BIO*DIVERSITY
Making Space for Difference in Environmental Science + Management
Cornell Department of Natural Resources
Graduate Student Association Annual Symposium
January 16 & 17, 2014
Mann Library Room 102
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Schedule

Thursday, January 16

8:30 Breakfast

9:00 Opening Remarks Benjamin Marcy-Quay & Catherine Sun, GSA Co-Presidents

9:10 Lincoln Larson, C. Cooper, R. Stedman, D. Decker
  Linking Nature-Based Recreation And Pro-Environmental Behavior In Rural Communities:
  Toward A Conservation-Recreation Model

9:30 Carrie Simon, B. Knuth
  Understanding Ecosystem-Based Management: A Content Analysis Of Publications In Select
  Environmental And Natural Resource Journals 1993-2013

9:50 Heidi Henrichs
  Limiting Bird Damage To Fruit Crops In New York: Damage Assessments And Potential
  Management Strategies For The Future

10:10 Annise Dobson, B. Blossey
  Prospects For Understory Plants In A Changing Landscape And A Changing Climate

10:30 Coffee Break

10:50 Benjamin Marcy-Quay, P. Sullivan, A. Alexiades
  Assessing Changes To New York’s Stream Trout Fishery

11:10 Alexander Alexiades, B. Marcy-Quay, P. Sullivan, K. Pollock
  Measurement Error In Catch Rate Estimation From Creel Surveys Using Complete And
  Incomplete Fishing Trips

11:30 Annie Scofield
  Comparative Analysis Of The Deep Chlorophyll Layer (DCL) Across The Great Lakes

11:50 Tom Daniel
  Brook Trout Population Dynamics in a Changing Climate

12:10 Lunch & Posters
  Michael Ashdown: Integration Of Hunting And Sterilization For Management Of Suburban
  Deer
  Amy Hetherington: Re-Engineering Oneida Lake: The Impacts Of Climate Change And New
  Invasive Species On The Dynamics Of Oneida Lake

1:00 Keynote Address Holmes Hummel, Senior Policy Advisor, U.S. Department of Energy
  Diversity in the Production of Knowledge and Diversity in Participation: Views on Environmental
  Science & Management from the Front Lines of Federal Energy & Climate Policy

2:00 Nirav Patel, R. Stedman
  The Effect Of Renewable Energy Education Programs On Attitudes Of Educators And Students
  Towards Renewable Energy Systems

2:20 Emily Pomeranz
  Redesigning Stakeholder Engagement Processes For Wildlife Management: NYS Citizen Task
  Forces And White-Tailed Deer

2:40 Coffee Break

3:00 Alexis Heinz
  Biophilia In Bradfield: An Examination Of Bradfield Hall And Innovative Renovations
3:20 Joseph Yavitt, E. Corteselli, A. Heinz
Plant Species Identity, Leaf Traits, And Leaf Decomposition Control Microbial Methanogenesis In A Forested Wetland Soil

3:40 Jeremy Dietrich
Invertebrates And Invasions: How Does Plant Origin, Invasion Gradient, And Litter Diversity Influence Aquatic Invertebrate Populations.

4:00 Binbin Wang
Distribution And Ecological Risk Assessment Of Heavy Metals In Sediments Of South River System Of Haihe River Watershed, China

Friday, January 17

8:30 Breakfast
9:00 Opening Remarks
9:10 Tim Fahey
The Role Of Intensive Sites In Advancing Ecological Research

9:30 Justin Proctor
An Artificial Nest-Box Approach To Uncovering The Biology And Life History Of The Golden Swallow In The Cordillera Central Of The Dominican Republic

9:50 Toby Holda
Sampling And 3D Distribution Of Mysid “Shrimps”

10:10 Yoke Lee Lee
Maliangin Sanctuary: A Model Marine Reserve For Enhancing Local Community’s Understanding Of The Importance Of Biodiversity Conservation

10:30 Coffee Break

10:50 Ellen George, M. Levine, L. Rudstam
Evidence Of Cisco Spawning In Chaumont Bay, Lake Ontario

11:10 Jaime Ortiz Pachar
Bio-Control or Bio-Politics? The Political Ecology of Invasive Species in the Galápagos Islands

11:30 James Burtis
Ticks And Earthworms: Can An Invasive Ecosystem Engineer Impact the Population Density Of Ixodes scapularis (Black-Legged Tick)?

