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ORAL PRESENTATIONS

(Abstracts ordered as on agenda)

Conserving Snake Species of Greatest Conservation Need Threatened by an Emerging Fungal Skin Disease

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Within the past several years, there appears to be an increase of observations of snake species exhibiting facial lesions, leading to many studies as to the cause. Recent work has correlated these facial lesions to fungal species *Ophiodiomyces ophiodiicola*, also known as snake fungal disease (SFD). These lesions often involve the orbit, pit organ, or labial region, causing concern for the individuals' survivorship. Following protocols of the New England Timber Rattlesnake (*Crotalus horridus*) research of SFD by Roger Williams Park Zoo (RWPZ, Providence, RI), we currently now have a 9 state SWG grant (2014-2015) to investigate the effects of SFD on populations. With this study we assess the presence of SFD in all snake species, within the 9 states by submitting biopsies to the National Wildlife Health Center and RWPZ. We are also assessing treatment strategies for severely infected individuals. In addition, the one MA population of Timber Rattlesnakes with the highest report of SFD is currently being radio tracked and to assess if there are any differences between infected and non-infected with regards to overwintering, movements, and habitat use. We are currently assessing management strategies of headstarting and captive breeding for populations not only suffering from SFD, but also isolation, inbreeding, and increased mortality from road kill, poaching, and intestinal killings.

A Comparison of Amphibian Metamorphic Success Between Created and Natural Wetlands

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Previous studies on the success of wetland mitigation indicate that created wetlands and natural wetlands differ in their ability to provide amphibian habitat. To isolate potential causative factors, we reared larval spring peepers (*Pseudacris crucifer*) and wood frogs (*Lithobates sylvaticus*) in twelve mesocosms containing water from three created wetlands and twelve mesocosms from three reference (natural) wetlands in West Virginia and evaluated effects of water quality on metamorphosis. Spring peepers experienced similar metamorphic success between created and natural wetland mesocosms ($P > 0.05$). Wood frog mass (created: mean = 0.59 g, SE = 0.02; natural: mean = 0.66 g, SE = 0.02) ($P = 0.052$) and body length (created: mean = 14.8 mm, SE = 0.17; natural: mean = 15.2 mm, SE = 0.12) ($P = 0.051$) upon completion of metamorphosis were greater in natural wetlands. Wood frog length of larval stage was shorter in natural wetlands (mean = 33.5 days, SE = 0.11) than in created wetlands (mean = 34.4 days, SE = 0.27) ($P = 0.011$). A short larval period and large body size at metamorphosis are ideal traits for amphibian life history. Water quality measurements of dissolved oxygen, conductivity, temperature, and total nitrogen were similar between created and natural wetlands ($P > 0.05$), while pH was higher in created wetlands (7.55) than in natural wetlands (7.26) ($P < 0.001$). These results suggest that wood frogs experience higher metamorphic success in natural wetlands, possibly due to effects of pH and dissolved oxygen in the water.

Effectiveness of Head-starting as a Management Tool for Establishing a Viable Population of Blanding's Turtles

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The Blanding's turtle occurs in 15 US states and 3 Canadian provinces and has protected status in most of them. To counteract shrinking populations, a Blanding's turtle repatriation project

has been underway at the Assabet River National Wildlife Refuge (NWR) in eastern Massachusetts since 2007. The initial environmental assessment evaluated the relative benefits and risks of using various life stages of Blanding's turtles collected from a donor population within the same watershed, including direct-release hatchlings (released shortly after hatching), head-started hatchlings (raised in captivity for nine months), subadults (9-11 years old), and adults. The results of population modeling suggested that annual releases consisting largely of head-started hatchlings was the release strategy most likely to result in a stable population at the Assabet NWR (recipient site) while minimizing negative impacts to the donor site. Therefore, annual releases at the Assabet NWR have resulted in the release of 401 directly-released and 440 head-started hatchlings from 2007-2014. We conducted an extensive aquatic trapping and recapture effort from 2011 to 2014 in order to obtain comparative post-release survivorship estimates (using Cormack-Jolly-Seber models) of head-started and direct-released Blanding's turtle hatchlings. This resulted in the recapture of 173 unique individuals, over 85% of whom had been head-started. The results of the Cormack-Jolly-Seber survivorship models demonstrated that head-started turtles have markedly higher rates of survival than direct-released turtles. The results of our research should aid biologists in evaluating the effectiveness of their own freshwater turtle reintroductions and highlight the potential for head-starting as a management technique.

Post Emergence Behavior, Habitat Selection, and Survival of Hatchling Wood Turtles (*Glyptemys insculpta*) in an Unusual Landscape

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Neonate turtles have been referred to as the missing link in the life histories of North American turtles due to their cryptic nature and difficulty to track. Although little is known from field studies, data suggests that hatchling turtles have higher mortality rates than adults due to their smaller size, more potential predator species, and an increased vulnerability to fluctuating environmental conditions. Therefore, understanding the factors that influence survival in this critical and poorly known life stage is a crucial step for turtle conservation. The North American wood turtle is considered endangered by the IUCN due to habitat loss, poaching for the illegal pet trade, increases in predators, and climate change. Nevertheless, little is known about the first season of life in this species. Our study site, at the southern end of the range, is unlike typical wood turtle habitat in that it lacks natural nest beaches; therefore hatchling turtles emerge in habitats predicted to be less conducive to survival. Sixty-eight hatchling turtles from five different nest patches were radio tracked from emergence until depredation, signal loss, or hibernation. Hatchlings migrated along the contour of the landscape to reach the stream, and moved during times of favorable weather conditions. Once at the stream, hatchlings selected

microhabitats that had more vegetation and deeper leaf litter. Survival of the hatchlings varied greatly by year (0.09-0.48) and by nest patch they emerged from. Behavior, habitat, and weather seem to play an important role for hatchling wood turtles.

Preliminary Results on Abundance and Demography of Aquatic Turtles in Rhode Island along a Gradient of Forest Cover

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Habitat loss and degradation, collection, and climate change have made freshwater aquatic turtles a taxa of particular conservation concern. The five aquatic turtle species native to Rhode Island use an array of upland habitats adjacent to wetlands, making a landscape-level understanding of what is driving distribution and abundance an important component of effective management. In Rhode Island, deforestation associated with development is the leading cause of habitat loss and fragmentation, but we know little about how aquatic turtle populations respond to this landscape-level alteration. An ongoing investigation was initiated in 2013 to study the effects of landscape composition and configuration on the distribution, abundance, demography, and genetic diversity of aquatic turtles in Rhode Island. This study is focusing on a subset of wetlands throughout the state, namely isolated, non-riparian wetlands less than two hectares in size and of semi-permanent to permanent hydroperiod. As this will mostly preclude encounters with certain species, the study will focus on results from three species; *Chelydra serpentina*, *Chrysemys picta*, and *Clemmys guttata*. A mark-recapture approach has been used to sample 58 wetlands across a gradient of forest cover throughout Rhode Island. Preliminary results on abundance and sex ratio are presented herein.

