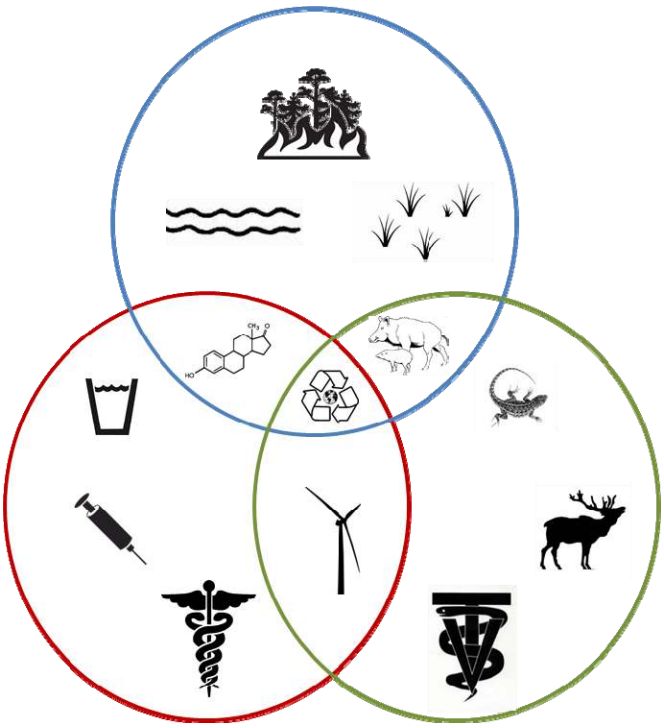
Pennsylvania Chapter

of The Wildlife Society

2015 Annual Conference & Workshop



Wildlife Diseases: Examining Impacts for Pennsylvania and Beyond

March 20 – 21, 2015
Ramada Inn, State College

Raffle and Auction Donations

The following individuals, businesses, and organizations donated items for the fundraising raffle this year. Information on donors is located at each raffle bucket. Please consider patronizing these businesses and thank those individuals and organizations for their commitment to improving the profession of wildlife management in Pennsylvania. Thanks again to all the donors.

Burris Optics

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Pennsylvania Wild Resource Conservation Fund

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PA TWS Chapter Members

Conference At-a-Glance**

Friday, March 20

10:00 am–4:00 pm	**Workshop, Scotia Range, SGL 176**: Deer Necropsy Workshop Meet at conference center lobby. Transportation provided. Depart Ramada 9:30 am. Boxed lunches will be provided.
12:30 pm	Boxed Lunch provided with paid workshop registration. Lunch will be after a morning lecture.
5 pm	**Poster setup** (poster session 5–6:30 p.m. Saturday)
5 – 10 pm	**Student-Professional Mixer, Conference Center Lobby**

Saturday, March 21

Breakfast	Coffee, pastries, and fruit
8 am – 12 pm	**Plenary Session, Ballroom A:** *Wildlife Diseases: Examining Pennsylvania and Beyond* PLENARY SPEAKERS: Kurt Regester, Clarion University "Diseases of Amphibians and Reptiles in Pennsylvania: Status and Directions for Research" Rich Chipman, USDA/APHIS/Wildlife Services "Tackling Rabies at its Source. A One-Health Approach in Action." Bryan Richards, USGS/National Wildlife Health Center "CWD in Pennsylvania: Now What?" Mike Scafini, Pennsylvania Game Commission "White-nose Syndrome in Pennsylvania: Current Status of our Bat Populations and Latest Research Initiatives"
8 – 10 am	**Photo Contest Registration, Conference Center Registration Desk**
12 – 1 pm	**Lunch, Ballroom B** (May be purchased until March 9)
12 – 1 pm	**Wildlife Leadership Academy Poster Session, Conference Center Lobby**

1 – 4:00 pm	**Concurrent Paper Sessions: Ballroom, Forum Room**
10 am – 5 pm	**Photo Contest Display and Voting, Conference Center Lobby**
4:15 – 5:15 pm	**Member & Business Meeting of State Wildlife Chapter, Forum Room** (Board Members required, all others welcome)
5 – 6:30 pm	**Poster Session, Conference Center Lobby** Presenters should be present and prepared to answer questions.
6:30 pm	**Grand Banquet, Ballroom:** (Banquet dinner purchased with registration until March 9)
	Banquet Speaker: Dr. Val Beasley Penn State Department of Veterinary & Biomedical Sciences

**Schedule subject to change.

Wildlife Workshop

Friday, March 20, 9:30am – 4:30pm

Deer Necropsy

Time	Activity
9:30am	Meet at Conference Center lobby (entrance to right of main Ramada entrance). Prepare for prompt 9:30am departure to Scotia Range, SGL 176. Transportation provided.
9:30am – 10:00am	**TRAVEL TO SCOTIA, SGL 176.**
10:00am – 12:00pm	Didactic Lecture: Dr. Justin Brown, Ph.D., DVM, Pennsylvania Game Commission Veterinarian
12:00pm – 1:00pm	**LUNCH at SGL 176 (provided)**
1:00 pm – 4:00pm	**Hands-on practical period during which participants will have an opportunity to necropsy a white-tailed deer**
4:00pm – 4:30	**RETURN TRAVEL TO RAMADA**

Plenary Schedule

Saturday, March 21, 8:30am – 11:50am
Ballroom A

Wildlife Diseases: Examining Pennsylvania and Beyond

Moderator: Christina Voorhees

Time	Title/Topic	Presenter	Affiliation
8:30am – 8:40am	Opening Remarks	Christina Voorhees	PA TWS
8:40am – 8:50am	TWS's Commitment to Supporting Chapters and Future Initiatives	Ed Thompson	The Wildlife Society
8:50am – 9:25am	Diseases of Amphibians and Reptiles in Pennsylvania: Status and Directions for Research	Kurt Regester	Clarion University
9:25am – 10:00am	Tackling Rabies at its Source. A One-Health Approach in Action	Rich Chipman	USDA/APHIS/ Wildlife Services
10:00am – 10:15am	**BREAK**		
10:15am – 10:40am	Chronic Wasting Disease in Pennsylvania: Now What?	Bryan Richards	USGS/National Wildlife Health Center
10:40am – 11:15am	White-nose Syndrome in Pennsylvania: Current Status of our Bat Populations and Latest Research Initiatives	Mike Scafini	PA Game Commission
11:15am – 11:50am	Moderated Discussion		

