2024 Annual Conference
Mid-Atlantic Chapter
Ecological Society of America

April 5th – 7th

Agriculture in Ecological Context

Hosted by

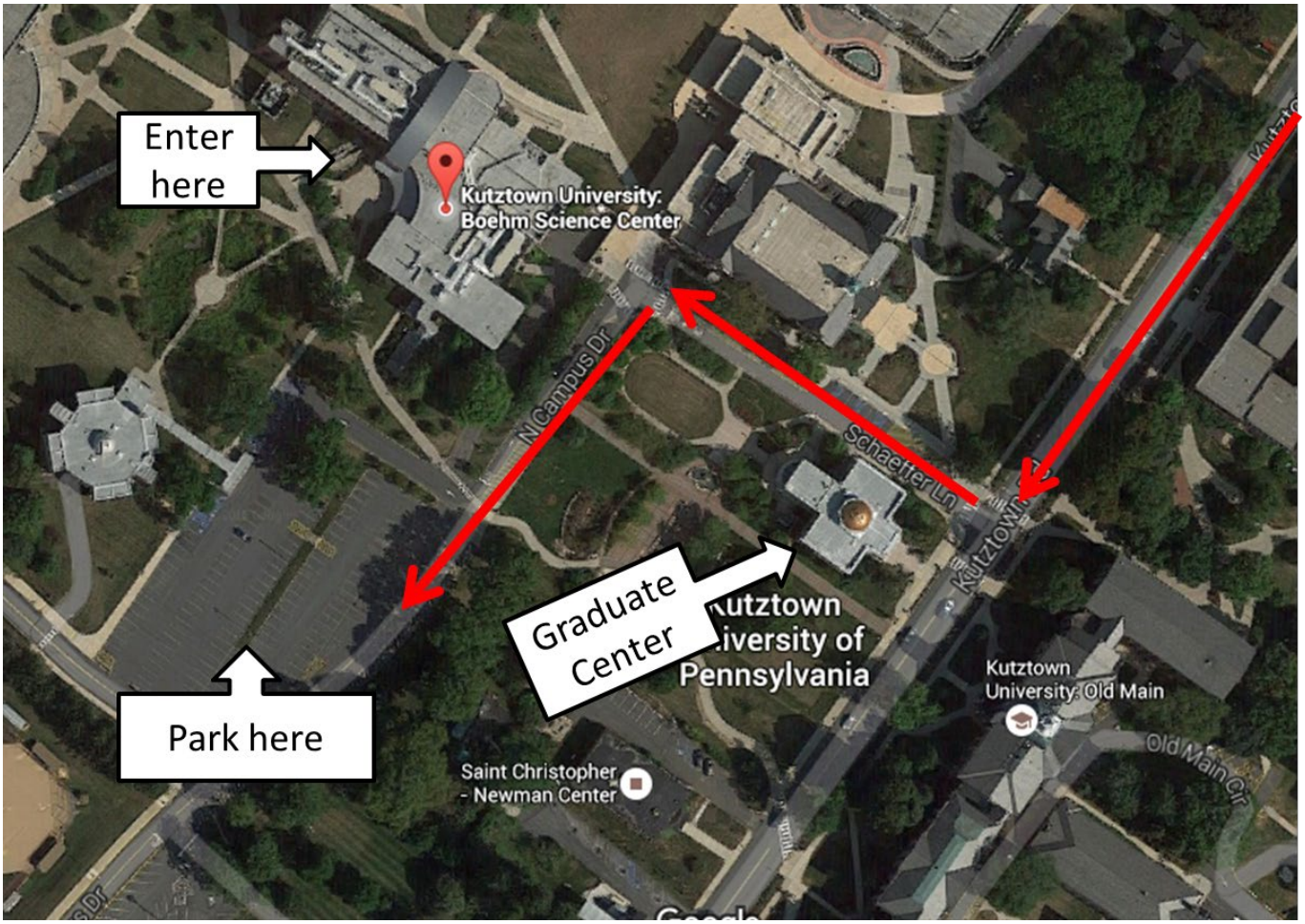
The Department of Biology, the Environmental Science Program
&
College of Liberal Arts and Sciences

Conference Location and Directions

The 2024 Annual Conference of the Mid-Atlantic Chapter of the Ecological Society of America will be held in the Boehm Science Center, Kutztown University.

From Interstate 78: Take Exit 40 and drive south on Krumsville Rd. (Route 737 South) for 6 miles. Turn right and follow West Main Street up the hill for ~0.5 miles. At the top of the hill, West Main Street turns into Kutztown Road. At the KU Graduate Center (granite building with copper top), turn right onto **Schaeffer Lane** and park in the closest available parking lot.

To enter the Boehm Science Center, climb up the stairs just north of the attached greenhouses (east of the moat-shaped retention pond).



MA-ESA 2024 Meeting Schedule

Friday, April 5, 2024

6:00 – 8:30 pm	Evening social *Saucony Creek Brewery and Gastropub*

Saturday, April 6, 2024

7:30 – 9:00 am	Registration and Continental Breakfast *Lobby, Boehm Science Building, Kutztown University*
9:00 – 9:15 am	Opening Remarks. Chris Habeck (MA-ESA Chair) and Laurie McMillian (Dean, College of Liberal Arts & Sciences) *Room 145, Boehm Science Building*
9:15 – 10:15 am	Keynote Address - Dr. Matthew Ryan (Cornell University): Agroecology for Advancing Regenerative Agriculture *Room 145, Boehm Science Building*
10:15 – 10:30 am	Morning Break
10:30 – 11:30 am	Panel Discussion with Matt Ryan (Cornell), Jake Sewall (Kutztown), Arash Ghale (Rodale Institute), Steve Schoeniger (Rainbow Farms), and Brent Habig (Two Creek Farms): Benefits and Challenges of Sustainable Agricultural Practices *Room 145, Boehm Science Building*
11:30 am – 1:30 pm	Box Lunch *Lobby, Boehm Science Center*
12:30 – 1:30 pm	MA-ESA Business Meeting – *Rm 220* Workshop I: Microbiomes for All! Data Analysis Workshop – *Rm 260* Workshop II: The basics of "R" programming for ecological research – *Rm 261* CANCELLED Workshop III: Digitized Natural History Collections and BCEENET CUREs: Bringing digital data into your classroom – *Rm 104* Workshop IV: Career Development – *Rm 262* *Boehm Science Center*
1:30 – 2:45 pm	Oral Session 1 *Rooms 105, 107, 145, 260, 261, 262, Boehm Science Building*
2:45 – 3:15 pm	Afternoon Break
3:15 – 4:30 pm	Oral Session 2 *Rooms 105, 107, 145, 260, 261, 262, Boehm Science Building*
4:45 – 6:15 pm	Poster Session *First Floor, Boehm Science Building*

6:30 – 9:00 pm Banquet and Student Presentation Awards.
Saucony Creek Brewery and Gastropub

Sunday, April 7, 2024

9:30 am – 1:30 pm Field Trip to the Rodale Institute to learn about their regenerative organic agricultural practices.
Meet at Boehm Science Building parking lot

Invited Speakers

Keynote Speaker

Dr. Matthew Ryan
Cornell University

Agroecology for Advancing Regenerative Agriculture

Boehm Science Building, Room 145
Saturday, April 6th at 9:15 AM

Panel Discussion

Dr. Arash Ghale
The Rodale Institute

Brent Habig
Two Creek Farms, Lakewood, PA

Dr. Matthew Ryan
Cornell University

Steve Schoeniger
Rainbow Farms, New Tripoli, PA

Dr. Jacob Sewall
Kutztown University

A Conversation about the Benefits and Challenges of Sustainable Agriculture

Boehm Science Building, Room 145
Saturday, April 6th at 10:30 AM

Invited Speaker Biographies

Keynote Speaker and Panelist, Dr. Matthew R. Ryan:

Matthew R. Ryan is an Associate Professor in the School of Integrative Plant Science at **Cornell University** where he studies agroecology. Dr. Ryan has authored over 90 research publications and teaches courses on sustainable and organic agriculture. As part of his research program, he quantifies cropping system performance in terms of crop productivity, profitability, resilience to extreme weather, pest suppression, soil health, and other ecosystem services. Dr. Ryan also conducts research on overcoming obstacles that limit cover crop adoption, reducing tillage in organic crop production, and integrating perennial grains into cropping systems.

