PENNSYLVANIA CHAPTER OF THE WILDLIFE SOCIETY & PENNSYLVANIA BIOLOGICAL SURVEY

2024 Joint Annual Conference & Workshops

Status and Management of Pennsylvania Species of Greatest Conservation Need

March 22 – 23, 2024
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 to all donors!

Silent Auction and Basket Raffle Items:

Keystone Elk Country Alliance
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PA Fish and Boat Commission
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Gold Level Sponsors: *Keystone Elk Country Alliance, PA Game Commission*
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Conference At-a-Glance

Friday, March 22nd

9:00am – 12:00pm **Professional Certification Workshop**, *Executive Forum Room*

TWS Certification means The Wildlife Society recognizes that a member meets the minimum educational, experience, and ethical standards adopted by the Society for professional wildlife biologists. In this interactive workshop I will briefly describe and discuss TWS' certification program for Associate Wildlife Biologist® and Certified Wildlife Biologist®, the value of professional certification, education and experience requirements, how the application process works, when and how to apply, and review solutions to the biggest problems most applicants encounter. Following the presentation and Q&A, direct technical assistance will be provided to workshop participants interested in pursuing certification. For those seriously contemplating certification and desiring assistance, it would be helpful to have a copy of your college transcripts and resume with you. This workshop is led by Cal DuBrock former Director of the Pennsylvania Game Commission's Bureau of Wildlife Management.

12:30pm – 4:30pm Field Trip: **Stream Restoration for Sensitive Wildlife – An Ecosystem Approach to Active Habitat Management**

Meet at conference center lobby, bring your own water and snacks. Depart Ramada 12:30pm. Knee or hiking boots are a must.

12:30pm – 4:00pm **Wildlife Forensics Workshop**, *Executive Forum Room*

The world of wildlife conservation is rapidly developing. Wildlife crime cases, such as poaching, often happen in remote areas without witnesses. First responders unintentionally disrupt the crime scene and crucial forensic traces get lost. Disruption in crime scenes, bad sample collections or broken chain of custody can lead to poor evidence presented in court. This wildlife forensic workshop is a basic overview session designed for professionals whose daily work may be influenced by forensic science as it relates to conservation efforts. We will review the basis of wildlife forensic and participate in hands on crime scene investigations. Participants will gain a stronger understanding of proper crime scene analysis, sample collection and storage, and types of forensic analyses available. This workshop is led by Dr. Nicole Chinnici, a Certified Wildlife Forensic Scientist with East Stroudsburg University's Dr. Jane Huffman Wildlife Genetics Institute.

6:30pm – 9:30pm **Student – Professional Mixer**, *Ballroom*
Raffle and silent auction begin

Saturday, March 23rd

8:00am – 8:30am	*Coffee & light refreshments*
8:30am – 8:45am	**Welcoming Remarks**, *Ballroom*
8:45am – 9:25am	**Plenary Session Talks**, *Ballroom* Speaker: Amber Wiewel *(PA-Bird Atlas)*
9:25am – 10:10am	**Plenary Session Talks**, *Ballroom* Speaker: Pamela Shellenberger *(USFWS)*
10:10am – 10:30am	*BREAK*
10:30am – 11:10am	**Plenary Session Talks**, *Ballroom* Speaker: Aaron Hanes; *Presentation: Carol Bocetti (PennWest University)*
11:10am – 11:50am	**Plenary Discussion**, *Ballroom* Theme: Status & Management of PA Species of Greatest Conservation Need
12:00pm – 1:00pm	**Lunch**, *Ballroom*
1:00pm – 4:00pm	**Wildlife Leadership Academy Posters**, *Lobby*
1:00pm – 5:20pm	**Concurrent Paper Sessions**, *Forum Room & Ballroom A & B* Student and professional presentations including break(s).
4:15pm – 5:15pm	**Poster Setup**, *Director's Room*
5:00pm – 5:30pm	**Business Meeting,** *Chairman's Room* Members welcome, board member attendance required
5:15pm – 6:15pm	**Poster Session & Silent Auction**, *Director's Room* Presenters should be present & prepared to answer questions.
6:30pm – 8:30pm	**Grand Banquet**, *Lobby & Ballroom* (Silent auction ends) Speaker: Charles Bier *(Western Pennsylvania Conservancy – Retired)*

Continuing Education Credits Approved by TWS National

The Wildlife Society has pre-approved contact hours or Continuing Education Units (CEU) for the 2024 PA TWS/PABS Conference. Listed CEUs count for Category I of the Certified Wildlife Biologist® Renewal or Professional Development Certificate Programs. The Wildlife Society will allow a **maximum of 16 CEUs (aka contact hours)** for participation in both days of the conference.

- Professional Development Workshop – 3 CEUs
- Wildlife Forensics Workshop – 3.5 CEUs
- Stream Restoration Field Trip – 4 CEUs
- Conference Sessions Only – 4 CEUs

THE WILDLIFE SOCIETY
Professional Certification Program

Field Trip Schedule

Off-site Friday, March 22 12:30-4:30pm

Stream Restoration for Sensitive Wildlife – An Ecosystem Approach to Active Habitat Management

Jacks Creek and its adjacent habitats located State Game Lands 107 sustains multiple Species of Greatest Conservation Need within a relatively small geographical area. The site's past land use and geology provide rich and diverse habitats. However, those very attributes threaten the sustainability of those habitats, primarily from erosion and sedimentation, non-native invasive species, and an overall disruption of natural processes. This field trip will examine several habitat restorations projects that have been implemented. In-stream restoration features include rock cross-vanes and mud sills to reduce bank erosion and restore flood plain connectivity. Terrestrial sites have undergone multiple treatments to create a variety of early successional habitats and to control invasive species. Future management strategies will also be discussed. At the core of the project's success is the central philosophy to restore or mimic ecosystem processes. These ecosystem processes ultimately provide specific conservation targets such as reducing sediment pollution; in-stream biodiversity and abundance; and wildlife habitat for American woodcock, golden-winged warbler, wood turtle, ruffed grouse, bats, and many more Species of Greatest Conservation Need.

Presenters:
Clayton Lutz –Wildlife Biologist, PA Game Commission
Richard Novak – Biologist, US Fish and Wildlife Service
Mark Thomas – Habitat Unlimited, USFWS Partners for Wildlife Program
Bailey Cody – Watershed Specialist, Mifflin County Conservation District
Dave Aurand – Forester, PA Game Commission

**Please bring your own water, snacks, and any personal items. Waterproof boots, knee-boots, or hip waders are highly recommended. The site is generally flat, but we will be walking on uneven and muddy terrain. Please dress appropriate for the weather as this workshop will be held outdoors. There are no bathroom facilities at the site. We will depart from the conference at 12:30 PM and return at 4:30 PM. There is approximately 35 minutes of travel time to the site.*

Plenary Schedule

Saturday, March 23, 8:00 am – 11:50 am
Ballroom

Theme:
Status and Management of Pennsylvania Species of Greatest Conservation Need

8-8:30am	**Refreshments**	**Speakers**
8:30-8:45am	**Welcome and Introduction**	Aaron Haines
8:45-9:25am	Pennsylvania's 3rd Bird Atlas: Engaging Community Scientists to Support Avian Conservation	Amber Wiewel - Introduction from Lillie Langlois
9:25-10:10am	Restoring and Managing Habitat for Imperiled Species	Pamela Shellenberger - Introduction from Elizabeth Crisfield
10:10-10:30am	**Break**	
10:30-11:10am	Conservation strategies to prevent extinction and promote recovery of endangered species	Carol I. Bocetti, Ph.D. - Introduction from Kyle Van Why Presented by Aaron Hanes
11:10-11:50am	**Questions and Open Discussion**	Moderator is Kyle Van Why

Plenary Speakers

Amber Wiewel, Pennsylvania Bird Atlas Coordinator, Hawk Mountain Sanctuary

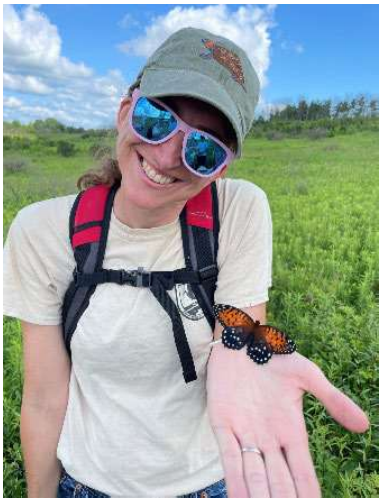
Pennsylvania's 3rd Bird Atlas: Engaging Community Scientists to Support Avian Conservation

Pennsylvania's 3rd Bird Atlas, a statewide community-driven inventory of the birds of the Commonwealth, launched on January 1, 2024. This atlas will provide valuable updates to Pennsylvania's first two breeding atlases, published in 1992 and 2012, and will introduce the state's first winter atlas, establishing a benchmark of winter bird distribution in Pennsylvania. Like the previous atlases, data produced in this atlas will be used to revise the state's lists of threatened and endangered species and Species of Greatest Conservation Need, and to identify where conservation and research actions should be targeted. Pennsylvania's previous atlases were highly successful in terms of reaching high birding coverage across the state and producing invaluable data for conservation, and they also set a standard which other states have aimed to match in conducting atlases. Pennsylvania's 3rd Bird Atlas will continue this tradition of supporting avian conservation by utilizing advancements in birding and outreach, and by engaging a growing population of birders across the Commonwealth and beyond.

Amber grew up in Missouri where she fell in love with birds in the Ozarks. She received her bachelor's degree from the University of Missouri and spent time chasing birds and other wildlife in Missouri, California, Puerto Rico, and west Africa. She then studied birds in Puerto Rico while earning a master's degree from Iowa State University and went on to work as a research wildlife biologist with USGS's Amphibian Research and Monitoring Initiative and Pennsylvania State University before joining the Pennsylvania Bird Atlas team as Atlas Coordinator in 2023.

Plenary Speakers

Pamela Shellenberger, Fish and Wildlife Biologist, U.S Fish and Wildlife Service



Restoring and Managing Habitat for Imperiled Species

The presentation will highlight federally listed and at-risk species and how the Service is working with partners to restore and manage their habitat to preclude listing or recover these species. The focus will be a brief overview of several case studies and how management and/or restoration was accomplished.

