Sixteenth Annual
Odum School of Ecology
Graduate Student Symposium
29-30 January, 2010

Ecology Auditorium
Odum School of Ecology
University of Georgia
Athens

Brought to you by:
The Ecology Graduate Students

Symposium Coordinators: Jessica Joyner & Shafkat Khan
Administrative Support: Brian Perkins & Brenda Mattox
Program Committee: Tyler Kartzinel, Andrew Mehring, & Jamie Winternitz
Undergraduate Poster Committee: Amy Trice & Athena Anderson
Judging Committee: Kathleen Frey & Athena Anderson
Souvenir Committee: Christina Baker & Virginia Schutte
Prospective Student Boarding: Bill McDowell & Nathan Pratt
Audio-visual Committee: Jenny Pahl & session volunteers
Moderator Committee: Pedro Torres & session volunteers
Food & Beverage Committee: Andrew Binderup, Peter Baas, & Megan Machmuller

Special thanks to all other students and faculty who made this possible!
Schedule of Events

Friday, January 29

8:30am  Coffee available in exhibit hall

9:00 - 9:05  Introduction by Jessica Joyner and Shafkat Khan, Symposium Coordinators

9:05 – 9:15  Welcome by Dr. John Gittleman, Dean, Odum School of Ecology

SESSION I – Introduction by Jamie Winternitz, Session Moderator

9:15 - 9:30  “Linking feedbacks on ecosystem engineers to ecosystem functioning” by Virginia Schutte

9:30 – 9:45  “Top-down effects of aquatic macroconsumers on benthic structure and function in a high-gradient neotropical stream” by Andrew Binderup

9:45 – 10:00  “Latitudinal differences in breeding season for two species of small mammals?” by Nathan Pratt

10:00 – 10:15  “The consequences of climate change-driven soil warming on biogeochemical processes in a southeastern piedmont forest: How will carbon and nitrogen dynamics change?” by Megan Machmuller

10:15 – 10:30  A.M. Coffee Break

SESSION II – Introduction by Rachel Katz, Session Moderator

10:30 – 10:45  “Indirect effects of dams on ecosystem processes: Shrimp extirpations alter leaf litter breakdown in neotropical streams, Puerto Rico” by Pedro Torres

10:45 – 11:00  “Delimiting cryptic species with mitochondrial and nuclear DNA in the recently described barnacle species group Chthamalus southwardorum in the tropical eastern Pacific” by Meredith Meyers

11:00 – 11:15  “Blackwater River dissolved organic carbon dynamics as affected by rainfall patterns” by Andrew Mehring

11:15 – 11:30  “Effects of forest fragmentation on symbiosis and population genetics of epiphytic orchids and bromeliads in Monteverde, Costa Rica” by Tyler Kartzinel

11:30 – 1:45  Lunch (on your own – transportation provided)
SESSION III – Introduction by Virginia Schutte, Session Moderator

1:45 – 2:00  “Amount of mammalian biodiversity to be lost with threatened species: Bad location or bad luck?” by Shan Huang

2:00 – 2:15  “Functional and genetic differences in coral-algal symbiosis during a coral bleaching event in Puerto Morelos, Mexico.” by Dustin Kemp

2:15 – 2:30  “Wavelet analysis of montane vole population cycles” by Jamie Winternitz

2:30 – 2:45  “Potential effects of climate change on the distribution and abundance of an invasive bivalve” by William McDowell

2:45 – 3:00  P. M. Coffee Break

SESSION IV – Introduction by Megan Machmuller, Session Moderator

3:00 – 3:15  “The direct and indirect effects of the red imported fire ant (*Solenopsis invicta*) on seed fate in the longleaf pine ecosystem” by Margaret Shearin

3:15 – 3:30  “Investigating the effects of urban land use on ecosystem structure and function in the Upper Oconee watershed” by Jessica Sterling

3:30 – 3:45  “Amplification of seasonal acidification in poorly-buffered neotropical streams following an historically large El Niño-southern oscillation event” by Gaston Small

3:45 – 4:00  “Zooplankton community structure, species diversity, and the predation-permanence gradient” by Marcus Zokan

SESSION V – Undergraduate Poster Session

4:00 – 5:00  Poster judging in exhibit hall

5:00  Refreshments in courtyard
Schedule of Events
Saturday, January 30

9:15 am  Coffee available in exhibit hall

SESSION VI – Introduction by Kathleen Frey, Session Moderator

9:45 – 10:00  “Assessing sustainability: Farmer participatory agroecosystem research for beef cattle grazing management in southern Indiana” by Josh Egenolf

10:00 – 10:15 “Food web structure of a neotropical stream before and after the extirpation of an amphibian assemblage” by Thomas Barnum

10:15 – 10:30 “Global warming and forest insect herbivory” by Fern Lehman

10:30 – 10:45 “The impact of submerged aquatic vegetation on carbon dynamics and doc bioavailability in a southeastern reservoir” by Stephen Shivers

10:45 – 11:00 “Attachment of V. cholerae to an environmental host – The marine copepod” by Jeff Turner

11:00 – 11:15 A.M. Coffee Break

SESSION VII – Introduction by Bill McDowell, Session Moderator

11:15 – 11:30 “Does the species composition of symbiotic microbial communities for corals and sponges change with time and space?” by Jessica Joyner

11:30 – 11:45 “Farmers sitting on money: Measuring market potential of ecological services in the Georgia Piedmont” by Kathleen Frey

11:45 – 12:00 “Carbon bioavailability along groundwater flow paths within an alluvial floodplain” by Ashley Helton

12:00 – 12:15 “Tropical tree seedlings’ response to climate change” by Shafkat Khan

12:15 – 2:15 Lunch (on your own – transportation provided)
### Schedule of Events

**SESSION VIII** – Introduction by Josh Egenolf, Session Moderator

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:15 – 2:30</td>
<td>“Amphibian community composition and health in contrasting wetlands in Costa Rica: Marshes and rice fields” by Kristy Segal</td>
</tr>
<tr>
<td>2:30 – 2:45</td>
<td>“The role of riparian zones as a buffer in the anthropogenically affected southern Appalachian streams for below-ground hydrology, nutrient cycling and its associated ecosystem functioning” by Peter Baas</td>
</tr>
<tr>
<td>2:45 – 3:00</td>
<td>“Effects of elevated soil temperatures on mycorrhiza in a temperate forest ecosystem” by Kathleen Bridges</td>
</tr>
<tr>
<td>3:15 – 3:30</td>
<td>“Directed evolution: “What you forsee may not be what you get” by Kenneth Leonard</td>
</tr>
<tr>
<td>3:00 – 3:15</td>
<td>“Dolphins as sentinel animals of oceans and human health: Surveying carriage of human enteric pathogens using molecular techniques” by J. Carrie Futch</td>
</tr>
<tr>
<td>3:30 – 3:45</td>
<td><strong>P.M. Coffee Break</strong></td>
</tr>
<tr>
<td>3:45 – 4:00</td>
<td><strong>Plenary speaker introduction by Dr. Catherine M. Pringle, Odum School of Ecology</strong></td>
</tr>
<tr>
<td>4:00 – 5:00</td>
<td>“Making conservation sustainable: Perspectives from East Africa and the Tropical Andes, two global centers of biodiversity.” Dr. Elizabeth Anderson, The Field Museum of Natural History</td>
</tr>
<tr>
<td>5:00 – 7:00</td>
<td><strong>Reception in the exhibit hall</strong></td>
</tr>
</tbody>
</table>
Plenary Speaker

Dr. Elizabeth Anderson

MAKING CONSERVATION SUSTAINABLE: PERSPECTIVES FROM EAST AFRICA AND THE TROPICAL ANDES, TWO GLOBAL CENTERS OF BIODIVERSITY.

