Annual Meeting of Northeast Partners in Amphibian and Reptile Conservation, July 29-31, 2026

ORAL PRESENTATIONS (alphabetical by presenter's last name)

No Choice but to Jaywalk, Revealing Juvenile Salamander Road Mortality using a Novel Semi-passive Method

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Roadways have severe negative impacts on migratory amphibian populations by disconnecting continuous habitat, increasing pollution, and through vehicle collisions. Many migratory amphibians move to and from breeding areas in the Spring and disperse from natal wetlands as juveniles in the Fall. While the impact of roadways on adult amphibians in the Spring is well studied and commonly mitigated, recently metamorphosed juvenile amphibians are severely understudied and subject to little to no mitigation despite constituting a major component of amphibian population viability. We address this gap in knowledge by investigating the road mortality rates of juvenile *A. maculatum* using (1) an established method to estimate mortality probability and (2) a novel semi-passive method to estimate how mortality changes across the migration period and within nights. We monitored *A. maculatum* road mortality in March-May and July-November 2025. To measure mortality rates, we recorded individual survival immediately before and after crossing using a novel drift fence/camera trap design. To estimate the probability of road mortality, we measured the crossing velocity of adult and juvenile salamanders. We present the first estimates of salamander road mortality by age class, hour, and month as well as compare estimates of mortality using a novel and established method. We found that the probability of juvenile road mortality was three times higher than adults. This suggests that previous studies have vastly underestimated juvenile road mortality. These results will help improve salamander road mortality mitigation by including the juvenile stage in population projections and mitigation efforts.

The Timber Rattlesnake Conservation Action Plan - What have we done? What do we need to do now?

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Concern for declining populations of Timber Rattlesnakes (*Crotalus horridus*) began in the 1970s. A symposium on the conservation of the timber rattlesnake in the northeast hosted by the Massachusetts Audubon Society brought the issue to the forefront leading to a symposium on eastern *Crotalus* species held at the SSAR meeting in Boone, NC in 1995. That symposium led to the idea of producing a comprehensive report on the rangewide life history, distribution,

status, and a conservation action plan for the Timber Rattlesnake. The final report was published in 2021 by PARC. Significant findings included a list of significant threats identified by the authors and a summary of actions completed to protect Timber Rattlesnakes. The report also identified additional conservation actions needed. I will discuss steps that need to be taken to implement the conservation action plan, impediments to accomplishing the stated objectives, and who can help us reach those goals. And finally, how we might measure success.

Harnessing Community Science in Tracking Amphibian Migrations

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Amphibian migrations mark the start of spring in temperate regions. This phenomenon is garnering substantial attention from a public concerned about roadway mortality and climate-driven phenological shifts. Here, we examine the power of community science in tracking patterns of amphibian migration, presenting data on phenology and community engagement from divergent models exemplified by: the Vernal Pool Listserv, which has served as a platform for decentralized observations in New England since 2002; and Maine Big Night, which has coordinated volunteer data collection across Maine since 2019. Transcriptions of 4656 casual observations sent via emails through the Vernal Pool Listserv enable us to estimate that spring migrations for the three dominant species – Wood Frog (*Lithobates sylvaticus*), Spotted Salamander (*Ambystoma maculatum*), and Spring Peeper (*Pseudacris crucifer*) – have shifted 16 (+/- 4) days earlier in southern New England over 23 years. Meanwhile, Maine Big Night has rapidly grown to a network of over 700 volunteers that, in 2025, conducted over 300 surveys statewide that hold the potential for fine-scale monitoring of population trends. These

projects demonstrate that enthusiasm for witnessing amphibian migrations is infectious, sustainable, and valuable to science and conservation. Moving forward, we recommend regional or national coordination prioritizing centralized data archiving, participant safety, effort tracking, minimization of volunteer-caused amphibian mortality, and community engagement. Beyond the value of the data to science, the most important outcome of these activities may be the educational and inspirational component of community members joining together to witness amphibian migrations.

Understanding the Importance of Time Budgets for Species Under Human Care- A Case Study of Eastern Hellbenders (*Cryptobranchus alleganiensis*)

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Zoological parks and aquariums house numerous species, serving as homes for *ex-situ* populations that act as assurance populations, populations that may have the chance to be released to the wild. When comparing a wild landscape to the artificial one created under human care it is important that all considerations are taken into account to provide for optimal animal wellbeing. A shift from a human centric approach to an animal centric approach is necessary, with a need to provide choice and control, and to allow for as close to a full expression of wild behaviors as possible, in their wild ratios. This is particularly important for species being released into the wild, species such as the Eastern Hellbender (*Cryptobranchus alleganiensis*). I utilized continuous observations to establish baseline time budgets for a captive Eastern Hellbender colony, while recording their spatial use and hide preference over a one year period. This provided insight into individual time budgets, directly impacting wellbeing monitoring and veterinary care, and highlighted a previously undocumented biological trait in one individual, shifting how the staff worked with the colony. The study provides a framework for animal care specialists and researchers to deploy for easy but effective monitoring efforts to improve animal wellbeing and understanding of the species they work with.

The Role of Floodplain Complexity in Wood Turtle Habitat Use

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Wood turtles (*Glyptemys insculpta*) occupy low-gradient riverine habitat throughout the northeastern United States and southeastern Canada. Studies across the species' range have quantified various aspects of their habitat, but none have quantified stream or floodplain geomorphic complexity. The goal of this study was to explore the role of stream channel and floodplain geomorphology in wood turtle habitat use. I calculated metrics of stream and floodplain geomorphic complexity using bare earth lidar to compare geomorphic condition of five floodplains along a New Hampshire wood turtle stream, and in one, I tested the effect of each of these variables and three components of vegetation structure on wood turtle habitat use. Results of this study show that certain metrics of geomorphic complexity and vegetation structure were positively associated with wood turtle habitat use. Although variables of vegetation structure showed stronger predictive value than elevation metrics, the best overall model for predicting wood turtle habitat use included metrics of both vegetation structure and

geomorphic complexity. These metrics contribute valuable information for identifying and evaluating known and potential wood turtle sites and for evaluating floodplain geomorphic condition across multiple sites and broad geographic regions. These, and other measures of stream and floodplain geomorphic complexity provide a means for establishing a quantitative framework for evaluating geomorphic condition of riverine ecosystems at multiple scales.

The State of USGS Amphibian Disease Research: Keeping Tabs on a Changing Landscape

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The scope of research on amphibian diseases is constantly evolving. We present an overview of results to date from the collaborative USGS Amphibian Research and Monitoring Initiative research in the Northeast US on Ranavirus, Bd, and Bsal. Results from wood frog (*Lithobates sylvaticus*) and spotted salamander (*Ambystoma maculatum*) disease dynamics on wildlife refuges indicate soil metals or metalloestrogens influence disease risk at individual wetlands, and pools in proximity do not necessarily correlate in infection status of Ranavirus and Bd from year to year. Predictive modeling for eastern red-spotted newts (*Notophthalmus viridescens*) indicates proactive actions yield the best outcomes for control of Bsal invasion, and robust surveillance for early detection improves outcomes. We also present a range of factors to consider when planning disease sampling designed to detect emerging disease invasions. We hope that presenting these different disease related projects will provide insights into how we can deal with disease detection and prevent disease spread at a regional scale.