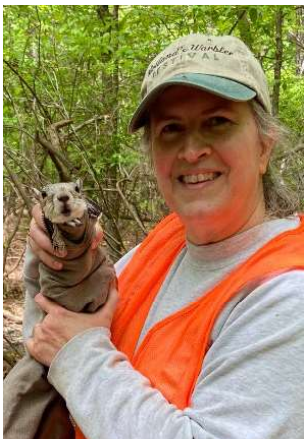
Pam Shellenberger is a Fish and Wildlife Biologist at the U.S. Fish and Wildlife Service Pennsylvania Field Office in State College, PA. During her 19-year tenure with the Service, Pam served as the eastern subspecies lead for the regal fritillary butterfly species status assessment and is the national lead for the northern population of the bog turtle. This fall, Pam was involved with a dam removal project near Meadville, PA that involved many partners and resulted in net conservation gains for federally listed freshwater mussels. Currently, she is working with several partners to build a bat hibernaculum in Greene County, PA to help foster bat recovery.

Pam enjoys working with others to solve complex conservation challenges and uses her expertise, collaborative attitude, and pragmatic approaches to provide beneficial outcomes to both the resource and the public.

Pam is a proud graduate of Shippensburg University where she focused on Geoenvironmental Studies and was a sprinter and hurdler on the track team. A native of Pennsylvania, Pam enjoys running, XC skiing, canoeing/kayaking, and exploring the outdoors with her husband and children.

Plenary Speakers

Carol I. Bocetti, Ph.D.,
Pennsylvania Western University



Conservation strategies to prevent extinction and promote recovery of endangered species.

Conservation strategies to prevent species extinction and promote recovery of threatened and endangered species must address diverse and species-specific conservation challenges, but commonalities also emerge. My decades-long work with two endangered species with historical ties to Pennsylvania taught me some lessons. Like 80% of listed threatened and endangered species, the key conservation challenge of working with the Kirtland's Warbler (*Setophaga kirtlandii*) is that the species is conservation-reliant. For the Delmarva fox squirrel (*Sciurus niger cinereus*), the key challenge is that it occurs mostly on fragmented, private lands. The successful de-listing of both species relied on collaborative conservation strategies, including strong research-management networks and insightful partnership development. Research-management networks should link diverse expertise in species biology, habitat ecology, habitat management, and human dimensions. Partnerships should represent the full range of conservation expertise, landowner ownership, and inclusive stakeholder participation. Delmarva fox squirrels were federally de-listed in 2015, and Kirtland's Warblers were federally de-listed in 2019. Both species remain on their respective state Endangered Species lists.

Carol I. Bocetti received her B.S. in Wildlife Ecology from University of Florida, and her M.S. and Ph.D. in Zoology from The Ohio State University. She worked for 12 years as a research scientist at USDI Patuxent Wildlife Research Center where she studied endangered species population ecology and effects of habitat management. She was the principal investigator for projects on Kirtland's Warblers and Delmarva Fox Squirrels, and a consultant for recovery programs for Black-capped Vireo, Golden-cheeked Warbler, Whooping Crane, Mississippi Sandhill Crane, and po'ouli. Dr. Bocetti moved to Pennsylvania and currently works at Pennsylvania Western University at California, Pennsylvania. She continued her Kirtland's Warbler and Delmarva fox squirrel research, and she also worked on avian communities in Lake Erie marshes before and after *Phragmites* control efforts and studies of avian community response to forest canopy removal. Dr. Bocetti has received Recovery Champion Awards from the US Fish and Wildlife Service for her work on both Kirtland's Warblers and Delmarva fox squirrels. She also received the Wings Across the Americas Award from USDA Forest Service for her work on Kirtland's Warblers.

Session Synopsis*

*Paper titles have been converted to short-hand only to accommodate the side-by-side comparison chart, student presentations are denoted by †

Time	**Session 1**: Forum Room	**Session 2**: Ballroom A	**Session 3**: Ballroom B
13:00-13:20	Banfield - Aerial Elk Population Surveys	Gunderman † - Marsh bird occupancy estimation	Keller, Tom - PA Mountain Lions: Fake News?
13:20-13:40	Eichelberger - Least Weasel Population Assessment	Hodges † - Scarlet Tanager Habitat Selection & Forest Management	Haines - Invasive Species Assessment
13:40-14:00	Janecka - Mammal Occupancy in a Strip Mine	Kolek † - Modeling Ruffed Grouse Habitat with LiDAR	Hoyt - OneHealth
14:00-14:20	Otterbein - Woodrat recovery in Pennsylvania	Witmer † - Saw-whet Owl Release Behavior after Capture	Rowley - Strategies to Reduce Tick Burden and Pathogens
14:20-14:40	Hauer - Allegheny Woodrats at Ft. Indiantown Gap	Trowbridge † - Distance Sampling with Variable Animal Density	Vile - Pentobarbital toxicosis in birds
14:40-15:00	Keller, Tom - American Marten reintroduction	Keele - Golden-winged Warbler Food Limitation	Goldman † - West Nile Virus Risk for Ruffed Grouse
15:00-15:20	**Break**	**Break**	**Break**
15:20-15:40	Scafini - Innovative Bat Habitat Management	Keller, Jeff - Habitat Patch Size at Threshold Occupancy	Walters † - Crows as Vectors for Chronic Wasting Disease
15:40-16:00	Johnson - Bats Hibernate in Rock Outcrops	Gipe - Conservation Planning for Three Turtle Species	Hoy-Petersen - Third Eyelid for Chronic Wasting Disease Detection
16:00-16:20	Hauf † - Urban Planning for Bats	Novak - Wood Turtle Ecology and Conservation Partnerships	Tilden - Regal Fritillary Conservation
16:20-16:40	Zak † - Snowshoe Hare Range Contraction	Russell - Constructed Nesting Mounds for Turtles	Crisfield - PABS Species Status Determination Process
16:40-17:00	Fameli † - White-tailed Deer Genetics	Everett - Drift-fence Monitoring of Massasauga	Keller, Tom - Finding Fulfillment as a Wildlife Professional
17:00-17:20	Stevens † - Rabies in White-Tailed Deer		

Concurrent Session 1 – Forum Room

Time	Title	Presenter	Affiliation
		Moderator: Vreeland	
13:00-13:20	Estimating Pennsylvania's elk population: lessons learned from 5 years of aerial surveys	Jeremy Banfield	PA Game Commission
13:20- 13:40	The Least Weasel (*Mustela Nivalis*) in Pennsylvania: a review of what is known, not known, and next steps for assessing populations of one of the state's most enigmatic mammals	Charlie Eichelberger	PA Natural Heritage Program
13:40-14:00	The effects of an abandoned open strip mine on diversity and occupancy of mammals at Powdermill Nature Reserve	Jan E. Janecka	Duquesne University
14:00-14:20	Allegheny woodrats on the road to recovery in Pennsylvania	Katelyn Amspacher Otterbein	PA Game Commission
14:20-14:40	Status of Allegheny woodrats (*Neotoma magister*) at Fort Indiantown Gap	Christopher Hauer	Pennsylvania Department of Military and Veterans Affairs
14:40-15:00	A plan for American marten reintroduction to Pennsylvania	Thomas J. Keller	PA Game Commission
15:00-15:20	**BREAK**		
		Moderator:	
15:20-15:40	Pennsylvania Bat Management Through Innovative Techniques	Michael Scafini	PA Game Commission
15:40-16:00	Widespread use of rocky outcrops by hibernating bats in Ohio and Pennsylvania	Levi E. Johnson	PA Game Commission
16:00-16:20	Urban planning for bats: green roofs and the surrounding environment	Darian Hauf †	Millersville University
16:20-16:40	Hare today, gone tomorrow: recent snowshoe hare range contraction in Pennsylvania	Amanda L. Zak †	Pennsylvania State University
16:40-17:00	Large-scale assessment of genetic structure of white-tailed deer: applications to genetic assignment tests	Alberto F. Fameli †	Pennsylvania State University
17:00-17:20	Clinical presentation of rabies virus in pennsylvania white-tailed deer (*Odocoileus virginianus*): association with chronic mutilation	Madison Stevens †	University of Pennsylvania School of Veterinary Medicine

Concurrent Session 2 – Ballroom A

Time	Title	Presenter	Affiliation
		Moderator: DiLorenzo	
13:00-13:20	Utilizing supplemental data sources to estimate occupancy of marsh birds, a group of species of greatest conservation need	Kathleen P. Gundermann †	Pennsylvania State University
13:20- 13:40	Examining the responses of Scarlet Tanager (*Piranga olivacea*) abundance, space use, and habitat selection to forest management in the Poconos region of Pennsylvania	Tyler James Hodges †	Indiana University of Pennsylvania
13:40-14:00	Using LiDAR and autonomous recording units to model Ruffed Grouse (*Bonasa umbellus*) drumming habitat in Pennsylvania	Randall Koleck †	Indiana University of Pennsylvania
14:00-14:20	Examination of Northern Saw-whet Owl (*Aegolius acadicus*) release behavior following banding in red light verses white light	Karter G. Witmer †	Pennsylvania State University
14:20-14:40	Accounting for animal density gradients in distance sampling surveys	Jacob Trowbridge †	Pennsylvania State University
14:40-15:00	Food limitation aligns with contrasting demographics in populations of an at-risk songbird	Emma C. Keele	Indiana University of Pennsylvania
15:00-15:20	**BREAK**		
		Moderator: DiLorenzo	
15:20-15:40	The importance of patch shape at threshold occupancy: functional patch size within total habitat amount	Jeffrey K. Keller	Cornell University
15:40-16:00	Wildlife action planning: an overview of three turtle regional conservation plans	Katharine D. Gipe	PA Fish & Boat Commission
16:00-16:20	The at-risk wood turtle: conservation status and opportunities for partnership	Richard A. Novak	US Fish and Wildlife Service
16:20-16:40	Constructing nesting mounds for freshwater turtles in central Pennsylvania	Travis Russell	Juniata College
16:40-17:00	Eastern Massasauga Rattlesnake monitoring using adapted-hunt drift fence technique (AHDriFT): high detection frequencies, individual identification, and prey assemblages using one cost-effective method	Rex Everett	EnviroScience, Inc.