Dr. Elizabeth Anderson
Division of Environment, Culture and Conservation, The Field Museum of Natural History

Elizabeth is originally from Stone Mountain, Georgia, and received her PhD in Ecology from the University of Georgia in 2004. Her main interests are freshwater ecology and conservation, and she has worked in diverse cultural and ecological settings of Central and South America, East Africa, and India.

Elizabeth’s graduate research at UGA examined the implications—both ecological and social—of hydropower development on rivers in Costa Rica. During this time she was also involved with the Costa Rica Ecology program and spent several years teaching field courses in tropical ecology for UGA, The Evergreen State College (WA), and the Organization for Tropical Studies. Following completion of her PhD, Elizabeth worked for the Organization for Tropical Studies as coordinator of a Research Experiences for Undergraduates (REU) program for U.S. and Costa Rican students at La Selva Biological Station.

Since 2005, Elizabeth has been affiliated with the Global Water for Sustainability (GLOWS) program (www.globalwaters.net; Miami, FL), an initiative sponsored by the U.S. Agency for International Development (USAID) to promote more integrated management of water resources worldwide. Through this program, she has been scientific adviser on several international projects. These include: a pilot environmental flow assessment for the Wami River, Tanzania, conducted in direct collaboration with the Tanzanian Ministry of Water; an analysis of water quality problems in the Pastaza River Basin, Ecuador, in collaboration with Ecuador’s National Secretary of Water; and an evaluation of traditional rainwater harvesting techniques for water conservation in Rajasthan, India, in collaboration with local universities and organizations.

Elizabeth is currently the Conservation Sustainability Director at The Field Museum of Natural History (www.fieldmuseum.org; Chicago, IL), in the Division of Environment, Culture and Conservation (ECCo). Here, she is part of a multi-disciplinary team of scientists working to identify and secure long-term protection for extraordinary landscapes in the Andes/Amazon region. Rapid biological and social inventories—conducted in collaboration with local scientists—are a cornerstone of this team’s strategy for setting priorities and catalyzing effective conservation action.
Oral Presentations

LISTED IN ALPHABETICAL ORDER

THE ROLE OF RIPARIAN ZONES AS A BUFFER IN THE ANTHROPOGENICALLY AFFECTED SOUTHERN APPALACHIAN STREAMS FOR BELOW-GROUND HYDROLOGY, NUTRIENT CYCLING AND ITS ASSOCIATED ECOSYSTEM FUNCTIONING

Peter Baas and Jacqueline E. Mohan
Odum School of Ecology, University of Georgia, Athens, GA

The Southeastern Appalachian have been experiencing increasing anthropogenic land-use. This disturbance, in combination with the severe droughts since the mid 1990’s is putting increasing pressure on the limited freshwater resources. Increasing anthropogenic land-use is resulting in a disturbance of the riparian zone which is affecting its ability to remove or retain nutrients before it reaches the stream. The effect of this riparian disturbance can increase the emission of greenhouse gasses due to increased soil respiration and N₂O emission from nitrogen cycle processes. In this study I wish to investigate the effect of increasing anthropogenic land-use on the below-ground hydrology and nutrient cycling in the riparian zones in the Southern Appalachian mountains. To assess hydrological functioning, electromagnetic induction (EMI) and soil resistivity (SER) techniques will be used. Using the hydrological mapping, transects will be selected to collect soil samples for measurements of nutrient concentrations and soil processes of N-mineralization, nitrification and denitrification. It is crucial for us to better understand the functioning of our stream and river ecosystems and the ecosystem services they provide to guide appropriate management policies in this fast and changing environment.

TOP-DOWN EFFECTS OF AQUATIC MACROCONSUMERS ON BENTHIC STRUCTURE AND FUNCTION IN A HIGH-GRADIENT NEOTROPICAL STREAM

Andrew J. Binderup, Michael C. Marshall, Catherine M. Pringle
Odum School of Ecology, University of Georgia, Athens, GA

Macroconsumers (fishes, crustaceans) can exert strong top-down effects on ecosystem properties and processes in freshwater systems. As part of the NSF-FIBR Trinidad Project, we asked: What are the top-down effects of specific macroconsumer taxa on benthic structure and function in Trinidadian high-gradient tropical streams? To tease out taxa-specific effects, we used a point-count method (20 hours of observations) to assess diel behavior and estimate density for each taxa in two stream reaches: one containing Hart’s Killifish (*Rivulus hartii*) and the crab *Eudaniela garmani*, and the other containing these two species plus guppies (*Poecilia reticulata*) and a catfish (*Rhamdia quelen*). These data were used to design four treatments utilizing underwater electric ‘fences’: Control (C, no electricity), Diurnal (D, Diurnal electricity), Nocturnal (N, Nocturnal electricity), and Electric (E, Permanent electricity). We quantified several ecosystem processes and properties (leaf decomposition rate and leaf pack invertebrate community, algal standing stock and rate of accrual, benthic metabolism, and benthic invertebrate community). We found that visitation rates of *Eudaniela* were significantly (p<0.01) greater in the absence of guppies, while *Rivulus* were significantly (p<0.05) more nocturnal with guppies present. Additionally, we found that treatments excluding guppies had significantly higher (p<0.05) algal standing crop than control treatments allowing guppy access, suggesting that guppies can play a major role in regulating algal communities in stream pools.
EFFECTS OF ELEVATED SOIL TEMPERATURES ON MYCORRHIZA IN A TEMPERATE FOREST ECOSYSTEM

Kathleen M. Bridges, Richard Shefferson, Paul Hendrix, and Jacqueline Mohan
School of Ecology, University of Georgia, Athens, GA

As climate change continues to affect global forest communities, it invariably affects all organisms associated with those tree species. One of the most important associations is the mycorrhizal symbiosis between trees and fungal species. It is important to understand how this symbiotic relationship will be affected by the changing climate as it may be a determining factor in the composition of future forest communities. In a newly developed soil warming study at Whitehall Forest, seedlings of several different tree species will be studied to discover how the mycorrhizal tree and fungus will react. The goals are to 1) determine if fungal type is aiding in the accelerated growth of typically slow growing tree species, 2) if fungal species composition is changing with the increased soil temperature which will be determined through DNA analysis, 3) if there is an overall increase or decrease in total mycorrhizal symbiosis, and 4) if fungal fruiting bodies (mushrooms) will decrease in heated soils. It is expected that increased soil temperatures will cause trees with certain types of fungal partners to benefit from the increased soil temperature, mycorrhizal fungal species composition to change, reduce the overall amount of mycorrhizal symbiosis and decrease the number of fruiting bodies. The results of this experiment may indicate which tree species’ ranges will change with the changing climate.

