

FEATURED PRESENTATION ABSTRACT

Title: Life and times of a West Virginia herpetologist: 48 years of searching hollows and ridges

Author: Dr. Thomas K. Pauley, Professor Emeritus, Marshall University, Huntington, WV

Abstract: I have studied amphibians and reptiles in West Virginia since 1966 (48 years) and during this time, I have witnessed a number of changes in species occurrences, distributions, and ranges. Thousands of hours in the field during all weather conditions both day and night have resulted in many lessons about these animals that I could not have gained by just reading papers and books. For example, I have learned not to jump to conclusions about what these animals may or may not do in the field, that habitats and the occurrences of species are dynamic, nothing in nature is forever, and do not make species in your area of the world conform to what is known about them in other regions, and nothing can be a substitute for dedicated field work. I will share my experiences regarding several species I have observed during these 48 years of field work including species that I believe are declining, those that might be extirpated in West Virginia, and some long-term trends I have witnessed. I will also discuss the overall status of herpetology in West Virginia.

ORAL PRESENTATION ABSTRACTS

(in order of presentation)

Title: Snapshots in time: a citizen science initiative to track the breeding phenology of the spotted salamander and the wood frog

Authors: Stephen F. Spear, Christopher L. Jenkins, Heidi Hall Holm, and Dirk J. Stevenson, The Orianna Society, 100 Phoenix Road, Athens, Georgia 30605; sspear@oriannesociety.org

Abstract: Citizen Science efforts are now assisting biologists to track changes in plant and animal phenology at spatial and time scales never before possible. In 2013, The Orianna Society initiated "Snapshots in Time", a long-term Citizen Science project aimed at mobilizing field herpetologists, naturalists, and other Citizen Scientists to monitor the timing of Spotted Salamander (*Ambystoma maculatum*) and Wood Frog (*Lithobates sylvaticus*) breeding throughout the respective ranges of these species. The purpose of this project is to use data collected annually to investigate possible effects of climate change on the timing of reproduction. For observations of both species, contributors are asked to provide observation date, locality information, site name, habitat type (vernal pond, floodplain pool, anthropogenic wetland, crossing road) and the approximate numbers of each life stage observed (i.e., numbers of eggs masses, larvae, metamorphs, and/or adults observed). Contributors are capable of and encouraged to embed photographs for verification purposes accompanying their datasheets, which are submitted on-line. Background on this study including species identification guides, and the standardized datasheets, can be found at The Orianna Society webpage (www.oriannesociety.org). Midway through the first breeding season, 92 observations have been submitted, by 34 contributors, including records for state and federal lands, preserves, and private lands; Citizen Scientists submitted Spotted Salamander records for 39 sites (in 13 different States) and Wood Frog records for 36 sites (in 10 States). Over time, results will allow us to identify early signs of climate change effects on amphibians, as well as further increase public awareness of local herpetofauna.

Title: Using the endangered species act to protect rare amphibians and reptiles in the northeast

Author: Collette L. Adkins Giese, Center for Biological Diversity, P.O. Box 339, Circle Pines, MN 55014; cadkingiese@biologicaldiversity.org

Abstract: The Center for Biological Diversity works to secure a future for all species, great and small, especially those hovering on the brink of extinction. By petitioning the U.S. Fish and Wildlife Service to provide Endangered Species Act protection for imperiled amphibians and reptiles – and following up with lawsuits when necessary – the Center is working to obtain federal safeguards and protected habitat for herps in the Northeast and across the country. Through hiring the nation’s first full-time attorney and biologist dedicated to conserving amphibians and reptiles, the Center is expanding its campaign to address the amphibian and reptile extinction crisis. In this presentation, Collette discusses the Center’s work to protect turtles and salamanders in the Northeast, including the wood turtle, spotted turtle and hellbender. These efforts include filing the largest-ever Endangered Species Act petition focused on amphibians and reptiles, campaigning to end use of wild-caught turtles in turtle races, and litigating to secure restrictions on pesticide use in endangered species habitats.

Title: The North Atlantic Vernal Pool Data Cooperative: compiling and modeling location data for conservation planning

Authors: Steven Faccio and Kent McFarland, Vermont Center for Ecostudies; Dan Lambert, High Branch Conservation Services; Jarlath O’Neil-Dunne, Sean MacFaden, and Ernest Buford, University of Vermont Spatial Analysis Lab

Abstract: The first step in developing effective conservation strategies for vernal pools and associated wildlife species is to know where on the landscape these small wetlands exist. Organized mapping efforts have occurred in several states in the Northeast and Mid-Atlantic regions, however these projects have used varying methods to identify pool locations. Additional data are scattered among non-governmental organizations, universities, herp atlas projects, natural resource agencies, municipalities, forestry professionals, and environmental consultants. Assembling information into a single, comprehensive GIS dataset could help advance vernal pool conservation and promote collaboration among vernal pool stakeholders. This presentation will introduce the Vernal Pool Data Cooperative (VPDC), a new conservation mapping and planning project funded by the North Atlantic Landscape Conservation Cooperative. Beginning this year, VPDC partners will compile potential and verified vernal pool locations in all or part of thirteen states and four Canadian provinces. This database will provide a common framework for: organizing observational and geospatial data; visualizing and analyzing information; and cataloguing data sources, field methods, and use restrictions. The VPDC will also develop a method to identify potential vernal pools using Light Detection and Ranging (LiDAR) technology and object-based image analysis, a technique that focuses on meaningful landscape objects rather than individual pixels. Once validated and refined, this remote-sensing approach may be used to fill geospatial data gaps and guide landscape-level conservation planning.

Title: The importance of forest habitat connectivity for species of ambystomid salamanders, focusing on the eastern tiger salamander

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Abstract: Most amphibians use both wetland and upland habitats, but the extent of their movement in these upland habitats is poorly known. Fragmented landscapes resulting from anthropogenic habitat modification can have significant impacts on dispersal, gene flow, and persistence of wildlife populations. Therefore, quantifying population connectivity across a mosaic of habitats in highly modified landscapes is critical for the development of conservation management plans for threatened populations. We used radiotelemetry to observe the movements eastern tiger salamanders, as well as population genetics and GIS to examine regional genetic population structure and potential barriers to migration among remaining populations. Individuals strictly chose refugia in pitch pine/oak forested habitat. We found low genetic diversity and high relatedness within populations. Nonetheless, landscape connectivity analyses reveal habitat corridors among remaining breeding ponds and molecular estimates of population connectivity among ponds indicate that gene flow still occurs. Further fragmentation of remaining forested habitat will potentially restrict dispersal among breeding ponds, cause the erosion of genetic diversity,

and exacerbate already high levels of inbreeding. We recommend the continued management and maintenance of forested habitat corridors to ensure long-term viability of these endangered populations.

