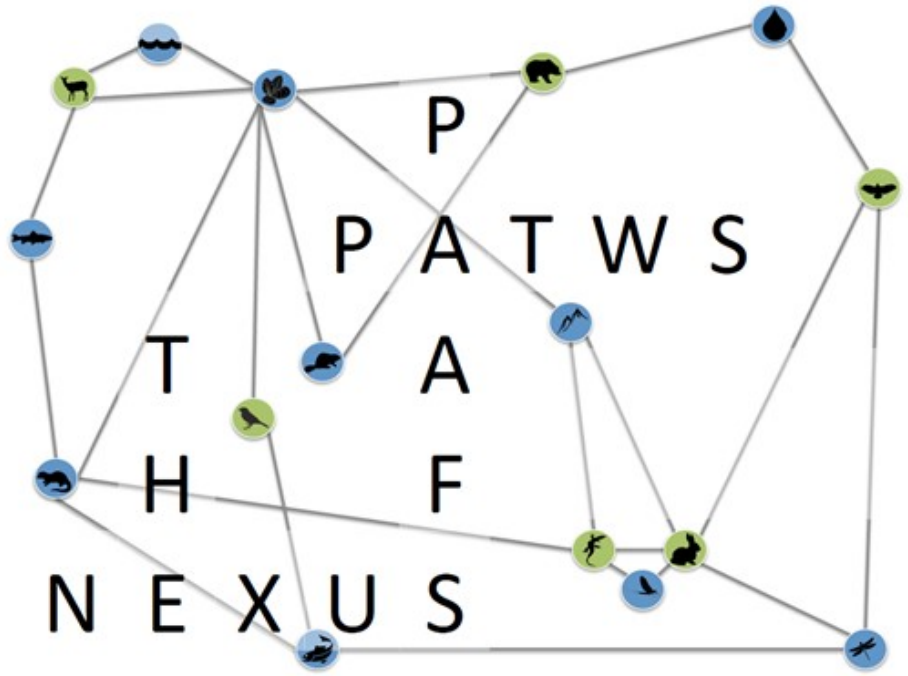
Pennsylvania Chapter of The Wildlife Society
&
Pennsylvania Chapter of the American Fisheries Society

2019 Annual Conference & Workshop



The Nexus:
Bridging Land and Water

February 21 – 23, 2019
The Ramada Inn
State College, PA

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!

Derek DeYoung
Dr. David Argent
Dr. Michael B. Cole
Droll Yankees Inc.
Estate of James Demcheck
Hawk Mountain Sanctuary Association
Jim's Sports Center
Lincoln Caverns
Midstate Engineering
Pennsylvania AFS Chapter Members
Pennsylvania Game Commission
Pennsylvania TWS Chapter Members
QDMA, Southeast Pennsylvania Branch
Ron Argent
Salmon Sisters
Trident Enterprises Deer Fence / Deerbusters
Woolrich Inc,

Sponsorships

Back Country Hunters and Anglers (Bronze level)
BASH Contracting Inc. (Bronze level)
Cussewago Farms (Bronze level)
Ernst Seed (Silver level)
Lotek (Bronze level)
Normandeau Associates, Inc. (Bronze level)
Pennsylvania Game Commission (Gold Level)
Pennsylvania Trappers Association (Gold Level)
William Kimmel (Bronze level)

Conference At-a-Glance

Thursday, 21 February 2019

(All events at the Ramada Hotel & Conference Center)

Workshops (***Important:*** *dinner not provided, break provided to eat dinner locally*)

3:30 – 4:30 p.m. Student Workshop - Becoming a Professional Biologist (Ballroom)

4:30 – 5:30 p.m. Student Workshop - Resume, Certification, Interview, Job Hunt (Ballroom)

5:30 – 7:30 p.m. *Dinner Break*

7:30 – 10:30 p.m. **Welcome Social Reception**

Friday, 22 February 2019

(All events at the Ramada Hotel & Conference Center)

7:00 – 8:00 a.m. Registration

8:00 – 8:10 a.m. Welcome and Opening Remarks

8:10 – 8:30 a.m. Remarks by Doug Austen, Executive Director of the American Fisheries Society

8:30 – 9:00 a.m. **Plenary Session #1**
Moderator: David Argent: Welcome and introductions
- Dustin Shull, Pennsylvania Department of Environmental Protection

9:00 – 9:30 a.m. **Plenary Session #2**
Moderator: Cal DuBrock: Welcome and introductions
- Cindy Adams Dunn, Department of Conservation & Natural Resources

9:30 – 10:00 a.m. **Plenary Q&A Session**

Friday, 22 February 2019 (continued)

(All events at the Ramada Hotel & Conference Center)

10:00 – 10:30 a.m.	*BREAK*
10:30 – 11:30 a.m.	**Concurrent Technical Sessions**
11:30 a.m. – 1:00 p.m.	*LUNCH*
1:00 – 2:20 p.m.	**Concurrent Technical Sessions**
2:20 – 2:40 p.m.	*BREAK*
2:40 – 4:00 p.m.	**Concurrent Technical Sessions**
4:30 – 5:30 p.m.	**Chapter Member & Business Meetings** AFS Business Meeting – Forum Room TWS Business Meeting - Chairman's Room *(Board Members required; everyone else invited and welcome)*
4:30 – 6:30 p.m.	**Poster Session** Presenters should be present and prepared to answer questions
6:30 – 8:30 p.m.	**Banquet and Awards Presentations**

Saturday, 23 February 2019

(All events at Forest Resources Building at Penn State's University Park Campus)

Workshops (***Important:*** *lunch not provided, bring your own or purchase locally*)

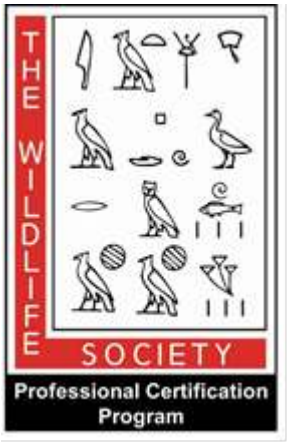
7:00 – 8:00 a.m.	Registration
8:00 a.m. – 12:00 p.m.	On-site Concurrent Workshops
8:00 a.m. – 2:00 p.m.	Off-site Workshop

Continuing Education Credits Approved by TWS National

The Wildlife Society has pre-approved contact hours or Continuing Education Units (CEU) for the 2019 PA TWS/PAFS 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 9.5 CEUs (aka contact hours)** for participation in both days of the conference:

- On-Site Workshop - 1.5 CEUs
- Off-Site Workshop - 2.0 CEUs
- Meeting Sessions Only – 7.5 CEUs



Banquet Presentation

Friday, February 22, 6:30pm
Ballroom

Cal DuBrock & David Argent – 2018-2019 Presidents Presenting

- Thanks and Recognition of all Conference Organizers
- Announce Location of Next Year's Conferences
- Introduction of New Board Members
- Passing the Gavel to 2019 – 2020 President Sara Mueller

PA TWS AWARDS PRESENTATIONS

Frank Felbaum Award:

- Jessica Brown, Penn State University

Northeast Student Field Course Scholarship:

- Lauren Helms, Delaware Valley University

PA TWS Annual Chapter Meeting Student Grants:

- Jeremiah Irwin, Penn State University
- Tony Kumetis, Clarion University
- Lane Naugle, Penn State University

PA AFS AWARDS PRESENTATIONS

- Cooper Award: Ben Kline, Penn State University

Best Student Paper Award
Best Student Poster Award
Special Recognition Award

Raffle and Silent Auction Winners

Workshop Schedule

Saturday, February 23, 8:00am – 12:00pm
**Off-Site Workshop 8:00am – 2:00pm*

Location: All workshops are located in the Forest Resources Building, University Park Campus.

Room	Workshop	Instructor
001 FRB	Begin Using R for Statistics	Christopher Stieha
101 FRB	EPT Identification	Mike Brickner
102 FRB	Technologies for Individual Monitoring in Fisheries and Wildlife	Shannon White
103 FRB	Fish and Wildlife Disease	Justin Brown & Coja Yamashita
106 FRB	Winter Botany	Leslie Horner & Sarah Wurzbacher
417 FRB	Introductory GIS for Natural Resource Professionals	Lillie Langlois
104 FRB	*Geological Tour - 104 FRB	David Klindienst

Parking: Parking in the East Parking Deck is free on weekends. The gates may require that you take a ticket on your way in, but will not charge you on the way out.

Workshop Descriptions

Saturday, February 23, 8:00am – 12:00pm
**Off-Site Workshop 8:00am – 2:00pm*

1. EPT Identification - Instructor: (24 person max)
The workshop will cover the three major taxonomic groups that are used as indicators of good water quality; (mayflies) Ephemeroptera, (stoneflies) Plecoptera, and (caddisflies) Trichoptera. The lecture will cover the general distinguishing characteristics of the three Orders and their Family levels. The lab component will be for participants to examine and identify specimens. Participants should have some prior experience with the collection and examination of macroinvertebrates and working with dichotomous keys.

2. Begin Using R for Statistics - (30 person max)
The R programming language is free and open-source software used for everything from programming to statistics with strong support in all branches of science. In this workshop, participants will be introduced to the basics of R, such as reading in data, plotting, and implementing statistical tests, such as ANOVA and regression. Computers will be available for use, but participants may also bring their own laptop. If bringing your own laptop, please install R from cran.r-project.org before attending the workshop. Although not required, you may also want to install RStudio (rstudio.com) as a friendly user interface to R.

3. Technologies for Individual Monitoring in Fisheries and Wildlife - (30 person max)
Tracking individual movement and behavior in fish and wildlife populations can provide improved understanding of resource use and survival, and can be used to identify potential threats to conservation. There is a myriad of technologies available to monitor individuals, ranging from computer software programs to advanced satellite telemetry, and understanding the benefits and limitations of each method is critical for project design and execution. This workshop will explore common monitoring techniques used in fish and wildlife research, including molecular, PIT, VIE, telemetry, Floy, and biomonitoring technologies. Highlighting data from trout, deer, amphibians, and rodents, technologies will be compared and introductory quantitative methods discussed.

4. Fish and Wildlife Disease - (24 person max)
The session will begin with an overview of avian-specific diseases followed by a hands-on necropsy session. Then, take a plunge into the aquatic realm with a fish disease discussion and necropsy.

5. Introductory GIS for Natural Resource Professionals - (30 person max)
Geographic Information Science (GIS) is one of the most important skills in the wildlife and fisheries fields. It is a powerful tool to analyze spatial data as well as publish professional quality maps. This seminar is aimed at a broad audience of scientists from those new to GIS to the ones already working with the program. First the basics of GIS will be covered: What is it? Advantages and challenges of working with GIS. Overview of the most common GIS tasks and tools. How to find spatial data of interest. This seminar is located in a Penn State Computer Lab where attendees will get hands-on experience using ArcGIS software. Global Positioning Systems (GPS) data will be applied in combination with other relevant data to map and complete tasks commonly required of natural resource professionals. Finally, a publication-quality map will be created using the provided example data.

6. Winter Botany - (30 person max)
This session will begin with a hands-on activity to familiarize participants with using a dichotomous key for trees. The bulk of the session will be outdoors, learning to identify trees on campus and nearby. Participants will learn how to use bark, twigs, buds, and other characteristics to identify a tree or shrub. In addition to teaching identification, the instructors will also discuss wildlife values of various tree species, and highlight species that are suitable for growth in riparian areas. Several important species of woody non-native invasive plants will also be noted for identification.

Geological Tour of Central Pennsylvania - (28 person max)
THE GRAND TOUR - Rocks, Forests, Waters and People! This field experience will introduce you to local areas with unique and significant geologic, biologic, historic and cultural features.
You will observe how changes in the area, with time spans of eons to a few minutes, have affected the environment and the people living in it. Transportation is by van with several stops for observation and conversation. Minimal walking but sturdy footwear is recommended. And of course, dress for the weather. The use of cameras and binoculars is encouraged. Workshop participants will have the opportunity to purchase lunch from a local BBQ restaurant while in route or may bring one along to enjoy on the road.

Plenary Schedule

Friday, February 22, 8:10 am – 10:00 am
Ballroom

The Nexus:
Bridging Land and Water

Moderator: David Argent and Cal DuBrock

Time	Title/Topic	Presenter	Affiliation
8:10am – 8:30am	Opening remarks	Doug Austen	AFS
8:30am – 9:00am	Plenary #1	Dustin Shull	PA DEP
9:00am – 9:30am	Plenary #2	Cindy Adams Dunn	DCNR
9:30am – 10:00am	Plenary Q&A	David Argent Cal DuBrock	PA AFS PA TWS
10:00am – 10:30am	**BREAK**		

Session Synopsis*

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

Time	**Session 1**: Forum Room	**Session 2**: Chairman's Room	**Session 3**: Ballroom
10:30–10:50	Greenawalt – Surveillance for Heterakis in PA Game Birds	Ganoe - Muskrat Ecology and Health	Parenzan - River designation drives community conservation engagement
10:50–11:10	Brown - Influenza A in PA Wild Ducks	Schall - Smallmouth Bass Population in the Susquehanna River Basin	Crisfield - Addressing climate change as a long-standing pervasive threats
11:10–11:30	Banfield – Assessment of Serum-Based Pregnancy Test for PA Elk	Mathis - Habitat Ecology of Native Bee Communities	Stoleson - Infestation by the exotic fruit fly
11:30–1:00	**Lunch**	**Lunch**	**Lunch**
1:00–1:20	Merovich - Ecosystem change in watershed developed for shale gas in WV	Petokas - Restoration of Eastern Hellbender in Susquehanna River	Smith - Arguments for lumping and splitting Smallmouth Bass surveys
1:20–1:40	Wertz – Instream Measures of Land Use from a Water Quality Index	Poppel - Relocation of Eastern Redbelly Turtle during dam-breach	DeMarco - Cost-effective Method for Studying Goshawks
1:40–2:00	Graves - AMD Influence on Brown Trout spawning	Tilden - Regal Fritillary Butterfly Conservation	Goguen - Effect of Video Cameras on Nest Fate in a Veery Population
2:00–2:20	Shank –Streamflow Alteration Shapes Fish Assemblages		Hauer - Optimizing Passive Acoustic Sampling of Bats
2:20–2:40	**Break**	**Break**	**Break**
2:40–3:00	Walsh – Landscape and Watershed Predictors of mussels	Kline - Quantifying interactions in stream fish using modeling	Petokas - Instream Tag Monitoring System for Eastern Hellbender
3:00–3:20	Rager - Two-Year Investigation of Ichthyoplankton	Massie - Statistical Power to Detect Temperature Effects on Fish Growth	Murphy - Avian Point Counts for an Endangered Species Using Auditory Detection
3:20–3:40	Dunbar - Removal of Sediments in Forest Restoration	Fiss - Multiscale Habitat Selection and Dispersal of Golden-winged Warbler in PA	Turner - Chemosensory Perception of Food and Predators
3:40–4:00	Kemp - Evaluating Fish Community Responses to Watershed Restoration	Parkhill - Using Multi-scalar Habitat Modelling of Wood Thrush for Forest Management	Shaffer - Role Lepidoptera Larvae have on Songbird Productivity