We Need To Talk… About The Broad Existential Threat To Declining SGCN Turtles From Increasing Mammalian Mesopredators

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Turtles have evolved some of the most sophisticated armor ever found in the animal kingdom. These adaptations are well suited to their unique life histories in balanced ecosystems, but anthropogenic influences on the environment jeopardize the long-term prospects for populations of many Species of Greatest Conservation Need (SGCN) turtles. One ubiquitous threat to SGCN turtles are elevated levels of mesopredators, especially those generalist species such as Raccoon (*Procyon lotor*), Striped Skunk (*Mephitis mephitis*), Virginia Opossum (*Didelphis virginiana*), and Red Fox (*Vulpes vulpes*); all species which have adapted well to and benefited from living alongside humans. Conservationists are faced with a reckoning on the necessary balance of wildlife populations if we're to look into the future well beyond our lifetimes. We present reviews of various forms of historical data on mesopredator population indexes as well as recent

studies of predation of turtles and turtle nests. Our reviews suggest considerable changes in mesopredator populations have occurred in the past century, with some mesopredator species having apparent increases while others have declined, and that drastic shifts in population management techniques may be necessary if our aim is to keep declining turtles common without waiting until their populations teeter on extirpation or extinction. Data-driven dialogue with furbearer managers and protected land managers is needed if we are to help shift long-term mesopredator management goals for the conservation of SGCN species and especially those experiencing multifaceted threats.

Boxturtleid.com: A Machine Learning Platform For Automated, Non-Invasive Individual Identification And Citizen Science Engagement

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Capture-recapture studies are the primary method for collecting population data on species of conservation concern such as the eastern box turtle (*Terrapene carolina*). The integrity of such studies depends on reliable individual identification systems, yet the most prevalent approach — physical mark-making on the carapace — is invasive, time-consuming, and degrades in accuracy over time due to wear. These limitations also make it difficult to integrate community observations that could broaden our understanding of box turtle distribution across fragmented landscapes.

In 2019, USGS Statistician Andy Royle began investigating machine learning approaches to individual identification using digital shell images. The resulting system applies Scale Invariant Feature Transform (SIFT) – an algorithm that identifies distinctive keypoints comparable across photographs – to generate unique signatures for individual turtles. This work has since grown into a multidisciplinary collaboration with Matt Berg, an expert in large scale data systems for global health and disease surveillance, and Robert Fabricant, a user centered design expert and steward of a 20-year eastern box turtle study.

Together, the team has integrated these algorithms into a cloud-based platform, boxturtleid.com, offering fully automated individual matching for both researchers and the general public. This presentation will introduce the NEPARC community to the platform and include a demo of its first application, a citizen science tool currently being piloted in Patuxent, MD, and New Paltz, NY. We will share results and learnings from this pilot and invite collaboration with researchers interested in expanding the platform's geographic footprint and conservation applications.

Limiting Wildlife Professionals' Contributions to Illegal Trade in Reptiles and Amphibians: A Turtle Case Study

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The illegal collection and trade in turtles is a complex global problem with environmental and social implications that has, in part, been propelled by the availability of information on the internet. Those who traffic turtles misuse available information to carry out illegal activities, and there is an increasing need for awareness about the sensitivity of information on turtles and other taxa in demand. Our objectives were to provide guidance for wildlife professionals on types of information that are sensitive and how to keep that information secure. Location descriptions or geographic coordinates can make individuals or populations vulnerable, notably for species associated with particular habitats, such as spotted turtles (*Clemmys guttata*) and ephemeral wetlands. Sharing information on key breeding times or population sizes at specific locations, such as nesting sites for diamondback terrapins (*Malaclemys terrapin*), can provide would-be collectors with information needed to find temporarily or spatially large numbers of turtles more quickly. Reporting prices at which turtles are being sold, or the popularity of certain species domestically or internationally, may unintentionally encourage illegal collection or increase demand. Biologists and those in related professions communicate their work in a wide variety of professional venues, including journals, conferences, grants, social media, and community science platforms, where sharing information can increase risk of collection for the illegal trade. We highlight examples that may have put individuals or populations at risk and offer guidance on how to keep information secure.

Predicting Future Amphibian Body Size across Northeastern United States under Different Climate and Land Use Scenarios

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Anthropogenic changes to the environment have been associated with changes in body size of multiple organisms. Although climate and land use influences on body size have been examined separately, the simultaneous effects and potential interactions of these two factors on body size have rarely been studied. We examined the size of three common North American amphibians (Spotted salamander, *Ambystoma maculatum*; Fowler's toad, *Anaxyrus fowleri*; and Wood frog, *Lithobates sylvaticus*) using museum specimens from 1930 to 2007. We used linear mixed effect models to quantify the potential interactive effects of climate change (temperature and precipitation) and land use change (natural area) on body size. We then predicted future body size under four climate-land use scenarios for 2041–2070 and compared change over time. Overall, we found that amphibian snout-vent length was negatively related to both precipitation and the interaction between temperature and natural areas. We found that warmer areas resulted in smaller body sizes with the greatest effect on size in areas with higher proportions of natural land cover. Within the next couple of decades, we predict that amphibian body size will decrease at over 90% of the collection localities across the Northeast regardless of climate-land use scenario. We encourage continued exploration of multi-species responses to changes in both

climate and land use to determine whether our results are representative of ectotherms more broadly.

Priority Amphibian and Reptile Conservation Areas: Implementing a National Conservation Framework

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Amphibian and reptile populations are undergoing declines across the United States, and one of the many challenges to implementing species recovery actions is a lack of resources. Additionally, herpetofauna are significantly underrepresented in conservation planning efforts compared to birds, fish, and game species. In 2012, using Important Bird Areas as a framework, Priority Amphibian and Reptile Conservation Areas (PARCAs) were developed by a national PARC task team to begin addressing the state and national conservation planning gaps for herpetofauna. Since then, the Amphibian and Reptile Conservancy (ARC) has become the steward of PARCA development by building collaborative partnerships with local, state, and federal conservation organizations to ensure that PARCAs best represent a state's most biodiverse habitats and landscapes. The process includes development of a spatial model to create a weighted PARCA metric that accounts for landscape integrity, herpetofauna richness, and presence of imperiled amphibian and reptile species. The PARCA metric is then evaluated by state-level experts to develop the final PARCA polygons that encompass the most viable populations of focal species and create a conservation 'roadmap' for each PARCA to guide research, habitat restoration and management, and recovery efforts, connecting local conservation to a regional strategy. Currently, ARC and its partners have developed 335 PARCAs for 33 states and initiated numerous habitat restoration and population recovery programs using PARCAs as an implementation framework, as well as integration with state and federal action plans. Successful programs have included frosted flatwoods salamander recovery in the Coastal Plains and Houston toad recovery in Texas.