ASSESSING SUSTAINABILITY: FARMER PARTICIPATORY AGROECOSYSTEM RESEARCH FOR BEEF CATTLE GRAZING MANAGEMENT IN SOUTHERN INDIANA

Josh Egenolf and Carl Jordan
Odum School of Ecology, University of Georgia, Athens, GA

I will collaborate with beef cattle producers in Clay, Greene, Owen, Monroe, Lawrence, & Martin counties in south-central Indiana who are members of the Indiana Beef Alliance. This contiguous study region contributes 6.9% to Indiana’s total beef cattle production. These southern Indiana beef producers face decreasing profitability due to rising input costs associated with conventional beef production, are in peril of losing accessible auction market outlets, and are under pressure to lessen the environmental and public health impacts of their production practices; thus, they desire alternative modes of production and marketing to sustain their livelihoods, the landscape that they depend on, and their contribution to this economic sector. This research has a two-fold objective: Discover how grazing management decisions are made and what effects are realized in terms of profitability, the ecological function of the pastures under management, and quality of life for beef cattle grazing managers and their communities; Identify training and learning opportunities desired by graziers to enhance their skills, knowledge, and expertise in researching and developing innovative, locally-adapted technologies, management techniques, and marketing options. I will adapt and apply the Sustainable Decisions Tool (Lengnick and Kask, 2009) to include elements of Holistic Management (Savory, 1999) and agroecosystems research in order to accomplish the project primary objectives. The research will be completed using qualitative and quantitative analytical techniques from 2011 to 2014.
FARMERS SITTING ON MONEY: MEASURING MARKET POTENTIAL OF ECOLOGICAL SERVICES IN THE GEORGIA PIEDMONT

Kathleen Frey and Carl F. Jordan
Odum School of Ecology, University of Georgia, Athens, GA

The purpose of this thesis is to examine ecological services provided by a selected number of Southeastern small farms while assigning value to these functions. Current economic markets reward small growers based on produce and/or livestock sold to consumers. Farm and fringe land provides the public with equally valuable products, including water purification, biological control, and pollination, that often go unrecognized on balance sheets. This thesis will examine a 100-acre bio-diverse working farm and conservation area in Athens, Georgia. The research experiment will compare actual income from produce and livestock to unrealized income provided by ecological services on uncultivated land. As interest in ecosystem services grows among economists and ecologists, there will be a greater demand of knowledge of the services provided in a particular locale and how to assign monetary value to those.

DOLPHINS AS SENTINEL ANIMALS OF OCEANS AND HUMAN HEALTH: SURVEYING CARRIAGE OF HUMAN ENTERIC PATHOGENS USING MOLECULAR TECHNIQUES

J. Carrie Futch¹, Greg Bossart², Patricia A. Fair³, Wayne McFee³, Jan Moore³, James Powell³, Jan Vinje⁴, Laura Webster³, Erin K. Lipp¹

¹University of Georgia, Athens, GA
²University of Miami, Miami, FL and Georgia Aquarium, Atlanta, GA
³Coastal Environmental Health and Biomedical Research, Charleston, SC
⁴Centers for Disease Control and Prevention, Atlanta, GA

Marine mammals are charismatic organisms that elicit strong interest among the public. Additionally, these organisms often share their habitat with humans in both polluted and pristine coastal waters. I examined Atlantic bottlenose dolphins as a possible sentinel species for human risk associated with bacterial and viral pathogens. Forty-four solid fecal samples and 36 fecal swabs were obtained from dolphins in and around coastal South Carolina and the Indian River Lagoon, FL between 2005 and 2009. All samples were screened for a range of microbial indicators and human enteric pathogens. Fresh samples (N = 4) were processed for fecal coliform bacteria, enterococci, Vibrio spp. and Salmonella spp. using traditional culture based techniques. All samples (N = 80), were analyzed for human adenoviruses, noroviruses, and enteroviruses via real time (RT) PCR, bacterial pathogens using conventional PCR, and novel caliciviruses using conventional RT-PCR. Among the fresh samples, indicator levels for enterococci ranged from none to too numerous to count and Vibrio spp. were detected in 50% of samples. Among the viruses, 23% of all samples were positive for calicivirus, no samples were positive for human adenovirus, 5% of solids were positive for human enterovirus (by conventional RT-PCR), and 3% of all samples were positive for human norovirus genogroup I. 53% of all samples were positive for Campylobacter, but no samples were positive for Salmonella. These results suggest that dolphins are exposed to human enteric pathogens in polluted water and can act as carriers of potential human pathogens.
CARBON BIOAVAILABILITY ALONG GROUNDWATER FLOW PATHS WITHIN AN ALLUVIAL FLOODPLAIN

Ashley M. Helton\textsuperscript{1}, Meredith S. Wright\textsuperscript{2}, Geoffrey C. Poole\textsuperscript{3}, Emily S. Bernhardt\textsuperscript{4}, and Jack A. Stanford\textsuperscript{2}

\textsuperscript{1}Odum School of Ecology, University of Georgia, Athens, GA
\textsuperscript{2}Flathead Lake Biological Station, University of Montana, Polson, MT
\textsuperscript{3}Department of Land Resources and Environmental Sciences, Montana State University, Bozeman, MT
\textsuperscript{4}Biology Department, Duke University, Durham, NC

The supply and availability of dissolved organic carbon (DOC) and its interactions with nutrients affects ecosystem processes, such as respiration, nutrient retention, and nutrient export. However, little is known about drivers of carbon bioavailability within aquatic ecosystems. We sampled surface and well water from the main channel and alluvial aquifer of the Nyack Floodplain of the Middle Fork Flathead River in northwestern Montana monthly from May, 2008 to October, 2009. We measured DOC and nutrient concentrations, along with dissolved oxygen, specific conductance, pH, temperature, and radon concentration (a surrogate for groundwater residence time (GWRT)). In the laboratory, we conducted aerobic nutrient-amended incubations of water samples and measured two metrics for DOC bioavailability (bDOC): CO\textsubscript{2} production and DOC depletion. bDOC typically increased with GWRT, suggesting autochthonous DOC production along groundwater flow paths. GWRT was also a good predictor of electron acceptor availability (dissolved oxygen, nitrate and sulfate concentrations), but their relationships changed throughout the year. This research suggests that electron donors and acceptors vary predictably along flow paths within the aquifer, but that the aquifer is a temporally dynamic mosaic of biogeochemical reactions that creates variable patterns of ecosystem respiration, nutrient retention, and export across seasons.

