

Abstracts

Paper Presentations

(Listed alphabetically by last name of presenter--italicized)

Timing and impact of habitat type on black bear corn crop damage

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Black bears (*Ursus americanus*) can cause significant damage to agricultural crops. However, there is a lack of scientific literature quantifying black bear damage in the United States. Our study compared bear damage to corn fields in two surrounding habitat types: forest cover in northern Clarion County (n=5) and agriculture in southern Clarion County (n=5). We established a walkable perimeter and a grid of transects 100-m apart. Field size varied from 10,934 m² to 181,526 m². Trail cameras were deployed at anticipated areas of bear entrance or where previous scat and tracks were observed. Damage was surveyed weekly and confirmed as bear damage by the presence of scat and tracks, damage characteristics, and trail camera photos from 13 August 2017 to 22 October 2017. All five fields in the north sustained bear damage, but only three fields in the south experienced damage. Percent damage ranged from 0 to 1.95% (0 to 831 m²) in the south and 0.55% to 14.58% (211 to 8445 m²) in the north. Mean damage to southern and northern fields was 0.474% and 4.644% respectively. There was strong evidence that surrounding habitat type had a significant impact on percentage of damage (p = 0.016). While the difference in mean amount of damage was not significant (p = 0.116) between the two habitat types, there was a tendency toward more damage in the northern fields. The earliest onset of damage was 13 August 2017 in a southern field. The remaining seven fields had damage by 20 August 2017. The majority of new damage was completed by 2 September 2017 at all study sites. This is consistent with a North Carolina study that documented 0.6% of bear-caused damage to corn, with the majority of damage occurring in a two-week period. Since our data suggest a time-sensitive pattern of damage, deterrent and repellent measures could be timed to the onset or peak of damage to reduce farmer and wildlife agency cost and effort.

Soil Chemistry and Interspecific Competition Influence Understory Forest Composition in Central Pennsylvania: Implications for Wildlife

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Eastern deciduous forest understories represent mosaics of food and cover for wildlife, supporting a diversity of insects, small mammals, birds, and large herbivores like white-tailed deer. Despite the focus on charismatic fauna, all wildlife populations rely either directly or indirectly on plant communities for food and shelter. Understanding the factors that shape plant diversity and understory composition are crucial for better managing wildlife habitat, especially in the context of food availability. In conjunction with full vegetation inventories, we collected data on abiotic conditions including soil chemistry, topography, and light across 24 permanent sites in the Rothrock and Bald Eagle State Forests from May to August 2014. Using Generalized Joint Attribute Modeling (GJAM), we assessed the effects of these abiotic conditions on plant abundance and compared correlations between taxa to assess competitive interactions. Ericaceous vegetation (huckleberry (*Gaylussacia* spp.), mountain laurel (*Kalmia latifolia*), and blueberry (*Vaccinium* spp.)) was positively associated with lower pH values ($\beta < -14.58$) and low levels of extractable potassium ($\beta < -10.69$), while high quality food taxa (Indian cucumber-root (*Medeola virginiana*), greenbrier (*Smilax rotundifolia*), and brambles (*Rubus* spp.)) were sensitive to horizon extractable manganese ($\beta < -3.33$). Indian cucumber-root and greenbrier were positively associated with ericaceous taxa ($r > 0.15$), and there were no negative relationships between ericaceous taxa and any seedling species. These results indicate that soil chemistry plays a role in shaping plant community composition, but that the presence of dominant ericaceous vegetation (high cover) does not limit the abundance of some valuable food resources for wildlife.

The Effects of Vegetation Management on Breeding Bird Usage of Utility Rights-of-Ways

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Early successional habitats and the flora and fauna that require them are in decline across the northeastern United States. The natural processes that create early successional habitat have been interrupted and now humans are the main creator of this habitat type. Utility rights-of-way (ROW) are a common example of these human-created, early successional habitat and comprise a sizeable area throughout the Appalachians. With this in mind, managing these areas as viable ecosystems should be a priority. In this study, long-term experimental sites were set up within a 256kv electrical transmission right-of-way in Centre County, PA. Seven treatments incorporating a variety of chemical, mechanical, and combinations of these methods were implemented to maintain these sites in an arrested stage of succession for over 60 years. To determine the effects of ROW habitat management on breeding birds, we conducted, transect-based singing surveys for three breeding seasons (2015-17) and productivity surveys (e.g., nesting success) were performed over two breeding seasons (2016-17). The average number of bird species found on sites with transitional border zones present was higher ($\bar{x} = 13.75$) than sites lacking borders ($\bar{x} = 7.5$). Between the two years of avian productivity work, integrated vegetation management occurred along the ROW. Avian nesting success prior to management was higher (49%, $n = 48$ nests) compared to first year post-treatment nesting success on the same sites (36.5%, $n = 62$ nests). Future plans include additional avian productivity assessment midway through the integrated vegetation management cycle to detect possible changes in nesting success over time.