Panelist, Dr. Arash Ghale:

Arash Ghale is the Research Director of **Rodale Institute**, overseeing numerous research projects relevant to organic agroecosystems. He collaborates with a team of scientists with different background such as climate science, perennial cropping systems, soil science, and horticulture to manage long-term and short-term agricultural research trials. Arash holds a Bachelor's degree in Agronomy and Plant Breeding, as well as a Master's and Ph.D. in Agroecology from the University of Mashhad (FUM) in Iran. Since 2015, he has served as a postdoctoral researcher and later as a Research/Adjunct Assistant Professor in the College of Agriculture at the University of Vermont. Additionally, he is a co-founder of the North American Center for Saffron Research and Development at UVM and continues to conduct research on specialty crops such as saffron, vegetables, and hemp at three of Rodale's campuses in Pennsylvania.

Panelist, Brent Habig:

Brent Habig is the owner of **Two Creek Farm** in Wayne County PA. Two Creek is a regenerative USDA-certified organic livestock and vegetable farm. Prior to Two Creek, Brent spent most of his career as an environmental executive in Africa and Asia, supporting governments and global corporations to build sustainable supply chains. Brent is an Accredited Professional with the Savory Institute.

Panelist, Steven Schoeniger:

Steven Schoeniger is the owner of **Rainbow Farms** in New Tripoli, PA. From an early age Steve wanted to farm. Throughout his life he dabbled in farming. In 2007, with the purchase of his present 29-acre farm, his dream came true. Thus began the long road of converting a poorly managed no-till row crop farm into an organic farm. He now raises beef, pork, and chicken on pasture in the sunshine the way God intended. His latest venture is farming 25 acres of organic small grains.

Panelist, Dr. Jacob Sewall:

Dr. Jacob Sewall is an Associate Professor in the Physical Science s Department at **Kutztown University**. Dr. Jacob “Jake” Sewall has a B.S. in Geology from Washington and Lee University and a Ph.D. in Earth Sciences from the University of California at Santa Cruz. Jake has used geological, paleoecological, and observational data in combination with numerical models to study the climate history, change, and dynamics of the Earth. Jake is currently the Program Coordinator for the Environmental Science Program at Kutztown University and is one of the chief architects of a new track in Regenerative Organic Agriculture. Jake is an avid amateur agriculturist and ecologist and spends as much of his free time as possible interacting with the broader biosphere.

Sunday, April 7th Field Trip:
The Rodale Institute, Kutztown, PA

Our filed trip will be hosted by the staff scientists at the Rodale Institute's international headquarters in Kutztown, Pennsylvania.

Rodale is a global leader in the development of regenerative organic agricultural practices. Their staff focus on agricultural research, farmer training programs, and consumer outreach. Rodale maintains a 386-acre working farm that includes some of the longest organic agriculture research experiments in the world.

Schedule:

9:30 AM	Meet in the B1 parking lot next the Boehm Science Building, Kutztown University
9:45 AM	Depart for the Rodale Institute's Kutztown campus
10:00 AM	Tour of the Rodale Institute's working farm trials
1:15 PM	Depart Rodale Institute
1:30 PM	Arrive Boehm Science Building, Kutztown University

Oral Presentation Concurrent Session 1

Time	Session 1A Boehm 145	Session 1B Boehm 105	Session 1C Boehm 107
1:30 PM	*Canopy Productivity and Density within an urban brownfield.* Yan, Gallagher - Rutgers, The State University of New Jersey	*Opportunistic Tickborne Disease Testing of Eastern Pennsylvania Small Mammals* Signore, Chinnici, Davies, Rollinson, Rowley, Whiter, Williams, LaDuke - East Stroudsburg University	3,000 Years of Pollen at the Glen Forney Vernals Natural Heritage Area, Michaux State Forest, Pennsylvania, USA Hegudus, Marr - Shippensburg University
1:45 PM	*Liriodendron tulipifera growth increases with reduced drought severity in urban forests* McCoach, Chavanne, Trammell, D'Amico - University of Delaware	*Avian Botulism: Microbial community shifts unveiled in seabird ectoparasites* Barber, Sheehan - Frostburg State University	*A dichotomous key for identification of trees in the Northeast using bark characteristics.* Saul – Rutgers University
2:00 PM	*Aligning urban forest management actions with urban sustainability goals: A multi-city expert elicitation* Bassett, Day, Konijnendijk, Hemming - University of British Columbia Roman - USDA Forest Service	*Are Antibiotic Resistant Genes Expressed within the Blue Marsh Watershed? Let's Find Out!* Duarte, Felker, Mysliwiec - Penn State Berks	*Reforesting the Mid-Atlantic: Tree Planting or Natural Regeneration?* Boucher - White Acres Farm
2:15 PM	*Hidden urban biodiversity: student-led project demonstrates significant herbaceous plant biodiversity in both cultivated and uncultivated lawns* Clarke - Prince George's Community College	*What's the scoop on the Mycoloop? Chytrid fungi associated with increased zooplankton density in the Chesapeake Bay* Kirkendall, Skelton - College of William and Mary	*Long-term conservation of white ash on the Allegheny National Forest* Kilgore - Washington & Jefferson College Knight, Flower, Royo - Northern Research Station, USDA Forest Service
2:30 PM	*Measuring Productivity Within A Naturally Assembled Urban Forest Stand* Mitroff, Gallagher - Rutgers The State University of New Jersey	*The Queen's Gambit: Developmental Diapause of Future Queens in Temperate Paper Wasps* Miller, O'Donnell, Lenhart - Drexel University	*Forest age and tree size shape development of tree-base microhabitats in second-growth forests* Holmes, Holcomb, Jankosky, Hingston, Miller, Stienberg – Chatham University

Oral Presentation Concurrent Session 1

Time	Session 1D Boehm 260	Session 1E Boehm 261	Session 1F Boehm 262
1:30 PM	*Snail physiological stress responses to predation affect biological soil crust stoichiometry* Rinehart – Drexler University Shamir Weller, Ben Lulu, Hawlena - The Hebrew University of Jerusalem	*Effects of warming and elevated CO2 on stomatal conductance and chlorophyll fluorescence of C3 and C4 coastal wetland species* Sendall, Muñoz, Ritter – Rider University Noyce, Megonigal - Smithsonian Environmental Research Center	*Population genetics of wild lupine (Lupinus perennis), an early successional plant species of conservation concern* Pettita, Sabo, López-Uribe - Pennsylvania State University
1:45 PM	*Microbial Antics: Unveiling the Unseen World of ant Aphaenogaster rudis* Kelleher, Ramalho – West Chester University	*Long Term Phenological Shifts in Moth Communities in Central New York* Foster, Grames - Binghamton University	*Does genetic relatedness or management context drive tree-associated insect communities in Baltimore city?* Perry, Burghardt - University of Maryland Shobe, Avolio – Johns Hopkins University Sonti, Locke – U.S. Forest Service
2:00 PM	*Seeds, flies, wasps: A new trophic chain to study top-down and bottom-up controls in the Arctic* McDonald, Carita Vaz, Fetcher – Wilkes University Unger – Florida International Univerrsity	*The influence of climate warming on flowering phenology in relation to historical annual and seasonal temperatures and plant functional traits* Niesenbaum, Geissler - Muhlenberg College	*Examining the effects of multiple stressors on Rubus allegheniensis using structural equation modeling* O'Sullivan, Morrison - The College of New Jersey
2:15 PM	*pH Influences the Thermal Performance Curves of Protist Populations* Najarro, Gilbert, Yammine – Duke University	*Climate Induced Phenology Changes of Western Pennsylvania Tree and Herb Species Over the Past 125 Years* Holcomb, Bierker, Utz - Chatham University Mason Herberling - Carnegie Museum of Natural History	*Clonal reproduction contributes to common milkweed (Asclepias syriaca) population dynamics in Northern Virginia, USA* Machiorlete, Dalgleish, Puzey, LaMar - College of William and Mary
2:30 PM	*Microplastic Microbial Hitchhikers in Blue Marsh Lake* Lu, Felker, Mysliwiec – Penn State Berks	*Multi-scale distribution modeling for the Spotted Lanternfly (Lycorma delicatula) reveals range expansion and increased risk to important viticultural regions under climate change.* Owens, Helmus – Temple University	*Factors limiting reproduction in the Pennsylvania endangered dwarf iris, Iris verna* Taylor, Sahli – Shippensburg University