11:50 Closing Remarks Daniel Decker, Department Chair
Abstracts
In Order of Presentation

Linking Nature-based Recreation and Pro-environmental Behavior in Rural Communities: Toward a Conservation-Recreation Model

Lincoln Larson, Caren B. Cooper, Richard C. Stedman, and Daniel J. Decker

Disintegration of rural communities due to emigration and other socio-ecological factors has negative impacts on economies, natural resources, and human well-being. Research suggests that efforts to conserve the health and viability of rural areas may ultimately depend on functional and emotional connections between local people and their environment. Outdoor recreation fosters many of these connections. Because nature-based recreation is a key component of life in many rural communities, recreation activities may help to cultivate participants’ sense of place and subsequent engagement in place-enhancing or pro-environmental behavior (local PEB). To empirically investigate hypothesized associates among nature-based recreation, place attachment, and local PEB, this study tested the Conservation-Recreation Model using a structural equation modeling approach. Data were collected in spring 2013 via surveys of landowners (n = 387), licensed hunters (n = 227), and avid birders (n = 646) across several rural counties in upstate New York. Results showed that participation in birding and hunting was a significant positive predictor of local PEB. This relationship was partially mediated by the effect of recreation participation on place attachment. Other factors associated with local PEB included age, gender, environmental self-efficacy, and community involvement.

Overall, this study provided evidence to support the Conservation-Recreation Model predicting engagement in local PEB. Findings could ultimately help managers and policy-makers understand the direct and indirect contributions of nature-based recreation to environmental conservation and quality of life in rural communities.

Understanding Ecosystem-Based Management: A Content Analysis of Publications in Select Environmental and Natural Resource Journals 1993-2013

Carrie Simon and Barbara Knuth

Ecosystem-based management (EBM) continues to be a ‘buzz’ word among state and federal agencies as a means to approach environmental management. However, the concept and meaning in practice may have changed over time as agencies and organizations gained more experience with the approach and researchers have devoted more attention to studying and debating its merits. The purpose of this content analysis is to gain a better understanding of how EBM has been defined over time, in what context it is most utilized and how the motivations and critiques towards using an EBM approach may have changed. The term “ecosystem-based management” was searched for in the abstracts of articles in three environmental and natural resource databases for years 1993-2013. The search yielded 1154 articles of which (n) were included in the analysis. The analysis focused on vital statistics of the articles (journal, impact factor, year of publication, number of citations) and analysis exploring how EBM is being defined, the reasons people choose to move towards an EBM approach, and critiques of the approach.
Limiting Bird Damage to Fruit Crops in New York: Damage Assessments and Potential Management Strategies for the Future

Heidi M. Henrichs

Fruit-crop losses due to birds are a longstanding and costly problem throughout the US. Although many deterrent techniques (e.g., acoustic scare tactics, netting, Mylar streamers, and chemical repellents) have been tested in the past, there is a lack of a systems approach to bird management. This project is part of a multi-region USDA study which integrates economic and consumer impacts, as well region-specific information and landscape-level effects on bird foraging behaviors. Our primary long-term goal is to provide fruit producers with cost-effective and environmentally-sustainable strategies for bird damage management, based on robust field testing and clearly identified costs and benefits. We have completed two seasons of field work in central New York State assessing bird damage through damage assessments and bird foraging observations in four crops: sweet cherries, blueberries, Honeycrisp apples, and Pinot Noir wine grapes. Damage assessments included exploration of edge effect and surrounding landscape types. Bird foraging behavior was studied through the use of point counts, as well as stationary and moving observation periods. In 2013, we pilot tested several deterrent techniques, including bird distress callers, hawk kites, and air dancers. Results from our first two years will be presented, but may have been confounded by severe frost damage to sweet cherry and apple harvest in 2012. In 2014, further experimental testing will focus on the use of air dancers as possible bird deterrents, as well as the promotion of American kestrel (Falco sparverius) nesting through the installation of nest boxes.