Title: Seeing spots: population and reproductive monitoring of spotted salamanders (*Ambystoma maculatum*) in central Ontario

Authors: Patrick D. Moldowan, MSc. Biology Candidate, Laurentian University, Sudbury, Ontario, Canada, P3E 2C6; pmoldowan1@laurentian.ca; Dr. Glenn J. Tattersall, Associate Professor, Brock University, St. Catharines, Ontario, Canada, L2S 3A1; gtattersall@brocku.ca; Jennifer Hoare, Park Biologist, Algonquin Provincial Park, Ontario, Canada, KOJ 2M0; jennifer.hoare@ontario.ca

Abstract: Since 2008, a breeding population of Spotted Salamanders (*Ambystoma maculatum*) has been intensively monitored through a summer student project at Bat Lake, Algonquin Provincial Park (Ontario, Canada). Bat Lake is a permanent water body, fishless, and acidic (pH 4.2), making it an interesting environment in which to study the biology of its resident amphibians. Our research has focused on establishing data records of individual morphometrics, breeding phenology (e.g., arrival, egg laying, and departure dates), population parameters (e.g., breeding population size, sex ratio), local pond and land use patterns, and environmental conditions at a site approaching the species' northern range limit. Annual mark-recapture is facilitated through the use of minimally invasive photographic identification software (Interactive Individual Identification System, i³S) that catalogues each salamander based on its unique spotting pattern. From our seven years of monitoring data, combined with records from the early 1990s, it is evident that the earliest lay date of salamanders has been steadily advancing to earlier in the season. Climate change seems a likely explanation for the underlying changes in the breeding phenology of Bat Lake salamanders; however, little research exists on whether these changes in climate may be involved in influencing population size, operational sex ratios, and arrival and departure dates of salamanders at breeding sites. Our research is asking and addressing questions related to sensitivity to environmental change of *A. maculatum*. This presentation will highlight findings of the Algonquin Park salamander monitoring project to date and discuss the use of photographic identification software in mark-recapture study.

Title: Comparison of movement patterns in captive-released eastern hellbenders (*Cryptobranchus alleganiensis alleganiensis*) using three different release methods

Authors: Julie Boerner*, Amy McMillan, Department of Biology, Buffalo State College, 1300 Elmwood Ave, Buffalo, NY 14222; boerneja01@mail.buffalostate.edu

Abstract: The Eastern hellbender (*Cryptobranchus alleganiensis alleganiensis*) has declined throughout much of its range. Previous captive-release programs have resulted in minimal success, presumably due to movement of translocated animals away from the release site. This study aimed to increase the success of future hellbender headstarting programs by implementing three different release methods and gauging the effectiveness of each method. Each of the two sites received identical study treatments. Three salamanders were placed in cages (one animal per cage), three salamanders were placed in nest boxes (one animal per box) with the entrance blocked over with screen, and three salamanders were released directly under cover rocks. Study animals were monitored using radio telemetry. Results show little difference in total movement and survivorship between stream sites or treatments. There does, however, appear to be an interesting relationship between movement and lunar cycle. Overall survival was low; 11 transmitters were recovered from either dead or eaten animals, four animals were not recovered, and only three animals survived for longer than six months. The information received from this study could aid further captive-rearing projects, as well as inform monitoring and survey efforts.

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Allegany State Park
2373 ASP Route 1, Salamanca, NY 14779
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Title: Unisexual salamanders: known knowns, known unknowns, unknown unknowns.

Authors: Noah D. Charney, Bryn Mawr College, Bryn Mawr, PA 19010; noah@alumni.amherst.edu

Abstract: Unisexual *Ambystoma* salamanders, which are included on many rare species lists across the northeast, represent perhaps the most interesting known vertebrate reproductive system. While there has been much research on these organisms, there remain many unanswered questions. Here, I review what is known about these salamanders, and report on new findings from three related studies. These animals represent a primarily female 5-million year old monophyletic mitochondrial lineage with no unique nuclear genomes of their own. Adults typically carry hybrid polyploidy nuclei with various combinations of genomes from five "regular" species on which the unisexuals likely act as sexual parasites. A team coordinated by the Massachusetts Natural Heritage and Endangered Species Program developed a protocol for identifying members of the unisexual species complex, and used this method to map genotypes across the state of Massachusetts. We found unisexuals breeding with Jefferson salamanders in the western parts of the state, blue-spotted salamanders in the eastern and southern parts of the state, and unisexual salamanders almost everywhere. Combining these geographic data with an evolutionary computer simulation and results of previous laboratory studies, I demonstrate inconsistencies in our understanding of unisexual reproductive ecology. In particular, the rates of paternal genome incorporation suggested by lab studies would imply extremely strong selection in favor of hybrid biotypes. I then discuss the implications of a road-killed unisexual found carrying developing embryos prior to egg-laying – a first for any egg-laying salamander. The bizarre ecology of unisexual salamanders complicates conservation and management, yet offers an opportunity to better understand vertebrate evolution and promises exciting new discoveries to come.

Title: Prevalence of ranavirus in wood frog (*Lithobates sylvaticus*) breeding ponds in Delaware, Maryland, and New Jersey.

