark L¹; Penick, Esther¹; Dybas, Linda¹ and Barks, John². ¹Knox College, Galesburg, IL; ²University of Michigan, Ann Arbor, MI.

Therapeutic hypothermia remains an important treatment modality in hospital-based ischemic stroke interventions. The mechanism by which hypothermic therapy functions is not fully understood, but involves reduction of metabolic and cytotoxic events in the ischemic cascade. TRPM8, the recently described cold-menthol receptor (CMR1), is critical to thermosensitive cold transduction in sensory nerve afferents. In the present study, postnatal day 7 (P7) rats underwent hypoxic-ischemic (HI) insult via unilateral right carotid ligation followed by 1.5 hours of exposure to 8% oxygen. Prior to hypoxia, animals received saline (0.9%) or menthol (200mg/kg) injections. Outcomes were determined on P12 by behavioral and histological assessments. Despite causing a moderate increase in core body temperature, menthol treatment significantly improved morphological outcomes post-HI. These findings suggest a mechanistic role for the TRPM8 thermosensory pathway in hypothermic therapy, and moderate neuroprotective properties of menthol.

***142. Creation of high surface area orthopedic surgical bone clamp for the proximal tibia**

Snell, Christopher M¹; Potaczek, Steven² and Thorn, Judith M¹. ¹Knox College, Galesburg, IL; ²Galesburg Clinic, Galesburg, IL.

Due to their lack of surface area, current instruments used to assist orthopedic surgeons in removing the proximal head of the tibia during total knee replacement surgery often cause bone breakage which requires the bone to be removed in multiple pieces, increasing removal time and the possibility of complications. Our new design corrected this problem in 4 ways. 1) Increased the surface area in the jaws of the instrument eliminated bone breakage and slippage during removal of the bone in preparation for the implant. 2) A serrated split created in the top jaw provided clearance for the medial and lateral tibial spines and prevented slippage while providing surface area to clamp both tibial plateaus. 3) A thinner and serrated bottom jaw allowed it to be slid beneath the cut proximal tibia and securely grip its surface. 4) For added control, our new design incorporates a gripping loop that allows two fingers to pass through along with single loop for the thumb. In addition to the superior control, the design of the actual tool and the clamping mechanism allows the instrument to be securely clamped over a wide range of bone thicknesses while maintaining a single hand operation. As a result, our changes in the design provide our instrument with the clamping ability of a common surgical clamp with increased surface area that allows added force to be applied while maintaining the structural

integrity of the bone to allow it to be removed in one piece. Our instrument is currently in clinical trial.

Division: Science, Mathematics & Technology Education

***143. Here's how you prove stuff: an approach to introducing high school students to mathematical proof techniques using basic computability theory**

Cummins, Desmond. University of Illinois Urbana-Champaign, Urbana, IL.

This paper will seek to address the difficulty of familiarizing high school students with the idea of mathematical proof. The traditional high school mathematics curriculum (through no fault of its own) is not a friendly environment for the young would-be abstract reasoner. Most of the proofs of the results therein either have an overly mechanical flavor (such as those of basic Euclidean geometry), or tend to inspire a “How on earth was I supposed to think of that?” reaction from students (such as the proof of the Pythagorean Theorem). Computability theory offers a refreshing escape from this unpleasantness. In this paper we will present some of the basic definitions and results of the subject. We will go on to demonstrate the ways in which it is an accessible and friendly mathematical training ground for high school students to practice rigorous and creative mathematical thinking.

***144. A content analysis of research methodology experience found in biology course descriptions of St. Louis area community colleges and universities**

Miller, Katherine M and AbuSharbain, Elaine M. Southern IL University Edwardsville, Edwardsville, IL.

The intent of this research was to examine differences in the scientific experience incorporated into introductory biology courses at the community college as compared to university courses at the same level. Community college instructors have limited backgrounds in biological research and these positions rarely require research. Students from community colleges may not receive the same experience in regard to research methodology as students who are taught at the university by faculty who are involved in research and have extensive backgrounds in research. A content analysis was completed on course descriptions from selected institutions in the St. Louis area. Introductory biology course descriptions from undergraduate catalogs of eleven universities and twenty-two community colleges were examined for terminology indicative of biological research or methodology. Identified terms were assigned numerical values correlated to the depth of experience in biological research. Results indicate three significant differences between the university level and community college level courses. Attention to this specific kind of experience may help to enhance the abilities of students who intend to transfer to a 4-year program at a university.

***145. Demonstrating how abiotic factors influence the distribution of animals**

Richardson, Matthew L. University of Illinois at Urbana -Champaign, Urbana, IL.

Students in ecology classes should know the definitions of abiotic and biotic and be able to identify and classify factors that may affect populations or communities of animals. While students normally understand that living organisms may help or harm one another, they often do not understand how organisms interact with their abiotic environment. I introduced about 60

seventh grade students to biotic and abiotic factors and they undertook experiments to learn how abiotic factors could influence the distribution of animals. I first engaged students in a discussion about biotic and abiotic factors, using aquatic invertebrates as a model system. Students then established gradients of abiotic factors, such as temperature, light, pH, gravity, and salt, in aquariums. Brine shrimp were added to these aquariums and left undisturbed for 30 minutes. The aquariums were then divided into five equal sections, isolating shrimp to prevent further movement across sections, and revealing their dispersion patterns. Students counted the number of shrimp in each section and reported the data to the class. We then interpreted the data and discussed the preferred habitat of the shrimp. The lesson was an effective educational experience for students: a post-activity quiz showed that students learned key ecological concepts.

***146. Molecular Visualization in High School Biology: "My Favorite Protein"**

Denos, Sharlene M¹, Kirkpatrick, Matthew²; Barker, Shelley³. ¹University of Illinois at Urbana - Champaign, Urbana, IL; ²Neuqua Valley High School, Naperville, Illinois; ³Danville High School, Danville, Illinois.

Though computer generated molecular visualizations have long been an integral part of introductory chemistry courses, their use in introductory biology courses has been limited, especially at the high school level. To address this issue, we have developed and implemented a 3-day molecular visualization lesson which employs the software "Visual Molecular Dynamics" to explore the relationship between function and three dimensional structure for a protein of the student's choice. This lesson has been implemented in 25 classrooms, over two years, at two schools with disparate demographics in Illinois. Students and teachers in this study had no prior experience with molecular visualization software. Assessments performed using students' written reports, surveys, physical protein models, presentations and video recordings of the classroom, reveal that students have little difficulty navigating the software, but struggle to make sense of the vast amount of information contained in the protein structure. Their ability to use the software to simplify structures and bring out relevant details increased dramatically with the level of the course, the school, and the overall performance of the student in the course. Though there was an increased level of engagement observed across all levels, only advanced students improved their depth and retention of molecular-level knowledge compared to similar students who were not exposed to computer-based molecular visualizations.

Division: Zoology

147. Geography of periodical cicadas in DuPage County, Illinois

Strang, Carl A and Velat, Tom C. Forest Preserve District of DuPage County, Wheaton, IL.