Concurrent Session 3 – Ballroom B

Time	Title	Presenter	Affiliation
		Moderator: Crisfield	
13:00-13:20	The mountain lion in Pennsylvania: fake news or legitimate occurrence?	Thomas J. Keller	PA Game Commission
13:20- 13:40	Quantifying the invasion: what efforts are needed to conserve rare species from invasive species in mainland and island habitats	Aaron M. Haines	Millersville University
13:40-14:00	Why Promote One Health?	Reginald A. Hoyt	Delaware Valley University
14:00-14:20	Evaluation of the effectiveness of tick mitigation strategies on reducing tick burden and tickborne pathogens across Pennsylvania	Michael G. Rowley	Tick Research Lab of PA
14:20-14:40	Pentobarbital toxicosis in wild avian species of Pennsylvania	Madeline Vile	Wildlife Futures Program
14:40-15:00	Assessing the influence of forest type and West Nile Virus risk on ruffed grouse (*Bonasa umbellus*) occupancy in regeneration timber harvests	Jacob Goldman †	Indiana University of Pennsylvania
15:00-15:20	**BREAK**		
		Moderator: Langlois	
15:20-15:40	American crow movement and resource selection in an area endemic for chronic wasting disease	Tyler S. Walters †	Pennsylvania State University
15:40-16:00	Detection of chronic wasting disease prions in third eyelids from white-tailed deer using RT-QuIC	Jennifer Høy-Petersen	Wildlife Futures Program
16:00-16:20	Updates on conservation efforts and status of the eastern regal fritillary butterfly	Virginia Tilden	Department of Military and Veteran's Affairs
16:20-16:40	The Pennsylvania Biological Survey species status determination process	Elizabeth Crisfield	Strategic Stewardship Initiative
16:40-17:00	Finding your place: navigating our profession and ourselves	Thomas J. Keller	PA Game Commission

Poster Session

Saturday, March 23, 5:15 – 6:15pm

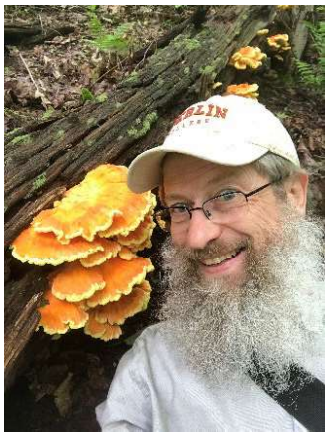
Director's Room

Title	Presenter	Affiliation
A Review the Amphibian Diversity in Somerset, Westmoreland, Indiana, and Cambria Counties in Pennsylvania	Aaron Capouellez †	Indiana University of Pennsylvania
Camera trapping techniques for small mammal communities	Orion Groff, Mary Weiss †	Millersville University
Integrating wildlife health priorities in the 2025-2035 Pennsylvania Wildlife Action Plan	R. Scott Larsen	Wildlife Futures Program
Land cover analysis of small mammal presence based on barn owl pellets	Evelyn Orlowski †	Millersville University
The Pennsylvania Biological Survey: mission, membership, and activities	Brady Porter	Duquesne University
Baseline mammal surveys at Powdermill Nature Reserve using camera traps and environmental DNA	Abigail Powell †	Duquesne University
Population structure and landscape connectivity of the American black bear (*Ursus americanus*) in Pennsylvania	Joshua Robinson †	Duquesne University
Modeling population demographics in a game species: a case study for wild turkey in Pennsylvania	Veronica A. Winter †	Pennsylvania State University
Uncovering the diet of Wood Thrush and Veery in ecological forestry gaps using DNA metabarcoding	Cassandra Ziegler, Ava Bailey †	Duquesne University

Banquet Presentation

Saturday, March 23 6:30 – 8:30pm

Lobby & Ballroom



Charles W. Bier

Conservation Scientist Emeritus

Western Pennsylvania Conservancy

A Career in Biodiversity Conservation: Slowly Shifting Paradigms

In the 1970s "biodiversity" was an incomplete concept and not a term much in use. Biodiversity conservation emerged in the following decades as a goal but is still in flux. The concepts of surrounding biodiversity and what should drive its conservation have become more informed over time, but as usual, in things of science and human values, need to be further refined. This talk offers personal perspectives over several decades from someone working in the field of biodiversity studies and the conservation of nature and provides examples from that experience.

Charles is a western Pennsylvania native and studied ecology at the University of Wisconsin. He has broad experience in regional flora, fauna, ecosystems, and conservation issues. Much of his focus has been on rare and endangered species, natural communities, and biodiversity conservation. Since 1981 he has worked for WPC; first as part of the PA Natural Heritage Program, and then broadly providing science support across programs. He is a Research Associate at Carnegie Museum of Natural History in the Section of Invertebrate Zoology and has been involved with several state committees including the Governor's Invasive Species Council, DCNR's Ecosystem Management Advisory Committee and technical committees of the PA Biological Survey. Charles retired at the end of 2023.

PA TWS AWARDS PRESENTATIONS

Annual Chapter Meeting Student Grants:
Evelyn Orlowski
Orion Groff
Terra Haines
Samantha Miron
Mary Weiss
Claire Rohrer

Frank Felbaum Scholarship:
Makayla Holleran

PA TWS Professional Development Grant:
Aaron Haines

Gordon Kirkland Lifetime Achievement Award

Best Student Paper Award

Best Student Poster Award

Raffle and Silent Auction Winners Announce

Abstracts

Paper Presentations

**in alphabetical order by session 1, 2 and 3*

Estimating Pennsylvania's elk population: lessons learned from 5 years of aerial surveys

Jeremy Banfield, David Stainbrook, and Dr. Chris Rosenberry, Pennsylvania Game Commission, 2001 Elmerton Avenue, Harrisburg, PA 17110

Jeremy Banfield, (814) 279-4542, jebanfield@pa.gov; professional oral presentation

Estimating abundance of wildlife populations continues to be one of the main challenges for nearly all wildlife agencies. Since 2020, the Pennsylvania Game Commission has been using a mark–resight-style estimate in which radio-collared individuals serve as the "marks" and an aerial survey utilizing infrared imagery provides the "resight." The aerial survey is contracted through Owyhee Air Research, based in Nampa, ID. GPS locations derived from radio collars are compared to aerial observations *post-hoc* to derive a detection rate. The traditional Lincoln-Peterson estimator then is used to estimate the overall population. Over the past 4-5 years, detection rates ranged from 59-85% and point estimates ranged from 1480-1278 with consistent overlap in confidence intervals, suggesting a relatively stable elk population. Logistical challenges, weather, terrain, and differentiation between deer and elk will be discussed during the presentation.

The Least Weasel (*Mustela Nivalis*) in Pennsylvania: a review of what is known, not known, and next steps for assessing populations of one of the state's most enigmatic mammals

Charlie Eichelberger, Ryan Miller, and Joe Wisgo (formerly), PA Natural Heritage Program, P.O. Box 8552, Harrisburg, PA, 17105-8552; Tammy Colt, Justin Duncan, Tom Keller, and Mike Scafini, Pennsylvania Game Commission, 2001 Elmerton Avenue, Harrisburg, PA 17110

Charlie Eichelberger, (717) 346-0076, ceichelberger@paconserve.org; professional oral presentation

Of Pennsylvania's 61 extant, native, regularly occurring mammal species, the Least Weasel (*Mustela nivalis*) remains one of the most poorly understood since its discovery in the state in 1900. Studies carried out by the PA Game Commission in 1929 and repeated in 1952 using records from the bounty system are the only dedicated studies of the species. Modern reports of PA Least Weasel observations have been at the rate of approximately one every five years. With these limited data, a reasonable assessment of the Least Weasel's conservation status is not possible. A 2021 study of North American weasels (*M. nivalis*, *M. richardsonii*, *Neogale frenata*) reported an 87-94% decline, and range-wide interest is growing to gathering more population information on all three weasel species. With this in mind, we have initiated a study to test efficacy and efficiency of different survey methods targeting Least Weasel at sites within its historic range, with special consideration given to recent (<20 years old) reliable reports. This ongoing study is testing modified trail camera setups focused on all weasel species with the hope of locating populations of Least Weasel where techniques may be further refined to help with an assessment of its conservation status. Since initiating the study in October 2022, surveys have been conducted in nine counties with 450,000 survey photos reviewed from 143 camera locations. Our preliminary results show that our modified trail camera setups are a useful survey device for all weasels and are necessary for passive detection of Least Weasel. Crude comparisons of contemporary weasel harvest data to historic bounty data suggest Pennsylvania's weasel populations likely have exhibited the population declines detected elsewhere, and all three weasel species are in need of expanded research efforts.

Large-scale assessment of genetic structure of white-tailed deer: applications to genetic assignment tests

Alberto F. Fameli, Kelly Russo-Petrick, Pennsylvania Cooperative Fish and Wildlife Research Unit, The Pennsylvania State University, University Park, PA 16802; Christopher S. Rosenberry, Pennsylvania Game Commission, 2001 Elmerton Ave, Harrisburg, PA 17110; Krysten L. Schuler, Cornell Wildlife Health Lab, New York State Wildlife Health Program, Ithaca, NY 14853; Michael J. Tonkovich, Ohio Department of Natural Resources, Division of Wildlife, 360 East State Street, Athens, OH 45701; Jessie E. Edson, Pennsylvania Cooperative Fish and Wildlife Research Unit, 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

Alberto F. Fameli, (814) 862-8163, ajf6443@psu.edu; student oral presentation

Delineation of Management Units (MU) is an important step in disease control, determining the extent of areas to be monitored and treated. Genetic analyses can help delineating MU, identifying genetic clusters separated by barriers to gene flow. If differences between these genetic MUs are strong, assignment tests can be applied to infer geographic origin of individuals of interest. We assessed genetic structure in white-tailed deer from Ohio and the mid-Atlantic region of USA (n=5,701), genotyping 10 microsatellites and applying spatial and non-spatial Bayesian clustering methods (BCM). Non-spatial BCM inferred two clusters: one mostly in Ohio and western Pennsylvania, the other in New York and the Valley and Ridge province of Pennsylvania, Maryland, and Virginia. Spatial BCM indicated nine clusters, identifying some barriers inferred in previous small-scale studies. We created simulated reference populations representing each nonspatial BCM cluster, spatial BCM cluster, physiographic province, and state. We performed genetic assignment tests of individuals to these reference populations, evaluating their performance. As expected, assignments to physiographic provinces or states (i.e., anthropogenic units) performed poorly (≈53% correct assignments). Assignments to non-spatial BCM clusters performed relatively well (≈73.4% correct assignments), but large geographic extent of these clusters makes assignments uninformative for management, while assignments to spatial BCM clusters performed poorly. We concluded that differences between spatial BCM clusters are too subtle to be used for inference of geographic origin, although management could benefit from incorporating detected landscape barriers into disease control. Future research incorporating more markers could improve efficiency of assignment tests.