Concurrent Session 1

Friday, February 22, 10:30 am – 3:40 pm -- Forum Room

Time	Title	Presenter	Affiliation
		Moderator: DuBrock	
10:30am–10:50am	Surveillance for Heterakis species in game birds of Pennsylvania	Denver Greenawalt †	Penn State University
10:50am – 11:10am	Surveillance for Influenza A Viruses in wild ducks in Northwest Pennsylvania	Justin Brown	PA Game Commission
11:10am – 11:30am	Assessment of a serum-based pregnancy test for Pennsylvania elk	Jeremy Banfield	PA Game Commission
11:30am – 1:00pm	**LUNCH**		
		Moderator: Henning	
1:00pm – 1:20pm	Changes in water chemistry and benthic macroinvertebrate assemblages in a watershed developed for shale gas production in West Virginia	George Merovich	Juniata College
1:20pm – 1:40pm	Instream measures of land use from a water quality index	Tim Wertz	PA Dept of Environmental Protection
1:40pm – 2:00pm	Influence of abandoned mine drainage on brown trout (*Salmo trutta*) spawning movement	Jennifer Graves †	Indiana University of Pennsylvania
2:00pm – 2:20pm	The Role of Streamflow Alteration in Shaping Fish Assemblages in Headwater Streams	Matthew Shank	Susquehanna River Basin Commission
2:20pm – 2:40pm	**BREAK**		
		Moderator: DiLorenzo	
2:40pm – 3:00pm	Landscape and watershed predictors of freshwater mussels in the Ohio River basin	Mary Walsh	Western Pennsylvania Conservancy
3:00pm – 3:20pm	Ohio River Ecological Research Program: A two-year investigation of ichthyoplankton at seven locations on the Ohio River	Jason Rager	EA Engineering, Science, Technology Inc
3:20pm – 3:40pm	Forest restoration on floodplains mantled with legacy sediments: Removing sediments is not necessary for successful restoration	Amanda Dunbar	University of Pennsylvania
3:40pm – 4:00pm	Evaluating Fish Community Responses to Watershed Restoration	Stanley Kemp	University of Baltimore

Concurrent Session 2

Friday, February 22, 10:30 am – 4:00 pm
Chairman's Room

Time	Title	Presenter	Affiliation
		Moderator: Rowan	
10:30am–10:50am	Muskrat (*Ondatra zibethicus*) ecology and health	Laken Ganoe †	Penn State University
10:50am – 11:10am	Population status of Smallmouth Bass in the Susquehanna River Basin	Megan Schall	Penn State University
11:10am – 11:30am	Habitat Ecology of Native Bee Communities within Early Seral Forests of the Central Appalachian Mountains	Codey Mathis†	Indiana University of Pennsylvania
11:30am – 1:00pm	**LUNCH**		
		Moderator: Wolbert	
1:00pm – 1:20pm	Progress on the Restoration of an Eastern Hellbender Population in the Upper Susquehanna River Watershed	Peter Petokas	Lycoming College
1:20pm – 1:40pm	Relocation of State-threatened Eastern Redbelly Turtle (*Pseudemys rubriventris*) during a dam-breach in Delaware County, Pennsylvania	Deborah Poppel	AECOM
1:40pm – 2:00pm	Finding our way to greener pastures: challenges of regal fritillary butterfly conservation, grassland management, and reintroductions	Virginia Tilden	Temple University
2:20pm – 2:40pm	**BREAK**		
		Moderator: Merovich	
2:40pm – 3:00pm	Quantifying the strength of mutualistic interactions in stream fish communities using multiple modeling frameworks	Benjamen Kline †	Penn State University
3:00pm – 3:20pm	The statistical power to detect temperature effects on fish growth at macroscales	Danielle Massie †	Penn State University
3:20pm – 3:40pm	Multiscale habitat selection and dispersal of fledgling Golden-winged Warblers in Pennsylvania	Cameron Fiss †	SUNY College
3:40pm – 4:00pm	Using multi-scalar habitat modelling of wood thrush in central Pennsylvania to inform novel forest management.	Nathaniel Scott Parkhill †	Penn State University

† Indicates student presentation

Concurrent Session 3

Friday, February 22, 10:30 am – 4:00 pm
Ballroom

Time	Title	Presenter	Affiliation
		Moderator: Wertz	
10:30am–10:50am	River designation drives community conservation engagement	Carol Parenzan	Middle Susquehanna River Assoc Inc
10:50am – 11:10am	Addressing climate change in the context of long-standing pervasive threats	Elizabeth Crisfield	Terwilliger Consulting Inc
11:10am – 11:30am	Infestation by the exotic fruit fly	Scott Stoleson	USDA Forest Service
11:30am – 1:00pm	**LUNCH**		
		Moderator: Moyer	
1:00pm – 1:20pm	Comparing Smallmouth Bass catch-rate and length-frequency data from seasonally disparate data sets from large river systems: arguments for lumping and splitting surveys.	Geoffrey Smith	PA Fish and Boat Commission
1:20pm – 1:40pm	A cost-effective method for studying goshawks	Chelsea DeMarco †	Penn State University
1:40pm – 2:00pm	Effect of video cameras on nest fate in a veery population in northeastern Pennsylvania.	Christopher Goguen	Penn State University
2:00pm – 2:20pm	Optimizing passive acoustic sampling of bats	Christopher Hauer	Temple University
2:20pm – 2:40pm	**BREAK**		
		Moderator: Argent	
2:40pm – 3:00pm	Development of an Instream Tag Monitoring System for the Eastern Hellbender Salamander	Peter Petokas	Lycoming College
3:00pm – 3:20pm	Describing the auditory detection processes on avian point counts for an endangered species.	Sean Murphy	PA Game Commission
3:20pm – 3:40pm	Water pollution and infodisruption: Chemosensory perception of food and predators by riverine invertebrates is impaired by a brine wastewater effluent.	Andy Turner	Clarion University
3:40pm – 4:00pm	Assessing the Potential Role of Lepidoptera Larvae Abundance on the Productivity of a Foraging Specialist Songbird	Dakotah Shaffer †	Indiana University of Pennsylvania

† Indicates student presentation

Poster Session

Friday, February 22, 4:30 – 6:30pm
Director's Hall & Lobby

Title	Presenter	Affiliation
Aerial insectivore response to Acid Mine Drainage in Pennsylvania Streams	Victoria Roper †	Bloomsburg University
Annual Allochthonous and Autochthonous Energy Flow in Two Permanent Wetlands During Hydroperiod Reduction	Lisa McKenzie †	Clarion University
Assessing rural ground water for atrazine contamination in central Pennsylvania	Francesca Ferguson †	Juniata College
Assessing The Effect Of Canopy Cover On Benthic Pond Communities	Tony Kumetis †	Clarion University
Assessment of macroinvertebrate communities in NAMD impacted streams	Katie Gallmeyer †	California University of Pennsylvania
Butterfly Communities occupying Early Successional Deciduous Forests of the Central Appalachian Mountains	Monica Lee †	Indiana University of Pennsylvania
Classifying ecological conditions in the Little Juniata River – linking benthic macroinvertebrate assemblages to landscape attributes	Katie Mattas †	Juniata College
Comparing Sedimentation Rates in Paired Perennial Streams Under Different Land Use During High Precipitation Events	Shane Moyer †	Susquehanna University
Crayfish habitat use, movement, and estimate of density in a forested central Pennsylvania stream	Grace Noll †	Juniata College
Data Resolution and Scale of Land Use Data Alter the Ability to Predict the Benefits of Riparian Buffers on Fish Populations	Cassey Fox †	Susquehanna University
Decreased Densities of a Terrestrial Salamander Associated with Forest Floor Habitats Dominated by Fern	Alexis Robison †	Clarion University
Diet analysis and presence of microplastics in Smallmouth Bass in the Susquehanna River.	Timothy Parks †	Susquehanna University
Eastern Gray Squirrels: Differences in Health, Size and Parasite Loads Between Males and Females	Elizabeth Bentz †	Juniata College

Effects of flooding on fish community composition in Pike Run	Travis Tacelosky †	California University of Pennsylvania
Egg mass abundance of spotted salamanders in relation to habitat quality of vernal pools	Cassidy Titus †	Juniata College
Estimating crayfish density in the Little Juniata River using electrofishing techniques	Jeremy Chen See †	Juniata College
Feeding preference of crayfish genus *Orconectus* and *Cambarus* compared to distance from trout stocking sites in central Pennsylvania	Marissa Cubbage †	Juniata College
Habitat Associations of Three At-risk Bird Species in Riparian Forests of Pennsylvania	Jeffery Larkin †	Indiana University of Pennsylvania
Impact of Environmental Factors, Predators and Patch Size on the Distribution of Allegheny Woodrats	Grace Lewis †	Juniata College
Pennsylvania distribution and prevalence of chytrid fungus and ranavirus in the Eastern Newt (*Notophthalmus viridescens*)	Christina Hoffman†	Clarion University
Potential Environmental Predictors of an important West Nile Virus vector (*Culex restuans*) in Ruffed Grouse Habitat	Samantha Maywald †	Bloomsburg University
Relationship Between Macroinvertebrates and Stream Sediment	Haley Miller †	Susquehanna University
Searching for Wild Trout in Pennsylvania: Eight years of Susquehanna University's sampling for the PFBC's Unassessed Waters Initiative.	Bailey Coder †	Susquehanna University
Temperature Based Competitive Interactions Between Brook Trout and Creek Chubs; Implications of Climate Change	David Huntzberry†	Susquehanna University
Temporal Attenuation of Abandoned Mine Drainage within the Mill Creek Watershed	Austin Nardi †	Clarion University
The Creation of an IBI Model that is Independent of Stream Size.	Sean Harlan †	Clarion University
Total Fish Populations Increase with Coarser Sediment in Restored Streams	Jackson Long †	Susquehanna University
Worth the Time: Improvements in Stream Condition and Fish Populations After a Restoration Project	Nicholas Smith †	Juniata College

† Student poster

Plenary Speakers

Cindy Adams Dunn is the sixth secretary of the Department of Conservation and Natural Resources. At DCNR, she has helped position Pennsylvania as a leader in land conservation, outdoor recreation, green practices and public land management. During her tenure the department created the Pennsylvania Outdoor Corps to connect youth and young adults with job opportunities relating to the outdoors and the environment.

Under her direction, Pennsylvania continues efforts to address the impacts of climate change, as well as providing leadership on planting forest buffers along streams to improve water quality.
Dunn has worked in both the public and private sectors. She served in several leadership posts at leading environmental advocacy groups like Audubon Pennsylvania, the Alliance for the Chesapeake Bay and PennFuture.

She is trained as a biologist, and when not at work championing conservation her hobbies include birding, fishing, canoeing and hiking.

Dustin Shull is a Water Program Specialist with the Pennsylvania DEP's Water Quality Division. He holds a MS in Biology from Shippensburg University, where he focused on aquatic ecology. He has been with DEP for 8 years and is currently responsible for developing assessment methodology as it relates to surface water quality. Prior to serving in this position, Dustin worked for DEP monitoring surface waters for unconventional oil and gas well impacts and was responsible for the evaluation of antidegradation streams within the Commonwealth.

Abstracts

Paper Presentations

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

Assessment of a serum-based pregnancy test for Pennsylvania elk

Julia Silva Seixas, Department of Biology, Eberly College of Science, The Pennsylvania State University, University Park, PA, USA; Bhushan M. Jayarao, Department of Veterinary and Biomedical Sciences, College of Agricultural Sciences, The Pennsylvania State University, University Park, PA, USA; Jeremiah E. Banfield, Joshua Johnson, and Justin D. Brown, Pennsylvania Game Commission, 2001 Elmerton Ave, Harrisburg, PA, 17001, USA.

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

Accurately estimating annual pregnancy rates for adult female elk (*Cervus elaphus*) is useful for modeling population growth and monitoring herd health. Historically, pregnancy testing in Pennsylvania was conducted via uteri examinations from hunter-harvested elk. This technique, however, may be insensitive during early pregnancies, relies on proper tissue collection, and may not be comparable with antemortem approaches. A commercially-available serum pregnancy specific protein B (PSPB) ELISA (BioPRYN®wild) is now commonly used to evaluate pregnancy in prime age adult females. However, to date, no assessment of the accuracy of the PSPB ELISA in elk has been published. Validating this commonly utilized test is needed to support conclusions and models dependent on accurate pregnancy rates. From 2013-2017 we compared 245 paired serum and uteri samples to evaluate the accuracy of the PSPB ELISA. We calculated sensitivity and specificity using the uteri results as the gold standard. Uterine examinations were performed by a single veterinarian and the crown-rump length for all grossly-visible embryos were measured to determine age of gestation. Overall, the PSPB ELISA yielded a sensitivity of 95% and a specificity of 91%. The embryos revealed gestational ages ranging from <14 to 50 days. Our results indicate the BioPRYN®wild PSPB ELISA is an accurate serum-based pregnancy test for elk.

Surveillance for Influenza A Viruses in wild ducks in Northwest Pennsylvania (2015-2018)

Justin Brown, Jeremy Stempka, and Josh Johnson, Pennsylvania Game Commission, 2001 Elmerton Avenue, Harrisburg, PA 17110; Kyle Van Why, United States Department of Agriculture, Animal Plant Health Inspection Service, Wildlife Services, Harrisburg, PA 17106- 0827; David Stallknecht and Rebecca Poulson, Southeastern Cooperative Wildlife Disease Study, 589 D.W. Brooks Drive, Athens, GA 30602

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

Wild ducks (Order Anseriformes, Family Anatidae) are important reservoirs for Influenza A Viruses (IAV) and harbor a wide-diversity of subtypes. Surveillance in wild ducks from the

Central and Mississippi Flyways indicate that both prevalence and subtype diversity are spatially- and seasonally-dependent. Similar epidemiologic data on IAV in ducks from the Atlantic Flyway, and specifically the Northeast United States, are lacking. To address this surveillance gap, cloacal swabs were collected from live-trapped, wild ducks during the spring
(n=758; February-March) of 2015-2018 and the fall (n=1,264; August-September) of 2015-2017. All samples were inoculated into embryonated chicken eggs and subtypes were determined through molecular methods. A high prevalence of IAV infection was detected in ducks sampled in the fall (range: 8-31%) and a low prevalence was detected in the spring (range: 0-1%). A wide diversity of subtypes was identified in the ducks, including H1-10 and H12. The most common hemagglutinin subtypes included H3, H4, and H6, while H5 and H7 were rare. These data from ducks in Northwest Pennsylvania are consistent with published studies from ducks in the Mississippi and Central Flyways. Collectively, these spatial, temporal, and other epidemiologic trends can be used to increase surveillance efficiency through targeted sampling.

Addressing climate change in the context of long-standing pervasive threats

Elizabeth Crisfield and Karen Terwilliger (Terwilliger Consulting, Inc.); 110 Chambers Alley, Boalsburg, PA, 16827

Elizabeth Crisfield, 814 777 3395, elizabeth@ssinitiative.com, professional oral presentation

The northeastern state wildlife diversity programs have been working together to understand exactly how the region's most imperiled species are vulnerable to the top threats, and how best to conserve them. The top five Northeast threats identified by State Wildlife Action Plans across the region are: development, natural systems modification, pollution, invasives and disease, and climate change. Climate change amplifies these priority threats and presents new challenges to management and conservation. Existing resources for wildlife conservation are inadequate to address the rising and pervasive risk that climate change adds to state fish and wildlife agencies responsibilities. To help address these challenges, this project, funded by the Northeast Climate Adaptation Science Center, seeks to enhance information and deliver tools to state wildlife diversity programs looking to implement climate smart actions found in Wildlife Action Plans.
In this presentation, we take a pragmatic approach to address climate change threats within state fish and wildlife programs. First, we consider the prioritized climate actions found in 2015 Wildlife Actions Plans. Second, we consider conservation opportunities unique to state fish and wildlife agencies. Finally, we review examples of how existing conservation plans addressing long-standing threats, can be improved by careful selection of sites and designs that are resilient to predicted changes in temperature and hydrology. By considering the viability and design of conservation projects in the context of future climate conditions, we seek to increase efficiency and collaboration among state and federal agencies interested in adapting fish and wildlife to climate change and other threats.