Local Adaptation in a Generalist Species: Examining Genomic Diversity in Bobcats

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The bobcat (*Lynx rufus*) is a successful generalist predator with a broad range across North America. As a generalist, it inhabits a diverse array of habitats with their prey use depending on the ecosystem they inhabit. The objective of this project was to examine bobcats from divergent ecosystems and to identify loci contributing to adaptation in local environments. The recent annotated version of the domestic cat genome presented the perfect opportunity to create a comprehensive bobcat genome sequence based on the structure of the domestic cat genome. We sequenced a New Mexico bobcat at a depth of 30x coverage and mapped reads to create a draft reference assembly. Subsequently a northern (Idaho, Montana; N=9) and southern (New Mexico, Arizona, southern California; N=9) populations of bobcats were sequenced for an average coverage of 10X for each population pool across the genome. A pooled-population of Canada Lynx (N=3) was also included in the analysis. This study reports the first genome wide analysis of bobcat diversity and tests for signals of selection that identify loci important for local adaptation at the genome-level. This study improves our understanding of species history and the specific genomic differences that make the bobcat populations in northern and southern ecosystems unique.

Understanding the cause of mange in black bears (*Ursus americanus*) in Pennsylvania

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Since the 1990s, the number and geographic distribution of mange cases in black bears in Pennsylvania has increased; however, the causative mite(s) has yet to be fully defined. We evaluated several diagnostic approaches for detection of mite(s) in 72 black bears with severe mange. *Sarcoptes scabiei* was morphologically identified in skin scrapes from 66 of the bears; no mites were identified in the remaining six. Histopathological lesions consistent with sarcoptic mange were observed in 39/40 bear skin samples examined, and intralesional mites were observed in 38 of these samples. Tissue samples were collected from a subset of the 72 bears for PCR testing targeting both the internal transcribed spacer (ITS)-2 region and cytochrome c oxidase I (*cox1*) gene, including 69 skin scrapes (ITS-2 only) and 56 skin biopsies (ITS-2 and *cox1*). Skin scrapes were more sensitive for PCR detection than skin biopsies, and the ITS-2 primers proved more sensitive than *cox1*. Using a commercial ELISA, antibodies to *S. scabiei* were detected in 45/49 black bears with confirmed mange and 0/62 cubs without mange and born

to seronegative sows. These data indicate *S. scabiei* is the predominant mite associated with mange in black bears in Pennsylvania. Diagnostically, cytologic examination of skin scrapes is the most effective approach for diagnosing active mite infestations in black bears. The evaluated serologic assay accurately detected antibodies to *S. scabiei* in most bears with confirmed infestations; however, additional research is needed to determine the usefulness of this approach for larger scale surveys and asymptomatic bears.

Turbine-integrated mortality reduction using real-time bat activity

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Species of bats have been experiencing high levels of wind turbine-related fatalities for many years. Given the continued increase in wind energy facilities (WEFs), particularly in the United States, combined with other emergent threats such as white-nose syndrome (WNS), it is increasingly important to significantly reduce the number of bat fatalities at WEFs. To help curb these fatalities, Normandeau Associates, in association with the Electric Power and Research Institute (EPRI) and WE Energies developed a real-time “smart” curtailment system known as the Turbine-Integrated Mortality Reduction (TIMR) system. TIMR incorporates real-time acquisition of weather and bat activity data from acoustic monitors to automatically curtail turbines when bat activity is detected. Normandeau tested the TIMR system at Blue Sky Green Field WEF, located in Wisconsin, from July 15 – October 31, 2015. Bat mortality at these turbines was compared to mortality at ten control turbines operating under normal conditions. Estimates of bat mortality were 82% lower for all species and 87% lower for *Myotis lucifugus* (little brown bats) at TIMR turbines compared to control turbines over the entire survey period. The results of the survey also showed a strong correlation between bat activity and mortality, validating the use of activity data to inform mitigation. The successful implementation of TIMR allows companies to maximize bat conservation while minimizing loss of energy and revenue associated with other curtailment strategies.

Temporal analysis of threats impacting federally protected species

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The U.S. Endangered Species Act (ESA) was created to protect and recover imperiled species and the ecosystems upon which they depend. Imperiled species are federally listed as either threatened

or endangered (T&E). The objectives of our study were to quantify how the number of threats impacting species at time of their listing has changed, and to evaluate how the occurrence of a given threat included in a listing decision changed between 1975 and 2016. We accessed Federal Register listing documents for all T&E species listed in the U.S. and its territories from 1975 through 2016 to develop a database of threats impacting federally listed species. We defined six threat categories and recorded the presence/absence of a given threat category for a given species. Threat categories included habitat modification, overutilization, pollution, species-species interaction, demographic stochasticity, and environmental stochasticity. On average, number of threats per listing decision increased by 1.17 threats per decade. Compared to 1975, we found that the top threat occurrence in 2016 was no longer dominated by habitat modification, but also included environmental stochasticity and species-species interaction. We found a significant decrease in threat occurrence for overutilization since 1975 and for demographic stochasticity and pollution since the early 2000s. The increase in environmental stochasticity is mainly associated with the dynamics of climate change. Based on these trends, we provide recommendations on how to improve the recovery process for endangered species. In addition, we provide preliminary findings on a finer scale analysis of threats facing T&E vertebrates.