Status of Allegheny woodrats (*Neotoma magister*) at Fort Indiantown Gap

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The Allegheny woodrat (*Neotoma magister*) is a medium-sized rodent closely associated with rocky habitats of the Appalachian Mountains in the eastern United States. Since the late 1970s, this species has experienced population declines throughout much of its historic range, including Pennsylvania where the species is listed as threatened and designated as a species of greatest conservation need. The Allegheny woodrat population at Fort Indiantown Gap National Guard Training Center in Annville, Pennsylvania has been monitored since 1999. To date, 27 habitat sites have been identified on the installation, most of which are located on the south-facing slope of Second Mountain which forms the northern boundary with State Game Lands 211. These sites consist of small (<0.5 ha) rock outcrops and boulder fields within mature oak-hickory forest. In the fall of 2016 to 2023, we searched known sites for fresh sign (e.g., food caches, latrines) and confirmed presence using baited camera-traps. Naïve occupancy ranged from 0.50 to 0.91. Based on camera-trap data from a subset of

sites, relative abundance of woodrats increased each year, suggesting that the population has remained stable or possibly increased in recent years. In 2022 and 2023, we documented several sub-adult woodrats, providing further evidence of successful reproduction on the installation. In the future, we plan to identify and survey additional habitat sites, assist with supplemental feeding and the distribution of anthelminthic baits, and assess the use of prescribed fire to increase food resources while reducing the prevalence of raccoon roundworm (*Baylisascaris procyonis*) surrounding known sites.

Urban planning for bats: green roofs and the surrounding environment

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Urbanization is a leading cause of habitat loss leading to biodiversity decline, including bats. Green roofs may provide a potential solution by providing alternative habitat for urban biodiversity. It has been hypothesized that green roofs are beneficial to bat species by attracting insects for them to eat. The goal of this research project was to determine if green roofs promote a higher rate of bat activity than conventional roofs. To determine this, acoustic audio devices were placed on numerous green and conventional roofs in Lancaster City, PA,. to record the frequency of bat activity and species diversity. Bat vocalization data were then downloaded and analyzed to determine the quantity of bat calls given by each bat species. Bat vocalization data were compared between green and conventional roofs along with other ecological variables within 100m (e.g., tree canopy cover, distance to water, etc.) to determine whether there was a significant effect on bat activity. We found that bat activity and presence, including bat species of greatest conservation need, was higher on green roofs in conjunction with other ecological variables.

The effects of an abandoned open strip mine on diversity and occupancy of mammals at Powdermill Nature Reserve

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Open-pit strip mining through the mid 1900s in Pennsylvania led to removal of forest habitat, landscape alterations, and soil and watershed contamination. Starting in the 1960s, the practice largely was eliminated as forests regenerated across the state. However, the legacy of mining may continue to impact species diversity because of its long-lasting effects. Powdermill Nature Reserve is an excellent study site to address this topic, as it encompasses the remains of an abandoned open-pit strip mine. In May 2022, we installed a network of 24 camera traps in two mine plots and one control plot to compare diversity and occupancy of mammals. Mammal diversity was examined for a 90-day survey period (24 May to 15 August 2022) and occupancy across 184 days (24 May to 30 December 2022). We found higher diversity in the mine plots, potentially due to more fine-scale variation in topography and vegetation. There was no difference in occupancy for red fox (*Vulpes vulpes*), cottontail rabbit (*Sylvilagus floridanus*), and porcupine (*Erethizon dorsatum*). Bobcats (*Lynx rufus*) had higher occupancy in the control plot, whereas coyotes (*Canis latrans*) had higher occupancy in the mine plots. This study provides insight on how abandoned open-pit strip mines affect mammal diversity and habitat use. Reclamation of the abandoned open-pit strip mine at PNR is planned for fall 2024. We will continue this study to evaluate changes to mammal diversity and occupancy after reclamation and assess effectiveness of the intervention.

Widespread use of rocky outcrops by hibernating bats in Ohio and Pennsylvania

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Bats commonly use subterranean environments for hibernation; however, few studies have investigated bat use of rocky outcrops for overwintering. We searched rocky outcrops from 15 December to 15 March, 2018–2021, and found 333 bats in 179 winter roosts. *Eptesicus fuscus* (Big Brown Bat) was found most often, but *Lasionycteris noctivagans* (Silver-haired Bat), *Perimyotis subflavus* (Tricolored bat), *Myotis lucifugus* (Little Brown Myotis), and *Myotis leibii* (Eastern Small-footed Myotis) also were observed. Average winter temperatures of 8 roosts were similar to temperatures in randomly sampled rock features. *Pseudogymnoascus destructans* was not detected on any bats. Winter roosts of *Eptesicus fuscus* were higher above the ground, in areas with greater forest cover, and at lower elevations than random features. Bat use of rocky outcrops as hibernacula appears widespread, and we recommend further research into use of these habitats.

A plan for American marten reintroduction to Pennsylvania

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The American marten (*Martes americana*) disappeared from the Pennsylvania landscape over 120 years ago due to massive deforestation and unregulated harvest. The Pennsylvania Game Commission has been working through the process of considering reintroduction of this once common native, and following the completion of a feasibility assessment, staff recently developed a long-term reintroduction and management plan. This document provides historical perspective, and information on ecology and habitat as well as cooperative partnerships. The plan also describes translocation methods, research and monitoring efforts, information and education strategies, and long-term population management strategies. A detailed budget and working timeline are included, as well as a variety of supporting information from letters of support to detailed plans for building holding and handling boxes. The plan is a science-based roadmap for returning a species to the forests of Pennsylvania while addressing public and partner concerns and reflecting the social support for such an effort.

Allegheny woodrats on the road to recovery in Pennsylvania

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Allegheny woodrats (*Neotoma magister*) are a species of greatest conservation need in Pennsylvania that has experienced precipitous declines across their range, likely due to a combination of limited food availability, habitat fragmentation, and disease. Our most recent surveys indicate that 70% of Pennsylvania's Allegheny woodrat sites now are extirpated, and we recently have documented seemingly stable populations wink out in less than a year. Because of this, the Pennsylvania Game Commission's Mammal Recovery team has been leading a combination of emergency actions to stabilize populations before they are lost, and long-term actions geared towards improving conditions for Allegheny woodrats into the future. Emergency actions taken to date

include supplemental feeding, translocation of individuals, and anthelmintic baiting; long-term initiatives such as habitat management, creating and improving rock features, and captive breeding programs are started. Capture surveys indicate priority sites that have received emergency actions have stable or increasing populations, and camera-trap surveys indicate that efforts to connect suitable habitats have been successful. Though the road to recovery is long, this multi-faceted approach to Allegheny woodrat recovery shows signs of promise.

Pennsylvania Bat Management Through Innovative Techniques

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The management of Pennsylvania bats has become of increasing importance in a White-nose syndrome (WNS) endemic landscape. This disease is caused by the invasive fungal pathogen *Psuedogymnoascus destructans* (Pd), which has devastated Pennsylvania's bat species since its introduction to the state in 2008, with nationwide estimates of >90% decline for three cave-hibernating species (*Myotis septentrionalis*, *M. lucifugus*, and *Perimyotis subflavus*). However, few effective management tools exist to help bats combat this disease. The PA Game Commission (PGC) and its partners have taken bold steps to aid in their recovery, with the PGC becoming a leader in this field, spearheading various novel strategies for bat management. One strategy includes the application of Polyethylene Glycol (PEG) 8000 to hibernacula as a means of delaying the environmental transmission of Pd to bats in early winter, thus limiting WNS disease effects and thereby benefiting bats. This work has shown significant decreases in both Pd load and infection extent in two studied species and a decrease in Pd prevalence in one species. Another developing strategy entails the manipulation of hibernacula to maximize the influx and capture of cold air, thus providing internal temperatures that meet those conditions that *M. lucifugus* survivors are seeking, with positive population trends where these techniques are successful.

Clinical presentation of rabies virus in pennsylvania white-tailed deer (*Odocoileus virginianus*): association with chronic mutilation

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Rabies is a universally fatal, prominent viral disease that affects a wide variety of mammalian species, notably small to medium-sized carnivores. However, other mammals, including large herbivores such as white-tailed deer (*Odocoileus virginianus),* also can be affected. Due to the increased risk of zoonotic disease, any external indication that an animal may have rabies would help wildlife handlers and field staff take appropriate precautions to reduce the risk of exposure. Between 2021 and 2023, six deer in Pennsylvania were diagnosed with rabies at the Wildlife Future's Program, Univ. of Pennsylvania. These animals originated from multiple regions of PA including Bedford (1), Dauphin (2), Jefferson (3), and Delaware (1) Counties, and consisted of adult females (3), adult males (2), and one yearling female (1). Five presented with neurologic clinical signs including running in circles, pedaling, unawareness, etc., and one was found dead before any behavioral abnormalities were observed. In three out of the six cases, evidence of chronic self-mutilation was observed. Self-mutilation on the head (2) was characterized by areas of hair loss with thickened, hardened skin, and one

case also exhibited bodily mutilation (1). This case series highlights a common and characteristic lesion that can be recognized by wildlife professionals to alert them of the increased potential of rabies in a deer. Recognition of these lesions would enable the appropriate precautions to be taken and prioritization of rabies testing to be performed, with minimal risk to individuals involved, even in animals without known neurological symptoms.

