### Schedule & Abstracts

#### Day 1  **Monday, January 25**

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<th>Time</th>
<th>Events and Presenters</th>
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<tr>
<td>8:30 - 9:00 AM</td>
<td>Breakfast</td>
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| 9:00 - 9:15 AM   | **Welcoming Remarks** Maria José Carreras Gamarra and Ritwick Ghosh  
|                  | Co-Presidents, Graduate Student Association, Natural Resources  
|                  | Dr. Dan Decker  
|                  | Professor and Chair, Natural Resources |
| 9:15 - 10:15 AM  | **Session 1: Examining Spatial Patterns**  
| 9:15 AM          | Annie Scofield  
|                  | Identifying Drivers of Deep Chlorophyll Layer Formation in Lake Ontario: Implications for Managing a Restructured Ecosystem |
| 9:35 AM          | Steven Sevillano  
|                  | Seasonal Patterns of Avian Diversity Along an Andean Elevation Gradient |
| 9:55 AM          | Alec Wong  
|                  | Identifying Spatial Patterns of Moose Density and Abundance in a Heterogeneous Landscape Using Spatial Capture Recapture |
| 10:15 - 10:25 AM | Break                |
| 10:25 - 11:45 AM | **Session 2 (Panel): Working in Protected Areas**  
| 10:25 AM         | Pepe Casis  
|                  | Design of a Payment for Ecosystem Services Program in a Natural Protected Area Through an Alternative Conflict Resolution Approach: The Case of Oaxaca, Mexico |
| 10:40 AM         | Jennie Miller  
|                  | Cecil’s the Lion’s Legacy: Aging Traits and Sustainable Lion Trophy Hunting |
| 10:55 AM         | Yi Yong  
|                  | Learn from Nature, Act for Conservation: WWF’s Environmental Education Work in China |
| 11:10 AM         | Katherine Kaplan  
|                  | Evaluating the Effect of Marine Protected Areas on Competition Between the Invasive Tunicate Didemnum vexillum and the Atlantic Sea Scallop Placopecten magellanicus |
| 11:25 AM         | Panel Questions     |
| 11:45 - 12:00 PM | Break                |
| 12:00 - 1:00 PM  | **Keynote Address**  
|                  | Dr. Josh Donlan  
<p>|                  | Director, Advanced Conservation Strategies |
| 1:00 - 2:00 PM   | Lunch                |</p>
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<tr>
<td>2:00 - 3:20</td>
<td><strong>Session 3 (Panel): Making Trade-offs in Conservation</strong></td>
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<td>2:00 PM</td>
<td>Philip Silva</td>
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<td>2:00 PM</td>
<td><em>Epistemic Cultures in Civic Ecology Practices: Casework from New York City</em></td>
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<tr>
<td>2:15 PM</td>
<td>Graciela Reyes-Retana</td>
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<td><em>Forestry Policies in Mexico: Money, Communities or Regulation?</em></td>
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<td><em>Household Resource Politics: Examining PES Implementation in La Visite National Park, Haiti</em></td>
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<td>Micah Ingalls</td>
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<td><em>Missing the Forest for the Trees? Navigating the Trade-offs Between Mitigation and Adaptation Under REDD</em></td>
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<td>3:00 PM</td>
<td>Panel Questions</td>
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<td>3:30 - 4:30</td>
<td><strong>Session 4: Conservation Actors</strong></td>
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<td>3:30 PM</td>
<td>Anne Armstrong</td>
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<td>3:30 PM</td>
<td><em>Climate Change Communication Strategies in Environmental Education</em></td>
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<td>3:50 PM</td>
<td>Steven Wolf</td>
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<td><em>Discipline in all its Forms: Toward an Interdisciplinary Analysis of Accountability</em></td>
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<td>4:10 PM</td>
<td>Emily Pomeranz</td>
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<td><em>Spatial and Jurisdictional Level of Wildlife Management Engagement Strategies and the Changing Roles of Process Facilitators and Issue Educators</em></td>
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<td>4:30 - 5:30</td>
<td><strong>Poster Session</strong></td>
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<td>Jen Fownes</td>
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<td><em>Climate Change Impacts: Examining the Relationship Between Extreme Weather, Public Opinion, and Political Communication</em></td>
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<td>Toby Holda</td>
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<td><em>Lake Trophic State and Mysid Brood Size: Bottom-up Effects?</em></td>
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<td>4:50 PM</td>
<td>Ted Lawrence</td>
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<td><em>Yucatec Maya Community Conservation and Sustainable Livelihoods</em></td>
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<td>5:00 PM</td>
<td>Eunju Lee</td>
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<td>5:00 PM</td>
<td><em>Towards Adaptive Co-management of Korean Village Groves</em></td>
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<td>5:10 PM</td>
<td>Sarah Naiman</td>
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<td><em>Place, Identity, and the Reasoned Action Approach: Promoting Place-protective Behavior in the Albany Pine Bush</em></td>
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<td>5:20 PM</td>
<td>Michael Roberts</td>
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<td>5:20 PM</td>
<td><em>Climate Interpretation and Engagement at Cornell Plantations Climate Change Garden</em></td>
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<td>5:30 PM</td>
<td>Emily Vail</td>
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<td><em>Barriers to Green Infrastructure in the Hudson Valley: An Electronic Survey of Implementers</em></td>
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# Day 2  
**Tuesday, January 26**