This study used maps prepared with G.I.S. to examine the distribution of periodical cicadas in DuPage County, Illinois, during the 2007 emergence. Only scattered memories and limited records had been kept in previous emergences. Two species of 17-year cicadas were found in 2007. Their distribution was limited relative to the county's available habitat. Results suggest that the cicadas have been expanding slowly from forest refuges in the Des Plaines River-Salt Creek area, following the riparian forests and also two major railways. The county's early suburban commuter communities grew up along those railways, with attendant planting of trees around homes, extending the forest habitat into what had been mainly prairie, then agricultural land. A surprising result was a significant dispersal of cicadas around June 9-11, which brought numbers of the insects into areas where few to none had emerged. This dispersal was mainly of

the more abundant, smaller species, *Magicicada cassini*, which had filled the zones of concentrated emergence out to their edges. The larger species, *M. septendecim*, generally remained at least 100 m behind those edges.

148. Geographic variation of *Parauchenoglanis ngamensis* (Boulenger 1991), (Pisces; Claroteidae; Auchenoglaninae), an African catfish.

Retzer, Mike. Illinois Natural History Survey, Champaign, IL.

Parauchenoglanis ngamensis, is a poorly studied auchenoglanid catfish distributed in the Kasai (Congo) and upper Zambesi-Okavango basins in southern Africa. The Kasai Basin population can be distinguished from the upper Zambesi-Okavango basins population by a less robust humeral process of the cleithrum, longer external mandibular barbel, and reduced pigmentation on the body and fins. A population at lac Calundo in Angola appears to represent a cline within the species or a hybrid zone between two forms in the Kasai and upper Zambesi-Okavango basins.

***149. Mate discrimination as a form of reproductive isolation in the topminnows *Fundulus notatus* and *F. olivaceus* (Fundulidae)**

Schoeneck, Brian D and Duvernell, David D. Southern Illinois University at Edwardsville, Edwardsville, IL.

Behavioral reproductive isolation can be an important barrier to genetic exchange between closely related species, and is a predicted outcome of sympatry when hybrids are less fit than parental genotypes. *Fundulus notatus* and *F. olivaceus* are two closely related species of topminnows that encounter one another in nature at locations where their respective preferred habitats intersect. Genetic studies of contact zones have demonstrated that hybrid individuals are present but rare. In a series of four experiments the mate-choice preferences of males and females of these two species were quantified by providing suitable mates of each species of the opposite sex. Eggs were collected and genotyped and the proportion of hybrid offspring was quantified. Male and female *F. olivaceus* individuals selected conspecific mates approximately 80% of the time while male and female *F. notatus* individuals were even more selective, preferring conspecific mates more than 96% of the time. Mate preference was tested against a null hypothesis of random mating and revealed that mate preferences of both males and females were highly significant for both species. The mate discrimination exhibited between these two species in sympatry is evidence of pre-zygotic barriers.

150. Hybridization between silver (*Hypophthalmichthys molitrix*) and bighead carp (*H. nobilis*) in the Mississippi and Illinois rivers

Lamer, James T¹; Dolan, Chad R²; Peterson, Jessica L³; Chick, John, H⁴ and Epifanio, John, M⁴.
¹Western Illinois University, Macomb, IL, ²Iowa Department of Natural Resources, Brighton, IA, ³University of California - Davis, Davis, CA, ⁴Illinois Natural History Survey, Champaign, IL.

Bighead and silver carp can be differentiated from one another by a number of distinct morphological characteristics. Fish sharing morphological characteristics of both bighead and silver carp have been captured in Swan Lake, a contiguous backwater lake located on river mile 5-12 along the Illinois River in Calhoun County, Illinois as well as 3 locations on pool 26 of the Mississippi River. A small biopsy of muscle, liver and eye were collected from these morphological intergrades and compared to field-identified bighead and silver carp at several

enzymatic loci via starch gel allozyme electrophoresis. In addition to the morphological variants showing a high degree of genetic hybridization, some of the fish identified in the field as true bigheads and silvers also displayed hybrid genotypes, with few fish exhibiting pure bighead or silver genotypes. These data suggest a potential for a hybrid swarm between these two species. Replacement of pure bighead and silver carp by some degree of bighead X silver hybrid is a plausible concern. Additionally, the mtDNA marker COII was used to detect gender bias in hybrid contribution which revealed that 80% of the hybridization was due to silver carp females. The impacts of this hybrid condition, both ecologically and taxonomically, warrants further attention. Additional collections and analyses of fish from alternate sites along the Mississippi and Illinois Rivers is being conducted.

151. Limb differentiation in the American alligator, *Alligator mississippiensis*

Livingston, Victoria J and Bonnan, Matthew F. Western Illinois University, Macomb, IL.

The evolution of bipedalism in dinosaurs may have resulted from differential allometry of the forelimb and hindlimb. Was this something unique to dinosaurs or was it a relict of their archosaur ancestors? To test the relict hypothesis, limb elements were measured throughout ontogeny in embryonic to adult American alligators (*Alligator mississippiensis*), a primitive outgroup to dinosaurs. We predicted an ontogenetic pattern in which the forelimb became relatively shorter. Embryonic specimens were cleared and stained for measurement, whereas adult data was obtained from a previous study. RMA regression was used to compare the lengths of the forelimb and hindlimb elements to the femur across ontogeny. Femur length was used because it is a proxy for body size in archosaurs. The data were non-normal and Wilcoxon tests for limb asymmetry revealed significant differences between right and left sides. RMA regression of left elements indicates the forelimb bones remain proportionally similar throughout ontogeny (isometry), although the tibia showed negative allometry. Right elements showed more variation, with some elements showing positive or negative allometry, and this probably reflects limb asymmetry. That the forelimb of alligators begins and remains short throughout ontogeny (i.e., it does not become relatively shorter in adults) suggests that the differential allometry reported for dinosaurs may have arisen in that clade.

152. Documentation of turtle mortality along the east edge of Beatty's Pond at Big Sand Mound Nature Preserve

McKay, Kelly J¹ and Hager, Stephen B². ¹BioEco Research and Monitoring Center, Hampton, IL; ²Augustana College, Rock Island, IL.

Big Sand Mound Nature Preserve (BSM) is a sand prairie grassland, floodplain forest, and wetland complex located in Muscatine and Louisa Counties, Iowa. This site is owned and managed by MidAmerican Energy and Monsanto Companies. During the spring of 2007, we discovered a substantial number of turtle carcasses along the eastern edge of Beatty's Pond. This is one of the major wetland areas at BSM. Consequently, we decided to document and quantify this mortality event. The 5-hectare study area was subdivided into 20 50m X 50m search units. Each unit was systematically searched, with individual carcasses being collected and identified. Overall, we recovered 259 individual carcasses representing 5 species. These included: 199 painted turtles (*Chrysemys picta*), 23 red-eared sliders (*Trachemys scripta*), 8 yellow mud turtles (*Kinosternon flavescens*), 4 snapping turtles (*Chelydra serpentina*), 4 map turtles (*Graptemys geographica*), and 21 unidentified carcasses. This produced an average of 12.9 turtle carcasses/search unit and an overall density of 51.8 turtles/hectare. Carcasses were not evenly distributed throughout the study area, with numbers in any given unit ranging from 0 to 53. This

was an extremely preliminary assessment of turtle mortality at BSM. We suggest that additional research is necessary to determine the cause or causes of this mortality, and whether it was localized or occurred among other wetland areas at BSM.

153. Abundance, richness, and diversity of frogs and toads at big sand mound nature preserve

Hager, Stephen, B¹ and McKay, Kelly, J². ¹Augustana College, Rock Island, IL; ¹BioEco Research and Monitoring Center, Hampton, IL.