A cost-effective method for studying goshawks

Chelsea DeMarco and Margaret Brittingham, Pennsylvania State University, University Park, PA, 16802; David F. Brinker, Maryland Department of Natural Resources, 1200 Frederick Rd., Catonsville, MD 21228; Laurie Goodrich, Hawk Mountain Sanctuary, 410 Summer Valley Road, Orwigsburg, PA 17961; Scott Stoleson, U.S. Forest Service, P.O. Box 267, Irvine, PA 16329

Chelsea DeMarco, (585) 519-1596, cmd428@psu.edu; student oral presentation

The northern goshawk (*Accipiter gentilis*) population in Pennsylvania may be in decline; however, the distribution and abundance of goshawks in Pennsylvania is not well known. A survey protocol using call playback has been developed and is currently the standard method used to study goshawks in the United States, but the method is expensive and has many limitations. Our goal was to modify existing survey protocols to create a cost-effective method that could be used to estimate and monitor breeding goshawk abundance. We used occupancy modelling with a stratified conditional sampling design to survey 168, 1km^2 sampling units in the Allegheny National Forest. Sixty-eight units had been occupied in the past and 100 units had unknown historic use. Additionally, the size of sampling units was reduced from 6 km^2 in the standard protocol to 1 km^2. The smaller units could be surveyed using all available methods, including pre-dawn surveys during courtship, stand searches during incubation and call playback surveys during the nestling and fledgling phase. The modifications allowed us to extend the field season by 3 months, conduct over 100 additional surveys compared to previous studies, and detect active territories before nests failed. Overall 10 active territories were located on the Allegheny National Forest and seven of the occupied sites had been active historically. Thus, stratifying based on known use is an effective way to improve the number of detections.
Preliminary estimates of breeding goshawks occupancy on the Allegheny National Forest is 10%; however, this estimate may change after covariates are added to the model.

Forest restoration on floodplains mantled with legacy sediments: Removing sediments is not necessary for successful restoration

Amanda Dunbar, University of Pennsylvania, Philadelphia, PA 19104; Bernard Sweeney, Charles Dow, and Melinda Daniels, Stroud Water Research Center, 970 Spencer Road, Avondale, PA 19311

Amanda Dunbar, (215) 264-5858, adunbar@sas.upenn.edu, professional oral presentation

Recent studies suggest very low survivorship of seedlings planted in streamside areas containing thick (>1m) deposits of legacy alluvial sediments. This has been used, in part, to promote more intensive restoration methods involving removal of legacy sediments before reforesting streamside areas. We planted 2,450 seedlings at a density of 990 stem/ha in a streamside area with legacy sediments greater than 1m thick and monitored their growth and survivorship. The overall 5-year survivorship of 60% was substantially higher than had been previously reported. Mean growth, averaged across all species planted and sub-plots, was substantial, ranging between 3-4m. In contrast to our expectations, tree survivorship

and growth were not significantly impacted by the depth of legacy sediments which suggests they do not present a barrier to successful riparian and floodplain forest restoration. We conclude that legacy sediments less than 2-3m thick do not need to be removed to successfully reforest a streamside area in the eastern Piedmont region of the U.S.A. The 60% survivorship suggests that the USDA CREP survivorship target of 222 stems/ha could be met in streamside areas by increasing the minimum USDA CREP planting density of 296 stems/ha by only 25%.

Multiscale habitat selection and dispersal of fledgling Golden-winged Warblers in Pennsylvania

Cameron J. Fiss, State University of New York College of Environmental Science and Forestry, Syracuse, NY 13210; Darin J. McNeil and Amanda D. Rodewald, Cornell University and Cornell Lab of Ornithology, Ithaca, NY 14850; Jeffery L. Larkin, Indiana University of Pennsylvania, Indiana, PA 15705

Cameron J. Fiss, (717) 860-3243, cafiss@syr.edu; student oral presentation

Effective conservation across the full annual lifecycle requires understanding how habitat needs vary across life stages. The post-fledging period of songbirds, in particular, can be characterized by a shift in habitat preferences, whereby the cover and vegetation structure selected by fledglings differs from that used by adults during the nesting period. For declining species like the Golden-winged Warbler (Vermivora chrysoptera), quantifying cover and vegetation features selected by fledglings can help land managers refine habitat prescriptions to improve productivity. We conducted the first multiscale habitat selection study of recently fledged Golden-winged Warblers (n=109) in two managed landscapes in the central Appalachian Mountains. Radio-tagged fledglings used habitats that were structurally distinct from nest sites, and cover type selection changed as fledglings aged. Fledglings selected primarily for early-successional forest but also selected mature forest and sapling stands. Within all cover types fledglings selected denser horizontal and vertical vegetation cover. In mature forest, fledglings selected for taller saplings and lower basal area. These results underscore the importance of disturbance associated vegetation characteristics, typical of young forests, during the post-fledging periods, and the need to view breeding habitat structure more broadly than attributes used for nesting alone. For Golden-winged Warblers breeding in the central Appalachian Mountains, the creation or maintenance of densely-vegetated and structurally-complex patches in close proximity to nesting cover should meet habitat needs during the post-fledging period.

Muskrat (*Ondatra zibethicus*) ecology and health

Laken Ganoe, Pennsylvania Cooperative Fish and Wildlife Research Unit, The Pennsylvania State University, University Park, PA 16802, Matthew Lovallo and Justin Brown, Pennsylvania Game Commission, 2001 Elmerton Ave., Harrisburg, PA 17110-9797, W. David Walter, U.S. Geological Survey, Pennsylvania Cooperative Fish and Wildlife Research Unit, The Pennsylvania State University, University Park, PA 16802

Laken Ganoe, (814) 227-7615, lsganoe11@gmail.com; student oral presentation

Declines in muskrat (*Ondatra zibethicus*) harvest has been observed throughout their range in North America. Harvest figures, historically used as indicators of population status, have declined significantly suggesting a decline in muskrat populations. Disease has been considered a cause for concern for muskrat population declines. This study was designed to investigate the movements and health of muskrats in a region of Pennsylvania. Expanding our understanding of muskrat movements, survival rates, and exposure to disease will increase the knowledge of the muskrat and potential reasons for their population decline. To understand muskrat movements, preliminary home range sizes are being estimated for muskrats within various habitat types using radio telemetry and capture locations. Dispersal distances and hourly movement is also being monitored using the same methods. We are using known fate models to determine survival estimates for captured individuals. Blood from live-trapped muskrats and organs from trapper- harvested muskrats has been collected and is the process of being analyzed for exposure to various diseases. We have captured 28 muskrats in the first field season of the project in central Pennsylvania. Of the 28 total muskrats captured, 18 were large enough to implant with radio transmitters. Two of the tagged individuals have died due to predation, one from complications with surgery, and the cause of mortality of an additional two is unknown. In addition, three other tagged muskrats are presumed to have dispersed. Preliminary results demonstrate variation in distances moved by muskrats in a shared habitat and muskrat exposure to several parasites.

Effect of video cameras on nest fate in a veery population in northeastern Pennsylvania.
Christopher B. Goguen, Science Program, Penn State – Hazleton, 76 University Dr., Hazleton, PA 18202; and Les D. Murray, Division of Science and Engineering, Penn State – Abington, 1600 Woodland Dr., Abington, PA 19001

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

Cameras are often used at nests to study factors impacting songbird nest success, particularly predation. One potential bias associated with nest camera use, however, is that the presence of the equipment may affect nest fate by influencing the likelihood of predation or nest abandonment. During summers 2014-2016, we used video cameras to study predation events at veery (*Catharus fuscescens*) nests in Luzerne County, northeastern Pennsylvania. During each summer, we placed miniature, infrared video cameras connected to digital video recorders at a sample of nests, deploying the cameras following published recommendations to minimize risk of camera-induced impacts associated with nest desertion or predator attraction. In total, we placed cameras at 67 nests documenting 44 nest mortality events (36 due to depredation, one due to starvation or disease, one due to weather, and six due to abandonment). Cameras did not appear to increase nest abandonment as rates at nests with cameras did not differ from those without ($p = 0.46$). Logistic exposure analyses, however, indicated a negative effect of cameras on nest survival, largely due to an increased predation rate (Probability of nest survival to fledging: Camera = 0.31, No camera = 0.44). These results differ from past studies, most of which found no effect or even a slight reduction in predation when cameras were present. Possible mechanisms explaining higher predation rates at nests with cameras include attraction of predators to cameras, predators learning to associate cameras with nests, or changes in adult

behaviors in response to cameras.

Influence of abandoned mine drainage on brown trout (*Salmo trutta*) spawning movement
Jennifer Graves and David Janetski, Indiana University of Pennsylvania, 975 Oakland Avenue, Indiana, PA 15705

Jennifer Graves, (860) 268-9789, gravejm10@gmail.com; student oral presentation

Abandoned mine drainage (AMD) can cause heavy accumulation of particulate metals within a stream system that essentially act as a fine sediment. This accumulation of particulates can degrade trout spawning habitat because aeration though gravel becomes inhibited, impacting egg survival. Little is understood if and how brown trout (*Salmo trutta*) spawning behavior is impacted by this habitat degradation. To test if the distance and direction traveled by brown trout during the spawning season is impacted by AMD, we employed radio telemetry to track the movements of 7 brown trout before, during, and after the spawning season. Trout were tagged in stream reaches both impacted and unimpacted by AMD. While a mixed-effect model failed to produce any statistically significant results, it was noted that fish in AMD impacted reaches tended to move downstream ($\bar{x}$=-53.57 meters) while trout in reaches unimpacted by AMD tended to move upstream during the spawning season ($\bar{x}$=21.78 meters). Moving downstream is opposite of the traditionally accepted theory that salmonid species move upstream to spawn. This study helps to further our understanding on the impacts of abandoned mine drainage on brown trout and provides baseline evidence for behavioral modification during spawn as a result of significant habitat degradation.

Surveillance for *Heterakis* species in game birds of Pennsylvania
D. Greenawalt Department of Veterinary and Biomedical Sciences, Penn State University, 111 Pennsylvania Game Commission, 2001 Elmerton Avenue Harrisburg, PA 17110, E. Pendleton,
P. Dunn, Animal Diagnostic Laboratory at Penn State University, Wiley Lane University Park, PA 16802, M.J. Yabsley, Southeastern Cooperative Wildlife Disease Study University of Georgia, 501 D.W. Brooks Drive Athens, GA 30601

Denver I. Greenawalt, (814)-592-0245, dendog1414@gmail.com, student oral presentation

Histomoniasis, caused by the protozoan *Histomonas meleagridis,* is a significant disease of wild and domestic gallinaceous birds. Transmission of this parasite is dependent on utilization of the cecal nematode *Heterakis gallinarum* as an intermediate host. Due to the critical role that *H. gallinarum* plays in the introduction, transmission, and maintenance of *H. meleagridis*, it is important to define the host range and distribution of this nematode. From 2015-2018, ceca were collected from 260 wild and propagated game birds from Pennsylvania. Cecal contents were examined for *Heterakis* nematodes and all *Heterakis* spp. were counted and identified based on morphologic characteristics of the male worms. The prevalence and intensity of infection were determined. *Heterakis* nematodes were detected in five of the eight game bird species examined, including ring-necked pheasants (*Phasianus colchicus*; 57/70, ruffed grouse (*Bonasa umbellus*; 96/117), wild turkeys (*Meleagris gallopavo*; 52/84), domestic chickens (*Gallus gallus domesticus*; 10/22), and chukars (*Alectoris chukar*; 4/39). All nematodes were

identified as *H. gallinarum*, except for the ruffed grouse samples, which harbored *H. isolonche*. No cohabitation of multiple *Heterakis* species was identified in any examined birds. No *Heterakis* nematodes were identified in ducks (*Anas* sp.; n=50), American woodcock (*Scolopax minor*; n=27), or domestic turkeys (*M. gallopavo,* n=10). The results presented indicate that *H. gallinarum* is common in wild and domestic upland game bird species. Future research is needed to determine the prevalence of *H. meleagridis* infection in these species and determine the potential for *H. isolonche* to serve as a paratenic host for *H. meleagridis*.

Optimizing passive acoustic sampling of bats for long-term monitoring programs

Christopher Hauer, Lisa Powers, and Brent J. Sewall, Department of Biology, Temple University, 1900 N. 12th Street, Philadelphia, PA 19122; David McNaughton, Pennsylvania Department of Military and Veterans Affairs, Fort Indiantown Gap National Guard Training Center, Building 11-19, Annville, PA 17003

Christopher Hauer, (570)-573-5270, tug49949@temple.edu; professional oral presentation

Passive acoustic monitoring is an increasingly utilized sampling technique for studying bats because it is non-invasive, cost effective, and allows for the collection of extensive datasets over long time periods. The level of sampling effort necessary to acoustically detect individual bat species and completely inventory whole bat assemblages is a key consideration when designing monitoring programs, particularly when resources are limited or rare species are expected. From April – October 2018, we passively sampled for bats at 5-7 permanent locations on Fort Indiantown Gap National Guard Training Center using Pettersson D500x detectors. We examined seasonal activity patterns and estimated species richness among detector locations and seasons using species accumulation curves. In addition, we estimated nightly detection probabilities for individual bat species using single-season occupancy models. We identified a total of 65,682 echolocation call sequences of 8 bat species/species groups in 1,083 detector nights. Activity patterns varied by species, with peaks in activity of WNS-affected northern long- eared myotis (*Myotis septentrionalis*) and eastern small-footed myotis (*M. leibii*) in late April and May. Species accumulation curves indicated that an average of 23 to 32 nights was needed to detect 90% of total species richness among locations and seasons. Relatively few nights (<10 nights) were needed to be 90% certain of detecting 5 of 8 species, however, many more nights were needed to detect acoustically rare species. Monitoring programs that incorporate efficient sampling methodologies will be critical for future conservation efforts as populations of several bat species continue to decline.

Evaluating Fish Community Responses to Watershed Restoration through Stormwater Control Measures: Delaware County PA

Stanley J. Kemp, Dustin Koller, and Mustafa Sayyed, University of Baltimore, 1420 N. Charles St. Baltimore, MD 21201; Emily Carambelas, James Kugel, and Andrea Welker, Villanova University, 800 Lancaster Ave., Villanova, PA 19085

Stanley J. Kemp, (610)777-1792, skemp@ubalt.edu, professional oral presentation

Understanding and quantifying the impact of stream and watershed restoration is a key in the

design of effective strategies for restoration. Since 2016, an impacted stream (Chrome Run) has been monitored to quantify the response to new stormwater control measures (SCMs) associated with the proposed Promenade at Granite Run, in Delaware County, PA. The new SCMs are part of the site redevelopment requirements of the former 1970s era Granite Run Mall, and are in contrast to the previous direct hydraulic connection of 66 impervious acres to Chrome Run. Since summer 2016, the physical, chemical and biological (fish and invertebrates) properties of two sites on Chrome Run (upstream, downstream) and three other area streams (Dismal Run, Rocky Run, and Dicks Run) have been monitored. Evaluation of the impacts of the SCMs at redevelopment site will be possible via a BACI design. Significant differences in the North Mid-Atlantic Slope IBI exist between study sites (RM One-way ANOVA; df=3; $p<0.001$). Species located in Dismal Run not found in Chrome Run included brown trout, cutlips minnow, and tessellated darter. Temperature monitoring data provide insight into habitat suitability for self- sustaining trout populations in this region, or lack thereof. The unique role of the American eel is shown by their dominance in biomass; ecological implications are discussed. SCMs at the redevelopment site have come online as of 10/18, and we look forward to the pending results of the BACI study. The results of the completed study will improve effective planning and implementation of SCMs.