Authors: Scott A. Smith*, Maryland DNR-Wildlife & Heritage Service, Wye Mills, MD 21679; sasmith@dnr.state.md.us; Kirsten J. Monsen-Collar, Department of Biology & Molecular Biology, Montclair St. University, Montclair, NJ 07043; monsenk@mail.montclair.edu; Holly S. Niederriter, Delaware Division of Fish & Wildlife, Smyrna DE 19977; holly.niederriter@state.de.us; Mackenzie L. Hall, Conserve Wildlife Foundation, Frenchtown, NJ 08825; mackenzie.hall@conservewildlifenj.org; Craig A. Patterson, Maryland DNR-Wildlife & Heritage Service, Wye Mills, MD 21679; craigapatterson@hotmail.com; D. Earl Green, USGS National Wildlife Health Center, Madison, WI 53711; degreen@usgs.gov

Abstract: These results represent the first year of a two-year Ranavirus study funded by the Northeastern States Regional Conservation Needs program. In 2013, a random sample of 30 wood frog (*Lithobates sylvaticus*) breeding ponds were chosen in each of 3 states (DE, MD, NJ), with a minimum distance between ponds of >3 km. Only ponds with ≥5 wood frog egg masses were included in the study, and were monitored through metamorphosis, die-off or pond dry-out. Standard Samples of 30 wood frog larvae per study pond at Gosner stage ≥27 were collected and analyzed at Montclair State University (NJ) by PCR for presence of Ranavirus. Die-off Samples were collected at any time a die-off was observed and analyzed at USGS-National Wildlife Health Center by PCR and virus culture. In summary, 24 of 60 (40%) study ponds where a Standard Sample was collected tested positive for Ranavirus (DE:12/21; MD:1/19; NJ:11/20). Additionally, 8 of 11 Die-Off Samples from study ponds tested positive for Ranavirus (DE:2/2; MD:6/6; NJ:0/3). All isolated viruses were further identified as FV-3. Die-off samples testing positive included larvae of wood frog, spring peeper (*Pseudacris crucifer*), spotted salamander (*Ambystoma maculatum*), and eastern spadefoot (*Scaphiopus holbrookii*). In total, 28 of 64 (43.8%) study ponds tested positive for Ranavirus. This study is the largest geographic data set ever assembled for Ranavirus testing. It represents the first cases of lab-confirmed Ranavirus in Delaware and the first in eastern spadefoots (in MD). Two additional states (PA and VA) will be included in the study in 2014.

Title: Blanding's turtle conservation in the northeast: an example of regional partnerships for rare reptiles and amphibians

Authors: Mike Marchand, New Hampshire Fish and Game Department, Liz Willey, Mike Jones, and Paul Sievert, Massachusetts Cooperative Fish & Wildlife Research Unit, Glenn Johnson, State University of New York, Potsdam, Jon Regosin and Lori Erb, Massachusetts Division of Fisheries and Wildlife, Angelena Ross, New York Department of Environmental

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Conservation, Derek Yorks, Jonathan Mays & Phillip DeMaynadier, Maine Department of Inland Fisheries and Wildlife, Kathy Gipe & Chris Urban, Pennsylvania Fish & Boat Commission, Mark Grgurovic, Parker River Clean Water Association, Bryan Windmiller, Grassroots Wildlife Conservation, Judith Rhymer, University of Maine, Stephanie Koch, Alison Whitlock, and Anthony Tur, US Fish and Wildlife Service

Abstract: The Northeast Blanding's Turtle Working Group has been working since 2004 to conserve the Blanding's Turtle (*Emydoidea blandingii*) throughout its range in the Northeast Region. The group initially collaborated on the development of a regional status assessment, completed in 2007 (Compton 2007). Representatives of wildlife agencies, universities, and NGOs, and individual researchers from five northeastern states, with funds from the U.S. Fish and Wildlife Service Competitive State Wildlife Program, in 2011 began a comprehensive planning process and long-term standardized monitoring effort to assess distribution, prioritize sites, evaluate genetic structure and diversity, and develop a baseline to evaluate change over time and assess the effectiveness of conservation actions. We developed site specific management plans for the highest priority sites in the region, and have reached out to land managing agencies, organizations, landowners, and interested individuals for feedback and to begin to implement the conservation strategy. This regional, collaborative effort has served as a model for a parallel wood turtle (*Glyptemys insculpta*) effort (Jones et al. 2014), and could serve as a model for other rare reptile and amphibian species in the Northeast region. We will give a brief overview of the Northeast Blanding's Turtle Conservation Plan, describe the process and lessons learned, and outline our implementation framework and future directions.

Title: Environmental associations of herpetofaunal communities in the pitch pine-scrub oak barrens of Albany County, NY

Authors: Lisa Pipino*, Albany Pine Bush Preserve Commission, Albany, NY 12203; lpipino@albanypinebush.org; Dr. George Robinson, Department of Biological Sciences, University at Albany, Albany, NY 12222; grobinson@albany.edu

Abstract: The Albany Pine Bush Preserve is one of the best remaining examples of about only 20 inland pine barrens worldwide. This study represents the first systematic herpetofaunal survey within these pitch pine-scrub oak communities, and sought to determine the habitat and landscape features that best explain species distributions and community structure of reptiles and amphibians. Fifteen native species, with a wide range of relative abundances, were identified over two seasons within this ecosystem. To explore correlations between species distributions and ecosystem properties, fifteen study sites were located in five units of the Preserve, with three replicates per unit representing one of each of three putative habitat categories; open barrens, pitch pine-scrub oak barrens, and pitch pine-scrub oak forests. Although validated with remote sensing data, and ground level surveys, habitat categories did not explain community structure. However, two vegetation elements, midstory cover and woody debris, were positively associated ($p < .05$) with variation in species richness and abundance patterns.

Among the five units, which are separated by highways, I found large discrepancies in the resident herpetofauna. Size of each unit was a poor predictor of community composition, however units with greater cover of open barrens vegetation had higher species abundance. Species-specific associations with measured variables were apparent for several herpetofauna (i.e. *Heterodon platirhinos* positively associated with percent of exposed dunes, and *Scaphiopus holbrooki* positively correlated with midstory cover). This nonrandom distribution of individual species argues for a heterogeneous landscape in order to retain a diverse herpetofaunal community within the Albany Pine Bush Preserve.

Title: The salamander species assemblage and environment of forested seeps of the Allegheny High Plateau, northwestern Pennsylvania

Author: Charles E. Williams*, Williams Ecological, LLC, 103 Hillcrest Lane, Shippenville, PA 16254; chuck.williams89@hotmail.com

Abstract: Seeps are shallow, slow-moving outflows of groundwater that can provide habitat and foraging areas for salamanders and other amphibians. Seeps are a patchy and largely unstudied component of slope landforms in the Allegheny High Plateau Ecoregion of northwestern Pennsylvania, particularly in regard to their salamander fauna. I conducted a survey

of forested seeps ($n = 30$) in the Allegheny National Forest of northwestern Pennsylvania in order to: 1) identify the salamander species assemblage associated with Allegheny High Plateau seeps; and 2) examine the relationship of the abundance of dominant salamander species, represented as catch-per-unit-effort (CPUE), with key physical and biotic habitat components of the seep environment. Five species of salamanders were encountered during time-constrained surveys of seeps including the northern dusky salamander (*Desmognathus fuscus*), the Allegheny Mountain dusky salamander (*D. ochrophaeus*), the northern spring salamander (*Gyrinophilus porphyriticus*), the redbacked salamander (*Plethodon cinereus*) and the northern two-lined salamander (*Eurycea bislineata*). CPUE of post-metamorphs for each of the two dominant salamander species, *D. fuscus* and *D. ochrophaeus*, was significantly associated with a small but distinct subset of seep habitat variables: CPUE for *D. fuscus* was significantly and positively associated with rock cover and pH, whereas CPUE for *D. ochrophaeus* was significantly and positively associated with vascular plant cover and slope.