AMOUNT OF MAMMALIAN BIODIVERSITY TO BE LOST WITH THREATENED SPECIES: BAD LOCATION OR BAD LUCK?

Shan Huang and John Gittleman
Odum School of Ecology, University of Georgia, Athens, GA

21\% of the terrestrial mammal species with adequate data have been recognized as threatened by IUCN in 2008, occurring in approximately 76\% of global land areas. If current extinction risk is a result of phylogenetic clumping factors, the amount of evolutionary history, indicating the diversity of existing species, to be lost with threatened species is expected to be higher than that under a random extinction scenario. The extinction of current threatened species would wipe out 14\% of the mammalian phylogenetic diversity (PD), which falls in the 95\% interval of PD to be lost under a globally random extinction model. However, when we assessed the risk of losing PD geographically, 17\% land area, mostly tropical and subtropical moist forests, showed potential PD losses higher than expected under a locally random extinction scenario. Such areas also showed low PD relative to their species richness, indicating coexistence of groups of closely related species as an explanation for high PD loss. Because low relative PD also indicates fast diversification, these areas have the potential to become cradles for future biodiversity. These results suggest an urgent need of prioritizing these areas in biodiversity conservation.
DOES THE SPECIES COMPOSITION OF SYMBIOTIC MICROBIAL COMMUNITIES FOR CORALS AND SPONGES CHANGE WITH TIME AND SPACE?

Jessica Joyner¹, Erin Lipp², Bill Fitt¹
1. Odum School of Ecology, University of Georgia, Athens GA
2. Environmental Health Science, University of Georgia, Athens, GA

Microbial communities are complex and are not fully understood. Corals and sponges characteristically have symbiotic microbes that they depend on for defense or nutrients. This symbiosis is uniquely complex and it has been proposed that sponges and corals cannot be studied without accounting for their symbionts, the ‘holobiont’ concept. Therefore, this holobiont concept will be the foundation for studying the natural variability of the microbial communities in the context of the symbiosis. These microbial communities could be different as distance increases between sampling sites and/or with changing seasons. Combining field samples for temporal variability and seasonal variability will allow a more holistic view of the holobiont and the roles of the microbial communities. Variability will initially be measured as the presence and abundance of bacterial genera and in some cases the species diversity within genera. It is predicted that similar times in the year will have similar symbiotic communities across years, but be different from symbiotic communities of different times in the same year. Individuals of the same species of coral or sponge will show less variation when individuals are in close proximity than individuals of different reefs. This study will greatly contribute to the field of environmental microbiology and coral reef ecology. The results will be necessary for making predictions of future changes in symbiont microbes due to environmental stress (i.e., pollution and climate change) and management practices.

EFFECTS OF FOREST FRAGMENTATION ON SYMBIOSIS AND POPULATION GENETICS OF EPiphytic ORCHIDS AND BROMELIADS IN MONTEVERDE, COSTA RICA

Tyler Kartzinel¹, Richard Shefferson¹, and Dorset Trapnell²
¹Odum School of Ecology, University of Georgia, Athens, GA
²Department of Plant Biology, University of Georgia, Athens, GA

Deforestation imperils biodiversity by degrading and isolating habitats. The impact of habitat degradation and fragmentation on tropical epiphytes, like canopy-dwelling orchids and bromeliads, is poorly known despite the foundational role of epiphytes in tropical forest canopies. Predicting how populations respond to habitat fragmentation requires knowledge of gene flow and the availability of sites for seedling establishment. This research asks: how do dispersal and establishment influence plant colonization in fragmented habitats? Habitat fragmentation affects both seed dispersal and the distribution of symbiotic mycorrhizal fungi. Increasingly, mycorrhizal fungi are known to affect plant persistence by influencing the distribution of sites for seedling establishment. As forests disappear, understanding how seed dispersal and mycorrhizal fungi interactively control patterns of plant colonization is fundamental to preserving biodiversity. We expect: (1) Mycorrhizal associations are highly specialized, reducing availability of sites for plant colonization in disturbed habitats; (2) Spatially limited seed dispersal produces high levels of geographic genetic structure in fragmented relative to undisturbed habitat. If plants rely on specific mycorrhizal partners, as expected for orchids, then absence of a fungus from disturbed areas could limit colonization more significantly than seed dispersal. Otherwise, as is expected for bromeliads, dispersal is likely to strongly limit to colonization. Preliminary data are consistent with such expectations.
FUNCTIONAL AND GENETIC DIFFERENCES IN CORAL-ALGAL SYMBIOSIS DURING A CORAL BLEACHING EVENT IN PUERTO MORELOS, MEXICO.

Dustin W. Kemp¹, Gregory W. Schmidt², William K. Fitt¹
¹ Odum School of Ecology, University of Georgia, Georgia, USA
² Department of Plant Biology, University of Georgia, Georgia, USA

Coral bleaching occurs when the symbiosis between coral and their endosymbiotic algae (Symbiodinium spp.) is disrupted. During a span of four years (2005 – 2009) two massive coral bleaching events were documented in Puerto Morelos, Mexico. Five dominant reef building coral species (Montastraea faveolata, M. annularis, Porites astreoides, Agaricia agaricites, A. tenuifolia) were sampled 3 times a year to investigate how reef building coral and their symbiotic algae were affected by these events. During bleaching events all coral showed expected decrease in symbiont density and chlorophyll a. P. astreoides were least affected by the bleaching events and retained the highest maximum quantum efficiency of photosystem II (Fv/Fm). P. astreoides have homogenous populations of Symbiodinium clade A which is known to have enhanced photoprotection pathways resulting in higher resilience to coral bleaching. Conversely, all other sampled corals were found to host Symbiodinium from clades B and C with the exception of M. faveolata which had mixed populations of Symbiodinium from clades A, B, and C. During bleaching episodes portions of M. faveolata colonies were found to be less affected by bleaching and retained pigmentation and higher symbionts densities. Further investigation revealed that these areas had populations of Symbiodinium clade A and were more resilient to bleaching than adjacent areas with Symbiodinium clade B or C.