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<tr>
<td>8:30 - 9:00 AM</td>
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| 9:00 - 10:20 AM | **Session 5 (Panel): Using Data for Conservation**<br>Moderator: Catherine Doyle-Capitman  
  9:00 AM  
  Maria Jose Carreras  
  *How to Achieve Successful Biodiversity Offsets in Latin America: Analysis of Metrics for Valuing Biodiversity Equivalences and Development of a Logic Model for Assessing Offset Performance Over Time and Across Space*  
  9:15 AM  
  Matt Paufve  
  *Compiling Decades of Data for Lake Ontario*  
  9:30 AM  
  Ritwick Ghosh  
  *Can Algorithms Bring More Science and Transparency to Conservation Planning Decisions?*  
  9:45 AM  
  Sara Davis  
  *Reducing Environmental Impacts of Roadside Ditches in the Chesapeake Bay Watershed: Getting from Science to Policy*  
  10:00 AM  
  Panel Questions                                                                                       |
| 10:20 - 10:30 AM | Break                                                                                                                                                |
| 10:30 - 11:30 AM | **Session 6: Species Survival and New Threats**<br>Moderator: Heidi Henrichs  
  10:30 AM  
  James Burtis  
  *Investigating the Impact of Soil Arthropod Predators on Blacklegged Ticks, the Primary Vector of Lyme Disease*  
  10:50 AM  
  Martin Feehan  
  *Suburban White-tailed Deer Fawn Survival at Fort Drum*  
  11:10 AM  
  Xiufeng Zhang  
  *Effects of Benthic-feeding Common Carp and Filter-feeding Silver Carp on Benthic-pelagic Coupling in Shallow Lakes: Implications for Ecosystem Management*                                                                 |
| 11:30 - 12:00 PM | **Strategic Planning with the Department of Natural Resources**<br>Dr. Patrick Sullivan  
  *Professor, Natural Resources*                                                                        |
| 12:00 - 1:00 PM | Lunch                                                                                                                                                |
| 1:00 - 2:20 PM | **Session 7: Addressing Multiple Objectives in Conservation**<br>Moderator: Cat Sun  
  1:00 PM  
  Darin James McNeil  
  *Range-wide Conservation for a Long-distance Migrant Songbird*  
  1:20 PM  
  Yue Li  
  *Development of Professional Networks Among Environmental Educators*  
  1:40 PM  
  Murodbek Laldjebaev  
  *Energy Poverty in Mountain Communities of Tajikistan*  
  2:00 PM  
  Samar Deen  
  *Evaluating the Biological and Economic Impacts of Coastal Ocean Acidification and Rising Sea Surface Temperature on the Bay Scallop (Argopecten irradiates)* |
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<td>2:30 - 3:30 PM</td>
<td><strong>Session 8: Biodiversity and Migration</strong></td>
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<td>2:30 PM</td>
<td>Joe Yavitt</td>
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<td><em>Ecological Interactions Versus Environmental Filters on Soil Microbial Diversity</em></td>
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<td>2:50 PM</td>
<td>Elizabeth Craig</td>
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<td><em>A Continental Divide in Migratory Behavior: Conservation Implications for the Common Tern</em></td>
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<td>3:10 PM</td>
<td>Ellen George</td>
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<td><em>Distribution and Morphology of Larval Cisco Coregonus artedi in Chaumont Bay, Lake Ontario</em></td>
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<td>3:30 - 3:45 PM</td>
<td><strong>Closing Remarks and Best Presentation Award</strong></td>
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<td></td>
<td>Dr. Joe Yavitt</td>
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<td><em>Professor and Director of Graduate Studies, Natural Resources</em></td>
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<td>3:45 - 4:00 PM</td>
<td>Break</td>
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<td>4:00 - 5:00 PM</td>
<td><strong>Career Panel</strong></td>
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<td>Moderator: Susi Sturzenegger Varvayanis</td>
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<td></td>
<td><em>Senior Director of the Broadening Experiences in Scientific Training Program</em></td>
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<td>Dr. Allison Chatrchyan</td>
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<td><em>Director, Cornell Institute for Climate Change and Agriculture</em></td>
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<td>Dr. Josh Donlan</td>
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<td><em>Founder and Director of Advanced Conservation Strategies and Keynote Speaker of the 2015 DNR GSA Symposium</em></td>
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<td>Dr. Alejandra Olivera</td>
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<td><em>Visiting Associate Professor, Cornell Department of Natural Resources, and Professor, Colegio de Postgraduados, San Luis Potosí, Mexico</em></td>
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<td>Dr. Lars Rudstam</td>
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<td><em>Professor, Cornell Department of Natural Resources</em></td>
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<td>Dr. Viviana Ruiz-Gutierrez</td>
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<td><em>Quantitative Ecologist, Cornell Lab of Ornithology</em></td>
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Identifying Spatial Patterns of Moose Density and Abundance in a Heterogeneous Landscape Using Spatial Capture Recapture
Alec Wong*

Organisms select landscape features variably at different spatial scales, and knowledge of this selection can provide insight into aspects of the behavior, population ecology, habitat characteristics, and inter- and intra-specific relationships of an organism. One scale of selection is the second order, or home range scale, an area over which an organism normally travels in its search for food and mates, and is shaped by ecologically resistant environmental factors. An understanding of the anisotropy of the home range with relation to landscape features and environmental factors has become increasingly more accessible with methods such as spatial capture-recapture. The moose *Alces alces* has recolonized its former range in New York beginning in the 1980s. Data on their populations are lacking; management currently employs a variety of monitoring methods to observe the species, and their management goal is a natural increase in abundance of moose in New York. The application of spatial capture-recapture is one proposed monitoring method, which genetically identifies individual moose using scat collected on the landscape to estimate the species’ distribution, density, and abundance. The method also allows for descriptions of environmental influences on these population characteristics. The model is versatile in its abilities, for example integrating telemetry data for descriptions of third-order (fine scale) space use, by measuring direct estimates of landscape connectivity, or by describing the spatial heterogeneity in density due to landscape covariates, providing great insight into the spatial ecology of moose in New York.

*Alec Wong is a first-year PhD student in the laboratory of Dr. Fuller, studying the population biology, spatial ecology, and genetics of moose in New York.

Climate Change Communication Strategies in Environmental Education
Anne Armstrong*, Marianne Krasny

This research seeks to address the following questions: how are environmental educators applying climate change communications research to their programs? To what extent are environmental education practitioners aware of the suggestions made in recent research about effective climate change communication? We will interview environmental educators in the spring of 2016 about their climate change communication strategies. Interviews, lesson plans, and relevant web-content from the educators’ organizations will be analyzed using content analysis. This study will provide insight into the state of climate change communication in environmental education. This insight will, in turn, inform the future development of innovative climate change trainings and resources that might close a gap between research and practice.

*Anne Armstrong is a first year MS/PhD student working with Marianne Krasny in the Civic Ecology Lab on climate change communication in environmental education.

Identifying Drivers of Deep Chlorophyll Layer Formation in Lake Ontario: Implications for Managing a Restructured Ecosystem
Annie Scofield*, Lars Rudstam, James Watkins

Greater water clarity in Lake Ontario in recent years has led to a vertical redistribution of phytoplankton and increased formation of deep chlorophyll layers (DCLs). Understanding the mechanisms driving DCL formation, maintenance and dissipation is a critical step toward evaluating the role of subsurface production in oligotrophic lakes. In this study, we investigated the spatial patterns in DCL formation throughout the stratified season, how subsurface chlorophyll maxima related to other water column
properties such as thermocline depth, and the major phytoplankton groups driving DCL production. We found that a strong DCL developed offshore during July through August, and it was closely associated with thermocline depth, nutricline depth, and subsurface maxima in dissolved oxygen saturation and beam attenuation. These results suggest that metalimnetic production and phytoplankton growth contribute to DCLs in Lake Ontario, rather than only processes such as photoadaptation and settling of dead cells. In addition, the depth of the 1% light level was not a strong predictor DCL depth, suggesting that nutrient limitation may be the more important variable in determining the depth of subsurface production. Metalimnetic phytoplankton biomass is typically dominated by diatoms, which are a good potential food source for zooplankton. The relative magnitude and quality of metalimnetic versus epilimnetic production may have important implications for the bioenergetics of zooplankton, mysids, and fish in Lake Ontario.

*Annie Scofield is a third year PhD student with Lars Rudstam. She studies primary and secondary production patterns across the Great Lakes, with an emphasis on the dynamics of deep chlorophyll layers.

Range-wide Conservation for a Long-distance Migrant Songbird
Darin James McNeil*, Amanda Rodewald, K. E. Johnson, J. L. Larkin

Due predominantly to human-driven alteration of landscapes, many neotropical bird species are experiencing population declines throughout their ranges. Of these, the Golden-winged Warbler (*Vermivora chrysoptera*) has experienced drastic population declines and contraction of its breeding range due predominantly to the loss of its young forest breeding habitat. Although reversing population declines (through habitat restoration) remains a daunting task, two publications - Golden-winged Warbler Habitat Best Management Practices and Golden-winged Warbler Conservation Plan - were critical first steps in this process. Still, species response to conservation requires the implementation of prescribed management and, thus, several governmental/non-governmental partner organizations have collectively agreed that management for Golden-winged Warblers remains a worthwhile pursuit. As such, these organizations have facilitated the creation of thousands of acres of potential habitat for the warbler (and associated species) throughout the species’ core breeding range: the upper Great Lakes and central Appalachian Mountains. In order to evaluate conservation efforts initiated by these organizations, we surveyed for Golden-winged Warblers, American Woodcock (*Scalopax minor*) and associated bird species at nearly 300 locations in four states: MN, PA, NJ, and MD. Our results suggest that sites managed using Golden-winged Warbler best management practices have not only the potential to provide benefit to Golden-winged Warblers, but also a wide array of other bird species.