Non-target Impacts Of Chemical Management Under Increased Temperature On *Lithobates pipiens*

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Multiple factors including pollutants and invasive species have contributed to the global decline of amphibians and due to changes in climate, declines in amphibian populations are expected to continue. Changes in climate may allow for greater range expansion of invasive plants and therefore, the use of chemicals to control invasive plants may increase. In this study, we conducted a controlled laboratory experiment to examine the individual and interactive effect of the invasive plant European buckthorn (*Rhamnus cathartica*), the herbicide triclopyr, and

increased temperature on the survival, growth, and development of Northern leopard frog (*Lithobates pipiens*) tadpoles. At the conclusion of this study, tadpoles in the elevated temperature were smaller, but more developmentally advanced. The presence of *R. cathartica* leachates appeared to enhance tadpole growth. The use of triclopyr to chemically manage invasive plants appears to have minimal negative effects on tadpole growth or survival at the concentration used in this experiment. Interaction treatments designed to simulate active chemical management using triclopyr to manage *R. cathartica* resulted in slight negative effects to tadpoles. Results from this study highlight the need for further examination on how changes in climate may impact amphibian populations.

Assessing the Sustainability of Virginia's Commercial Snapping Turtle Harvest

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Overharvesting of animal populations, largely for human consumption, has profoundly impacted freshwater and marine ecosystems worldwide. Localized population crashes in aquatic systems have led to the creation of a global market in order to meet increasing consumer demand. An increasing number of freshwater turtles are being targeted by commercial harvesters in the United States. The snapping turtle, *Chelydra serpentina*, has been harvested and exported at an alarming rate in recent history. Over 2 million live snapping turtles were exported from the US to Asia in 2012-13 alone. Much of this export has been supplied by wild snapping turtle populations, which are being harvested in unprecedented numbers. In Virginia, the harvest rates have precipitously increased almost 1200% over the past 10 years. With whole female snapping turtles being sold for \$2 a pound and males for \$1 a pound, this lucrative harvest is expected to increase. And with many states in the mid-Atlantic region implementing stricter regulations on the commercial harvest, Virginia has also seen an increase in the number of out-of-state harvesters. In 2012, out-of-state harvesters accounted for almost 70% of the harvest. This situation has led to some outrage from Virginia harvesters and what is being perceived as an unsustainable level of harvest being conducted by a few commercial operators. In order to address this issue, three rivers of varying harvest pressure were investigated through the use of radio-telemetry and mark-recapture to characterize the demography, habitat use and home ranges, and assess sustainability under current and projected harvest rates.

Status of the Northern Red-bellied Cooter (*Pseudemys rubriventris*) in Plymouth County, Massachusetts

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At the time of their federal listing as Endangered in 1980, the Massachusetts population of Northern Red-bellied Cooters (*Pseudemys rubriventris*) was known primarily from ~12 ponds in Plymouth County isolated by >380 km from the nearest populations, with an estimated population of ~200 individuals. In 1984, the Massachusetts Division of Fisheries & Wildlife and U.S. Fish & Wildlife Service began a headstarting program to increase recruitment rates and expand the extent of occurrence. More than 3,500 wild-born cooters were headstarted, marked, and released at ~28 sites. Early work by Alison Haskell and colleagues revealed evidence of possible pond-based differences in survivorship of headstarted turtles. From 2013–2014, we undertook a reassessment of *P. rubriventris* in Massachusetts to estimate total population size, long-term and pond-specific survivorship of headstarted turtles, and spatially-explicit pond-based recruitment rates. In 2015, we expanded our sampling effort to include most of the original occurrences, as well additional isolated ponds that had received large numbers (>100) of headstarted turtles. Our sampling design incorporated standardized and repeatable protocols, and a range of capture techniques including basking traps, net captures from kayaks, and snorkel surveys. Each captured turtle was tagged with a PIT to avoid disturbing original notches. Using open population models, we estimated the population size for each of three pond complexes. Our preliminary results from 2013–2014 indicate that annual headstart survivorship over multiple decades to exceed 95% in at least three pond complexes. At multiple sites believed to comprise headstarted turtles and their offspring, we found evidence of nesting and recruitment. However, our initial estimates indicate that recruitment rates are highly variable, ranging from negligible in one complex to over 0.31 recruits per female reproductive year in another, the latter of which is suggestive of an increasing population. Results from 2013–2015 will be incorporated into a status assessment and conservation plan.

Infection Rates of Ranavirus and Batrachochytrium Dendrobatidis in Green Frog Populations of Pennsylvania

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In 2013 and 2014, we surveyed 25 wetlands throughout Pennsylvania to document the occurrence of Ranavirus and chytrid fungus (*Batrachochytrium dendrobatidis*) in populations of green frog (*Lithobates clamitans melanota*) tadpoles. Ranavirus was detected in just two

populations, while chytrid fungus was detected in 88% of the wetlands we surveyed. The chytrid zoospore intensity was significantly higher in human-created mitigation wetlands (n=12) than in natural wetlands (n=13), with one-third of mitigated wetlands exceeding 1,000 zoospores equivalents per infected individual. Chytrid infection prevalence was highest in mitigated wetlands (exceeding 89% in two wetlands), but prevalence was not significantly different between mitigated and natural wetlands. We also examined whether human alterations to wetland buffer zones influenced infection parameters. Forest cover within 250m of a wetland was weakly correlated with infection prevalence ($r = -0.465$) and the intensity of infections ($r = -0.515$), but only among wetlands with relatively few anthropogenic stressors. Once the 100m buffer surrounding a wetland was impacted by two or more categories of stressor, forest cover failed to explain much variation in infection parameters. In conclusion, chytrid fungus appears to be widespread among Pennsylvania's green frog populations in both natural, and human-created, wetlands. Furthermore, maintaining forested buffers around wetlands may only influence chytrid infections when other anthropogenic stressors are kept to a minimum.