Oral Presentation Concurrent Session 2

Time	Session 2A Boehm 145	Session 2B Boehm 105	Session 2C Boehm 107
3:15 PM	*Characterization of Cyanobacteria in Blue Marsh Lake* Popescu, Felker, Mysliwiec – Penn State Berks	*Forest understory condition is affected by interactions between invasive species and the environment* Sabo, Nilson, Burkhart - Penn State University Stark - American Chestnut Foundation	*Leaf Litter Quantity Influences on Microclimate and Wildflower Phenology* Yancy - University of Pittsburgh Miller - Chatham University Heberling - Carnegie Museum of Nat. Hist. Kuebbing - Yale University
3:30 PM	*Understanding a pH Anomaly in a Coastal Plain Lake* Witt, Ficken, Griffin, Quick – Stockton University	*Assessing Impacts of Buckthorn (Rhamnus spp.) as invasives on Vegetation Distribution and species Diversity within Hudson River valley, New York, USA* Mlotha - Antioch University Patsun - North Central Conservation District, CT	*Effects of soil fertility and moisture on soil respiration by fine roots, fungi, and prokaryotes in a tropical forest drying experiment* Dietterich, Cordeiro, Cusack - Colorado State Univ. McFarlane - Lawrence Livermore Natl. Lab
3:45 PM	*Impact of wave exposure on coral dispersion patterns at Rapa Nui* Herlan, Staniczenko, McDonald - City College of New York Santos, James – Florida Intl. University Gaymer - ESMOI	*Patterns of Invasive Plant Species in Urban Forests Vary Across Spatial Scales* Levy-Diedrich – University of Delaware D'Amico - US Forest Service	*Gone with the wind: pre- and post-tornado comparisons of small mammal communities* Sheffield - Bowie State University
4:00 PM	*Plastic pollution disrupts primary production and trophic interactions in aquatic food chains* Sheehan, McHale - Frostburg State University	*Invasion Density and Soil Moisture Influence Soil Nitrogen Cycling in Forests Invaded by the Shrub Rosa multiflora* Moore, Pouyat*, Trammell - University of Delaware; U.S. Forest Service	*Pre-copulatory behavior in color polymorphic tortoise beetle, Chelymorpha alternans* Parker - Chatham University Strickland – Boston University
4:15 PM	*Oyster Aquaculture Supports a Diverse Community of Fishes and Macroinvertebrates* Motz, Campbell, Hudock, Hale, Carlisle - University of Delaware	*A Potential New Nemesis for Garlic Mustard? Exploring the Range and Impacts of a Newly Arrived Specialist Aphid* Troutman, Stuble, Watson, Jenkins, Engerman - Holden Forests and Gardens	*Using passive acoustics to assess bat activity on barrier island habitats in New York* Costante, Warren - Stony Brook University

Oral Presentation Concurrent Session 2

Time	Session 2D Boehm 260	Session 2E Boehm 261	Session 2F Boehm 262
3:15 PM	*ARBOREAL: A new network to support undergraduate researchers investigating temperate forest canopy biodiversity* Kilgore, Hoffman - Washington & Jefferson College *see abstract for additional authors	*Data and artwork from the forest floor: connecting ways of knowing* Morrison - The College of New Jersey	*Testing for an effect of predator body size on the relative importance of consumptive versus non-consumptive effects in streams* Toscano, Segal, Exnerova, Ver Pault – Trinity College
3:30 PM	*Taking course-based undergraduate research experiences (CUREs) one step further: interdisciplinary team teaching* Sewall, Palkendo, Habeck – Kutztown University	*Merging Traditional Ecological Knowledge with Modern Organic Practices: A Case Study in Participatory Research* Silva - University of Wisconsin-Madison	*Exploring tree preference of Odocoileus virginianus for antler rubbing in an urban park* Zaleski, Aiello, Lecrone, Pellow, González Santoro, Olmsted - University of Pittsburgh
3:45 PM	*You're in my personal space! How using spatial autoregression can change a model outcome.* Kafas - The College of New Jersey	*Integrated Urban Farming: Synergizing Solar Energy, Rainwater Harvesting, and Sustainable Agriculture for Enhanced Resource Efficiency* Nowshin, Shujath, Al Rousan, Azam – Univ. of the D.C. Roman - State University of New York	*Modeling Presence and Occupancy of Wildlife on the Trinity Washington University Campus* Nielson - Trinity Washington University
4:00 PM	*Structural equation modeling examines factors influencing suburban forest indigenous plant diversity* Ciuba, Morrison - The College of New Jersey	*Environmental and landscape indicators: A pathway for improved biosphere integrity assessment* Shaker - SUNY College of Environmental Science and Forestry Mackay - Toronto Metropolitan University	*Age structure and window-collision mortality of avian migrants in an urban greenspace* Xu, Holzapfel – Rutgers University
4:15 PM	*A Stochastic Individual Based Model of Eriophorum vaginatum growth* Mahler, Carita Vaz, Fetcher- Wilkes University	*Flocking by migrant and resident birds during migratory stopover* Hidayati, Buler - University of Delaware Zenzal, Jr. - US Geological Survey, Wetland and Aquatic Research Center	*Does belonging to the species matter to the bacterial leaf-cutting ant community?* Gianaris, Ramalho – West Chester Univ. Bueno - Unesp Rio Claro Martins - UFPI

Poster Session

	Title	Author(s)	Primary Affiliation
1	*Beneath the Aftermath: Exploring Soil Respiration in Temple's Tornado-Disturbed Forest*	Flores, Caplan, Bonfim, Stevenson, LeClair, Eisenman, Cortese, Freestone	Temple University
2	*Assessing the Thermal Tolerance of Infected and Uninfected Bombus impatiens to a Variable Thermal Environment*	Lohr	Mount Holyoke College
3	*American ginseng's mating game: Insights into pollination and reproductive success of an Appalachian icon*	Polich, Chandler	West Chester University
4	*Gas exchange of temperate and boreal tree seedlings under warming and drought*	Ritter, Sendall, Stefanski, Villanueva	Rider University
5	*Soil clay minerals trump fire and plant productivity to explain carbon distribution in a tropical savanna*	Watson, Hedin, Coetsee, Wigley, February	Princeton University
6	*Non-timber forest products: a framework for sustainable management in small forest areas*	Goncalves Lazzaro, Wilkinson Kaye, Muth, Pugh, Coville	Pennsylvania State University
7	*Using deer enclosures to aid in forest understory restoration at Rider University*	Murphy, Sendall	Rider University
8	*Toxic interactions of glufosinate ammonium, co-formulants, and tank additives on the agrobiont wolf spider Pardosa milvina*	Aben, Roan, Rossi, Seibert, Persons	Susquehanna University
9	*Analyzing Earlywood and Latewood Tree Ring Width Differences in Response to Precipitation and Temperature in Nepal*	Banyacski, Druckenbrod	Rider University
10	*Chemically-mediated antipredator responses among neustonic prey of males and females of the semi-aquatic fishing spider Dolomedes triton*	Shilcusky, Ahmed, Persons	Susquehanna University
11	*Analysis of Rhodococcus rhodochrous by Activity-Based Labeling in the Presence of Soil*	Adler, Hyman	NC State University
12	*The wolf spider Tigrosa helluo uses visual associative and beacon landmarks during water maze navigation tasks*	Weidman, Persons	Susquehanna University
13	*Effects of Color, Pattern, and Distance from a Pond on Predator Attack Rates on Clay Model Frogs in Central Ohio*	Copeland, Smith	Denison University
14	*Examining early plant community response to a novel tornado disturbance*	LeClair, Sewall, Freestone, Bonfim, Gutierrez Velez, Caplan, Razzaghi Asl	Temple University
15	*Algal community composition and response to disturbance in mid-order rivers*	Desjardins, Peipoch, Schedlbauer	West Chester University
16	*Monitoring Harmful Algal Blooms: Preliminary Findings in Assessing the Accuracy of Low-Cost Algal Toxin Detection Methods at Spruce Run Reservoir, New Jersey*	Barrett, Stander, Scarpantonio	Raritan Valley Community College

