POSTER ABSTRACTS

Student

TITLE: Maine Amphibian and Reptile Atlas Project 2018: Examining Idiosyncrasies in Species' Ranges to Power Conservation

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ABSTRACT: Reptiles and amphibians are a valued aspect of Maine's natural heritage and an essential component of its ecosystems. Much of the information that we have on Maine reptiles and amphibians comes from the database of the Maine Amphibian and Reptile Atlas Project, a citizen science project that was initiated in 1986 by the Maine Audubon Society, the University of Maine, and three other organizations. To date, this project has recorded over 9,000 observations with the help of over 300 volunteers. Despite this success, there is still much that we do not understand about these animals. For example, several species' ranges exhibit gaps, and at least one species may be expanding its range northward with Maine's changing climate. Drs. Hunter and Calhoun, three scientists from Maine Department of Inland Fisheries and Wildlife, and Mr. Lindemann have identified four species to investigate in targeted field work in the summer of 2018. Surveys take place in three general regions: (1) Northeast Maine: Gray Treefrog (*Hyla versicolor*); (2) Eastern Maine: Common Watersnake (*Nerodia sipedon*); and (3) Northern Maine: Snapping Turtle (*Chelydra serpentina*) and Pickerel Frog (*Lithobates palustris*). Mr Lindemann and his team also record all incidental observations of reptiles and amphibians.

Project fieldwork is ongoing, and this poster represents an opportunity to discuss survey progress and current results. To date, the project has already achieved goals of documenting Gray Treefrog farther north than previously encountered, and has documented Snapping Turtle in northwest Maine, where there was previously believed to be a range gap.

TITLE: A Habitat Assessment for a Central Maine Population of Wood Turtles (*Glyptemys insculpta*) – Abstract

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ABSTRACT: Wood Turtles (*Glyptemys insculpta*) are a medium sized, North American turtle in decline throughout their range with their status currently under review in Maine. This study focused on a small population of Wood Turtles (Glyptemys insculpta) in Waldo Co., Maine, to develop a greater understanding of the habitat conservation needs of the Wood Turtle with the intent of contributing to the state-wide status review of the species. The study, which ran from April 2017 to October 2017, used telemetry and geographic information systems (GIS) to determine upland habitat characteristics to provide management recommendations, and served as part of my undergraduate thesis.

TITLE: Habitat Use of the Wood Turtle (*Glyptemys insculpta)* in a Disturbed Area

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ABSTRACT: This project targets the Wood Turtle (*Glyptemys insculpta)*, which is listed as Endangered by the IUCN. Wood Turtles face decline due to anthropogenic disturbances, including pollution, habitat destruction, and illegal exploitation. Predation and road mortality are also substantial threats to the persistence of this species, especially as Wood Turtle habitat is often infiltrated by residential and recreational developments. To further Wood Turtle conservation, this project seeks to provide vital information regarding this species' habitat use and home range size in an environment with high anthropogenic impact. To accomplish this project, I captured and radio-tracked turtles in 2017 and 2018 in a disturbed field site located in Fortin Park, Otsego County, NY. Areas of suitable Wood Turtle habitat are substantially impacted by litter, invasive species, and recreational activity. When a Wood Turtle was located, various microhabitat characteristics were noted and, also, the presence or absence of Japanese Knotweed (*Fallopia japonica).*

TITLE: Interactive and Main Effects of Pesticide, Fertilizer, and Salt on Fluctuating Asymmetry in Southern Leopard Frogs (*Lithobates sphenocephala*)

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ABSTRACT: Humans have irrevocably altered surrounding ecosystems in many ways, one of which is the chemicals that are regularly released to the environment. Of these, pesticides, fertilizers, and road salts are heavily applied and often disperse into waterways. This is problematic for all aquatic organisms, but amphibians in particular are susceptible to absorption of these chemicals and many species are already declining. One mechanism by which frogs are impacted is by unevenness of limbs, or fluctuating asymmetry, which reflects issues with development. This may also be influenced by increased stress caused by exposure to the chemicals. To examine potential effects of environmental pollutants on amphibians, southern leopard frog (*Lithobates sphenocephala*) eggs were collected from Queen Anne's County, MD and exposed as larvae to single or multiple treatments of atrazine, ammonium nitrate, and sodium chloride throughout their development in the greenhouse at Washington College. At complete metamorphosis, each frog's right and left thumb, foot, femur, radioulna, and tibiofibula were measured using digital calipers to calculate fluctuating asymmetry. There were significant main effects of N and ATZ on average radioulna difference (ANOVA p=0.030 and p=0.015, respectively) and a significant main effect of NaCl on fluctuating asymmetry of the thumb (ANOVA p=0.044). The asymmetry detected is an indicator of environmental stressors during larval development. These developmental abnormalities may reduce frog survival later in life, and uneven limb lengths could impact movement, feeding ability, or mate choice. As a result, determining the effect of environmental factors that contribute to fluctuating asymmetry is critical.