Effects of Salt Marsh Restoration on Spotted Turtle Populations and Habitat Use at Medouie Creek, Nantucket Island, MA

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Medouie Creek, an historic saltmarsh on Nantucket, MA, experienced altered hydrology by the construction of ditches and dikes prior to 1938. These alterations restricted tidal flow, impounded freshwater, and decreased soil salinity, resulting in the conversion to a freshwater marsh dominated by cattail (*Typha* sp.) and non-native common reed (*Phragmites australis*). In 2003, the Massachusetts Office of Coastal Zone Management Wetlands Restoration Program (MWRP) declared Medouie Creek a high priority wetland restoration site. In 2008 NCF installed a culvert and excavated a channel to increase tidal influence to the marsh to reduce the extent of *P. australis* and promote the restoration of saltmarsh vegetation. The marsh has since experienced changes to hydrology and soil salinity and a shift toward a saltmarsh vegetation community. One of the Island's largest populations spotted turtles (*Clemmys guttata*) inhabited Medouie Creek prior to restoration. While the spotted turtle was delisted as Species of Special Concern in Massachusetts in 2006, there remains interest in Nantucket populations due to development, habitat fragmentation and isolation from mainland populations. In 2008, NCF began a study to estimate changes to population size and shifts in habitat use and home range in response to restoration. We captured over 150 individual turtles and radio-tracked 32 adults between 2008-2014. Due to regular tidal fluctuations and increased salinity within the Medouie Creek marsh, spotted turtles have discontinued use of most of the marsh, decreased home range sizes and use shrub swamp communities throughout the year rather than just seasonally. We continue to monitor changes to the marsh and the response of spotted turtles.

Created vernal pools: how well are we doing?

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Vernal pools are small, isolated, ephemeral wetlands that undergo cyclical periods of drying and inundation; they provide key habitat for several amphibian and invertebrate species. Vernal pools often lack legal protection and are subject to destruction. Although pools have been created as mitigation for development projects or as management efforts to enhance existing habitat, it is not known how well created pools mimic the ecology of natural pools. To address this, we compared 7 vernal pools in southeastern New York (created in 2006) with 6 established vernal pools in northeastern Connecticut. In 2013 and 2014, we collected data from spring through mid- to late- summer on: physical, habitat, water chemistry, productivity, amphibians, and macroinvertebrates. Physical habitat structure of constructed and reference pools differed: created pools were smaller in area, had shallower basins, more open canopies, greater amounts of duckweed, cattail, and *Phragmites*, and were less likely to dry. Created pools had higher pH, conductivity, and total dissolved solids, and did not demonstrate a seasonal increase in dissolved organic carbon. Amphibian species richness did not differ, but created pools had fewer egg masses of key vernal-pool breeding amphibians (wood frogs and spotted salamanders), with both amphibian species present in only 4 of the 7 created sites. Macroinvertebrate richness was similar across sites, but composition differed between created and reference pools. Our results indicate that although created vernal pools can provide habitat for a variety of species, the ability to mimic the physical and ecological functions of natural vernal pools is suspect.

Determinants of Nest Success, Hatchling Survival, and Recruitment for the State Threatened Wood Turtle (*Glyptemys insculpta*)

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The wood turtle (*Glyptemys insculpta*) is one of several North American turtles that has been severely impacted by human encroachment and yet remains understudied relative to the degree of threat and increasing pace of range contraction. National forest lands and adjacent properties afford the most immediate, and possibly the best, opportunity for conservation of wood turtle populations in Virginia. However, many of the wood turtle populations on national forest lands are found in the upper reaches of watersheds, where suitable nesting sites are limited. It was therefore our objective to determine the principle components of nest site selection, nest success, hatching success, and hatchling survival in a Virginia population of the

wood turtle. Between 2010 and 2014, aquatic and terrestrial visual encounter surveys were conducted in order to capture female wood turtles and monitor their behavior during the nesting season. A subset of captured females were fitted with a radio transmitter and 762 m thread spools to aid in the nest location process. To this end, a total of 543 turtle captures were made across the five years, 244 adult females were radio-located, and a total of 217 nests were monitored. Only five of 217 nests (2%) were on non-anthropogenic locations, and 77% of nests had at least some emergence. Slope, dominant aspect, and vegetative cover were found to be influential in the selection of turtle nests.

Patterns in Pool-breeding Amphibian Health across a Gradient of Human Disturbance

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Despite heightened conflicts between vernal pool conservation and development, there is little information on how disturbances from urbanization may contribute to population declines of vernal pool-breeding amphibians. Examining the relationship between amphibian health and disturbance can lead to better understanding of the pool and landscape conditions necessary to maintain healthy populations. During 2014, we collected health data on larval wood frog (*Lithobates sylvaticus*) and mole salamander (*Ambystoma* spp.) at 43 vernal pools in central Maine. During bi-weekly health surveys we measured body length, mass, and volume and recorded developmental stage, injuries, malformations, and indications of disease. Throughout the season we quantified changes in within-pool vegetation, hydrology, and water chemistry. We also quantified percent impervious surface within 90, 300, 600, and 990 m of pools. Using multivariate analyses, we grouped pools based on health variable profiles, determined which pool and landscape factors explained the majority of the variation in health groupings, and plotted health groups along selected principle component axes. Pools were clustered into 2 clearly-defined groups based on wood frog profiles and 4 moderately well-defined groups for mole salamanders. Small (within pool) and large scale (within 90-990m from pools) site characteristics appear to influence morphology of wood frog larvae. Interestingly, larger wood frog larvae occurred in landscapes with greater levels of human disturbance and increased vegetation cover. These trends and other weak patterns in mole salamander health will be further examined as this study continues through 2016.

Basking Habitat Assessment of the Northern Red-Bellied Cooter in Plymouth County, Massachusetts

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The Massachusetts population of the Northern Red-bellied Cooter (*Pseudemys rubriventris*) was listed as a federally endangered species in 1980. At the northern extent of its range, basking habitat availability may be a critical component of maintaining viable populations. We quantified basking site usage across coastal plain ponds located within a matrix dominated by fragmented forested lands, residential areas, and cranberry bogs in Plymouth County, MA. At each focal pond, we conducted visual surveys via kayak during pre-nesting (April and May), nesting (June) and post-nesting (July and August) seasons and recorded basking sites used by *P. rubriventris* during each visit. Within each season, basking feature usage was characterized by frequency of use. Each confirmed basking site was then characterized by feature type (e.g., rock, log, vegetation mat), size, orientation, water temperature, water depth, height above water, angle of inclination, distance to shoreline, distance to nearest known basking object, and surrounding land use at multiple scales. Random potential basking objects were also evaluated and compared with confirmed basking objects using generalized linear models and Classification Trees. We used our results to evaluate shifts in basking behaviors and seasonal distribution across multiple spatial and temporal scales as a result of changing weather conditions, seasons, and water levels. This assessment will be used to inform future management actions to improve *P. rubriventris* habitat in Massachusetts.