17	*Instrument bias in measuring leaf gas exchange: a comparison among species and habitats*	Apuzzo, Sendall	Rider University
18	*Pollinia Germination and Hybridization in Milkweed*	Cunningham, Barlow, Dalgleish, Puzey	William and Mary Biology Department
19	***CANCELLED*** *Using NOAA's Marine Recreational Information Program (MRIP) recreational catch data to assess changes in species' latitudinal range and distribution associated with climate change*	Roday, Hudock, Millea, Hale, Carlisle	University of Delaware
20	*Methodology for the investigation of metabolic costs in M. genalis facultative sociality using stop-flow respirometry.*	Barnes, Wcislo, Somjee	Trinity college
21	*A Preliminary Comparison of Two Automated Software Measurement Programs in the Assessment of Morphological Differences in Gambusia affinis*	Rodriguez, Lutnesky	Texas A&M University - San Antonio
22	*Effect of burning on the microbial composition of grassland soils in NE Pennsylvania*	Brown, Fortunato	Widener University
23	*Cannibalism risk outweighs the effect of physical interference on water bug feeding rates*	Ver Pault, Acee	Trinity College
24	*Burrowing Crab Effects on Plant Communities along a Chronosequence of Tidal Marsh Restoration.*	Quitel, Cherry, Dybiec, Rinehart	Drexel University
25	*Investigating the invasiveness of Pennsylvania non-native plant species versus native species after disturbance*	Tomb, Mastria, Castelluccio, Sahli	Shippensburg University
26	*Phenotypic divergence is associated with urbanization in the common butterfly Pieris rapae*	McManus, Spigler	Temple University
27	*Fish Community Surveys at the Union City Dam of French Creek*	Beall, Squires, Frantz, Dakin, Honick, Porter	Duquesne University
28	*Effect of elevated growth temperature on photosynthetic rate in Phaseolus vulgaris*	Jansons, Schedlbauer	West Chester University
29	*Targeting Single-Use Plastics: Determining Impacts of Location on Trash Amounts and Effectiveness of Bans*	Brown, Moreira, Fork	West Chester University Biology Department
30	*Exploring Biodiversity Over a Vertical Gradient in Two Red Oak trees*	Hyatt, Norris	Stevenson University
31	*The Impact of Milkweed Nectar Microbes on the Reproduction of Common Milkweed (Asclepias syriaca)*	Barlow, Machiorlete, Williamson, Puzey, Dalgleish	College of William & Mary
32	*Effects of Reservoir Morphometry on Phytoplankton Community Dynamics During the Fall Transition*	Rose, Holt	Susquehanna University
33	*Effects of Water Availability and Simulated Herbivory on Extrafloral Nectaries in Vicia faba*	Thomas, Packer	Susquehanna University
34	*Does color morphology influence water retention in Plethodon cinereus?*	Sherinsky, Hauk, Hawley-Matlaga	Susquehanna University
35	*Burning questions in food web ecology*	DeCresenza, O'Boyle, Erickson, Savitski, Fetcher, Howey, Stratford	Wilkes University
36	*Assessing changing carbon pool dynamics and species composition in a Pennsylvania broadleaf forest fragment*	Levinsky, Schedlbauer	West Chester University of Pennsylvania
37	*Are single-use plastic bans effective? A preliminary look at urban streams in southeastern Pennsylvania*	Moreira, Brown, Fork	West Chester University

38	*Tracking the Eastern Expansion of the Coyote (Canis latrans var.) on Long Island*	Traficante, Nieto-Fernandez, Klein	SUNY Old Westbury
39	*Diatom assemblages of the Ridley Creek watershed over 114 years of observations*	Barker, McGrath, Potapova	Drexel University
40	*Treatments for managing the invasive grass Microstegium vimineum differ in effectiveness, effort required, and regeneration of native plants over time.*	Johnson, Petri, Oordt, Thomas, Horne	Longwood Gardens
41	*Soil moisture and temperature in forest gaps across multiple eastern U.S. cities*	Kang, Trammell, Yesilonis, Piana, Hallett	University of Delaware
42	*Do winners lose, too? Investigating the success of Prunus serotina in a long-term deer exclosure study*	Basch, Morrison	The College of New Jersey
43	*Evolving Partnerships: A Multi-Stage Analysis of Host-Microbe Dynamics in the Life Cycle of the Spotted Lanternfly (Lycorma delicatula)*	Munshower, Ramalho, Chandler, Donze-Reiner	West Chester University
44	*The long and salty road: understanding the consequences of road salt deposition on native plant community restoration practices*	Conway, Brudvig	Michigan State University
45	*Dispersal-mediated resilience to altered pH in aquatic arthropods*	Licopoli, Brandt, Doubleday, DeCristofaro	Muhlenberg College
46	*Patterns of leaf traits, herbivory, and photosynthesis in the canopies of mature red oak canopies*	Stevens, Norris	The Bryn Mawr School
47	*Gene Expression in Eastern Oak Species is Impacted by Underlying Site Geology*	Alving, Kaye, Hamilton, Zhebentyayeva	Pennsylvania State University
48	*The Role of Transportation and Environment in Shaping the Spread of Spotted Lanternfly Invasion Dynamics*	Stonefield, Bonfim, Leclair, Swartz, Banks, Freestone, Sewall	Temple University
49	*The Effects of Multiple Stressors on Green Ash*	Mirza, Morrison	The College of New Jersey
50	*Avian Foraging Habits in Aquaculture: Insights from Parasite Community Analysis*	Olsen, Sheehan	Frostburg State University
51	*Correlating social factors and species biodiversity within a historically redlined part of Philadelphia*	Iralien, Lhanyitsang, Baumgarten	Bryn Mawr College
52	*Baseline mammal surveys before strip mine reclamation using camera traps and environmental DNA.*	Powell, DeRienzo, Neugebauer, Robinson, Bierer, Porter, Janecka	Duquesne University
53	*Spatial Distribution of Arbuscular Mycorrhizal Fungi Diversity and Heavy Metal Soil Concentrations as a Function of Urban Structure in Philadelphia, PA*	Berrios, Kremer, Goldsmith, Egan	Villanova University
54	*Burrowing Crabs do not Affect Decomposition Rates Along a Tidal Marsh Chronosequence*	Rodriguez, Cherry, Dybiec, Rinehart	Drexel University
55	*Surveying salamanders' presence and absence to determine the health of local forests.*	Norris, Vickery	Irvine Nature Center & Stevenson University
56	*Defense Mechanisms of Bumblebees (B. griseocollis and B. impatiens) Against Conopid Fly Parasitism*	Ashby, Roulston	University of Virginia
57	*Exploring Wolbachia Diversity in the Global Ant Genus Pheidole: Implications for Biogeography and Ecological Success*	Pisiechko, Manuela, Lovell	West Chester University

58	*The influence of feather mite load on body condition of four songbirds*	Friscia, Underwood	Kutztown University
59	*Evidence for Aegopodium podagraria's complex effects on soil quality and biodiversity in Southwestern Pennsylvania*	Evanov, Olmsted, Stanley	University of Pittsburgh
60	*Engaging Students in Introductory Ecology through iNaturalist*	Barry	West Virginia University
61	*Does Varying Predator Biomass Impact Non-consumptive Interactions?*	Kitaygorodskiy, Gosnell, Corpuz, Uddin, Betke, Lande, Agustin	Bernard M. Baruch College
62	*Assessing Impact of Current Management Practices on Female Spotted Lanternfly Populations.*	Hodges, Sewall, Bonfim, Leclair	Temple University, Ambler Field Station
63	*Climate-Driven Disturbances Alter Carbon Dynamics in Mature Temperate Forests*	Kern, Bonfim, Cortese, Freestone	Temple University, Ambler Field Station
64	*Are native bee foraging behaviors changing in the urban ecosystem?*	Benitez, Sturtevant, Bankson	Massasoit Community College
65	*Fecal Matter Preservation: Examining the Effects on Microbial Composition 5-years Later*	Cudmore, Wohl	Elizabethtown College
66	*Human presence does not elicit spatiotemporal responses in mammals at Hawk Mountain Sanctuary, Pennsylvania*	Keller, Mashintonio	Kutztown University
67	*Seasonal variation in movements and home rang sizes of White-Tailed Deer (Odocoileus virginianus) in a suburban habitat*	Potapov, McMackin, Bryntesson, Higgins	Bryn Athyn College
68	*A metabarcoding approach to analyze the diet of the Yucatán black howler monkey from Toledo District, Belize*	Roberts, Laychock, Habeck, Stone, El Mounadi	Kutztown University
69	*Isolation and identification of soil fungi with ovicidal activity against pig parasites*	Henrikson, Ruiz, Hernandez, Major, El Mounadi	Kutztown University
70	*Comparing carbon footprints of organic and conventional farming systems in Pennsylvania*	Graham, Ghalehgolabbehbahani, Smith, Carr	Rodale Institute
71	*Lehmann lovegrass (Eragrostis lehmanniana) removal and black gramma (Bouteloua eriopoda) restoration in the Chihuahuan Desert.*	Buerdsell, Lehnhoff	Wilson College
72	*"Won't You Be My Neighbor?": An Ecological and Community Rehabilitation Project*	Landis	Kutztown University
73	*Determining the Biodiversity of Heterotrophic Bacterial Species and Overall Water Quality of Remote and Populated Lake Locations in Eastern Pennsylvania*	Hewko, Aruscavage	Kutztown University
74	*Rates of distribution increase in two Asian plant species in North America over a 120-year period*	Brown, Griffin, Habeck	Kutztown University
75	*BCEENET: Creating inclusive CUREs using digitized natural history collections*	Krumm, Shea, Jordan, Bronson, Weglarz, Lee	Widener University