TROPICAL TREE SEEDLINGS’ RESPONSE TO CLIMATE CHANGE

Shafkat Khan and Jacqueline Mohan,
Odum School of Ecology, University of Georgia, Athens GA

Tropical forests are projected to go through profound changes in plant species composition because of anthropogenic climate change. Species are projected to migrate along environmental gradients, assuming that tropical species are only able to survive and grow in a narrow environmental window. This basic assumption has not been examined extensively: especially whether and how species will adapt to warmer conditions remains poorly understood. I will present an ongoing reciprocal transplant (common garden) experiment that examines response of juvenile high, mid and low elevation tree species response to changes in climate variables (temperature, soil moisture, solar radiation and total precipitation) in Southwestern Costa Rica. I will also present first season data of seedling growth and mortality fresh from the field.
GLOBAL WARMING AND FOREST INSECT HERBIVORY

Fern R. Lehman and Jacqueline E. Mohan
Odum School of Ecology, University of Georgia, Athens, GA

In a warmer and CO₂ enriched world insect herbivory is predicted to increase, induced indirectly via changes in foliar quality (carbon:nitrogen) and directly via changes in insect and plant community composition. Yet this has rarely been tested in the field. Because plants provide carbon and nutrients for higher trophic levels, changes in plant community composition and physiology will have significant implications for insect herbivores. Insect prefer nitrogen rich plants, the availability of which depends on soil biological activity. Warming studies found higher foliar N (low C:N) concentrations under elevated temperatures and increased herbivory. Insect populations have also responded strongly to foliar phosphorus (C:P) concentrations. I will measure insect herbivory and foliar quality (C:N, C:P) on tree seedlings growing in warming chambers and survey insects at Whitehall Forest (GA) and Harvard Forest (MA). I will also conduct lab controlled feeding trials on warmed leaves. My proposed study will advance knowledge of the response of plant-animal interactions to global warming and will be the first of its kind to warm both the soil and the air. My laboratory colleagues will also be assessing soil N and P biogeochemistry responses to warming, as well as tree demographic and phenological response. This data will be available to me for integrative modeling of in situ warming impacts on herbivory.

DIRECTED EVOLUTION: “WHAT YOU FORSEE MAY NOT BE WHAT YOU GET”

Kenneth E. Leonard
Odum School of Ecology, University of Georgia, Athens, GA

In ecology we often encounter or construct regimes where it appears that a single interaction, ratio or supply is the dominant factor limiting the growth of a population. In evolutionary terms, then, we commonly assume that the most likely sequence of mutation, selection and evolution will be one which does the most to “directly” relieve the limiting interaction, ratio or supply. We expect that a population will not grow faster or larger (have greater fitness) until it has evolved to better escape predator X (interaction), to tolerate new soil pH Y (ratio), or to use less resource Z (supply) to produce a kilogram of new biomass. We tend to expect very simple “directed evolution” while ignoring genetic background and contingency—limitations of “what can happen” by “what there is to work with” and “where there is room to move”. In my current work with evolution in Saccharomyces cerevisiae I have found one lineage which confounded the intended directed evolution, escaped the experimental constraints, and evolved in three directions—at the same time or in very close succession—to a single terminal population. It is as if the beam of a flashlight spread to the usual pattern but zigged then zagged then zogged, in mid-flight, to illuminate somewhere at a sharp angle from where it was pointed. I present some unexpected data and a few intriguing hypotheses of how it came to be.
THE CONSEQUENCES OF CLIMATE CHANGE-DRIVEN SOIL WARMING ON BIOGEOCHEMICAL PROCESSES IN A SOUTHEASTERN PIEDMONT FOREST: HOW WILL CARBON AND NITROGEN DYNAMICS CHANGE?

Megan Machmuller and Jacqueline Mohan
Odum School of Ecology, University of Georgia, Athens, GA

Exchange of carbon dioxide from soils to the atmosphere is one of the largest fluxes in the global carbon cycle and is significantly higher than the release of carbon dioxide from anthropogenic activities. Warming trends associated with climate change have the potential to increase this flux, thus affecting the carbon storage capacity of the terrestrial biosphere. Ultimately this could lead to a positive feedback that would exacerbate projected future warming trends. Previous climate warming studies have all been conducted on nutrient rich soils with relatively abundant organic matter, and not on low-organic matter ancient clay Ultisol and Oxisol soils that typify much of the lower-latitude zones of the world (ie; southeastern U.S. Piedmont, subtropics and tropics). In this study I plan to investigate the biogeochemical responses to warming in a southern Piedmont region of Georgia (Whitehall Forest) and compare these results to other sites along a natural climate gradient using the same experimental warming design (Duke Forest, NC and Harvard Forest, MA). I will gain insight into how temperature, as well as temperature-by-site interactions, impact soil carbon and nitrogen dynamics. The results of this experiment will improve our predictions for regions of the terrestrial biosphere that are responsible for a significant portion of global carbon and nitrogen cycling.

POTENTIAL EFFECTS OF CLIMATE CHANGE ON THE DISTRIBUTION AND ABUNDANCE OF AN INVASIVE BIVALVE

William G. McDowell and James E. Byers
Odum School of Ecology, University of Georgia, Athens, GA

Increases in temperature and alterations of precipitation frequency and intensity are predicted throughout the southeastern United States over the next 50 years. Coupled with these climate changes is an increase in population and water demand. I propose to examine how global climate change and the human responses to it will affect the distribution and abundance of the invasive Asian clam, Corbicula fluminea. I propose a series of experiments and observational studies to determine: 1) how will increased temperatures and altered flow regimes alter the timing and frequency of Corbicula die offs in unimpounded rivers? 2) what is the role of reservoirs in the dispersal and maintenance of Corbicula fluminea populations in southeastern streams and rivers? 3) how will the alteration of the flow in streams and rivers due to impoundments and withdrawals affect downstream Corbicula populations?
BLACKWATER RIVER DISSOLVED ORGANIC CARBON DYNAMICS AS AFFECTED BY RAINFALL PATTERNS

Andrew Mehring, Richard Lowrance, Ashley Helton, George Vellidis, Catherine Pringle
1 Odum School of Ecology, University of Georgia, Athens, GA
2 USDA-ARS Southeast Watershed Research Laboratory, Tifton, GA
3 Department of Biological and Agricultural Engineering, University of Georgia, Tifton, GA

Dissolved organic carbon (DOC) transport is one of the largest carbon fluxes in oxygen-poor blackwater rivers, but predicting its effects on oxygen availability is not straightforward. Although total DOC concentrations are used in models predicting oxygen availability, some fractions of DOC pools have limited bioavailability, and are not readily utilized by oxygen-consuming bacteria. DOC concentrations also vary temporally, and may be affected by patterns of rainfall. We hypothesize that (1) the magnitude and (2) bioavailability of DOC will be highest immediately following droughts, due to stocks of labile carbon that accumulate through decreased microbial activity under dry conditions. This stored pool may be released suddenly from dry organic matter when river channels refill. We combine long-term data from the Little River Experimental Watershed (LREW) in southern Georgia with laboratory tests of bioavailability, and describe a method for pinpointing DOC fluxes that are higher or lower than predicted by stream flow alone. Data analyzed to date indicate relatively high bioavailability, fluctuating between 10-30% utilized by bacteria over 7 days. DOC bioavailability is not highest immediately after dry periods as hypothesized. Concentrations, however, peak after dry periods each year. Incorporation of predictable seasonal trends in DOC concentration could enhance the accuracy of oxygen models.