Update on the Rangewide Distribution and Status of the Atlantic Coast Leopard Frog (*Rana kauffeldi*)

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Following the recent formal description of the cryptic Atlantic Coast leopard frog (*Rana* [= *Lithobates*] *kauffeldi*), nine northeastern states are collaborating to determine the distribution, conservation status, and habitat use of each of the region's three leopard frog species through co-located bioacoustics, morphological study, and genetic data. This investigation is needed because an understanding of the distribution of each species within each state is critical to the application of proper conservation measures given declines in leopard frogs in our region. A secondary goal is to confirm that the co-occurrence of unique calls, patterning, morphology, and genetics documented for the New York City metropolitan area holds rangewide, and confirm field marks to distinguish among species. In short, we wish to provide the raw material for the field guide page for this newly confirmed species. In August 2015 we will be nearing the completion of field work for this two-year project. We will present some of the history of confusion (and flashes of enlightenment) regarding leopard frogs in our region, this project's background, some preliminary results, challenges we have faced, and reflection upon factors that kept this species hidden for so long.

The Salamander Population and Adaptation Research Collaboration Network (SPARCnet): The First Two Years in Regional Population Monitoring

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SPARCnet was established in the fall of 2013 as a partnership between the USGS-Amphibian Research and Monitoring Initiative (ARMI) and researchers at Penn State University. It has grown to include collaborators from several different states and institutions. Our goal is to increase the understanding of how landscape characteristics and climate change affect amphibian populations. We use the Red-backed salamander (*Plethodon cinereus*) as a model species to elucidate adaptive capacity to these drivers in order to better characterize regional trends in the Northeast. *P. cinereus* is widely distributed and common in woodland habitats, allowing us to make strong inferences about salamander population dynamics. Here we present the findings from the first two years of mark-recapture field surveys, totaling in over 3,000

captures of *P. cinereus*. Within a spatial capture-recapture framework, we estimate regional variation in salamander population densities, movement, and survival. Additionally, while mark-recapture is the central focus, SPARCnet uses a multi-scale approach to address our questions of interest by incorporating *in situ* and *ex situ* experiments, participation from local schools and citizen science, and by expanding our collaboration network. We show how this multifaceted network enables connections between researchers, educators, managers, and youth to address important topics in amphibian conservation and management.

Patterns of Long-Term Abundance and Survival of Snapping Turtles Before and After a Population Catastrophe

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Population catastrophes are widespread but unpredictable phenomena occurring in natural populations that have important, yet frequently underappreciated, consequences for persistence. As human impacts on ecosystems increase globally, the frequency of catastrophes is likely to rise while increasingly fragmented and depleted populations become more vulnerable. Species with long life histories are expected to recover slowly from catastrophes because of their longer generation times, and assessing their population recovery requires data spanning long periods. We report results from a long-term mark-recapture study of a population of Snapping Turtles (*Chelydra serpentina*) in Algonquin Provincial Park, Ontario, that experienced a major mortality event. We estimated abundance and survival of nesting females before, during, and 23 years following the catastrophe. We used a Bayesian approach to build multistate mark-recapture models incorporating movement between sites, temporary emigration, and behavioural response. We found that nesting female abundance declined by 39% overall, and by 49% at our focal nesting area during three winters of high mortality. Apparent survivorship during this period fell from 0.94 before the mortality event to 0.76 and 0.86 at each of two sampling areas, respectively. Survivorship over the following 23-year period averaged 0.972 and 0.94 at the two sampling areas except during a flooding event in one interval when it was lower. Despite high post-catastrophe survivorship and connectivity with other populations, the population failed to recover, with overall abundances remaining similar across 23 post-catastrophe years. We discuss the relationship between life history attributes and the causes and consequences of local catastrophes and conservation implications.

POSTER PRESENTATIONS

(Abstracts ordered alphabetically by presenter's last name)

A Systematic Review of Headstarting Programs for Freshwater Turtle Populations: Review Protocol, Data Extraction, and Preliminary Results

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Freshwater turtles are declining globally, facing numerous threats from habitat loss to subsidized predation to poaching and disease. Turtles rely on a long life coupled with many reproductive events to maximized fitness as survivorship of turtle nests is naturally low. One conservation tool used to offset population declines is headstarting: the removal of eggs or hatchlings from the wild and then rearing of those young in captivity until they reach a larger body size. The effectiveness of headstarting as a tool for increasing populations had long been debated in the literature, and modelling exercises have demonstrated the limited power of headstarting to counter declines caused by increased adult mortality. Furthermore, following up with headstarted individuals after release is an expensive and time-consuming effort, and gathering empirical evidence of population trends often requires over a decade of annual, intensive field research. Thus, while headstarting is a widely used conservation tool, information regarding the outcomes from headstarting projects is sparse and scattered among personal expertise, technical reports, and the primary literature. The goal of this project is to gather as much information on headstarting outcomes as possible through systematic review and an online survey. In partnership with Wildlife Preservation Canada, the results of this systematic review and survey will be made public through publication in the primary literature and accessible online through a living document. Our ultimate purpose is to consolidate knowledge and identify areas of data deficiency where further research is required, thus facilitating current and future freshwater turtle conservation projects.

Preliminary assessment of the diamondback terrapin population at Allens Pond Wildlife Sanctuary

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Salt marshes, estuaries, bays, sounds and adjoining uplands are picturesque features of the coastline that serve as nurseries or homes for many species. One reptile in the United States is completely dependent on this habitat: the diamondback terrapin, *Malaclemys terrapin*. Diamondback terrapins are top predators in marshes, so they may be reliable indicators of a healthy ecosystem. This species is currently listed as threatened in Massachusetts, and Allens Pond is one of few sites known to support populations. However, no rigorous studies have been conducted to evaluate the conservation status of

the population. The purposes of this study were to determine the size and structure of the terrapin population at Allens Pond, identify terrapin nesting areas, and analyze habitat characteristics and predation pressures. Twenty-three terrapins were collected, with the majority being juveniles and the sex ratio nearly 1:1. The presence of numerous deer, rabbits, and field mice, and only a few canids, suggests low local predation pressure. These data will form a valuable baseline for future research at Allens pond and comparable sites, and for the development of conservation and management strategies to reduce the risk of extinction, which may result in negative consequences throughout the entire ecosystem.