Prospects for Understory Plants in a Changing Landscape and a Changing Climate

Annise Dobson and Bernd Blossey

Determining the best conservation practices to maintain future biodiversity requires not only a detailed understanding of drivers of plant communities in their current range, but accurate predictions of how plants will respond to these drivers in the face of a changing climate. For example, a degraded forest understory with inhospitable growing conditions is limited in its ability to function as a dispersal corridor or ecological refuge for species affected by climate change. In our lab, we have shown that increased deer abundance and earthworm invasion negatively affect the survival, growth and reproduction of a wide range of understory species, and may mediate relationships between seedlings and other stressors such as rodents and insect herbivores. We are using a factorial design represented by a network of paired 50 x 50m fenced and open plots (N=10) along a gradient of deer browse intensity and presence/absence of earthworms to isolate distinct and culminate impacts of deer and earthworms on native understory plant communities. In the first year of the experiment, seedling survival of 11 of 15 species was negatively correlated with increasing earthworm biomass. We will be expanding the current design to include seedling transplant experiments to sites along a latitudinal gradient. To understand how species may respond to increased temperatures, genotypes native to Tompkins County will be planted at sites within the projected range of temperature shift in the next 25-50 years. We will also include plots along a northward gradient to determine the viability of ecological refuges at the edge of the current species range.
Assessing Changes to New York's Stream Trout Fishery

Benjamin Marcy-Quay, Alex Alexiades, Patrick Sullivan, and Cliff Kraft

Every year thousands of anglers flock to New York's 3,000+ miles of streams to catch a variety of native and introduced trout species. Stocking has long been used to support this interest, with the first records of brown and rainbow trout stocking dating back to the late 1800's. Since the 1980's the state has used a philosophy known as Catch Rate Oriented Trout Stocking (CROTS) to guide stocking and management decisions. A 30 year-old model, however, may no longer accurately represent the fishery it was created for. We undertook a three year research project to examine the current state of NY's stream trout fishery. Creel censuses were employed to assess angler behavior and success, while in-stream electrofishing gave estimates of population abundance and change. We found a number of differences from the rates and assumptions historically used in the stocking model. Most notably, angler effort levels were lower than previously thought and catch-and-release fishing was far more prevalent. By combining this information with maximum-likelihood estimation we were able to estimate new parameters for the model that better reflect the current state of the fishery.

Measurement error in Catch Rate Estimation from Creel Surveys Using Complete and Incomplete Fishing Trips

Alexander V. Alexiades, Benjamin Marcy-Quay, Patrick J. Sullivan, and Kenneth H. Pollock

Information on fishing effort, catch, harvest, and survival is critical for formulating management policies in freshwater fisheries and understanding the dynamics of aquatic ecosystems. Fisheries managers often use creel surveys to assess fisheries statistics parameters. The mean-of-ratios estimator is traditionally the accepted method for estimating catch rates from incomplete angler trips, while the ratio-of-means estimator is preferable for estimating catch rates from complete trips. Recent studies have demonstrated persistent bias when comparing the two estimators using catch data from incomplete and complete trips from the same sample of anglers and promoted the use of linear regression models to correct for apparent bias in catch rates based on incomplete trips. We contend that ordinary least squares linear regression is inappropriate to correct for this apparent bias because there is measurement error in both the response (e.g., catch rate estimated from complete trips) and explanatory (e.g., catch rate estimated from incomplete trips) variables, which underestimates the slope of the relationship. Alternatively, when both variables contain measurement error, model II regression methods provide less biased estimates. Despite the availability of several methods for dealing with error in variables, relatively few ecologists or fisheries managers account for this problem, instead relying on linear regression irrespective of potential measurement error. Using interview data (incomplete trips) from roving creel surveys collected by the New York Department of Environmental Conservation and a catch card survey (completed trips) conducted on the same sample of anglers, we compared catch rates derived from both estimators to show that linear regression underestimates the slope of the relationship and that model II regression reduces bias and performs better as a corrective model.
Comparative Analysis of the Deep Chlorophyll Layer (DCL) Across the Great Lakes

Annie Scofield

Deep chlorophyll layers (DCL’s) are important features during thermal stratification in large oligotrophic lakes. The presence of a DCL has been observed in all five of the North American Great Lakes, but its ecological significance is not well understood. Drivers of DCL formation and maintenance is variable across lakes and seasons, and further studies are required to better understand the dynamics of these potential productivity maxima. The Great Lakes National Program Office (GLNPO) of the United States Environmental Protection Agency (US EPA) has conducted targeted monitoring of the DCL during their bi-annual surveys starting in 1996. I am working with GLNPO researchers to better understand the ecological importance of the DCL across the Great Lakes, with a particular focus on Lake Ontario this year. Greater clarity in Lake Ontario in recent years has led to increased formation of the DCL and a vertical re-structuring of the food web. The shift in primary production from warm surface waters to cool deeper waters may have important implications for the bioenergetics of organisms using this food source, including zooplankton, mysids and fish. I will present the results of our 2013 monitoring efforts, focusing on the spatial distribution of the DCL. Better understanding the extent and strength of the DCL is a critical step in predicting the response of organisms such as native coregonids to the changing lake ecosystem.