Hare today, gone tomorrow: recent snowshoe hare range contraction in Pennsylvania

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The range of the snowshoe hare (*Lepus americanus*) has been contracting northward along its southern boundary over the last century. In Pennsylvania, winter temperatures and snowfall have been identified as key drivers of this range shift; changes in the distribution of hunter harvests in the late twentieth century show a northward contraction to the coldest regions of the state, and spatial variation in snowfall has been found to explain snowshoe hare site occupancy in these areas. In 2023, we used occupancy modeling based on presence-absence data from tracks and fecal DNA to model current snowshoe hare occupancy across northern Pennsylvania, with a goal of assessing whether range contraction had continued as predicted based on occupancy data collected in 2004. The best model indicated that winter snowfall remained an important factor explaining snowshoe hare occupancy, along with the amount of surrounding forest cover and the proportion of that forest cover in the early-successional stage. Using this model to estimate snowshoe hare occupancy probabilities across the study area in 2004 and 2023 showed an overall decline in occupancy, with the total area with a ≥60% predicted probability of occupancy declining by 86%. This contraction is occurring faster than was previously predicted and was not mitigated by increases in the amount of early-successional forest cover in the study area over the last two decades. These findings have negative implications for the persistence of snowshoe hares in Pennsylvania as the decreasing trend in winter snowfall is expected to continue.

Eastern Massasauga Rattlesnake monitoring using adapted-hunt drift fence technique (AHDriFT): high detection frequencies, individual identification, and prey assemblages using one cost-effective method

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The Adapted-Hunt Drift Fence Technique (AHDriFT) is a camera-trap survey method recently developed for the Eastern Massasauga Rattlesnake (*Sistrurus catenatus*; EMR) as a more efficient alternative to traditional survey techniques. However, the AHDriFT method has not been applied widely outside of pilot studies in Ohio. Our objectives were to determine a baseline index of abundance for two EMR populations in southeastern Michigan using AHDriFT and visual encounter surveys (VES), and to provide recommendations for future monitoring at the two sites. AHDriFT arrays were deployed from mid-May to late October in 2023. The populations did not contain melanistic EMR, and individual EMR were identified based on unique patterns. Detection frequency was calculated for all incidental captures of vertebrate species. At population A, three AHDriFT arrays resulted in five observations of four EMR individuals. At population B, five AHDriFT arrays resulted in 40 observations of 29 EMR individuals. EMR observations peaked in mid-September, and the latest observation was on 24 October. Incidental observations included a minimum of 15 mammal species, four reptiles, two amphibians, and five birds at population A and 13 mammals, seven reptiles, two amphibians,

and three birds at population B. VES surveys recorded one EMR in 18.7 person-hours at population A and two EMR in 33.5 person-hours at population B. This study adds to a body of evidence in favor of using AHDriFT for long-term monitoring of EMR populations throughout its range and is the first to identify individual EMR using camera traps.

Wildlife action planning: an overview of three turtle regional conservation plans

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Since 2007, combined resources from the State Wildlife Grant funding program have been made available at the regional level to address conservation priorities common across state lines. The Northeast region has been very successful leveraging these grant funds to advance conservation of turtle species of greatest conservation need. Of particular relevance to Pennsylvania, over the past several years, we have seen completion of regional status assessments and conservation plans for the wood turtle (*Glyptemys insculpta*), spotted turtle (*Clemmys guttata*), and eastern box turtle (subspecies woodland box turtle, *Terrapene carolina carolina*). These assessments and plans provide (1) an overview of the biology and ecology of each species in the northeast, (2) a summary of threats to the species, (3) results of a standardized sampling protocol, (4) a regional genetic assessment, and (5) an analysis of regional habitat impairment. Finally, they present a regional strategy for conserving the species and addressing key threats. Each conservation plan also provides a Conservation Action Plan that details recommendations to address threats and support the long-term persistence of the turtles. Appendices include habitat management guidelines and best management practices.

Utilizing supplemental data sources to estimate occupancy of marsh birds, a group of species of greatest conservation need

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Understanding distributions and habitat associations of species of greatest conservation need (SGCN) is critical for making appropriate management recommendations. However, some SGCN, such as marsh birds, are difficult to monitor due to their secretive nature. In Pennsylvania, many marsh birds are considered species of conservation need and primarily are monitored through systematic, repeated detection/non-detection surveys. However, additional data sources on marsh birds are available through semi-structured surveys conducted by volunteers using guidelines provided by the PGC, and unstructured community science data (e.g., eBird). Our objective was to compare the effect of supplemental data sources on the precision of site-level occupancy estimates using a multi-species, integrated data occupancy model in a Bayesian framework. We first developed this modeling framework and compared the precision of site-level estimates of occupancy using different combinations of data types. In addition, we used spatial splines to account for unexplained spatial autocorrelation of occupancy estimates. This modeling framework allowed us to share information about detection probability from the structured surveys with the semi- and unstructured surveys. Our results indicate that supplemental data, in the form of semi-structured or community science detections, increased precision of occupancy estimates, specifically in areas where structured surveys were not conducted. We found that habitat associations were the largest drivers of probability of occupancy in all models, especially for ground nesting

species. Through this work, we have highlighted how the use of supplemental data sources, such as unstructured community science data, can increase the precision of occupancy estimates for low-density and elusive species.

Examining the responses of Scarlet Tanager (*Piranga olivacea*) abundance, space use, and habitat selection to forest management in the Poconos region of Pennsylvania

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Scarlet Tanagers (*Piranga olivacea*) are migratory songbirds that breed in forests throughout eastern North America. Short-term population indices reveal an alarming range-wide decline of 10.4%. Within Pennsylvania, they are listed as a species of greatest conservation need (SGCN), partly because 13.73% of the global breeding population dwells in the state. Existing literature indicates that this mature-forest-nesting species responds variably to forest management, potentially complicating conservation. We investigated Scarlet Tanager abundance, space use, and resource selection in forests with varying intensities of management in northeastern PA. We leveraged point-count data collected at 876 locations in the Poconos during 2019-2021 and tracked 16 adult males via radiotelemetry in 2023. Forest structural covariates were gleaned from a high-resolution LiDAR dataset. Analysis of point-count data revealed that abundance had negative relationships with understory density and canopy surface heterogeneity. Average home range size was 9.01 ha (95% CI: 4.88–15.20 ha), and average core use area was 1.93ha (95% CI: 1.08–3.17 ha). Core use areas were larger for birds in managed blocks than those in unmanaged blocks. No differences were found in forest structure between core use and peripheral home ranges, although structure differed when comparing each space-use metric between managed and unmanaged sites. Preliminary third-order habitat selection analyses reveal individual variation in selection patterns, but in most instances, LiDAR covariates we considered were poor predictors of used locations. Conservation practitioners can use these results to balance needs of Scarlet Tanagers and more imperiled, management-reliant SGCN such as Golden-winged Warblers (*Vermivora chrysoptera*).

Food limitation aligns with contrasting demographics in populations of an at-risk songbird

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Golden-winged Warblers (*Vermivora chrysoptera*) have become rare across much of their historic breeding range and response to conservation efforts is variable. Evidence from several recent studies suggests potential food limitation may be driving breeding output disparity between two subpopulations of the warbler's

Appalachian breeding range: central Pennsylvania ("central subpopulation"), where breeding productivity is relatively low, and eastern Pennsylvania ("eastern subpopulation"), where breeding productivity is relatively high. To test the food-limitation hypothesis in this system, we measured density of caterpillars, plasma lipid metabolites (triglycerides and glycerol), body mass of adults, and acquired data for body mass of fledglings at 38 sites managed for nesting habitat. Contrary to our predictions, we counted 55% more caterpillars (n = 970, 20 sites) in the central subpopulation. However, leaf-roller caterpillar density was 24x lower in the central subpopulation. In warbler blood samples (n = 82, 22 sites), triglyceride concentrations peaked when males first arrived on the breeding grounds in the eastern subpopulation, but were similar between subpopulations when adults were feeding nestlings. Glycerol concentrations and adult body mass were higher in the eastern subpopulation across both breeding stages. Finally, fledgling body mass (n = 156, 19 sites) also was 11% lower in the central subpopulation. Collectively, our results suggest that poor breeding success of Golden-winged Warblers in the central subpopulation could be driven by limitation of preferred prey (leaf-roller caterpillars), and this in turn, reduces their response to conservation efforts.

The importance of patch shape at threshold occupancy: functional patch size within total habitat amount

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The habitat amount hypothesis (HAH) stresses the importance of *total patch amount* over the size of individual patches in determining species richness within a local landscape. However, the absence of some species from patches too small to contain a territory would be inconsistent with the HAH. Using the association of territory size with body size and the circle as optimal territory shape, we tested several HAH predictions of threshold patch occupancy and richness of 19 guilds of primarily insectivorous breeding birds. We characterized 16 guild-associated patch types at high spatial resolution and assigned one type to each guild. We measured *functional patch size* as the largest circle that fit within each patch type occurring in a local landscape. Functional patch size was the sole or primary predictor in regression models of species richness for 15 of the 19 guilds. Total patch amount was the sole or primary variable in only 2 models. Quantifying patch size at high resolution also demonstrated that breeding birds should be absent from patches that are too small to contain a territory and larger species should occur only in larger patches. Functional patch size is a readily interpretable metric that helps explain the habitat basis for differences in species composition and richness between areas. It provides a tool to assess the combined effects of patch size, shape, and perforation on threshold habitat availability, and with total patch amount can inform design and/or evaluation of conservation, restoration or enhancement options for focal taxa or biodiversity in general.