The Cheat Sheet*

Time	Session 1: Ballroom A	Session 2: Forum Rm
1:00pm-1:20pm	K. Hydock— Brodifacoum intoxication of a captive Andean condor	G. Stauffer— Distribution of songbird point-counts observations in PA
1:20pm-1:40pm	J. Skebo— Influence of community interactions on chytrid fungus dynamics	C. Goguen— Post-fledging survival and movements of Veery
1:40pm-2:00pm	W. Miller— Landscape genetics of white-tailed deer in PA	A. Haines— Research needs of wildlife law enforcement
2:00pm-2:20pm	E. Carollo— Is there a risk for disease transmission between captive cervids and wild deer?	K. Van Why— Pennsylvania's feral swine: piecing together the puzzle
2:20pm-2:40pm	J. Julian— Infection rates of *Ranavirus* and *Batrachochytrium dendrobatidis* in frogs	S. Stoleson— Effects of geolocators on parameters of male cerulean warblers
2:40pm-3:00pm		
3:00pm-3:20pm	K. Gipe— Prevalence of Ranavirus in wood frog in the northeast U.S.	S. Mueller— Foraging habits of *Etheostoma caeruleum*
3:20pm-3:40pm	J. Brown— Identification of lymphoproliferative disease virus in wild turkeys	W. Miller— The importance of connectivity for dispersal among salamander populations
3:40pm-4:00pm	K. Van Why— Wild canids as sentinels for zoonotic disease in Pennsylvania	W. Vreeland— Dispersal timing, distances, and rates of Pennsylvania black bear

*Paper titles have been converted to short-hand only to accommodate the side-by-side comparison chart.

Concurrent Session 1

Saturday, March 21, 1:00 – 4:00pm
Ballroom A

Moderator: W. David Walter

Time	Title	Presenter	Affiliation
1:00pm– 1:20pm	Brodifacoum intoxication of a captive Andean condor	Kira Hydock†	Penn State University
1:20pm – 1:40pm	Influence of community interactions on the dynamics of chytrid fungus	Jerrod Skebo†	Penn State University
1:40pm – 2:00pm	Landscape genetics of white-tailed deer to assess population structure for surveillance of chronic wasting disease	Will Miller†	Penn State University
2:00pm – 2:20pm	Is there a risk for disease transmission between captive cervids and wild deer in Pennsylvania?	Emily Carollo†	Penn State University
2:20pm – 2:40pm	Infection rates of *Ranavirus* and *Batrachochytrium dendrobatidis* in green frog populations of Pennsylvania	James Julian	Penn State University-Altoona
2:40pm – 3:00pm	**BREAK**		
3:00pm – 3:20pm	Prevalence of Ranavirus in wood frog (*Lithobates sylvaticus*) breeding ponds in a 5-state region of the northeastern U.S.	Katharine Gipe	PA Fish & Boat Commission
3:20pm – 3:40pm	Identification of lymphoproliferative disease virus in wild turkeys (*Meleagris gallopavo*) in North America	Justin Brown	PA Game Commission
3:40pm – 4:00pm	Wild canids as sentinels for zoonotic disease, *Toxoplama gondii* and *Leptospira sp.* infections in coyotes, red fox, and gray fox from Pennsylvania	Kyle Van Why	USDA/APHIS/WS

† Indicates student presentation

Concurrent Session 2

Saturday, March 21, 1:00 – 4:00pm
Forum Room

Moderator: Emily Boyd

Time	Title	Presenter	Affiliation
1:00pm– 1:20pm	Distribution of songbird point-count observations on state-owned and private land in Pennsylvania	Glen Stauffer	Penn State University
1:20pm – 1:40pm	Post-fledging survival and movements of the Veery in Nescopeck State Park, northeastern Pennsylvania.	Christopher Goguen	Penn State University - Hazelton
1:40pm – 2:00pm	What are the research needs of wildlife law enforcement?	Aaron Haines	Millersville University
2:00pm – 2:20pm	Pennsylvania's feral swine: piecing together the puzzle.	Kyle Van Why	USDA/APHIS/WS
2:20pm – 2:40pm	Effects of geolocators on annual return rates, nestling provisioning, and reproductive success of male cerulean warblers	Scott Stoleson	USFS Northern Research Station
2:40pm – 3:00pm	**BREAK**		
3:00pm – 3:20pm	Foraging habits of *Etheostoma caeruleum* to determine diet variability	Sara Mueller†	Penn State University
3:20pm – 3:40pm	The importance of terrestrial dispersal for connectivity among headwater salamander populations	Will Miller†	Penn State University
3:40pm – 4:00pm	Dispersal timing, distances, and rates of Pennsylvania black bear	Wendy Vreeland†	Penn State University

† Indicates student presentation

Poster Session

Saturday, March 21, 5:00 – 6:00pm
Conference Center Lobby

Title	Presenter	Affiliation
Through the mouths of birds: A survey of West Nile virus in Pennsylvania	Corinne Bozich/ Corey Coleman†	University of Pittsburgh-Johnstown
Biomass and nutrient standing stocks associated with populations of the Eastern Red-backed salamander (*Plethodon cinereus)* on State Game Land 69, Crawford County, Pennsylvania	Chelsea Buell†	Clarion University
Morphometric analysis of Pennsylvania coyotes	Avery Corondi†	Delaware Valley College
Powdermill Nature Reserve camera trapping survey for bobcat (*Lynx rufus*)	Matthew Jevit†	Duquesne University
Study of regional PA tick species utilizing collections from PA Game Commission CWD hunter check stations: A preliminary study	Frederic Brenner	Grove City College
Biomass of Eastern Hellbender (*Cryptobranchus alleganiensis*) populations in western Pennsylvania	Devin Taydus†	Clarion University
Comparison of cytology and histopathology for diagnosis of avian pox in wild turkeys	Kira Hydock†	Penn State University

† Indicates student poster

Banquet Presentation

Saturday, March 23, 6:30pm
Ballroom

One Health & Wildlife Management: Shared Mission, Shared Needs, Shared Opportunities

Val Beasley

Penn State Department of Veterinary & Biomedical Sciences

Human, animal, plant, and ecosystem health are inseparable: in that sense, there is *only* One Health. In Pennsylvania and around the world, humans, domestic animals, wildlife, and plants concurrently suffer impacts from ongoing societal drivers that culminate in invasions of non-native and opportunistic species, emerging and re-emerging infections, direct and indirect impacts of chemical contaminants, malnutrition, overpopulation in some species, and declines and extinctions in others. Economic and ethical arguments as well as education can be used to garner support for better surveillance and management of wildlife populations, especially at the interface with domestic animals and human beings. For example, in 2012, the World Bank estimated that losses from a single, severe, global, influenza pandemic could include 71 million human deaths and $3 trillion. Aims of wildlife managers should include obtaining broader support and financial investment to enable movement toward recovering and increasingly disease-resilient landscapes and water bodies. Thus, management actions are needed that simultaneously benefit economic wellbeing as well as the health of ecosystems, wild and cultivated plants, wildlife, domestic animals, and humans. A future One Health program should unify the efficiency of public health, the depth of human medicine and plant pathology, the breadth of veterinary medicine, the expanse of ecology and wildlife biology, the practicality of economics and wildlife management, and the wisdom of constructive dialog. Nested, site-specific data on humans, domestic animals, wildlife, plants, and ecosystems are needed to underpin adaptive management to efficiently improve One Health.