Title: Understanding factors that influence the distribution of the endemic shorthead garter snake in northwestern Pennsylvania

Authors: Julie Mibroda*, Department of Biology, Indiana University of Pennsylvania, Indiana, PA 15705; jmibroda@verizon.net; Joe Duchamp, Department of Biology, Indiana University of Pennsylvania, Indiana, PA 15705; j.e.duchamp@iup.edu; Josiah Townsend, Department of Biology, Indiana University of Pennsylvania, Indiana, PA 15705; josiah.townsend@iup.edu; and Jeffery Larkin, Department of Biology, Indiana University of Pennsylvania, Indiana, PA 15705; larkin@iup.edu

Abstract: The shorthead garter snake (*Thamnophis brachystoma*) has one of the most restricted ranges of any snake species in the United States, with approximately 90% lying within northwestern Pennsylvania. Although recent surveys indicate that the shorthead garter snake is relatively abundant in certain populations, there is at least some evidence of overall population decline. Furthermore, the specific requirements that may contribute to the restricted range of this species are currently unknown. In 2010, we conducted shorthead garter snake occupancy surveys and associated habitat sampling at 40 sites in northwestern Pennsylvania. We used logistic regression to model the relationship between shorthead garter snake occupancy and habitat covariates. We detected shorthead garter snakes at 18 of 40 sites surveyed. Based on the regression analysis, canopy cover ($p=0.034$) and distance to water ($p=0.033$) were found to be the best predicting factors for shorthead garter snake occupancy (AUC=0.82). There was less percent canopy cover at occupied sites (avg=1.4) than unoccupied sites (avg=10.9), and distance to water was shorter from occupied sites (avg=397m) than unoccupied sites (avg=1598m). Our results suggest that extensive canopy cover at sites with otherwise appropriate conditions may influence shorthead garter snake presence, and that the decline of this species may be linked to patterns of landscape-scale regrowth of forests that have occurred throughout much of the species restricted range. A better understanding of shorthead garter snake habitat requirements and areas of occupancy is a necessary first step toward the development of an appropriate species-specific conservation strategy.

Title: The salamander trajectory: local knowledge, ethnoherpetology & biodiversity conservation

Authors: Michael Caron, Kansas Herpetological Society, Independent Scholar, Lawrence, Kansas, 66046; mcaron@sunflower.com; Lauren Kekahbah, Kanza/Potawatomi/Osage-Haskell Indian Nations University*, Lawrence, KS 66046; lkekahbah@gmail.com

Abstract: Academic ethnoherpetology was born in the Six Nations of the Iroquois. In 1950 Frank Speck, who first recorded the amphibian lore of the Cayuga, suffered his final heart attack within walking distance of this conference site. We review how the work of this great anthropologist intersects with Anashinaabe writer Gerald Vizenor's famous essay "The Tragic Wisdom of Salamanders" and the seminal ethnoherpetological research of Gary Paul Nabhan. Each of these scholars recognized that indigenous peoples who have lived for centuries observing and passing on local knowledge of herpetofauna often possess understandings of biological interactions and other ecological associations that can compliment and bring deeper clarity to observations of herpetologists. Speck published several herpetological papers prior to entering college. He spent his career recording and preserving the local knowledge of Naskapi, Penobscots, Iroquois, Mohecan-Pequot, and other indigenous

peoples within the geographic limits of NEPARC. Speck's enthusiasm for field ethnology and passion for herpetology were legendary. He described "Aboriginal Conservator" knowledge many decades before other scientists recognized Traditional Ecological Knowledge (TEK). Gerald Vizenor, a leading theoretician of indigenous world views, revolutionized Native American perspectives on biodiversity conservation in "The Tragic Wisdom of Salamanders", a call for rethinking old platitudes about Indians as natural born ecologists. Finally, Gary Nabhan, particularly in his study of Seri Indian ethnoherpetology, has demonstrated the enormous value, both scientifically and cross-culturally, of paying serious attention to indigenous knowledge of herps and their interactions in endangered habitats. Together the work of these three scholars emblazons an important path for ethnoherpetology.

POSTER ABSTRACTS

(alphabetical by first author's last name)

Title: Habitat restoration for the endangered *Sistrurus catenatus* (eastern Massasauga rattlesnake) on a NY state-owned property.

Author: Tom Bell, Jr. NYSDEC Bureau of Wildlife, 1285 Fisher Ave Cortland, NY 13045; tjbelle@gw.dec.state.ny.us

Abstract: In 2010, the Region 7 Cortland Wildlife unit of the New York State Department of Environmental Conservation (NYSDEC) received a USFWS Great Lakes Restoration Initiative (GLRI) grant to conduct habitat management activities on a Wildlife Management Area (WMA). The goal of this project was to improve habitat for the state endangered *Sistrurus catenatus* (Eastern Massasauga Rattlesnake) as natural succession is known to be impacting the population by limiting gestation sites. This WMA is one, of only two, known sites to harbor these snakes. This work was furthered through State Wildlife Grant funds in 2013 and 2014. The latest estimates (2013) for the population at this location are ~168 individuals, up from ~121 in 2006. Habitat work critical to the survival of the snakes included clearing 6.13 acres of all shrubs so that the pregnant female snakes could bask, therefore improving birth and survival rates. The success of the habitat work has been monitored by researchers from SUNY ESF and DEC through 2014.

Title: Can the northern redback salamander (*Plethodon cinereus*) persist in an acidified landscape?