Using LiDAR and autonomous recording units to model Ruffed Grouse (*Bonasa umbellus*) drumming habitat in Pennsylvania

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Many eastern forest bird populations, such as Ruffed Grouse (*Bonasa umbellus*)— a species of greatest

conservation need in PA—have declined over the past half-century due to reduced availability of early successional communities as forests in the region have matured. Efforts to increase availability of early successional communities and associated monitoring programs are challenged by an incomplete understanding of the amount and distribution of existing shrublands and young forest, especially across large spatial extents comprised of multiple ownership types. This challenge is driven by a lack of remotely sensed data that can accurately identify shrublands and young forests. We present a novel approach to overcome this challenge using two advancing technologies: autonomous recording units (ARUs) and Light Detection and Ranging (LiDAR). We surveyed grouse at 1038 unique locations in Pennsylvania from 2020-23 and used resulting occurrence data to create a weekly grouse detection history for each location. We then modeled grouse presence using several LiDAR-derived metrics of forest structure. Grouse presence was best predicted by latitude (+), number of survey days (+), and two LiDAR metrics: percent of first returns at 1-5 m (quadratic; understory density) and canopy height (quadratic) (AUC = 0.843, Brier's score = 0.151). Both covariates are indicative of grouse association with young forest communities embedded in local landscapes with complex structure. Work is ongoing to create a predictive Ruffed Grouse occurrence map for Pennsylvania to inform monitoring and habitat restoration efforts.

The at-risk wood turtle: conservation status and opportunities for partnership

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Like many northeastern turtle species, the wood turtle (*Glyptemys insculpta*) is in decline across much of its range due to habitat loss, illegal collection, road mortality, and other factors. This stream-obligate species currently is under review for federal listing under the Endangered Species Act of 1973, and its state status varies across its range. Proactive conservation of this species is a key tool in addressing the issues leading to its decline. However, resources available to turtle managers often are limited. I present summarized findings of my master's thesis which explored the potential value of new partnerships for including wood turtles in stream restoration design and implementation, a practice that historically has not focused on wood turtles, to provide conservation benefit to the species. I demonstrate that the stream restoration community appears highly willing to consider the wood turtle in their work, but is in need of guidance to do so effectively. I also show that historical stream restoration effort in PA greatly overlaps with the species, and significant levels of funding have been expended in areas where wood turtles occur. Additionally, I share some case study examples of recently completed stream restoration projects, and discuss them in the context of the species. These components highlight the value of interdisciplinary work among natural resource professionals to address the needs of this at-risk species, and point to the need for targeted research on how to effectively incorporate wood turtle habitat in stream design.

Constructing nesting mounds for freshwater turtles in central Pennsylvania

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Freshwater turtle conservation presents challenges that vary by species and location. Adult female turtles are at greater risk of injury or mortality during nesting seasons. Suitable nesting habitats are limited for turtles in central Pennsylvania and there are several species of special concern that may benefit through the construction of nesting habitat. We began working with the Pennsylvania Game Commission in 2021 to create large nesting mounds of sand and shale for freshwater turtles near streams and lentic wetlands on State Game Lands in central Pennsylvania. Our goals were to create additional nesting habitat, mitigate turtle road mortality, and

provide safe distances away from roads to reduce future mortality in all age classes of local freshwater turtle species. Basking habitat was created for turtles near the nesting mounds. We discuss the planning process, materials, personnel, and cost, to provide guidance when creating nesting habitats for freshwater turtles. We review our monitoring of constructed nesting mounds, including protecting nests to increase hatchling recruitment. Our project demonstrates the value of collaborative conservation efforts between academic research teams, state and federal agencies, and local conservation agencies.

Accounting for animal density gradients in distance sampling surveys

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Monitoring the abundance of large ungulates via distance sampling has often used roads as transects because these species can avoid observers on foot and dense vegetation rules out aerial surveys. When roads are used as transects the distance sampling estimator likely will be biased because (1) deer are not distributed uniformly with respect to distance from a road and (2) roads are not distributed randomly on the landscape. We use auxiliary data on the density gradient of deer relative to transects and a generalized form of the distance sampling estimator to eliminate the assumption that objects must be uniformly distributed relative to the transect. However, the generalized estimator is unbiased only for the area surveyed. To account for roads not being representative of the study area, we further modified the estimator to incorporate data on the proportion of the population encountered in the surveyed region. We illustrate our approach using data from white-tailed deer populations in Pennsylvania, USA where both detection and distribution is affected by using roads as transects. We used locations from a sample of deer fitted with GPS satellite radio-collars as auxiliary data to model the distribution of deer. We show that violation of assumptions when using roads as transects results in unpredictable bias in the standard distance sampling estimator.

Examination of Northern Saw-whet Owl (*Aegolius acadicus*) release behavior following banding in red light verses white light

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Karter Witmer, (570) 439-4787, kgw5107@psu.edu; student oral presentation

Project Owlnet began in 1997 to study the migration of Northern Saw-whet Owls (*Aegolius acadicus*) and to date, thousands of owls have been captured and banded. Volunteers of the project communicate often and have noted instances of predation. To reduce predation, volunteers proposed using red light as opposed to white light while processing the owls to decrease the effect of light on their vision upon release. This study was conducted to determine predation rate upon release and the impact of the color of artificial light used to process the owls on their release behavior. Owls were captured for two years at the Penn State DuBois station in

Ridgway, Pennsylvania and banded inside a well-lit room, alternating the color of light between white light and red light for each owl. The owls were then taken outside and recorded upon release with a thermal imaging monocular to observe behavior and to determine the amount of time it took for the owl to fly away. Ultimately, this study observed no predations of the 63 owls recorded but found a significant decrease in the average amount of time it took for the owls to fly from the release perch when they had been processed using the red light verses white light ($p = 0.012$). With further behavioral analysis, conclusions from this study could lead to changing the Project Owlnet protocol to include a recommendation for the use of red light while processing owls to create a less invasive banding environment.

The Pennsylvania Biological Survey species status determination process

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The Pennsylvania Biological Survey (PABS) is an all-volunteer organization whose purpose is to increase knowledge of, and foster the perpetuation of, the natural biological diversity of the Commonwealth of Pennsylvania. An important responsibility of the organization is to determine the status of wild species of animals, plants, and other organisms occurring in the state. The process for determining status of species, subspecies, and varieties of organisms and ecological communities is an adaptation of standard methods developed by NatureServe, the International Union for Conservation of Nature, and the Committee on the Status of Endangered Wildlife in Canada. PABS' status determination is advisory, not regulatory. This presentation will explain the steps taken by PABS technical committees to review the biological diversity of Pennsylvania to identify risks of decline and possible extirpation.

Assessing the influence of forest type and West Nile Virus risk on ruffed grouse (*Bonasa umbellus*) occupancy in regeneration timber harvests

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Ruffed Grouse (*Bonasa umbellus*) populations have experienced long-term declines and are considered a species of greatest conservation need in Pennsylvania. These declines are strongly correlated with reduced availability of early successional forest and, in more recent decades, West Nile Virus (WNV). Monitoring grouse response to habitat creation through the lens of WNV and forest community type can provide managers with insight regarding drivers of grouse population recovery. We deployed automated recording units (ARU) at 307 timber harvests (7–16-year-old) in Pennsylvania from April-May 2021-23. Survey locations were stratified by WNV risk level (low vs. high) and forest type (mixed oak vs. northern hardwoods). Drumming grouse were detected at 232 of 307 (75%) survey locations. In our global model, grouse occupancy was most influenced by latitude (+) and small woody stem density (-). While the global model set suggested that WNV risk was a poor predictor of occupancy, parsing the dataset by forest type revealed a strong effect of WNV risk on grouse occupancy in oak-dominated landscapes, but not in those dominated by northern hardwoods. Nonetheless,

managers in Pennsylvania can expect generally high grouse occupancy in 7–16-year-old forest regardless of forest type, especially at northern latitudes. However, our results suggest that the WNV decision support tool might be improved by accounting for forest type. We plan to expand this work by 1) applying abundance-based models to our ARU-derived grouse detection histories and 2) conducting additional years of ARU sampling to investigate how grouse populations respond to annual variation in WNV prevalence.

Quantifying the invasion: what efforts are needed to conserve rare species from invasive species in mainland and island habitats

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Aaron Haines, (717) 871-7451, aaron.haines@millersville.edu, Professional oral presentation

Invasive alien species (IAS) are one of the greatest threats to global biodiversity and one of the leading causes of federal protection required for native species under the United States Endangered Species Act (ESA). Our goal was to document how IAS impact threatened and endangered species (T&ES) under the ESA to improve recovery efforts. We reviewed Federal Register listing decisions for 1,545 T&ES listed under the ESA and found that 58% were impacted by IAS. Pacific Island T&ES (97%) face greater threats from IAS compared to Mainland (38%) and Atlantic Island T&ES (22%), but the number of IAS impacting T&ES has increased over time in all 3 geographic areas, except for animals on Atlantic Islands. We found that IAS impacted T&ES most through adverse habitat modification, predation, and competition. Most of the negative interactions caused by IAS on the mainland were from invasive fish and plants, while on the Pacific and Atlantic Islands they were caused by invasive mammals and plants. IAS causing the greatest number of negative interactions included rats, pigs, goats, fish, and various genera of plants. Based on our findings, immediate actions are needed to protect native biodiversity in the U.S. from IAS, especially on Pacific Islands. Such management actions include restoration of native habitat, development of robust policies that aim to prevent the further spread and establishment of IAS, and effective decision support tools. These efforts will require coordinated government leadership, especially given the synergistic impacts of international trade and climate change.

Detection of chronic wasting disease prions in third eyelids from white-tailed deer using RT-QuIC

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Chronic wasting disease (CWD) is a fatal neurodegenerative disease caused by prions found in cervid species

and new cases continue to appear in cervid populations in North America and globally. The current gold standard for diagnosing CWD is by enzyme-linked immunosorbent assay and immunohistochemistry (IHC) to detect infectious CWD prion protein in the obex and/or retropharyngeal lymph nodes. Acquiring these samples can be challenging as they require anatomical knowledge, skill, and time to dissect. The third eyelid is a lymphoid tissue that is more easily collected than lymph nodes. In this study we explored whether third eyelids from naturally infected white-tailed deer (*Odocoileus virginianus*) are a reliable tissue for detecting infectious CWD prions using real-time quaking-induced conversion (RT-QuIC), if positive results can be confirmed by IHC of third eyelids, and if these results are reproducible between labs. Out of 121 third eyelids from known CWD-positive white-tailed deer, 114 tested positive by RT-QuIC (94% sensitivity), and all 99 third eyelids from previously confirmed CWD-negative deer tested negative by RT-QuIC (100% specificity). Additionally, we found that pooling third eyelid samples had an 89% sensitivity and 100% specificity by RT-QuIC. While IHC on third eyelids can be used to support a positive RT-QuIC diagnosis, using IHC on third eyelids alone should be performed with caution as further validation is required. Our results support that third eyelids could be used as a potentially more cost-effective way for management agencies to improve and expand their CWD surveillance.