Combining Data Sources to Understand Drivers of Spotted Salamander (*Ambystoma maculatum*) Population Abundance

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Courtney L. Davis, (315) 651-6159, cld303@psu.edu; graduate student presentation

Robust methods for estimating abundance of wetland-breeding amphibian species such as mark-recapture are often resource-intensive. This limits our ability to study the processes that influence species abundance. Alternatively, more efficient sampling methods, such as indices based on visual encounter surveys (e.g., egg masses; VES), may be biased by variability in detection probabilities and species biology (e.g., # of egg masses per female). We combine data sources (i.e., VES and capture-mark-recapture) to provide an efficient technique for monitoring wetland-breeding amphibians. Our study focuses on understanding factors determining local abundance of Spotted Salamanders, *Ambystoma maculatum*, in Pennsylvania. We first estimated abundance for a subset of wetlands using single-season, capture-mark-recapture data and then verified egg mass counts collected from a wider network of wetlands as an unbiased index of abundance. We found a strong correlation between estimated adult abundance and estimated egg mass abundance with an estimated ratio of 1 egg mass per adult per breeding effort. We next determined the factors that best explained variation in estimated *A. maculatum* egg mass abundance and consequently, adult abundance among sites. Our ‘best-fit’ model included effects for wetland hydroperiod and quadratic effects of mean water temperature. We also report positive, but weak, association with two co-occurring amphibian species, Jefferson Salamanders, *A. jeffersonianum* and Wood Frogs, *Lithobates sylvaticus*. We demonstrate how combining sampling approaches can provide efficient abundance estimates in wetland ecosystems. In particular, positive co-occurrence among species indicates shared habitat preferences that may enable us to predict the presence of difficult-to-detect species using only VES.

Challenges of managing private forests in Pennsylvania

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Private forestlands are often the most susceptible to poor forest management practices, such as “high grading”, that prioritize removal of the healthiest, most valuable trees to maximize short-term gain, without consideration for long-term forest health. Studies have shown that this occurs when a landowner has a harvest completed without working with a professional forester. As a result, inventories of these sites show they can be less diverse, containing poorer quality habitat poorly suited to supporting a diversity of wildlife. The Appalachian Mountains Joint Venture, is working with several partners to promote sustainable forest management on private lands that will both maximize benefits to priority bird species and improve overall forest health and resilience.

Much of this work is in partnership with the Natural Resources Conservation Service, using their cost-share programs to provide technical and financial assistance to forest landowners to complete conservation actions on the ground. While the body of human dimensions research has aided us in our engagement with private landowners, a range of challenges beyond landowner motivation remain that affect the successful implementation of our private lands efforts in the Appalachians.

These include landowner inability to financially contribute to management in spite of a strong desire to see it accomplished, conflicting views about sustainable forest management (by both landowners and forest managers), and difficulties completing non-commercial harvests. This presentation will explore these issues and outline how our partners are adapting our outreach and implementation strategies to achieve our forest conservation goals.

Acoustic Survey of Bat Species of Concern at Lancaster County Conservancy Preserves

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Populations of little brown bats (*Myotis lucifugus*), Northern long-eared bats (*Myotis septentrionalis*), and Indiana bats (*Myotis sodalis*) have declined dramatically in PA due to disease; protection of these remnant bat colonies is of high conservation priority throughout North America. A preliminary acoustic survey was conducted fall 2017 for bat species within Lancaster County Conservancy (LCC) preserves using the Echo Meter Touch 2 PRO with auto-identification of species through its Kaleidoscope software. The LCC preserves surveyed were identified as near current or anticipated construction that could potentially disturb roosting bats: Climber’s Run, Kelly’s Run, Steinman Run, Trout Run, and Tuquan Glen. Recordings were analyzed by calls per hour per species and per preserve. Initial potential presence was revealed for the little brown, Northern long-eared, and Indiana bats at Kelly’s Run; Indiana bats at Trout Run; and little brown bats at Steinman Run. All five preserves also showed initial potential presence of other identified bat species of concern in PA. This preliminary survey developed protocol to be

used in spring 2018 with a group of volunteer and student citizen scientists conducting similar surveys at LCC preserves. Citizen science survey efforts will help in identifying the remaining populations of these bats so they can be protected and maintained. Survey results shared with local and state organizations will allow for more efficient netting efforts based on likelihood of species presence in certain areas. This procedure can also serve as protocol for other citizen science bat survey programs across the country and worldwide.

Space use of white-tailed deer neonates using micro-GPS units

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Contradictory findings fuel uncertainty about the relationship between the space use of ungulate neonates and their survival. While home range size and resource selection could be important to ungulate neonate survival, traditional very high frequency (VHF) radio-telemetry often cannot collect a sufficient number of locations to estimate a home range for neonates ≤ 4 weeks of age. Potentially undetected movements may result in an incorrect representation of neonate space use. Radiocollars that use the global positioning system (GPS) obtain more locations and reduce position error but size and weight restrictions render current GPS units unavailable to study movements of neonates of even large herbivores. We modified commercially available GPS units designed to track domestic house cats (*Felis catus*) and subsequently constructed home ranges for white-tailed deer (*Odocoileus virginianus*) neonates at 1-, 4-, and 4+ weeks of age. We present preliminary results that indicate neonate home range size increases with age. Additional research is needed to produce micro-GPS units capable of minimizing battery and software failures while maximizing GPS positions. Recent advances in micro-GPS units may soon render their widespread deployment on ungulate neonates. Our research highlights the need to use GPS when available to determine how space use influences survival and sources of mortality at different ages.