Val Beasley

Penn State Department of Veterinary & Biomedical Sciences

Val Beasley earned a DVM degree at Purdue University. He was a small-animal practitioner for six years. He then completed a residency and PhD in toxicology, and stayed on as a faculty member of the College of Veterinary Medicine of the University of Illinois. There, he was responsible for teaching the required course in veterinary toxicology and a range of electives in pharmacology and toxicology, helping start the world's first animal poison control center, expanding or starting research projects or programs in mycotoxins, cyanobacterial toxins, pesticides, heavy metals, and declining amphibians; establishing the Envirovet Program in Wildlife and Ecosystem Health, hosting 16 of its Summer Institute sessions; and serving as Chair of Pharmacology and Toxicology as well as Assistant Head of the Department of Comparative Biosciences. In September of 2014, he began a new position as Professor and Head of Veterinary and Biomedical Sciences in the College of Agricultural Sciences at The Pennsylvania State University.

Plenary Speakers

Diseases of amphibians and reptiles in Pennsylvania: status and directions for research

Kurt Regester, Clarion University

Kurt Regester is a professor of biology at Clarion University and instructor at University of Pittsburgh's Pymatuning Laboratory of Ecology. He teaches courses on Zoology, Wildlife Ecology, Population Biology, Animal Behavior, and Ornithology and a field-based course on the Ecology of Amphibians and Reptiles. Kurt conducts research on the ecology of amphibians and reptiles, with particular interests in disease ecology and the roles of salamanders in terrestrial and aquatic food webs. Kurt serves as associate editor for the journal Herpetological Conservation and Biology and is affiliated with the Society for the Study of Amphibians and Reptiles, The Wildlife Society, and the Seneca Rocks Chapter of the Audubon Society. He serves as advisor for the Clarion University Chapter of TWS.

Tackling rabies at its source. A One-Health approach in action

Richard Chipman, United States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services, Concord, NH

Richard Chipman is a Certified Wildlife Biologist living in Concord, New Hampshire. He has worked for USDA, Animal and Plant Health Inspection Service (APHIS), Wildlife Services (WS) since 1991 including 7 years as a Wildlife Biologist in Vermont, 10 years as the New York State Director, 6 years as the Assistant National Rabies Management Coordinator and since June 2012 has served as the National Rabies Management Coordinator. He has also worked as the acting WS West Nile Virus Coordinator. Prior to that, he worked for state wildlife agencies and universities on nongame and endangered wildlife in Vermont, Maine, Kansas and Costa Rica.
Rich received his BA in Biology and BS in Wildlife Management from the University of Maine, his MS in Wildlife Biology from the University of Vermont and a MBA from the University at Albany – SUNY.

CWD in Pennsylvania: now what?

Bryan Richards, USGS/National Wildlife Health Center

Bryan Richards is the Emerging Disease Coordinator at the US Geological Survey's National Wildlife Health Center (NWHC) in Madison, Wisconsin. A Wisconsin native, Richards completed his undergraduate work in Wildlife Ecology at UW-Madison, and graduate work at Southern Illinois University. After 11 years with Texas Parks and Wildlife Department, Richards returned to Wisconsin in 2004 to assist with Chronic Wasting Disease (CWD) efforts at NWHC. Over the past decade Richards has worked extensively with states, tribes, federal and international agencies, academia and non-governmental entities on CWD research and management activities.

More recent activities include providing wildlife disease training to tribal wildlife managers, and biosurveillance and emergency management roles with the Departments of Interior and Homeland Security.

White-nose syndrome in Pennsylvania: current status of our bat populations and latest research initiatives

Mike Scafini, Endangered Mammal Specialist, Pennsylvania Game Commission

Mike has worked with the Pennsylvania Game Commission for the past three years. He is currently the Endangered Mammal Specialist with the Wildlife Diversity Program. The focus of his position is on bat management, including hibernacula and maternity surveys, management, and protection. He leads annual surveys of caves and mines statewide for hibernating bats and summer mist-netting efforts, coordinating this field work throughout the state. Prior to joining the agency, he was employed in a number of different capacities from the state to federal level, where he has worked with bats in varying degrees from hibernacula, mist-net, and acoustic surveys to making voucher specimens and giving public bat presentations. He has a B.S. in Wildlife Conservation from the University of Delaware and a M.S. in Biology from East Stroudsburg University, where his thesis focused on post-construction mortality surveys at a wind farm in PA with an analysis of the effects of weather.

Abstracts

Paper Presentations

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

Identification of lymphoproliferative disease virus in wild turkeys (*Meleagris gallopavo*) in North America

Justin Brown, Pennsylvania Game Commission, Animal Diagnostic Laboratory, Wiley Lane, Pennsylvania State University, University Park, PA 16802; Jesse Thomas and Michael Yabsley, Southeastern Cooperative Wildlife Disease Study, Department of Population Health, 589 D.W. Brooks Drive, College of Veterinary Medicine, University of Georgia, Athens, GA 30602; Edward Holmes, Marie Bashir Institute for Infectious Diseases and Biosecurity, Charles Perkins Centre, School of Biological Sciences and Sydney Medical School, University of Sydney, NSW 2006, Australia; and Andrew Allison, Baker Institute for Animal Health, Department of Microbiology and Immunology, College of Veterinary Medicine, Cornell University, Ithaca, NY 14853.

Justin Brown, (814) 863-8370, judbrow@pa.gov; professional presentation

Historically, viral-induced neoplasia in wild turkeys has been rare and most often associated with reticuloendotheliosis virus. In 2009, lymphoproliferative disease virus (LPDV), an uncommon source of lymphotumoral disease in domestic turkeys in Europe and Israel, was first identified by polymerase chain reaction (PCR) and sequence confirmation in a wild turkey (*Meleagris gallopavo*) from Arkansas with lymphoid tumors in multiple organs. Subsequent surveillance identified LPDV in a total of 41 wild turkey diagnostic cases from 18 states in the eastern United States of America (USA). Based on gross and microscopic lesions, lymphoid neoplasia was determined to be the cause of morbidity or mortality in a minority (15%) of these LPDV positive wild turkeys. In order to better understand LPDV in North American wild turkeys, we then surveyed 1,164 reportedly asymptomatic hunter-harvested wild turkeys from 17 states in the eastern USA for the presence of LPDV using PCR. In total, 564/1,164 (47%) turkeys were positive for LPDV. Wild turkeys from each state had a relatively high prevalence of infection, although statewide prevalence varied from 26 to 83%. Phylogenetic analysis revealed two major clades of LPDV, although one was at a low frequency suggesting restricted transmission. Collectively, these results indicate that LPDV infection is common and widespread in wild turkey populations throughout the eastern USA; however, viral-induced neoplasia is rare among LPDV-positive birds. Although LPDV-induced neoplasia is uncommon in adult wild turkeys, the full impacts of this newly identified virus on wild turkey populations are not completely defined.