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Abstract: The northern redback salamander (*Plethodon cinereus*) is an abundant, top predator in the leaf litter community of northeastern forests. These salamanders are major facilitators of nutrients to higher order consumers, and their ability to efficiently assimilate ingested material into biomass makes them an important component of energy flow in forest food webs. Research has shown that the depletion of soil nutrients (i.e calcium), and acidification of forest soils, may have negative effects on redback salamanders— one suggested mechanism is through changes in prey availability and quality. Recent research has found that *P. cinereus* may be able to persist in highly acidified forests, presenting the question whether this species has geographic variation in tolerance to acidic soils. We studied several aspects of *P. cinereus* ecology across 16 sites with varying base cation availability and soil acidification in the White and Green Mountains. We investigated whether trends in salamander abundance, body condition, diet composition, and elemental content are associated with the availability of soil and foliar nutrients, and invertebrate prey availability. We found no difference in the abundance, body condition, or nutrient content of salamanders across a soil pH and base cation gradient. Across all populations we found springtails, mites, and soft-bodied larvae were the most important prey groups in *P. cinereus* diet, although the relative

importance of other prey groups varied across populations. These data suggest a tolerance of *P. cinereus* for a greater range of soil pH and base cation availability than has been proposed previously.

Title: An ecological assessment of vernal pools in Rhinebeck, New York.

Author: Jillian Bonitatibus, Biodiversity, Conservation and Policy, University at Albany, Albany, NY 12222;
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Abstract: Vernal pools are a unique habitat found in the Northeastern United States. The pool basin, and the surrounding upland habitat contain a large amount of biodiversity and productivity. Vernal pools provide a refuge for amphibious wildlife, while also providing ecosystem services for humans as well as outdoor classrooms. However, the small size and ephemeral nature of vernal pools create a challenge in the management and conservation of these habitats. In New York State, most vernal pools do not meet the size requirement (12.4 acres) for regulation by the state. As a result, some local governments have developed regulations to protect vernal pools. Based on guidance from vernal pool experts in Maine, a set of criteria was developed to help establish vernal pools of the highest ecological value (Tier 1) in Rhinebeck, New York. Criteria consisted of site level biological and hydrological characteristics combined with landscape scale variables. Out of 39 vernal pools surveyed, 21 tier 1 vernal pools were identified. Establishing criteria specific to Rhinebeck's vernal pools allows for localized guidance when assessing new pools in the future. Public outreach that targets private landowners with vernal pools located on their properties would also help raise awareness about the importance of these habitats. Providing recommendations and management strategies to landowners could help to conserve a continuum of vernal pools across the Rhinebeck landscape.

Title: Potential for reduction in terrestrial salamander ranges associated with Marcellus shale development

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Abstract: The Marcellus shale is a gas-bearing sedimentary rock formation in much of the Appalachian region of the eastern United States. The number of gas wells across the basin is increasing rapidly, and well permit data suggest that this trend will continue. A taxonomic group of significant concern in this context is the Plethodontid salamanders, several species of which have ranges corresponding closely to the Marcellus shale play. Most of these species are classified as 'globally secure' by the IUCN, primarily because much of their ranges include state- and federally protected lands, which have been presumed to be free from habitat loss. To begin to address the gaps in our knowledge of the direct impacts of shale gas development, we developed occurrence models for five species of terrestrial Plethodontid salamanders found largely within the Marcellus shale play. We examined current habitat loss and predicted future Marcellus shale development under several scenarios. Under scenarios of 10000, 20000, and 50000 new gas wells, we predict 4%, 8%, and 20% forest loss, respectively, within the play. Predictions of habitat loss vary among species, but in general, *Plethodon electromorphus* and *P. wehrlei* are predicted to lose the greatest proportion of forested habitat within their ranges if future Marcellus predictions are based on characteristics of the shale play. If predictions are based on current well locations, *P. richmondi* is predicted to lose the greatest proportion of habitat. Models showed high uncertainty in species' ranges and emphasize the need for distribution data collected by widespread, randomized surveys.

Title: The herpetofauna of Cattaraugus County, NY

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Abstract: The first comprehensive survey of the herpetofauna of SW New York was conducted by Sherman C. Bishop in the 1920s. Bishop noted that “nowhere in the East are to be found more favorable situations for studying amphibians and reptiles.” Bishop was part of a team of scientists from the NYS Museum sent to survey the flora, fauna and geology of the recently established Allegany State Park that had been formally dedicated on July 30, 1921. Bishop documented 19 species of amphibians and 16 species of reptiles. A second study also supported by the NYSM was undertaken by Margaret M. Stewart in 1957 to determine species of herpetofauna present on the adjacent Seneca Indian Nation tribal lands and to estimate probable effects of flooding from the proposed Kinzua Dam which was completed in 1965. Stewart identified 17 species of amphibians and 16 species of reptiles including 3 species (Four-toed Salamander, Coal Skink, and Spiny Softshell) not found by Bishop. Shortly after joining the faculty at St. Bonaventure University in 1958, Richard C. Bothner began surveys throughout Cattaraugus County. He found 22 species of amphibians and 15 species of reptiles adding 2 species to the combined list of Bishop and Stewart, the Eastern Long-tailed Salamander and the Western Chorus Frog. The New York Amphibian and Reptile Atlas project, with the help of 62 volunteers, submitted 1651 species reports to the Cattaraugus County database, adding 2 additional species, the Queen Snake and the Woodland Box Turtle, bringing the total to 45 species for the county. However, four species, (Northern Red Salamander, Eastern Musk Turtle, Spotted Turtle and the Eastern Ratsnake) have not been documented since Bishop’s surveys.

Title: Effects of deforestation on microhabitat suitability for salamander communities

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Abstract: The objective of this study was to determine the impact of recent selective logging on the community of salamanders at Strawberry Hill Nature Preserve in south-central, Pennsylvania. We predicted a lower abundance of salamanders in riparian buffer zones adjacent to logged areas compared to undisturbed areas, and that salamanders in these buffer zones would exhibit a significantly different spatial distribution relative to unlogged areas. We also predicted that riparian buffer zones would exhibit significantly different microhabitats compared to undisturbed areas. Study sites were established along one of the preserve’s streams to compare the abundance and distribution of salamanders in riparian buffer zones with undisturbed forest patches. Leaf litter depth, canopy cover, substrate temperature, substrate moisture, and salamander cover types were also quantified to test for microhabitat preferences by terrestrial and aquatic salamander guilds. There was no significant difference between salamander abundances in riparian buffer zones and unlogged areas. However, significant differences were found in salamander distributions with a greater proportion of salamanders restricted to areas closer to the stream in riparian buffer zones compared to unlogged areas. Riparian buffer zones and unlogged habitat differed only in that unlogged areas had a warmer substrate temperature and greater canopy cover. Analysis of salamander cover types revealed a preference for log cover relative to available cover types. Our results suggest that selective logging may have had subtle negative effects on the salamander communities of the preserve and that the use of riparian buffer zones may help to mitigate the effects of logging.