Coarse woody debris in riparian corridors of Central Pennsylvania: how abundance, characteristics, and dynamics vary with anthropogenic disturbance

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The wetlands and riparian corridors of North America's Mid-Atlantic Region (MAR) have been under constant pressure from anthropogenic settlement since before the arrival of Europeans on the continent. An understanding of the detrimental effects of landscape alteration has grown within the past few decades, along with a body of research on how to reverse these effects through restoration. Floodplains have been of particular interest, as they provide myriad valuable services, including water storage, soil enrichment, and wildlife habitat. Within the context of

floodplains, limited attention has been paid to coarse woody debris (CWD) and its role in the ecosystem. Historically, CWD has been removed from riparian corridors, but it is now understood to be a crucial element of ecosystem architecture. This project utilizes rapid field assessments of habitat quality, in conjunction with intensive surveys of debris, to determine how anthropogenic disturbance influences debris abundances and characteristics in floodplain systems. Work was completed in the central Pennsylvania portion of the MAR, an area that has received little attention in prior debris studies. Results demonstrate that the greatest quantities of debris are associated with sites experiencing the least amount of anthropogenic disturbance, and that the debris found at these sites shows greater diversity in size than debris found elsewhere. A moderately-robust mathematical relationship was established between debris counts and riparian forest basal areas, indicating that this measurement of habitat quality may be the best predictor of debris concentration. These findings have important implications for both ecological integrity and ecosystem service provisioning.

A Discussion of Proposed Amendments to the Endangered Species Act

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In 2017, the current presidential administration proposed and implemented a number of changes in federal environmental policy, including proposed changes to the Endangered Species Act (ESA). These changes reflect a major goal of the current administration; promote economic growth by minimizing regulatory uncertainty. In certain regions of the U.S., the ESA impacts local economic and infrastructure development. In response, the current administration has recommended several amendments to the ESA including reduction of lawsuits, a cap on species listings and more involvement of states in the listing and recovery process. Based on a review of federal register delisting documents for recovered species, we outlined the associated costs and benefits to the administration's proposed amendments to the ESA. The goal of our analysis was to identify strategies that can reduce conflict between species conservation and economic growth. Recommended strategies include expediting the listing process for unprotected at risk species to expedite future recovery potential, provide economic incentives to working private landowners who manage for federally listed species, and have states and federal agencies work more closely to establish agreements and assurances in managing at risk and federally protected species. These recommendations help establish scientifically based bipartisan efforts to reduce the need for federal listing and expedite species recovery under the ESA.

The use of acoustic monitoring to assess the effects of shelterwood harvest on bat activity

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As populations of several bat species continue to decline from White-nose Syndrome and other threats, it is increasingly important that natural resource managers understand how bat species respond to forest management in order to direct appropriate conservation efforts. The objective of this study, therefore, was to examine the effects of shelterwood harvest on bat activity at Fort Indiantown Gap, a military training site in south-central Pennsylvania. We used Pettersson D500x ultrasonic detectors to passively record bat echolocation call sequences within mixed-oak forest stands of 3 treatments: 1) first-stage shelterwood harvest; 2) unharvested forest; and 3) control. We predicted that species-specific activity levels would reflect differences in morphology and echolocation call design, with medium to large-bodied bat species responding more favorably to a reduction in forest structure than small-bodied species. We sampled bat activity for a minimum of 3 nights at 63 sites from 26 May – 27 August 2017. When possible, bat calls were identified to species or species groups using SonoBat 4.0.7 automated software and confirmed through manual-vetting. Our preliminary results showed a positive or negligible response by bats to shelterwood harvest, indicating that this silviculture practice may provide suitable habitat for foraging bats. We plan to replicate this study in summer 2018 to determine whether the benefits of shelterwood harvest persist across years.

Species distribution models and maps provide insights into seasonal distributions of migratory tree bats impacted by wind energy development in northeastern North America

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The geographic distributions of highly visible species, such as large mammals and migratory birds, are usually well known, but less is known about the distributions of cryptic or nocturnal species. Many species of bat are small, reclusive, and rarely observable during daytime. Species distribution models (SDMs) have been used to suggest sites with high potential for occurrence of rare or cryptic species. We are in the process of analyzing the seasonal distributions of migratory tree bats impacted by wind energy development in North America, as well as with other species of management concern. Here, we use hoary bats (*Lasiurus cinereus*) as a case study species using 2,753 occurrence records from North America. This is a species that roosts individually in trees, undergoes continental-scale migrations, and are occasionally encountered by humans. We analyzed and mapped the distributions of this species using 5 approaches to species distribution modeling: logistic regression, multivariate adaptive regression splines, boosted regression trees, random forest, and maximum entropy, and evaluated algorithm performance using a variety of SDM performance metrics. Seasonally-dynamic SDMs suggested that hoary bats winter in regions with relatively long growing seasons where temperatures are moderated by proximity to oceans, then move to the continental interior for summer. This case study using hoary bats demonstrates how species distribution models and maps can help generate insights into the seasonal distributions of bat species impacted by wind energy development, and by other human activities.