First Evidence of Neonicotinoid Pesticide Contamination in Wild Reptiles: A Pilot Study of Snakes in Agricultural Landscapes in Vermont

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Neonicotinoids are among the most widely used classes of pesticides in the world. They have significant negative effects on insect, bird, fish, and amphibian populations globally. While there is evidence of endocrine disruption and liver toxicity in captive squamates experimentally exposed, the presence of neonicotinoids in wild reptile populations has never been documented. To begin addressing this knowledge gap, we conducted a pilot study to test for neonicotinoid contamination in the blood plasma of snakes at 11 sites in Chittenden, Washington, and Addison

Counties, Vermont. During spring and summer 2024, we collected blood from 57 individual snakes across five colubrid species: *Lampropeltis triangulum* (Eastern Milksnake), *Opheodrys vernalis* (Smooth Greensnake), *Storeria dekayi* (Dekay's Brownsnake), *Storeria occipitomaculata* (Red-bellied Snake), and *Thamnophis sirtalis* (Common Gartersnake). Low-volume plasma samples were pooled by site and date to achieve target volumes of 50 µL, and then analyzed for neonicotinoids via Ultra-Performance Liquid Chromatography–Tandem Mass Spectrometry (UPLC-MS/MS). Two samples—one from a pooled *L. triangulum/T. sirtalis* sample, and one from *S. dekayi*—tested positive for trace amounts of thiamethoxam, representing the first documented detection of neonicotinoid pesticide contamination in wild reptiles, to the best of our knowledge. Our findings underscore the need for expanded research on neonicotinoid exposure pathways in reptiles, optimized blood sampling protocols for reptile species, and investigation of possible sublethal effects these contaminants may have on reptiles.

Amphibian Brigade Collaboration Session

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The Vernal Pool Working Group, in partnership with the Landscape Connectivity Working Group, is sponsoring a presentation session during the 2026 NEPARC meeting to encourage organizations conducting amphibian "brigade" volunteer efforts to explore the behind-the-scenes coordination of these projects. Speakers will include leads of established amphibian migration rescue programs who will discuss how their programs began, how they run, and what data is collected. They will also share lessons learned in dealing with local officials and residents, the logistics of training volunteers, finding funding, and other obstacles that they have overcome to maintain these brigades. Following these brief program introductions, a discussion session will be guided by a recent analysis of community science impacts on tracking amphibian migration patterns, understanding phenological changes, and engaging the community through divergent organizational models. Discussions will highlight both the unique and shared challenges of these volunteer efforts before exploring ideas for standardizing methods and data in order to answer regional questions about the efficacy of these brigades and the status of local migrating amphibian populations. We will also explore how NEPARC can support these volunteer programs and address those larger, regional topics.

A Decade-Long Study on Eastern Copperhead Habitat Selection in the Central Piedmont of New Jersey

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The eastern copperhead, *Agkistrodon contortrix*, is a threatened species in New Jersey, mainly restricted to the northern Highlands and Ridge-and-Valley regions, with few scattered populations found in portions of the Piedmont. Our Piedmont study population within the Sourland Mountain region represents the species' southernmost known population in the state. Friends of Hopewell Valley Open Space, in partnership with NJ Fish & Wildlife, Mercer County, and Rutgers University, has conducted a decade-long radio telemetry study to examine the spatial ecology and habitat use of this isolated copperhead population. Using data from 70 radio-tagged copperheads tracked for multiple active seasons, we quantified the home range size, determined the habitat characteristics influencing site selection, and described the characteristics of communal hibernacula and gestation sites, including thermal conditions of the latter. More recently, our findings have been used to design and implement stewardship efforts to create and improve copperhead habitats, especially in an area with high anthropogenic activity. Our study highlights the importance of certain habitat features for supporting copperhead populations, expanding the understanding of this species in a habitat with relatively high pressure from humans.

Diel activity cycles and overwintering phenology of Timber Rattlesnakes (*Crotalus horridus*) in the northeastern United States

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The general phenology of the timber rattlesnake (*Crotalus horridus*) in the Northeast has been well-documented. However, the degree of interannual variation in timing of phenological activities, as well as the effects of factors such as elevation and latitude on spatial variation in phenology, have not been quantified. Diel activity cycles of the species are also not well described. Observations from the northeastern United States indicate that the species' active season has expanded over several decades in response to directional climate variation. Fine-scale understanding of spatiotemporal variation in the timing of ingress and egress to and from overwintering sites, in relation to annual weather conditions, will be useful for predicting how the species will continue to respond to climatic trends. We deployed camera traps at timber rattlesnake hibernacula across four regions (two in Pennsylvania and two in New York) to capture aboveground activity during spring emergence and fall ingress in 2024 and 2025. This enabled us to document how the species' annual cycles varied across regions and in response to local temperatures, and to understand diel activity cycles during emergence and ingress. Earliest date of recorded activity, latest date of recorded aboveground activity, and activity peaks during both emergence and ingress varied by year and region. At hibernacula, snakes were significantly more nocturnal during autumn than spring, corresponding to our lower daytime visual encounter survey counts in the autumn. We are continuing to monitor these sites through 2026 to understand annual variation in phenology.

The Discovery of the White-spotted Slimy Salamander, a Species Previously Unknown to Occur in Connecticut

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The northern slimy salamander (*Plethodon glutinosus glutinosus*) is part of a contentious complex of 16 salamanders, the *Plethodon glutinosus* complex, described in 1989 by Herpetologist, Richard Highton. Based on the stark contrast in habitat requirements and use east versus west of the Hudson River, it was hypothesized that Connecticut slimy salamander populations would be genetically different or a potentially undescribed species in the complex. This research compares samples from east and west of the Hudson River in the States of Connecticut, New York, and Pennsylvania. Over 100 tail clip samples were obtained at 16 sample sites across these states during 2024 and 2025, DNA was extracted and mitochondrial locus nd2 (NADH dehydrogenase 2) amplified at CCSU and sequenced via Eurofin genomics in Kentucky. Sequences were curated and analyzed to compare against each other and against complex samples available on GenBank. This study led to the discovery of a previously undocumented species of slimy salamander in Connecticut, the white-spotted slimy salamander (*Plethodon cylindraceus*) whose closest known occurrence is in Virginia and West Virginia, nearly 250 miles southwest of Connecticut. Documented at only three sites in extreme southwestern Connecticut, there is limited biogeographical knowledge on how this species came to occur in Connecticut.

POSTERS (alphabetical by presenter's last name)

Total Mercury in Anuran Livers by Direct Solids Analysis from a Historically Industrial Region of Northern New York (2017)

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Mercury is a highly toxic, naturally occurring element that can be readily absorbed and retained in humans and other organisms. Chemical disturbance, including heavy metal pollution, contributes to the global decline of amphibian species, which are uniquely sensitive to aquatic chemical contaminants due to their highly permeable skin and life history traits. This experiment utilized a Leco AMA254 direct mercury analyzer to quantitatively determine the mercury concentration in the livers of 22 frogs [N = 6 Green frog (*Lithobates clamitans*), N = 5 Northern Leopard frog (*Lithobates pipiens*), and N =7 American Bullfrog (*Lithobates catesbeianus*)] collected in St. Lawrence County, NY, by direct solids analysis. All the livers were determined to have elevated mercury levels, some as high as 554.7 ppb dry mercury concentration, and none lower than 53.1 ppb. This experiment reveals the implications of coal-burning and atmospheric

mercury deposition as potential contributors to global amphibian decline. Continued industrial and agricultural activity in the region underscores the need for further research to quantify the extent of methylmercury contamination in amphibians and its ecological impacts in Northern New York and beyond.