Title: Dispersal and overwintering behavior of newly-emerged diamond-backed terrapin (*Malaclemys terrapin*) hatchlings at Jamaica Bay, NY

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Abstract: Overwintering behavior of hatchling diamond-backed terrapins (*Malaclemys terrapin*) is enigmatic; they may be the only aquatic turtles in which the hatchlings routinely spend their first winter on land outside the nest. However, this behavior is poorly documented. Anecdotal accounts suggest that terrapin hatchlings overwinter in wrack lines and in intertidal high marsh vegetation, two habitats that are rare at our Jamaica Bay, New York study site. We implanted 341 newly-emerged terrapin hatchlings with RFID tags in 2009-2011, released them at their nest sites, and tracked them as long as possible. Hatchlings used the wrack line only as short-term cover, instead they quickly moved to upland terrestrial refugia where they overwintered. Distance from nest to overwintering sites was dramatically right-skewed; average distance was 4.8 meters but one hatchling overwintered 40 meters (straight-line distance) from its nest. Average % ground cover, % forb cover, and % grass cover were lower around temporary refugia than around overwintering refugia, suggesting that hatchlings selected overwintering sites with specific habitat characteristics. Hatchling refugia depths were variable, up to 10cm deep, and hatchlings moved vertically in their refugia. Three tags were recovered with hatchling remains and nine tags were recovered without any direct evidence of mortality. Eighty-one hatchlings survived and emerged in the spring, between 17 March and 2 July, indicating up to 282 days underground. The advantage of terrestrial overwintering outside the natal nest is unclear but it may minimize desiccation. These findings add to a little known aspect of the *M. terrapin* life history.

Title: Tracking northern cricket frog movement through the seasons

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Abstract: Though the Northern Cricket Frog (*Acris crepitans*) is endangered in New York State, there are many aspects of its life history and habitat use that we do not fully understand. We undertook a set of studies to determine (a) how far and over what time scale Northern Cricket Frogs (NCF) move from their summer swamp habitat to their upland overwintering habitat; and (b) what conditions are needed for successful NCF overwintering. To address the first question, we conducted a mark-recapture study with Visual Implant Elastomer (VIE) codes specific to date and location, then used UV-fluorescent powder to track movements of individual frogs through the uplands. Between August 22 and November 11, we marked 440 individual frogs and recaptured 82 of them. Unfortunately, there was no clear pattern to frog movements; some remained in the same region of swamp over extended periods, some moved upland, and others moved swampward. Of the 43 NCF tracked with fluorescent powder, there was little indication of directional movement for most of the frogs, though several were tracked to potential hibernacula. To address our second question, we placed temperature and humidity loggers down these and other potential hibernacula to record abiotic conditions through the winter. As snow melted, we enclosed the potential hibernacula and checked for emergence daily. Only one enclosure yielded a frog, which we had encountered under leaves in early December. While the data loggers can provide information on the abiotic conditions of the potential hibernacula, they cannot clarify NCF preference or survival needs.

Title: What do we know about home ranges of the eastern box turtle, *T. carolina*: a meta-analysis

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Abstract: Previous studies measuring the home ranges of *Terrapene carolina* (Eastern Box Turtle), have shown wide variation in home range sizes within and between populations, probably due to factors such as data collection method and differences in habitat. These diverse studies were performed using different tracking methods (i.e., radio telemetry, string trailer), analyzed differently (minimum convex polygons, kernel analysis, bivariate normal, M.O.U., harmonic mean method), and have different sample sizes, which may contribute to the variable results. Dodd (2001) included a table of 19 field studies on *T. carolina* and *T. ornata*, but there has never been a systematic review, including all studies with home range data, to really summarize what we know about home range size in this well-studied species. After a thorough search of the literature, including unpublished thesis to avoid biased results due to under publication, I found 23 studies listing the home range areas of *T. carolina*. A meta-analysis of data from these papers was conducted to quantify the effect of sex, latitude, sample size, number of captures, and tracking method, analysis method, and duration of study on *T. carolina* home range size estimation. The effects caused by relocation were also considered.

Title: Pool Arrangement and scale of translocation influence movement parameters and habitat selection of green frogs (*Rana clamitans*)

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Abstract: Vernal pool restoration is increasing, often to provide critical amphibian habitat. Discerning spatial patterns of amphibian use of these landscapes is critical for successful restoration. Individual-level habitat selection of a vernal pool facultative species, green frogs (*Rana clamitans*), was investigated in an experimental forest consisting of 39 constructed pools arranged in clusters of one, three, or nine pools. Movement parameters and habitat selection were measured by tracking movements, using fluorescent powder, following translocations (n=139) across different types and scales of habitat. At each pool cluster density, translocations were performed at three spatial scales: pool (\bar{x} =13 m), intra-cluster (\bar{x} =57 m), and inter-cluster (\bar{x} =344 m). Inter-cluster scale translocations resulted in frogs moving more tortuously and moving further net distances, but this was mediated by pool density. Additionally, a scaling test revealed that smaller scale trials exhibited goal-oriented movement behavior. This suggests frogs may move differently when dispersing amongst pools at larger, metapopulation scales versus smaller-scale pool clusters. Frogs tended to select the pool nearest their release point, but this behavior was diminished when translocations were at the intra-cluster scale or at high pool densities. Because scale and density affect both movement parameters and pool selection, the design of pool networks should consider colonizing animals' dispersal characteristics affecting pool encounters and spatial designs which promote desired levels of movement between pools. This information can be taken into account when predicting colonization of constructed pool complexes and used to recommend pool spatial arrangements and associations with existing source populations.