Oral Abstracts

Session 1A

1. Canopy productivity and density within an urban brownfield

Han Yan, Rutgers University
Frank Gallagher, Rutgers University

As global demographic continues to transition to urbanization, the role of urban forests is becoming increasingly significant. Our previous work made significant advances in understanding the mechanistic relationships between the metalliferous soils of an urban brownfield and the photosynthetic capacity of the associated novel tree assemblage. In this paper, we continue that examination of photosynthetic capacity trajectory from 2007 to 2023 add the forest canopy structural dimensions. We use 4 band multispectral imaging to calculate the normalized difference vegetation index (NDVI) for both years. These data were compared to a previously established total soil metal load (TML) using a polynomial regression model to determine the strength of the soil metal filter. We also used elevation data in "leaf on" condition to calculate the height of vegetation for both 2007 and 2023. Elevation data of 2023 is derived from DJI Phantom 4 Pro drone equipped with an RTK unit. Elevation data of 2007 is derived from the New Jersey state LiDAR set. Canopy structures from 2007 and 2023 were measured and compared both planarized and in 3-dimension. The planarized results show the change of canopy spatial distribution while 3- dimension volumetric measurement provides comparison of the canopy structure. The regression value of .78 between TML (Total metal load) and NDVI from the 2003 data correlates well with earlier published results which used slightly different analysis methodology. Both yield strong polynomial relationships indicating a TML threshold at approximately 3.5 on a scale of 0-5. The 2023 data indicate a much weaker relationship (.57) with a higher >4 TML threshold. In addition, volumetric measurement of canopy structure 4 meters above ground is totaled to 1700139.3m3, which shows increased significantly from 2007. In conclusion these data indicate that the strength of the filter imposed by the TML appears to be decreasing over time.

2. Liriodendron tulipifera growth increases with reduced drought severity in urban forests

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Michelle Chavanne, University of Delaware
Tara Trammell, University of Delaware
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L. tulipifera (tulip poplar) is a fast-growing, economically important, pioneer species which is abundant in eastern US deciduous forests. Despite this abundance, most dendroecological studies in the eastern US have focused primarily on other species such as *Quercus spp*. (oak). Tulip poplar is distinct from other eastern hardwood species due to its diffuse porous wood anatomy and indeterminate apical growth. This continued growth later in the growing season may cause tulip poplar to be more prone to late summer drought than other frequently studied hardwood species. Growth of tulip poplar has been shown to be climate sensitive and correlate positively with water availability in rural deciduous forests, but urban forests may experience unique climatic conditions that obscure climate-growth associations in tulip poplar. We ask the following research question: What is the climate-growth response of tulip poplar in eastern deciduous urban forests? We cored 20 tulip poplar trees from forests within Baltimore, MD, Newark, DE, and Philadelphia PA (total 60 trees). We built a tulip poplar master chronology for each city after cross-dating and detrending ring width series. The resulting chronologies were used to determine

relationships between tulip poplar growth and a variety of climate metrics (e.g., drought indices) over the entire chronology. Tulip poplar showed a decrease in growth from 1980 to present day yet an increase in growth with lower summer drought severity in Newark forests. These preliminary results are consistent with expectations that increased water availability would increase growth, particularly due to tulip poplar's indeterminate apical growth pattern. These findings in spite of disturbance and intense competition in these dense urban forests demonstrate tulip poplar's potentially elevated climate sensitivity relative to other hardwood species. To accurately predict forest response to climate change, there is a need to study tree growth across all species and forest types.

3. Aligning urban forest management actions with urban sustainability goals: a multi-city expert elicitation

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Susan Day, University of British Columbia
Cecil C. Konijnendijk, University of British Columbia
Lara A. Roman, USDA Forest Service
Victoria Hemming, University of British Columbia

Urban forests, as a key component of urban ecosystems, are known to provide critical services that can address social and ecological goals cities are setting such as reducing urban heat, mitigating stormwater flooding, and providing habitat. Current paradigms of urban forest management typically prioritize managing for increased tree canopy cover or similar goals that are viewed as proxies for increased ecosystem service provision in a general sense. Unfortunately, there is little information available to managers on the management actions available to maximize the provision of specific ecosystem services in urban forests, such as urban cooling or habitat provision. Our study aims to address this gap. We conducted a multi-city expert elicitation of urban foresters in Washington, D.C, Vancouver, BC, and Honolulu, HI. Experts completed questionnaires and a full day workshop, following an established elicitation protocol, modified for a qualitative elicitation. Our objective was to assess the effectiveness of forty direct management actions to advance five different ecosystem service objectives: (1) canopy cover and risk reduction, (2) urban heat reduction, (3) people-nature relationships, (4) wildlife habitat, and (5) stormwater interception and infiltration. We identified hat certain goals had groups of actions which aligned with each other more than others, and that certain actions were only deemed needed for specific goals and within specific contexts. For example, planting native species was needed to increase wildlife habitat, and was rarely selected for other goals. We found expert elicitation to be a valuable method to efficiently uncover links between ecosystem management decisions and strategic goals, which can support assessment of tradeoffs and successful multi-objective management. Overall, in this study we present urban foresters as key agents of change within urban ecosystems and identify their key points of influence to advance urban sustainability goals.

4. Hidden urban biodiversity: student-led project demonstrates significant herbaceous plant biodiversity in both cultivated and uncultivated lawns

Lorraine Clarke, Prince George's Community College

Residential urban lawns are intensely managed spaces, ubiquitous across the Northeast United States. Lawns are often characterized as homogenous spaces with low biodiversity, as spontaneous weedy vegetation is selected against. However, this study challenges that assertion with lawn biodiversity data collected over the last four years. Undergraduate student data was used for a broad look at cultivated and uncultivated grassy spaces across Prince George's County, MD. The ethnic and socioeconomic diversity of community college students means a large data set with randomized plots across varied neighborhoods,

creating a snapshot of Maryland lawns. I hypothesized that cultivated lawns would have lower alpha and beta diversity and have lower herbaceous plant cover than uncultivated grassy spaces due to management. Data was collected via a field project in an undergraduate biology course. Students in class individually collected plant richness and abundance information from cultivated and uncultivated grassy quadrats, using the iNaturalist app "Seek" and standardized abundance categories. Across four years, 120 separate locations and 480 separate plots were organized into a large biodiversity and abundance matrix. Alpha and beta diversity, species accumulation curves, and species richness/cover were compared between cultivated and uncultivated spaces. Overall, cultivated and uncultivated grassy areas were much more diverse than expected. Over 260 unique species were recorded by students, with nearly 150 of those found in cultivated lawns and 220+ found in uncultivated locations, even after vetting for individual sample accuracy. Over half the species identified were unique to uncultivated lots, while 49 species were unique to cultivated lawns. Cultivated lawns had significantly lower average species richness and cover of flowering plants than uncultivated spaces ($p<0.01$) and were more homogenous than uncultivated spaces. Our results suggest that while the urban lawns are more homogenous than vacant lots, a significant amount of plant biodiversity exists in grassy urban spaces.