Preliminary Results on Abundance and Demography of Aquatic Turtles in Rhode Island along a Gradient of Forest Cover

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Habitat loss and degradation, collection, and climate change have made freshwater aquatic turtles a taxa of particular conservation concern. The five aquatic turtle species native to Rhode Island use an array of upland habitats adjacent to wetlands, making a landscape-level understanding of what is driving distribution and abundance an important component of effective management. In Rhode Island, deforestation associated with development is the leading cause of habitat loss and fragmentation, but we know little about how aquatic turtle populations respond to this landscape-level alteration. An ongoing investigation was initiated in 2013 to study the effects of landscape composition and configuration on the distribution, abundance, demography, and genetic diversity of aquatic turtles in Rhode Island. This study is focusing on a subset of wetlands throughout the state, namely isolated, non-riparian wetlands less than two hectares in size and of semi-permanent to permanent hydroperiod. As this will mostly preclude encounters with certain species, the study will focus on results from three species; *Chelydra serpentina*, *Chrysemys picta*, and *Clemmys guttata*. A mark-recapture approach has been used to sample 58 wetlands across a gradient of forest cover throughout Rhode Island. Preliminary results on abundance and sex ratio are presented herein.

Use of Miniature Data Loggers to Investigate Turtle Ecology

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The use of miniaturized environmentally-rugged sensors and data storage devices (tags) have made it possible for researchers to collect field data never available before. We report here on three types of miniature data loggers used to investigate turtle ecology. iButton temperature tags we attached to the shells of overwintering box turtles (*Terrapene carolina*) showed that they approached 0°C but not colder, despite much colder air temperatures. We surgically implanted a temperature tag into the abdominal cavity of another box turtle, and confirmed that T_B as low as -0.8°C, indicating that the turtle probably did not freeze despite T_A as low as -8°C. We attached depth and temperature tags to 12 adult female diamond-back terrapins (*Malaclemys terrapin*) in July 2013 when they came ashore to nest in Jamaica Bay, New York, to learn about their diving and overwintering behavior. Terrapins spent a considerable amount of time >2m deep, but were at or near the surface in every month, even when shell temperatures dropped to -1°C for a week. We suggest that these turtles routinely overwinter at close to their tolerance levels.

Fitness Consequences of Infection by *Batrachochytrium dendrobatidis* in Northern Leopard Frogs (*Lithobates pipiens*)

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The amphibian chytrid fungus, *Batrachochytrium dendrobatidis* (*Bd*), has been linked to amphibian declines and extinctions worldwide. The pathogen has been found on amphibians throughout the eastern United States, but has not been associated with mass die-offs in this region. We conducted laboratory experiments on the effects of *Bd* infection in a putative carrier species, the Northern Leopard Frog (*Lithobates pipiens*), using two estimators of fitness: jumping performance and testes morphology. Over the eight-week study period, peak acceleration during jumping was not significantly different between infected and uninfected animals. Peak velocity, however, was significantly lower for infected animals after eight weeks. Two measures of sperm production, germinal epithelium depth and maximum spermatid cyst diameter, showed no difference between infected and uninfected animals. The width, but not length, of testes of infected animals was significantly greater than in uninfected animals. This study is the first to show effects on whole-organism performance of *Bd* infection in post-metamorphic amphibians, and may have important long-term, evolutionary implications for amphibian populations co-existing with *Bd* infection.

Habitat and Prey Density Analysis of Wood Turtles in Central New York

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Known to be opportunists, Wood Turtles need a calcium rich diet in order to maintain the integrity of their shells. Snails provide a great source of nutrition for Wood Turtles in the northern extent of their range where individuals are found with more damage than those in southern populations. During a Master's Thesis study in Central New York, we observed a majority of individuals with snail remains on their beaks. Our study examined the density of snails relative to identified Wood Turtle locations. Groups of three cardboard square (300cm x 300cm each) were soaked in water and placed 1 meter apart in known turtle locations. Four total groups were placed at each site. Three of the groups at each site were centered at exact sites where Wood Turtles were located and one control placed in suitable habitat where no turtles were found. Boards were left for 24 hours and then checked for any slugs, snails, insects, and other organisms. Plants surrounding each piece of cardboard will also be surveyed and quantified to hopefully help us better understand the preferred habitat of Wood Turtles. Any data collected in this survey will increase our knowledge on Wood Turtles and help to protect and conserve them more effectively.

Utilization of "Capture Quotas" to Standardize Long-Term Mark-Recapture Studies Involving Turtle Species with Cryptic Habits

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Detecting trends for any population requires good data and robust models, but many long-term mark-recapture datasets are collected without following rigid protocols or sampling schedules. Such datasets are common for species with cryptic habits in which observer bias, observer skill, weather conditions, and other environmental factors influence capture rates. Standardized protocols have been developed for both *Glyptemys* species but adhering to rigid sampling schedules and controlling for observer skill/bias remain difficult. We collected a long-term (1998-2015) wood turtle (*G. insculpta*) population dataset from northern New Jersey. Sampling protocol was not standardized and sampling effort varied greatly between annual sampling occasions. Wood turtles were hand-captured during annual nesting seasons, stream surveys, and while tracking radioed turtles. We obtained annual, sex-specific apparent survival and abundance estimates by analyzing the entire dataset in Program MARK. Then, to control the effects of non-standardized sampling and observer bias, we grouped set a number (average captures per year from 1998-2015) of individual captures into annual occasions and ran a similar analysis in MARK. Sampling occasions that could not meet the annual capture quota

were excluded from the analysis. All other sampling occasions were made commensurate by randomly eliminating captures until the annual capture quota was met. Assuming a population remains stable enough to consistently meet the annual capture quota, capture quotas can be used as an index of sampling effort. This method will allow us to conduct meaningful analyses on non-standardized survey data and eliminate the need for stringent protocols when sampling species with cryptic habits.

A Monitoring Design for Tracking Broadscale Population Trends in Box Turtles

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Eastern box turtles (*Terrapene carolina carolina*) are at the edge of their range and they have low population densities in Massachusetts, where they are listed as a Species of Special Concern. A statewide population monitoring program was developed to aid in the conservation efforts for this species. We performed visual surveys from 2010–2012 then used these baseline data to evaluate occupancy models and our ability to detect population change over time. The probability of box turtle occupancy was estimated to be 0.81 ± 0.10 (mean \pm SE) with a mean detection probability of 0.29 ± 0.18 . Covariates affecting occupancy estimates were vegetation density and presence of roads, and variables affecting detection were survey start time, humidity, and surveyor. Our results indicated that this sampling design will allow us to detect a 10% decline in occupancy between 5-year sampling rounds within 15 years (~2% annual decline).