Is there a risk for disease transmission between captive cervids and wild deer in Pennsylvania?

Emily M. Carollo, Pennsylvania Cooperative Fish and Wildlife Research Unit, 433 Forest Resources Building, The Pennsylvania State University, University Park, PA 16802; W. David Walter, U.S. Geological Survey, Pennsylvania Cooperative Fish and Wildlife Research Unit, 403

Forest Resources Building, The Pennsylvania State University, University Park, PA 16802; and Justin Brown, Pennsylvania Game Commission, Animal Diagnostic Laboratory, Wiley Ln., The Pennsylvania State University, University Park, PA 16802

Emily M. Carollo, (814) 865-2130, emc6xp@virginia.edu; student presentation

Captive cervid facilities are common in some states in the U.S. with Pennsylvania having over 1000 captive deer facilities accounting for over 25,000 individual deer. Laws and regulations regarding captive facilities are usually minimal, but recently have become more common and enforced due to increases of disease in captive cervids. With how likely disease can occur in captive facilities because of aggregation and confinement over prolonged periods, and how easily disease can be spread from captive facilities to wild deer populations, a more complete understanding of captive facilities will aid wildlife and agricultural managers in understanding this dynamic. We examined the landscape characteristics of captive cervid facilities in Pennsylvania to understand where wild cervid populations may be most at risk for disease transmission from captive cervids or vice versa. We solicited and received land parcel layers, location of captive facilities, and environmental predictors (e.g., state game lands, forest cover) that were available at the county level in Geographic Information System format from 48 counties in Pennsylvania. We were able to examine landscape characteristics for 920 captive cervid facilities that were considered "active" operations. Preliminary results indicate that captive cervid facilities are located within low-elevation topography at the edge of the agriculture-forest interface. Our results could assist agencies with identifying areas at high risk for disease transmission between captive and wild deer to more efficiently sample the over 1,000 captive operations and one million wild deer in Pennsylvania.

Prevalence of Ranavirus in wood frog (*Lithobates sylvaticus*) breeding ponds in a 5-state region of the northeastern U.S.

Scott A. Smith, Maryland DNR-Wildlife & Heritage Service; Kirsten J. Monsen-Collar, Montclair State University; Holly S. Niederriter, Delaware Division of Fish & Wildlife; Mackenzie L. Hall, Conserve Wildlife Foundation; Katharine D. Gipe, PA Fish and Boat Commission, 450 Robinson Lane, Bellefonte, PA 16823; Chris Urban, PA Fish and Boat Comm; Kimberly Terrell, Smithsonian Conservation Biology Institute; Craig A. Patterson, Maryland DNR-Wildlife & Heritage Service; D. Earl Green, USGS National Wildlife Health Center

Katharine D. Gipe, (814) 359-5186, c-kgipe@pa.gov; professional presentation

Ranavirus is an emerging infectious disease of fish, amphibians and reptiles. A 2-year study funded by a NEAFWA RCN grant was conducted in DE, MD, NJ, PA and VA; the largest geographic area ever surveyed for this disease. A random sample of 30 wood frog breeding ponds were chosen in each state, with a minimum distance between ponds of >3 km. Only ponds with ≥5 wood frog egg masses were included in the study, and were monitored through metamorphosis, die-off or pond dry-out. Standard Samples of 30 wood frog larvae/study pond at Gosner stage ≥27 were collected and analyzed by PCR for presence of Ranavirus. Die-off Samples were collected whenever a die-off of any species was observed and were analyzed by PCR and virus culture. In 2013 field work was conducted in DE, MD and NJ, and 28 of 64

(43.8%) study ponds tested positive for Ranavirus, while die-offs were only observed at 8 ponds (DE: 2, MD:6). All isolated viruses were identified as Frog Virus-3. Samples testing positive for Ranavirus included larvae of wood frog, spring peeper (*Pseudacris crucifer*), spotted salamander (*Ambystoma maculatum*), and eastern spadefoot (*Scaphiopus holbrookii*). Results from the 2014 samples, which included all 28 ponds that tested positive in 2013 plus 30 PA ponds and 26 VA ponds, will be presented and discussed, with emphasis on the results from Pennsylvania.

Post-fledging survival and movements of the Veery in Nescopeck State Park, northeastern Pennsylvania

Christopher B. Goguen, Science Program, Penn State – Hazleton, 76 University Dr., Hazleton, PA 18202.

Christopher B. Goguen, (570) 450-3088, cbg10@psu.edu; professional presentation

Although much is known about songbird survival during the nesting stage, much less is known about the post-fledging period when young birds are learning to care for themselves because it is difficult to follow the fate of young once they leave the nest. As part of a long-term study of a Veery (*Catharus fuscescens*) population in Nescopeck State Park, Luzerne County, Pennsylvania, I used radiotelemetry to study fledgling survival and movements during summer 2013 and 2014. During each summer, I located and monitored Veery nests and attached a 0.75 g radiotransmitter to one nestling per nest, typically at 8-9 days post-hatching. I then re-located each fledgling every 1-3 days recording its location, habitat, and interactions with adults or other young. Over both years, I radiotagged and tracked 29 fledglings. Mean distance of the fledglings from their nest increased from 74 m at 7 days to 316 m at 21 days. Beyond 21 days it was difficult to relocate many fledglings due to increased movement and a limited road system for tracking. Only 6 fledglings (20.7%) died during tracking, with 5 of 6 deaths occurring within 5 days of fledging. In most cases, the predator was unknown. However, a nesting pair of broad-winged hawks (*Buteo platypterus*) killed two fledglings in 2014.

What Are the research needs of wildlife law enforcement?

Aaron M. Haines and Folake Meshe, Millersville University, P.O. Box 1002, Millersville PA. 17551; and Stephen Webb, The Samuel Roberts Noble Foundation, 2510 Sam Noble Parkway, Ardmore, OK 73401, USA

Aaron M. Haines, (717) 872-3355, aaron.haines@millersville.edu; professional presentation

The scope of poaching and illegal wildlife trafficking has grown dramatically within the last decade, thereby greatly increasing extinction risks for a number of wildlife species. Poaching and illegal wildlife trafficking are now a multi-billion dollar international industry with ties to organized crime and terrorist groups. In response, both national and international efforts have been proposed recently to deal with illegal wildlife trade. Wildlife law enforcement protocols can be facilitated through increased scientific research and collaboration between wildlife conservation officers (WCOs), scientists and prosecutors to reduce wildlife crime. The reduction

of wildlife crime is good for effective wildlife management and conservation. New scientific advances and technologies are being employed in wildlife law enforcement to combat crimes against wildlife, however many of these technologies and techniques have lacked adequate scientific testing to determine whether they are effective. The goal of this study was to survey the National Association of Conservation Law Enforcement Chiefs from around the United States to identify important research needs in wildlife law enforcement. The results of this survey will presented including an outline of how wildlife researchers can collaborate with wildlife law enforcement to help reduce wildlife crime.