Integrating Remote Sensing and Community Science to Support Conservation of Woodland Vernal Pools in New York

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Vernal pools are an important part of northeastern landscapes and provide habitat for countless species, including critical breeding sites for several amphibians including Spotted Salamanders (*Ambystoma maculatum*), Marbled Salamanders (*Ambystoma opacum*), and Wood Frogs (*Lithobates sylvaticus*). The New York Natural Heritage Program (NYNHP) is working with organizations in the Midwest and Northeast to increase our knowledge of vernal pools using new mapping tools and community science. Remote sensing has been used to find potential vernal pools in three focal areas in the western, northern, and Hudson Valley regions of New York. NYNHP is building a participant network though a community science program (NY POOLS). Community scientists are verifying potential vernal pools and monitoring for breeding amphibians and other important species. NYNHP has been working closely with the Northeast Midwest Vernal Pool Collaborative to create our community science program, test the remote sensing methodology, and collect information on vernal pool biodiversity in our state. The first year of the NY POOLS program has begun, with four volunteer training workshops held and 62 visits to vernal pools by 26 volunteers conducted to date. Additional volunteers will be recruited for the 2027 vernal pool season.

Assessing Skidder Ruts and Other Anthropogenic Forest Depressions as Amphibian Habitat

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Amphibians are key indicators of environmental health but are unfortunately experiencing a variety of worldwide threats including climate change, disease, invasive species, and habitat loss. Despite these challenges, amphibians can demonstrate remarkable resilience adapting to human disturbances and are often able to thrive in anthropogenically altered environments. In regard to timber harvesting, amphibians have shown mixed responses depending on species, age class, and forest management technique. Paul Smith's College owns approximately 14,000 acres of land in northern New York, with significant tracts actively managed for timber harvesting. Skidder ruts and other forest depressions are legacies of forest management and the carved and compacted soil often retains water, creating a pool. Using egg mass surveys, combined temperature/light data loggers, and pool envelope surveys, I examined anthropogenic pools across Paul Smith's

lands to assess if they can act as suitable reproductive habitat for amphibians. I hypothesized that skidder ruts do have the capacity to support amphibian production but are less productive and dry out faster than natural vernal pools. Preliminary results suggest that pool-breeding amphibians can use anthropogenic pools to effectively reproduce - at one log landing site 116 *Ambystoma maculatum* egg masses were counted. Anthropogenic pool envelope surveys have shown very little amphibian presence in upland habitats, with only two *Plethodon cinereus* individuals observed at the same log landing site. Temperature and light measurements will continue throughout the summer and camera bucket traps will be installed to gauge metamorph survival and development.

Evaluating the Performance of Population Abundance Estimators with *Plethodon cinereus* Count and Spatial Recapture Data

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Abundance estimation plays a key role in wildlife ecology studies and conservation management, aiding in population monitoring efforts and providing information on population dynamics. However, different data types and associated models may produce different estimates, making it challenging to compare among studies. Count surveys are fast and can produce abundance estimates using 'N-mixture' models but are known to overestimate abundance. Spatial-Capture-Recapture (SCR) surveys collect more detailed information on the capture locations of marked animals, and SCR models produce a reliable estimate of density, however this approach requires substantially more time and effort. There are trade-offs that make each survey, data type, and model useful for estimating population density, but each model may produce different estimates with the same data. Our aim is to compare estimates from N-mixture and SCR models to determine how to translate results between them and increase the reliability of count models. We expect that the differences in the observation process portions of each model will result in different density estimates, which may scale with population abundance. Using *Plethodon cinereus* (Eastern Red-Backed Salamander) as a study species, the results of this study will expand our ability to compare different data types from across their range.

Lessons Learned from Long-Term Amphibian Monitoring

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The USGS Northeast Amphibian Monitoring Program (NEARMI) has several long-term amphibian monitoring projects. One of these projects includes work with the Salamander Population and Adaptation Research and Collaboration Network (SPARCnet). SPARCnet is a regional initiative designed to advance our understanding of salamander ecology under environmental change, using mark-recapture and count data of the redback salamander, *Plethodon cinereus*. Over the last 15 years NEARMI and collaborators have observed surprising movements of redback salamanders, confirmed that red-backed salamanders are efficient predators of ticks, estimated densities at multiple locations throughout the species range, and observed instances of cannibalism in the species. While this species is typically thought to have a home range of $1m^2$ we have observed this species making up to 143m movements across our SPARCnet plots. Our study on tick consumption of red-backed salamanders shows that consumption rates vary across habitat densities and our regional work shows that densities and biomass were much higher than expected. Lastly, while not observed frequently, we showcase our observations of red-backed salamander cannibalism. SPARCnet is just one example of NEARMI's involvement in long-term collaborative monitoring programs which allow for range wide assessments of species change.

Estimating Habitat Use of Freshwater Aquatic Turtles in the Delaware River

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Protected areas, such as national parks, provide opportunities for freshwater ecosystem conservation. However, increased popularity in nature-based recreation has caused competing interests between conserving biodiversity and promoting visitation. As resource agencies work to protect biodiversity, they require detailed data on the distribution of organisms within their protected areas. Freshwater turtles are of particular concern because anthropogenic modifications and disturbances to freshwater ecosystems threaten these species. Our study was conducted along the Delaware River in two national park units, the Upper Delaware Scenic and Recreational River and the Delaware Water Gap National Recreation Area. This section of the Delaware River serves as an important public resource that also contains significant amounts of riparian habitat, which is integral for conserving regional biodiversity. Additionally, these park units receive high visitation as there are several aquatic recreational opportunities. Despite conservation efforts focused on freshwater turtles, no formal survey work has been conducted within the Parks to identify where species occur in relation to biotic and abiotic factors. Using hoop traps, we surveyed 23 sites in 2024 and 2025 to determine the spatial distribution of freshwater turtles within the two Parks and used occupancy models to estimate habitat use as it relates to human recreation and riparian characteristics. We captured six different species across the 23 sites and found that among species, predicted habitat use was related to site-level habitat variables, such as water temperature and depth. These results contribute to our understanding of habitat use among freshwater turtles within the Delaware River.

Going Out On a Limb: Supernumerary Appendages in Eastern Red-Spotted Newts (*Notophthalmus viridescens*)

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Malformations including extra limbs, toes, or under-developed parts of limbs, also called polymelia, polydactyly, and micromelia, respectively, have been observed in a number of amphibian species. *Notophthalmus viridescens* (Eastern red-spotted Newt), is one of the most common newt species in the northeast United States and their ability to develop and regenerate limbs has been well studied, yet instances of abnormal limb growth are rarely reported. After observing an adult *N. viridescens* individual with supernumerary appendages, we sought to compile other observations of this phenomenon. In several capture-recapture studies and one disease surveillance study (unrelated to limb growth), many *N. viridescens* individuals were observed, yet very few exhibited clear signs of supernumerary appendages.