Why Promote One Health?

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Reginald Hoyt, (215) 489 2943, reginald.hoyt@delval.edu; Professional oral presentation

Wildlife management, as a profession, embraces the principle that management must not solely focus on animal species, but also must recognize the interactions between species, environments, and humans. The concept of One Health also recognizes the inextricable connection among these elements, although it primarily has focused on health-related issues. This paper will argue that the promotion of the One Health concept can help address the challenges and goals of wildlife conservation and management by promoting to all students and community members the linkages identified within the model and recognizing the responsibilities everyone has for environmental and species well-being, but also how interactions with these elements also benefit our own well-being. Tangle benefits may be accrued by each of the One Health elements while promoting greater interaction with the natural world and trans-disciplinary approaches to addressing issues faced locally, regionally, and/or internationally. Delaware Valley University has been promoting the One Health concept across all majors and within its greater community. Examples of its efforts will be used to support the benefits of encouraging the broader use of this concept in the wildlife community, along with addressing how it may benefit specific issues of concern to the management and conservation profession.

The mountain lion in Pennsylvania: fake news or legitimate occurrence?

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

The last wild mountain lion (*Felis concolor*) in Pennsylvania was thought to have been killed in the 1870s, yet over 150 years later, hundreds of Pennsylvanians report sightings each year throughout the state. This therefore begs the question, do mountain lions still haunt the wilderness of the Keystone state, or has this apex predator's legendary status remained only as a ghost of the past? Examining the potential for lion sightings within the state provides a variety of different explanations ranging from escaped domestic animals to distant wild population dispersals and mis-identified species. When sightings are reported, a variety of ways exist to investigate these, and ensuring the right evidence is gathered becomes critical. As the state wildlife agency, the Pennsylvania Game Commission must take these sightings seriously and work hard to educate the public on this once common native species.

Finding your place: navigating our profession and ourselves

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The wildlife profession often is considered a small field with a narrow gate and limited opportunities, but upon closer inspection, many different specialties exist, along with a variety of paths to take. Like other professionals, as we choose paths towards specific career goals, opportunities can narrow along with our focus as we pursue a particular position or title. Once we've reached the mountain top, however, things aren't always as we had anticipated, and we may question our choices. Have we found our place within the profession? How do we know when we've found our place, or how to identify it for the future? Finding place means feeling fulfillment, identity, purpose, and contentment. In some instances, we hurry past our place in pursuit of the next rung along the ladder and we begin to climb away from our passion. Whether a new wildlife student, someone halfway through their career, or a seasoned professional standing on retirements doorstep, it's critical that we use the tools of self-reflection and the experience of our colleagues to make a lasting impact for the resource with the fleeting time we have been given.

Evaluation of the effectiveness of tick mitigation strategies on reducing tick burden and tickborne pathogens across Pennsylvania

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Michael G. Rowley, (301)-848-1456, Mrowley01@esu.edu; Professional oral presentation

Human pathogens vectored by ticks are a growing public health crisis across the United States, comprising over 75% of vector-borne disease cases in the United States. Additionally, small mammals, such as deer mice (*Peromyscus* spp.), are among the most important reservoir hosts for tickborne pathogens. To assess the effectiveness of different mitigation strategies and ultimately reduce rates of tickborne pathogen infection in Pennsylvania, baseline data on black-legged tick (*Ixodes scapularis*) density, small mammal host abundance, and environmental variables were collected across 36 sites including schools, parks, and residential communities in 4 Pennsylvania counties. During baseline data collection from Fall 2022 to Fall 2023, 16,160 adult and nymph black-legged ticks were collected, and 2,313 small mammals were sampled over 3,718 capture events. Ticks collected during drags, and blood and tissue collected from small mammals, were tested for the prevalence of Powassan virus, *Borrelia burgdorferi*, *Borrelia miyamotoi*, *Babesia microti*, and *Anaplasma phagocytophilum* with variant distinction.

Updates on conservation efforts and status of the eastern regal fritillary butterfly

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Virginia Tilden, (717) 861-2449, vtilden@pa.gov; professional oral presentation

Only one population of the eastern regal fritillary butterfly (*Argynnis idalia idalia*) remains, and resides at Fort Indiantown Gap National Guard Training Center (FIG), Annville, PA. The species (including the western and eastern subspecies) is being reviewed for protection under the Endangered Species Act. The future of this species in the East depends on the conservation at FIG, as well as our attempt to reintroduce the butterfly

elsewhere. These efforts include partnerships across multiple organizations and groups such as ZooAmerica, Pennsylvania Game Commission and the US Fish and Wildlife Service. This talk will provide an update on the population at FIG, work completed with our reintroduction partners, and creation of a Candidate Conservation Agreement. We will overview some of the successes and challenges we have faced and discuss future goals and objectives.

Pentobarbital toxicosis in wild avian species of Pennsylvania

Madeline Vile[1], Lisa Murphy[1,2], Sherrill Davison[2], Erica Miller[1], and Kevin Niedringhaus[1]
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Pentobarbital is a common drug used for chemical euthanasia in domestic and wild animals. Scavenging wild birds could consume animals euthanized by this drug, resulting in acute toxicosis and death. While legal requirements exist for disposal of these animals to reduce the risk to scavengers, pentobarbital toxicosis is documented in a variety of avian species. Through necropsy and toxicology testing of the liver and ventricular contents, pentobarbital toxicosis was diagnosed in ten native Pennsylvania birds submitted to the University of Pennsylvania between 2019 and 2024. Species affected include bald eagle *(Haliaeetus leucocephalus)* (3), black vulture *(Coragyps atratus)* (2), red-tailed hawk *(Buteo jamaicensis)* (2), common raven *(Corvus corax)* (1), wild turkey *(Meleagris gallopavo)* (1), and Canada goose *(Branta canadensis)* (1). Reviewing the histories of these submissions showed that only two individuals had known consumption of a dead animal prior to mortality, but half of these animals were clustered or part of the same mortality event. This case series highlights that while uncommon, pentobarbital can result in mortality in multiple native Pennsylvania avian species, including several unexpected or non-scavenging species as well as those of conservation or management importance. Emphases should continue to be placed on proper disposal of chemically euthanized animals and the value of submitting birds with unexplained mortality to diagnostic labs for disease investigation to aid in documentation and prevention of future pentobarbital toxicity cases.

American crow movement and resource selection in an area endemic for chronic wasting disease

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Tyler Walters, (517) 304-0202, tsw5223@psu.edu; student oral presentation

American crows (*Corvus brachyrhynchos*) are common birds found throughout much of North America that utilize both urban and rural landscapes. The relationship between crows and humans can take several forms including hunting opportunities, urban nuisance issues, and agricultural damage. Relative to chronic wasting disease (CWD), interest in crows has increased since 2012 when they were documented to be able to transmit infectious prions after consumption of infected material in a controlled lab setting. Our understanding of how crows move and use the landscape, however, is still limited, especially in areas where CWD is endemic in wild and captive cervids. This is partially due to the difficulty in trapping these birds and a historic lack of suitable GPS transmitters to gather fine-scale data. We captured American crows in central Pennsylvania within Disease Management Area 2 which was created during the initial CWD outbreak in Pennsylvania in 2012. We employed a variety of trapping methods to maximize capture success that included Australian ladder traps,

ground based netlauchers, bownets, walk in traps, and handheld netlaunchers. Crows were captured in both urban and rural areas and outfitted with 10g solar-powered GPS transmitters which collected GPS fixes every 10 minutes. The fine-scale data obtained from these individuals enable a comprehensive assessment of resource selection and movements by crows. We will also determine distance to and use of captive cervid facilities in the area to determine the level of use in areas of known CWD presence.

Abstracts

Poster Presentations

**in alphabetical order*

A Review the Amphibian Diversity in Somerset, Westmoreland, Indiana, and Cambria Counties in Pennsylvania

Aaron Capouellez, and Josiah Townsend, Indiana University of Pennsylvania Kopchick Hall 421 North Walk, Indiana, PA 15705

Aaron Capouellez, 814-475-7800, aaron_capouellez@yahoo.com; Student poster presentation

Amphibians worldwide have declined due to climate change, deforestation, and disease. In Pennsylvania, Twenty-four of forty-two native species are considered either a Species of Special Concern, At-risk, or Endangered at the state level. Documenting amphibian distributions is essential to providing a baseline understanding to support conservation and management planning. Examining locality records over time suggests regional abundance trends and provides evidence of local extirpation. I used publicly available citizen science records, iNaturalist and PARS (Pennsylvania Amphibian and Reptile Survey), as a means of supplementing the available literature and updating our knowledge of amphibian diversity in four target counties: Somerset, Westmoreland, Indiana, and Cambria. The reviewed data from these four counties suggests that declines may have occurred in amphibian species once reported to be abundant. This paper reviews the literature to understand amphibian distributions in the target counties, and on the possibility that declines may have occurred or are ongoing.

Camera trapping techniques for small mammal communities

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Small mammal communities are critical to ecosystem function, consisting of important herbivores, seed dispersers, prey species, predators, and potentially pollinators. Despite their ecological importance, small mammals are often neglected in terms of conservation efforts in favor of larger, more charismatic, mammal species. While live-trapping has been used to monitor small mammal populations, it can be invasive and may require more funding than camera trapping. Due to their cryptic nature, various novel techniques have been utilized for small mammal camera trapping. We tested the efficacy of three camera-trap types (oblique, mostela, and bucket) combined with potential attractants (kill squeaks, scent lures, and meat bait) to photograph and identify small mammals. These novel camera trap techniques may provide insight into the status of Pennsylvania small mammal species of conservation concern, such as Least Shrew (*Cryptotis parva*), Long-tailed Shrew (*Sorex dispar*), Northern Water Shrew (*Sorex palustris albibarbis*), Maryland Shrew (*Sorex cinereus fontinalis*), Prairie Deer Mouse (*Peromyscus maniculatus bairdii*) and Rock Vole (*Microtus chrotorrhinus*). We will compare the success of the various camera-trap types and attractants in capturing greater proportions of small mammal species. Activity patterns, species richness, diversity, and range overlap will also be assessed.