Brook Trout Population Dynamics in a Changing Climate

Tom Daniel and Cliff Kraft

Brook trout (Salvelinus fontinalis) are a dominant fish in waters ranging from the Appalachian Mountains to the Arctic Circle. Although their highly variable life history has allowed them to colonize coldwater habitats in streams, lakes and coastal ocean waters, these popular sport fish face an uncertain fate in light of several climate change scenarios. Assessing the potential influence of variable temperature and hydrological regimes on brook trout populations poses an important challenge to fisheries biologists. For the past four years we have estimated brook trout population size and mortality in three Adirondack lakes with contrasting thermal conditions by conducting a robust design mark-recapture study. Each lake provides ample, minimal or no thermal refuge during the warm summer months due to differences in morphometry, landscape position and stratification. We expect to see reduced brook trout survivorship in lakes with little to no thermal stratification because lethal temperatures often occur throughout these lakes in mid-summer. We captured fish in gill net and trap net surveys in these and several other Adirondack lakes in an attempt to compare results from our labor-intensive robust design population estimates with less intense survey methods. By comparing the results of our robust design mark-recapture study with our gill net and trap net surveys, we also hope to evaluate the degree to which the latter, less intensive, methods accurately reflect brook trout population characteristics.
Integration of Hunting and Sterilization for Management of Suburban Deer

Michael Ashdown, Jason Boulanger, and Paul Curtis

Lethal control of overabundant white-tailed deer (*Odocoileus virginianus*) populations in suburban landscapes remains controversial; these management techniques are often impeded by public attitudes and safety concerns. We are implementing a combination of surgical sterilization and hunting to mitigate deer-related impacts on Cornell University lands near Ithaca, New York. University lands have been divided into a suburban core campus area (1,100 acres) and adjacent outlying areas that contain lands where deer hunting is permitted (~4,000 acres). During this 10-year study, surgical sterilization is the primary technique used to reduce deer abundance in the core campus zone; increased harvest of female deer is implemented in the hunting zone through an Earn-a-Buck program. During the first 6 years of this study, project staff spayed 94 female deer (~95% of all deer on campus); 59 adult does were marked with radio transmitters to monitor movements and survival. In addition, 26 control deer have been captured and radio-collared for a comparison of fawning rates and survival. Preliminary results suggest that the core campus deer population has been stabilized, but not reduced. Results from infrared-triggered camera surveys suggest a steady population of about 100 deer from 2009 to 2013. Since 2008, over 500 deer (69–165 each hunting season) have been harvested. In the hunting zone, deer populations will continue to be monitored using a deer sighting log and biological data collected at a mandatory deer check station. Browse surveys using sentinel red oak seedlings, and monitoring deer-vehicle accidents, will eventually help ascertain deer impacts in both zones.

Re-Engineering Oneida Lake: The Impacts of Climate Change and New Invasive Species on the Dynamics of Oneida Lake

Amy L. Hetherington, Alicia Zhao, Lars G. Rudstam, Rebecca L. Schneider, and Jonathan Hunn

As climate is changing, invasive species are also impacting the structure and function of inland waters. Predictions of the effects of climate change on lakes and reservoirs need to include the influence of new invasive species on the ecological interactions within bodies of water. The goal of this study was to understand the interactive impacts of climate change and invasive mussel species on phytoplankton in Oneida Lake, a 207 km$^2$ shallow, polymictic lake in Central New York, USA. Replicated, microcosm experiments were used to measure and compare filtration rates of zebra, *Dreissena polymorpha*, and quagga, *Dreissena rostriformis bugensis*, mussels at a range of temperatures from 2–30°C. A single species of algae, *Chlamydomonas reinhardii*, was used as the food source and feeding rates were measured as a change in fluorescence, translated to chlorophyll-a concentrations, over a 2 hour period. Preliminary experimental results indicated filtration rates of zebra and quagga mussels at different temperatures followed the same general pattern, peaking at 16°C with lower rates at higher and lower temperatures. However, filtration rates of zebra mussels consistently exceeded those of quagga mussels at all temperatures. Based on the results of this study, zebra mussels would be expected to dominate across current and predicted temperature regimes; however, other factors need to be considered due to the ubiquity of quagga mussels in numerous lakes worldwide.
Diversity in the Production of Knowledge and Diversity in Participation: Views on Environmental Science & Management from the Front Lines of Federal Energy & Climate Policy

Holmes Hummel, former Senior Policy Advisor, U.S. Department of Energy

Biography: Holmes Hummel served as the Senior Policy Advisor in the U.S. Department of Energy's policy office from 2009 to 2013. In that capacity, Dr. Hummel stewarded a wide range of policy deliberations related to clean energy finance, environmental regulation, grid reliability, natural gas resource development, trade policy, and implementation of the Recovery Act. Since departing the federal government in October, Dr. Hummel has devoted more attention to business innovators and public interest advocates who are charting a course to fossil freedom.