Brodifacoum intoxication of a captive Andean condor

Kira L. Hydock, 283 Simmons Hall, University Park, PA 16802; Dr. Camille DeClementi, ASPCA Animal Poison Control Center, 1717 South Philo Road Suite 36, Urabana, IL 61802; and Dr. Pilar Fish, The National Aviary, 700 Arch Street, Pittsburgh, PA 15212

Kira L. Hydock, (412) 613-7754, klh5535@psu.edu; student presentation

Brodifacoum, a second generation anticoagulant rodenticide, acts through inhibition of vitamin K_1 epoxide reductase, an enzyme vital for the biosynthesis of vitamin K-dependent clotting factors. Based on the resulting coagulopathy, wildlife professionals may expect that brodifacoum toxicosis would present clinically as overt, generalized hemorrhage evidenced by hematuria, melena, and contusions. The Andean condor (*Vultur gryphus*) in this case study did not exhibit overt bleeding, but instead demonstrated profound weakness, anorexia, and nausea prior to death. Laboratory rodenticide results did not return until after the bird's death, but revealed a trace amount of brodifacoum (0.005 ppm) in whole blood. Postmortem liver samples contained 0.038 ug/g wet weight brodifacoum. Past studies have indicated liver levels of >0.1 ug/g can be associated with mortality in birds of prey, although one case in a great horned own had reported liver levels of 0.01 ug/g. The larger implication concerns the threat of secondary brodifacoum toxicosis to wild raptors and other upper echelon carnivores. Brodifacoum accumulates in the liver, kidney, and pancreas, which combined with its slow excretion from the body, enables bioaccumulation up the food chain. Birds of prey, when presented to wildlife rehabilitation clinics, may not exhibit overt bleeding, but instead may present similar to the bird in this case study with marked weakness, depression, and anorexia. The bioactivity of brodifacoum must be considered when treating these birds, as supportive care and vitamin K_1 administration must be sustained until brodifacoum is cleared from the liver, a process that could last upwards of 4 months.

Infection rates of *Ranavirus* and *Batrachochytrium dendrobatidis* in green frog populations of Pennsylvania

James T. Julian, Penn State University-Altoona College, Division of Mathematics and Natural Science, 3000 Ivyside Park, Altoona, PA 16601; and Robert P. Brooks, Penn State University-University Park, Department of Geography, 302 Walker Building, University Park, PA 16802; and Gavin W. Glenney and John A. Coll, U.S. Fish and Wildlife Service, Northeast Fishery Center-Fish Health Unit, 400 Washington Ave, Lamar, PA 16848

James T. Julian, (814) 940-3315, jtj2@psu.edu; professional presentation

In 2013 and 2014, we surveyed 25 wetlands throughout Pennsylvania to document the occurrence of *Ranavirus* and chytrid fungus (*Batrachochytrium dendrobatidis*) in populations of green frog (*Lithobates clamitans melanota*) tadpoles. *Ranavirus* was detected in just two populations, while chytrid fungus was detected in 88% of the wetlands we surveyed. Chytrid infection parameters did not significantly differ between natural (n=13) and human-created mitigation wetlands (n=12), although mitigation wetlands contained populations with the highest prevalence of chytrid (up to 95% of individuals infected), as well as the highest intensity of infection (approximately 3,800 zoospore equivalents/infected individual). We examined whether human alterations to wetland buffer zones influenced infection parameters. Forest cover within 250m of a wetland was weakly correlated with infection prevalence (r = -0.465) and the intensity of infections (r = -0.515), but only among wetlands with relatively few anthropogenic stressors. Once the 100m buffer surrounding a wetland was impacted by two or more categories of stressor, forest cover failed to explain variation in infection parameters. In conclusion, chytrid fungus appears to be widespread among Pennsylvania's green frog populations that inhabit both natural, and human-created, wetlands. Furthermore, maintaining forested buffers around wetlands may only influence chytrid infections when other anthropogenic stressors are kept to a minimum.

The importance of terrestrial dispersal for genetic connectivity among headwater salamander populations

William L. Miller[1], Department of Biological Sciences, Towson University, Towson, MD 21252; Joel W. Snodgrass[2], Department of Biological Sciences, Towson University, Towson, MD 21252; and Gail E. Gasparich, Department of Biological Sciences, Towson University, Towson, MD 21252

[1] *Present Address: Pennsylvania Cooperative Fish and Wildlife Research Unit, 433 Forest Resources Building, The Pennsylvania State University, University Park, PA 16802*
[2] *Present Address: Department of Fish and Wildlife Conservation, Virginia Tech, 310 West Campus Drive, Blacksburg, VA 24061*

William L. Miller, (814) 865-2130, wlm159@psu.edu; student presentation

Many organisms are primarily constrained to the channels of the upstream terminus of river networks with limited capacities for both in-stream and overland dispersal. Dispersal is believed to contribute to gene flow and the stability of headwater populations. While assumed, the importance of overland dispersal is largely unexplored in headwater salamanders. Six microsatellite markers were used to assess dispersal patterns for a headwater salamander, *Desmognathus fuscus*. Tissue samples were collected using a nested hierarchical study design, which specifically addressed the contribution of overland movements to headwater population connectivity. Genetic divergence was significant among all populations (F_{st} = 0.027 to 0.405) and at all hierarchical spatial scales. However, lower degrees of genetic population structure were observed among proximal streams that shared no downstream hydrologic connections. Mantel tests indicated a significant relationship between genetic divergence and overland distance,

suggesting that *D. fuscus* populations conform to an isolation-by-distance model of dispersal. Dispersal among headwater streams was limited, with an average of less than one effective migrant per generation moving between paired headwater streams. These results indicate that regional patterns of genetic population structure are influenced by overland dispersal and suggest the importance of terrestrial movements in maintaining population connectivity among *D. fuscus* populations.