Bobwhite quail restoration efforts in Pennsylvania: beginning the journey to recovery

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Thomas Keller, (570) 380-0833, thkeller@pa.gov; professional presentation

The Northern Bobwhite Quail (*Colinus virginianus*) was commonly found in Pennsylvania as part of its northern range and considered both an important game bird as well as song bird enjoyed by many. With its continual decline throughout the years being punctuated in 2014 by a declaration of complete extirpation from the Commonwealth, steps were taken from the Pennsylvania Game Commissions *Northern Bobwhite Quail Management Plan* to begin restoration efforts of this lost native species. The initial step was to create a habitat model for the state to determine what existing suitable habitat remained. The second step was to locate large public landholders having at least 1,500 acres of suitable or potential habitat to be managed long-term specifically for quail. Following the National Bobwhite Conservation Initiative's *Coordinated Implementation Program* document, finding a site willing to complete and maintain intense habitat management as well as continued monitoring to measure results was of utmost importance. Throughout this process the PGC also began exploring translocation donor state possibilities. Once a suitable site was located and partnership formed, cover mapping took place to evaluate current habitat and future needs. Following this, a comprehensive management plan was written outlining the who, what, and where of creating and maintaining the focus area over the term of the agreement. Initial surveys have been completed and habitat work has begun on Pennsylvania's first Bobwhite Quail Focus Area located at Letterkenny Army Depot in Chambersburg. This project is ongoing.

Genetic assignment tests provide insight into the epidemiology of chronic wasting disease in Pennsylvania

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William L. Miller, (814) 826-4136, wlm159@psu.edu; graduate student presentation

Identifying the sources of ongoing and novel disease outbreaks is critical for understanding the geographic diffusion of epizootic diseases; however, this is difficult when there is no discernable difference between hosts originating from different sources. Genetic assignment procedures show great promise for assessing transmission dynamics in situations where it is otherwise impossible to differentiate between putative infection sources. Here, we use assignment tests to determine the source of chronic wasting disease (CWD) infections in white-tailed deer (*Odocoileus virginianus*) populations in Pennsylvania. Both natural dispersal and egression from farming operations represent potential sources of infection. A total of 432 samples from four free-ranging populations and 49 samples from five captive cervid facilities were used to create simulated reference clusters that represented the average allele frequencies of their respective populations. This novel methodology increases assignment power and minimizes bias when compared to

traditional genetic assignment techniques. Using these simulated reference clusters, we evaluated the origin of 41 CWD positive or suspect deer. Several cases showed a high probability of assignment to captive origin ($P \geq 0.80$). Indirect estimates of gene flow suggest that dispersal is also occurring among disease management areas, is ongoing, and leaves a lasting influence on host genetic structure. Continuing to evaluate the origins of CWD positive deer and assess the relative importance of infection sources will help in understanding the epidemiology of CWD while also benefiting disease management efforts in Pennsylvania.

Small Mammal Presence and Abundance within the Prairie at Jennings Environmental Education Center

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The relict prairie ecosystem at Jennings Environmental Education Center is unique in its flora and fauna. To further the understanding of this uncommon ecosystem within the Commonwealth, we live-trapped small mammals to document species presence and compare relative abundance in the prairie ecosystem and in the adjacent forest where an expansion of the prairie habitat has been proposed. Approximately 270m of transects were trapped in each of 4 prairie quadrants and in each of 2 sections of adjacent forest. Traps were set 15m apart with two traps set at each point; one box Sherman trap and one collapsible Sherman trap. Over 8 trap nights a total of 171 individuals were caught, consisting of six species and one sub-species. Based on Shannon's Diversity Index the prairie was approximately two times more diverse than the forest (Forest = 2.01, Prairie = 4.5). We also found that the rigid box traps captured animals at a higher rate than the collapsible traps ($P < 0.001$). Although parasitism rates were not a primary goal of this study, we also documented that botfly parasitism was greater in *Peromyscus* than in other rodents ($P = 0.002$). Species captured were *Peromyscus leucopus*, *Peromyscus maniculatus*, *Blarina brevicauda*, *Microtus pennsylvanicus*, *Zapus hudsonius*, *Napaeozapus insignis*, and the subspecies *Peromyscus maniculatus bairdii*. These results show that small mammal biodiversity is higher in the prairie and we expect prairie expansion to be beneficial in helping this unique ecosystem to prosper.

Effects of noise from shale gas compressors on songbird reproduction and behavior

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Natural gas extraction requires large compressor stations that emit loud, low-frequency noise that can travel hundreds of meters into otherwise undisturbed habitat. Previous studies have demonstrated that anthropogenic noise can cause birds to change their habitat use and experience reduced reproductive success. However, the causes of these effects have been largely untested. In this study, eighty nest boxes were established to attract eastern bluebirds (*Sialia sialis*) and tree swallows (*Tachycineta bicolor*). Chronic shale gas compressor noise was experimentally

introduced to half the boxes using speakers. Neither species demonstrated a preference for treatment type when choosing a nesting site. Eastern bluebirds in noise-exposed nest boxes had reduced incubation time ($p < 0.001$), reduced hatching success ($p = 0.04$), and smaller brood sizes ($p = 0.02$) but showed no differences in feeding rates, nestling body condition, or fledging rates. Tree swallows in noise-exposed boxes also had reduced hatching success ($p = 0.05$), but were otherwise unaffected. This study demonstrates that anthropogenic noise causes behavioral changes that can lead to reduced reproductive success even in species adapted to breeding near people. It also provides evidence that sound disturbance can act as an ecological trap, turning seemingly desirable habitat into an area where birds experience reduced fitness.