Prior to being appointed to the Obama Administration, Dr. Hummel served as a Congressional Science Fellow and subsequently offered courses on climate policy design for both professionals in the Silicon Valley as well as scholars at the University of California at Berkeley. Dr. Hummel is among the first graduates of the Interdisciplinary Program on Environment and Resources at Stanford University, earning a doctorate degree for research on scenarios for climate stabilization. In addition to receiving a Switzer Environmental Fellowship, the Environmental Leadership Program has recognized Dr. Hummel as a “visionary, action-oriented leader.”

The Effect of Renewable Energy Education programs on Attitudes of educators and students towards Renewable Energy Systems

Nirav S. Patel and Dr Richard C. Stedman

Concerns over global climate change, environmental degradation, and dwindling nonrenewable energy resources have prompted the need for an effective Renewable Energy Education (REE). The study evaluates attitudes of educators and their students towards Renewable Energy Systems (RES) across five states (DE, MD, NY, OH and PA). It specifically examines information and attitude-based factors that affect REE. The purpose of the current study was to determine whether the students of teachers trained in REE were more likely to pursue renewable energy education, compared to students of teachers who had not attended similar workshops. A survey tool was administered to two groups of students: 1) students of trained teachers, 2) students of untrained teachers. Preliminary results indicate that while workshop attendance influenced educator attitudes, such effects were not passed down to students. However, the students did show an increased interest in renewable energy education, if educators formalized it within their course(s) or if required it as a wider part of the curricula and standardized testing measures.

However, compared to other issues (e.g., hunger and poverty), students were less aware of issues related to renewable energy and climate change. The perception is that climate change is distant, and not an immediate concern, such as poverty and hunger. This suggests a dissonance that can only be addressed through an interdisciplinary curricula adoption of renewable energy.
Redesigning Stakeholder Engagement Processes for Wildlife Management: NYS Citizen Task Forces and White-Tailed Deer

Emily F. Pomeranz

Participatory approaches have become an increasingly popular tool for wildlife resource governance, as traditional expert models of management are questioned by the public as inflexible and considering only a narrow set of interests in the face of changing demographic and socioeconomic patterns. Although natural resource management agencies have turned towards participatory processes often organized at the local level, many have found these processes to be time consuming and resource intensive. This has created challenges, which may be exacerbated as agencies face changes in available budgetary or personnel resources, or as managerial and/or stakeholder needs change over time. Thus, circumstances may necessitate a redesign of existing participatory processes, potentially organized at a different spatial scale. While much research has focused on designing collaborative models for natural resource management, comparatively little has been written on redesigning an established process in order to accommodate changing needs. This presentation will explore these trends with respect to the New York State’s Department of Environmental Conservation’s (DEC) citizen task forces (CTFs), a stakeholder engagement process that has been used to help inform white-tailed deer management since 1992, which the DEC is seeking to redesign. Using both existing literature and semi-structured interviews with CTF facilitators, participants, and DEC managers, I will present a history of the CTFs, current concerns with its effectiveness and functionality, and explore my current thinking regarding benefits and detriments to successfully guiding a transition to a new participatory process while maintaining inclusivity, representation, and efficacy as valued by both managers and the public.

Biophilia in Bradfield: An Examination of Bradfield Hall and Innovative Renovations

Alexis Heinz

Ulrich Franzen designed Bradfield Hall in the brutalist style. It was constructed in 1968 to be energy efficient. Therefore, most laboratories and offices are windowless. Presently, Bradfield is considered an unpleasant working environment, making it more difficult for departments to attract talented faculty and staff to the building. Biophilic improvements – those involving natural design elements such as daylight and plants – and resultant financial, environmental, and educational benefits are discussed within the framework of the university’s stance on sustainability. Based on information gathered from site analysis, occupancy data, and faculty interviews, innovative renovations are suggested. The story is told in the context of the upcoming merge between departments in Bradfield Hall and Plant Science Building.
Plant Species Identity, Leaf Traits, and Leaf Decomposition Control Microbial Methanogenesis in a Forested Wetland Soil