*D.J. McNeil is a PhD student in Amanda Rodewald’s lab. As such, D.J. is associated with the Natural Resources Department at Cornell as well as the Lab of Ornithology: Conservation Science.

A Continental Divide in Migratory Behavior: Conservation Implications for the Common Tern
Elizabeth Craig*, Paul Curtis, Wynne Hannan

The Common Tern (*Sterna hirundo*) is a threatened species in NY. The Cornell Biological Field Station, in partnership with NYS DEC, has protected and studied a small colony of terns on Oneida Lake since the 1970’s. Traditionally, conservation efforts have focused on improving breeding conditions for these birds. However, terns are long-distance migrants that spend only a third of the year on the breeding grounds, and little is known about the migratory and wintering behavior of this population. Addressing this information gap is an important first step in understanding and confronting conservation challenges during these critical periods of the year. In 2014, we deployed geolocators on 10 terns to observe their movements during the following year. Seven of the 10 geolocators were retrieved in 2015. All seven birds exhibited similar migratory and wintering habitat use, although there was variation in the timing of some events. Birds breeding on Oneida migrated down the Atlantic coast, stopped in Cuba, and then migrated down the west coast of South America to winter in Peru. During northward migration, some
birds spent a shorter stopover period along the Atlantic coast before returning to the breeding grounds. This migratory and wintering behavior is markedly different than what has been observed in Common Terns breeding at coastal colonies, as these birds winter in Eastern South America. Our data highlight a continental divide in migratory and wintering behavior among breeding populations of Common Terns, providing novel and critical information for the conservation of this species in the Americas.

*Elizabeth Craig is a Postdoctoral Associate in Natural Resources working with Paul Curtis on Common Tern conservation.*

**Distribution and Morphology of Larval Cisco *Coregonus artedi* in Chaumont Bay, Lake Ontario**
Ellen George*, Wendy Lee Stott, Darran Crabtree, Brian Lantry, Lars Rudstam

Cisco *Coregonus artedi* are an important prey fish for many Great Lakes predators, including lake trout *Salvelinus namaycush* and Atlantic salmon *Salmo salar*. 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 pseudoharengus*, overfishing, and habitat degradation. Chaumont Bay, New York contains one of the last remaining spawning populations of cisco in Lake Ontario. In 2014 the first confirmed cisco larvae in Chaumont Bay in decades were found. Larvae were sampled weekly using light traps and surface neuston net tows. Larvae were identified using both traditional visual methods and genetic barcoding of the mitochondrial CO1 gene. After hatching, larvae quickly moved into shallow nearshore locations away from the spawning shoals. Analysis of larval morphometrics show that Chaumont Bay cisco share many characteristics with lake whitefish *Coregonus clupeaformis*, to the extent where common keys are not reliable in distinguishing between larvae of these two species. The larval stages of fish development are critical time periods, and understanding the early life history of Chaumont Bay cisco is instrumental in identifying recruitment limitations that may be affecting this essential and poorly understood population.

*Ellen George is an MS/PhD student, Advisor Lars Rudstam, Department of Natural Resources*

**Spatial and Jurisdictional Level of Wildlife Management Engagement Strategies and the Changing Roles of Process Facilitators and Issue Educators**
Emily F. Pomeranz*, Dan Decker

In the United States over the last two decades, wildlife resource decision making and management has become a process that is inherently participatory. In many contexts, community members, municipal leaders, public issues educators, stakeholder groups, wildlife managers, technical experts, and legislators all participate in wildlife-management decision making to varying degrees in various contexts. Typically, the focus for participatory process has been on local engagement strategies, although some have argued that as the needs and expectations of stakeholders change, state agencies face budgetary and staff constraints, and management turns its focus to landscape-level processes, we may begin to witness a change in the scale at which agencies engage the public. While local processes remain the norm, the need exists for more expansive, regional processes. These changes may not be as simple as abandoning engagement at one level in favor of another; hotspots of human-wildlife interaction cannot be resolved by applying engagement strategies that are designed for a broader level. The engagement processes that occur at both the regional and local levels may necessitate different roles for the various actors in decision making, as well as different evaluations of success with respect to both outcome and process. Drawing on interviews with 20 Cooperative Extension educators, this presentation will explore how roles and associated challenges for public issue educators as process facilitators change according to the spatial and jurisdictional level of wildlife management, how those changes affect stakeholder engagement processes, and the implications of the dynamic nature of the public issue educator role.

*Emily Pomerantz is a PhD Candidate.*
Barriers to Green Infrastructure in the Hudson Valley: An Electronic Survey of Implementers
Emily Vail*, Andrew Meyer

Despite the progress made since the Clean Water Act was passed, nonpoint source pollution remains a major issue for water quality in the Hudson Valley. According to NYS DEC, stormwater runoff is the leading cause of stream impairments in the Hudson River estuary watershed. Green infrastructure practices (such as rain gardens, porous pavement, green roofs, and vegetated swales) maintain or restore stormwater’s natural flow pattern by allowing water to slowly soak into the ground and be used by plants. These practices can improve many of the water quality and quantity problems affiliated with traditional stormwater management. While there are successful examples of green infrastructure practices being implemented in the Hudson Valley, there are also potential difficulties to its being adopted as a routine aspect of development and redevelopment, including local government regulations, site constraints, engineer training, developer enthusiasm, public perception, and more.

The Hudson River Estuary Program conducted a survey to identify the largest roadblocks to green infrastructure implementation in the ten counties of our program area. We received 127 completed responses with information from a wide range of green infrastructure practitioners - geographically broad, with diverse positions in their communities and having experience with many different types of practices. Respondents cited cost, lack of knowledge, and resistance from local, municipal officials as the top barriers. The responses make it clear that in addition to more funding sources, there is a great need for outreach and education to local governments to familiarize them with green infrastructure practices.

*Emily Vail is an MS Natural Resources student at Cornell University and the Watershed Outreach Specialist for the NYS DEC Hudson River Estuary Program, in cooperation with NYS Water Resources Institute at Cornell University.

Towards Adaptive Co-management of Korean Village Groves
Eunju Lee*

Traditional village groves have a long history of people and nature interactions in Korea. During the past several decades of industrialization, they have been degraded and even destroyed due to the lack of interest and proper management. Recently the cultural and ecological value of village groves is recognized and leads to restoration projects across the country. However, not many studies have been done on desired outcomes of restoration projects for forest resources and villages, and how such changes can influence on better management practices and village groves resilience. Facing constant disturbances (e.g., natural disasters and/or human-induced disturbances), villages need to have not only immediate response to change, but also long-term adaptive strategies to cope with future change. Thus, this study investigated the impact of village groves restoration projects on the management of village groves and examined potentials of adaptive co-management in the Korean context. For this purpose, two restoration projects are selected and key informant interviews and document review are conducted. Further implications for the role of villages/villagers will be investigated to understand better way to enhance their proactive adaptation and village groves resilience in the face of future changes.