5. Measuring productivity within a naturally assembled urban forest stand

Nicole Mitroff, Rutgers University
Frank Gallagher, Rutgers University

By 2050, it is estimated by the United Nations that two thirds of the worlds' population would live in cities (United Nations, 2018). This global demographic transition, which favors urbanization, makes way for a significant role of urban forestry when considering contamination, air pollution, and urban heat island effect. The resiliency of urban novel plant assemblages has been an area of concern and recent study. Towards this end we examine the trajectory (area lost and gained) of a hardwood assemblage within an Urban Brownfield from 2010 to 2023. Past studies have shown that the early development of the hardwood assemblage on this urban brownfield correlated positively with the increasing soil metal loads. The hardwood assemblage's trajectory was documented by the ariel photography and Landsat images between 1969 and 2000. We updated these data using a DJI Phantom 4 Pro drone equipped with an RTK unit that allowed for assessing the microtopography boundary identification vegetative assemblage. Significantly, the data from 2010 and 2023 are before and after the impacts of Superstorm Sandy during which the site was flooded with water from the New York Bay. Our results indicate that the hardwood coverage has had a net increase of 45 Acres since 2010. As expected, areas of hardwood assemblage gain were generally found where the total soil metal load was low. Interestingly, due to recent extreme weather events, there has also been forest loss in the area. Area of hardwood assemblage loss however yielded no significant correlation with soil metal load concentrations. These data indicate that the forest trajectory has exhibited some resiliency during recent extreme weather events and that the strength of the soil metal contamination may not be playing a critical role in the assemblage trajectory.

Session 1B

1. Opportunistic tickborne disease testing of eastern Pennsylvania small mammals

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Nicole Chinnici, East Stroudsburg University
Gaimi Davies
Emily Rollinson

Michael Rowley
Jennifer White
Matthew Williams
Thomas LaDuke

Pathogens transmitted by ticks are responsible for the majority of vector-borne diseases in the United States. The increasing prevalence of tickborne pathogens (TBPs) has been correlated to habitat fragmentation, the geographical expansion of tick populations, and climate change as more people encounter tick habitat. The surveillance of reservoir host populations is key to monitoring TBPs including the causative agents of Lyme disease, Babesiosis, and Powassan virus. Opportunistic sampling of deceased animals in a small mammal density study across 18 sites in Northeast Pennsylvania was used to evaluate the prevalence of three tickborne pathogens (*Borrelia burgdorferi*, *Babesia mircoti* and Powassan virus). A total of 63 Peromyscus leucopus and 62 other individuals (including Peromyscus *maniculatis*, *Blarina br*evicauda, *Sorex* sp., *Clethrionomys gapperi*, etc.) were sampled. Five tissue types (heart, brain, spleen, bladder, and ear) provided a comparison of the rate of pathogen detection between organs of an individual animal and between species. This comprehensive sampling of small mammal populations will aid in understanding optimal field sampling methods for emerging tickborne pathogens.

2. Avian botulism: microbial community shifts unveiled in seabird ectoparasites

Sonja Barber, Frostburg State University
Kate Sheehan, Frostburg State University

Bacterial microbiomes can cause physiological changes in their hosts. A balanced microbiome can support the host by producing antibiotics, improving digestion, and increasing resistance to pathogens. Thus, any disruption to a microbiome's equilibrium (i.e., dysbiosis) can negatively impact the host's health. One such disruptor can be *Clostridium botulinum*; a bacterium that can produce neurotoxins and that is responsible for a unique seabird die-off event on Middleton Island, Alaska in 2021. Because C. botulinum can also disrupt gut microbial communities, we suspect its effects include secondary complications that likely impact more than just the gut microbiome. We compared the surficial microbiomes from Black-Legged Kittiwakes (*Rissa tridactyla*) that were part of the 2021 AB die-off event with those from healthy conspecifics collected under non-die-off conditions in 2016. Ectoparasites can exchange microbes while interacting with the host. As such, the ectoparasite microbiomes of Black-Legged Kittiwakes serve as proxies for the surficial microbiomes and overall condition of each bird. Our results suggest that the diversity and richness of the observed microbial operational taxonomic units (OTUs) are higher in AB-intoxicated birds (Shannon $p=0.023$, Richness $p=0.031$, Kruskal-Wallis). The microbial communities further differed in OTU abundance ($p=0.028$, Bray-Curtis) and prevalence ($p=0.11$ Jaccard). Using bacterial class frequencies, we could discriminate between Healthy and AB-intoxicated birds with a 100% prediction rate. We identify and review these classes that were most associated with either Healthy or AB-intoxicated birds. This study provides the first assessment of AB-die-off microbiomes in Alaskan seabirds and discusses the impact of changes in microbial functional groups on avian host health. The evaluation of surficial microbiomes could be considered when looking for non-invasive tools to monitor host populations for pathogenic and commensal communities of bacterial groups. This approach could be particularly effective in detecting emerging, inconspicuous diseases or while monitoring environmental stressors.

3. Are antibiotic resistant genes expressed within the Blue Marsh watershed? Let's find out!

Shantelle Duarte, Penn State Berks
Jill Felker, Penn State Berks

Tami Mysliwiec, Penn State Berks

Antibiotic-resistant bacteria within the Blue Marsh Watershed in Berks County, Pennsylvania, is a growing health concern. This study identifies antibiotic-resistant *Enterococci* spp and Escherichia coli bacteria within this local watershed. The EPA uses Enterococci spp and *Escherichia coli* as indicator species for detecting potential pathogens in recreational water supplies. Three sample sites were chosen to look for *Enterococci* and *Escherichia coli* based on anthropogenic activities in the watershed. Each sample site may be affected by different human activities: the upstream site is surrounded by agricultural lands, the lake site is used for recreational activities, and the downstream site may be influenced by industrial non-point pollution. Water and sediment samples from each site were collected monthly. Enterococci and E. coli were isolated from sediment samples using EPA-standard membrane filtration protocols for recreational waters. Isolated *Enterococci* and *E. coli* colonies were subjected to Kirby Bauer assessments for antibiotic profiling. Isolated *Enterococci* and *E. coli* cultures were found to be resistant to seven commonly prescribed antibiotics by physicians. Several antibiotic-resistance genes were identified using PCR analysis on DNA extracted from sediment samples collected from all sites within the Blue Marsh Watershed.

4. What's the scoop on the mycoloop? Chytrid fungi associated with increased zooplankton density in the Chesapeake Bay

Darren Kirkendall, College of William and Mary
James Skelton, College of William and Mary

Fungi are a little known but important part of aquatic ecosystems. Aquatic fungi are commonly regarded as important decomposers that release nutrients from dead biomass, but a recent hypothesis – the mycoloop – proposes that they may also act as parasites on hard-to-eat algae and help release their nutrients to zooplankton and higher trophic levels. This interaction can form an important energy source during algal blooms when zooplankton may otherwise starve. Most previous work studying the mycoloop has focused on freshwater lakes with some attention paid to marine environments. In this study I determine the effect that the mycoloop has on the abundance and community composition of zooplankton of a large estuary, the Chesapeake Bay. Sampling was conducted over 3 months (June, July, August) in 2023 at 27 sites. I collected samples of zooplankton, environmental DNA, and phytoplankton/fungal sporangia to determine how the zooplankton and fungal communities were related. To confirm that zooplankton were consuming aquatic fungi I assessed their gut contents using eDNA. I determined that the zooplankton and fungal communities varied both spatially and temporally. I found a significant relationship between fungi with the lifestyle "algal parasite" and the abundance of zooplankton. This study improves our understanding of the functional roles of fungi in estuarine systems and supports the importance of the mycoloop hypothesis in the lower food web of the Chesapeake Bay.

5. **The queen's gambit: developmental diapause of future queens in temperate paper wasps**

Laura Miller, Drexel University
Sean O'Donnell, Drexel University
Kari Lenhart, Drexel University

Seasonal changes influence the physiology of many organisms such as the development of winter coats in many mammals and fat storage to prepare for hibernation. Eusocial insects, defined as having sterile and reproductive castes, in temperate regions follow an annual cycle influencing their colony organization. In

the primitively eusocial paper wasp, *Polistes*, the future queens (gynes) emerge as adults with less developed ovaries than the sterile worker caste. Workers can activate their ovaries to the extent of the queen at any point after adult emergence. However, despite gynes mating in the fall, they cannot develop their ovaries until after a diapause period during the winter months. In honeybees, it has been seen that ovary activation can be prompted by inducing diapause. The stimuli that prompt ovary activation in Polistes gynes are not well understood. This study will provide information on the extent to which gynes rely on environmental stimuli to induce ovary activation. Information from this study can indicate the extent the annual cycle of <i>Polistes<i/> may be impacted by the rising winter temperatures in temperate regions. I performed immunohistochemistry on ovaries of *Polistes exclamans* gynes to identify how and where oogenesis is halted during the developmental diapause in gynes. Oogenesis halts before nurse cells, germ cells that divide from the oocyte, dump their cytoplasmic contents to support oocyte growth. I placed gynes in diapause to analyze whether diapause alone induces at least partial ovary development.