Joseph B. Yavitt, Elizabeth Corteselli, Alexis Heinz

Because microorganisms are so obscure in soils, the growing body of knowledge that links above- and belowground communities has tremendous potential for using plant identity aboveground to better understand and predict rates of microbial activity belowground. For example, wetlands harbor methane-producing microorganisms and are well known sources of atmospheric methane, but we still have difficulty discerning which wetlands support larger or smaller rates of methane production, and why. Establishing a connection between plant identity in a wetland and the microbial processes leading to methanogenesis could improve estimates of wetland methane sources in the past, now, and in the future. Our basic hypothesis was that leaves that decompose quickly and/or provide soluble organics will, in turn, fuel faster rates of methane production. We used leaf litter from 15 tree species (angiosperm and gymnosperm, deciduous and evergreen) and soil from a forested wetland in New York State. We quantified the rate of leaf decomposition in the field and correlated variation in rates with leaf litter traits. We also tested how litter added to soil induced methane production. Deciduous angiosperm litter decomposed faster than gymnosperm needle litter. However, rates of methane production were faster in soil amended with gymnosperm litter than with angiosperm litter, even though angiosperm litter supported more soil microbial biomass and greater rates of microbial activity (carbon dioxide production). Leaf litter traits show promise as an index to understand ecosystem function and predict rates of soil microbial activity.

Invertebrates and Invasions: How Does Plant Origin, Invasion Gradient, and Litter Diversity Influence Aquatic Invertebrate Populations

Jeremy Dietrich

A common flaw in invasive species research is the multitude of short-term work comparing invaders to phylogenetically unrelated native species or testing single pairs of congeneric species to test for effects of origin. The results of these tests are often highly contradictory. Studies testing for origin effects along invasion gradients, under similar environmental conditions, against identical taxa are lacking. Accumulating evidence suggests that variation in detritus chemistry has a large effect on organismal performance and food web dynamics. By affecting algal productivity, detritus quality should ultimately affect the performance higher trophic levels. We used a long term (18mo) mesocosm experiment to test origin, invasion, and litter diversity effects using four paired congeneric plant invaders over a broad invasion gradient on an aquatic invertebrate community. We analyzed leaf chemistry traits to provide mechanistic explanations for any differences in aquatic invertebrate performance among experimental treatments. We found no effect of plant origin or invasion level, questioning origin as a predictive factor for ecological outcomes. We found the interaction of invasion and plant phylogeny to affect aquatic invertebrate abundance. Leaf trait effects were found to be uniform across all invertebrate taxa and offered a clear mechanistic signal, allowing predictable functional responses of plant invasions on higher trophic levels. The ability to reduce effects of different
plant species to aspects of detritus chemistry allows comparing invasions along a ‘lowest common denominator’. By doing so, we may gain considerable power in predicting ecosystem effects of invading species.

**Distribution and Ecological Risk Assessment of Heavy Metals in Sediments of South River System of Haihe River Watershed, China**

Binbin Wang

To figure out the pollution level and ecological risk of trace metals in South River System of Haihe River, the total concentrations and fraction proportions of ten metals (As, Co, Cu, Cd, Cr, Hg, Mn, Pb, Ni and Zn) were detected in 25 sediment samples taken from seven reservoirs, three estuaries and fifteen plain sites. Results showed that most metals' highest concentrations appeared at plain sites. Cd had the highest toxicity with the highest percentage of exchangeable and carbonated fractions nearly at all sites. The stability of Co, Cd, Cu, Mn, Pb and Zn increased parallel with their individual total contents or the TOC content in sediments. Pollution load indexes and Hakanson potential ecological risk assessment indicated that Aixinzhuang and Xinxiang were the top two contaminated sites with extremely severe ecological risk, Cd and Hg were the most threatening metals. The cluster analysis divided the pollution sample sites into two types: Cd based multiple pollution sites and Hg pollution sites. All the sites with equal to or higher than medium ecological risks were in plain areas, except Wangkuai Reservoir, and all the sites having severe or extremely severe pollutions were at downstream of iron mining lots of contact metasomatism types. Correlation coefficient analysis signifies Co, Mn and As mainly originate from parent rocks, while Cr, Cd, Cu, Ni, Pb, Hg and Zn are mainly effected by anthropogenic activities.