Effects of Light Pollution on Substrate Selection in Post-Metamorphic Wood Frogs (*Lithobates sylvaticus*) and Blue-Spotted Salamanders (*Ambystoma laterale x jeffersonianum*)

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Light pollution is known to be problematic for many nocturnal organisms, but our understanding of its effects on amphibians is relatively poor. This is particularly true for post-metamorphic amphibians, as their small size makes them difficult to track. Our objectives were to determine if wood frogs (*L. sylvaticus*) and unisexual blue-spotted salamanders (*A. laterale x jeffersonianum*) prefer deciduous or coniferous leaf litter and if this preference was affected by artificial light. We conducted choice experiments using 42 salamanders and 46 frogs placed in covered outdoor mesocosms. Each mesocosm was divided into half coniferous and half deciduous leaf litter and its underlying soil. Animals were given one night to choose a substrate, and their positions were recorded the next morning. We then conducted lighted trials in the same mesocosms, with a flashlight illuminating one substrate one night, and the other substrate the following night. Frogs did not have a leaf litter preference ($p > 0.20$), and did not show a preference when either substrate was illuminated ($p > 0.20$ with deciduous lit and $0.10 < p < 0.20$ with coniferous lit). Salamanders strongly preferred deciduous litter ($p < 0.001$). This preference ratio changed in illuminated deciduous trials ($p < 0.001$), but the majority of salamanders still chose illuminated deciduous litter (31 of the 43). Salamanders chose coniferous litter more often when it was illuminated than in substrate trials with no illumination ($p < 0.001$). Our results suggest that artificial lighting could attract these salamanders to substrates they would not normally prefer, but more research is needed to understand the basis for the observed patterns.

Temporal Infection Rates of Chytrid Fungus (*Batrachochytrium dendrobatidis*) on Green Frog (*Lithobates clamitans melanota*) Tadpoles in Pennsylvania Wetlands.

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Chytridiomycosis is an emergent infectious disease caused by the fungus *Batrachochytrium dendrobatidis* (*Bd*) that has resulted in population declines of hundreds of species of amphibians. The objective of this study was to compare the prevalence of *Bd* infections between tadpoles that had overwintered (collected in early June), to tadpoles recently-hatched tadpoles which had not overwintered (collected in late July-September). All tadpoles were swabbed to collect *Bd* zoospores, and then tested with qualitative PCR to determine their intensity of *Bd* zoospores. We found that green frog tadpoles that had not overwintered were not infected with *Bd*, even though prevalence rates among overwintering cohorts collected earlier in the year ranged from 8.9% to 95%. Furthermore, we failed to detect *Bd* infections in 22 tadpoles collected in August and September that were about to enter their second overwintering. Although seasonal changes in *Bd* infection rates have been documented in adult anurans, our study is one of the first studies to document this temporal variation in larval

anurans. Further research is necessary to determine whether high water temperatures during the late summer can rid tadpoles of *Bd* zoospores, and whether tadpoles must overwinter to obtain zoospores.

A Salamander Enigma; Testing the Unisexual Salamander's Reproduction Paradigm in Maine

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Unisexual salamanders (*Ambystoma laterale* x sp.) are nearly all female, have DNA from multiple species, use sperm from a related species to stimulate their eggs to develop, and lay eggs in the same pools where they obtain sperm. In Maine, the only known sperm donor species is the blue-spotted salamander (*A. laterale*), but an intensive two-year survey of four vernal pools revealed that very few males were available to provide sperm to the abundant unisexual salamanders (ranging from 24 to 138 females per male). Despite the low numbers of male blue-spotted salamanders, some pools still had perplexingly high reproductive success (with over 100 dispersing juveniles per male 4 of 8 events), causing us to question the paradigm that blue-spotted salamanders are necessary for reproductive success in Maine. We used cloacal flushes and breeding chambers to test the hypotheses that the unisexuals: 1) do not require sperm for reproduction; 2) are capable of using sperm from a more distantly related species (the spotted salamander, *A. maculatum*); or 3) obtain sperm before entering the vernal pool. All unisexuals caught entering the breeding pool were sperm negative. Unisexual salamanders in breeding chambers submerged within the pool failed to oviposit, regardless of the availability of spotted salamander males or spermatophores (however, female spotted salamanders readily laid egg masses). Our results do not support any of our hypotheses, and we remain puzzled by the recruitment at our field sites.

Examining the Density and Age Effects of Connecticut's Exurban Environment on the Presence and Abundance of *Desmognathus fuscus* and *Eurycea bislineata*

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Exurban development has been the fastest growing form of land use since the 1950s. This development perforates intact forests and creates forest edges, which can have profound effects on wildlife. Research has quantified changes along the rural-urban gradient, but the ecological effects of development types within exurban development are much less clear. The physical and chemical composition of headwater streams can be significantly altered by development such that stream-dwelling salamanders, which occupy these discrete, measurable headwater habitats, can serve as biological indicators. Urban streams are known to have reduced salamander abundance and larval retention. Therefore, habitat characteristics linked to increasing exurbanization should be reflected by changes in the presence and abundance of salamanders. *Desmognathus fuscus* and *Eurycea bislineata*, which differ in their size, behavior, and habitat use, were used to examine this relationship. Area-constrained surveys of 15 first-order streams in Coventry and Mansfield, Connecticut, were conducted monthly between May and August 2014. Streams were categorized by age (new: houses built after 1980, old: houses built prior to 1980) and density (low: <15%, high: >15%), as well as control streams (<0.05% development). Individuals were marked using unique visible implant elastomer tags. We marked 27 *D. fuscus* and 406 *E. bislineata* and recaptured 2 *D. fuscus* and 15 *E. bislineata* salamanders. *E. bislineata* abundance was significantly higher in undeveloped compared to developed streams, and *D. fuscus* were absent from streams with high density, old development. Results should be considered in future development planning and protection of first-order streams and their buffer zones.

Diet of Bog Turtles (*Glyptemys muhlenbergii*): Comparison From Populations Found in Northern and Southern New Jersey.

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The bog turtle (*Glyptemys muhlenbergii*) experienced a 50% reduction in range and population size between 1977-1997 and is currently listed as an endangered species in New Jersey. The most well documented threat to bog turtles is the loss and degradation of suitable wetland habitat due to human intervention, which may involve loss of suitable dietary items for this species. Research on the diet of bog turtles is, however, underrepresented in the literature. Therefore we initiated a study to examine and compare the diets of two NJ bog turtle populations. Radio telemetry was used to find turtles, and fecal samples were collected and analyzed to determine the identity of food items in the bog turtles' diet. Food items identified were beetles, millipedes, ants, caddisfly larvae, snails, plant material and seeds. Turtles from the northern site consumed more millipedes and caddisfly larvae than turtles from the southern site, and their fecal samples also contained fly and snail segments, which were not found in samples from the southern site. Turtles from the southern site consumed more beetles and seeds than turtles from the northern site. The consumed beetles from the southern site were identified to be the invasive Japanese beetles (*Popillia japonica*). It is our hope that

our work will provide a foundation of diet data that will be useful for conservation efforts on *Glyptemys muhlenbergii*.