Amphibians are declining worldwide, both in abundance and diversity. Reasons for these trends are numerous and varied. Understanding these declines is difficult due to the paucity of baseline information regarding basic population biology for many amphibian species. We assessed the abundance (number of individuals per species), richness (number of species), and diversity (relative richness at sampling sites) of anurans (frogs and toads) at Big Sand Mound Nature Preserve (Muscatine and Louisa Counties, Iowa) using standardized field methods established by the North American Amphibian Monitoring Program. Breeding chorus surveys were conducted twice a month from April through July 2007, at 8 sampling sites located among the major wetland areas at this preserve. Overall, we documented 12 species of anurans. These included: American toad (*Bufo americanus*), Fowler's tad (*Bufo fowleri*), cricket frog (*Acris crepitans*), eastern gray treefrog (*Hyla versicolor*), Cope's gray treefrog (*Hyla chrysoscelis*), spring peeper (*Pseudacris crucifer*), western chorus frog (*Pseudacris triseriata*), bullfrog (*Rana catesbeiana*), green frog (*Rana clamitans*), northern leopard frog (*Rana pipiens*), southern leopard frog (*Rana utricularia*), and plains leopard frog (*Rana blairi*). Abundant species included Western Chorus Frog, Eastern Gray Treefrog, and Cricket Frog, with very few Green Frogs and Spring Peepers encountered. We believe this is the first study to directly assess anuran abundance and diversity at Big Sand Mound Nature Preserve.

154. Birdlife of the upper Mississippi River: a field adventure on the Port Louisa National Wildlife Refuge

McKay, Kelly J¹ and Blevins, Brian L¹. and Harvey, Karen D². ¹BioEco Research and Monitoring Center, Hampton, IL; ²U.S. Fish and Wildlife Service, Port Louisa National Wildlife Refuge, Wapello, IA.

Noteworthy declines among many avian species have been documented throughout the Midwest region during the last half century. The primary factors causing these population declines appears to be habitat loss and alteration resulting from various human activities. Natural habitats throughout much of Illinois and Iowa have been lost or severely altered, while the floodplain of the Upper Mississippi River (UMR) maintains relatively large amounts of intact wildlife habitats. This acreage is primarily owned and managed by the U.S. Fish and Wildlife Service and the U.S. Army Corps of Engineers. The Port Louisa National Wildlife Refuge conducted avian point count surveys from 1992-1996, and again in 2004-2006. To date, only an extremely preliminary analysis of the data has been completed. In the four-year sampling period (1993-1996), a cumulative of 127 species were recorded at the Big Timber study area (BT), while 143 species were encountered at the Keithsburg study area (KB). By comparison, in 2004, 101 species were identified at BT, along with 112 species at KB. During this presentation, we will discuss changes in land use throughout Iowa and Illinois, and how this has influenced the importance of UMR floodplain habitats to Midwestern avifaunal populations. We will also examine the potential threats to UMR habitats. Finally, we will discuss the status and occurrence of several "high priority" species.

155. Results of the 2005-2008 Milan Bottoms Bald Eagle Night Roost Survey Project

McKay, Kelly J; Monson, Cathleen D; Bryant, Robert R; Zuurdeeg, Walter M; Ritter, Brian P and Blevins, Brian L. BioEco Research and Monitoring Center, Hampton, IL.

Human development and activities continue to increase and encroach on the floodplain habitats of the Upper Mississippi River. For example, economic development is occurring immediately adjacent to the Milan Bottoms Complex in Rock Island County, Illinois. Evidence suggests that this area is a major night roost location for wintering Bald Eagles (*Haliaeetus leucocephalus*). Therefore we conducted a standardized survey here during three consecutive winters (2005-2008), in order to document the importance of this site as a night roost for wintering Bald Eagles. Weekly evening and morning surveys were carried out from early December through late March each year. In 2005-2006, a total of 10,386 observations of eagles entering or exiting the night roost were recorded. Of these, 32% were adults, 36% were immatures, and 32% were unaged. In contrast, only 2,553 eagle observations were reported in 2006-2007, including 44% adults, 32% immatures, and 24% unaged. By comparison, during the first half of 2007-2008 (December and January), 5,402 observations were documented (37% adults, 26% immatures, and 37% unaged). During the first two years of this project, the majority of night roosting eagle observations occurred in December (30%) and January (43%), with decreasing numbers in February (20%) and March (7%). The upstream end of Milan Bottoms (i.e. the widest tract of floodplain forest) is the most heavily utilized for night roosting purposes.

156. Bats and rabies in Illinois

Hofmann, Joyce E¹; Mengelkoch, Jean M¹; Austin, Connie² and Amundsen, Steven B¹, ¹Illinois Natural History Survey, Champaign, IL, ²Illinois Department of Public Health, Springfield, IL

Many bats are submitted annually to Illinois Department of Public Health and Illinois Department of Agriculture laboratories to be tested for rabies by the immunofluorescent method. Six times as many bats were submitted for testing during 2007 as during 1990. Of 12,157 bats for which there were conclusive test results during the period 1990-2007, 4.2% were positive for rabies. The percent positive varied annually, ranging from 2.8% in 2001 and 2003 to 8.0% in 1996. Because bats submitted for testing represent a biased sample, the incidence of rabies among Illinois bats is likely lower than indicated by test results. During the period 1998-2007, 8,986 of the tested bats were identified to species (and, if possible, gender and age-class) at the Illinois Natural History Survey. The big brown bat (*Eptesicus fuscus*) was the most frequently submitted species and accounted for 75.1% of all bats identified. The next most common species in the sample were the silver-haired bat (*Lasiurus noctivagans*) and eastern red bat (*Lasiurus borealis*), which accounted for 9.5% and 8.8%, respectively. The highest number of positive cases was among big brown bats (227), but the proportion of big brown bats that tested positive was only 3.4% over the 10-year period. The proportion of positive bats was highest for the hoary bat (*Lasiurus cinereus*) at 20.2%, eastern pipistrelle (*Pipistrellus subflavus*) at 16.9%, and eastern red bat at 8.8%.

157. The chronicles of Mollusca – four short stories about mollusk related projects in Illinois

Tiemann, Jeremy S. Illinois Natural History Survey, Champaign, IL.

There are several mollusk-related projects occurring in Illinois, including the following four: 1) Freshwater mussel propagation – plans are underway to propagate two species of freshwater mussels back into Illinois. One of the first steps in this process is determining densities of host

fishes. I report on fish surveys I conducted in the summer of 2007. 2) Distribution of exotic aquatic mollusks – There are six species of exotic aquatic mollusks that are established in Illinois. INHS staff are determining the distribution of three species by conducting field surveys and examining museum collection holdings. Data presented are on what is known thus far. 3) Distribution of pleurocerids – Pleurocerids are known as “rock snails” and require clean, rocky substrates. As with many mollusks, pleurocerids are experiencing declines in their distributions. However, not much is known about the status of the ten species in Illinois. INHS staff are working on rectifying the paucity of data by conducting field surveys and examining museum collection holdings. Data presented are on what is known thus far. 4) Effects of lowhead dams on pleurocerids – a plethora of data are available on the effects of dams on aquatic insects, fishes, and freshwater mussels; however, little is known about their impacts on aquatic snails. In the summer of 2007, I examined the effects of lowhead dams on pleurocerids by sampling four sites-types (upstream and downstream reference areas and areas immediat.....incomplete

***158. Movement of a bacterial plant pathogen through the gut of its beetle vector**

Mitchell, Robert F and Hanks, Lawrence M. University of Illinois at Urbana-Champaign, Urbana, IL, 61801.