Surveillance for West Nile Virus in Ruffed Grouse Habitat – Pilot Project Year 1 Results and Management Implications

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West Nile Virus (WNV) is increasingly implicated in population declines of Ruffed Grouse (*Bonasa umbellus*) in Pennsylvania, however little is known about the WNV transmission cycle in the remote woodland habitat occupied by grouse. Nearly all mosquito surveillance efforts occur in urban, suburban and other peri-domestic environments for the purpose of monitoring risks to human health. Using human-focused surveillance efforts, therefore, does not provide information on the timing, vector(s), and prevalence of WNV in forested settings. The objectives of this pilot study were to identify potential vectors of WNV in grouse habitat and evaluate whether DEP surveillance data reflects WNV viral activity in woodlands. Mosquito surveillance was conducted in 8 sites on SGL 176 for 12 weeks from mid-June through mid-September. Paired traps (gravid + CO₂) were used in order to capture a wide array of mosquito species on each site. Larval surveillance was also used to identify important production sites for WNV vector species. More than 15,000 adult mosquitoes of 25 species were captured. The known WNV-vector *Culex restuans* made up 22% of the adult sample, and *C. restuans* samples tested positive for WNV beginning in mid-July. This data suggests that *C. restuans* is the predominant vector of WNV in woodland habitats and that information on distribution of this species may be useful in developing a management response to the threat of WNV for ruffed grouse and other woodland birds.

Abstracts

Posters

(listed alphabetically by last name of presenter--italicized)

Skeletochronology of the Eastern Hellbender (*Cryptobranchus alleganiensis*): age structure and management implications for Pennsylvania's state amphibian

Taylor Braunagel and Kurt Regester, Department of Biology and Geosciences, Clarion University, Clarion, PA 16214

Taylor Braunagel, (814) 393-1636, T.M.Braunagel@eagle.clarion.edu; student poster

Population demographics are a foundation of conservation and understanding these dynamics yields information of a population's response to social, economic, and environmental changes. Attempts to slow amphibian declines have increased around the world but a lack of detailed demographic information on many populations has hindered long-term management plans for many species. Age classes and growth rates have been used to study the biology of amphibians through skeletochronology. Skeletochronological assessment involves the analysis of annual growth rings in bones, or lines of arrested growth (LAG). In this study, we quantified LAGs in phalanges from ~45 Eastern Hellbenders (*Cryptobranchus alleganiensis*) representing four populations in western Pennsylvania. Because existing age classes for hellbenders are based on total length and body size is not a reliable indicator of age or sexual maturity, most populations typically appear skewed towards an adult age classes. However, because habitats vary in resource availability and competition, length is not an accurate indicator of age. Our baseline data reveal a more varied age structure in hellbender populations than previously known. Skeletochronology, as a complimentary technique to field-based estimates of demography, is a valuable technique in amphibian management and conservation.

Northeast Regional Wildlife Action Plan Opportunities: Integrating Species, Habitats, and Threats to Identify Actions

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The first revision of State Wildlife Action Plans (SWAPs) marks a decade of implementation, learning and updates since the original 2005 SWAPs. These comprehensive strategic planning documents have served State Fish and Wildlife Agencies and their partners by guiding the conservation of priority species of greatest conservation need and their key habitats over the last decade. What do the northeast SWAPs tell us collectively are the key priorities that will guide collaborative conservation for the next decade? In this poster, we used the Northeast SWAP Database to explore links between Regional Species of Greatest Conservation Need (RSGCN), key habitats for these species, and widespread and severe threats acting in these habitats on these

species to discover regional conservation actions. These results have been reviewed by the Northeast Fish and Wildlife Diversity Technical Committee and the Northeast Association of Fish and Wildlife Agencies. Visit the poster to learn about shared threats and offer your ideas for protecting species of greatest conservation need collaboratively throughout our region.

An Index of Biotic Integrity for the Maiden Creek Watershed using Fish Communities

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Garrett Herigan, 717-829-3429, Gheri670@live.kutztown.edu student poster

An Index of Biotic Integrity (IBI) is a means of quantifying an ecosystem's ability to support a balanced assemblage of organisms comparable to the species composition and diversity of the natural state in an area. An IBI contains a number of metrics covering species composition, abundance, and trophic organization. These metrics produce a value by comparing current conditions to historical data and this value corresponds to a score of biological integrity for a system. Fish are often used as the focal species when developing an IBI because they are relatively quick and easy to sample, as well as accurately identified in the field. The objective of this study was to develop a fish IBI to provide an initial assessment of water quality at two creeks, Saucony and Mill, which are part of the Maiden Creek Watershed. Fish were sampled using a Smith-Root Backpack Electro-fishing unit following a three-pass electro-fishing technique. A total of 197 fishes were captured and identified from the two creeks, 85 individuals from Saucony and 112 from Mill. Both creeks had similar species richness values ($S = 11$ and 10 for Saucony and Mill Creek, respectively), but were dominated by different species; Saucony Creek was dominated by White Suckers (*Catostomus commersoni*) and Cutlips Minnow (*Exoglossum maxillingua*), while Mill Creek was dominated by Blacknose Dace (*Rhinichthys aratulus*). The IBI scores produced were 28 for Saucony Creek and 26 for Mill Creek, which corresponds to "fair" water quality rating, which indicates that intolerant species are largely absent and the community is less balanced than in historical samples. These results suggest there may be disturbances negatively affecting these ecosystems, and further studies could help clarify potential sources.