**The Role of Intensive Sites in Advancing Ecological Research**

Tim Fahey

During the past few decades there has been a trend in ecology to concentrate many studies at intensive field sites. This trend reflects the advantages of focusing efforts at one site but raises important questions about the nature of intensive sites, how they are selected, to what extent results can be scaled to represent broader areas, and the implications of this approach for scientific discovery. Among the key advantages of intensive sites are the context for discovery and the sentinels of change provided by long-term, archived data sets; the capacity for parameterizing and validating models of complex ecological processes; and the intellectual cross-fertilization among environmental scientists and sub-disciplines. The criteria that have contributed to the selection of particular intensive sites are diverse, and the ability to generalize or scale up ecological observations often depends upon the site selection criteria. I will provide an overview of these issues with a particular focus on one prominent intensive research site, Hubbard Brook Experimental Forest (HBEF) in New Hampshire. Ecological research at intensive sites will continue to provide basic insights into ecological phenomena that are not possible in isolated process studies and that are generally valid for broader application outside the specific site. However, large-scale use of this knowledge in predicting ecological responses to global change still requires wide-ranging measurements of ecological patterns and processes for parameterization and validation purposes.
An Artificial Nest-box Approach to Uncovering the Biology and Life History of the Golden Swallow in the Cordillera Central of the Dominican Republic

Justin Proctor

In 2008, Cornell University began a scientific study entitled Golondrinas de Las Americas, an international collaborative effort aimed at better understanding the differences in life history strategies within a genus of swallows, the Tachycinetas, nine birds whose collective breeding distributions span the length of the Western Hemisphere. Under the framework of that project, I developed my graduate thesis on studying the limitations and determinants of the reproductive success of the poorly known Golden Swallow (Tachycineta euchrysea sclateri), a threatened passerine endemic to the island of Hispaniola, and ultimately using that information to create and implement a conservation plan for the species.

In an effort to stimulate local stewardship over this endemic bird as well as secure the sustainability of the research, over the past two years the thesis has fundamentally grown from its initial scientific study to a multi-faceted collaboration now known as the Golden Swallow Project. An array of local NGO’s, foundations, and societies are taking responsibility for different elements of the project, including educational outreach on the community level, partnerships with local universities, nest-box monitoring programs, and study-site amplification. Starting in 2014, we are excited to begin integrating specific elements of the Golden Swallow Project into the Caribbean Birding Trail (CBT), an effort underway by Birds Caribbean to use avian systems to attract ecotourism and stimulate sustainable livelihoods throughout the Caribbean. Additionally, we will be further developing a nest-box network that spans the altitudinal range of nesting Golden Swallow populations for future comparative studies while organizing the development of the first comprehensive distribution map of the species on Hispaniola.

Sampling and 3D Distribution of Mysid “Shrimps”

Toby J. Holda

Mysid “shrimps” (Mysis diluviana) form an integral part of the Great Lakes food web. They are increasingly important as prey of alewives (Alosa pseudoharengus). Alewives are the main forage of the Salmonids that drive the multi-billion dollar sport-fishing industry in the region. As well, Mysids compete with alewives for zooplankton prey, and have a biomass equivalent to 40% of the biomass of zooplankton prey. Thus, an understanding of Mysids is important for managing and responding to the system. As part of the international, multi-agency, and multi-institutional monitoring of the Great Lakes, abundance and biomass estimates are intensively calculated for Mysids and other taxa every 5 years to track trends and compare lakes. I am interested in Mysids’ spatial distribution so we can ask questions about their spatial ecology. We understand vertical distributions and what drives them fairly well, but the recent vertical restructuring of Lake Ontario, as well as the decline in Diporeia and introduction of Dresseinids, requires reassessment of our understanding. Also, we have a poor understanding of horizontal distributions and the factors that drive horizontal distributions. The objectives of my thesis research are to: 1) refine and establish field and lab methods, 2) estimate lake-wide abundances
and biomass in Lake Ontario for 2013, and 3) describe 3-D distributions and identify driving factors. I will use data from acoustic surveys analyzed in EchoView and net tow samples analyzed with photographs and image].