*Eunju Lee, a PhD student of Dr. Krasny, living in Korea right now and working as Korea Focal-point at the Tripartite Environmental Education Network (TEEN) among Korea, China, and Japan.
Forestry Policies in Mexico: Money, Communities or Regulation?
Graciela Reyes-Retana*

Mexico is historically a leader among developing countries in forestry management and policy, and is currently undergoing a major transition away from mostly conservation-oriented programs toward multi-objective forestry management programs. The objective of my research is to identify the factors which influence communities’ decisions to participate in forest management incentive programs in Mexico, as well as to identify their perceived and observed environmental and socio-economic outcomes. To accomplish my research objectives, I will compare four main policy scenarios: 1) Community Forest Management; 2) Payment for Environmental Services; 3) Natural Protected Areas; and 4) no intervention. In the symposium, I will present a section of my early research ideas.

*Graciela Reyes-Retana is a third year PhD Student of Natural Resources, under David R. Lee, from the Dyson School for Applied Economics. Her research interests are in the intersection between policy, economics, and natural sciences. She has an Undergraduate degree in Economics from the Universidad Iberoamericana, Mexico, and a Master in Science in Environment and Development from the University of Edinburgh, United Kingdom. Before starting her PhD, Graciela worked at World Bank as an Environmental Economist. Previously, she worked at the World Resources Institute, in the Markets and Enterprise program as the Coordinator for Special Programs in Mexico. Graciela is a Fulbright Scholar and a Chevening Alumni.

Investigating the Impact of Soil Arthropod Predators on Blacklegged Ticks, the Primary Vector of Lyme Disease
James Burtis*

We will present early evidence that the presence and abundance of large arthropod predators in the soil may have an impact on the density and overwinter survival of *Ixodes scapularis* (Blacklegged Tick), the primary vector for many tick-borne diseases in the United States. These trends were observed over the winter of 2013/2014 and have been further explored in laboratory and field trials carried out during the summer of 2015. In the laboratory trials two life stages of *I. scapularis* were presented to common arthropod predators (spiders/centipedes), and incidences of predation were recorded. During these trials a species of wolf spider (*Schizocosa ocreata*) was identified as a potential tick predator. The potential impact of this predator on *I. scapularis* nymphs was further evaluated in field microcosms where alternative prey items were present. We found a significant reduction in tick survival in the presence of *S. ocreata* in the field microcosms. Ongoing research which continues to investigate the role of the soil environment on the overwinter survival of *I. scapularis*, including potential factors impacting the distribution of this important disease vector, will be discussed.

*James Burtis is a PhD student in the Department of Natural Resources working under Dr. Joseph Yavitt. His research focuses on the impact of factors within the soil environment on *Ixodes scapularis* survival.

Household Resource Politics: Examining PES Implementation in La Visite National Park, Haiti
James Goetz*

Use of payments for environmental services (PES) has gained attention in part because of hopes that it can both protect biodiversity, and alleviate local poverty. Many studies have sought to assess the environmental impact of PES, but still little is known about the effect that the payments and the concomitant land use restrictions, as well as other impacts of program participation may have at a household level. A pilot PES project funded by international donors to protect and restore habitat for migratory bird and other endemic fauna and flora in La Visite National Park, Haiti, provides a ready case study of implementation of this cutting-edge conservation tool amid the daily realities of traditional society in rural Haiti. Data from semi-structured interviews, surveys, focus groups, and direct
observation conducted with PES program participants, suggest that power asymmetries within the households and extended families cause cash payments to disproportionately benefit patriarchs, while land use restrictions disproportionately disadvantage female conjugal partners and young males, by reducing their access to crop and pasture land. Further, although this conservation project appears to reduce forest loss on contracted land parcels, it may simply shift degradation to neighboring sites outside the project area. I will discuss the implications of these findings for designing PES programs to enhance positive social and environmental impacts, in the context of regions such as rural Haiti, with complex political, class, tenure, conjugal and kin relations.

*James Goetz is a PhD Candidate in Cornell Department of Natural Resources, currently on leave of absence. For the past three years he has been directing implementation of a forest conservation program based on the payment for ecosystem services model in a national park in Haiti.*

**Climate Change Impacts: Examining the Relationship Between Extreme Weather, Public Opinion, and Political Communication**

Jennifer R. Fownes*, Shorna B. Allred, Drew B. Margolin, Vincent Chao Yu

Climate change will impact weather patterns across the United States, affecting physical and biological systems, and presenting risks to human systems. However, the US has yet to pass widespread legislation to combat anthropogenic climate change. Before policy outcomes are enacted, communication by elected officials has the potential to affect the news media (a process known as agenda-building), which in turn influences the salience of issues in the political and public area (known as agenda-setting). This research will focus on the first level of agenda-building, in which politicians add a topic to the agenda by discussing it; we will measure how often and in what way members of the US House of Representatives for New York State discuss climate change on social media, such as Twitter. In many cases, policy outcomes, on issues ranging from social welfare to defense, have been found to follow public opinion, although this effect may be tempered by factors such as party politics, elite interests, and issue salience. Currently the majority of Americans support climate change mitigation policies, so this research will investigate whether politicians' communication reflects their constituents' belief in and concern about climate change. Individuals' climate change opinions have been found to be affected by personal experience with extreme weather events, such as temperature anomalies. This research will investigate whether politicians’ communication is influenced by extreme weather in their political districts.

*Jen Fownes is a first-year MS student with Shorna Allred. She previously worked as an environmental consultant at ICF International, supporting hazardous chemical risk assessments through measuring and modeling exposure and toxicological effects. Jen is interested in the relationship between scientific assessments of environmental risk and policy outcomes.*

**Cecil's the Lion's Legacy: Aging Traits and Sustainable Lion Trophy Hunting**

Jennine Miller*

As evident from last summer's media spotlight on ‘Cecil the Lion’, the role of trophy hunting in conservation is ecologically, economically and ethically complex, yet a significant source of funding for conservation in Africa. Trophy hunting of African lions is currently ecologically unsustainable and a driver of the species’ 2015 placement on the U.S. Endangered Species List. In an attempt to limit hunting quotas, several African countries recently implemented a science--informed age--based quota system, where hunters are restricted to older males who have already reproduced. However, in order for this system to be successful hunters must be able to accurately age lions in the field. Using known-age lion photos from across Africa, we investigated which phenotypic traits can be used to accurately age lions and explored how trait development differs by geographic region. We also also surveyed professional hunters' aging accuracy before and after an aging training to determine the effect of education and the feasibility of aging lions in the field. Our results reveal that hunters can age lions with
high accuracy using several key traits, indicating that sustainable trophy hunting may be attainable with age-based restrictions and training.

*Jennie Miller is a Postdoctoral Researcher with the non-profit organization Panthera and affiliated with Angela Fuller’s lab group in DNR at Cornell. Her research focuses on developing science-based conservation tools to assist stakeholders, managers and policymakers in strengthening carnivore and community coexistence.

Ecological Interactions Versus Environmental Filters on Soil Microbial Diversity
Joseph B. Yavitt*

Species conservation implies that we fully understand the mechanisms that determine diversity at local to global scales. One set of ideas emphasizes the importance of species-species interactions, such as competition for resources and predation, as key determinants of diversity. Alternative theory focuses on variation in environmental conditions that act as filters for species adapted to specific conditions, but not others. How biotic interactions versus environmental filters influence community composition for macro-organisms is poorly understood, and their relative roles in shaping microbial community composition are less clear. I will describe a study of soil microorganisms – focusing on denitrifying bacteria – that occur across very short, but sharp gradients in soil pH. Soil pH is thought to be an important environmental filter for microbial community composition, and testing it at a scale coincident with competition for resources, soil nitrate in this case, is novel. The results provide insight into the conservation of soil resources for dealing with soil nitrate pollution and the importance of environmental variation for maintaining microbial community composition.