TITLE: SPARCnet Year 1.5: Preliminary Results of a Long Term Mark-Recapture Study on *Plethodon cinereus* in Bridgewater, MA.

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ABSTRACT: The Salamander Population Adaptation Research Collaboration Network (SPARCnet) is a collaborative network of researchers throughout northeastern North America who are studying regional variation and responses to climate change and land use on populations of the eastern red-backed salamander (*Plethodon cinereus*). In 2016, we established three pairs of SPARCnet plots, each with 50 standardized artificial cover objects (untreated pine) in Great Hill Forest, Bridgewater, MA. Plots are visited weekly, six times each in the fall and spring, and all salamanders are marked with a unique color code of visual implant elastomer. Additionally, snout-vent length, total length, sex and reproductive status, and color morph are all recorded. After three sampling seasons, we have marked 392 individual salamanders, and have recapture rates that average 42% per season. Salamander density between plots is highly

variable, ranging from 0.18–2.76 salamanders/m^2, but fairly consistent within a plot between seasons. In 2017, we established two new experimental plots. These plots follow SPARCnet protocols but are not contributing data to the core SPARCnet projects, therefore we can carry out experimental manipulations which may impact salamander abundance (e.g., adjusting shade cover). We are sampling these new plots weekly and continuously from April through November. This poster summarizes our SPARCnet data collected thus far and compares the new experimental plots to the original six plots in terms of salamander abundance, canopy cover, and soil composition. We are continuing to collect baseline abundance data in the experimental plots through Fall 2018 and begin shade treatments in Spring 2019.

TITLE: The Effectiveness of Terrestrial Amphibians as Indicator Species for Long-term Monitoring of Ecosystem Changes in Eastern USA Forests

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ABSTRACT: Long-term ecological research (LTER) accrue invaluable ecological data that inform policy decisions that enable mitigation of environmental changes. However, selection and use of effective ecological indicators for LTER programs remains a challenge, and there is great interest among ecologists and conservation biologists in identifying such indicators for studying environmental changes. Across the eastern US, eastern hemlock (*Tsugacanadensis*) is declining from irruptions of a nonnative insect, the hemlock woolly adelgid (*Adelgestsugae*). We use data from the Harvard Forest LTER site's Hemlock Removal Experiment to show that plethodontid salamanders can be reliable indicators of ongoing ecological changes in hemlock and hardwood forests in the northeastern USA. These salamanders are abundant, sensitive to environmental changes, have a history of demographic stability, are both predators and prey, and can be sampled and monitored easily and cost-effectively. At the Harvard Forest LTER, red-backed salamanders (*Plethodoncinereus*) were strong indicators of intact forests dominated by eastern hemlock (*Tsugacanadensis*); their high site fidelity and habitat specificity yielded an indicator value (IndVal) of 0.99 for the species. Eastern red-spotted newts (*Notopthalmus viridescens*) were better indicators of nearby stands made up of young, mixed hardwood species, such as those replacing declining hemlock stands. We conclude that plethodontid salamanders satisfy most criteria for reliable ecological indicators of environmental changes in northeastern US forests.

TITLE: Comparison of Daily Movements and Brumation Patterns of Resident and Translocated Northern Map Turtles in the Upper Niagara River

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ABSTRACT:
The Northern map turtle (*Graptemys geographica*) is an aquatic turtle species located in the Upper Niagara River. During their active season, the Northern map turtle population mainly inhabits a marina and an unused boat-slip located adjacent to the Black Rock Lock. In this area, urban development and shoreline alterations have limited their access to terrestrial nesting sites and there has been little recruitment into the population. In October 2016 we translocated ten Northern map turtles from Presque Isle State Park, PA into the river for a comparative study between resident and translocated individuals. All turtles were outfitted with radio and sonic transmitters, and tracked nearly every day to analyze daily distances moved, home ranges, and behaviors. Distances moved per day were calculated and upriver and downriver movements were recorded. Water current was measured and entered into Geographic Information System (GIS) to generate hypothetical swimming paths for turtles. Preliminary analysis indicates that turtles may use areas in the river with the slowest water current during long distance movements. Dates that turtles became active in the spring and inactive in the fall were recorded and compared between resident and translocated individuals. We also investigated the dates that an individual became active and inactive in consecutive years. Preliminary analysis shows that resident turtles have very similar dates of becoming active and inactive between years. Water temperature, photoperiod, and body mass are potential factors affecting the length of the active season.