Quantifying the strength of mutualistic interactions in stream fish communities using multiple modeling frameworks

Benjamen C. Kline[a,*], Shannon L. White[b], and Tyler Wagner[c]
[a] Department of Ecosystem Science and Management, Pennsylvania State University
[b] Pennsylvania Cooperative Fish and Wildlife Research Unit, Pennsylvania State University [c] U.S. Geological Survey, Pennsylvania Cooperative Fish and Wildlife Research Unit, Pennsylvania State University

Benjamen C. Kline : bfk5077@psu.edu, 413 Forest Resources Building, University Park, Pennsylvania 16802, USA, Tel: +1-570-765-8489; student oral presentation

Understanding how habitat influences species distributions is a fundamental question in ecology and management. Ecologists have traditionally modeled species distributions as a function of only abiotic components of the environment. However, more recent modeling frameworks have allowed for simultaneous inclusion of biotic and abiotic factors in a single predictive model. To- date, ecologists have primarily incorporated negative biotic interactions between species (*i.e.,* competition and predation) into these models; however, positive species interactions (*i.e.,* facilitation and mutualism) have been shown to be equally important in determining species distributions. Hierarchical Modeling of Species Communities (HMSC), is a new modeling approach that can quantify the strength of interactions (both positive and negative) among species in a community and can provide increased understanding of the biotic components shaping species distributions. We compared the predictive performance of HMSC models to traditional, univariate models that do not account for biotic interactions in streams occupied by chubs (*Nocomis spp. and Semotilus spp.*) and stonerollers (*Campostoma spp.*). These taxa are known for are known for constructing spawning nests or pits that are mutualistically used by other species of nest associates, with many species becoming obligatory nest associates in degraded habitats. Importantly, many nest associates are data-poor, making species-habitat relationships and distribution difficult to quantify using

traditional statistical frameworks. This talk will compare species-habitat predictions generated by traditional logistic regression with HMSC models that incorporate species interactions and discuss the strengths and weaknesses associated with each modeling technique.

The statistical power to detect temperature effects on fish growth at macroscales

Danielle L. Massie, Pennsylvania Cooperative Fish and Wildlife Research Unit, Wildlife and Fisheries Sciences, Pennsylvania State University, 413 Forest Resources Building, University Park, Pennsylvania 16802; Tyler Wagner, U.S. Geological Survey, Pennsylvania Cooperative Fish and Wildlife Research Unit, Pennsylvania State University, 402 Forest Resources Building, University Park, Pennsylvania 16802; Yin Li, North Carolina Department of Environment Quality, North Carolina Division of Marine Fisheries, Morehead City, North Carolina 28557

Danielle L. Massie, (304)268-9468, dlm459@psu.edu; student oral presentation

Quantifying the spatial variability of fish growth is necessary to understand large-scale drivers of growth and to predict how different fish species will respond to environmental change. Although, to date, no studies have developed an approach for determining the statistical power to detect a temperature effect on fish growth at macroscales. Using the Flathead Catfish as a case- study, we conducted a power analysis to evaluate how statistical power is influenced across a range of different sampling scenarios -including varying the number of fish sampled per lake, the number of lakes sampled, and the size of the temperature effect. Preliminary results indicate that at a strong effect size (a 5% increase in growth coefficient for every 1 □C increase in temperature), an acceptable power (e.g. power of 0.8) is not achieved unless hundreds of lakes are sampled. Detecting temperature effects on fish growth at macroscales is difficult due to the inherent variability in length-age data and high variability in growth among lakes, thus likely requires sampling hundreds of lakes to detect moderate to strong temperature effects.

Habitat Ecology of Native Bee Communities within Early Seral Forests of the Central Appalachian Mountains

Codey Mathis, Monica Lee, Jeffery Larkin, Indiana University of Pennsylvania, W Walk St Room 126, Indiana, PA, 15701; D. J. McNeil Jr., Cornell University, 159 Sapsucker Woods Rd, Ithaca, NY, 14850; Christina Grozinger, Pennsylvania State University, Millennium Science Complex, University Park, PA 16802.

Codey Mathis, (541) 232-6163, mathiscodey@gmail.com; student oral presentation

There exists strong evidence that native pollinators like bees are in decline worldwide. While population declines may be occurring across many regions, some heavily forested landscapes continue to support healthy bee populations. In spite of this, many pollinator studies remain focused where species declines are prevalent, and little is known regarding bee population ecology within heavily forested landscapes where bees remain abundant. During the 2018 growing season, we collected data on bee communities within 75 regenerating forest sites

across Pennsylvania, each visited five times from May-August to assess the factors associated with bee abundance within managed forest communities. We sampled bee communities using nonlethal visual transect surveys and lethal trapping (elevated blue-vane traps and ground-level bee bowls). We also conducted a) flower surveys during each visit and b) structural vegetation surveys in each forest stand. During sampling, we observed over 1,800 bees, over 100 different floral species, and collected 757 bee specimens. Models of bee abundance suggested that forest stands with the greatest number of flowers blooming across a season also supported the highest bee abundance. Likewise, structural vegetation models suggested that structural components which fail to provide floral resources (e.g., saplings and ferns) were negatively associated with bee abundance. Finally, we observed significantly fewer bees in stands over 6 years post-harvest, with our model predicting > 15 times more bees in 1-year stands than in 9-year stands. These results can inform the management of timber harvests in Pennsylvania to promote healthy native bee communities.

Changes in water chemistry and benthic macroinvertebrate assemblages in a watershed developed for shale gas production in West Virginia

George T. Merovich, Jr., Fisheries and Aquatic Sciences Program, Department of Environmental Science, Juniata College, 1904 Moore St., Huntingdon, PA 16652; Mack W. Frantz, West Virginia Cooperative Fish and Wildlife Research Unit, School of Natural Resources, West Virginia University, P.O. Box 6125, Morgantown, WV, 26506; Petra B. Wood U.S. Geological Survey, West Virginia Cooperative Fish and Wildlife Research Unit, West Virginia University,
P.O. Box 6125, Morgantown, WV, 26506

George T. Merovich, Jr., (814) 641-3954, merovich@juniata.edu, professional oral presentation

We sampled streams over 3 years around known shale gas development activities (i.e., hydraulic fracking; HF) to characterize changes in water chemistry and macroinvertebrates. Impacts from HF (e.g., well-pad construction, sedimentation, etc.) over the duration of the study decreased then increased again but not to levels seen the first year. Water chemistry and macroinvertebrates showed weak but definitive responses to HF; the magnitude of these responses tended to follow changes in magnitude of HF intensity over the study. PH, dissolved solids (TDS), and conductance (SpC) trended lower upstream of HF while downstream reaches increased in these parameters. Likewise, common metrics summarizing the integrity of macroinvertebrate assemblages (e.g., richness) trended better upstream of HF, even if not statistically better. GLIMPSS, an index of biotic integrity, however, did not differ statistically between upstream and downstream reaches. Multivariate analyses indicated that macroinvertebrate assemblages became different between impacted and un-impacted stream reaches over the study, suggesting cumulative and persistent signals of landscape impacts on aquatic communities. This assemblage-level divergence between impacted and un-impacted reaches was related to patterns in water chemistry. Finally, indicator species analysis linked key genera to downstream impacted conditions, but several sensitive taxa were statistically related to downstream conditions during the study when HF intensity was lower. Our study shows that HF was related to lower quality in water chemistry and benthic macroinvertebrate assemblages; those changes may have consequences to wildlife that rely on aquatic prey as food resources both in stream and in riparian zones of intact forests.

Describing the auditory detection processes on avian point counts for an endangered species.

Sean Murphy, Bureau of Wildlife Management, Wildlife Diversity Division, Pennsylvania Game Commission, 2001 Elmerton Avenue, Harrisburg, PA 17110; Tom Virzi, Conservation InSight, 13203 SE 172nd Avenue, Suite 166-121, Happy Valley, OR 97086.

Sean Murphy, 717-433-2732, semurphy@pa.gov; professional oral presentation.

Point-count surveys are commonly used to determine abundance and population trends of breeding birds. To accurately estimate population abundance, it is imperative to account for detection probability. Researchers studying the endangered Cape Sable Seaside Sparrow (*Ammodramus maritimus mirabilis*), which is endemic to the Everglades ecosystem and at risk of global extinction, conduct extensive annual aural counts of singing males across the range of the subspecies to compute an index of total population. Here, we use a time-of-detection approach incorporated into the point-count survey methods to better describe the detection process including site and survey-level effects. The time-of- detection method divides detection probability into separate intervals allowing for a singing rate effect. We tested for variation in detection among count-time intervals, heterogeneity, distance, replicate, observer, seasonal, and time effect. The best fit model predicted detectability of singing sparrows varied among interval and supports shortening the currently used 7-min survey period. Moreover, detection varied by observer, distance of detection, and day of season. Our results suggest that detection is not constant and should be considered during the collection and analysis of the range-wide annual surveys to accurately estimate the global population of Cape Sable Seaside Sparrows. Understanding the detection process will improve population estimates with an accurate estimation of uncertainty and allow stakeholders to make stronger inferences about population change and better informed management decisions.

River designation drives community conservation engagement

Carol Parenzan, Middle Susquehanna Riverkeeper Association, Inc., 112 Market Street, Sunbury, PA 17801

Carol Parenzan, (570) 768-6300, midsusriver@gmail.com; professional oral presentation

The Pennsylvania Department of Conservation and Natural Resources (PA DCNR) and Pennsylvania Organization for Watersheds and Rivers (POWR) designated the Loyalsock Creek, a 64-mile long tributary of the West Branch Susquehanna River located primarily in Sullivan and Lycoming Counties, the 2018 River of the Year (ROY). As the nominating organization, Middle Susquehanna Riverkeeper Association, Inc. (MSRKA), having been awarded a Leadership Grant to spearhead community engagement programs around the watershed during the year-long celebration, developed programming beyond the traditional ROY sojourn with the purpose to engage a diverse group of residents and visitors and provide the opportunity for connecting to (and caring for) the watershed. These events included Science on the 'Sock, a family-friendly hands-on science exploration afternoon; a family- and dog-friendly hike to Jacoby Falls; a Floating Classroom Program aboard the Hiawatha Paddlewheel Riverboat with the focus on healthy tributaries for a healthy river; Worlds End Day, integrating arts, music and culture with

creek-side activities; wellness by the water, incorporating yoga, Qi Gong, and meditation; a bog walk and talk to explore the headwaters; a book discussion of *The Vanishing Trout* by Charles Lose with the local Trout Unlimited Chapter; a partnered agriculture day to focus on the healthy soils-water connection; underwater photography and videography presentation by river snorkeler Keith Williams; and, of course, an educational sojourn. As a result, these events engaged thousands of individuals and brought awareness to the environmental challenges not only of the Loyalsock Creek but of the natural water resources of Pennsylvania.

Using multi-scalar habitat modelling of wood thrush in central Pennsylvania to inform novel forest management.

Nathaniel Scott Parkhill, Margaret Brittingham, and David Miller, Department of Ecosystem Science and Management, Penn State University, University Park, PA 16802; Justin Vreeland, Pennsylvania Game Commission, Southcentral Regional Office, Huntingdon, PA 16652

Nathaniel Scott Parkhill, 207-403-4280, nsp56@psu.edu; student oral presentation

Wood thrush (*Hylocichla mustelina*) have declined an estimated 60% in the past 50 years with habitat loss across Eastern North American breeding grounds identified as a major cause of decline. Existing forest management guidelines for wood thrush are broad and encompass the variety of forests in which wood thrush are found across their breeding range. With approximately 8% of the global population of wood thrush breeding in Pennsylvania, the development of targeted forest management guidelines is needed. The objective of this study was to model wood thrush habitat selection in central Pennsylvania in order to inform targeted forest management guidelines. We conducted point counts at 205 survey points in 23 predominately oak stands across Huntingdon, Mifflin, and Center counties in the summer of 2018. We located 78 active nests which we monitored every 3-4 days and measured forest vegetation at survey points, nest sites, and paired points to determine use-availability habitat selection. We detected wood thrush at 131 of our survey points and observed 38 nests fail which is a higher failure rate than previous studies, with only one nest containing evidence of brown-headed cowbird (*Molothrus ater*) nest parasitism. Nest survival probability calculated using the Mayfield method ranged from 0.09 to 0.68 across study sites. Nest sites had significantly lower basal area than paired 50 meter points ($p=0.014$) with 70% of nests placed in shade tolerant species with witch hazel, beech and maple saplings comprising a majority host species. These results suggest that forest management techniques which emulate natural gap formation might increase nest site availability in contiguous even aged forests lacking desirable nest shrub conditions.

Progress on the Restoration of an Eastern Hellbender Population in the Upper Susquehanna River Watershed

Peter J. Petokas, Lycoming College, Williamsport, PA 17701; Michelle R. Herman, SUNY Environmental Science and Forestry, Syracuse, NY 13210

Peter J. Petokas, (570) 321-4006, petokas@lycoming.edu; professional oral presentation

Catastrophic flood events, urban development, road and highway construction, industrial discharge, and forestry and agricultural practices have all impacted the ecology of streams and rivers in the Susquehanna River watershed in ways that have restricted, diminished, or eliminated quality habitat for the Eastern Hellbender (*Cryptobranchus alleganiensis*). In addition, crayfish invasions and amphibian disease epidemics have further stressed hellbender populations. The Eastern Hellbender has experienced range-wide local extinctions since the late 1990's and is currently a candidate species for federal listing as threatened or endangered. In the fall of 2014, fertile hellbender eggs were collected in Pennsylvania and reared by the Wildlife Conservation Society at the Bronx Zoo until age 2-1/2 years, then transferred to a newly-constructed rearing lab in central New York. We assessed the growth and health of 99 juvenile hellbenders at the lab on a monthly basis for one year. Three weeks before the release date, we implanted a microchip beneath the skin on the tail of each individual. Prior to release, we installed 200 pieces of sedimentary slab rock in the stream channel at the release site to serve as natural habitat. We also constructed and installed 20 artificial habitat structures and wire cages in the stream channel to serve as "soft release" locations. In order to continuously monitor the juveniles following their release, we installed two state-of-the-art solar-driven instream antenna systems at the release site. Following two weeks of acclimation inside soft release environments, the juveniles were released to the wild then monitored using fixed and mobile PIT-tag reading systems.

Development of an Instream Tag Monitoring System for the Eastern Hellbender Salamander

Peter J. Petokas, Lycoming College, Williamsport, PA 17701; Michelle R. Herman, SUNY Environmental Science and Forestry, Syracuse, NY 13210

Peter J. Petokas, (570) 321-4006, petokas@lycoming.edu; professional oral presentation

We designed, installed, and operated two instream passive integrated transponder (PIT) monitoring systems for the Eastern Hellbender (*Cryptobranchus alleganiensis*) during the summer through late fall of 2018. The systems were intended to monitor the activity of 99 three and one-half year old juvenile hellbenders that were tagged and released in August 2018 to restore a historic, and largely extirpated, hellbender population in the Upper Susquehanna River watershed. Each monitoring system consisted of a hairpin-loop antenna that spanned a 20-meter wide stream channel and was anchored to the stream pavement with rebar and zip-ties. A tag reader was securely mounted on a streamside post and was connected to the antenna and to a control box located 30 meters landward. Each monitoring system received 24 volts of power from a bank of four solar storage batteries charged by a solar panel installed 30 meters distant in an open field. The control box contains a removeable flash drive that holds recorded tag data and an interface used to tune the system and to change system parameters. Since hellbenders are bottom crawlers, their tags are read when they walk across the antenna. The two monitoring systems provided data on movements of the juveniles into and out of the release sites, and on diel activity patterns. Most movements occurred late at night and, as such, would have been otherwise undetected.