NORTHERN CHTHALUS SOUTHWARDORUM AND THE CENTRAL AMERICAN GAP: DELIMITING CRYPTIC SPECIES WITH MITOCHONDRIAL AND NUCLEAR DNA IN A RECENTLY DESCRIBED BARNACLE SPECIES

Meredith Meyers, Sabrina Pankey, and John Wares
1 Odum School of Ecology, University of Georgia, Athens, GA
2 Dept. of Genetics, University of Georgia, Athens, GA

To further explore genetic relationships in Chthamalid barnacles along the Tropical Eastern Pacific (TEP), we investigated the hypothesis that the newly described barnacle species C. southwardorum (Pitombo and Burton 2007), actually consists of two or more genetically distinct populations. We used traditional phylogenetic analyses on two mitochondrial (16S and CO1) and three nuclear (NAKAS, LTRS, EF1) loci on specimens collected throughout the reported range of C. southwardorum. We show strong support for species-level divergence in the mitochondrial loci; however polyphyletic nuclear data demonstrates some degree of introgression or incomplete lineage sorting. Geographic separation of the divergent populations along the TEP coastline suggests allopatric speciation, with the geographic break matching species divergences in other marine taxa. Furthermore, we applied coalescent based analytical methods to our multi-locus dataset to estimate demographic parameters, including splitting time.
LATITUDINAL DIFFERENCES IN BREEDING SEASON FOR TWO SPECIES OF SMALL MAMMALS

Nathan L. Pratt and Gary W. Barrett
Odum School of Ecology, University of Georgia, Athens, GA

Latitudinal variation in reproductive patterns for numerous small mammal species related to litter size has been well documented; however, the relationship between latitude and breeding season has been largely overlooked. The white-footed mouse (*Peromyscus leucopus*) and the golden mouse (*Ochrotomys nuttalli*) are fairly ubiquitous species distributed across most of the Eastern United States. There appears to exist a maximum period of reproduction during winter for southern populations for these two species, in contrast to a maximum period of reproduction during summer for northern populations. The influence of climate change is likely to increase mean temperatures across the Eastern United States, which may influence the breeding patterns of golden mice and white-footed mice, as well as other small mammal species. If seasonal cues for reproduction are altered, northern and southern populations of small mammals may experience changes in reproductive success, especially if biological factors such as predation and parasitism are exacerbated. Our primary aim in this research is to: 1) elucidate intraspecific differences in breeding season for these two small mammals; 2) establish a thermal gradient in the Southeastern United States based on mean annual temperature where the breeding season shifts from summer to winter; and 3) provide possible explanations for this shift based on abiotic and biotic variations at differing latitudes.

LINKING FEEDBACKS ON ECOSYSTEM ENGINEERS TO ECOSYSTEM FUNCTIONING

Virginia G. W. Schutte and James E. Byers
Odum School of Ecology, University of Georgia, Athens, GA

Ecosystem engineers shape the environment and its resources and are inherently important to ecosystem function and community structure. Despite their importance, our knowledge of the interactions between engineers and the organisms that live in the environment they create is asymmetrical. Many studies have examined how engineers affect their attendant communities, but little is known about the potentially broad ramifications of feedbacks to engineers. Understanding how the effects of feedbacks propagate throughout an ecosystem is essential to creating effective management strategies and assessing mechanistic controls on ecosystem health. Mangroves are ideal for exploring the reciprocal relationships that engineers have with the communities they foster. The red mangrove, *Rhizophora mangle*, fringes coastlines and mangrove islands in the Caribbean, where it filters coastal waters, harbors a number of commercially important species, and provides the structural basis for a unique marine habitat. *R. mangle* is nitrogen limited but can obtain inorganic nitrogen from *Tedania ignis* and *Haliclona implexiformis*, sponges that foul the subtidal portions of its prop roots, while the sponge obtains carbon from the tree. Individuals of both species have higher growth rates when this mutualism occurs. In summer 2009 I performed an experiment to elucidate the conditions under which this mutualism is beneficial to sponges and for my dissertation work I plan to study how this mutualism may enhance the consequences of feedbacks to *R. mangle* in nutrient polluted waters.
Humans modify their environment in many ways, but two of the most important currently for ecological sustainability are anthropogenic climate change and human land use. While the theoretical implications of these modifications have been delineated, the theories still need to be tested with field experiments. We are working to establish an experimental research site to study regional climate change and land use in the Rio Tempisque Basin, Costa Rica. Within this context, I am proposing a study of amphibian assemblages within contrasting land use types: the Palo Verde Ramsar marsh, conventional rice farms and organic rice farms. I will use open and closed mark-recapture techniques to study survivorship over time. All captured individuals will be measured, sexed, and have blood samples and cloacal swabs taken, which will allow me to monitor disease and parasite incidence. I will also examine the amphibians for common morphological abnormalities which may result from developmental stress in polluted environments. I expect to find a higher occurrence of morphological abnormalities, a higher disease and parasite burden, and lower survivorship in rice fields than in the pristine wetlands, with organic rice farming being an intermediate habitat quality.

THE DIRECT AND INDIRECT EFFECTS OF THE RED IMPORTED FIRE ANT (SOLENOPSIS INVICTA) ON SEED FATE IN THE LONGLEAF PINE ECOSYSTEM

Margaret Shearin¹,², L. Katherine Kirkman², and C. Ronald Carroll¹
¹ Odum School of Ecology, University of Georgia, Athens, GA
² Joseph W. Jones Ecological Research Center at Ichauway, GA

Biological invasions disrupt the natural relationships of native communities in numerous ways. Solenopsis invicta (the red imported fire ant) is a well-known invasive of the southeast United States. Negative impacts to human health, agriculture, and wildlife are widely recognized and are attributed to its extensive range, abundance, and aggressiveness. However, the impacts of this invasive ant species on native plant communities are less well understood, partially because the impacts are usually coupled with human disturbance. The longleaf pine ecosystem is one of the few native communities that has been successfully invaded by S. invicta. These invaders may affect the relationship between ants and plants directly through seed collection, or indirectly though impacts on the native ant community. My thesis research will examine impacts of S. invicta on the plant community in a natural longleaf pine ecosystem using descriptive and experimental approaches. The objectives are to: 1) determine the fate of seeds once they are collected by S. invicta, 2) compare ant species composition in previously disturbed and undisturbed ground cover in natural longleaf pine stands, and 3) quantify the initial change in the arthropod community and the impacts on seed removal due to disturbance by timber harvesting activities.
ORAL PRESENTATIONS