*Dr. Yavitt is faculty in Natural Resources and examines soil microbial composition.

Evaluating the Effect of Marine Protected Areas on Competition Between the Invasive Tunicate Didemnum vexillum and the Atlantic Sea Scallop Placopecten magellanicus
Katherine A. Kaplan*, Deborah Hart, Patrick Sullivan

Marine protected areas (MPAs) are an ecosystem based management strategy that have been successful in protecting several benthic invertebrate fisheries since these species are not highly migratory and their habitat range can be delineated within zoning boundaries. In particular, the Atlantic sea scallop (Placopecten magellanicus) has recently become the highest valued fishery in New England due in part to dramatic increases in scallop biomass inside areas protected from bottom-fishing, which were put in place in Georges Bank in 1994. While the success of protected areas in promoting high fish biomass in some fisheries has been well-documented, less well known is how MPAs might serve to protect against invasive species. In 2002, an invasive tunicate Didemnum vexillum was discovered on Georges Bank and the population has since experienced extremely high growth rates in the region. We hypothesized that the Atlantic sea scallop competes with Didemnum for habitat and their abundances are negatively correlated as a result. We also hypothesized that the relationship between sea scallops and Didemnum may differ in areas open to bottom-fishing versus areas protected from bottom-fishing. Data for this study was collected using the habitat camera mapping system, which produces high resolution images of the seafloor. Our results indicate a negative correlation occurs between the Atlantic sea scallop and Didemnum in areas closed and open to bottom fishing, however greater proportional densities of Didemnum are found in areas open to fishing. It has been suggested that bottom-fishing may facilitate the spread of Didemnum, which is also supported by our data. This research highlights the potential of area closure in protecting essential fish habitat from degradation due to invasive species.

*Katherine is a PhD candidate in the Department of Natural Resources.
**How to Achieve Successful Biodiversity Offsets in Latin America: Analysis of Metrics for Valuing Biodiversity Equivalences and Development of a Logic Model for Assessing Offset Performance Over Time and Across Space**

Maria Jose Carreras*

Interest in biodiversity offsetting has surged over the past decade as a mechanism to achieve no net loss of biodiversity while economic development continues. With interest in offsets increasing worldwide, the development of tools and policies for their regulation have gained attention in recent years. However, given the complexities and challenges associated with offset strategies, the question remains if these frameworks are feasible and adequate enough for developing successful compensation strategies and thus achieving the promise of offset schemes. Evidence suggests these are not.

Several offset policies have been criticized for their poor track record of effective implementation, and there appears to be a generalized failure to address biodiversity offset key issues, and to develop sufficient and appropriate interventions. If done right, offsets can play a useful role in conservation, but if done wrong, they can undermine conservation efforts, resulting in an even greater loss of biodiversity. Are these the results that the development of biodiversity offsetting schemes in Latin America will generate? What is needed and what is of utmost importance in the short term in order to promote the development of successful offset strategies in the region?

In this context, the goal of my research is to provide future and current stakeholders working with offset schemes in Latin America a structured decision making tool to work from for the adequate implementation and evaluation of their projects. Framed under the “human-centered” approach, it aims at providing a model for assessing the ecological equivalence between biodiversity impact losses and offset gains, as a means of achieving no net loss of biodiversity.

*Maria Jose Carreras is a graduate student in the Department of Natural Resources, where she is currently researching the role and performance of biodiversity offsets in Latin America. She has broad experience developing both investment projects for biodiversity conservation and management and environmental impact studies throughout South America. In Peru, she has led several biodiversity assessments focused on national and international compliance standards. She has worked this summer at Ecology and Environment Inc. as an Environmental Specialist, and have been working with Advanced Conservation Strategies for the past year on projects focused on a critical review of biodiversity offset policies and marine spatial planning.*

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**Suburban White-tailed Deer Fawn Survival at Fort Drum**

Martin J. R. Feehan*, Paul D. Curtis (PI)

White-tailed deer (*Odocoileus virginianus*) populations are overabundant in many suburban landscapes. In such areas, the costs of vehicle collisions and landscape damage continue to rise, along with rising risks for transmission of Lyme disease. With these increasing negative impacts, there has been a trend toward controlled deer hunting in suburban areas. In order to gain insight into fawn survival and recruitment within suburban environments, fawns were radio-collared and tracked daily to assess causes of mortality and the impact of suburban hunting. While there have been many fawn survival studies, little has been done within suburban landscapes due to property access constraints. This study examines fawn survival within the cantonment area of Fort Drum which is characterized by housing developments and office buildings. Fort Drum was also one of the earliest communities to open a suburban deer harvest. In addition to characterizing fawn survival we collected blood to examine neonatal health.

*Martin Feehan is a MS student in the Department of Natural Resources advised by Paul Curtis.*
Compiling Decades of Data for Lake Ontario
Matt Paufve*

The Great Lakes Observing System (GLOS) has funded a project to coalesce five decades of ship-based limnological data for Lake Ontario into databases made available online. Monitoring programs administered by binational government agencies and educational institutions, and lake-wide intensive field seasons (LOLA in 2003 and 2008 and CSMI in 2013) have resulted in many separate sets of spatially-referenced data. These include water column profiles (temperature, dissolved oxygen, PAR, chlorophyll fluorescence, and other parameters), zooplankton density and biomass, water chemistry, nutrients and chlorophyll-a concentrations. Compiling these into consistently formatted databases will enable access to previously inaccessible data, set a precedent for data sharing for Lake Ontario and assist researchers and managers in understanding Lake Ontario ecosystem dynamics on a lake-wide scale and in a historical context. A database containing lake-wide zooplankton data from 2013 has been completed and preliminary trends in density and biomass will be discussed.

*Matt Paufve is a data management technician. Data processing methods used to compile Lake Ontario data and preliminary results from completed databases will be presented.

Missing the Forest for the Trees? Navigating the Trade-offs Between Mitigation and Adaptation Under REDD
Micah Ingalls*, Michael B. Dwyer

Forested landscapes play a critical role in mitigating climate change by sequestering carbon while at the same time fostering adaptation by supporting ecosystem services. It has been suggested, therefore, that the conservation of forested landscapes may provide a potential win-win in the fight against global environmental change. Despite the potential synergies between mitigation and adaptation efforts, recent studies have also raised concerns about possible trade-offs. Our research employs the analytic lens of social-ecological resilience to explore the intersection between mitigation and adaptation in the context of a Reduced Emissions from Deforestation and forest Degradation (REDD) project in Lao PDR. Drawing on ecosystem analyses, group discussions and interviews with policy makers, practitioners and resource-dependent communities, we identify three potential limitations of REDD for achieving climate synergies. First, by disrupting existing disturbance regimes, REDD interventions run the risk of reducing diversity and structural heterogeneity and thus may undermine functional redundancy core to resilience. Second, REDD-as-practiced has tended to select local, rather than structural, drivers of deforestation, focusing disproportionately on curtailing local livelihood practices, reducing local resources for adaptation. Third, REDD risks redirecting ecosystem service benefits away from local communities toward state agencies, incentivizing recentralization and limiting the scope of local governance. We argue that REDD+'s potential for delivering synergies between climate change mitigation and adaptation in Laos is currently attenuated by structural factors rooted in development policies and broader political-economic trajectories in ways that may not be legible to, or adequately addressed by, current programmes and policy.