Pennsylvania citizen scientists as a resource for amphibian pathogen surveillance

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Worldwide amphibian populations are in decline due to pathogens identified as chytrid fungus, *Batrachochytrium dendrobatidis*/*Batrachochytrium salamandrivorans* (*Bd/BSal*), and ranavirus (RV). Unfortunately, little is known about the geographic and taxonomic distribution of these pathogens in Pennsylvania amphibians. Our project was designed to provide a baseline distribution of pathogens in a common focal species. Eastern Newts (*Notophthalmus viridescens*) are confirmed asymptomatic carriers of chytrid fungus and ranavirus. As common inhabitants of wetlands and ponds, they may pose a threat as vectors for more vulnerable species. This project

has twofold importance. One is to increase general public awareness of conservation issues, provide wildlife education, and promote hands-on experiences in wilderness inquiry. Secondly, it aims to assess pathogen infection threats to fauna within Pennsylvania. The Pennsylvania Amphibian and Reptile Survey (PARS) is project comprised of volunteer citizen scientists ranging from amateur outdoorsman to professional researchers. They have offered their assistance in sampling newts statewide. Kits are distributed to trained volunteers to collect samples. Volunteers then present their samples to Clarion University for analysis. After processing, PCR or qPCR are performed to ascertain pathogen prevalence. Preliminary results confirm the statewide presence of one (52% Bd, 4% RV) or both pathogens (2%) in newts. Infected newts did not show a significant difference in scaled mass; infected animals cannot be identified merely by physical appearance. With continued data collection, we hope to better understand possible modes of transmission.

Assessing the effect of hydroperiod modification on wetland energy flow and breeding success of vernal pool specialists

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Wetland loss is a global phenomenon, affecting the persistence of vernal pool specialists both locally and worldwide. Included in this habitat loss is the degradation and alteration of vernal pools, which provide breeding habitat for mole salamanders (*Ambystoma*), wood frogs (*Lithobates sylvaticus*), and other amphibians, and aquatic invertebrates adapted for life in temporary waters. When these ephemeral wetlands are lost or altered, consequent restoration efforts often rely on pool creation or alteration, including hydroperiod modification, to restore proper ecosystem function and maintain local biodiversity. The objective of this study was to assess the effects of hydroperiod modification on wetland energy flow, in an effort to improve breeding success of local declining salamander populations. Our study was primarily focused on the Jefferson Salamander (*Ambystoma jeffersonianum*), the Spotted Salamander (*Ambystoma maculatum*), and the Four-Toed Salamander (*Hemidactylium scutatum*), all bi-phasic vernal pool specialists. Since spring 2017, two local permanent wetlands on SGL 63 in Clarion County, have been systematically sampled for larval amphibians, fish, coarse woody debris (CWD), organic debris (OD), macroinvertebrates, zooplankton, and periphyton using both benthic drop can sampling and seining. Baseline data for the first year of the study (2017), prior to wetland modification, indicate differences between wetlands in carbon storage components and major pathways of energy flow, particularly for detritus components.

Serological survey of canine influenza virus subtypes H3N8 and H3N2 in free-ranging canids from 24 counties in Pennsylvania, 2017

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Influenza A virus is a pathogen of global importance. Although carnivores are susceptible to spillover infection and intra-specific transmission of several influenza virus subtypes, there are few, sporadic reports of influenza viruses in free-ranging carnivores. Canine influenza virus (CIV) subtypes H3N8 and H3N2 are enzootic among domestic dog populations in the northeastern United States. Coyotes and foxes are generalist mesocarnivores that exploit anthropogenic and peri-urban habitats creating a wide interface with domestic dogs and high potential for transmission of infectious disease. To investigate the potential exposure of free-ranging canids to CIV in Pennsylvania, plasma samples were obtained from freshly killed coyotes (*Canis latrans*, $n=67$), grey fox (*Urocyon cinereoargenteus*, $n=8$), and red fox (*Vulpes vulpes*, $n=5$) from 24 counties in Pennsylvania harvested during the January-February 2017 hunting season. Hemagglutination inhibition antibody titers against subtypes H3N2 and H3N8 were measured using assays validated for domestic dogs. All titers were <8 , inconsistent with exposure and immune response to CIV. Results suggest that CIV is not endemic in coyote and fox populations in PA or that prevalence is too low to be detected by the limited sample size. This is the first investigation of CIV spillover to free-ranging carnivores in PA. As this emerging infectious disease becomes more prevalent in domestic carnivore populations, surveillance of free-ranging carnivores should be more strongly considered.