THE IMPACT OF SUBMERGED AQUATIC VEGETATION ON CARBON DYNAMICS AND DOC BIOAVAILABILITY IN A SOUTHEASTERN RESERVOIR

Stephen D. Shivers¹,², Stephen P. Opsahl¹, and Alan P. Covich²
¹ Joseph W. Jones Ecological Research Center, Newton, GA
² Institute of Ecology, Odum School of Ecology, University of Georgia, Athens, GA

Although inland freshwater ecosystems comprise a small proportion of the Earth, they make significant contributions to the global carbon cycle. With an estimated global surface area of 1.5 million km², reservoirs could potentially play a crucial role in the biogeochemical cycling of carbon. The inputs of carbon to reservoirs are not only from riverine and atmospheric sources, but also from submerged aquatic vegetation (SAV) within the reservoir. We performed diurnal (24 hour) sampling within a dense stand of Hydrilla verticillata on Lake Seminole in order to study the effects of SAV on carbon dynamics and bioavailability. Preliminary analysis shows large fluxes of DOC with the greatest differences occurring in surface waters and near the sediment during periods of high primary productivity. Oxygen consumption was measured using BOD bottles every six hours at three depths to assess carbon bioavailability. Nutrient amendments were added to a subset of BOD bottles to evaluate nutrient limitation of microbial communities. Preliminary results indicate C limitation at all depths and PO₄ co-limitation at lower depths. Because Lake Seminole is the last impoundment before the Apalachicola River flows into the Gulf of Mexico, changes that occur within the lake will have influences downstream.

AMPLIFICATION OF SEASONAL ACIDIFICATION IN POORLY-BUFFERED NEOTROPICAL STREAMS FOLLOWING AN HISTORICALLY LARGE EL NIÑO-SOUTHERN OSCILLATION EVENT

Gaston E. Small¹, Marcelo Ardón², Alan P. Jackman³, John H. Duff³, Frank J. Triska³, Alonso Ramírez⁴, Marcía Snyder¹, and Catherine M. Pringle¹
¹ Odum School of Ecology, University of Georgia, Athens, GA
² Biology Department, Duke University, Durham, NC
³ Water Resources Division, U.S. Geological Survey, Menlo Park, CA
⁴ Institute for Tropical Ecosystem Studies, University of Puerto Rico, San Juan, Puerto Rico.

Acidification of freshwater ecosystems can have harmful biological effects, and the causes and effects of anthropogenic acidification have been well-documented. Effects of seasonality and climate change on natural acidification events have received less attention. In this study, we analyzed a twelve-year dataset of monthly pH measurements collected from streams at La Selva Biological Station, Costa Rica, that are solute-rich (well-buffered) or solute-poor (poorly-buffered) depending on whether they receive inputs of geothermally-derived groundwater. During the wet season of 1998, which followed an historically large El Niño-Southern Oscillation event, pH in six poorly-buffered streams dropped from 5.5 to 4.0 for seven months. Evidence supports our hypothesis that this prolonged acidification event was an amplification of normal seasonal trends, largely due to increases in dissolved carbon dioxide. We hypothesize that low precipitation totals during the 1998 dry season resulted in an increased supply of labile organic carbon in the soil, which resulted in increased soil respiration when the wet season commenced. Based on predicted changes in inter- and intra-annual variation in rainfall for the tropics, we predict increased magnitude of seasonal acidification in unbuffered, solute-poor Neotropical streams, with potentially important biological implications.
INVESTIGATING THE EFFECTS OF URBAN LAND USE ON ECOSYSTEM STRUCTURE AND FUNCTION IN THE UPPER OCONEE WATERSHED

Jessica L. Sterling and Amy D. Rosemond
Odum School of Ecology, University of Georgia, Athens, GA

As land is converted from forested and agricultural uses to urban and suburban uses, it is important to conduct studies that examine the ecosystem-level responses to urbanization in small streams. When examining the effects of land use on stream ecosystems, it is important to consider changes to both structure (e.g. biotic community composition) and function (e.g. organic matter processing, nutrient uptake). Effects of urbanization on ecological structure and function are difficult to predict because (1) there are often multiple stressors that act concurrently, and (2) different stressors can have opposing effects on any one variable. Thus, challenges in identifying how stream structure and function respond to urbanization include comparing established patterns in variables to a reference state and attempting to isolate important stressors. In this study, we examine both structure and function in urban, suburban and transitional watersheds in the upper Oconee River basin, Georgia, USA. The response variables used include macroinvertebrate biotic indicators, algal-dominated biofilms and carbon processing rates and associated heterotrophic microorganisms. Each response variable is predicted to respond to different suites of environmental stressors in different ways, thus yielding a comprehensive view of urbanization effects in these streams.

INDIRECT EFFECTS OF DAMS ON ECOSYSTEM PROCESSES: SHRIMP EXTIRPATIONS ALTER LEAF LITTER BREAKDOWN IN NEOTROPICAL STREAMS, PUERTO RICO

Pedro J. Torres and Catherine M. Pringle
Odum School of Ecology, University of Georgia, Athens, GA

Tropical island streams are characterized by a high number of migratory species that require access to the estuary in order to complete their life cycle. In Puerto Rico, the dominant native freshwater fauna is composed of migratory shrimps. The high density of dams in the island has shown to have a negative impact on the life cycles of shrimps and other migratory organism by blocking their migration pathways leading to extirpation of these populations in stream ecosystems above the dams. In this study we addressed the impact of these extirpations on stream ecosystem processes by means of leaf litter breakdown. We performed leaf decomposition experiments in both dammed(n=7) and undammed(n=7) streams across the island and hypothesized that leaf breakdown would be faster in undammed streams where the native macroconsumers are present. We also ran an in-situ macroconsumer exclusion experiment using an electric-exclusion technique in two of these sites to be able to directly relate changes in breakdown with changes in the macroconsumer community. Mean leaf breakdown rate of Cecropia schreberiana was higher in undammed streams (k=0.0257) compared to dammed streams(K=0.0117). Also, leaf decomposition was higher in the macroconsumer exclusion treatments of the in-situ experiment suggesting that their presence have a direct impact of leaf breakdown.
ATTACHMENT OF V. CHOLERAE TO AN ENVIRONMENTAL HOST – THE MARINE COPEPOD

Jeff W. Turner1, 2, Jason Westrich1, 2, Eric V. Stabb3, Erin K. Lipp2
1Odum School of Ecology, 2Department of Environmental Health Science and 3Department of Microbiology, University of Georgia, Athens, GA