The striped cucumber beetle, *Acalymma vittatum* (Fabricius), is an agricultural pest and the primary vector of bacterial wilt of cucurbits. The causative agent of this disease, the bacterium *Erwinia tracheiphila* (Smith), is suspected to reside in the gut of the beetle and infect cucurbits through the frass. However, the relationship between these two organisms is poorly understood. We sought to develop a sensitive but non-lethal method of identifying vectors to better understand these relationships. We developed a PCR-based technique for extracting and identifying bacterial DNA in the frass of the beetle. In most cases, bacterial DNA was present in the frass for 24 hours after beetles had consumed inoculum, but diminished quickly and disappeared within 96 hours. The length of time varied based on the amount of inoculum, how long the beetle was exposed to it, and the strain of bacterium. The frass was highly infective to cucumber plants until shortly before the bacterial DNA became undetectable, demonstrating a connection between DNA and viable bacteria. This study confirms that frass is a key mechanism for spreading bacterial wilt when a source of inoculum is present.

159. Arm regeneration in the Pacific octopus *Octopus bimaculoides

Ossler, Julia and Bennett, Heather. Illinois College, Jacksonville, IL.

Arm regeneration in octopodid molluscs has occasionally been reported in the literature; however, the process of regeneration has not been documented in the laboratory. In this study, living specimens of *Octopus bimaculoides*, a small Pacific species, were reared in a recirculating seawater system. Arms of adults were surgically removed, and arm regrowth was monitored. Regrowth of arms was noted and measured in all treated specimens. Preliminary histological data show regeneration of epithelial and muscle tissues. The results of this study will be used for future projects examining the cellular and molecular basis of arm development and regrowth in *Octopus*.

***160. Cause of injury in raptors admitted to the Illinois Raptor Center, 1995-2006**

Neese, Mallory¹ and Horn, David J.². ¹University of Illinois, Urbana, IL; Millikin University, Decatur, IL.

Raptors are experiencing increasing threats from anthropogenic and natural causes. We examined the cause of injury and their temporal occurrence in raptors admitted to the Illinois Raptor Center in Decatur, IL from 1995-2006. For the study, 929 raptors of six species were used including Cooper's hawk (*Accipiter cooperii*), Red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), eastern screech-owl (*Otus asio*), great horned owl (*Bubo virginianus*), and Barred Owl (*Strix varia*). Each raptor species was susceptible to a different suite of injuries. Sixty-five percent of all window collisions involved Cooper's hawk, and 61% of all vehicle collisions involved owls. By understanding how raptor behavior influences injury, we can develop solutions to reduce morbidity and mortality associated with these causes.

***161. Do local and landscape-level habitat characteristics influence pond occupancy by painted turtles (*Chrysemys picta*)?**

Cosentino, Bradley, J.¹; Phillips, Christopher A.²; Schooley, Robert, L.¹. ¹University of Illinois, Urbana, IL, ²Illinois Natural History Survey, Champaign, IL.

Modeling species occupancy as a function of habitat characteristics can provide key insights into habitat quality and distributional constraints related to landscape structure. I estimated the occupancy probability (ψ) of *Chrysemys picta* (Painted Turtle) across 90 wetlands from May-August, 2007 in Lee County, Illinois. Likelihood-based models that account for imperfect detection probability (ρ) were developed to predict how this species responds to critical habitat features at local and landscape-scales. The model set was constructed using combinations of site and survey-level covariates, and program PRESENCE was used to estimate ψ and ρ given species encounter histories. Akaike's Information Criterion (AICc) was used for model selection. I first modeled the effect of covariates on ρ while keeping ψ constant. The best detection model was then used to create alternative habitat models in which ψ was a function of covariates. The highest-ranking detection model included a quadratic effect of date on ρ , with detection peaking in early June. The highest-ranking occupancy model included negative effects of emergent vegetation cover and agricultural cover within 150-m of ponds on ψ . These data suggest that both local and landscape-level habitat features are important for predicting *C. picta* occupancy patterns. Our habitat models can be used to generate predictions on *C. picta* habitat suitability, and the effect of habitat heterogeneity on landscape connectivity and metapopulation dynamics.

***162. Historical population structure of two communities in Madison County, Illinois in 1860.**

Berger, Elise and Kohn, Luci Ann. Southern Illinois University Edwardsville, Edwardsville, IL.

The study of demography and structure of historic populations provides us with an understanding of population dynamics of within or between populations. Using records of birth, death and migration, we can understand important characteristics related to the change of these populations over time. These characteristics also relate to the underlying genetic structure of the populations. These techniques are applied to two communities within historical Madison County, Illinois. A random sample of census records for individuals living in Alton, Illinois and Edwardsville, Illinois in 1860 were examined. These data include name, age and place of birth of each household member. These data were used to calculate migration rate, birth interval, effective population size, and family composition. These quantities are compared between these two

communities. Differences between Alton, the community based on river commerce and activity, is contrasted with Edwardsville, a more agricultural and aristocratic community.

163. The effect of epiphyseal cartilage loss in the appendicular skeleton of the American Alligator, *Alligator mississippiensis*

Sandrik, Jennifer L. and Bonnan, Matthew F.

Department of Biological Sciences, Western Illinois University, Macomb, IL.

In this study, American alligators (*Alligator mississippiensis*) were examined because crocodylians represent the plesiomorphic archosaur outgroup to dinosaurs, and show the primitive condition of articular cartilage growth. The forelimbs and hindlimbs of 36 alligators were dissected at each joint, then measured and immersed in a water bath to macerate the muscle tissues and, eventually, remove the articular cartilage. Repeated measures ANOVA of the \log_{10} transformed data revealed that the method used to remove the muscle did not significantly change the cartilage ($p > 0.05$). After cartilage removal, most bone dimensions were significantly truncated ($p < 0.05$), indicating that there is a difference in the shape of the joint and length of the bone when the cartilage is removed. Reduced major axis regression of bones with and without articular cartilage ($r^2 > 0.9$) revealed a mostly isometric pattern indicating there is no difference in the amount of articular cartilage between juveniles and adults. However, there were some positive or negative allometric changes. I also found that the medial condyle of the humerus and the lateral condyle of the femur changed insignificantly and in juveniles the long bones were slightly twisted through the long axis of the bone, and the condyles were rotated medially. This may be the result of the lighter weight and active lifestyle of juveniles, increasing the tendency to walk semi-erect. My data suggest that the plesiomorphic condition for dinosaur long bones was that articular cartilage contributed significantly to long bone length.

DRIVING DIRECTIONS, PARKING, FLOOR PLANS

Illinois Natural History Survey and University of Illinois

This year's sponsors are located in Champaign-Urbana. These sister cities are accessed easily by I-74, I-57, or I-72, all of which converge on the cities.

Directions to the Friday, 4 April afternoon venue at the Illinois Natural History Survey bldg. (I-bldg., we know it is an unimaginative name!), 1816 S Oak St., Champaign, IL 61820.