TITLE: Employing an External Backpack Radio Transmitter to Track Post-Breeding Movements of Yellow-Spotted Salamanders

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ABSTRACT: Yellow Spotted Salamanders (*Ambystoma maculatum*) display elusive behavior, spending most of the year out of sight and presumably in underground burrows except for a few weeks during the spring breeding season. Given their habits, it is difficult to study their behavior throughout the year unless previous measures are taken to follow their terrestrial. Previous studies have used passive pitfall traps to

provide data on the general direction of travel from vernal pools, while other studies employed implantable radio transmitters, which require anesthesia and surgery. In this study, I sought to find an effective method of applying external transmitters that would 1) remain intact without abrading skin and 2) allow for unimpeded movement in the field. To these ends, I designed a harness that held Advanced Telemetry Supplies A1015 Series transmitters (0.55g). The Velcro® harness was tested to fit just posteriorly to a salamander's front legs with a transmitter attached dorsally. Five outfitted Spotted Salamanders were held overnight as well as in the field for 30 minutes minimum before release. Four of the five transmitters were tracked and retrieved over 11 days, with movements ranging from 86ft to 173ft. This method holds promise over previously used techniques for short term tracking of salamanders due to its non-invasive nature, quick application, and lightweight quality.

TITLE: Updating the Summary of Vernal Pool Policies and Protections in the Northeast

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ABSTRACT: Vernal pools are a unique class of small, isolated, shallow ephemeral wetlands that undergo cyclical periods of drying and inundation. In the Northeast, vernal pools typically occur in forested landscapes and are an important ecological resource, including habitat for many invertebrate and amphibian species. The small size and dynamic nature of vernal pools creates challenges in their conservation and not all states regulate them in their freshwater wetland policies. In 2010, Anne Duperault, member of the NEPARC vernal pool working group, prepared a summary of current regulations governing vernal pools for the northeastern states of Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, and West Virginia. It is approaching a decade since the summary was finalized and the summary needs updating. We are currently researching changes to previous regulations and policies, identifying key state agency contacts, and summarizing key state-level sources of information (e.g., websites, documents). Our research will be summarized and a draft revision of the summary of vernal pools regulations will be prepared.

TITLE: Assessing Salt Tolerance in Coastal vs Inland Breeding Spotted Salamanders (*Ambystoma maculatum*) Through Behavioral Avoidance Tests

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ABSTRACT: In Acadia National Park, Maine, USA, a population of Spotted Salamanders (*Ambystoma maculatum*) breeds in vernal pools that are in close proximity to the high tide zone. Breeding adults at this locale, in turn, are subject to periodic spikes in salinity that occasionally approach full strength sea water (35 ppt). As part of a long-term study on the effect of elevated salinity levels on all life history stages of this local population, we employed behavioral avoidance tests to assess the level of salt tolerance between coastal breeding adult salamanders and adult salamanders that breed in inland pools with salinity levels <1 ppt. Salamanders were collected from each site and placed in one of two adjoining test chambers that randomly contained freshwater or salt water with ion concentrations that increased incrementally from 3.9 to 17.5 ppt. We then recorded time spent by individual salamanders in either chamber over 60 minutes, testing eight salamanders per concentration. For both coastal breeding and inland breeding salamanders, 17.5 ppt represented the threshold at which salamanders spent significantly less time in salt water compared to freshwater. The magnitude of avoidance behavior, however, was greater in coastal breeding salamanders than inland breeding salamanders (time spent in 17.5 ppt: 2.7 – 25.5 minutes and 13.75 – 60 minutes, respectively). Our data suggest that both coastal and inland breeding salamanders can tolerate increasing salt concentrations to the same upper threshold but coastal salamanders have a more rapid avoidance response to this upper threshold than that observed in inland salamanders.