Sympatric frogs and salamanders harbor divergent gut viral communities

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The vertebrate gut microbiome (GM) is a diverse community of microorganisms, including both bacteria and viruses. This community plays essential roles in host immunity and digestion, serving as an important indicator of host health. The composition, diversity, and function of gut bacteria tend to vary with host ecological and evolutionary factors. However, sources of viral variation remain poorly understood across the Tree of Life, especially for amphibians. Here, we leverage the incredible amphibian biodiversity of New York's Southern Tier to compare patterns of bacterial and viral community variation. Using shotgun metagenomic sequencing, we show that gut bacterial communities remain remarkably conserved among 13 species of sympatric frogs and salamanders despite millions of years of evolutionary divergence. However, gut viral communities were strongly correlated with host phylogenetic distance. Together, these results suggest gut bacteria are tuned to environmental variation while the virome primarily reflects host evolution. Next steps will include fine-scale analyses of how host ecology shapes gut function within and between host species.

Conservation and Working Land Management for The Eastern Box Turtle (*Terrapene carolina carolina*) and Spotted Turtle (*Clemmys guttata*) in Virginia

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The Eastern Box Turtle (*Terrapene carolina carolina*) and Spotted Turtle (*Clemmys guttata*) were once widespread and common throughout the Eastern United States, but recent status assessments have indicated population declines. Habitat loss, climate change, illegal collection, and machine related mortality are primary drivers of decline. Rural working farms in Virginia have been shown to hold remnant populations of Box and Spotted Turtles, potentially acting as refugia. By working with local farmers we aim to understand the impacts of different land

management practices on the abundance, seasonal movement, and habitat use of these species. Our field station, Eldon Farms, is a 7,100 acre working farm in Rappahannock County Virginia that primarily focuses on regenerative cattle grazing and fostering healthy grassland ecosystems. To estimate local abundance of Box Turtles we are conducting mark-recapture surveys on two 250-acre plots from April-October. To understand habitat use and seasonal movement in response to changes in land management we have integrated the use of high resolution tracking technology. 18 Box Turtles have been given ultralight GPS data loggers across the farm in areas with different management regimes (i.e. mowing, grazing, prescribed burning). To estimate abundance and movement of Spotted Turtles, traps were set from March-May across suitable wetlands. 5 unique individuals were found, and all were given VHF tags to track weekly movement. Research is ongoing but preliminary findings suggest that agricultural equipment is a significant threat, and that localized cattle grazing influences movement and detectability in both species.

Eastern Box Turtle Pathogen Dynamics in a Pre-Repatriation Captive Cohort

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Eastern box turtles (*Terrapene carolina carolina*) are declining across their range due to the illegal wildlife trade, other anthropogenic factors like habitat loss, and disease-related mortality events. One strategy to help mitigate species declines is repatriation of animals recovered from the illegal trade back to the landscape. When considering this, it is crucial to avoid jeopardizing the health of free-ranging herpetofauna. Repatriation decisions should therefore be informed by pathogen presence and type, the relationship between disease status and clinical symptoms, and longitudinal variability in shedding. Rate of detection may vary depending on host factors including pathogen burden, the stage of infection, and the overall wellbeing of the animal and its immune system, as well as testing factors such as sample type and test specificity and sensitivity. Therefore, testing for common chelonian respiratory pathogens should be serial in order to best inform management decisions surrounding these events. We present a case study of 45 displaced box turtles and their pathogen status from collection to pre-release. We tested each living individual in October 2025, January, March, and May of 2026, for Ranavirus (Ranavirus rana1), Terrapene herpesvirus (Herpes), Box turtle Mycoplasma sp. (BTMyco), and Terrapene adenovirus (ADV). Wild turtles at candidate release sites were also swabbed in summer 2026. Ranavirus was not detected in any turtle tested. Herpes, BTMyco, and ADV were detected in

both captive and wild turtles. In captive animals, pathogen prevalence varied by target and date, with all three pathogens decreasing at each interval (and ADV not detected after January).

Quantifying the Propagule Pressure of Released Species posed by Local Exotic Reptile Trade Networks in the Mid-Atlantic Region

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The exotic reptile trade is a major industry that can result in the spread of invasive species when non-native reptiles are accidentally or intentionally released into the wild. The biggest driver of invasion risk is propagule pressure, i.e. the quantity of organisms released into a non-native environment. In this study, we sought to quantify differences in potential propagule pressure of exotic reptiles traded in the mid-Atlantic region using local trade data and species-specific release probabilities. To determine local trade volume, we first visually surveyed eight reptile trade shows and 47 exotic pet stores across five states in the mid-Atlantic region. For each species we observed, we then calculated relative release probability based on six biological and economic traits associated with release using a boosted regression tree modeling approach. Finally, we calculated expected propagule pressure for each species by multiplying relative trade prevalence by release probability. Across 280 non-native species recorded in our surveys, release probabilities ranged from 0.059 to 0.854 (mean = 0.289), and approximately 11% of species had above average propagule pressure, including potentially risky species such as *Salvator merianae*. Furthermore, 15% of species had release probabilities greater than 0.5 despite below average trade volume, indicating these species could be at higher risk of establishment if demand for these species increases in the future. These findings help identify which species exhibit the highest risk of release and establishment in the mid-Atlantic region, and have the potential to guide regional invasive species management and prevention.

Landscape drivers of the *Ambystoma laterale-jeffersonianum* complex in Massachusetts

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The factors governing populations of unisexual salamanders (genus *Ambystoma*) and their bisexual host species remain an outstanding conundrum for ecology, evolutionary biology, and conservation. In New England, where Unisexual *Ambystoma* co-occur with Blue-spotted Salamanders (*A. laterale*) or Jefferson Salamanders (*A. jeffersonianum*), observations of these cryptic organisms are patchy and frequently missing important taxonomic information for assessing species-specific habitat conditions suitable for different taxa. We examined landscape scale environmental predictors of salamander populations in Massachusetts, using genetically verified population data from 1197 individuals comprising 96 sites (mostly breeding individuals from distinct wetlands) from 2009–2020 to estimate habitat gradients associated with different

assemblages of *A. laterale*, *A. jeffersonianum*, and Unisexual *Ambystoma*, and applying a novel analytical approach to explore drivers of genome compositions within populations to better understand ecological variation across the species complex and predict assemblages of different populations over a large spatial extent. Contiguous aquatic habitat and seasonality appeared to be major driving factors of salamanders in the complex along a genomic continuum, with Jefferson Salamanders (J genome) associated with broader temperature regimes and drier forested landscapes, Blue-spotted Salamanders (L genome) affiliated with expansive wetland cover and riparian networks, and Unisexual *Ambystoma* (variable LLJ/LJJ biotypes) appearing to fit an intermediate aquatic habitat niche, especially with respect to hydric soils. Assessing landscape aquatic habitat availability beyond vernal pool distributions may be helpful for identifying potentially unique populations over large regional extents. Further study on hydroperiod associations and spatiotemporal dynamics of different assemblages may better contextualize how aquatic and terrestrial habitat components facilitate interactions of different species.