Relocation of State-threatened Eastern Redbelly Turtle (*Pseudemys rubriventris*) during a dam-breach in Delaware County, Pennsylvania.

Deborah Poppel and Bryan Strawn, AECOM, 625 West Ridge Pike, Conshohocken, PA 19428

Deborah K. Poppel, (610) 832-3597, Deborah.poppel@aecom.com, professional oral presentation

The Pennsylvania Department of Environmental Protection (PADEP) needed to remove a high-hazard dam from Broomall Lake in Media, Delaware County. The state-threatened eastern redbelly turtle (*Pseudemys rubriventris*) was thought to inhabit the lake. Pennsylvania Fish and Boat Commission (PFBC) required PADEP to contract a state recognized, qualified redbelly turtle surveyor to ensure that no protected species of turtle were harmed during the construction activity. From April 2017 through June 2017, AECOM biologists trapped and relocated turtles including the target species, from Broomall Lake to suitable, PFBC-approved habitats downstream. The permitting process, trapping techniques, construction oversight, and species collected will all be discussed during this presentation.

Ohio River Ecological Research Program: A two-year investigation of ichthyoplankton at seven locations on the Ohio River

Jason Rager, EA Engineering, Science, & Technology, Inc., PBC, 444 Lake Cook Road, Suite 18 Deerfield, IL 60015

Jason Rager, (302) 383-9666, jrager@eaest.com; professional oral presentation

The Ohio River, formed by the confluence of the Allegheny and Monongahela rivers in Pittsburgh, Pennsylvania, flows for 981 river miles to its confluence with the Mississippi River in Cairo, Illinois. In 2015 and 2016, a two-year study of ichthyoplankton at seven locations on the Ohio River, spanning over 70 percent of the river length, was conducted to meet Clean Water Act requirements for seven power generating facilities. The study was the first effort to characterize ichthyoplankton in the Ohio River on a large scale since the 1980s and early 1990s. Over 280,000 specimens were collected during the study representing 12 fish families. In general, Gizzard Shad (and Clupeidae sp. and *Dorosoma* sp.), Freshwater Drum, and Ictiobinae sp. were the dominant taxa among both years and facilities. Patterns of total ichthyoplankton density between years were variable by location with considerable consistency evident at some location, while other locations displayed changes in both magnitude and timing of periods of peak abundance. Comparison of densities by individual taxon or taxa groups between 2015 and 2016 showed that some experienced overall increases throughout the study area (e.g., Logperch type and Asian carp [where they were observed]), while other taxa showed localized variability depending on facility (e.g., Freshwater Drum, Emerald Shiner type, Gizzard Shad, and Ictiobinae sp.). The two-year study highlighted the between-year variability that can occur at individual locations and revealed study-wide patterns (or lack thereof) across more than 700 miles of the Ohio River.

Population status of Smallmouth Bass in the Susquehanna River Basin: consideration of population dynamics and fish health characteristics

Megan K. Schall, Penn State Hazleton, 76 University Drive, Hazleton, PA 18202, Geoffrey D. Smith, Pennsylvania Fish and Boat Commission, Division of Fisheries Management, 1601 Elmerton Ave, Box 67000, Harrisburg, PA 17106, Vicki S. Blazer, U.S. Geological Survey, Fish Health Branch, Leetown Science Center, 11649 Leetown Road, Kearneysville, WV 25340, Yan Li, North Carolina Division of Marine Fisheries, North Carolina Department of Environmental Quality, 3441 Arendell Street, P.O. Box 769, Morehead City, NC 28557, and Tyler Wagner, U.S. Geological Survey, Pennsylvania Cooperative Fish and Wildlife Research Unit, Pennsylvania State University, 402 Forest Resources Building, University Park, PA 16802

Megan K. Schall, (814)-482-8032, mvk10@psu.edu, professional oral presentation

Smallmouth Bass (*Micropterus dolomieu)* are an ecologically and economically important species in the Susquehanna River Basin. Fish health and population level concerns began over a decade ago (2005) following young-of-the-year (YOY) Smallmouth Bass mortality events and observations of external lesions. In this study, we used a population dynamics model to evaluate changes in Smallmouth Bass catch and mortality rates within sub-basins of the Susquehanna River Basin. We also evaluated fish health data for YOY and adults, including observations of external lesions and intersex prevalence. Smallmouth Bass survey (YOY: 1991-2017, Adult: 1990-2017) and length-at-age data (1986-2017) were obtained from Pennsylvania Fish and Boat Commission for rivers in the state of Pennsylvania. Fish health data were collected during targeted sampling events after 2005. Following several years of declining catch rates (#/hr), recent surveys indicate that catch rates are increasing and reaching levels similar to those observed prior to the early 2000's. Although, similar patterns in catch rates were not observed in all sub-basins, when it was observed it often coincided with declines in YOY natural mortality and adult total mortality rates and prevalence of observable lesions in YOY, suggesting that factors affecting YOY and adult survival may be playing an important role. Fish health characteristics were not consistent over time or across fish size classes or sub-basins. Identifying risk factors for disease and management actions that may have contributed to the different patterns in catch rates and fish health characteristics observed will be important in maintaining robust populations.

Assessing the Potential Role of Lepidoptera Larvae Abundance on the Productivity of a Foraging Specialist Songbird

Dakotah Shaffer, Indiana University of Pennsylvania, Department of Biology, Indiana, PA, 15705; Cameron Fiss, State University of New York College of Environmental Science and Forestry, Department of Environmental and Forest Biology, Syracuse, NY, 13210; Darin McNeil, Cornell University, Department of Natural Resources, Lab of Ornithology, Ithaca, NY, 14850; Justin O'Neill, Indiana University of Pennsylvania, Department of Biology, Indiana, PA, 15705; Dr. Jeffrey Larkin, Indiana University of Pennsylvania, Department of Biology, Indiana, PA, 15705, American Bird Conservancy, The Plains, VA, 20198

Dakotah Shaffer, (717)-487-2303, vfvw@iup.edu, student oral presentation

Lepidoptera larvae (i.e., caterpillars) play an important role as prey for many songbird species, and prey availability has been directly linked to avian productivity. Previous research on the Golden-winged Warbler (*Vermivora chrysoptera*) in Pennsylvania revealed that caterpillar availability influenced territory placement and foraging site selection. A recent study found considerable differences in reproductive success of Golden-winged Warblers occupying two regions of Pennsylvania. To examine the degree caterpillar abundance is correlated with regional differences in Golden-winged Warbler productivity, we sampled caterpillars on 12 woody species during the avian breeding season in the Poconos (higher warbler productivity) and PA Wilds (lower warbler productivity). We sampled 906 individual sapling/shrubs and recorded 970 caterpillars between the Poconos (n=372) and PA Wilds (n=598). Small smooth caterpillars (SSC) were detected on all woody species in both regions. Leaf-roller caterpillars (LRC) were detected on multiple species, but >95% of individuals were on witch hazel (*Hamamelis virginiana).* When we adjusted caterpillar abundance by regional stem densities for each woody species, SSC abundance was higher (~3.9x) in the PA Wilds (41,586 vs. 10,615 SSC/ha).
However, LRC abundance was higher (~12.7x) in the Poconos (6,129 vs. 481 LRC/ha). Because Golden-winged Warblers are leaf-probing specialist, LRC abundance may better predict food availability. Given the regional correlation between LRC abundance and Golden-winged Warbler productivity, our results suggest that LRC could be a limiting resource for Golden- winged Warblers. As such, management to create Golden-winged Warbler breeding habitat should seek to promote witch hazel or other woody species that support abundant LRC populations.

The Role of Streamflow Alteration in Shaping Fish Assemblages in Headwater Streams
Matthew K. Shank, Susquehanna River Basin Commission, 4423 N. Front St., Harrisburg, PA 17110

Matthew K. Shank, 717-238-0423; 1113, mshank@srbc.net, Professional Oral Presentation

The natural flow regime exerts extensive influence on Pennsylvania Rivers and streams. Streamflow creates and maintains physical habitat, which influences biological communities that have adapted to these conditions. Water is also essential for communities, industry, and commerce, which necessitates withdrawals from surface waters that alters the natural flow regime. Headwater streams, are at increased risk of flow alteration due to characteristically low flow yields. The Susquehanna River Basin Commission (SRBC) and The Nature Conservancy developed a set of ecosystem flow needs to protect species and ecological processes unique to the Susquehanna watershed. These recommendations were incorporated into a regulatory paradigm adopted by SRBC in 2012, the Low Flow Protection Policy (LFPP), which is currently used to regulate water withdrawals in the Pennsylvania portion of the Susquehanna watershed. The main objective of this research was to develop meaningful statistical relationships between stream ecology indicators and ecosystem flow needs to evaluate the efficacy of the LFPP. Physical, chemical, and biological data were collected from 41 headwater stream sites, 27 of which included water withdrawals. Multiple linear regression models indicated that alterations to both low and high flow metrics resulted in considerable changes to fish assemblages. When riverine impoundments were used in concert with water withdrawals, fish assemblages were increasingly effected. Results suggest that protection of the entire flow

regime is advantageous compared to protecting static minimum low flow conditions. These results highlight the importance of maintaining the natural flow regime in headwater settings to support sensitive ecosystems, habitats, and anthropogenic users downstream.

Comparing Smallmouth Bass catch-rate and length-frequency data from seasonally disparate data sets from large river systems: arguments for lumping and splitting surveys.

Geoffrey D. Smith, Division of Fisheries Management, Pennsylvania Fish and Boat Commission, 595 E. Rolling Ridge Dr., Bellefonte, PA 16823

Geoffrey D. Smith, geofsmith@pa.gov, professional oral presentation

As demands increase among natural resource agencies, there is growing interest in streamlining operations which could mean combining surveys for important species, such as Smallmouth Bass, or altering field schedules to account for emerging needs. This could mean departing from typical sampling periods that long-term data sets were developed under. Life history and behavior can influence seasonal habitat usage by Smallmouth Bass in riverine systems. As such, the catchability during electrofishing surveys may also be influenced; affecting the resulting relative abundance estimates and population characteristics derived from those surveys. This is especially critical when the data is used for regulatory evaluation in an adaptive management scenario for a popular recreational fishery. I compare electrofishing catch rates (catch per unit effort, CPUE, fish/h) and length-frequency distributions (CPUE per 25 mm total length group) of adult Smallmouth Bass from surveys during different seasons at similar reaches of the Juniata River (Spring – Summer) and Susquehanna River (Summer – Fall) to see if resulting data differed. Further, I evaluate whether the data collected under different sampling periods would suggest different management outcomes based on the adaptive management thresholds recently developed. This evaluation could help resource agencies and researchers in vetting seasonally disparate data sets to include in data analysis and fisheries management activities.

Infestation by the exotic fruit fly, *Drosophila suzukii*, reduces local abundance of frugivorous birds in a Pennsylvania forest.

Scott H. Stoleson, USDA Forest Service, Northern Research Station, Irvine PA 16329; Christopher Lituma and Dan Roche, Davis College, Division of Forestry and Natural Resources West Virginia University, 1145 Evansdale Drive, Morgantown, WV 26506.

Scott H. Stoleson (814) 563-1080, sstoleson@usda.gov; professional oral presentation

The Spotted-winged Drosophila (SWD, *Drosophila suzukii*), an invasive pest of berry and stone fruit, has spread rapidly across the continent since it first appeared on the West coast in 2008. Unlike native fruit flies, which oviposit on overripe or decaying fruit, SWD has a saw-

like ovipositor that enables it to lay its eggs in unripe fruit and thus prevent full ripening. Although the devastating effects of SWD on commercial fruit production have been well-studied globally, its prevalence and impacts on native forest ecosystems remain unknown. Since 2006 we have used constant-effort mist-netting to monitor post-breeding bird abundance in recent timber harvests on the Allegheny National Forest. In 2016, we discovered an infestation of SWD in two recent harvests dominated by blackberry (*Rubus allegheniensis*). As the berries ripened, large numbers of fruit flies appeared and destroyed the entire fruit crop within 2 weeks. Compared to averages from 2009 - 2015, capture rates of non-frugivorous birds remained high in 2016-2018, but numbers of primarily frugivorous species (e.g., *Catharus*, *Bombycilla*) dropped drastically. It remains unknown whether frugivorous birds turned to alternate food resources, relocated to areas without SWD, or if local populations were actually reduced. Because frugivorous birds function as key seed dispersers in forests, their reduction, mediated through the loss of soft mast to SWD, may have serious long-term negative ecological consequences, such as changes in forest composition and regeneration.

Finding our way to greener pastures: challenges of regal fritillary butterfly conservation, grassland management, and reintroductions

Virginia Tilden and Erika McKinney, Temple University at Fort Indiantown Gap, ENV Division, Bldg 11-19, Annville, PA 17003; Mark Swartz, Department of Military and Veteran's Affairs, Fort Indiantown Gap ENV Division, Bldg 11-19, Annville, PA 17003; Tim Becker, ZooAmerica North American Wildlife Park, 201 Park Avenue, Hershey, PA 17033.

Virginia Tilden, (717) 861-2449, vatilden@comcast.net; professional oral presentation

The regal fritillary (*Speyeria idalia*) is a grassland endemic butterfly that declined dramatically in the mid to late 1900s. While there are still relatively stable populations west of the Mississippi River, in the East, only one population remains, at Fort Indiantown Gap National Guard Training Center (FIG), Annville, PA. The regal persists at FIG because soil disturbances due to military training and fire created and sustained a mosaic of high quality native warm-season grasslands. The future of this species in the East depends on the conservation at FIG, as well as our attempt to reintroduce the butterfly elsewhere. This talk will provide an update on the population at FIG and work completed with our reintroduction partners. We will overview some of the successes and challenges we have faced and discuss future goals and objectives.

Water pollution and infodisruption: Chemosensory perception of food and predators by riverine invertebrates is impaired by a brine wastewater effluent.

Andy Turner and Brianna Reed, Department of Biology and Geosciences, Clarion University, Clarion, PA, 16214.

Andy Turner, 814-393-2237, aturner@clarion.edu, professional oral presentation

Most aquatic organisms rely on chemical cues to acquire information regarding predation risk, food availability, and other important ecological factors. Recent studies suggest that even low concentrations of some pollutants can disrupt the efficacy of chemical cues. Here we present experiments on the lethal and sublethal effects of a brine effluent derived from the natural gas industry and discharged into the Allegheny River. We focused on whether sublethal concentrations of brine water might impair predator avoidance or food finding ability of two

species of freshwater snail, *Helisoma anceps* and *Helisoma trivolvis*. Conventional toxicity testing (LC_{50}) revealed that brine concentrations in the range of 7-9% (approximately 5000 – 6000 mg/l TDS) were lethal to both species. Working in riverside mesocosms, we conducted a series of experiments manipulating both the concentration of brine water and olfactory cues associated with fish predation or food. These studies showed that sublethal concentrations of brine inhibited both predator avoidance and food finding ability, and that the concentrations necessary to reduce these behaviors to half of their baseline states were about ½ of the lethal concentrations.
Because these behavioral shift have important ecological consequences, these results suggest that pollutants may influence ecological communities at concentrations well below the toxic thresholds.