Identifying and Managing Impacts of Natural Gas Pipelines on Timber Rattlesnakes in the Northeast

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Upgrading aging utility infrastructure has the potential to impact wildlife species significantly. New pipeline construction is often located adjacent to existing lines and can infringe on critical wildlife habitats created by the existing ROWs. In the case of natural gas pipelines, the actual pipeline corridors have in some instances been colonized by various snake species, including *Crotalus horridus* (Timber Rattlesnake). As new pipelines are being constructed and older lines are being replaced, the Timber Rattlesnake as well as other species which have colonized existing corridors and utilize the adjacent rock windrow for basking and gestating could be put at risk. The objectives of the ongoing studies in New York, Pennsylvania, New Jersey and Connecticut are to identify the criteria which initiated snake colonization of the pipeline corridors, improve methods of locating these sites and determine how best to protect them during maintenance and construction. Criteria associated with pipeline corridor denning included the lack of water breaker installation during the original construction, groundwater seepage through the area, composition of the soils, surface geology and bedrock formations, and sometimes the even the presence of *Marmota monax* (Woodchuck). Surveys and telemetry studies confirmed that pipeline corridor denning occurs in abandoned pipelines left *in situ* as well as in the older active lines. During pipeline maintenance work in 2013 through timber rattlesnake habitat we successfully preserved an identified pipeline corridor denning site and a natural den working cooperatively with the contractor through careful excavation and restoration.

Nesting of diamondback terrapins (*Malaclemys terrapin*) at three locations in coastal New Jersey.

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Barneget Bay Estuary in New Jersey is a diverse ecosystem that is home to many species including the northern diamondback terrapin (*Malaclemys terrapin*). The increase in human activity along the New Jersey Shore, especially during the summer months (coinciding with the nesting season) may have a negative impact on terrapin nesting behavior. This study examines previously undocumented *M. terrapin* populations on Long Beach Island (LBI) and compares this population to populations on North Sedge Island (NSI) and the Edwin B Forsythe National

Wildlife Refuge (EBFNWR). We examined female morphometrics along with information on proximity of sightings and nests to water access, roads, and human structures. For nesting females at NSI, mean straight-carapace length was 196.0 mm (± 1.4 SE) and mean clutch size of 12.6 eggs (± 0.5 SE). Females at LBI had a mean straight-carapace length of 197.2 mm (± 2.0 SE) and a mean clutch size of 12.9 eggs (± 0.3 SE). Females located at FR had a mean straight-carapace length of 149.5 mm (± 0.92 SE) and a mean clutch size of 11.5 eggs (± 0.9 SE). Females on LBI nested less than 190.5 m from water access whereas on NSI and EBFNWR females nested less than 90 m from water access. Our results show that there were higher nest densities in areas where land was more accessible to females. Simple precautions such as limiting watercraft traffic near nesting areas can be undertaken to improve long-term viability of New Jersey *M. terrapin* populations.

Decreased Blanding's Turtle Nesting and Movement in a Dutchess County, NY Population During 2015 Compared With Previous Seasons

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We studied a population of Blanding's turtles (*Emydoidea blandingii*) comprised of three subgroups in a north-south valley corridor in Dutchess County, NY. During the 2015 nesting season, only one turtle nested in each subgroup. Six female Blanding's turtles from the Southern subpopulation were tracked during 2015, of which four exhibited unusual movement patterns. During nesting surveys in the Southern subpopulation from late May through early July and almost-daily tracking from mid-May to early July of 2015, only one female Blanding's turtle was observed making a nesting attempt. One other female was suspected of having nested based on daily movement patterns. In the central subgroup, live-trap captures were very similar between years; however, during 2015 seven radio-tracked adult females moved between locations significantly less often, visited significantly fewer locations, stayed in ponds significantly longer, and traveled significantly shorter total distances as compared with previous nesting seasons. In the Northern subgroup, only one Blanding's female nested, and most adults stayed in ponds and moved infrequently. The reproductive effort of the total wetland turtle community (including Painted turtles (*Chrysemis picta*) and Snapping turtles (*Chelydra serpentina*)) within the central wetland complex was significantly reduced, with fewer nests laid with eggs, fewer eggs per nest, and half as many total eggs laid in all nests compared with the previous four years. We presume that the reduced movement and reproduction patterns of

2015 relative to 2014 and earlier may be a response by the turtle populations to extreme weather during this past winter and spring.

Determining the Status of the Wood Turtle (*Glyptemys insculpta*) in New York State

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At a pivotal time for the Wood Turtle (*Glyptemys insculpta*), we recently uncovered a collection of roughly 260 dried specimens from SUNY-Oneonta storage, which date back to the late 1950s. Collected by the late Dr. John New, the assemblage serves as a genetic cache which we hope to utilize. As a piece of a larger masters thesis, we intend to use this rare data set to identify changes in Wood turtle populations across New York State. Unlike previous Wood Turtle studies, the existence of our historical data set provides rare context, which will be compared to contemporary population data acquired over two summers field seasons (2015 & 2016). Specifically, we will identify parameters such as the effective population size (N_e), the fixation index (F_{st}), and the inbreeding coefficient (F) for both contemporary and historical populations. Ideally, this information will be paired with mark-recapture data to assist in assessing the viability of our populations here in New York State. Our goal is to address these criteria and build an informative report to the NYSDEC. By doing so we will recommend the most appropriate course of management to maintain the Wood Turtle in New York State.