A Bend in the River: Scoliosis in *Necturus maculosus* of the Upper Hudson River

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During collection of experimental in-river freshwater mussel rearing cage for a project in the Upper Hudson River three adult mudpuppies (*Necturus maculosus*) were incidentally collected, all of which had pronounced spinal deformities. After further investigation of the Upper Hudson River and 21 tributaries, mudpuppies with spinal deformities were documented throughout the Upper Hudson River mainstem north of the Federal Dam in Troy, NY. In total, eight of the eleven adult mudpuppies captured in the mainstem Hudson River had some degree of spinal deformity. Mudpuppies were found in two tributaries in the Upper Hudson River watershed. In tributary one, mudpuppies were found 0.8km from the Hudson River and four of eight mudpuppies had spinal deformities. In tributary two, mudpuppies were found at 3.2 km from the Hudson River zero of ten mudpuppies had spinal deformities. Although sample size is limited, the data suggest that with increased distance north from the Federal Dam spinal deformities increased in rate and severity, and as distance from the mainstem Hudson River increased in the tributaries, spinal deformities decreased. Some potential causes of spinal deformities in Hudson River mudpuppies include genetics, calcium deficiency, contaminant exposure, or parasites, however, more investigations are needed to better understand these phenomena.

Home Is Where You Make It: Mussel Rearing Cages as Underwater Coverboards and SCUBA Surveys for Mudpuppies

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Mudpuppy (*Necturus maculosus*) surveys are known to have very low success rates in deeper water habitats. Trapping requires cold weather and many traps to be successful; rock turning has been limited to areas with habitat and shallow water and finding habitat in anthropogenically altered or dredged systems can be difficult. Here we describe the accidental success of underwater coverboards and the deliberate success of SCUBA surveys for mudpuppies in a large river and lake. Three mudpuppies were incidentally captured under three unrelated freshwater mussel cages during one survey in 2024, leading to targeted but still opportunistic SCUBA surveys in 2025. SCUBA combined with cover surveys captured 11 adult mudpuppies, 5 subadult mudpuppies, and 8 juvenile mudpuppies, although many more mudpuppies were observed than captured. However, many more mudpuppies of all age classes were seen during surveys than were captured (capture rate ~25%). SCUBA surveys captured all age classes of mudpuppies which has been a documented hardship with traditional trapping and rock turning. The use of underwater coverboards paired with SCUBA surveys shows promise as a method to monitor mudpuppy populations in both shallow and deepwater habitats. We also describe a tool that may be helpful in capturing mudpuppies in large waterbodies during SCUBA surveys.

Search Encounter Surveys of Eastern Box Turtles with Spatial Capture-Recapture Models Yield Precise Abundance Estimates Across Effort and Weather Conditions

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Eastern box turtles (*Terrapene carolina carolina*) are difficult to survey due to cryptic behavior and unpredictable activity patterns that result in low detection probabilities and complicate accurate population estimation. We evaluated volunteer-assisted visual encounter surveys combined with spatial capture-recapture (SCR) modeling to estimate abundance and optimize sampling strategies for box turtles in Northern Virginia. From April through October 2025, we surveyed two forested plots (101 ha and 93 ha) using a standardized haphazard search with a lead surveyor and 0–2 volunteers. We examined temperature, humidity, precipitation, wind, observer number, and spatially explicit sampling effort as covariates of detection probability and investigated how reduced sampling across or within months affected abundance estimates and precision. Wind-related covariates were among the strongest predictors of detection probability based on AICc model selection, though the top weather model (wind average Q) performed only marginally better than the null model (ΔAICc = 4.808, AICc Wt = 0.217). Increasing survey effort improved spatial recaptures and precision of abundance estimates, though point estimates stabilized by July. Three-observer surveys yielded substantially greater detection probabilities than single-observer surveys at both properties. Full-season models estimated 7.59 (95% CI: 6.26–9.21) and 6.53 (95% CI: 5.30–8.02) turtles per ha at site A and site B, respectively. Coefficients of variation declined from 22.67 and 56.04 to 9.84 and 10.54 as surveys progressed from April through October. Volunteer-assisted visual encounter surveys paired with SCR modeling can generate robust, precise population estimates and provide a scalable framework for long-term box turtle monitoring.

Population Dynamics of a Threatened Pitviper in a Geographic Stronghold: Implications for Persistence and Conservation

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Estimating long-term variation in population parameters can provide important insights into the mechanisms regulating population dynamics and support at-risk species conservation. These studies are rare for species with slow life histories, such as many reptiles, due to the extended time series required to capture key demographic events. We used long-term capture-recapture data (2011 – 2025) on eastern massasauga rattlesnakes in southwest Michigan to estimate survival, recruitment, and derived estimates of realized population growth and abundance using robust design time-symmetric models with the Huggins model incorporated over secondary sampling occasions. Apparent survival varied over time (0.598 – 0.776) as a positive linear function of snout-vent-length, a temporal population-level covariate. Annual per-capita recruitment rate was constant over time, at 0.319 (95% CI: 0.270 – 0.372). Model-averaged estimates of adult female abundance ranged from 42.5 – 140.7. The model-averaged mean estimate of realized population growth was 1.013 (95% CI = 0.986 – 1.040), suggesting slight positive growth, but statistically indistinguishable from stability. Survival accounted for 0.685 of realized population growth (95% CI = 0.636 – 0.733) and was 2.19 (95% CI: 1.75 – 2.74) times more impactful than recruitment on realized population growth. The larger contribution of survival to realized population growth indicates that management efforts focused on reducing adult female mortality, rather than increasing recruitment, may be the most effective strategy to increase the probability of population persistence.

Impacts of habitat degradation and restoration on wood turtles (*Glyptemys insculpta*)

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Wood turtles (*Glyptemys insculpta*) are an endangered riparian species that are primarily affected by habitat degradation. Our local population's habitat, especially their nesting habitat, is overtaken by anthropogenic structures and invasive species like knotweed (*Reynoutria spp.*). Artificial nesting mounds are one conservation method commonly used for other turtle populations. This thesis project aims to study how restored nesting habitat affects nest viability. We will have two test sites with three habitat types in each: artificial nesting mound, raked area, and natural area. An iButton will be installed in each habitat type to measure temperature. We will then survey for and track females and protect their nests. We will compare the nest success of nests laid in each habitat type. This work will be conducted during the June 2026 nesting season, so results have not been collected yet, but they will be prepared in time for the

conference. We hope to use the findings of our study to improve future conservation of the wood turtles in the Susquehanna River Basin.

Quantifying the Threat of Trout Predation to Larval and Juvenile Hellbenders Based on Hellbender and Trout Morphology

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Hellbenders, *Cryptobranchus alleganiensis*, are giant salamanders endemic to the eastern United States that are facing significant declines throughout their range. Many populations are presumed to be extirpated while others exhibit declines and age structuring, such that only the largest, most mature hellbenders remain. This structuring is indicative of high rates of mortality in pre-reproductive hellbenders and may be influenced by predation from non-native predatory trout. Several states in the hellbender range have no native trout species (KY, OH, IN, IL, MO, AR, MS, and AL), and non-native rainbow and brown trout have been stocked in every hellbender state since the late 1800s, often with increasing stocking numbers and/or sizes over that time. Head-starting has been used to augment declining hellbender populations, yet head-started hellbenders from a state with no native trout did not exhibit anti-predator behavior in the presence of non-native trout, increasing their vulnerability to predation. Trout are a gape-limited predator, so prey vulnerability is dependent on the prey being smaller than the trout gape dimensions. Morphological data from head-started hellbenders as well as rainbow and brown trout from the DEC Chateaugay Fish Hatchery was collected. Hellbender head widths and trout gape dimensions will be correlated to total lengths and compared to each other to identify what sized hellbenders are vulnerable to predation by non-native trout, prioritize limited conservation resources, maximize augmentation success, and explore the potential impact of non-native trout predation to the age structuring observed in extant hellbender populations.