Parking is free in the large lot to the south of the building. If you get lost, you may call Dr. DeWalt at 217-649-7414 or INHS Executive Secretary Ms. Cathy Bialeschki at 217-244-2120 (please use this number sparingly).

From I-57 traveling south.

- Merge onto I-74 E via EXIT 237A toward INDIANAPOLIS. Travel 2.4 mi.
- Take the NEIL ST. exit, EXIT 182 south toward CHAMPAIGN. Travel 2.6 mi.
- Turn LEFT (East) onto St. Mary's Ave. Travel 0.2 mi.
- Turn RIGHT (South) onto S Oak St. Travel 0.1 mi.
- The INHS is the second building on your left.

From I-57 traveling north.

- Take EXIT 229 toward MONTICELLO/ SAVOY. Travel 2.4 mi EAST on Co. Rd. 1000N
- Turn LEFT onto US-45 N. Travel 4.9 mi
- Turn RIGHT onto ST MARY'S RD. Travel 0.2 mi.
- Turn RIGHT onto S OAK ST. Travel 0.1 mi.
- The INHS is the second building on your left.

From I-72 traveling east.

- Travel I-72 E to Champaign until it becomes W UNIVERSITY AVE (one-way heading east). Travel 0.3 mi.
- Turn RIGHT onto S MATTIS AVE. Travel 1.3 mi south.
- Turn LEFT onto W KIRBY AVE. Travel 1.9 mi
- Turn RIGHT onto S OAK ST. Travel 0.3 mi and across St. Mary's Ave. INHS is second building on right after St. Mary's Ave.

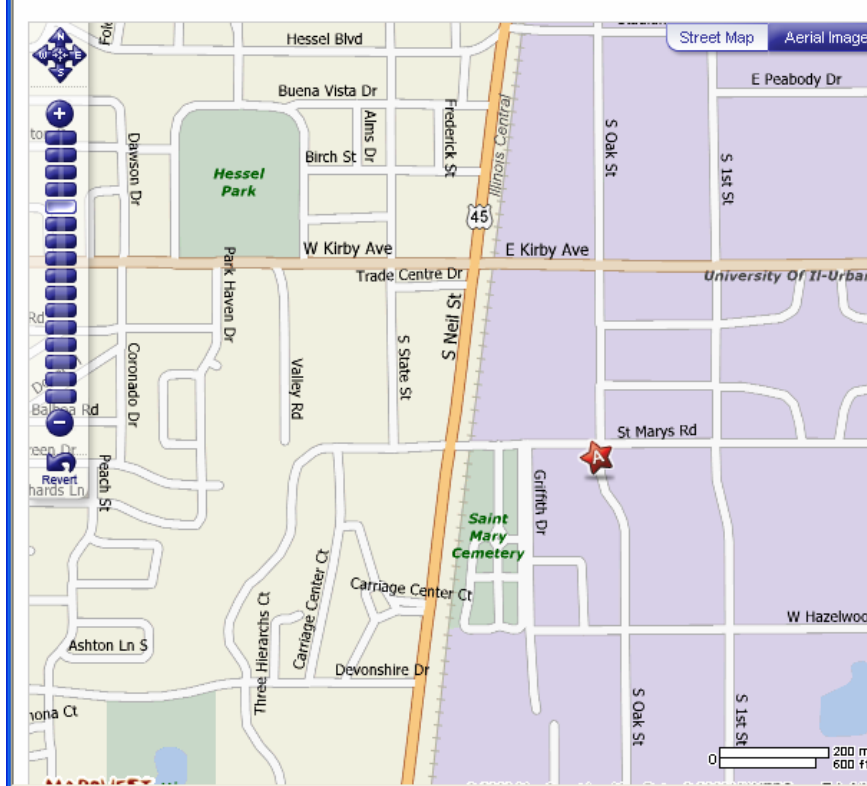
From I-74 traveling east.

- Take the NEIL ST. exit, EXIT 182 south toward CHAMPAIGN. Travel 2.6 mi.
- Turn LEFT (East) onto St. Mary's Ave. Travel 0.2 mi.
- Turn RIGHT (South) onto S Oak St. Travel 0.1 mi.
- The INHS is the second building on your left.

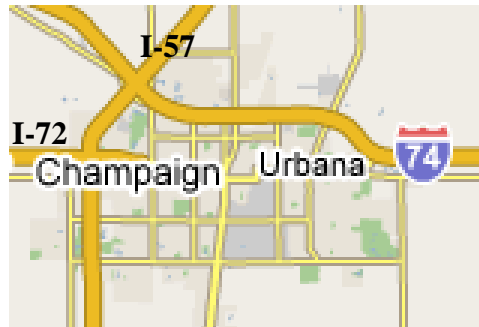
Map to Champaign-Urbana. Star indicates INHS at 1816 S Oak St.



Map for INHS location.



Directions to the Saturday, 5 April all day venue at the University of Illinois Levis Faculty Center.



DRIVING DIRECTIONS

Levis Faculty Center is conveniently located on the East entrance to the University of Illinois at Urbana-Champaign. With 3 major Interstates (I-57, I-74, I-72) running through town, Levis Faculty Center is easily accessible from all directions.

From the North:

Take I-57 south to I-74 (approximately 132 miles from Chicago.)

Take I-74 east to the Lincoln Avenue exit.

Turn right on Lincoln Avenue (south) and drive approximately 3 miles (6 traffic lights) to Illinois Street.

Turn right on Illinois Street and you will see Levis on the left hand (south) side.

From the East:

Take I-74 west to the Lincoln Avenue exit.

Turn left on Lincoln Avenue (south) and drive approximately 3 miles (6 traffic lights) to Illinois Street.

Turn right on Illinois Street and you will see Levis on the left hand (south) side.

From the West:

Take I-72 east to Champaign. From St. Louis, take I-55 to I-72.

Upon entering Champaign, I-72 becomes University Avenue.

Proceed east on University Avenue to Lincoln Avenue.

Turn right on Lincoln Avenue (south) and drive approximately 1 mile to Illinois Street.

Turn right on Illinois Street and you will see Levis on the left hand (south) side.

From the South:

Take I-57 north to I-72 west. From St. Louis, take I-70 to I-57.