*Micah Ingalls has served as an advisor and technical expert to the Mekong River Commission, USAID-Afghanistan, CARE International, WWF Greater Mekong, the Center for International Forestry Research and the United Nations Development Program, Conservation Director for WWF-Laos and Country Director for WWF-Cambodia. He is the son of an eleventh-generation American farmer and the father of four.

Climate Interpretation and Engagement at Cornell Plantations Climate Change Garden
Michael J. Roberts*, Marianne E. Krasny, Sonja Skelly, Joshua F. Cerra

The Climate Change Garden was developed in 2011 through a collaborative effort that brought together multiple units and funding streams both internal to Cornell Plantations and from the broader Cornell
academic community. The original vision of its creators, Sonja Skelly, Joshua Cerra and Dr. Chris Wien, was that the Climate Change Garden (CCG) be used as a template for other public gardens to adopt and build upon. Its purpose is to engage visitors in an interactive educational demonstration of the effects of climate change on plants. Couple with this is a data collection effort to assess the ability of the installation to educate visitors on the effects of climate change. As the current iteration of the CCG is a pilot, the garden is in a period of transition and growth. There is messaging to develop, data to be analyzed and long term maintenance needs that require support. Surveys have been administered to a convenience sample of students, some of whom were able to interact with the gardens displays and other who did not. These data are currently being analyzed.

In order to create the platform needed to disseminate processes, concepts and designs, as well as augment the current facilities, a Garden Master Plan needs to be developed. My project will support the continued development of Cornell Plantations’ Climate Change Garden through the drafting of this Master Plan.

*Michael Roberts is an employee at Cornell Plantations pursuing his M.P.S. through the Department of Natural Resources. He graduated from the same department in 2010 with a Concentration in Planning and Management. He is returning to school to build his career in resource conservation management.

**Energy Poverty in Mountain Communities of Tajikistan**
Murodbek Laldjebaev*

Drawing on a survey of 386 households in rural areas of Khatlon region, Tajikistan, this presentation will detail the energy access situation and discuss the implications for rural people’s livelihoods. Particular focus will be placed on the problem of energy poverty as it reflects the current condition of access to energy services at the level of the community and household. Rural communities in Tajikistan continue to rely on solid biomass (wood, straw, animal dung) to meet their thermal energy needs, and many households are not connected to the electrical grid. For those connected to the grid, access to electricity is not reliable, or affordable. During the winter season, when energy needs are particularly acute, households experience daily blackouts. Lack of access to energy is associated with serious socio-economic and environmental repercussions. For example, removing crop residues and animal dung from fields to burn for heating and cooking leads to soil degradation and lower agricultural productivity. Decreasing yields necessitate purchasing of more food and fertilizers as well as more irrigation. Further, air pollution from burning biomass indoors adversely affects human health. Many hours are spent primarily by women and children in securing biomass from distant locations as the more accessible woodlands have already been depleted. Deforestation causes more soil erosion and leads to disappearance of wild plants and animals that communities depend on for food, medicine, clothing, household tools and cultural festivals. The interaction of these factors then exacerbates rural poverty.

*Murodbek Laldjebaev is a PhD Candidate at DNR. In his dissertation Murodbek examines the vulnerabilities of energy systems in Tajikistan, assesses the energy needs of rural communities, and recommends sustainable solutions to improve livelihoods of local people. Murodbek has a Masters in Public Policy from the National University of Singapore, and a Bachelor’s degree in English Language from Khorog State University, Tajikistan. He completed non-degree courses at the University of Saint Thomas, Harvard Graduate School of Education, and Upper Canada College. He worked in teacher education, consulted the World Bank, and worked for the Ministry of Economic Development, Tajikistan.
Strategic Planning with the Department of Natural Resources
Patrick J Sullivan*

The Department of Natural Resources is reviewing and revising its strategic plan. The idea is to update the Department's vision of stewardship, intra and inter disciplinary research with a view towards linking social and ecological processes. We hope to share how this plan is developing and ask for input and reflection on where we've been and where we are going.

*Patrick J Sullivan is a Professor in DNR.

Design of a Payment for Ecosystem Services Program in a Natural Protected Area Through an Alternative Conflict Resolution Approach: The Case of Oaxaca, Mexico
Pepe Casis*

In this practical and applied research I propose to combine environmental economics and policy with deliberative planning theory to develop a methodology to design an economic policy instrument for environmental conservation. This policy instrument will have many characteristics of a Payment for Ecosystem Services (PES) program. However, considering the multiple problems that traditional design of PES face, the design of this policy will expect to produce a hybrid model of environmental governance (instead of a pure market-instrument as proposed by traditional PES design). This hybrid model will be designed through the use of deliberative methods for conflict resolution. Thus, this project will bring stakeholders together to design a PES project to reduce floods and landslides. The research will be implemented in the buffer zone of a national park that hosts a biodiversity hotspot in Oaxaca, Mexico: the National Park Benito Juarez.

I believe that a deliberative process to design a PES will be able to better incorporate the complexities of real life (of both biophysical and socioeconomic realms) than traditional neoclassical PES design. I will use deliberation to deal with the conflict between stakeholders involved in the area’s governance instead of hiding it behind technical scientific assumptions. I expect that a more realistic PES design – one that incorporates real life transaction costs – will improve the governance of the instrument, thus bringing the expected environmental and social outcomes for which it was designed.

*Pepe is an environmental economist who is currently seeking new paths to move away from such label. He believes that any scientist interested in providing recommendations for environmental conservation – especially in developing countries – needs to fully understand the intense conflict between conservation and people’s needs to generate income. He believes that the best way to understand such conflict is to address it directly as a conflict instead of hiding it behind technicalities and assumptions often present in environmental economics. He is thus exploring new paths in the fields of conflict resolution, deliberative policy, and institutional economics.

Epistemic Cultures in Civic Ecology Practices: Casework from New York City
Philip Silva*

Civic Ecology practices are self-organized environmental stewardship initiatives, often found in urban areas, creating positive outcomes for individuals, communities, and ecosystems (Krasny and Tidball 2012; 2015). These practices operate in complex and uncertain social ecological systems that demand iterative cycles of learning and adaptation, relying on field monitoring, data collection, and analysis. Civic Ecology practices can therefore be classified as knowledge-intensive (Karreman 2008; Davenport and Prusak 2000) practices that deal in both knowledge making and knowledge management. This study empirically explores the multiple epistemic dimensions of three civic ecology practices underway in New York City using qualitative data collection and analysis methods framed by constructivist paradigm. This study also draws on literatures in organizational theory, sociology of scientific knowledge, and adult education to critically construct three categories of knowledge work underway in
Civic Ecology practices: 1) knowledge imported from sources outside the practice; 2) knowledge developed socially within the practice; and 3) knowledge constructed from outcomes monitoring as part of the practice. In constructing these categories, this study explores the process, the products, the challenges, and the opportunities attached to knowledge work in small-scale urban environmental stewardship initiatives.