Recreation, Distribution and Prevalence of the Pathogenic Fungus *Batrachochytrium dendrobatidis* in the Adirondack Park, NY

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The emerging disease chytridiomycosis, caused by the fungal pathogen *Batrachochytrium dendrobatidis* (*Bd*), has been implicated as a driver of global declines, extirpations, and extinctions of many amphibian species. While the pet trade is likely responsible for *Bd*'s pan global distribution, it unclear what drives regional pathogen transmission. Anthropogenic land use may be a key driver of this transmission, and outdoor enthusiasts may unknowingly be introducing or moving *Bd* between sites causing pathogen establishment at novel locations. Disease prevalence may be positively correlated to high natural forest canopy density which provides suitable microhabitat for *Bd* growth and fewer basking sites that amphibians can use to clear their systems of *Bd*. The objectives of this study are to 1) determine the current distribution of the pathogen in the Adirondack Park; and 2) determine the relationship of

recreational land use to pathogen distribution and infection intensity. In May-June I conducted 90 minute transect surveys at 45 sites classified by levels of recreational pressure and elevation. I found eight amphibian species, with higher total abundances in the southeastern (and generally less acidic) portion of the park. Notably, northern two-lined salamanders (*Eurycea bislineata*) were found at 20 sites and stream salamanders (*Gyrinophilus porphyriticus*) were at six sites. Results of PCR analysis to assess pathogen presence and infection intensity are pending; I will construct a risk map based on a habitat suitability model for *Bd*. This research in a highly-protected landscape may shed light on amphibian pathogen transmission in other northern temperate forests.

Assessment of the First Herpetofauna Tunnels in New Jersey

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On an urban landscape such as New Jersey, roads create barriers to wildlife movement and vehicles often strike animals, injuring or killing them. Reptiles and amphibians are particularly vulnerable to roadway mortality, due to life history traits and migration patterns. River Road in Bedminster, New Jersey represents one of the many examples of a roadway intersecting the migration pathway of wildlife. To help restore connectivity and limit wildlife mortality the Township of Bedminster installed five wildlife crossing tunnels and specialized fencing along River Road in the fall of 2014. Montclair State University in collaboration with the Township and New Jersey Division of Fish & Wildlife assessed the effectiveness of these wildlife-crossing structures by placing pitfall traps at each end of the culverts. Pitfall traps allowed the identification of animals potentially using the culverts and also assisted in determining the efficiency of the fencing in keeping herpetofauna off the road. Volunteers conducted daily surveys of the pitfall traps and wildlife road mortality from March to July 2015. Throughout the study period a total of 2,157 animals were identified. The most common species were wood frogs (*Rana sylvatica*) (n=1,232), American toads (*Anaxyrus americanus*) (n=592), and green frogs (*Rana clamitans*) (n=245). Forty-eight road mortalities were recorded with the most common road mortality being northern grey tree frogs (*Hyla versicolor*) (n=30). Northern grey tree frogs toe pads give them the ability to climb over the fencing therefore avoiding the use of the culverts. Further studies on culvert use will be conducted in the spring of 2016.

Preliminary Chytrid Fungus and Ranavirus Screenings in the Stone Valley Forest, Huntingdon County, Pennsylvania.

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Two emergent infectious diseases (EID) have been sampled for in the Stone Valley Forest, Huntingdon Co., Pennsylvania. Chytrid fungus (*Batrachochytrium dendrobatitis*) (Bd) has been sampled for in 2014 and 2015. We sampled populations of green frogs (*Lithobates clamitans*) and wood frogs (*Lithobates sylvaticus*) in Stone Valley Forest (SVF) to investigate the relationship between the presence of infected green frogs and the presence, persistence, and intensity of Bd infections in wood frogs. Six out of 17 wood frog populations contained individuals positive for Bd, while all green frog sites tested positive for Bd. All of the wood frog populations that contained green frogs (n = 5) were infected with Bd, while only two out of twelve wood frog sites without green frogs were positive for Bd. This supported our hypothesis that wood frog populations either co-mingled, or within close proximity to, infected green frog populations will have higher rates of infection than isolated populations. In spring 2015 ten sites containing wood frogs, green frogs, or both species, were observed having large die-offs. This prompted screenings for ranavirus. Samples were only able to be collected from six of the sites. Five sites had individuals with ranavirus present including: green frogs, wood frogs, and one Jefferson salamander (*Ambystoma jeffersonianum*). Though there were no die-off events observed in the 2014 sampling season, tissue samples were collected and stored and will be screened this year.

The Effect of Temperature Fluctuations on Hatch Rate in *Ambystoma maculatum* (Spotted Salamanders)

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The spotted salamander (*Ambystoma maculatum*) is widely distributed throughout the northeastern and southeastern United States along the Atlantic Coast. *A. maculatum* is a fossorial amphibian that migrates to vernal pools to breed on rainy, early spring nights. Females deposit egg clutches eight to ten inches below the water surface on submerged branches, and each clutch can have up to 200 eggs. Rates of embryo survival and development are dependent upon egg incubation temperatures. The tolerance range for egg development in *A. maculatum* ranges from 6°C to 24°C. This experiment was designed to determine the effects of temperature variation on the hatch rate of *A. maculatum*. We collected three *A. maculatum* egg clutches in Southern Berkshire County, MA and divided each clutch in half. Half of each clutch was put into an environmental chamber that remained stable at 15°C while the other half was put into a chamber that alternated temperature between 10°C and 20°C every 48 hours. Eggs were observed daily to record hatch rate and survivorship. This research serves as a pilot study for future research investigating potential effects of climate change on spotted salamander populations in the northeastern United States.

A Roadway Wildlife Crossing Structure Designed for State-threatened Wood Turtles (*Glyptemys insculpta*) in New Jersey, United States

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Terrestrial wildlife in suburban landscapes regularly encounters barriers to movement within their home range. Local two-lane roads, one example of a movement barrier, may not themselves deter animals from crossing over them to the other side, but vehicles traveling along the roadway can kill or injure species attempting to traverse the obstacle. Designing and constructing crossing structures to facilitate safe movement of wildlife across barriers has increasingly become an important conservation topic. Through a state regulatory review process and subsequent coordination meetings, we assisted in the design of a wildlife crossing structure along a well-traveled municipal road in Bedminster Township, Somerset County, New Jersey. Underground tunnels and associated funnel fencing were constructed with consideration for a local population of state-threatened wood turtles (*Glyptemys insculpta*), in addition to other documented herpetofauna. Wood turtles move from their home stream across the road to nest and forage. Diverse assemblages of frogs are driven to cross the road to seasonally breed in two man-made impoundments that are functioning as ephemeral and semi-permanent ponds. Five “turtle tunnels” with grated tops span the road along approximately 910 meters of transect. Angled, wooden fencing and tunnel headwalls along both sides of the road guide animals from habitat to one of the five tunnels. The away-from-road angle of the fencing is meant to allow animals an escape should they get onto the roadway. Bedminster Township funded the project in full at an approximate cost of \$90,000 and completed construction over a staggered period of five months. The finalized structures and fencing opened in April 2015 and we are working with project partners on monitoring the effectiveness of the project at minimizing the number of small animal casualties along this section of road.