TITLE: Ranavirus Prevalence and Viral Load in Vermont Amphibian Communities

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ABSTRACT: Ranaviruses are a group of emerging pathogens negatively impacting amphibian communities around the globe and have the capability of causing mass mortality events; yet, their distribution and natural variation are not entirely understood. The goal of this study was to estimate ranavirus prevalence and viral load in amphibian communities of northwestern Vermont. In summer 2016, we collected tissue from a total of 1,822 amphibians across 18 sites at 7 time points. Using a random subset of samples (n=629), we tested for ranavirus using quantitative PCR (qPCR) to amplify a conserved region in its major capsid protein and obtained prevalence and viral load estimates. No mass mortality events were witnessed throughout each summer, however our results indicated ranavirus was present in 31 of the 629 tested samples (5%) and in 7 of the 18 sites, which is lower than prevalence estimates from previous studies in surrounding states. Ranavirus was found in 7 of the 10 species collected and in all life stages. No statistically significant differences in prevalence and viral load were detected between sites, species, or life stages. Additionally, none of the infected individuals exhibited clinical signs in the field and the majority of positive samples had a low viral load. Future studies will focus on determining why ranavirus prevalence and viral load of Vermont amphibian communities is lower than surrounding states. We hope to expand our results by incorporating more samples from more sites and years to eventually inform amphibian conservation efforts by identifying disease hotspots in the state.

TITLE: Predicting the Range of Anuran Body Temperatures in the Field Using Agar Models and Mechanistic Niche Modelling

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ABTRACT: Amphibians have been experiencing extinctions and declines at unprecedented rates, and as ectotherms, they may be particularly sensitive to environmental changes. Determining the best way to predict body temperatures in the field is a critical tool to better understanding the adverse impacts of environmental changes on this imperiled taxon. Using agar models, mechanistic niche modelling, and

field collected data, we attempted to accurately model the range of body temperatures that Green frogs, *Lithobates (Rana) clamitans*, a semi-aquatic species, may experience at three sites in Northwestern Pennsylvania. Agar models containing temperature loggers were deployed, and plasti-dip was utilized to create permeable and non-permeable models to encompass the potential range of cutaneous water loss seen in nature. We then employed the program Niche Mapper™ to model the body temperatures of amphibians in their environment utilizing data on microclimate and amphibian physiology. Both night and day surveys were also conducted to collect actual frog body temperatures using non-contact infrared thermometers. Temperatures experienced by agar models were greatly influenced by model permeability, despite occupying similar microhabitats. These data in conjunction with Niche Mapper™ projections provided an encompassing gradient for temperatures of live anurans. Moving forward we are working to refine both environmental and physiological Niche Mapper™ parameters to improve the accuracy of predicted frog body temperatures further. Ultimately, the ability to model amphibian body temperatures will allow us to predict changes in behavior, physiology and potentially also disease risk in response to changes in the environment.

TITLE: Comparing environmental DNA sampling techniques for detecting amphibian pathogens

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ABSTRACT: Recent studies have detected the environmental DNA (eDNA) of amphibian pathogens with sampling methods that include pumping pond water through a fine filter, as well as centrifuging water samples to concentrate eDNA in pond water debris. Filtering pond water with a hand-held pump can be time intensive and filters can rapidly clog, but centrifugation methods are less likely to be used by NGOs, nonprofits, and citizen-scientist efforts because these organizations typically lack access to centrifuges. Our study will compare the amounts of amphibian pathogen eDNA extracted by both sampling methods at ten ponds whose amphibian larvae that have previously tested positive for *Batrachochytrium dendrobatidis* (Bd) and/or *Ranavirus* species (Rv). We will visit each site twice in the summer of 2018 and we will take simultaneous water samples for filtering (via hand-held pumps) and centrifugation. We will use quantitative PCR to compare the amount of Bd and Rv eDNA collected by each method. If filtering yields results that are as sensitive as centrifugation, then we can recommend this method as a relatively inexpensive means to monitor amphibian

pathogen outbreaks for non-profits, NGOs, and other institutes to lack access to expensive laboratory equipment.

TITLE: Environmental Context Influence on the Common Mudpuppy (*Necturus maculosus*)

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ABSTRACT: Many organisms inhabit a wide variety of habitats with differing environmental context, potentially influencing their behavior and morphology. For example, some fish species show significant differences in body shape dependent on whether they inhabit lake or stream environments. However, environmental context effects on herpetofauna body shape remain largely unexplored. The Common mudpuppy (*Necturus maculosus*) is a large, fully aquatic salamander species that inhabits a variety of hydrologically different habitats, including lake and stream environments. This project compares a suite of morphological measurements, as well as differences in diet and behavior, collected from lake and stream populations of mudpuppies in Western New York and Southeastern Canada. Preliminary results show that lake and stream mudpuppy morphology is not significantly different, despite the populations being reproductively distinct. Two females captured under rocks with nests regurgitated multiple eggs during gastric lavage. These observations increase our understanding of how environmental context may influence behavior and morphology of the common mudpuppy while adding to the limited knowledge base of this understudied aquatic salamander.