Session 1C

1. 3,000 years of pollen at the Glen Forney Vernals Natural Heritage Area, Michaux State Forest, Pennsylvania, USA

Emily Hegedus, Shippensburg University
Paul Marr, Shippensburg University

The Glen Forney Vernals Natural Area in Michaux State Forest, PA is home to several dozen vernal pools. The surrounding landscape is also dotted with these seasonally inundated wetlands, and several paleoecological studies have been performed at three of these regional sites. This study seeks to add to the wealth of paleoecological data provided by previous studies by performing pollen analysis and radiocarbon dating of sediments with a vernal pool at Glen Forney in order to determine the origin of these pools and to examine the changes in forest composition before and after mass deforestation that occurred during the 1800s. The results indicate that the Glen Forney vernal pools are likely natural in origin based on the age of sediments within the sampled pool and that widespread deforestation in the 1800s caused lasting impacts on the landscape evidenced by the pollen record. The presence of *Nuphar lutea* (water lily) pollen within the pre-deforestation sediments is a primary indicator that this vernal pool was once a perennial waterbody. These results have potential implications for the fields of wetland and forest ecology.

2. A dichotomous key for identification of trees in the Northeast using bark characteristics

Atomu Saul, Rutgers University

Tree identification, a fundamental skill in botany, forestry, and urban forestry, often relies on intricate details of leaves and twigs, posing challenges for beginners and professionals alike. Though some bark identification tools exist, they are limited to certain areas, and only include that of native species found within natural lands. In this project, a dichotomous key was developed solely based on tree bark characteristics to simplify the identification process, particularly targeting urban environments in the Northeast United States. Methodology involved extensive fieldwork, where tree bark images from 142 individual species were systematically captured across diverse environments, including state forests, urban neighborhoods, and campuses. Both conifers and angiosperms of both native and ornamental, are represented in 67 different genera. Bark samples were categorized based on observable traits such as color, texture, and breakage patterns. Analysis revealed that despite bark's apparent complexity, it can be

simplified for species recognition, primarily through understanding bark breakage patterns resulting from tree growth and external factors. Various bark characteristics, including texture, color, and scent, were identified as species or genus-specific, forming the basis for a logical identification framework. The developed dichotomous key presents a user-friendly approach to tree identification, that will be later tested for feedback by students, serving as a valuable resource for students, enthusiasts, and professional foresters. Moreover, it lays the foundation for potential integration into electronic applications, facilitating artificial intelligence training for automated tree recognition systems. By simplifying the identification process, this bark key could help urban residents become more connected to their local green spaces through tree identification.

3. Reforesting the Mid-Atlantic: tree planting or natural regeneration?

Doug Boucher, White Acres Farm

I compared tree-planting and natural regeneration as strategies for reforestation in central Maryland. Old-field succession was allowed to proceed without disturbance in a 20-year- long study of a 1 hectare plot. The resulting naturally regenerated forest was composed of 99.6% native trees, dominated by *Liriodendron tulipifera*, with over 13,700 seedlings per hectare establishing in the first 14 years. Canopy closure was reached after 17 years, and mean canopy height was 12.4 m by year 20. Self-thinning after canopy closure was intense, reducing tree density to 5,800 per hectare by year 20. Flowering of the new trees began in year 16, and by year 20 there were 428 new trees producing the seeds that will form the 2nd generation. The rate of carbon sequestration was high, particularly after year 13, averaging 5.3 tons-C/ha-yr in recent years. I used economic data from the 1-hectare plot and from a newly begun tree-planting project adjacent to it, to compare the cost, effectiveness, and speed of forest establishment by tree-planting versus natural regeneration. The costs of natural regeneration were very low - - a few thousand dollars – to establish over 5,000 trees per hectare. Furthermore, most of these expenses were related to data gathering, which was not needed for forest establishment. Tree-planting, on the other hand, cost over $ 82,000/ha to establish just under 500 trees/ha. Thus, natural regeneration established a forest with ten times as many trees at a much lower cost. The principal advantage of tree-planting is time: it took 8 years for the trees in the naturally regenerated forest to reach the same density and mean DBH as the planted trees. Nonetheless, the differences in cost-effectiveness are so large that natural regeneration, possibly supplemented with deer protection and vine control, should be used for reforestation wherever possible.

4. Long-term conservation of white ash on the Allegheny National Forest

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Kathleen Knight, USDA Forest Service
Charles Flower, USDA Forest Service
Alejandro Royo, USDA Forest Service

The non-native and invasive emerald ash borer (EAB, *Agrilus planipennis*) has decimated ash (*Fraxinus spp*.) across eastern hardwood forests of North America in two decades, and ash are rapidly approaching functional extirpation throughout the range of EAB invasion. Loss of ash can change the composition and structure of some forests and could lead to a trophic cascade of population crashes by insects dependent on ash. Systemic pesticides can save individual trees; this approach is utilized in urban/suburban areas. These treatments require recurring, costly applications making their widespread use in forest landscapes cost-prohibitive. However, based on our results on the Allegheny National Forest (ANF), selective treatment of a portion of the white ash (F. americana) population may provide a level of protection against EAB throughout the landscape. Some ash trees that have survived the initial wave of EAB-induced mortality have demonstrated heritable resistance to EAB, forming the foundation of a tree resistance

breeding program. On the ANF, we have identified lingering white ash from which scions will be propagated for further testing of EAB resistance. Initiatives to identify and confirm lingering ash would increase the genetic diversity of source material from which the breeding program could develop. Integrated and synergistic approaches will be required to prevent the extinction of white ash and conserve its dependent insect communities and functional resource dynamics.

5. **Forest age and tree size shape development of tree-base microhabitats in second-growth forests**

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Hunter Holcomb, Chatham University
Oliver Jankosky, Chatham University
Phil Hingston, Chatham University
Trish Miller, Chatham University
Emily Steinberg, Chatham University
Hannah Thomas, Chatham University
Shannon Byers, Chatham University
Victoria Jeffords, Chatham University
Stevie Murphy, Chatham University
Lucy Ruzanic, Chatham University
Caroline Sipper, University of Pittsburgh

Microsites at the bases of trees contribute to forest biodiversity because they are often distinct from the surrounding forest floor in moisture, soil attributes, litter presence, and herb layer composition. One common feature of tree-base microsites is a ring of bare soil adjacent to the root flare, where litter has been washed away by water flowing down the trunk. Because litter influences ground-layer plant community composition, seed germination, and phenology, the presence of bare-soil microhabitats likely contributes to diversity in the herb layer. Many tree-mediated microhabitats are uncommon in young forests and develop through time, but less is known about successional development of tree-base microhabitats. We tested the hypothesis that bare-soil tree-base microhabitats are rare in young forests with small trees, and appear with increasing stand age due to increasing tree size that results in larger amounts of stemflow to wash litter away. We sampled 136 trees in oak-dominated forests at Chatham University's Eden Hall campus in Gibsonia, PA. Trees were sampled in two young forests 10-40 years past canopy closure and two forests >100 years past canopy closure using 10x50 meter belt transects in which all trees over 10 cm DBH were assessed. Bare soil diameter and microtopography were measured at the four cardinal directions for each tree. Bare-soil microhabitat size increased significantly with increasing tree diameter, and in sites with steeper microtopography. Presence of bare soil was significantly predicted by tree diameter, and bare-soil microhabitats generally started to appear around trees between 30 and 50 cm DBH. We conclude that tree-base bare-soil microhabitats develop through successional time, concurrent with increasing tree size. The lack of bare soil zones observed in the young forest group indicates that trees in these sites have not yet reached the critical size threshold for development of this microhabitat type.