Landscape and watershed predictors of freshwater mussels in the Ohio River basin
Mary Walsh, Chris Tracey, and Molly Moore, Pennsylvania Natural Heritage Program, Western Pennsylvania Conservancy, 800 Waterfront Drive, Pittsburgh, PA 15222

Mary Walsh, 814-689-1823, mwalsh@paconserve.org; professional oral presentation

Due to habitat alteration and water pollution the ranges of many freshwater mussel species in Pennsylvania have greatly shrunk since the early 20th century. Twelve species have been extirpated from Pennsylvania; 80% of the Commonwealth's freshwater mussels are rated Species of Greatest Conservation Need (SCGN) in the Pennsylvania Wildlife Action Plan. To better understand the current day distributions and environmental variables associated with upper Ohio River basin freshwater mussels, surveys in understudied habitats in the Ohio River and distribution models of 21 species were completed. Model training records included species occurrences from project transect surveys in the Ohio River and records from other sources in Pennsylvania, New York, West Virginia and Ohio. Landscape and watershed variables, such as geology, land cover, hydrology and river size were evaluated in RandomForest species distribution models of 21 freshwater mussels. Models evaluated with the True Skill Statistic (TSS) had fair to good ratings. Variables associated with the distributions vary by species; the occurrence of northern riffleshell, Epioblasma rangiana, include watershed elevation, agricultural landcover type, and stream temperature. Predicted distributions of freshwater mussels may assist conservation prioritization for aquatic habitats and may be applied for selecting sites for future surveys.

Instream measures of land use from a water quality index
Tim Wertz, PADEP, 400 Market St. Harrisburg, PA 17101; Matthew Shank, SRBC, 4423 North Front Street, Harrisburg, PA 17110.

Tim Wertz, (717) 783-7574, twertz@pa.gov; professional oral presentation

Anthropogenic influences throughout a landscape can have significant effects on a stream's water quality and its biotic inhabitants. Quantifying these effects within or among watersheds is necessary to fulfill the assessment and reporting requirements of the federal Clean Water Act. Moreover, it is an important step that must be considered before evaluating the response of biotic communities to abiotic, anthropogenic stress. The need to quantify and effectively communicate

anthropogenic stress currently exists and was the objective of this study. A water quality index (WQI) was developed for Pennsylvania's waterways that briefly identifies the dominant stressor(s), then classifies and ranks cumulative stress along a 0-100 index range. The WQI has shown considerable utility for measuring and communicating changes in stress through time and space.

Abstracts

Posters

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

Eastern Gray Squirrels: Differences in Health, Size and Parasite Loads between Males and Females

Elizabeth Bentz and Jesse Eddinger, Department of Environmental Science and Studies, Juniata College, Huntingdon PA 16652

Elizabeth Bentz, BENTZEK15@juniata.edu and EDDINJR15@juniata.edu; student poster

Eastern gray squirrels (*Sciurus carolinensis*) are found throughout Eastern North America and are important forest regenerators for an ecosystem. The focus of our study was to compare differences in parasite loads, body fat, and morphometric measurements between male and female squirrels. We used male (N=30) and female (N = 30) squirrels that were brought to the Shamokin Mountain Squirrel Tournament in Middleburg PA. All animals were weighed and measured. We used two different techniques to identify endoparasite loads. This first involved extracting parasite eggs from fecal matter using a flotation technique. The second involved intestinal washing. While we did not find differences in the parasite egg count in the fecal floats, males had significantly more intestinal parasites than females. This difference could be the result of sexual dimorphism, with males being larger than females. It could also be because of differences in diet or home range size between males and females. We used bone marrow body fat and BMI as indices of overall health. Bone marrow fat is the last fat deposit to be used during low food availability. Our results indicate that food was not a limiting factor for squirrels in early winter, since bone marrow fat was normal at an average of 34.7% with a range between 19.8% and 59.8%. Males had significantly higher average BMI than females, but we did not find a relationship between bone marrow fat and BMI. While males were larger than females, female body to tail ratio was higher than males. This difference has been reported in other arboreal squirrels, and indicates differential selection pressures.

Estimating crayfish density in the Little Juniata River using electrofishing techniques

Jeremy Chen See, Nicki Leiby, Dr. George Merovich, and Dr. Dennis Johnson, Fisheries and Aquatic Sciences Program, Environmental Science Department, Juniata College, 1700 Moore St., Huntingdon, PA 16652

Jeremy Chen See and *Nichole Leiby*, (610) 301-8799, chensjr16@juniata.edu; student poster

Despite crayfish's status as good indicators of water quality and important components of aquatic ecosystems, their densities in Pennsylvania are largely unknown. Furthermore, invasive crayfish, of which we have little ecological information, such as rusty crayfish *Orconectes rusticus* are becoming the dominant species in the Juniata River Basin. We surveyed 7 sites on the Little Juniata River to determine population densities of Allegheny

crayfish, *Orconectes obscurus*, and rusty crayfish. We used electroshocking with a triple pass method to collect and identify species within quadrats. Crayfish density was estimated by dividing the total number of crayfish caught by the area sampled and by using the depletion method when possible. We also noted correlations between crayfish density and water quality parameters. We found an average crayfish density of 1 crayfish per m^2, with a range of 0.03 to 2.42. Standard error was 0.35.
Allegheny and rusty crayfish never co-occurred at study sites. The depletion method was unusable for most of our sites due to depletion not being achieved. However, our density estimates were strikingly similar to other density estimates employing different sampling techniques in the Juniata basin (see Noll et al. this meeting). Moreover, our estimate of crayfish density in the Little Juniata watershed provides information currently lacking for this important aquatic taxon. Importantly, this study informs the methods of future work on crayfish density, as our data suggest quadrat surveys work well. Our data also suggest electrofishing is ineffective for depleting crayfish populations in three passes for some currently unknown reason.

Searching for Wild Trout in Pennsylvania: Eight years of Susquehanna University's sampling for the PFBC's Unassessed Waters Initiative.

Bailey Coder, John Miller, Nicholas Visser, Brett Miller, Dr. Jonathan, M. Niles, Freshwater Research Initiative, Susquehanna University, 514 University Avenue, Selinsgrove, PA 17870

Bailey Coder, (717) 994-7860, coder@susqu.edu; student poster

Since 2011 Susquehanna University has partnered with the Pennsylvania Fish and Boat Commission's Unassessed Waters Initiative. This cooperative program between the PFBC and colleges and universities seeks to collect biological data on previously unsampled (unassessed) streams across Pennsylvania to determine their status as possible new Wild Trout streams. Prior to this program, which began in 2010, only 8% of the 62,725 streams across Pennsylvania had been sampled for biological data by the PFBC. Since 2011, Susquehanna University faculty, staff and students have surveyed 849 previously unassessed waters as part of the program. Our sample sites across north central Pennsylvania have mostly been in the following major watersheds: Loyalsock Creek, Schrader Creek, Muncy Creek, Lycoming Creek, Buffalo Creek, Penns Creek, Swatara Creek, White Deer Creek, First Fork Sinnemahoning Creek, Redbank Creek and Dubois River. Over the course of eight years we have found wild trout (Brook Trout *Salvelinus fontinalis* and Brown Trout *Salmo trutta*) in 47% of the streams (401 of the 849) we surveyed. In 2018, the majority of the sampling occurred in the following sub-basins: Redbank Creek, Little Sandy Creek, Sandy Lick Creek, First Fork Sinnemahoning Creek, and East Licking Creek. In 2018, we sampled 88 sites and found that 43 of the sites had wild trout in them. We found 15 sites that were dry at the time of the surveys this summer. The Unassessed Waters Initiative has led to the designation of over 1700 new wild trout streams, with many more to be added in the future.

Feeding preference of crayfish genus *Orconectus* and *Cambarus* compared to distance from trout stocking sites in central Pennsylvania

Marissa Cubbage and Catherine Neville, Juniata College, Huntingdon, Pennsylvania 16652

Marissa Cubbage and Catherine Neville, 2677724541, cubbaml15@juniata.edu, 7816354478, nevilcx15@juniata.edu; student poster

We completed a feeding preference test on central PA crayfish genus *Cambarus* and *Orconectus* for stocked brown trout (*Salmo trutta)* or native brook trout (*Salvelinus fontinalis)*. We collected crayfish from four streams that varied in the proximity and degree of recent trout stocking events. We conducted both a flowing Y-apparatus set of trials (with brown trout at one arm and brook trout at the other) as well as a static aquarium-based experiment (with brown trout and brook trout on different sides of an aquarium). In the y-apparatus experiment crayfish from unstocked streams (two streams farthest from stocking site) had a significant preference for Brook trout (n=26, df=2, p=0.015), but crayfish from stocked streams (two streams closest to stocking site) had no preference (n=31, df=2, p=0.542). Crayfish exhibited no detectable feeding preference in the aquarium trials (as measured in number or length of visits to the different food choices) (p=0.408 for streams near stocking site, p=0.733 for streams far from stocking site). Overall, our results suggest that a history of exposure to stocked brown trout did not cause a detectable preference or differential perception of brown or brook trout as food sources. However, a lack of historic exposure to brown trout may cause crayfish to be more reluctant to accept brown trout as a food source (as supported by our y-apparatus trials).

Assessing rural ground water for atrazine contamination in central Pennsylvania

Francesca M. Ferguson, Ursula J. Williams, and Sharon S. Yohn, Department of Chemistry and Biochemistry, Juniata College, Huntingdon PA, 16652; George T. Merovich, Jr. Department of Environmental Science & Studies, Fisheries and Aquatic Science Program, Juniata College, Huntingdon PA, 16652

Francesca M. Ferguson, (814) 327-8974, fergufm15@juniata.edu; student poster

Atrazine is the second most abundant herbicide used in the United States. Atrazine is an endocrine disrupting compound (EDC) due to its adverse effects on the reproductive and neurological systems in vertebrates and invertebrates. The objective of this study is to investigate atrazine's occurrence in well water samples and how its presence is linked to land use in central Pennsylvania. Twenty-four wells in Huntingdon, Centre, and Blair counties were sampled across a range of various land-use characteristics from September – November, 2018. A one-liter water sample was collected at each site. Water samples were filtered then extracted using an Oasis HLB solid-phase filter. Analysis was ran on a High-Performance Liquid Chromatography (HPLC-UV) using a linear solvent system of 60:40 (v/v) water:methanol to 100% methanol. Atrazine concentrations were obtained using a standard curve, prepared daily from a stock solution. We found quantifiable amounts of atrazine in 5 of 24 wells, ranging in concentration from 0 to 421 ppt. All atrazine concentrations observed were within regulatory limits set by the US EPA at 0.003mg/L (3ppb). Variation in atrazine concentrations was linked to land-use. We expected to see atrazine associated with greater agricultural land use. Land-use

characteristics were quantified within a one-kilometer buffer around each well using ArcMap (ESRI, Redlands, CA). Contrary to expectation we observed no statistically significant correlations to land-use. Atrazine is commonly sprayed on corn cultivation, potentially spiking concentrations closer to April, May, and June during its application season. Further study should investigate seasonal variation in atrazine levels.

Data Resolution and Scale of Land Use Data Alter the Ability to Predict the Benefits of Riparian Buffers on Fish Populations

Cassey Fox, Dr. Jonathan Niles, and Dr. Daniel Ressler, Freshwater Research Initiative at Susquehanna University, Selinsgrove, PA 17870

Cassey Fox, 856-723-2890, foxc@susqu.edu; student poster

Forested riparian buffers are a best management practice used in stream restoration projects because after some time, they will provide shade to the stream water, bind soil under tree roots, and trap sediment and nutrients moving in from nearby landscapes. Land use datasets are being used to prioritize stream segments for stream restoration based on the existing abundance of forest cover around a stream bank. The U.S. Geological Survey Land Use Land Cover data is a 30-m resolution dataset that covers the nation, but higher resolution data are becoming available like the Chesapeake Conservancy's 1-m data for the Chesapeake Bay Watershed. The objective of this study is to use these data sources to predict fish populations in small streams by building regression relationships from sites that have had fish population surveys which are undergoing or have undergone stream restoration. Streams across a wide range of land uses and water quality impairments have been selected at 27 sites within Northumberland, Montour, Centre, and Union Counties (PA). Each site has been characterized by electro-fishing 100-m reaches as well as sampling sediments from the stream bottom in each reach. Stream corridors are constructed by creating an 11-m, 100-m, and 500-m buffer from the stream center-line that extends 1000-m upstream from the electrofishing point. Multivariate statistical analyses were conducted in R. The width of the corridor strongly influences the ability to predict fish populations, but the resolution may not significantly improve the prediction.

Assessment of macroinvertebrate communities in NAMD impacted streams

Katie Gallmeyer, David Argent, and William Kimmel, California University of Pennsylvania,

Katie Gallmeyer, GAL8271@calu.edu; argent@calu.edu; 724-938-1529; student poster

Significant portions of Pennsylvania's flowing waters and attendant ecosystems have been degraded by acid mine drainage. This pollutant has emerged as one of the most environmentally damaging, impacting over 4,000 km of the Commonwealth's streams. As such it has been well studied. Net alkaline mine drainage (NAMD) by contrast is even more pervasive, resulting in streams with circumneutral pH but with stream bottoms encrusted with iron precipitate which gives the streams a familiar orange appearance. Little is known of the ecology of these systems and in particular their benthic or bottom dwelling communities. We sampled macroinvertebrates in 10 NAMD impacted streams of southwestern Pennsylvania. Three kick-net samples were

combined to form a station. Water samples were collected and tested for iron, sulfate, alkalinity, specific conductance, pH, and temperature. We found appreciable differences between NAMD impacted reaches and their adjacent un-impacted upstream reach for several parameters; and most NAMD stream reaches supported macroinvertebrates despite the elevated levels of iron. These findings suggest that these streams, although orange in color are biologically productive and with a little help could be restored to full functionality.

The Creation of an IBI Model that is Independent of Stream Size.

Sean Harlan, Clarion University of Pennsylvania, 840 Wood Street, Clarion, PA 16214; Andrew Turner, Clarion University of Pennsylvania, 840 Wood Street, Clarion, PA 16214; Mark Russell, Shenango River Watchers, Inc, 730 Forker Blvd, Hermitage, PA 16148.

Sean Harlan, (724)-674-7704, S.M.Harlon@eagle.clarion.edu; student poster

An Index of Biological Integrity (IBI) is a metric for evaluating the degree to which the biological community of a stream is impaired by anthropogenic stressors. Most IBI's weigh three aspects of community structure: species richness and composition, trophic composition and overall abundance. These community aspects are then divided into multiple parameters that can be used to create a final score. Most IBI models are dependent on the reference site that is used for a baseline. Reference sites can skew results due to differences in stream size or biogeographic differences in the streams being evaluated. The goal of this research is to modify IBI parameters and create an IBI model that yields scores independent of stream size. We used a large dataset of fish assemblages in the Shenango River watershed for model development. For this evaluation process, two sites that display excellent fish communities were used as reference sites, French Creek and the Little Shenango River. The two streams are different in size. These reference sites were then used to find IBI values for several sites along the Middle Shenango River. As a result, seven parameters were selected for the final IBI model. The two sets of values were not significantly different (p-value of 0.594, and a correlation value of 88%). This project is the first step of many to create an IBI model that can be applied to any stream without manipulating references sites.