Professional

TITLE: Assessing the Distribution of Timber Rattlesnakes (*Crotalus horridus*) in West Virginia Using a Citizen Science Approach

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ABSTRACT: Continued declines in timber rattlesnakes (*Crotalus horridus*) across the species' range, due to direct persecution, habitat loss, and disease, has elevated the conservation priority of the species. The timber rattlesnake is the State Reptile of West Virginia, and is currently listed as a Priority 1 Species of Greatest Conservation Need in the West Virginia State Wildlife Action Plan. West Virginia is 78% forested, and still maintains much of the intact, forested habitat required by healthy timber rattlesnake populations, making the state a key player in conservation efforts. Little is currently known about the exact distribution of timber rattlesnakes in West Virginia, specifically how the animals are distributed within their expected range. Using a citizen science approach, to increase public participation in timber rattlesnake conservation and allow for increased outreach opportunities, the West Virginia Division of Natural Resources initiated a project to map the Extent of Occurrence and Area of Occupancy of timber rattlesnakes in West Virginia. Data collected during this study will allow the agency to develop a conservation action plan for timber rattlesnakes in the state. This includes highlighting areas in need of increased outreach due to higher than normal human-rattlesnake interactions, as well as locating potential "hot spots" to focus conservation efforts. Data collection will continue through December 2019. We present timber rattlesnake observation data collected through June 2018.

TITLE: Assessing Amphibian Health in Maine

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Note that Matthew Chatfield and Cheryl Frederick will be co-presenting the poster.

ABSTRACT: Amphibians are the most endangered of all vertebrate classes with nearly one third threatened with extinction. Emerging infectious diseases, such as chytridiomycosis, caused by the fungal pathogen *Batrachochytrium dendrobatidis*, (*Bd*) or ranavirus, are among the threats. Not all species, however, are equally affected by these pathogens. Green Frogs (*Lithobates clamitans*) are thought to be carriers and largely resistant to developing these diseases. Infection may be influenced by the innate immune system of the amphibian itself, such as through the production of antimicrobial peptides (AMPs) or metabolites produced by beneficial bacteria on the amphibian's skin. These intrinsic defenses are highly variable across amphibian species. Extrinsic factors found in an amphibian's environment may also influence whether individuals

succumb to disease. Environmental stressors, including human-induced problems such as pollution and agriculture, may result in sublethal disease effects, even in resistant species. We surveyed populations of Green Frogs at nine ponds with varying levels of agricultural intensity in the surrounding uplands. Besides testing for the presence of *Bd* and ranavirus, we analyzed the skin microbiome and antimicrobial peptide production, recorded calling activity and took multiple morphological measurements including symmetry, color, and body condition. Our work to date suggests that the isolated island populations are not infected with either pathogen and have relatively low levels of skin immune defense while inland populations from areas with more or less agricultural activity test positive for both pathogens and have a more diverse skin microbiome.

TITLE: Assessing Bait Preference in Spotted Turtles (*Clemmys guttata*)

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ABSTRACT: Interest in management of spotted turtles (*Clemmys guttata*) has grown since the species was petitioned for listing under the Endangered Species Act. Standardized sampling methods are currently being developed to assess the species status and assist with development of long-term monitoring programs. Passive sampling using baited traps is a common method for spotted turtles. Researchers have typically used canned sardines as bait, but research into the effectiveness and feasibility of other bait types is lacking. A recent study conducted at ponds in Missouri found that wet cat food was equally as effective as sardines at capturing snapping turtles (*Chelydra serpentina*), and six times more effective at capturing painted turtles (*Chrysemys picta*; Richardson et al. 2017). In spring 2018, we began a study to determine if wet cat food was an effective bait for spotted turtles inhabiting shallow wetlands in West Virginia, as well as to determine if the findings of Richardson et al. (2017) were consistent when sampling in a different region and different habitat types. Preliminary results suggest no significant difference in spotted turtle captures ($p = 0.396$, $N = 37$ paired trap tests), with 26 and 17 unique individuals captured using canned sardines and wet cat food, respectively. We will continue the experiment with these spotted turtle populations, as well as test bait preference for riverine turtle populations in West Virginia. Because wet cat food is substantially less expensive than canned sardines, our findings suggest that it may be a better bait option for spotted turtle monitoring programs.