Seasonal Inundation Patterns Influence Amphibian Population Dynamics in Ephemeral Wetlands

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Wetland hydrologic regimes affect vegetation communities, predator abundance, and overall amphibian reproductive success, highlighting the need to understand variation in surface water extent across potential breeding sites and times. We monitored water levels from 2012–2026 for nine wetlands on Eglin Air Force Base in southwestern Florida to assess inter-annual and seasonal variation in hydrology (e.g., inundation timing, drying rates) in relation to reticulated

flatwoods salamander (*Ambystoma bishopi*) occupancy. Because flatwoods salamanders lay eggs terrestrially, wetlands must be dry in early fall for females to lay eggs but need to remain filled through late spring for larvae to survive to metamorphosis. Water levels during the breeding season varied considerably across years (e.g., extremely wet and dry season in 2019 and 2026, respectively). Notably for one occupied wetland, we observed a reduction in the maximum flooding duration in recent years. Although the drying rate of this site remained relatively stable over time, we recorded a subsequent decrease in occupancy as larvae have not been detected for the last six consecutive years. This suggests that changes in wetland hydrology could lead to population extirpation. We expect that alterations in hydrology may be linked to changes in vegetation structure that also impact population success. Understanding multiple aspects of hydrologic regime and long-term monitoring of wetland dynamics is critically important for guiding amphibian conservation efforts.

Analyzing the Role of Trade Shows and Pet Stores in a Regional Exotic Reptile and Amphibian Trade Network

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The global trade in reptiles and amphibians as exotic pets can drive overexploitation and the spread of invasive species and disease. At a regional scale, exotic pets are frequently sold at physical pet stores and trade shows; despite their prevalence, the relative contributions of pet stores and trade shows to the diversity and potential conservation risks of regional pet trade networks are understudied. To address this knowledge gap, we visually surveyed 8 trade shows and 47 exotic pet stores across five states in the Mid-Atlantic region from June to August 2025. We compared species diversity, selling prices, and potential conservation risks between trade shows and pet stores. We found that there was greater species diversity at trade shows, with trade shows having 368 species and pet stores having 112 species. No species were found exclusively at pet stores, meaning approximately 70% of all species observed were only found at trade shows. Importantly, 75% of species are not CITES listed and approximately 20% of species were listed as threatened by the IUCN Red List. Additionally, trade shows have an average selling price of approximately $150 per animal, compared to approximately $100 at pet stores; this may indicate that rare, valuable, or otherwise high demand animals are more frequently being sold at trade shows. Overall, our findings suggest that trade shows are primary drivers of regional trade network diversity and may pose comparatively higher conservation risks than pet stores.

Pathogen Prevalence in Wood Turtle (*Glyptemys insculpta*) Populations in West Virginia

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Repatriation of confiscated and surrendered native turtles represents a significant management challenge due to the risk of unintentionally introducing pathogens into wild populations. Effective repatriation decision-making requires baseline data on pathogen prevalence in wild turtle populations; however, such data are largely lacking for many regions. To address this gap

and support the development of a science-based repatriation strategy, the West Virginia Division of Natural Resources (WVDNR) initiated a study to assess the prevalence of three priority pathogens—ranavirus (Frog Virus 3), *Mycoplasma spp.*, and herpesvirus (*Glyptemys* variant, *Terrepene* variant, *Emydid* variant)—in wild turtle populations. Here, we present pathogen prevalence results for wood turtle (*Glyptemys insculpta*) populations in West Virginia. This work provides the first empirically derived baseline of pathogen occurrence in wild turtle populations in the state. These data strengthen the WVDNR's capacity to evaluate disease risks associated with repatriation and increase confidence in management decisions regarding the return of confiscated or surrendered wood turtles to the wild.

Assessing the Impacts of Urbanization on Stream Salamanders in Mecklenburg Co., NC

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This study sought to determine the extent to which stream salamander relative density is impacted by watershed urbanization. From August to November 2025, we conducted monthly salamander surveys in 29 streams from 10 watersheds in Mecklenburg County. During these monthly surveys, we collected environmental data on variables including canopy cover, local developed land cover, water quality, stream discharge, and streambed substrate composition. I collected data on adults of two salamander species, the northern dusky salamander (*Desmognathus fuscus*) and the southern two-lined salamander (*Eurycea cirrigera*), as well as larval salamanders. While both species rely on streams for breeding and larval development, northern dusky salamanders spend most of their life within streams, while southern two-lined salamanders utilize local terrestrial habitats to a greater extent. Larval salamanders are present in local streams year-round, with ovipositing from spring through summer for both species. My analysis indicates that the relative density of stream salamanders in Mecklenburg County are significantly impacted by the survey month and the percent developed cover within 150 m of the site. The relative density of northern dusky salamander and total adult salamander numbers showed a positive correlation to local development levels. Overall larval salamander relative densities had a positive relationship with the month of survey. These results may demonstrate high environmental tolerance by northern dusky salamanders and an increase in the juvenile cohort during the fall breeding season. Further research should investigate if similar patterns exist in cities with different salamander species and with varying greenspace management or abundance.

Herpetofauna of the Adirondacks: Sampling Bias Complicates Comparisons of Historical and Recent Citizen-science Data

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The Adirondack Park of New York spans six million acres of mixed public and private lands, supporting ~42 amphibian and reptile species. I compared two citizen-science datasets from a generation apart, the New York State Herp Atlas (1990–1999; 7,244 records, 267 observers) and iNaturalist (2008–2025; 9,849 open-location records, 2,974 observers), across 201 standard USGS survey blocks (~52 mi²). While the datasets showed broad spatial overlap (185 of 201 blocks) and strongly correlated species-level record counts ($r = 0.90$), the Atlas was more record-dense: 3.83 records/block/year versus 2.88 for iNaturalist. Naïve occupancy declined for 27 of 31 species with sufficient Atlas records, including a 34% decline for Mink Frog (-34%), a northern, cold-associated species hypothesized to be sensitive to climate warming. iNaturalist detections were also significantly more spatially clustered than Atlas records ($p < 0.0001$); one block containing Cranberry Lake contained 1,031 records, nearly 50 times the typical (median) block total of 21.5, reflecting concentrated visitation at select sites. Overall, iNaturalist relies on many casual contributors (median 1 record/user, max 184), while the Atlas relied on fewer, more prolific contributors (median 4, max 1,750). iNaturalist records were also 40% closer to roads and trails than Atlas records, suggesting reduced detection of even common species in more remote areas, and automated geoprivacy further limits its use for monitoring rare species. Structured, standardized surveys are still needed to reliably track distributional change and determine whether declines indicated by iNaturalist data reflect biology or an artefact of sampling bias.