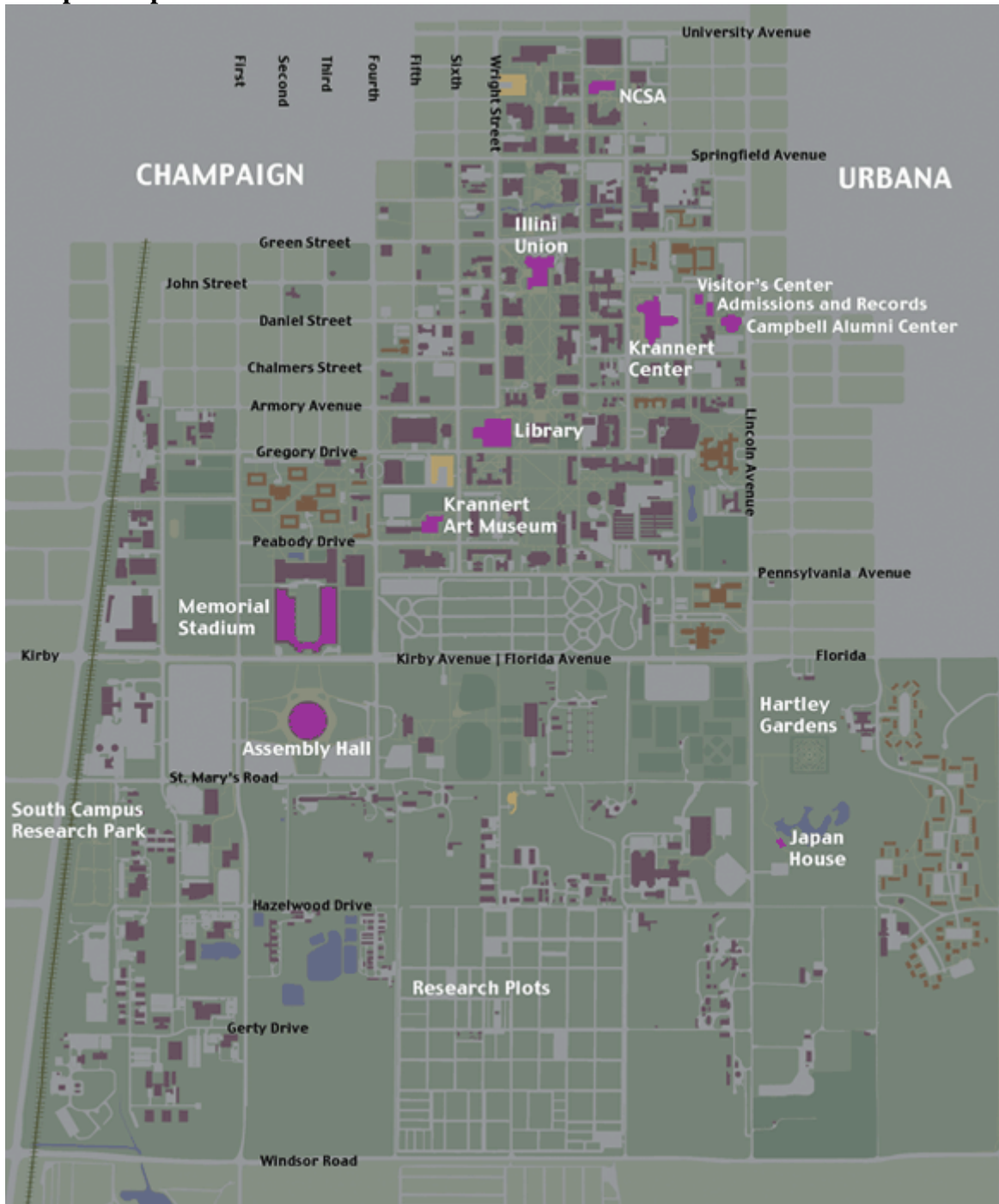
Upon entering Champaign, I-72 becomes University Avenue.

Proceed east on University Avenue to Lincoln Avenue.

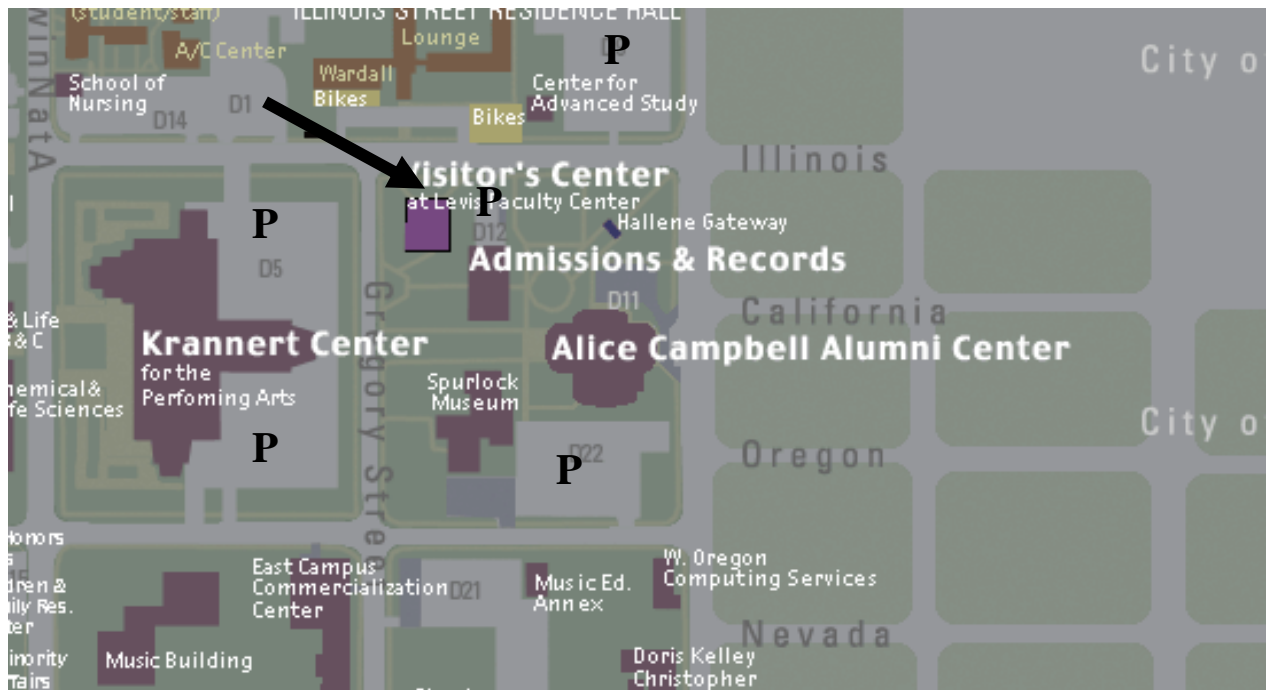
Turn right on Lincoln Avenue (south) and drive approximately 1 mile to Illinois Street.

Turn right on Illinois Street and you will see Levis on the left hand (south) side.

Campus Map



Levis Faculty Center area



PARKING

There are several options for parking near the Levis Faculty Center. Street parking is City of Urbana jurisdiction; lot parking is controlled by UIUC Parking

Parking Lot D9 (corner of Lincoln Ave. and Illinois St.)

University Parking Lot D9 is located across Illinois Street from the Levis Faculty Center on the northwest corner of Lincoln Avenue and Illinois Street. It contains 40 all day parking meters. The meters are enforced 24 hours a day, 7 days a week. The rate is 75 cents per hour.

There is no parking in the reserved spaces without a permit. Reserved spaces are enforced 24 hours a day, 7 days a week.

Parking Lot D12 (just East of Levis)

This parking lot, the closest parking lot to Levis, contains 6 meters that make it ideal for quick visits to Levis Faculty Center. Meters are enforced M-F from 6AM - 5PM. The rate is 75 cents per hour. There is no charge to park at the meters on Saturday and Sunday.

Parking Lot D14 (just West of Levis)

University Parking Lot D14, located just west of Levis and accessed from Illinois St. has over 20 spaces that are not monitored on Saturdays. Avoid the spaces marked for enforcement 7 days and 24 hrs/day.

Parking Lot D22 (corner of Lincoln Ave. and Oregon St.). A good choice.

This University parking lot is located right next to the Spurlock Museum. It contains 20 metered spaces, enforced M-F from 6AM - 5PM. The rate is 75 cents per hour. There are also 60 reserved spaces, enforced M-F from 6AM - 5PM. There is no parking in reserved spaces without a permit during these times. There is no charge to park in reserved or metered spaces on Saturday and Sunday.