Vibrio cholerae is an important human pathogen that persists in marine environments as a natural component of the microbial flora. The attachment of V. cholerae to biotic surfaces, such as the chitinous exoskeletons of copepods, is viewed as key to the seasonal prevalence of this pathogen. In a previous study, we showed that juvenile copepods were correlated with the prevalence of V. cholerae in natural plankton samples, whereas adult copepods showed no correlation. To observe the attachment of V. cholerae to the marine copepod (Tigriopus californicus), in situ, we have transferred a gfp plasmid into a V. cholerae strain (ATCC 39315) by triparental mating using E. coli donor strain DH5α(pKV111) (gfp Cm') and the E. coli conjugative helper strain cc118λpir(pEVS104) (tra trb Kn'). We have shown that the gfp plasmid was retained by more than 90% of cells following 30 generations of growth on non-selective media. In a series of microcosms, adult and juvenile life stages of Tigriopus californicus will be infected with GFP-expressing V. cholerae. We hypothesize that adult copepods, having attained a terminal molt and a wax epicuticle, exude less available chitin and are therefore not colonized as heavily compared to juvenile copepods, which are continuously molting.

WAVELET ANALYSIS OF MONTANE VOLE POPULATION CYCLES

Jamie C. Winternitz
Odum School of Ecology, University of Georgia, Athens, GA

Understanding and explaining multi-annual population cycles have been a central issue of ecology since Elton’s classic works. Not only do population cycles provide insight into mechanisms that influence population dynamics (e.g. density dependent and delayed-density dependent effects), but they are ecologically important for the pulses of resources they contribute to the greater ecosystem. Of special concern is the recent observation that during the past two decades population cycles in multiple species (voles, grouse, and insects) have been fading out in Europe, possibly due to climate effects. A first step in understanding the interacting factors affecting animal population cycles is to determine if populations are indeed, cyclic. By using wavelet analysis, an old concept newly gaining popularity for ecological time-series, I first determine if evidence from multiple short (9-18 year) time-series supports that North American montane voles (Microtus montanus) cycle with a period of three years. I then compare the results of wavelet analysis with results from more traditional nonlinear time series modeling. While both sets of analyses provide support for three year population cycles, wavelet analysis tends to perform better for short time series. Overall, there is a need for longer time-series for North American voles to assess the generality of the assumption that alpine voles cycle with three year periods.
Current conceptual models of the factors affecting community structure in temporary wetlands suggest that structure is driven both by environmental constraints and biotic interactions. This relationship is most often portrayed as a predation-permanence gradient in which the two most important factors are predation and hydroperiod. This concept states that environmental constraints on life history are greatest in short hydroperiod wetlands and decrease in importance as wetlands become more permanent. Conversely, predation is most important in long hydroperiod wetlands and becomes less of a factor as wetlands become more ephemeral. While the importance of predation in temporary wetlands has been tested experimentally, support for the importance of hydroperiod is largely correlative. Therefore, we propose a field mesocosm experiment to experimentally test the importance of predation and hydroperiod within a community of microcrustacean zooplankton. In addition, we will test the hypothesis that species diversity will be greater at some intermediate point on the predation-permanence gradient due to a lessoning of environmental stress and predation pressure.
REGIONAL DIFFERENCES IN THE ASSOCIATION BETWEEN LAND COVER AND WEST NILE VIRUS INCIDENCE IN HUMANS

Sarah Bowden, Krisztian Magori, and John Drake
Odum School of Ecology, University of Georgia, Athens, GA

West Nile virus (WNV) is generally considered to be an urban disease, but studies associating land cover and WNV incidence in humans, birds, wild mammals, and mosquitoes report varying and sometimes contradictory results at an array of spatial extents. We analyzed data on the incidence of WNV in humans to obtain a comprehensive picture of how transmission activity and land cover type are associated across the U.S. We found that WNV incidence in Northeastern regions was positively associated with urban land cover, while incidence in the Western U.S. was positively associated with agricultural land covers (grassland and crops). We suggest that one possible mechanism underlying these regional associations is the difference in the habitat preferences of the prominent WNV vector in these areas: Culex pipiens in the Northeast and Culex tarsalis in the Western U.S.

INTRODUCING A NEW METHOD TO COWEETA LTER SYNOPTIC SAMPLING: ARTIFACT-BASED BEHAVIORAL INDICATORS OF HUMAN ACTIVITY

Stenka Vulova, Sakura Evans¹, and Ted Gragson²
¹Department of Anthropology, University of Georgia, Athens, GA
²Odum School of Ecology, University of Georgia, Athens, GA

The Long Term Ecological Research (LTER) program consists of 26 sites studying ecological processes over extended temporal and spatial scales. The Coweeta LTER specifically studies regional-scale watershed ecosystem processes in the southern Appalachian Mountains. Synoptic sampling, a bi-annual process of short-term sampling across large spatial scales, was recently started at the Coweeta LTER in order to assess the geomorphic, biotic, and chemical state of selected streams within the Little Tennessee River watershed. We used a social science sampling method in the Synoptic Sampling event during the summer of 2009 to record human land use and impact near streams. We took note of behavioral indicators of human activity centering on water, recording observations of physical evidence of land use 5 m apart along 100m transects. Data recorded was placed in ten categories (Road, Bridge, Residential, Structures, Features, Agriculture, Animals, Artifacts, Riparian Vegetation, and Riparian Zone Treatment) with corresponding subcategories. The data was analyzed using the textual analysis software MaxQDA. Using this software, content analysis was performed on the site descriptions, producing a short list of terms for grouping data into clusters. These data clusters were used to create a dendrogram, illustrating relationships between different sites. This analysis helps to more fully characterize near-stream human behavioral impacts than does geomorphic, biotic or chemical information alone.
Nutrient enrichment due to anthropogenic activity causes significant damage to streams, altering nitrogen and phosphorus levels and threatening stream biodiversity. While many studies have examined nutrient enrichment on autotrophic streams, less research has explored the effects of nutrient enrichment on heterotrophic streams. This study compared the effects of nutrient enrichment on phosphorus and nitrogen content of basal resources between two adjacent, heterotrophic streams in Coweeta Hydrologic Laboratory in Macon Co., North Carolina. One of these streams received experimental nutrient enrichment while the other remained undisturbed. I found an average increase of P in seston samples between the reference and treatment streams of 70.27% The average change in P levels for leaf transects indicated an increase of 44% in the enriched stream. Regression analysis of N vs. P revealed a significant correlation (p=0.0123) between N and P of seston in the treatment stream. These results indicate that suspended particulate matter and leaf matter in streams are impacted by nutrient enrichment. Enrichment affects both the water quality and seasonal variability of freshwater ecosystems, suggesting that efficient water management practices are imperative to deter pollution in streams and sustain stream ecosystems.