Title: Comparative community ecology of dusky salamander assemblages (Plethodontidae: *Desmognathus*) in the northern Appalachian Mountains and Glaciated Plateau of Pennsylvania

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Abstract: Salamanders are the most abundant vertebrate predators of northeastern forests and are highly influential on forest ecosystem processes, particularly in headwater watersheds where caudates typically dominate the vertebrate community. Unfortunately, caudate communities are declining rapidly due to habitat destabilizing factors such as habitat alteration and loss of wetland habitat. Conservation of headwaters for utilization by salamander communities requires an accurate assessment of the ecological requirements of participating assemblage species to accurately determine necessary riparian

buffer habitat. Dusky salamanders (Plethodontidae: *Desmognathus*) are a species-rich adaptive radiation of aquatic and semi-aquatic salamanders typical of seeps and streams throughout eastern North America. *Desmognathus* predominantly have biphasic life histories with gilled aquatic larvae. These salamanders are often found sympatrically in multiple-species assemblages with adults distributed along a terrestrial to aquatic gradient, with smaller species becoming more terrestrial in the presence of larger congeners. Shifts in microhabitat utilization and narrowing of niche breadth among “small” species have been observed in the presence of larger congeners. As such, small species in complex assemblages may be the most imperiled, occupying a niche on the periphery of assemblage habitat. Stream communities of *Desmognathus* provide an opportunity to study the link between habitat selection, interspecific interaction, and evolution of adult body size. This study used varying assemblages of *D. fuscus*, *D. ochrophaeus*, and *D. monticola* across two different biogeographic regions: the northern Appalachians and the Glaciated plateau of south-central and northwestern Pennsylvania respectively to measure niche breadth by measuring distance of capture from open water as well as using HOBO dataloggers to examine temperature variation across the habitat gradient.

Title: Leveraging the 2014 Year of the Salamander campaign to engage undergraduates across the disciplines

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Abstract: Partners in Amphibian and Reptile Conservation (PARC) and its collaborators have declared 2014 “Year of the Salamander.” The purpose of this campaign is to energize salamander education, research, and conservation efforts worldwide. Supporting materials have been contributed by partner organizations and individuals from all walks of life – lay public to professional. Siena College faculty and undergraduates representing several departments and student organizations have been involved in various aspects of the campaign. These efforts have involved independent and collaborative projects, culminating in a public event, the “Year of the Salamander Education Celebration” that was held on Earth Day 2014. Independent and small group work involved: chairing the event planning team, organizing a discussion symposium at a national meeting, soliciting organizations to partner in the campaign, researching and drafting text and suggesting images for the *State of the Salamander* monograph, and drafting text for *Salamander Saturdays* (part of the social media campaign). Semester-long class projects have included: translating the *State of the Salamander* into Spanish (“Advanced Spanish”), designing salamander natural history interpretive panels and developing environmental education lesson plans incorporating salamander activities and crafts for grades K-5 (“Environmental Interpretation”). Student organizations (e.g., Environmental Club, Students for Fair Trade) were lead players in publicizing and running the Education Celebration event, which was attended by faculty, college students, and local school children. The event featured salamander experts, live salamanders for viewing, fair trade chocolate salamander confections, and a variety of salamander crafts. In fall 2014, environmental education lesson plans with a salamander focus will be disseminated to local elementary teachers. The Year of the Salamander campaign has been an ideal framework to engage the Siena community and has provided several experiential learning opportunities for undergraduates.

Title: Assessing priority amphibian and reptile conservation areas (PARCAs) in the North Atlantic Landscape Conservation Cooperative

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Abstract: Reptile and amphibian populations are threatened by habitat loss and fragmentation, climate change, pollution, disease, illegal collection, and introduced species. Yet formulating conservation solutions is limited by a lack of information about their population status and distributions. The Priority Amphibian and Reptile Conservation Area (PARCA) project is a national initiative to develop a network of non-regulatory focus areas that contain specialized habitats required by reptiles and amphibians. Comprehensive surveys rarely document species distributions across large regions such as the northeastern U.S. and opportunistic observations can be biased towards easily seen or heard species in accessible areas. We used presence-only species distribution models, expert-derived biotic and abiotic variables, and local expert review to identify PARCAs in the northeastern United States that host species of global, national, or regional conservation significance and areas of exceptional diversity. PARCAs with extensive, contiguous habitat that can support viable populations were given extra weight in the prioritization process. We evaluated our models using area under the curve metrics and our predicted species distribution models performed well. Generally, we found PARCAs were unevenly distributed across the states because many priority species reach their northern range limit in the study region. Our PARCAs provide a useful tool to raise public awareness and spark voluntary protection by local conservation partners.

Title: A new collaborative project to understand red-backed salamander population dynamics and climate change adaptation

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Abstract: We provide an overview of a recently established research and monitoring network focused on understanding local and regional drivers of population dynamics. Our goal is to develop a model for understanding how landscape and climate change affects amphibian populations. We selected the Red-backed salamander (*Plethodon cinereus*) as a model species to elucidate adaptive capacity to these drivers in order to better characterize regional trends. The Salamander Population and Adaptation Research Collaborative (SPARC) began in 2013 as a partnership between the USGS-Amphibian Research and Monitoring Initiative (ARMI) and researchers at Penn State University with the establishment of study sites in Massachusetts, Maryland, and Pennsylvania. Since then, additional sites have been, or will be, established in Michigan, New York, and Virginia in 2014-15. The study has two main objectives: (1) to understand population dynamics across the species' distribution by creating a versatile, statistically and methodologically efficient population monitoring protocol (2) to assess the potential impacts of climate and landscape change on the species via linked observational studies and experimental environmental manipulation. Central to the study design are replicated plots where mark-recapture data are collected using a robust-sampling design. This will provide estimates of abundance, survival, recruitment, growth, and movement; additional count data informs site-level spatial variation in color morph frequencies, surface activity, body size, and abundance. In addition, we are developing concurrent studies to determine range dynamics, behavior, and regional variation in physiology. This hierarchical design will allow us to gain important insights across multiple scales of organization.

Title: Empirical evidence of local adaptation and response to climate change in the American toad (*Anaxyrus americanus*).

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Abstract: In species with large ranges, different populations may be exposed to very different climate conditions such that the temperature tolerances of any one population may not represent those of all populations. The American toad (*Anaxyrus americanus*), for example, has a latitudinal range that extends across almost half of North America, from Georgia to Northern

Québec and thus may exhibit local adaptation to climatic variables, especially temperature. To examine whether this may be true, we collected American toad tadpoles from the northern and southern extremes of the species' range as well as the mid-point and raised them in a common garden experiment under differing temperature and light regimes. Tadpoles were grown individually in 1L pots that were submerged in circulating water baths to ensure that they maintained temperatures of 26°C, 22°C or 16°C. For each of these temperatures, tadpoles were subjected to either a 12hr light:12hr dark cycle or a 16hr light:8hr dark cycle, representing the southern and northern limits of the species' range, respectively. Tadpole total length was measured during development until metamorphosis. Metamorphosed toadlets were weighed once all four limbs had appeared, and again following complete absorption of the tail. We found that tadpoles showed significant differences in their development rate depending on where they were from and in what treatment they were reared. These findings suggest that populations of *A. americanus* are locally adapted to climatic regimes, implying that the response of the species to climate warming is unlikely to be uniform across its range.