Pennsylvania distribution and prevalence of chytrid fungus and ranavirus in the Eastern Newt (*Notophthalmus viridescens*)

Christina Hoffman, Cody Little, Helen Hampikian, and Kurt Regester, Department of Biology and Geosciences, Clarion University, Clarion, PA 16214

Christina Hoffman, (717) 372-8397, c.g.hoffman@eagle.clarion.edu; student poster

Pathogens have been identified within Pennsylvania which have been heavily implicated in amphibian population declines worldwide. Described collectively as chytrid fungus, *Batrachochytrium dendrobatidis/Batrachochytrium salamandrivorans* (Bd/BSal) have been especially destructive to frog populations in North and South America. Ranaviruses (RV) are a group of diverse, deadly viruses, which have also played a role in numerous infections and

population losses. The Eastern Newt (*Notophthalmus viridescens*) is a broadly distributed habitat generalist suspected to pose a threat to other taxa as vectors. The movement of these vectors over land facilitates the spread of pathogens to other bodies of water. Through a statewide cooperative with citizen scientists, samples from a focal species were collected. Each newt sampled was associated with its specific ecological region. Over a span of two years, there were 281 samples collected in the form of Bd/Bsal swabs of the ventral surfaces and 277 samples of tail clippings for RV detection. Year 1 had a 31.9% Bd and 13.7% RV infection. Year 2 had a 47.2% Bd and 15.7% RV infection. Newts had several strong positives for RV infection, but was less frequent than Bd. Overall prevalence for Bd over the span of the study was 39.9%, and 14.8% had RV infections. None of the sampled newts showed a positive result for Bsal. The relatively broad distribution of infection prevalence for both pathogens statewide shows the reach of the infection. This may be cause for concern and merits greater monitoring efforts to assess possible pathogen-associated amphibian population fluctuations over time.

Temperature Based Competitive Interactions between Brook Trout and Creek Chubs; Implications of Climate Change

Matthew Persons, and Jonathan Niles, Susquehanna University, Selinsgrove, PA

17870 *David Huntzberry*, (443) 545-9424, huntzberry@susqu.edu; student poster

As global warming continues, water temperatures will begin to rise strongly influencing competitive intra- and interspecific feeding behaviors of many fish species because of physiological and behavioral differences in species-level thermal tolerances. As temperatures increase, a common cyprinid species called Creek Chub that can be found in both warm and cold water streams throughout Pennsylvania, will begin to compete with Brook Trout for similar prey and habitat. Creek Chub (*Semotilus atromaculatus*) and Brook Trout (*Salvelinus fontinalis*) are sympatric and syntopic within Pennsylvanian headwater streams yet the effects of temperature on their competitive interactions is largely unknown. Previous research shows that Brook Trout should respond more negatively to increases in stream temperature then Creek Chubs due to a much lower thermal maximum and a much higher demand for oxygen concentrations. While Brook Trout and Creek Chubs are kept together in high water temperatures, Creek Chubs will show aggressive behaviors and take preferential feeding habitat from the thermally stressed Brook Trout. We measured feeding and aggressive behaviors among three combinations of conspecific and heterospecific dyads of Creek Chub and Brook Trout within laboratory raceways at three different temperatures. We used a within-between subject's experimental design with three between species treatments (Creek Chub pairs, Brook Trout pairs, chub/trout pair) and three within temperature treatments among each dyad. Behaviors measured included feeding latency, feeding rate, rate, aggressive bumps, and displacement during feeding. We also documented submissive and defensive behaviors including freezing, dropping, and avoidance.

Assessing the Effect of Canopy Cover on Benthic Pond Communities

Tony Kumetis and Dr. Kurt Regester, Department of Biology and Geoscience. Clarion University of Pennsylvania, Clarion PA, 16214

Tony Kumetis, (814)-661-5717, T.J.Kumetis@eagle.clarion.edu; student poster

Leaf litter is primary source of energy in many aquatic systems, and is a strong influence on the structure and function of woodland pond ecosystems. Canopy cover, light levels, and leaf litter influence the amount of photosynthetic production in a pond system, which in turn affects the benthic community composition. The objective of this study was to quantify the seasonal changes in biomass of the benthic invertebrate communities in closed canopy and open canopy ponds. We would expect a closed canopy pond with an input of leaf litter detritus to have more shredding macroinvertebrates and an open canopy pond with active photosynthesis to have more scraping macroinvertebrates. Samples were taken in June, August, and October of 2017 using benthic drop can sampling methods at two permanent ponds located on Pennsylvania State Game Land 63 in Clarion County. We found a higher total macroinvertebrate biomass in the closed pond than in the open pond (2.50g/m2 compared to 0.66g/m2). Primary consumer biomass and diversity also differed between pond types throughout the year. October samples in the open pond had higher biomass than June samples (2.50g/m2 compared to 0.37g/m2), which may be from amphibian predators leaving the ponds by the October collection or from variation in community structures due to insect emergences in the spring and early summer. Ponds with large amounts of leaf litter inputs had declined levels of biomass and order richness while insignificantly increasing community evenness.

Habitat Associations of Three At-risk Bird Species in Riparian Forests of Pennsylvania

Jeffery T. Larkin, Brett Ramer, and Dr. Jeffery L. Larkin, Indiana University of Pennsylvania, 975 Oakland Avenue, Indiana, Pa 15705, Cameron Fiss, SUNY-College of Environmental Science and Forestry, 1 Forestry Dr, Syracuse, NY 13210

Jeffery T. Larkin, (724)-549-2769, NZQW@iup.edu, student poster

Pennsylvania contains nearly 7 million hectares of forest and more than 138,000 km of rivers, streams, and creeks many of which are forested. These streams provide habitat for a unique set of avian species, including several that are experiencing population declines. We examined the influence of riparian forest vegetation and stand-level forest management on the abundances of three at-risk songbirds: Wood Thrush (*Hylocichla mustelina*), Canada Warbler (*Cardellina canadensis*), and Louisiana Waterthrush (*Parkesia motacilla*). Specifically, we conducted point count surveys along 23 stream sections totaling 183 points on public lands in central and southwest Pennsylvania during May-June 2018. The total number of surveys with at least one of the focal species was 62 for Canada Warblers, 36 for Louisiana Waterthrush, and 60 for Wood Thrush. Distance to stand-level management, including overstory removal and shelterwood harvests, most influenced Wood Thrush abundance, whereby abundance increased closer to managed areas. Microhabitat features including small and medium sapling density and rhododendron cover most influenced Canada Warbler abundance, whereby density increased

with greater amounts of these habitat features. Distance to overstory removal and rhododendron height most influenced Louisiana Waterthrush abundance, whereby abundance increased closer to overstory removals and with increased rhododendron height. Our results suggest that these three species may benefit from forest management activities that promote age class diversity and increased understory structural complexity. Future studies should advance beyond our findings by examining full-breeding season reproductive success of our focal species in relationship to forest management in and adjacent to riparian zones.

Butterfly Communities occupying Early Successional Deciduous Forests of the Central Appalachian Mountains

Monica Lee, Codey Mathis, Jeffery Larkin, Indiana University of Pennsylvania, W Walk St Room 126, Indiana, PA, 15701; D. J. McNeil Jr., Cornell University, 159 Sapsucker Woods Rd, Ithaca, NY, 14850; Christina Grozinger, Pennsylvania State University, Millennium Science Complex, University Park, PA 16802.

Monica Lee, (814)-505-7411, qqrv@iup.edu, student poster

Pollinator populations are experiencing declines throughout North America. Butterfly declines have been linked to reduced floral populations (i.e., the milkweed and the monarch [Danaus plexippus]), but research regarding specific habitat characteristics that may promote healthy populations is limited. In 2018, we initiated a research project that focuses on quantifying the butterfly communities within early successional deciduous forests in the Appalachian Mountains region of Pennsylvania. We surveyed 75 regenerating forest stands across Pennsylvania ranging from 1-9 years post-timber harvest. We visited each stand five times from May-August to assess butterfly abundance and diversity, vegetation structure, and floral abundance and diversity. Butterfly communities were visually surveyed along transects randomly located within each stand. Additionally, we collected butterflies using raised blue-vane traps and ground-level bowls traps. We recorded 279 butterfly observations, 165 flower species, and collected 62 specimens. The most commonly identified butterflies were the eastern tiger swallowtail (*Papilio glaucus*), spicebush swallowtail (*Papilio troilus*), and red-spotted purple (*Limenitis arthemis*). Our analyses revealed that floral abundance was not associated with butterfly abundance ($p=0.52$). Time since harvest was a significant predictor of butterfly abundance, and our model predicted that butterfly abundance will be 5 times higher in stands 1-year post-harvest compared to stands 9-years post-harvest. Additionally, we found that butterfly abundance was negatively associated with fern and large shrub cover, and positively associated with grass cover. These results suggest that factors such as limited early successional forests and stands with expansive fern cover are likely limiting the value of Pennsylvania's forests to butterfly communities.

Impact of Environmental Factors, Predators and Patch Size on the Distribution of Allegheny Woodrats

Grace Lewis, Desmond O'Donovan; Gwynne Domashinski; Colton Moyer, Department of Environmental Science and Studies, Juniata College, Huntingdon PA 16652

Grace Lewis, LEWISGE17@juniata.edu; ODONODR16@juniata.edu; DOMASGT16@juniata.edu; and MOYERCM15@juniata.edu; student poster

Allegheny woodrats (*Neotoma magister*) are a listed species throughout their range. A variety of factors have contributed to this decline, including their dependence on rocky outcrops, competition from porcupines for these sites, habitat fragmentation and predation. The goal of our study was to determine factors that influence the distribution of woodrats, and to use this information to predict woodrat presence in unsurveyed sites. Our study sites included State Game lands 112 and 067. To record the presence of woodrats at each habitat patch, we used camera traps paired with bait tubes filled with suet. To increase our site sample size, we also included data from previous years. We looked at the activity of woodrats in response to presence of predators, competition, time of day and temperature. Woodrats were most active between 8:00pm to 3:00am, at a temperature of 17˚C to 18˚C. We found that the presence of predators was greater at sites with woodrats, indicating that woodrat presence probably drives predator presence. Using a logistic regression model we looked to see if patch size, distance between patches or predator presence could be used to predict the presence of woodrats at each patch. We then used this model to predict woodrat presence in unsurveyed habitat patches.

Total Fish Populations Increase with Coarser Sediment in Restored Streams

Jackson Long, Jonathan Niles, and Daniel Ressler, Freshwater Research Initiative at Susquehanna University, Selinsgrove, PA 17870

Jackson Long, 717-649-5272, longjg@susqu.edu; student poster

Stream restoration projects attempt to improve fish habitat, prevent erosion, and enhance recreational opportunities. Several streams in Montour, Union, Northumberland, and Centre counties have been identified by high resolution topographic and land cover data developed by the Chesapeake Conservancy and are receiving stream restoration. Sampling of fish populations and sediments were performed on both pre-restoration and post-restoration sites through electrofishing and sediment dredging. Fish species were identified, counted, and measured on site. Sediment samples were processed through sieving and a hydrometer analysis to determine grain size from clay to 16-millimeter coarse fragments. A trend was identified between coarser grain size and total fish populations. These correlations reveal the ecological benefits of stream restoration techniques and serve as a justification to continue with the practice.

Classifying ecological conditions in the Little Juniata River – linking benthic macroinvertebrate assemblages to landscape attributes

Katie Mattas, Nick Smith, George Merovich, Fisheries and Aquatic Sciences Program, Department of Environmental Sciences, Juniata College, 1904 Moore Street, Huntingdon, PA 16652

Katie Mattas, (717) 891-1479, mattakm15@juniata.edu; student poster

Landcover of the surrounding watershed of a river can have a great influence on the benthic macroinvertebrate community of that river. The Little Juniata River is a popular cold-water fishery, however we do not know many of the details of the health of the river. We studied benthic macroinvertebrates on the Little Juniata River in the summer of 2018 to understand the health of the river at the watershed scale. We collected and identified (genus level) benthic macroinvertebrates from 14 sites along the main stem following PA DEP sampling protocols to evaluate biological integrity. The most common orders of benthic macroinvertebrates among all sites were *Ephemeroptera*, *Diptera*, and *Coleoptera*. PA IBI scores ranged from 16 to 68. In general, IBI scores were very poor in the headwaters and slowly improved downstream. Assemblage structure determined with an NMDS ordination was variable. We also calculated a measure of ecological value (EV), by weighting IBI scores by the area of the segment level watershed (SLW) from where the sample was taken. EV was then linearly interpolated between sampled SLWs to estimate likely conditions in un-sampled SLWs. EV accumulated downstream as predicted but was noticeably lower than expected. We also compared IBI scores to landcover attributes of the surrounding watershed and in-stream water quality parameters. We found very weak relationships with landcover and with water quality (most correlation coefficients < 0.5, p- values > 0.05). This suggests that there are other environmental variables or anthropogenic stressors affecting benthic macroinvertebrate assemblages in the Little Juniata River. Being able to classify stream conditions will allow us to identify high quality areas for protection and will allow us to identify low quality areas that can be targeted for restoration. Further research is need to determine the reason for poor IBI scores observed in this study, given that the river supports an impressive trout fishery.

Potential Environmental Predictors of an important West Nile Virus vector (*Culex restuans*) in Ruffed Grouse Habitat

Samantha Maywald, Clay Corbin, John Hranitz, Karl Henry, Bloomsburg University, 400 R 2nd St, Bloomsburg, PA 17815; Lisa Williams, PA Game Commission, 2001 Elmerton Avenue, Harrisburg, PA 17110; Mike Hutchinson, PA Department of Environmental Protection, 2575 Interstate Drive, Harrisburg, PA 17110.

Samantha Maywald, (570) 479-6398, slm77687@huskies.bloomu.edu, student poster

Since 2001, Ruffed Grouse (*Bonasa umbellus*) population in Pennsylvania have been declining

and were correlated with the prevalence of West Nile Virus (WNV). While there are many studies of environmental predictors of mosquito abundance in urban habitats, little is known about WNV vectors in forests. We think the same environmental factors in urban habitats (water availability, topography, and bird hosts) will predict the abundance of *Culex restuans*, an important WNV vector, in Ruffed Grouse habitat. Mosquitos were surveyed mid-late summer at eight sites in Luzerne County using paired gravid mosquito traps. Samples (1/week x 13weeks) were sent to PADEP for identification and assay of WNV. We used analysis of variance and regression to test if elevation, distance from human activity, temperature, and humidity were predictors of mosquito abundance. Mosquito densities ranged from 72 to 624 per site and WNV was positive in five sites. Across sites, none of our independent variables predicted mosquito abundance. Other local effects such as aspects of hydrography, vegetation, and bird hosts may be more important in determining the dynamics of WNV vectors. These latter predictors, a second season of data (summer 2019), and blood meal analysis, will help provide a habitat management plan for Ruffed Grouse in Pennsylvania.

Annual Allochthonous and Autochthonous Energy Flow in Two Permanent Wetlands during Hydroperiod Reduction

Lisa McKenzie, Tony Kumetis, Lexi Robison, and Kurt Regester, Department of Biology and Geosciences, Clarion University, Clarion, PA 16214

Lisa McKenzie, (914) 261-1072, l.j.mckenzie@eagle.clarion.edu; student poster

Wetland loss is a global phenomenon, affecting the persistence of vernal pool specialists locally and worldwide. Vernal pools provide essential breeding habitat for mole salamanders (*Ambystoma*), Wood Frogs (*Lithobates sylvaticus*), aquatic invertebrates, and a multitude of other organisms adapted for life in temporary waters. When ephemeral wetlands are lost or degraded, restoration efforts often employ pool creation or alteration, including hydroperiod modification, to restore proper ecosystem function and maintain local biodiversity. The objective of this study was to assess the effects of hydroperiod modification on allochthonous and autochthonous wetland energy flow, to ultimately improve breeding success of local declining salamander populations. Our study was primarily focused on the Jefferson Salamander (*Ambystoma jeffersonianum*), the Spotted Salamander (*Ambystoma maculatum*), and the Four- Toed Salamander (*Hemidactylium scutatum*), all local bi-phasic vernal pool specialists. Beginning in spring of 2017, two local permanent ponds on SGL 63 in Clarion County have been systematically sampled via benthic drop can sampling for larval amphibians, fish, coarse woody debris (CWD), organic debris (OD), macroinvertebrates, and zooplankton, both before and after hydroperiod modification. Data indicate differences through time and space between the allochthonous and autochthonous wetlands in carbon storage components and major pathways of energy flow, particularly for detritus components and macroinvertebrate assemblages. These findings are relevant for effective wetland management, especially for amphibians and other declining vernal pool specialists.