*Philip's research examines participatory knowledge making processes in civic ecology practices in NYC. He holds an M.S. in Urban Policy and a B.A. in Urban Studies from The New School. He is co-founder of TreeKIT, an initiative helping volunteers measure, map, and manage urban forests.*

**Can Algorithms Bring More Science and Transparency to Conservation Planning Decisions?**
Ritwick Ghosh*

I explore the inclusion of more scientific and economic rationale in environmental policy decisions by studying the use of a performance measurement system in the largest agri-environmental program in the US. The Conservation Stewardship Program (CSP) is a $10 billion Farm Bill Conservation Program that rewards farmers for their conservation activities. All CSP applications are processed through a scoring algorithm called the Conservation Measurement Tool (CMT). In many ways, the CMT is a grand project to standardize farmlands, score environmental benefits, and determine payments. The model produces a single score for each applicant based on 28 ecosystem services for more than 90 different management practices. For instance, the CMT enables a numeric comparison across no-till practices in a corn farm in North Dakota with biodiversity friendly fencing in an apple orchard in New York State. By drawing on social science literature on commensuration, quantification, and standardization, this paper unpacks the practices of using algorithms in conservation planning. I suggest a need to extend the question stated in the title of this presentation: Do algorithms such as the CMT present an opportunity for more scientific rationality and transparency in conservation decisions or do they have a politics of their own? In my presentation, I will offer some preliminary insights while laying out my plan for further research.

*Ritwick Ghosh is a PhD Candidate in the Department of Natural Resources. He studies the political economy of markets for ecosystem services by focusing on the politics of data science, ecological modeling, scoring algorithms, and performance metrics.*

**Evaluating the Biological and Economic Impacts of Coastal Ocean Acidification and Rising Sea Surface Temperature on the Bay Scallop (Argopecten irradians)**
Samar Deen*

Rising global CO2 levels are directly and indirectly influencing coastal ocean acidification (OA) and rising sea surface temperature (SST). The bioeconomic consequences of coastal OA and rising SST on species such as the bay scallop (Argopecten irradians) are not fully explored. The bay scallop has considerable cultural and economic value in New England, USA, especially Massachusetts. The Northeast is experiencing an increase in extreme precipitation events, more variation in seasonal precipitation, lower snow cover and earlier snow-melts. Significant freshwater inputs into the Gulf of Maine result in river plumes that can generate local corrosive events and increased stratification in the summer months are contributing to a regional OA events. This presentation will propose a preliminary spatial stochastic bioeconomic model for understanding the system and will explore methods to get local stakeholder groups feedback on the economic implications of alternative scenarios associated with management and climate scenarios and its corresponding impacts on resilience within communities.

*Samar Deen is third year PhD Student in Patrick Sullivan's Lab. She has a Bachelors in Computer Sciences, a Masters in Public Administration and has previously worked at UNICEF, and consulted for the World Bank.*
Reducing Environmental Impacts of Roadside Ditches in the Chesapeake Bay Watershed: Getting from Science to Policy
Sara Davis*, Rebecca Schneider

The Chesapeake Bay watershed is the largest estuary in the United States, covering six states and Washington, D.C. Roadside ditches run parallel to almost every mile of road in the watershed. These ditch networks intercept approximately 20 percent of runoff from roads and farms and carry the water to nearby streams. A strong body of research indicates that poorly managed roadside ditches can contribute significantly to flooding. Additional research indicates that water from roadside ditches has degraded in-stream aquatic habitats by altering flow regimes, eroding stream banks, and degrading habitat quality and food web structures far downstream. Poor roadside ditch management practices include scraping ditches to remove all vegetation without reseeding the ditch, leaving soil exposed to erosion; and digging ditches deeper to carry greater volumes of water, causing rapid and potentially destructive flows with increased pollution. New York State highway maintenance crews reported that scraping without reseeding and digging deeper ditches were common practices. Highway managers reported that they were aware of best management practices (BMPs) but did not generally implement them due to lack of financial resources, inappropriate equipment, and lack of support from municipal policy makers. My research will develop a better understanding of the political and socio-economic factors hindering BMP implementation; I will then recommend strategies appropriate for regional, state, county, and local stakeholders to support roadside ditch management BMPs.

*Sara Reynolds Davis is a first year PhD student working with Rebecca Schneider. She is developing expertise in the interplay of scientific, political, and social factors that affect global water security and sanitation access. Sara earned her Masters in Regional Planning at Cornell.

Place, Identity, and the Reasoned Action Approach: Promoting Place-protective Behavior in the Albany Pine Bush
Sarah Naiman* and Shorna Allred

Despite the use of the Reasoned Action Approach (RAA) to explore place-specific conservation behaviors, it has failed to take into account the place in which place-protective behaviors are exhibited. An understanding of sense of place theory is essential to understanding the strength of an individual’s intentions to exhibit a behavior. Through the use of qualitative interviews and a survey, we plan to investigate the potential impact of identity, place use, and place meanings on the perceived behavioral control and norms of residents near the Albany Pine Bush Preserve (APB). The Albany Pine Bush (APB) is one of the largest inland pine barrens in the world (Albany Pine Bush, 2011). It is located just outside of New York’s capital of Albany and is the home to at least 20 at risk species (Barnes, 2003). Due to the nature of the ecosystem, the preserve requires periodic disturbances such as prescribed fires (Ibid). Thus, residential support for the APB is essential. An understanding of residents’ personal interactions with the Albany Pine Bush and their likelihood to exhibit place-protective behavior will allow us to develop a framework that integrates the sense of place theory into the Reasoned Action Approach. This framework not only will be useful in the prediction of future protective behaviors for the APB, but can be applied to better predict any place-specific behavior.

*Sarah Naiman is a first year MS student working with Shorna Allred on the role of identity, sense of place, and the reasoned action approach on pro-environmental behavior.

Seasonal Patterns of Avian Diversity Along an Andean Elevation Gradient
Steven Sevillano*

The tropical Andes are recognized as one of the most diverse places in the world. Yet, our understanding of the extent to which elevation and seasonality drive diversity in the High Andes
Remains incomplete, despite that climate change is expected to alter both and threaten montane ecosystems. I described seasonal patterns of avian species richness in *Polylepis* forests distributed along an elevational gradient (~3,300 – 4,700 m) in five glacial valleys in Huascaran National Park within the Cordillera Blanca range of Peru. In 2014-2015, birds were surveyed at 130 point count locations and systematically observed between points during wet and dry seasons. Number of species expected (S(est)) was calculated using the asymptotic Abundance-Coverage Estimator (ACE) for valleys, seasons, and within 100-m elevational bands. An estimated 70 to 100 species occupied each of the five glacial valleys, with only 10 bird species dominating over half of the individuals recorded in communities. Species richness was lower in dry than wet seasons, particularly at lower elevations (<3,800 m). Reductions in species richness during dry season were least likely to occur at high elevations in areas with *Polylepis* forest remnants. Species richness peaked at mid-elevations for the bird community overall and for three guilds (nectarivores, granivores and aerial insectivores) and was highest at ~4,000 m. Number of frugivorous species decreased with the elevation, whereas terrestrial insectivores increased. The greatest number of endemics and threatened species, which primarily were *Polylepis* specialists, were found at ~4,300 m. The high estimates of species richness, which exceeded those of previous studies, challenge the idea that high elevation habitats are not as speciose as lower elevations and, rather, are species rich and home to many endemic and threatened species. Although declines in species richness during dry seasons suggests that the projected warmer and drier conditions in the region may negatively affect certain species, my work provides evidence that *Polylepis* forest fragments might provide important refuge or buffering against future climate changes.

*Steven is a MS/PhD student in the Department of Natural Resources advised by Amanda Rodewald. He is currently studying the bird community associated to Polylepis forest in Peru, and awarded recently with the Peruvian Scholarship from FONDECYT to continue with his PhD studies.*

### Discipline in all its Forms: Toward an Interdisciplinary Analysis of Accountability

Steven Wolf*

Sustainability is an innovation imperative. Specifically, we must advance institutional innovation in order to introduce discipline and accountability into environmental policy and practice. Discipline connotes hierarchical and coercive relations, and this is one, but not the only, potential vector. We can understand prices, property rights, and market relations as pathways to introduce discipline. Similarly, we can understand community norms, common-pool resource management, and cultural embeddedness as potential means to introduce discipline and accountability. I am exploring the utility of the concepts of discipline and accountability to advance a pragmatic response to institutional failure applied to environment.