A Success Story: Utilizing A Wetland Restoration Project to Facilitate Amphibian Research

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The survival of many Pennsylvania amphibian species depends on the presence of viable pond habitat for successful breeding. Unfortunately, in 2007 when a population of local amphibians returned to their breeding site (near a sewage treatment plant in Bell Acres, PA) they found it had been destroyed. Having no other body of water close by, the animals found their way into the sewage treatment tanks and many perished. Since then, conservation efforts have been made by numerous community partners to restore the habitat by creating ephemeral and perennial ponds which are now used for scientific research and education. Studies include: 1) annual Jefferson Salamander (*Ambystoma jeffersonianum*) mark-recapture studies using pit traps; 2) directional migration/habitat assessments using a drone; 3) amphibian pathogen testing via swabbing/tissue sampling. Mark-recapture studies have yielded a high number of recaptured individuals (approx. 35%) and indicate that the population was severely damaged during the eight-year absence of a significant breeding habitat. Directional studies show that the amphibians are approaching primarily from the southwest bordering an adjacent tract of undeveloped parkland (1200 acres). As a result, recent efforts have been made to establish a conservation easement protecting this migration corridor in perpetuity. Pathogen testing on 5 amphibian species ($n=16$) has revealed no positive results for the presence of either *Chytrid* fungus (B.d.) or *Ranavirus*. This restoration continues to be a stellar model for how community and industry can come together to solve environmental issues and it will serve as a working outdoor laboratory for years to come.

The Effectiveness of Using Feeding Stations to Assist with Winter Passerine Mist Net Trapping

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Reduced food supplies have a greater impact on short distance, temperate migrants than on tropical migrants because temperatures well below thermal neutral zones increase the energy required for thermal regulation. For some species, a constant and easily accessible food source can decrease the chance of winter mortality and nutritional stress. Also, movements, flocking, and site fidelity may differ among areas where food is regularly supplied by humans compared with sites with no supplemental feeding. We hypothesized that using feeders would increase the likelihood of trapping winter passerines within our mist nets. We observed the feeding behavior of five common Pennsylvania winter species at a feeding station. We placed a mist net next to the feeding station and placed seven other nets randomly throughout the site, without feeders nearby. The data collected in this study supports the hypothesis. We found that baiting the mist nets with feeders does indeed increase the success rate of winter mist net trapping of all species combined. The mist net with the feeders caught approximately 1200% more birds per 100 net-hours than any of the other nets, suggesting that the increased cost and effort associated with maintaining a feeding station in most situations is worth the significantly increased capture rate. Although we only observed a few species at the feeders, these methods could be applied to any winter songbirds that readily visit feeders.

The influence of habitat type and structure on sites used by wintering red-tailed hawks, American kestrels, and northern harriers in central Pennsylvania

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It has become increasingly important to take into account data collected from multiple seasons within the annual cycle of migrating farmland raptors as breeding and wintering distributions are affected by, and respond to, climate change and land use changes. Three species of diurnal migratory farmland raptors wintering in Pennsylvania, the northern harrier (*Circus cyaneus*), American kestrel (*Falco sparverius*), and red-tailed hawk (*Buteo jamaicensis*), were surveyed within the Pennsylvania counties of Union, Snyder, and Montour during the months of November through March. Four routes >20 mi in length were surveyed seven times each along a road transect. The survey routes were determined by using recorded sightings of both wintering and nesting raptors obtained from Hawk Mountain Sanctuary's Farmland Raptor Project database and were designed to contain primarily farmland habitat. The type and composition of wintering grounds being utilized by each sighted individual was recorded and compared to reveal trends in

wintering ground choice. Common land types included riparian, wetlands, fallow land, legumes, hay, winter wheat, corn, pasture, and old field. We expect to find a wintering ground preference for farmed or open land that is not being used heavily for agro-pastoralism or being planted with row crops such as corn and soy bean. We have also observed a higher frequency of wintering raptors in habitat that contains pasture or old field. As land fulfilling these criteria has been in a trending decline, this could help to explain the decline in farmland raptor species.

Vehicle Mounting the Coda Netlauncher® to Capture Gulls at a Landfill

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Kyle Van Why, 717-236-9451, kyle.r.vanwhy@aphis.usda.gov, professional poster

Using net launchers such as rocket or cannon nets are a common tool used to capture avian species. These tools often require environments where equipment can be staged and birds acclimated to the site to increase capture efficiency. We conducted gull capture at a landfill in Berks County, Pennsylvania where birds were overly abundant, but the terrain and environment made the use of traditional cannon net designs impractical. To accomplish this task a Coda Netlauncher® (.308 blank cartridge powered launcher deploying a 7.6 x 9.1 m net) was mounted to a full sized pick-up truck to create a mobile capture system. Because this device was mobile it could be moved and launched where birds congregated while a vehicle acted as camouflage, mimicking daily operations at the facility increasing capture success. This also allowed deployment in areas where risk of damage by traffic and landfill operational activities was minimal. In six capture days between July and August 2011, 289 gulls representing four species were captured in 11 attempts. In February and March 2017 the system was redeployed, in 3 days a total of 137 gulls representing two species were captured in 12 attempts. Capture rates ranged from 7-42 birds per attempt and were variable by season and target species. This adaptation of a commercially available capture tool significantly increased the ability to capture this abundant species in this complicated work environment where traditional methods could not have been used.