Krannert Underground Parking Lot D5 (accessible from Illinois St.) A good choice.

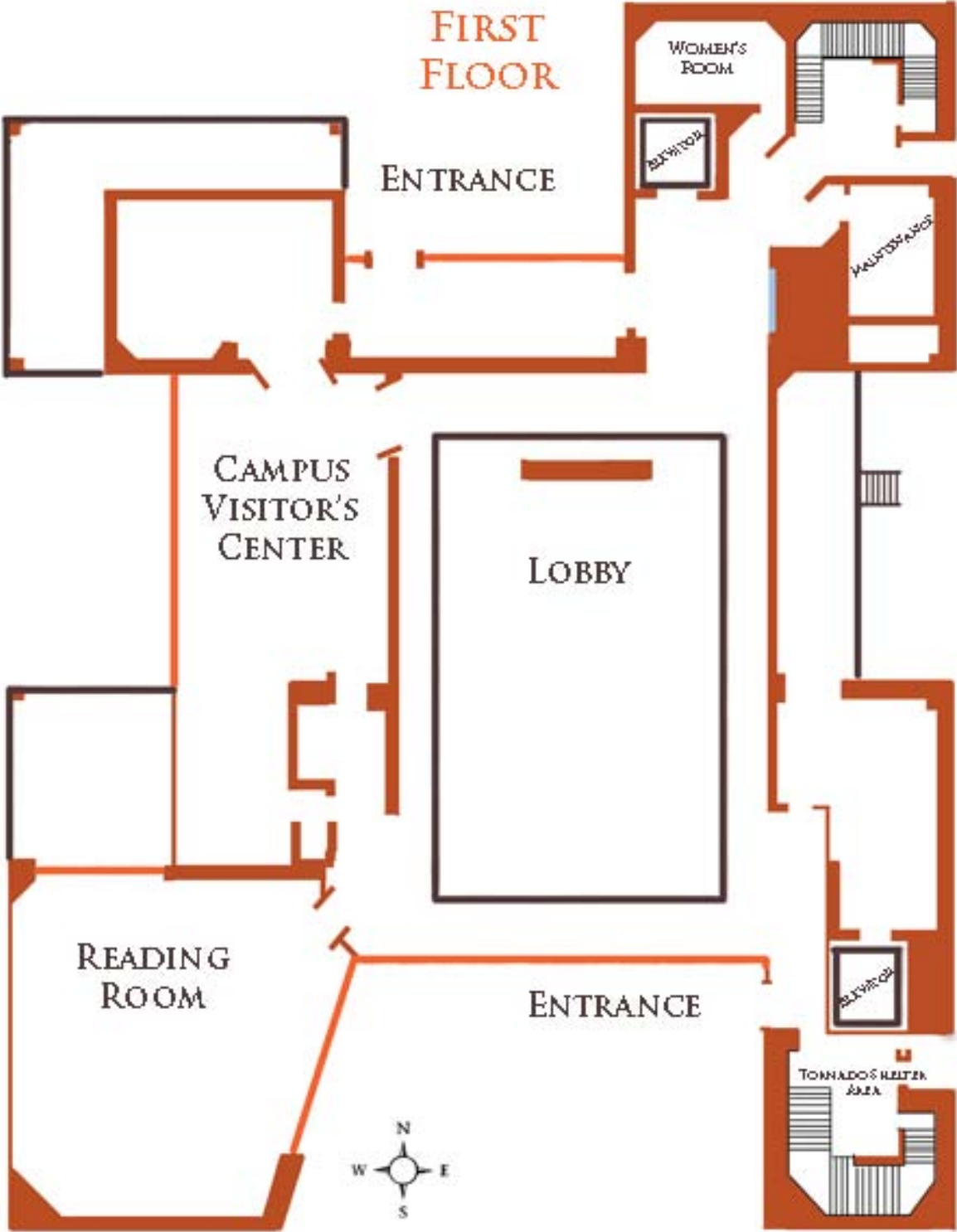
Across the street from the Levis Faculty Center, the Krannert Center for the Performing Arts offers underground parking. Levis guests are welcomed to take advantage of the parking lot's close proximity and underground location. The underground parking is accessible from entrances on the north end of the Krannert Center (Illinois Street). Although it is mainly a rental lot for University employees during the week, there are 79 metered parking spaces that are open to the public at the rate of 75 cents per hour. All reserved spaces are enforced M-F from 6AM - 5PM. There is no charge to park in metered or reserved spaces in Saturday and Sunday.

City of Urbana Metered Parking

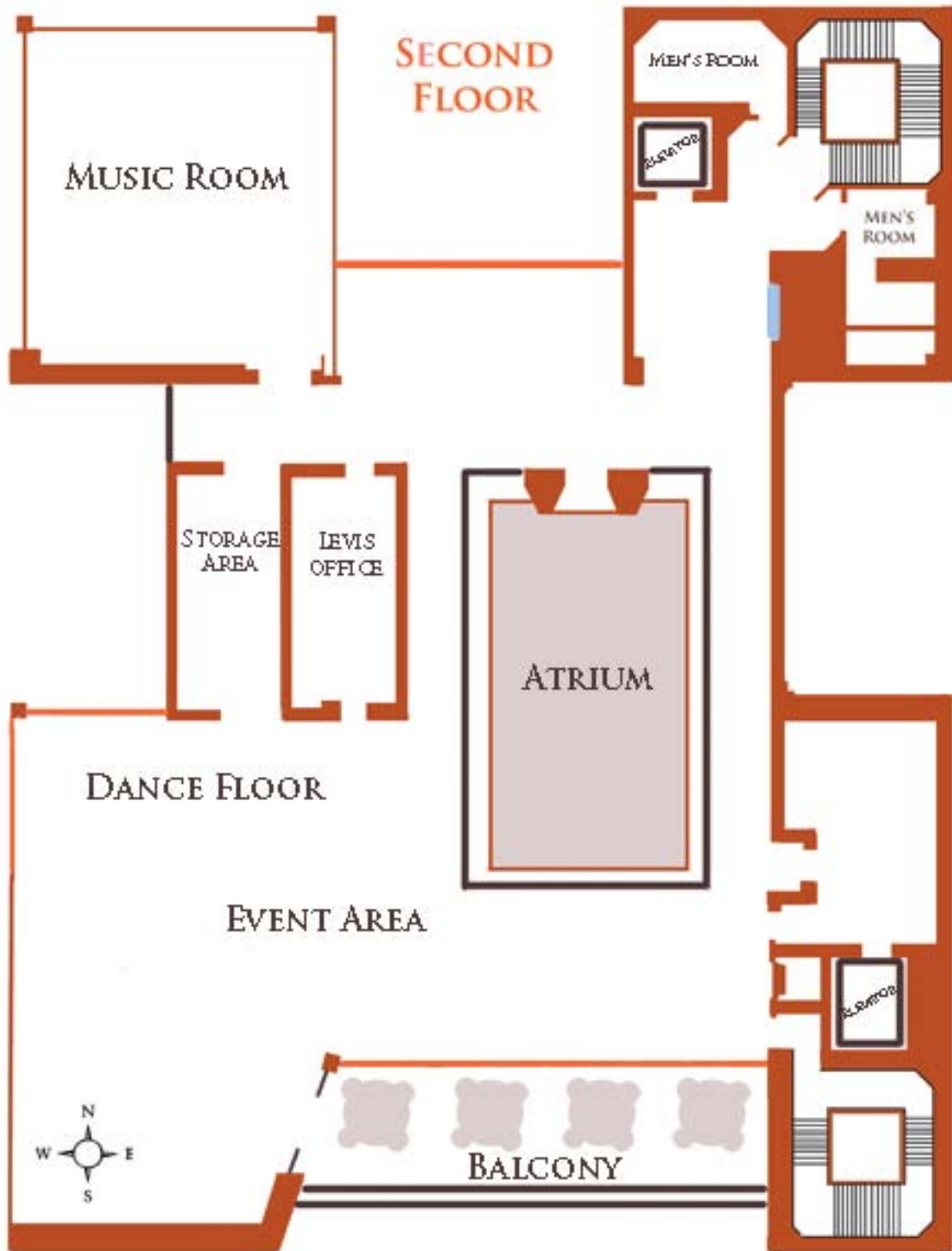
Another option for parking near the Levis Faculty Center is to use the City of Urbana's metered street parking on Illinois Street and Gregory Street. Meters are enforced M-Sa from 7AM - 6PM. The rate is 75 cents per hour.