*Steven Wolf is an Associate Professor in DNR.*

### Lake Trophic State and Mysid Brood Size: Bottom-up Effects?

Toby Holda*, Mitchell Johnson, Lars Rudstam, and Jim Watkins

Mysids are an important component of the food webs of the Great Lakes. In spite of being an important food resource, they have life-spans of 1-4 years, usually reproducing only once - sometimes twice. Most females bear 5-35 embryos. Females carry their young for about 5 months in an exterior brood pouch (marsupium), earning the species the common name, “opossum shrimp.” The number of embryos a given female mysid carries (brood size) is greatly determined by her biomass (larger females carry more young). However, it has also been hypothesized that a lake’s trophic state may influence the brood size of females in that lake, as well as the generation time and growth rate. Our analysis found spring total phosphorus to significantly influence brood size, even when accounting for female biomass.
Yucatec Maya Community Conservation and Sustainable Livelihoods
Ted J. Lawrence*, Stephen J. Morreale, Richard C. Stedman

We work together closely with indigenous (Maya) communities in the heart of the mixed agricultural and forested region of Yucatán México to establish long-term community- and science-based conservation and adaptive management initiatives. México is a biologically mega-diverse hotspot that ranks fourth among countries world-wide in overall species richness, but México’s forests and the biodiversity they harbor are under severe threat from deforestation. In Yucatán México the forests primarily consist of indigenous community-owned lands (roughly 55% of all of Yucatán’s total land area), which are under extreme pressure from undirected agriculture, cattle ranching, timber harvesting, subsistence hunting, and land conversion due excessive development.

Our goal is lasting biodiversity conservation across Yucatán México’s fragile and critically endangered forested landscapes that currently harbor endemic, rare and globally endangered plants and animals, through regional conservation education, participatory action, and adaptive management. Using a blended conservation strategy and a collaborative approach informed by local Maya people, we aim to join with additional communities in a partnership designed to map out a comprehensive conservation plan for the future of their landscapes. The focus of our collaborative effort aligns the highest priority conservation needs with the continued well-being of the communities. We primarily address impacts that fragment, shrink, and isolate wildlife habitats across the landscape as well as diminishing resources that the local Maya people directly depend on for their livelihoods.

*Ted Lawrence is a Ph.D. candidate in Natural Resources with a concentration in conservation biology and community natural resource management. He also holds masters degrees in biodiversity conservation, anthropology, economics, and public policy. Ted is a certified associate ecologist with the Ecological Society of America, and has 14 years of combined conservation and sustainability planning experience with government and non-government entities. He is the Founder and President of the Foundation for Developing Sustainable Societies, and has assisted rural communities in Yucatán México with conservation and sustainable livelihood projects since 2009.

Effects of Benthic-feeding Common Carp and Filter-feeding Silver Carp on Benthic-pelagic Coupling in Shallow Lakes: Implications for Ecosystem Management
Xiufeng Zhang*, Lars G. Rudstam

Benthic-pelagic coupling is a key factor in the dynamics of shallow lakes. A 12-week mesocosm experiment was set up to test the hypotheses that benthic-feeding common carp (Cyprinus carpio) reduce the growth of benthic algae and promote eutrophication and that filter-feeding silver carp (Hypophthalmichthys molitrix) stimulate benthic algae growth and promote the establishment of a clear-water state. Compared to the controls, the common carp treatment had higher concentrations of TN and TP in the water column, higher biomass of pelagic algae (as chlorophyll a), higher total suspended solids (TSS) concentrations, lower light intensity, and lower biomass of benthic algae. Silver carp did not change the chlorophyll a of pelagic algae relative to the controls, but they did decrease the biomass of benthic algae and increase TP and TSS. A microcosm experiment using 32P radiotracer was conducted to examine effects of the two carp species on the release of sediment phosphorus (P). The P release to the water column was higher with common carp present than without common carp. This was not the case in the silver carp experiments. Our findings show that both carps deteriorate water quality by increasing TP and TSS concentrations and decreasing the biomass of benthic algae at the sediment surface. Common carp had a larger negative effect on water quality than silver carp. The implications are that removal of both common carp and silver carp from shallow lakes may enhance the growth of benthic algae and help promote the establishment of a clear-water state.
Learn from Nature, Act for Conservation: WWF’s Environmental Education Work in China
Dr. Yi Yong*

WWF used to be very active in EE globally and in mainland China. Main achievements incl. working with MOE (Ministry of Education) to release the national EE guideline for elementary and secondary schools in China, as well as supported the establishment of EE centers in 21 Normal Universities around China.

Although the WWF EE programme had been vanishing in the past decade, WWF China had confirmed to restart our EE work during the strategy transformation recently as we believe EE is an essential way to engage as the social support for conservation, addressing human behavior as the biggest challenge on nature. Now, WWF China’s EE work, still in a beginning stage, is mainly covering the following three areas:

   Top-down: National level policy advocacy, capacity building, guideline and principle research and national level exchange platform development.

   Bottom-up 1: Informal Education - Promote and implement education for conservation based on EE bases in protected area, e.g. nature reserves, national parks. Key work incl. thematic EE event organization, environmental interpretation, education curriculum development for conservation, capacity building for educators etc.

   Bottom-up 2: Formal education: Assist education sector to better engage EE elements into formal education system and making connection with outdoor EE bases and sites. Key work incl. guideline and principle research, providing guidance for curriculum development, training for school managers and pilot teachers.

Furthermore, although EE is still a new topic for China (no undergraduate education yet), it is in rapid development progress now. A signal is the increasing vivid academic forums and workshop held in China, and another is the growing numbers of EE organizations, esp. the grass-rooted NGOs and social enterprises. WWF China aware the positive trend and is willing to take our advantage as an int. organization to seek for more resources and opportunities to cultivate this vivid trend.

*Dr. Yi Yong is programme manager of Environmental Education, WWF China.

Development of Professional Networks Among Environmental Educators
Yue Li*

Professional development programs provide an opportunity for environmental educators to connect to each other to exchange ideas and resources. Previous research showed that participant-participant and instructor-participant online interactions have positive relationship with networking among participants in an urban environmental education online course (Li, Krasny & Russ, 2014). However little is known about how and why diverse environmental educators form networks among each other through both online and face-to-face professional development activities. The aim of this study is 1) to examine the change of the networks as a result of professional development activities, and 2) to identify factors that influence the development of the networks. Three professional development groups, which are part of EPA’s national environmental education training program, EECapacity (PI: M Krasny), brought together diverse environmental educators to exchange ideas and resources. To identify changes of networks
among these educators, I conducted social network surveys before and after the professional activities. By running regression models, I examined the factors that influence the development of networks. The results showed that all three networks became denser, and participants in the fellowship program were more interactive than other two groups. Further, participation in the online discussion had significant positive relationship with development of networks. In addition, the study suggested the ways for educators to be better engaged in such professional development activities and develop professional networks. Also the study discussed the implications of developing professional networks, through which educators get new ideas and resources for their own environmental education practices.

*Yue Li’s research focuses on professional development for environmental educators through both online and face-to-face activities. She uses social network analysis to identify changes of networks and examine the impact of these changes on practice innovation in environmental education programs.*