**Maliangin Sanctuary: A Model Marine Reserve for Enhancing Local Community’s Understanding of the Importance of Biodiversity Conservation**

Lee, Yoke Lee

Maliangin Sanctuary is a collaborative conservation project on a 150-hectare island located within an upcoming multiple-use marine managed area named Tun Mustapha Park, currently undergoing gazettal processes. The project was set up to demonstrate to local communities the ecological and socioeconomic benefits of marine reserves; experiment with co-management arrangements; and to protect the biodiversity of the island. Participatory rural appraisal was used to engage with the local community to seek consensus for the establishment of the marine reserve, identify potential alternative livelihood activities, property rights, delineation of traditional fishing grounds, marine turtle nesting sites and foraging areas, and potential no-take zones that will be locally monitored against destructive fishing practices and encroachment by commercial fishing vessel. Simultaneous to the community consultations were discussions with government agencies such as Sabah Parks and Department of Fisheries to ensure the legitimacy of the model site. Community maps with approximate areas for no-take, turtle nesting grounds, and traditional fishing grounds were generated and the name Maliangin Sanctuary of the site was formalized. Handicraft and ecotourism were found to be compatible with community strengths and interests. The Maliangin Island Community Association (MICA) was eventually established as the platform for alternative income programs. A community-run surveillance group was also set up to strengthen the capacity to protect the site from unsustainable fishing practices.

**Evidence of Cisco Spawning in Chaumont Bay, Lake Ontario**

Ellen M. George, Mathew Levine, and Lars G. Rudstam

Cisco *Coregonus artedii* are an important prey fish for many Great Lakes predators, including lake trout *Salvelinus namaycush*. Their numbers have declined drastically in the last century due to the impacts of invasive species such as sea lamprey *Petromyzon marinus* and alewife *Alosa pseudoharangus*, overfishing, and habitat degradation. Chaumont Bay, New York contains one of the last suspected remnant spawning populations of cisco in Lake Ontario. In November and December of 2013 we attempted to identify the spawning site in Chaumont Bay using radio telemetry and egg pumping. 25 fish were tagged with radio transmitters and tracked through the bay. Additionally, we used a centrifugal pump to search for eggs in order to confirm spawning site location. Future work on this project includes location and genetic identification of hatched cisco larvae, investigation into the possible predation on larvae by invasive alewife, and modeling of other potential spawning sites in Chaumont Bay.
**Bio-Control or Bio-Politics? The Political Ecology of Invasive Species in the Galápagos Islands**

Jaime Ortiz Pachar

An unusual combination of forces creates not only a biological laboratory but a social one in the Galapagos Islands. Historically, research on invasive species and island restoration has focused only on the ecological and biological aspects of specific invasive species. The socio-political, economic and ecological implications derived from the decisions made by the current Ecuadorian government and a private institutional network working towards the management of introduced species has not been addressed. A political ecology approach towards invasive species management in Galapagos offers a useful framework to integrate the visions and interests from different stakeholders (“political nature”) while also enabling an understanding the functioning of ecosystems (“ecological nature”). This is an important issue for the conservation of Galapagos, but also one with global implications. Globalization is increasing the spread of invasive species everywhere, with massive environmental and human costs. In some cases commercial, backed by private and public funds are materializing to “control” invasive species everywhere. Almost everywhere these control programs are conducted in a strictly ecological context. What are the social and economic dimensions of this escalating activity? Galapagos presents a good opportunity not only for understanding the phenomenon in a special place – a global biodiversity hotspot where there is much conflict over how to proceed with nature conservation and development of society – but also understanding the issue’s larger dimensions and global implications.

**Ticks and Earthworms: Can an invasive ecosystem engineer impact the population density of *Ixodes scapularis* (black-legged tick)?**

James Burtis

The prevalence of tick-borne disease is a growing issue in the United States, particularly in the Northeastern states where the incidence of Lyme disease is so high that it is often considered an epidemic. Despite public concern we still have a poor understanding of the factors that drive the spread of tick-borne diseases. One key element is the distribution of tick vectors. The impact of host movement and large scale climate patterns on the distribution of black-legged ticks has been well studied, but the effects of small scale changes to soil ecosystems have been largely ignored. Earthworms are known to have various effects on soil ecosystems, including impacting arthropod communities and microhabitat availability. The pattern of earthworm invasion in New York State is sporadic, with many invaded and uninvaded areas adjacent to one another within the same forest. This sporadic invasion pattern provides an excellent opportunity to investigate how multi-scale changes to soil ecosystems might affect tick populations. This project focused on five pairs (earthworm / reference) of one-hectare sites within four separate contiguous forests in New York State. The presence of earthworms negatively impacted the density of black-legged ticks and a wide variety of other litter dwelling arthropods. Accounting for earthworms provides new insight into the distribution and fate of tick-borne diseases and highlights the complexities involved in understanding the ecology of infectious diseases.