Title: Three-year, student-driven study of prevalence patterns of *Batrachochytrium dendrobatidis* and ranavirus in Oswego County, NY

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Abstract: Both chytrid fungus (*Batrachochytrium dendrobatidis*, *Bd*) and ranavirus are known globally as factors related to drastic amphibian declines. However, in the Northeastern United States little is known about the prevalence of these pathogens and any potential links to declines. In 2012 undergraduates and faculty at SUNY Oswego began a long-term amphibian monitoring program in Oswego County, NY, aimed at tracking the prevalence of *Bd* and ranavirus and training students in field and molecular research. In 2012, 82 samples were collected from Rice Creek Field Station (RCFS) and the prevalence of *Bd* and ranavirus was 30% and 25%, respectively. In 2013, 146 samples were collected from RCFS and two additional sites, Snake Swamp and Independence Park; prevalence for ranavirus was similar to 2012, but *Bd* prevalence decreased to 3.4%. Seasonal patterns for both pathogens differed, suggesting an association with local weather and climate fluctuations. Thus far in 2014, 81 samples have been collected across the three sites, and across all years 12 species have been tested for the pathogens. In addition to providing data that allow comparison of patterns across multiple years, different seasons, and multiple species, this study has facilitated training of 30+ students in field and decontamination protocols, and six in molecular diagnostic methods, including DNA extraction and Polymerase Chain Reaction. Additionally, the study has resulted in two independent honors theses and multiple public outreach events led by students who engage the community in conservation issues affecting amphibians in our region.

Title: Utilizing the Wetlands Reserve Program as a tool to achieve bog turtle (*Clemmys muhlenbergii*) conservation in Maryland

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Abstract: This work focuses on using the Wetlands Reserve Program (WRP) as a tool to ensure long-term restoration and management of bog turtle habitat in Maryland. The northern population of bog turtles (*Clemmys muhlenbergii*) has been listed as threatened since 1997. The greatest threats to the population are habitat loss, degradation and fragmentation caused by development, succession and invasive species, and illegal collection for the pet trade. Restoration and management of bog turtle habitat play a major role in this species' conservation. The WRP establishes permanent

conservation easements on hydrologically altered wetlands on private land and provides funding for management through the National Resource Conservation Service (NRCS). Bog turtle population and habitat assessment protocols were developed for long term inventory and monitoring across the bog turtle's northern range to better understand the status of the species and impacts of management. For this work, a rapid habitat assessment protocol was used to measure habitat characteristics on WRP easement sites in Maryland. Permanent monitoring plots were established at each site (~1/acre) and will continue to be monitored to evaluate management. Comprehensive management plans will be created for each WRP site based on input from the landowner, U.S. Fish and Wildlife Service, NRCS, and state biologists. Forming partnerships across organizations such as the U.S. Fish and Wildlife Service, NRCS, the Mid-Atlantic Center of Herpetology and Conservation, and the Maryland Department of Natural Resources and engaging private landowners, proves to be a useful approach in establishing long-term protection of bog turtle habitat with funding for restoration and management on private land.

Title: Addressing amphibian road mortality in the northeastern U.S.

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Abstract: Amphibian road mortality is a considerable conservation issue, particularly during the highly-synchronized annual spring migrations ("Big Nights") undertaken by vernal pool-breeding species in the Northeast. Observed road mortality rates along even low-traffic rural roads may be high enough to lead to localized extirpation of pool-breeding amphibians, and long-term impacts of roads on amphibian population dynamics can be severe (Gibbs and Shriver 2005; Beebee 2013). Over the last decade, conservation groups throughout the Northeast have responded to this issue by organizing amphibian crossing brigades, in which trained volunteers move migrating amphibians across the road by hand during periods of peak traffic. In this poster, we report on a pilot effort to assess the effectiveness of one such crossing brigade in southwestern New Hampshire during 2014. In addition, we present a study design for long-term photo mark-recapture of spotted salamanders (*Ambystoma maculatum*) at selected road crossing sites throughout the Northeast beginning in 2015, focused primarily on gaining a more robust empirical assessment of the impacts of road mortality on regional spotted salamander populations. Our overarching goal is to grow this project into a regional, multi-year, collaborative research initiative focused on amphibian road mortality in the Northeast, which would help conservation organizations and transportation planners to design more effective crossing brigade efforts and to identify nights when road closures and/or crossing brigade efforts would have the greatest impact.

Title: Ecology of eastern hog-nosed snakes on a barrier island

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Abstract: The ecology and natural history of *Heterodon platirhinos* (Eastern Hog-nosed Snake) is poorly understood, despite noted declines and protected status in many northeastern states. The Eastern Hog-nosed Snake is traditionally thought of as an upland species, a denizen of xeric pine-barrens and scrubland, but also occurs on barrier islands throughout its range. Recent telemetry work in NH, MA, and upstate NY has shed light on home range and macro-habitat selection in mainland populations, but the ecology of barrier island snakes has been largely ignored. In 2013, we identified a remnant population of *H. platirhinos* on a NY barrier island and began a radio-telemetry and mark-recapture study to better understand the natural history, home-range, and demography of insular hognose snakes. Preliminary results identified 59 snakes of all age classes (46 adults, 12 neonates, and 1 sub-adult), plus the remains of a successful nest. All adult snakes were small, ranging from 68.3 to 175 g ($\bar{x} = 105.3 \pm 5.4$ g), and phenotypically similar (yellow with brown blotches; no melanism was observed). Telemetry revealed variable home ranges, and high usage of dry, invasive *Phragmites* marsh, a novel habitat type for this species. All 2013 radio-tracked snakes hibernated individually ($n = 8$), and were never observed crossing paved roads. Overall, we suspect this is a large population, as there were no re-captures, and new snakes were consistently found up until 31-Oct. Telemetry and mark-recapture will resume in 2014 to allow for population modelling and better estimates of home-range, dispersal, and habitat utilization.