Floor Plan of Levis Faculty Center

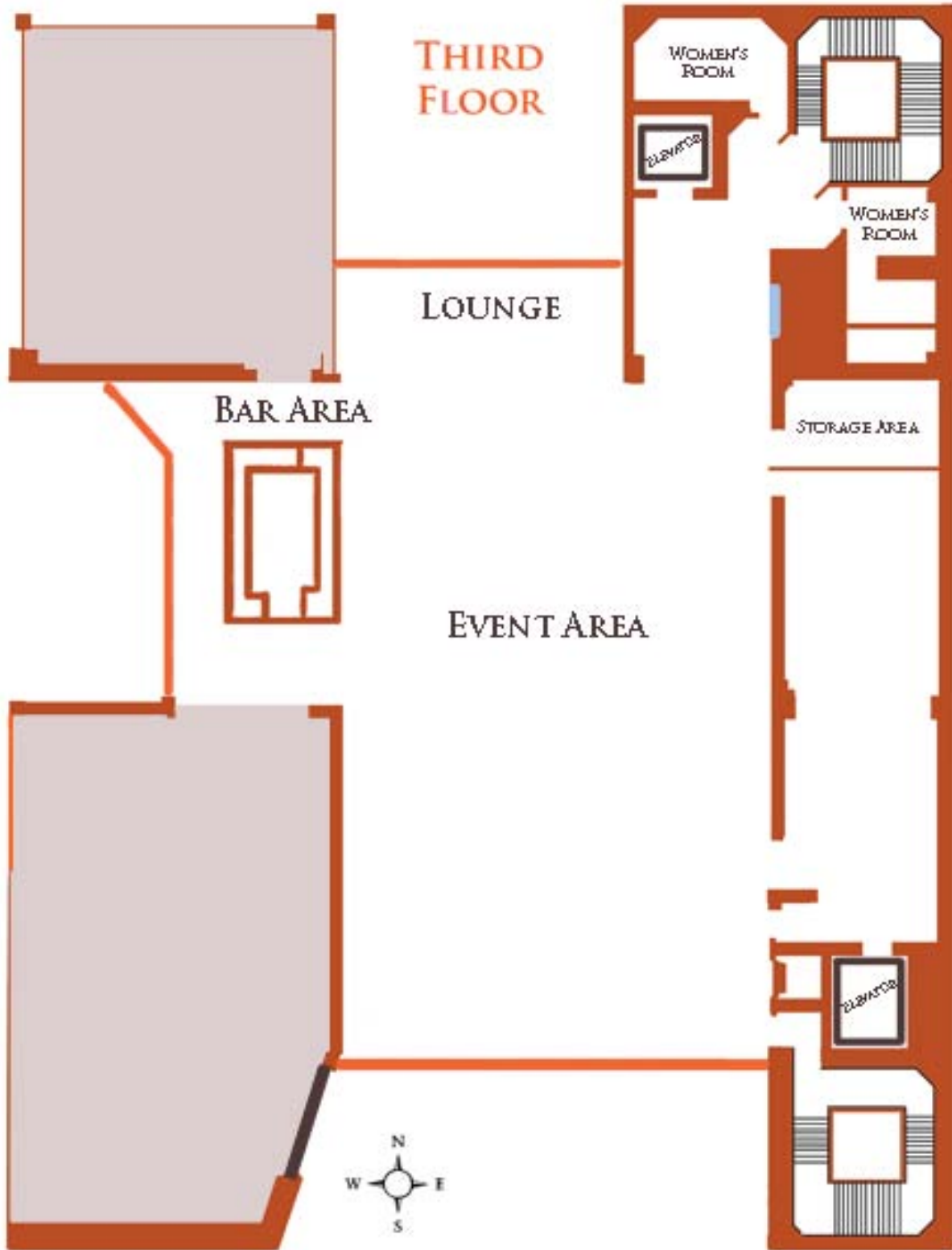
Floor 1



Floor 2



Floor 3



Floor 4



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May 2007 - May 2008
(As of March 2008)

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#Membership: open

#Nominations and Elections: open

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Museum Board Room: 217/782-5860.

FUTURE MEETINGS

April 2008: INHS UIUC

April 2009: SIUE

April 2010: open

#Denotes presidential appointments.

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1984	Donald R. Dickerson	Geology
1984	Norman R. Farnsworth	Pharmacology
1984	James E. House	Chemistry
1984	Harold M. Kaplan	Physiology
1984	Richard C. Keating	Botany
1984	James E. King	Paleobotany
1984	Willard D. Klimstra	Zoology
1984	William M. Lewis	Zoology
1984	Robert H. Mohlenbrock	Botany
1984	Lambertus H. Princen	Chemistry
1984	David G. Rands	Chemistry
1985	Robert C. Duty	Chemistry
1986	Ronald A. Browning	Physiology
1986	Richard L. Leary	Geology
1986	David S. Seigler	Botany
1988	Roger C. Anderson	Botany
1988	John E. Ebinger	Botany
1990	Amrik Dhaliwal	Biology
1990	Leon Gershbein	Chemistry
1990	John W. Reeves	Biology
1991	Geoffrey A. Cordell	Chemistry
1991	George H. Fraunfelter	Geology
1992	Joseph E. Lambert	Chemistry
1992	R. Bruce McMillan	Anthropology
1993	Stanley A. Changnon	Geology
1995	Billy Geer	Biology
1995	Lawrence C. Matten	Botany
1996	Herbert L. Monoson	Botany
1996	Paul P. Sipiera	Geology
1996	Marian Smith	Botany
1998	Andrzej Bartke	Zoology
1999	Bonnie W. Styles	Anthropology
1999	Michael A. Goodrich	Zoology
2001	Howard E. Buhse, Jr.	Cell, Molecular, and Developmental Biology
2001	Ralph Troll	Biology
2002	Walter J. Sundberg	Botany
2003	Laurence E. Crofutt	Bacteriology
2003	Nektal M. Made Gowda	Chemistry
2004	James Rastorfer	Environmental Science
2005	William McClain	Botany
2008	Janice M. Coons	Botany
2008	Richard B. Brugam	Environmental Science

ACKNOWLEDGMENTS

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