Approaches for Identifying Potentially Suitable Habitat for Four State Listed Reptile Species Using Geospatial Analysis

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Federally and state listed reptile species are often difficult to survey efficiently across large areas, creating challenges during the environmental review and conservation planning processes. This presentation outlines geospatial analysis methods that we are developing to identify, classify, and compare potentially suitable habitat for New York State listed reptile species. We will apply a consistent landscape-scale framework that will be further refined based on species-specific habitat requirements. Comparative examples will be presented for four species: the state listed threatened Blanding's turtle (*Emydoidea blandingii*) and timber rattlesnake (*Crotalus horridus*), the state listed endangered and federally listed threatened bog turtle (*Glyptemys muhlenbergii*), and the wood turtle (*Glyptemys insculpta*), a state listed species of special concern. The results of this assessment are expected to inform environmental review, conservation planning, development of more efficient field investigations, and expanded analyses that may include larger areas and/or additional species.

Eastern Copperhead Movements And Home Ranges In An Urban Park

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We investigated Eastern Copperhead (*Agkistrodon contortrix*) movements and habitat use in an urban park in New Castle County, Delaware over the course of two years. Ten snakes (5 males, 5 females) were captured in May and June and brought into the lab for surgical implantation of subcutaneous radio-transmitters (ATS R1600 series). Prior to implantation, snakes were anesthetized with isoflurane following published procedures. Implanted snakes were held 24-48 hours after revival then released at their capture location. Each year, snakes were radio tracked 3 times a week from June through October, once a week in November, and once in December. In total we acquired 1,210 radio locations. No mortalities were recorded. Snakes utilized available habitats seasonally: lowlands and meadows in spring, riparian zone in summer, and steep forested rocky slopes in fall. Hibernation occurred at scattered sites on forested rocky slopes with 1-2 snakes per location. No human-snake conflicts were documented despite snakes' close proximity to popular walking trails, park benches, and lawns. We calculated individual home ranges using both a 95% Kernel Density Estimate and a 50% Kernel Density Estimate. The average 95% Kernel Density Estimate was 14.6 acres and average 50% Kernel Density Estimate was 3.3 acres. There were no significant differences between male and female home range sizes.

Eastern Tiger Salamander Post-Breeding Terrestrial Movements

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We radio-tracked 42 male Tiger Salamanders (*Ambystoma tigrinum*) to understand post-breeding movements and habitat use at one site in 2022 and another two sites in 2025. Salamanders were captured in vernal pools using minnow traps baited with orange glowsticks and brought into the lab for surgical implantation of subcutaneous radio-transmitters. Salamanders were anesthetized using MS-222 and released after a 24-hour recovery period. Salamanders were released into vernal pools in early-late March. We tracked salamanders as they moved out of the pools 1-2 times per month following precipitation events and recorded 373 radiolocations. Fourteen salamanders were tracked at the first site, 8 were tracked at the second, and 20 at the third. Seven mortality events were recorded and signals were lost on four individuals almost immediately after release. All transmitters died by the end of October. The minimum straight-line distance moved from the vernal pool was 17.7 meters, the average was 123.5 meters, and the maximum was 390.5 meters.

Conservation Genomics of the Atlantic Coast Leopard Frog (*Lithobates kauffeldi*)

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Urbanization fundamentally changes the way organisms use their environments, disperse, and interact. Described in 2014 from Staten Island, the Atlantic Coast Leopard Frog (*Lithobates kauffeldi*) exists within one of North America's largest urban areas, has disappeared from multiple parts of its former range, and is endangered in two states. We created a conservation genomic toolkit for the species using a reference-quality genome and population-level whole genome resequencing data. Using 25.6x long-read Oxford Nanopore data and 24.99x Hi-C, we assembled a chromosome-level genome 6.3 Gb long and scaffolded into 13 chromosomes, with a BUSCO completeness of 89.8%, the highest of any available Lithobates assembly. We also used these genomic data to estimate historical changes to effective population sizes (Ne) using a Pairwise Sequentially Markovian Coalescent analysis, finding a steady decline over the past several million years that culminates in low Ne in the most recent time points. Using multi-species whole genome resequencing we characterized the hybridization between *L. kauffeldi* and its congenerics, finding introgression with *L. sphenocephalus* (Southern Leopard Frog) in the southern portions of its range. Finally, using a single-species dataset we tested patterns of gene flow, finding continuous gene flow across the range until recent time periods. Collectively, we demonstrate that these data can be used to effectively assess conservation status and priorities for the species.

Eastern Ratsnake (*Pantherophis alleghaniensis*) Nest Site Selection in the North Central Connecticut Lowlands

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In 2025, 16 adult female eastern ratsnakes (*P. alleghaniensis*) were fitted with external radio-transmitters and tracked to identify nest site locations. Of these sixteen, six were confirmed gravid prior to egg deposition. After egg deposition in early July, radio-transmitters were removed. A single communal nest site was documented within a large rotting white ash tree (*Fraxinus americana*), containing seventy-eight eggs from an estimated eight to twelve ratsnakes, in addition to three eastern milksnake (*Lampropeltis t. triangulum*) eggs. Temperature and humidity data loggers recorded conditions every hour within the nesting cavity and at control sites throughout the incubation period. During incubation, mean temperatures of the egg clutches were 26.74 ± 2.63˚C (range 19.1˚C to 31.7˚C). Relative humidity of the nesting cavity averaged 100.9 ± 1.82% (range 73.8% to 103.9%). External temperatures of the rotting ash tree averaged 18.96 ± 3.66˚C (range 5.6˚C to 34.6˚C), with humidity averaging 95.09 ± 6.10% (range 46.4 to 107.0%). Humidity over 100% indicated prolonged exposure to excess condensation or precipitation. The mean daily temperature change inside the nesting cavity was 1.18 ± 0.68˚C, whereas the mean daily temperature change on the outside of the rotting ash tree was 11.61 ±

3.85˚C. Seventy-seven of the seventy-eight ratsnake eggs hatched successfully. Results indicate that the nesting cavity provided a stable thermal environment ideal for egg development. Ratsnakes were also observed to use the rotting ash tree for refuge and during shed cycles, suggesting that deadwood, particularly in open canopy habitats, are an important habitat feature for this species.

Counting Our Losses: Quantifying Cumulative Land Cover Conversion and Forest Fragmentation in the Hudson Valley

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Land conversion and habitat loss are a leading factor in the biodiversity crisis, a phenomenon particularly apparent in the Hudson Valley. In New York State, land-use planning decisions are generally made at the municipal level, resulting in fragmented decision-making and a fragmented landscape. Scenic Hudson's Land-use Change Analysis examines how cumulative changes in land cover have altered the Hudson Valley from 1985 – 2024. We used the University of Connecticut's Landscape Fragmentation Tool to analyze the newly created Annual National Land Cover Dataset, and quantified changes in acreage of human-developed land, forest core, forest fragments and edges, and agricultural lands. For our ten-county study area, we observed over 107,000 acres of new development, and corresponding losses of forest core acreage (-79,000 acres) and agricultural lands (-49,000 acres). Our results at the municipal level revealed patterns reflecting land-use planning decisions and variation across population density; although some communities lost both forest core and forest fragment acreages, others saw an increase in forest fragment acreage as core forests were fragmented by development. This analysis will help Scenic Hudson and conservation partners prioritize areas for land conservation, and will help engage the public in land-use planning that encourages balanced growth and conservation with connectivity in mind. Both outcomes will help conserve biodiversity, including herpetofauna. Our methods can be easily replicated for other regions.