Landscape genetics of white-tailed deer to assess population structure for surveillance of chronic wasting disease

William L. Miller, Pennsylvania Cooperative Fish and Wildlife Research Unit, 433 Forest Resources Building, The Pennsylvania State University, University Park, PA 16802; W. David Walter, U.S. Geological Survey, Pennsylvania Cooperative Fish and Wildlife Research Unit, 403 Forest Resources Building, The Pennsylvania State University, University Park, PA 16802; and Justin Brown, Pennsylvania Game Commission, Animal Diagnostic Laboratory, Wiley Ln., The Pennsylvania State University, University Park, PA 16802

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Chronic wasting disease (CWD) is a transmissible spongiform encephalopathy that affects a number of free-ranging cervid species. While the disease is endemic to Wyoming and Colorado, it has recently been identified in captive and free-ranging white-tailed deer populations (*Odocoileus virginianus*) in parts of West Virginia, Virginia, Maryland, and Pennsylvania. Infectious CWD prions can be spread via direct animal contact or indirectly through the environment. Predictive models that incorporate population connectivity (e.g. dispersal) and environmental factors (e.g. topology, land cover) would allow managers to identify potential routes of white-tailed deer and subsequently mitigate the potential spread of CWD throughout the region. Measuring demographic connectivity presents a challenge to these efforts as it is often difficult to get estimates of dispersal rates, particularly at regional scales. We will measure patterns of genetic population structure using 13 microsatellite markers in order to infer patterns of regional population connectivity for white-tailed deer. Approximately 200 – 400 tissue samples will be taken each year from 2013 to 2015 over a sampling area that encompasses Pennsylvania, Virginia, and Maryland (~25,000 km^2). Sex, age, and harvest location will be recorded in order to relate genetic population structure to demographic and environmental factors which may control dispersal. Additionally, we will genotype each deer in order to test for known single-nucleotide polymorphisms in the prion protein gene related to disease susceptibility. We hope to use these data to identify landscape characteristics controlling deer dispersal, identify potential transmission pathways, and assess population susceptibility to CWD at the conclusion of this project.

Foraging habits of *Etheostoma caeruleum* to determine diet variability

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The objective of this study is to gain insight into the foraging habits of the Rainbow Darter, *Etheostoma caeruleum,* in communities where there are varying degrees of competition with other benthic species. Fishes were collected from one site on Woodcock Creek and two sites on Elk Creek in northeastern Pennsylvania. In Woodcock Creek, four species of darter compete with the Rainbow Darter. In Elk Creek, no other darter species compete with the Rainbow Darter. However, Round Gobies, *Neogobius melanostomus*, are present at the site closest to the mouth of Elk Creek. Fishes were collected with a 3 meter seine in July, August and September of 2013. Additionally, macroinvertebrate substrate samples were collected using a D-frame kicknet and the standard nine 30-second sampling technique during periods of fish sampling. Stomach contents of each fish were identified and analyzed to determine a difference in prey selection among the three populations. Principal component analyses and MANOVA tests were used to determine groups of similar prey selections among populations. Factor scores for at least one principal component were statistically different in all comparisons made. From this we are able to conclude that there is a shift in darter diet when in competition with an exotic species, that there is a shift in darter diet when in competition with other darter species, and that the shift of diet is context dependent.

Influence of community interactions on the dynamics of chytrid fungus

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Batrachochytrium dendrobatitis (Bd) is a species of fungus that parasitizes vertebrates and causes chytridiomycosis, an epidermal disease in amphibians hypothesized to interfere with electrolyte and osmotic functions which can be fatal in severe cases. Recent studies have confirmed Bd infections are present in amphibian populations in Pennsylvania: green frogs (*Lithobates clamitans*) in the Stone Valley Forest have tested positive for Bd. We sampled populations of green frogs and wood frogs (*Lithobates sylvaticus*) in the Stone Valley Forest to investigate the relationship between the presence of infected green frogs and the presence, persistence, and intensity of Bd infections in wood frogs. The migratory behaviors of green frogs and observed higher tolerance to heavy infection make them a potentially important vector for the disease. We expected wood frog populations that are either co-mingled or within close proximity to infected green frog populations to have higher rates of infection than isolated populations. We collected lip swabs and tissues from 17 wood frog sites and 8 green frog sites. We used quantitative polymerase chain reaction (qPCR) analysis to ascertain presence and determine the prevalence of Bd at each site. Out of 17 wood frog sites, 4 contained samples positive for Bd. Three of the ten green frog sites have been analyzed and are positive for Bd. Preliminary analyses show that 50% of wood frog sites with positive hits for Bd were also inhabited by green frogs where only 7.7% of wood frogs site that were negative for Bd had a present green frog population.

Distribution of songbird point-count observations on state-owned and private land in Pennsylvania

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Public lands in Pennsylvania have an important role in the protection of wildlife resources. However, the relative role of public versus private lands is likely to vary among species based on distribution and habitat type. We investigated relative distributions of 3 guilds of songbirds on state-owned land (State Game Lands and State Forests) and other land using point count data from the 2nd Pennsylvania Breeding Bird Atlas (PBBA; 2004-2008). Approximately 7.5% of 33852 PBBA points were located on state land. Among species considered to be strongly associated either with forest-interiors or forests with a strong hemlock component, >30% of all of PBBA observations were on state lands, and for a few species >50% of observations were on state lands. Conversely, <1% of the observations of grassland/farmland associated birds were on state lands, and for all but 2 species <2% of observations were on state lands. These results indicate 1) the importance of state lands for conservation of forest birds, and 2) the crucial need to consider private lands in conservation plans for grassland songbirds.

Effects of geolocators on annual return rates, nestling provisioning, and reproductive success of male cerulean warblers

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The Cerulean Warbler (*Setophaga cerulea*) is a Neotropical migrant that breeds locally in mature hardwood forests across the eastern states. Because its population has declined by over 3% annually since the 1960s, the Cerulean is considered a species of high conservation concern and has been the subject of intense research on the breeding and wintering grounds. However, we still know very little about its migration routes, stopover sites, or migratory connectivity between breeding and wintering populations of this species. Recently, the development and use of light-sensitive geolocators has made it possible to follow migration patterns of individual birds, thereby illuminating their full annual cycle. Prior work on other species has suggested that geolocators or their attachment method can have negative impacts on return rates of some species, but not others. In 2014, ten adult male Cerulean Warblers were captured and color-banded at two study sites in NW Pennsylvania and fitted with 0.3 gram geolocators using leg loop harnesses. We also color-banded an additional 14 adult males without geolocators to serve as controls. We compared nestling provisioning rates using 2-hr video recordings, and fledging success, at nests of males with and without geolocators. We found no differences in either metric, indicating no detectable impact of geolocators on Cerulean Warblers. Our 2014 field season was a trial assessment in coordination with the USGS Bird Banding Laboratory. This year we will increase our sample

sizes of geolocator-fitted Ceruleans in PA; collaborators will begin deploying them in Arkansas, Tennessee, and Michigan as well.