Relationship between Macroinvertebrates and Stream Sediment: The Need for Riparian Buffers

Haley Miller, Jonathan Niles, and Daniel Ressler, Freshwater Research Initiative at Susquehanna University, Selinsgrove, PA 17870

Haley Miller, 610-563-7255, millerh@susqu.edu; student poster

Riparian buffers and stream structures serve many environmental roles, one being to reduce the rate of erosion and sedimentation within a stream. Characteristics of stream sediment, particularly the size of sediment particles, have a large effect on the diversity and density of macroinvertebrate populations. Stream sediment and macroinvertebrate samples were collected from various farm streams throughout Clinton and Centre counties prior to restoration along Elk Creek in the summer of 2017 and post restoration in the summer of 2018. The macroinvertebrate metrics were percentage of Ephemeroptera, Plecoptera, and Trichoptera (%EPT) and Hilsenhoff biotic index. The sediment characteristics measured were C:N ratio, organic matter content, grain size, and percent fine earth. A Mann-Whitney U test performed on the sediment results between each year showed significant improvements following stream restoration, it is anticipated the results will be similar for macroinvertebrate metrics when identification of 2018 samples is complete. Correlations between the macroinvertebrate metrics and sediment results show a statistically significant relationship between macroinvertebrate populations and percent fine earth as well as grain size. Larger stream sediment particles correlate with a higher %EPT and a lower Hilsenhoff score. Maintaining healthy streams is vital for maintaining macroinvertebrate communities which are near the base of stream trophic webs.

Comparing Sedimentation Rates in Paired Perennial Streams under Different Land Use during High Precipitation Events

Shane Moyer and Daniel Ressler, Freshwater Research Initiative at Susquehanna University, Selinsgrove, PA 17870

Shane Moyer, 570-713-4535, moyershane@susqu.edu; student poster

Sediment and nutrient delivery are the primary impairments in the Chesapeake Bay, and much of these threats are produced in the agricultural landscapes along the Susquehanna River watershed in Pennsylvania. Best management practices like forested riparian buffers and livestock exclusion are key features in a stream restoration project. This study will present the sediment transportation characteristics of paired micro-watersheds in unnamed tributaries to Elk Creek in Centre County, Pennsylvania before the restoration project begins. Water samples were collected every six hours by autosamplers at upstream and downstream locations on a barnyard where restoration will begin next year, and a forested reference site. Samples were analyzed for field parameters, turbidity, and sediment content using a hydrometer to estimate suspended sediments according to their size. During heavy rain, the two watersheds often had similar turbidity, but the agricultural stream carried far more fine particles than the forested site. This study will be repeated after the stream restoration is complete to determine the

effectiveness of the practices used in the restoration.

Temporal Attenuation of Abandoned Mine Drainage within the Mill Creek Watershed

Austin Nardi, Alicia Brooks, Terry Morrow, and Andrew Turner: Clarion University, 840 Wood Street, Clarion, PA 16214

Austin Nardi, (724) 884-7514, A.L.Nardi@eagle.clarion.edu; student poster

Extensive coal mining in western Pennsylvania has caused abandoned mine drainage (AMD), containing high concentrations of iron, aluminum, and other metals, to enter our waterways. It has been observed that water quality of these discharges, even if untreated, tends to show some "natural" improvement over time as deposits of sulfide bearing minerals are depleted. Understanding how the chemistry of abandoned mine drainage changes over time is key in strategic planning for watershed restoration, but there are few detailed studies of temporal attenuation. The Mill Creek watershed in western Pennsylvania has been the focus of intensive restoration efforts, with two dozen treatment systems having been installed. Because of the restoration activity, there are good long-term water chemistry data from approximately fifteen discharges for time spans of up to 28 years. These sites were resampled in 2018, and water samples were subject to a complete analysis including metal ions. An analysis of these data shows that the rate of natural attenuation of dissolved iron is highly variable among discharges. Averaged across sites, the rate of decline in iron concentrations is less than 1% per year. Ongoing sampling and analyses will focus on how the characteristics of individual discharges relate to the rate of attenuation.

Crayfish habitat use, movement, and estimate of density in a forested central Pennsylvania stream

Grace Noll, Brad Sheredy, Marissa Cubbage, George Merovich
Fisheries and Aquatic Sciences Program, Department of Environmental Science, Juniata College, 1904 Moore St., Huntingdon, PA 16652

Grace Noll, (908) 310-6446, Nollgx15@juniata.edu; student poster

Crayfish are dominant omnivores that are important components of functioning stream ecosystems. We focused on characterizing crayfish density and movement in this study. Our study stream was Tatman Run, a 4^{th} order, forested mountain stream. We employed mark and recapture techniques to estimate crayfish densities. Crayfish were captured with baited minnow traps in October 2018 and were marked individually with a unique color code using the Visual Implant Elastomer (VIE) system. The total area of the survey spanned 775 m^2. Marking occurred over 5 weeks, therefore we employed the Schnabel multiple mark-recapture method to estimate density. Out of 143 total crayfish caught, there were 13 recaptures. We estimated the density of crayfish to be 1.0 ± 0.002 per m^2. Throughout October, the movement of crayfish was erratic. Of the 13 recaptured crayfish, the distance travelled varied from 0-110 m. The average distance travelled by individual crayfishes was 18.5 ± 33.1 m. There was no statistical

difference between number of crayfish found in riffle vs pool habitats (p=0.910). Additionally, there was no correlation between temperature and habitats where crayfish were found (p=0.757). Temperature was not statistically correlated with average number of crayfish captured per trap (p=0.168), but there appeared to be a negative trend. Our study provided important information on crayfish densities that is lacking, and we found the VIE system to work well. Additional studies should observe seasonal patterns and variation in density to monitor the health of populations and stream ecosystems across a wider region of the Juniata.

Diet analysis and presence of microplastics in Smallmouth Bass in the Susquehanna River.

Timothy Parks, Tommy Bluj, and Johnathan Niles, Department of Ecology, Susquehanna University, 520 University Avenue, Selinsgrove, PA 17870

Timothy Parks, (570) 441-6577, Parkst@susqu.edu; student poster

Microplastics are an emerging concern in freshwater systems for fish and other organisms, and the presence of them may impact the diet of freshwater fish. A diet analysis was performed amongst Smallmouth Bass, (*Micropterus dolomieu*) collected from the central portion of the Susquehanna River and its tributaries. We examined frequency of occurrence, percent composition by number of organisms present and inspected stomachs for the presence of microplastics (plastic particles less than 5 millimeters in length). The stomachs of 67 Susquehanna River originated Smallmouth Bass were examined for evidence of accumulation of microplastics. Diet analysis thus far indicates a variety of forage (*Cambaridae, Ephemeroptera, Plecoptera, and Diptera*) being consumed by Smallmouth Bass. Analysis for the presence of microplastics will be conducted with a wet peroxide oxidation procedure. Previous research using this method found that microplastics had a high level of occurrence (83%) in Smallmouth Bass stomachs. Our study will help increase the knowledge base of what Smallmouth Bass consume in their diet and the presence and concentration of microplastics in freshwater fish species found in the Susquehanna River.

Decreased Densities of a Terrestrial Salamander Associated with Forest Floor Habitats Dominated by Fern

Alexis Robison, Meg Toy, Suzanne Boyden, and Kurt Regester, Clarion University of Pennsylvania, 840 Wood Street, Clarion, PA 16214.

Alexis Robison, (814) 691-1900, A.L.Robison@eagle.clarion.edu; student poster

Northern hardwood forests have been dramatically altered from historic conditions, in part due to increased levels of herbivory associated with high densities of White-tailed Deer (*Odocoileus virginianus*). Selective browsing by deer promotes an overabundance of fern that limits the regeneration of many hardwood tree species. Few studies have investigated the indirect effects of deer on forest floor habitat quality for terrestrial amphibians. Our study tested for an effect of fern on the density of Redback Salamanders (*Plethodon cinereus*), abundant top predator in forest floor food webs. At Clear Creek State Forest, we used replicated 1 x 1 m quadrats to compare salamander densities in an equal number of plots with and without fern in four forest management conditions

(inside/outside a deer exclosure and inside/outside a controlled burn treatment). Leaf litter, wood, and rock cover was searched within each quadrat. We sampled a total of 72 m2 during similar environmental conditions and encountered 19 Redback Salamanders. Mean salamander density was lower in fern-dominated patches (0.14 salamanders/m2) than in patches without fern (0.39 salamanders/m2) (p=0.04). Our findings show that Redback Salamander densities were reduced by greater than 50% in forest floor patches dominated by fern. Salamander preference is most likely explained by unfavorable microhabitat conditions, such as changes in moisture, temperature, soils, or food resources in forest patches dominated by fern. Northern hardwood forests continue to be shaped by deer, so a broader understanding how deer management plans impact non-game species is important for conserving all components of these ecosystems.

Aerial insectivore response to Acid Mine Drainage in Pennsylvania Streams

Victoria G. Roper, Amanda L. Aulenbach, and Benjamin R. Paul, and Lauri Green, Bloomsburg University Department of Biological and Allied Health Sciences, 400 E 2nd St, Bloomsburg, PA 17815

Victoria G. Roper, (504) 717-6391, vgr92217@huskies.bloomu.edu; student poster

Acid Mine drainage (AMD) is the runoff of acidic water from metal or coal mines into aquatic ecosystems. Acid Mine Drainage increases stream acidification, metal concentrations, and sedimentation which can decrease food web complexity by negatively affecting insect and bird diversity. Stream acidification reduces acid-sensitive macroinvertebrate taxa that are important food sources to aerial insectivore birds foraging along riparian communities. Despite the known effects of acidification on stream biodiversity, little is known about the nest density of aerial insectivore birds foraging along riparian ecosystems impacted from AMD. This study quantified differences in water quality, nest density, and nest activity for all aerial insectivores (*Sayornis phoebe, Stelgidopteryx serripennis*, and *Petrochelidon pyrrhonota*) nesting along ten sites that vary with respect to acid mine drainage in six creeks. The field water quality parameters that were taken were pH, temperature, depth, dissolved oxygen concentration, and conductivity using a sonde. Nest density was recorded by taking under-bridge nest tallies, species of each nest, and recording whether the nest was active or not. Streams impacted from historical acid mine drainage were Catawissa Creek, Shamokin Creek, and Nescopeck Creek. Streams not impacted from AMD were Huntington Creek, Fishing Creek, and Roaring Creek. All data was collected between June 2018 and October 2018. Our data suggests AMD impacted sites had lower nesting densities and reduced number of active nests. Additionally, the water quality parameters recorded at sites impacted from AMD indicated reduced pH, alkalinity, dissolved oxygen concentration, and an increase in turbidity and conductivity.

Worth the time: improvements in stream condition and fish populations after a restoration project.

Nicholas A. Smith, Katie M. Mattas, and George T. Merovich Jr., Fisheries & Aquatics Sciences Program, Environmental Science and Studies Department, Juniata College, 1700 Moore Street, Huntingdon, PA 16652

Nicholas A. Smith, (717) 250-3680, smithna17@juniata.edu; student poster

Stream fish habitat restoration is a major business and is especially popular in cold-water systems to improve trout populations. In this study, we compared stream habitat conditions and the fish assemblage before and after a habitat improvement project on a headwater stream that was geomorphically devastated by flood waters from Hurricane Ivan in 2004. Located in Blair County, Kelso Run is a 1.34 mile stretch of wild trout water, supporting a wild population of naturally reproducing brook trout (*Salvelinus fontinalis*) and brown trout (*Salmo trutta*). To improve stream habitat and trout use, a restoration project took place in the summer of 2018. Acted on by members of the Little Juniata River Association & students of Juniata College, the restoration's mission was to fill in gaps in the banks of the stream and provide more pools for trout to reside in. We studied macroinvertebrate, fish, habitat, and water quality parameters to understand if restoration improved the overall health of the stream. To do this, we performed a before and after comparison of the data collected. After the project, we found no major differences in the water quality or sediment composition of the stream. Average stream depth increased by 0.14 m, the amount of slow water (pools and glides) increased by 13%, and distance to fish cover decreased by 1.5 m, indicating much improved habitat conditions for harvestable sized trout . In addition, before the restoration, we observed 5 fish species: slimy sculpin (*Cottus cognatus*), blacknose dace (*Rhinichthys atratulus*), creek chub (*Semotilus atromaculatus*), brook trout, and brown trout. Afterwards, we only observed 3 of those species: slimy sculpin, brook trout, and brown trout. However, overall fish density doubled. We believe the differences in richness and density could be due to the timing of our sampling, the increase in habitat for the fish inhabiting the water, or another unmeasurable characteristic. When classifying the stream using the Pennsylvania Fish and Boat commission's wild trout classification scale, Kelso Run is still considered a Class D naturally reproducing wild trout stream, but the biomass of wild trout increased from 5.11 kg/ha before the restoration to 8.44 kg/ha after the restoration. With this increase, we hypothesize that over a longer time period, Kelso Run may even increase its biomass of wild trout to more than 10 kg/ha, improving its classification to a class C wild trout stream.

Effects of flooding on fish community composition in Pike Run

Travis Tacelosky and David Argent, California University of Pennsylvania

Travis Tacelosky, TAC4031@calu.edu; argent@calu.edu; 724-938-1529; student poster

Floods are often thought to cause major shifts in fish community and in stream substrate composition; however these suppositions are not well documented. Mirco-refugia may exist within streams that buffer the ferocity of a flood-event. Here we document changes in fish and substrate composition in response to intense flooding that occurred in Pike Run, Washington County. We sampled fish, using a back-pack electrofisher, on 8 September 2018 within a 100-m reach. On 10 September 2018, Pike Run experienced a major flood event and was re-sampled on 30 October, 2018. We recorded the number and type of fish collected during each sampling event. In addition, the USEPAs habitat evaluation form for low gradient streams was completed. We found a dramatic decline among minnow, sucker, and darter species; but sunfishes were seemingly unaffected. In

addition, pool substrate and sediment deposition shifted, likely due to the scouring effects of the flood. While floods may represent a temporary shift in community composition, many stream fishes are resilient to such events.

Egg mass abundance of spotted salamanders in relation to habitat quality of vernal pools

Cassidy Titus, Juniata College, 1700 Moore Street, Huntingdon, PA 16652

Cassidy Titus, (443) 752-8615, tituscn16@juniata.edu; student poster

Vernal pools are small ephemeral wetlands that host obligate species, such as spotted salamanders (*Ambystoma maculatum*) which utilize the pools during breeding season. I developed an eastern forest specific rapid assessment protocol for vernal pools based on several established protocols. I evaluated this protocol by comparing assessment scores to the peak number of egg masses deposited by spotted salamanders in Huntingdon County, Pennsylvania during the 2018 spring breeding season. A single-observer approach was used to estimate the egg mass abundance at each vernal pool site. Sites that scored lower in habitat quality had fewer spotted salamander egg masses present; however, the correlation values, between habitat quality and egg mass abundance even though strong was not statistically significant (r=0.994 P=0.065). These preliminary results suggest that greater sample size could validate the assessment protocol.

Save the date - 2019

The Wildlife Society
&
American Fisheries Society
September 29 – October 3
Reno, Nevada

American Fisheries Society and The Wildlife Society will come together for the first-ever joint national conference of these two organizations. The event will likely be the largest gathering of fish and wildlife professionals ever, registration opens in May!