Integrating wildlife health priorities in the 2025-2035 Pennsylvania Wildlife Action Plan

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R. Scott Larsen, (720) 402-7299, rslarsen@vet.upenn.edu; Professional poster presentation

Wildlife health threats include disease-causing organisms, toxins, and pollutants that may negatively impact species or entire taxonomic orders, potentially leading to ecosystem-wide disruptions. This developing project will identify and prioritize existing and emerging health threats that may lead to population-level impacts for Pennsylvania species of greatest conservation need (SGCN). It will describe knowledge gaps, identify priorities for surveillance and research, and evaluate management strategies that could mitigate population-level impacts and geographic spread of priority wildlife health threats. The approach to this project includes assembling working and advisory groups, synthesizing literature on known wildlife health threats, and surveying wildlife health professionals and wildlife agencies in the Northeast. Information from literature searches and survey results will be summarized to generate a succinct wildlife health section for the 2025-2035 Pennsylvania Wildlife Action Plan, with a focus on actionable content.

Land cover analysis of small mammal presence based on barn owl pellets

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Evelyn Orlowski, (484) 753-4780, evorlows@millersville.edu; Student poster presentation

Many small mammals are considered keystone species and contribute to structural and functional aspects of their environment such as revegetation processes, insect population regulation, and predator population dynamics. The presence, absence, or abundance of a keystone species within an ecosystem can result in significant impacts to populations of other species. However, understanding these dynamics is challenging. The analysis of owl pellets is a tool in the field of ecological research to facilitate understanding of small mammal community dynamics including, abundance, diversity, spatial distribution, and predator- prey relationships. Barn owl (*Tyto alba*) pellets were collected by the Pennsylvania Game Commission and dissected by students from Millersville University of Pennsylvania. Approximately 5,000 skulls were extracted from owl pellets and identified based on their general taxa (e.g., voles, shrew, mole). Collection site, latitude, longitude, date collected, and skull identification were recorded. In addition, spatial data on land cover and areas with conservation reserve enhancement program (CREP) were analyzed using GIS for each owl pellet collection location. The objective of this study was to identify and compare land cover types associated with small mammals consumed by barn owls, and determine whether shifts in agricultural and other land-use practices impacted small mammal communities.

The Pennsylvania Biological Survey: mission, membership, and activities

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Brady Porter, 412-396-5786, porterb@duq.edu; Professional poster presentation

The Pennsylvania Biological Survey (PABS) mission is to "increase the knowledge of, and foster the perpetuation of, the natural biological diversity of the Commonwealth of Pennsylvania." In response to the federal Endangered Species Act and growing concerns of state species declines, the organization was formed in 1979 to provide status information on imperiled species, producing the first compilation of *Species of Special Concern in Pennsylvania* (1985). PABS was incorporated as a 501(c)(3) nonprofit organization in 1988. It brings together a network of volunteer scientists, wildlife managers, lay naturalists, land stewards, and state and federal agency personnel to serve as a forum working towards the survey and conservation of native biodiversity. Given its independent, apolitical, and science-based approach, PABS strives to produce impartial scientific information on the distribution and status of all taxa, including those not addressed by existing law. PABS is governed by an elected Steering Committee that oversees 11 taxonomic technical committees (TC), and several standing committees. Memoranda of understanding link PABS and its ornithological and mammal technical committees with the Pennsylvania Game Commission, and the fishes, amphibians & reptiles, and invertebrates TCs with the Pennsylvania Fish & Boat Commission. Working as an advisory body, PABS assists these state agencies with the development of the State Wildlife Action Plans, published every decade since 2005 to identify, prioritize, and manage species of greatest conservation need. PABS communicates research activities through iNaturalist projects, box score updates by taxonomic group, publishing species checklists, leveraging community science surveys, and supporting natural history collections.

Baseline mammal surveys at Powdermill Nature Reserve using camera traps and environmental DNA

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Abigail Powell, (724) 993-5114, powella6@duq.edu; student poster presentation

Traditional techniques for wildlife monitoring, such as biotic surveys and dietary analyses, rely on invasive methods that may disturb the species being studied. Noninvasive sampling through camera trapping and collection of environmental DNA (eDNA) serves as an alternative to these techniques. Each potentially has different capture probabilities. To monitor the impact of reclamation on mammals at two abandoned strip mines in Powdermill Nature Reserve (PNR), we installed 24 camera traps in the strip mines along with a control plot. Although camera trapping is reliable for detecting a subset of mammals, we hypothesized that eDNA metabarcoding will enable the detection of more elusive and small-bodied species. Thus, we also extracted eDNA from 24 water samples collected within the area of interest and sequenced the mitochondrial 12S ribosomal RNA barcode to identify mammalian species present at each site. We compared the diversity of mammals collected through both methods prior to reclamation as a baseline analysis. Between March and April of 2023, eight mammal species were detected in the camera traps while eDNA metabarcoding detected fourteen mammal species. Both methods detected four common species, including white-tailed deer (*Odocoileus virginianus*). The eDNA metabarcoding detected a greater number of small mammals, such as the southern bog lemming (*Synaptomys cooperi*), American mink (*Neogale vison*) and star-nosed mole (*Condylura cristata*). While both methods possess limitations in detection, integrated use provides a more effective tools in monitoring wildlife. They will continue to be utilized to monitor the changes in mammalian diversity after reclamation of the abandoned strip mines.

Population structure and landscape connectivity of the American black bear (*Ursus americanus*) in Pennsylvania

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Management practices informed by genetic structure can sustain long-term productivity of harvested populations by reducing negative changes associated with harvesting, such as loss of genetic diversity, alteration of population subdivision, and selective genetic changes. In Pennsylvania, American black bears (*Ursus americanus*) are managed through 23 Wildlife Management Units (WMUs). The genetic structure of the black bear in Pennsylvania should be assessed to ensure this design is appropriate and supportive of long-term viability. During the 2022 and 2023 annual black bear harvests, a small section of the tongue from 342 black bears across the state were collected. Additionally, we collected county of origin, GPS coordinates, presence of sarcoptic mange, and presence of a white blaze for each bear. In a preliminary analysis, eight tetranucleotide microsatellites were genotyped in 277 black bears. The black bears contained high levels of genetic diversity ($A_N = 11.250 \pm 1.878$, $A_E = 5.879 \pm 0.992$, $H_O = 0.754 \pm 0.043$, $H_E = 0.784 \pm 0.041$), and slight spatial autocorrelation was observed across the state (Mantel's $r = 0.096$, $R^2 = 0.009$, $P = 0.002$). In a Bayesian cluster analysis conducted without regard to geographic origin in STRUCTURE, all samples showed evidence of admixture for three clusters, but samples from northeastern Pennsylvania appear to form a unique subdivision. Further analyses will include additional samples, additional microsatellite loci, and geographic information to fully characterize the genetic structure of black bears in Pennsylvania, assess the applicability of the WMUs, and better inform the management of black bears.

Modeling population demographics in a game species: a case study for wild turkey in Pennsylvania

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Understanding population dynamics is crucial for making informed management decisions for wildlife populations. Integrated population models (IPM) are a statistical framework that provides a single, unified demographic analysis using multiple sources of data (e.g., counts, survival rates, age structure, etc.). Integrating multiple data sources can provide more accurate estimates of population size and other demographic parameters, as well as insights into the factors that affect population dynamics. In Pennsylvania, interest is growing in understanding wild turkey population dynamics to aid managers in setting harvest levels. The state has two turkey-hunting seasons, which make modeling these interactions a challenge. We first developed a spreadsheet-based IPM to demonstrate that the available data (spring harvest rates, annual survival rates, recruitment estimates, and harvests) were sufficient to model population dynamics. However, accounting for uncertainty in this framework would require obtaining the joint likelihood, which can be difficult to calculate. Subsequently, we examined turkey population dynamics using a Bayesian model that propagates uncertainty across data sources and demographic processes. Simulations showed that the model produced accurate parameter estimates. We found that, while survival and abundance fluctuated at the management unit level, overall population abundance remained stable across the state. Extensions of this work include using this model to refine our understanding of demographic processes in wild turkey populations at the management unit

level and to produce data-driven harvest management decisions.

Uncovering the diet of Wood Thrush and Veery in ecological forestry gaps using DNA metabarcoding

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Ecological forestry gaps (EFGs) are areas where unfavorable trees have been removed to create diversified forest structure of early successional plant growth within mature forests. Wood Thrush *(Hylocichla mustelina*) and Veery *(Catharus fuscescens*), Neotropical migratory thrushes which have experienced population declines over the last 50 years, utilize EFGs after fledging and before migration in the Floraroze Forest in northwestern Pennsylvania**.** This project aims to determine the arthropods and plants in the diets of these two species during this critical period. High-calorie fruits and seeds made available by the early successional plants in EFGs are needed to prepare for the physical demands of fall migration and are therefore of particular importance to identify. Fecal samples were obtained during bird banding in 2022 and 2023 and used as a source of dietary DNA for metabarcoding analyses using arthropod primers targeting a region of cytochrome *c* oxidase I (COI) mitochondrial gene and a unique combination of plant primers targeting the UAA intron (trnL) chloroplast gene. Dietary taxa were identified from the resulting sequences and compared by frequency of occurrence. The arthropod results show that both species primarily consume moths, beetles, and flies and the plant results show that both species consume a variety of plant species including trees (magnolia, cherry, maple), shrubs (honeysuckle, rose, bramble), and vines (grapevine). These results indicate the importance of a variety of plant species from mature forests and early successional growth to support bird species. This study will aid in bird conservation, forest management, and habitat recovery efforts.

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