Pennsylvania's feral swine: piecing together the puzzle

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Awareness and documentation of feral swine (*Sus scrofa*) has increased nationwide and Pennsylvania is no exception. Although feral swine have been documented in the Commonwealth since the late 1990's the distribution, population, and sources are still not clear. Many of the initial populations were believed to have originated from escapes or releases from shooting facilities. USDA-WS is working to create a risk assessment of the feral swine shooting and breeding facilities in Pennsylvania to better understand this problem. This data includes understanding source of stock, type of swine at each facility, number of swine at each site, and seasonality of animals on the landscape. Feral swine have also been documented in areas where no known hunting facilities are located complicating the feral swine picture. Likely sources include illegal importation, sale, and intentional release of animals for sport. Changes in farming practices are also a potential source of feral swine in Pennsylvania, from escaped free-range or pasturing stock. Increased use of these methods and limited regulations on pasture raised swine, pose issues when animals escape and quickly become feral. Additionally pasture swine are at increased risk of disease due to potential direct contact with feral populations. The diversity of potential sources of feral swine creates problems with conducting management and crafting regulations to reduce feral swine populations. Increased pressure from sportsmen's groups, agricultural produces, businesses, and the public related to feral swine management cause significant problems for agencies attempting to stem the tide of the feral swine invasion.

Wild canids as sentinels for zoonotic disease, *Toxoplama gondii* and *Leptospira sp.* infections in coyotes, red fox, and gray fox from Pennsylvania

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Wild canids, coyotes (Canis latrans), red fox (Vulpes vulpes), and gray fox (Urocyon cinereoargenteus) are found across a wide range of habitats, in Pennsylvania these species inhabit all 67 counties. Their habitat use and behavior can expose them to a diversity of disease threats. These factors make them them an excellent surveillance tool to study diseases that may affect

humans, domestic animals, and wildlife. In this study we examined Toxoplasmosis and Leptospirosis infections in wild canid species. Toxoplasmosis is caused by the protozoan parasite *Toxoplasma gondii*, while Leptospirosis is cause by bacteria of the genus *Leptospira.* Both diseases can affect warm blooded species and cause significant health concerns. During 2011 - 2012 we sampled 164 coyotes and 29 foxes (red and gray) for *T. gondii* from 42 counties and found infection in 19% of coyotes and 85% of fox. From 2012-2014 we sampled the same species for *Leptospira sp* (117 coyotes and 4 fox) from 41 counties and found 51% of coyotes and 75% fox were infected. *T. gondii* infections were more likely in females (28%) than males (14%) for coyotes as well as fox (75% f, 58% m). *Leptorspria* infections were also more common in female (56%) than male (48%) coyotes. By using wildlife to better understand zoonotic disease threats to humans, domestic animals, and sensitive wildlife populations, wildlife managers, veterinarians, and human health professionals can help safeguard their respective charges.

Dispersal timing, distances, and rates of Pennsylvania black bear

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In Pennsylvania, the black bear (*Ursus americanus*) population has expanded its range since bear abundance began increasing in the early 1980s. We investigated if dispersal timing, distances, and rates had changed and if those changes corresponded with range expansion and increasing abundance. We used records of bears captured and ear-tagged at <16 months of age with specific locations of tagging and recovery (n = 466). We classified bears as dispersed if the measured distance between initial capture and final recovery was ≥13 km for females and ≥26 km for males. Based on these criteria, we classified <5% of bears as dispersing before 16 months of age and we detected minimal changes in dispersal rates after 16-19 months of age. Median distance dispersed was greater for males (47.03 km, n = 98) than females (25.84 km, n = 70). Overall male dispersal rate was 0.41 (SE = 2.48) and female dispersal rate was 0.28 (SE = 2.34). We estimated dispersal rates and found that dispersal rates increased by decade and differed by region. The largest increase in female dispersal rates occurred in the south-central area of the state. Our results indicated a greater rate of dispersal, at greater distances, for female bears than previous research in Pennsylvania. Male dispersal rates were lower than previous studies in Pennsylvania, but dispersal distances were similar. Our results suggest that the increased movement by females may partially explain the expansion of the bear population across Pennsylvania.

Abstracts

Posters

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

Study of regional PA tick species utilizing collections from PA Game Commission CWD hunter check stations: a preliminary study

Rachel Masciarelli; Stephanie Pitman; Amanda Hutzelmann; Amy Lind; Tracy Farone, DVM; Heather Barton, Ph.D.; Frederic Brenner, Ph.D.; Ryan Braumann, Amanda Everett, Abigail Cleveland, and Colin Fort

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In humans and susceptible animals, the incidence rates and locations of tick-borne diseases have been shifting as tick species have been transported to different parts of the United States through varying migratory bird flight patterns, climate change, and geographical host range changes. While the Centers for Disease Control and Prevention (CDC) has predominantly documented *Ixodes scapularis* (*I. scapularis*) in Pennsylvania, we have identified *Dermacentor albipictus* ticks in addition to the *I. scapularis*. Ticks were collected from six PA Game Commission Chronic Waste Disease (CWD) deer check stations during the fall of 2013 indicate that *Dermacentor albipictus* is becoming a dominant collected species along with *I. scapularis*. In addition, *I. scapularis*, *Dermacentor variabilis*, *Rhipicephalus sanguineus* and the *Dermacentor albipictus* were identified from samples collected from the six regions and Presque Isle State Park. This is a significant public health concern because various ticks' species can introduce Lyme disease and other disease into historically low incident-rate areas. Our research goals are to 1. Identify ticks by species, 2. Inform the public about potential exposures to current and potentially new tick-borne diseases in Pennsylvania; and 3. Provide opportunities for undergraduate student involvement in a cooperative research program.

Through the mouths of birds: A survey of West Nile virus in Pennsylvania

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Corinne Bozich and Corey Coleman, 814-792-5266, cnb31@pitt.edu; student poster

In 1999 West Nile virus (WNV) first appeared in the United States and has subsequently infected more than a million people and untold numbers of wildlife. The current status of WNV and its effects on wildlife in Pennsylvania is sparsely monitored through sporadic testing of dead birds. In order to acquire a more comprehensive understanding of the status of WNV in wild bird populations we have sampled local and migratory birds between 2012-2014 throughout Pennsylvania. In 2012 we sampled 276 birds from Westmoreland County, from which we found two positive individuals. This low rate of positivity correlated with low human infection rates in

that area of Pennsylvania. We sampled that initial population cloacally and orally to compare the effectiveness of both sampling techniques, and have settled on the less invasive oral sampling method after finding agreement between our sampling methodologies. Between 2013-2014 we expanded our sampling to additional counties and species. We have subsequently orally sampled over 1000 birds, primarily passerines but also including ducks, falcons, woodpeckers and owls. Our data can be used to assess risks of WNV to current avian populations, determine rates of WNV infectivity throughout the state of Pennsylvania, and look for correlations between avian and human infection rates.