TITLE: Vernal Pool Policies and Protections in the Northeast: Insights from Experts

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ABSTRACT: Vernal pools are small, seasonally-flooded wetlands that reach their maximum size in spring and lack connections to permanent surface waters. These pools harbor a unique suite of species –including aquatic invertebrates and pool-breeding amphibians. Vernal pools are subject to degradation and destruction, and declines in their associated biological communities have become a concern in recent decades. Despite these concerns, many vernal pools are not afforded federal-level protections as a result of two prominent U.S. Supreme Court decisions handed down over the past two decades, and the importance of regional, state, or local regulations as alternative approaches to conserving vernal pools is becoming more evident. This study was investigation was initially driven by the Northeast Partners in Amphibian and Reptile Conservation (NEPARC) to understand expert perceptions about technically feasible solutions for protecting vernal pools in the region and what might facilitate or constrain those solutions. This study was implemented to better understand expert perceptions about technically feasible solutions for protecting vernal pools in the region and what might facilitate or constrain those solutions. We interviewed vernal pool experts in the northeastern U.S. regarding approaches to vernal pool protection and analyzed their perceptions through the lens of Kingdon's multiple streams policy development framework. The framework recognizes three processes associated with policy development: problem identification, policy solution development, and the impacts of politics. We found participants most often discussed feasibility of policy formulation and implementation, particularly with regard to protecting vernal pools of high value while also remaining within the bounds of what public opinion supports.

TITLE: NEPARC Vernal Pool Working Group: Highlights and Future Initiatives

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ABSTRACT: The Northeast Partners in Amphibian and Reptile Conservation (NEPARC) vernal pool working group was initiated nearly a decade ago to address the growing concern in the region for amphibians and other species that rely on vernal pools for successful breeding. Vernal pools are small, intermittent wetlands that are

geographically isolated from permanent water bodies. These pools are difficult to locate and identify, thus they are especially vulnerable to filling, draining, and other alteration. Furthermore, federal wetland protections leave most vernal pools unprotected, further exacerbating the potential for amphibian habitat loss. To date, working group members spurred several initiatives to advance vernal pool conservation across the region. For example, vernal pool mapping and conservation efforts were compiled and are available online, and members have served as experts in contributing to a recent study evaluating approaches to protecting vernal pools at the state-level. Potential projects on the horizon include drafting an updated vernal pool bibliography and making it available in a sharable reference format. Broadly, NEPARC facilitates a wide variety of efforts that support vernal pool conservation, including basic and applied research and monitoring, conservation and appreciation of vernal pool ecosystems and species, disinfecting protocols for prevention of disease transmission between vernal pools, and bibliographies of the environmental impacts of road salt. The vernal pool working group meets at the NEPARC annual conference to discuss progress and initiate coordination of efforts to improve our knowledge of vernal pools and to advance their conservation in the region. Opportunities to be active in the group are presented and feedback on other initiatives to pursue are welcome.

TITLE: The Vermont Vernal Pool Monitoring Project

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ABSTRACT: Vernal pools provide critical habitat for a variety of amphibian and invertebrate species, including Wood Frogs, *Ambystomatid* salamanders, and fairy shrimp. In addition, they may also act as stepping stones that facilitate amphibian movement across an otherwise terrestrial landscape. Having already mapped >4,000 potential vernal pools across Vermont using color infrared aerial photo-interpretation, and field-verified ~1,000 pools with the help of trained citizen scientists, we recently initiated a new project to collect long-term vernal pool data through annual monitoring. The spring of 2018 marked the pilot season of VCE's Vermont Vernal Pool Monitoring Project (VPMon). Using citizen scientist volunteers equipped and trained by VCE staff, VPMon will build a base of knowledge regarding the status of Vermont's vernal pools and pool-breeding amphibians, reveal effects of regional stressors including climate change, and raise public awareness about their ecological value. VPMon project protocols use a variety of monitoring technologies, including digital acoustic monitors and water temperature loggers, as well as the phone app, iNaturalist. With an online database in the works, VPMon data will be openly accessible for use by agencies,

conservation organizations, and the public. A long-term objective of VPMon is to provide data that will inform and advance vernal pool conservation planning and management at the state and local levels.