Biomass and nutrient standing stocks associated with populations of the Eastern Red-backed salamander (*Plethodon cinereus)* on State Game Land 69, Crawford County, Pennsylvania

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Two classic studies by Burton and Likens (1975) are widely cited in the scientific literature and textbooks as evidence of the ecosystem-level importance of salamander populations in eastern deciduous forests. However, few other studies have been conducted to compare terrestrial salamander biomass and nutrient standing stocks in similar systems. We quantified biomass (dry mass = DM, ash-free dry mass = AFDM) and nutrient standing stocks (N, Ca, P, K, S, Na, Mg, Zn) associated with Eastern Red-backed salamander (*Plethodon cinereus*) populations on State Game Land 69, Crawford County, Pennsylvania. During 2010, 2012, and 2014, we conducted salamander sampling using 50-75 randomly selected quadrats positioned along parallel transects. We developed and used species-specific allometric relationships to estimate individual salamander DM and AFDM from field measurements of snout-vent length, then used published values to convert DM to specific nutrients. Salamander biomass (mean ± 1SE) was 0.050 ± 0.009 g/m^2 DM and 0.042 ± 0.008 g/m^2 AFDM in 2010, 0.039 ± 0.008 g/m^2 DM and 0.033 ± 0.007 g/m^2 AFDM in 2012, and 0.019 ± 0.004 g/m^2 DM and 0.016 ± 0.004 g/m^2 AFDM in 2014. Our results were similar to those of Burton and Likens (1975) and indicate that salamander populations occur at relatively high biomass and nutrient standing stocks compared to published estimates for other vertebrates. These findings underscore the importance of terrestrial salamanders in temperate forest food webs and their role in ecosystem-level processes such as energy flow and nutrient cycling.

Morphometric analysis of Pennsylvania coyotes

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Coyotes (*Canis latrans*) and coyote-wolf hybrids (*Canis latrans x Canis lupus*) were remarkably successful in recently colonizing the Eastern United States due to their adaptability. This relatively new canid shows significant differences to their conspecifics from the west in both ecology and behavior due to several factors (Parker 1995). In addition, Eastern coyotes are significantly larger than their counterparts in the west. The mechanisms for this difference may be due to hybridization and/or prey size as distinguished by geographic variations (Lawrence and Bossert 1975; Thurber and Peterson 1991). The purpose of this study is to examine morphological differences within coyotes inhabiting the Commonwealth of Pennsylvania, using skull measurements, to evaluate geographic variation across physiogeographic regions. The study may provide evidence to either support or refute previous research investigating the modes of migration into the Commonwealth. Whole carcasses or heads alone were collected from hunters, trappers, and taxidermists beginning in January 2014 and continuing through March 2015 (n=111). In accordance with Kays, Curtis, and Kirchman (2009), ten cranial and four mandibular measurements are recorded per skull. Analysis is to occur in the spring of 2015 after the end of the 2015 organized coyote hunt season.

Comparison of cytology and histopathology for diagnosis of avian pox in wild turkeys

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Proliferative skin lesions are a common reason wild turkeys (*Meleagris gallopavo*) are submitted for diagnostic examination. Previous retrospective studies have indicated that avian pox is the most common cause of skin disease in wild turkeys, but other grossly indistinguishable causes exist, including bacterial infections and neoplasia. Histopathology is a common diagnostic approach for identifying avian pox in wild turkeys. Cytology has traditionally been underutilized for diagnosing avian pox; however, it offers multiple advantages, including low cost, minimal equipment and reagent requirements, rapid turnaround time, potential for antemortem diagnosis, and ease of sample storage. The objective of this study was to evaluate the utility of cytology for diagnosing avian pox in wild turkeys. Proliferative skin lesions in nine wild turkeys were blindly analyzed using cytology and histopathology by a clinical and an anatomic pathologist, respectively. All nine turkeys had lesions on the unfeathered skin of the head, while a subset also had nodular lesions on mucosal surfaces of the upper gastrointestinal tract (n = 2) or unfeathered skin of the legs (n = 2). Cytology and histopathology both identified morphologic changes diagnostic for avian pox in proliferative skin lesions of the head in all nine wild turkeys. These preliminary results suggest cytology may serve as a valuable tool for diagnosing avian pox in wild turkeys. We will continue to analyze additional wild turkeys in order to generate a statistically significant sample size and calculate the sensitivity and specificity of cytology for avian pox relative to histopathology.

Powdermill Nature Reserve camera trapping survey for bobcat (*Lynx rufus*)

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Powdermill Nature Reserve is a 4.69 km^2 property owned by the Carnegie Museums. Located in Westmoreland County, it is used extensively as an important ecological research station. The area primarily consists of second growth Appalachian oak forest dominated by maples, and oaks at elevations raging from 426 to 548 meters. Between June 5 and October 11 of 2014; automated camera trap were used to estimate the distribution and abundance of bobcats (*Lunx rufus*). Presently, PA's bobcat populations have been expanding both in size and distribution. We have begun surveys in Southwestern PA starting with Powdermill because it represent typical forested habitat and provides for north-to-south dispersal and has a history of research. We placed 5 camera trapping stations, each with 2 Bushnell Trophy Cams HD, throughout the property and ran them for a total of 675 trap nights. We observed black bear, coyote, raccoons, white tailed deer and numerous small mammals. Bobcats were photographed 10 times at three sites in the lower portion of the property. Of these 10 events, 9 occurred after September 1st. This suggests that either bobcats shift home ranges between summer and fall or are more active in the fall thereby increasing capture probability. It is possible that in the summer bobcats using the Powdermill area spend time on larger forest tracts nearby that contain more resources and move to Powdermill in the fall. The fall peak in activity is consistent with previous studies. Additional surveys are needed to understand bobcat population dynamics at Powdermill.

Biomass of Eastern Hellbender (*Cryptobranchus alleganiensis*) populations in western Pennsylvania

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The Eastern Hellbender (*Cryptobranchus alleganiensis*) is a large, permanently aquatic salamander inhabiting streams throughout the Allegheny and Susquehanna River drainages in Pennsylvania. Although hellbender populations are declining in many areas within their range in the eastern and mid-western United States, hellbender abundance is relatively high in localized high quality streams throughout western Pennsylvania. Many biologists refer to the Eastern Hellbender as a keystone species, one that has a disproportionate effect on stream community structure and ecosystem function, but few studies have provided quantitative evidence to support their status as a keystone species. To assess the relative importance of hellbenders in stream communities, we quantified hellbender population biomass for 10 streams during five years (2010-2014). Hellbender surveys were conducted in each stream, each captured salamander was weighed for wet mass (kg), and GIS was used to estimate surface area for each stream survey. Based on published values of biomass (kg/ha) for stream-dwelling populations of organisms, including other vertebrates, hellbender biomass was relatively high in four streams but

considerably lower than the biomass of macro-invertebrates and fish in six streams we examined. Our results support the status of the Eastern Hellbender as a keystone species in stream reaches where they are abundant but highly localized. Additional studies are required to assess how hellbender biomass varies with environmental factors at local and landscape scales. Studies further quantifying the ecological roles of hellbenders and their importance in stream structure and function will provide a rationale for the conservation of this unique salamander.