Session 1D

1. Snail physiological stress responses to predation affect biological soil crust stoichiometry

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Netta Shamir Weller, The Hebrew University of Jerusalem
Coral Ben Lulu, The Hebrew University of Jerusalem
Dror Hawlena, The Hebrew University of Jerusalem

Predators regulate ecosystem functions by consuming prey and eliciting prey defensive phenotypes such as shifts in prey physiology, behavior, morphology, and life history. Physiological defensive phenotypes, including physiological stress responses, are energetically costly, and often result in shifts in prey tissue stoichiometry. Stoichiometric shifts in prey tissues can have important consequences for ecosystem functions such as decomposition rates. However, empirical evidence linking prey physiological stress responses to ecosystem-level processes is limiting, especially in systems dominated by non-vascular primary producers (e.g., biological soil crusts or biocrusts). Here, we conducted a series of manipulative laboratory studies to evaluate how snail physiological stress responses to spiny mouse (*Acomys cahirinus*) predation-risk affects the relationship between snail [*Xerocrassa simulate* (XS) and *Sphincterochila prophetarum* (SP)] mucus and biocrust stoichiometry and C process rates. We observed species-specific cascading effects of spiny mouse predation-risk on biocrust stoichiometry. Predation-risk did not alter the nature of XS mucus effects on biocrust C content, N content, and C:N. However, predation-risk did alter the effect of XS mucus on biocrust respiration rates. Predation-risk also affected the nature of SP mucus effects on biocrust C content, N content, and C:N— with no effects on biocrust respiration rates. Specifically, mucus from risk-exposed SP increased biocrust C content and decreased biocrust N content relative to mucus from non-risk exposed SP—resulting in biocrusts under risk-exposed conditions having a higher C:N than biocrusts under no-risk conditions. Biocrusts under risk-exposed conditions always had lower variability in their C content, N content, and C:N than biocrusts under no risk conditions. Our study demonstrated that prey physiological stress responses can cascade to affect the concentration and heterogeneity of nutrients across the landscape. Additionally, this is the first example of a trophic cascade in biocrust-dominated environments, highlighting the generality of predator effects across diverse ecosystems.

2. Microbial antics: unveiling the unseen world of ant Aphaenogaster rudis

Lily Kelleher, West Chester University
Manuela Ramalho, West Chester University

There are currently over 17,000 described species of ants with a worldwide distribution. Due to the high diversity between species, ants are considered vital keystone species to many ecosystems. They provide basic ecosystem services such as: seed dispersal, soil bioturbation, decomposition and pest control. Within these ecosystems ants form complex symbiotic relationships with plants, fungi and bacteria. However these symbiosis remain largely unstudied in terms of the microbiome. A microbiome is a grouping of microscopic organisms, such as bacteria, archaea, protists and nematodes, in a singular environment. Studying the interaction between ants and their microbiome is important because of the crucial role that microbes play in the overall health of the ants. *Aphaenogaster rudis*, which is a native North American ant species, remains entirely unstudied in terms of their microbiome, more precisely their bacterial community. This study aims to determine the taxonomic composition and abundance of the *Aphaenogaster rudis* bacterial community and to determine if this association impacts the fitness of these insects. For this study, ants from several colonies were collected from the Gordon Natural Area in West Chester, Pennsylvania, USA. DNA was then extracted from the ants in all stages of development and the

16S rRNA gene was amplified and sequencing following the NGS amplicon approach. The findings from this study are novel and this information can be used to help better understand ant-microbe interactions.

3. Seeds, flies, wasps: a new trophic chain to study top-down and bottom-up controls in the Arctic

Colleen McDonald, Wilkes University
Marcel Carita Vaz, Wilkes University
Steven Unger, Florida International University
Ned Fetcher, Wilkes University

Polar amplification is causing climate change to proceed faster in the Arctic than anywhere else, threatening the health and stability of unique ecosystems like the tundra. The foundation species *Eriophorum vaginatum* (tussock cottongrass; Cyperaceae), e.g., has already shifted 140 kilometers northward because of warming temperatures. Such migration is only possible through mass production of wind-dispersed seeds, but cottongrass has a very conservative reproductive strategy, investing most of its resources into vegetative growth. Oddly enough, cottongrass blooms more intensely after fires, which relaxes the strong nutrient limitation in the tundra. Concomitantly, seed production is limited by predation by flies (*Pseudopachychaeta*), which in turn are predated by an unknown parasitic wasp. Therefore, by comparing undisturbed and burned sites, we tested if seed production is regulated by soil nutrients (bottom-up) or seed predation (top-down). In June of 2017, exclusion bags were fastened to the inflorescences of cottongrass at three sites in the northeast Brooks Range: Toolik Lake, Sagwon and the Anaktuvuk Burn. The mesh of the bags was large enough to allow pollen to pass through, but too small to allow wasps in or flies out. After collecting bagged and unbagged (control) infructescences from each site, they were dissected and the number of seeds, flies, and wasps per sample was recorded. We found higher seed counts in control samples from the burn, indicating an influence of nutrients on seed production (bottom-up), consistent with prior findings. Seed counts of bagged samples from the burn were similar to other sites, showing a significant effect of the fly on seed production (top-down). Bagged samples also had far fewer seeds than the control samples, indicating the importance of the parasitoid wasp in regulating seed predation . Our study suggests that fires allied with this unknown, rare wasp play a significant role in increasing seed production and preventing seed predation, respectively , thus providing cottongrass with a fighting chance against climate change.

4. pH influences the thermal performance curves of protist populations

Melodie Najarro, Duke University
Jean-Philippe Gibert, Duke University
Andrea Yammine, Duke University

Global climate change has led to major direct and indirect impacts on ecosystems worldwide. For example, rising temperatures have been linked to direct changes to the microbial community structure and function of peatlands, which in turn affects C-cycling in these ecosystems. But climate change is also associated with other less studied geochemical shifts, such as the acidification of peatlands and other aquatic/semi-aquatic ecosystems. As temperature and pH are recognized to be significant drivers of microbial community composition and ecosystem function, it is important to understand the joint impacts of these abiotic variables on microbial systems. Here, we provide a window into those possible changes by investigating how pH influences the population growth rates of three different protist species — which serve as significant predators within peatland microbial food webs — at rising temperatures. Specifically, we answer the following questions: 1) how do different pH conditions affect thermal performance? And 2) how do microbes adjust their functional traits to cope with temperature and acidity changes in their environment? To address these questions, we quantified the Thermal Performance Curve of population intrinsic growth rate (r-TPC) of populations acclimated to different pH conditions and incubated at

different temperatures. We found that the initial pH conditions significantly impacted the thermal performance of the three species, with the effects of pH varying between the smaller, faster growing species and the larger, slower growing species. Initial pH was also found to significantly affect cell size, shape, and cellular contents — three traits previously shown to likely influence r-TPC shape. Our study highlights the importance of evaluating the joint effects of multiple climate change associated abiotic shifts — not just temperature — on microbial communities and their ecosystems.

5. **Microplastic microbial hitchhikers in Blue Marsh Lake**

Vinh Lu, Penn State Berks
Jill Felker, Penn State Berks
Tami Mysliwiec, Penn State Berks

Anthropogenic activities have deposited significant pollutants in and around global waterways. Millions of manufactured plastic products composed of various chemical composites degrade into microscopic pieces known as microplastics. Microplastics within waterways significantly impact aquatic ecosystems, including habitat contamination and the bioaccumulation of plastic in aquatic life. Along with the impact that microplastics have on the aquatic environment, they also have a negative influence on human health. Microplastics have been shown to cause harm to mammalian gastrointestinal tracts, behave as endocrine disruptors, and influence metabolic oxidative stress. Microplastic particles in waterways may also serve as transportation systems for microbial pathogens potentially posing unexplored health implications locally and for populations downstream. This study assessed the presence of microplastics and analyzed bacteria residing on microplastics from Blue Marsh Lake, a tributary to the Schuylkill River, which flows into the Delaware River Watershed. This watershed serves as an essential source of drinking water for Philadelphia residents. Water samples were collected using a modified version of the NOAA microplastic collection protocol at a shore location adjacent to a recreational swimming area. Quantitation of dried samples revealed locally elevated levels of microplastics in Blue Marsh Lake (51% fibers, 46% nurdles, and 3% fragments). These levels suggest the drinking water quality in the Philadelphia area may be negatively impacted. Composite testing of particles is underway using FT-IR analysis. Microbial populations residing on the microplastics are also being examined to determine if potential pathogens transported via ‘microplastic hitchhiking’ can spread antibiotic resistance along the waterway.

Session 1E

1. **Effects of warming and elevated CO2 on stomatal conductance and chlorophyll fluorescence of C3 and C4 coastal wetland species**

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Genevieve Noyce, Smithsonian Environmental Research Center
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Coastal salt marsh communities provide numerous valuable ecosystem services such as flood and erosion prevention, soil accretion, and essential habitat for coastal wildlife, but are some of the most vulnerable to the threats of climate change. This work investigates the combined effects of two climate stressors, elevated temperature and elevated CO2, on leaf physiological traits of dominant salt marsh plant species. The research took place in 2017 and 2018 at the Salt Marsh Accretion Response to Temperature eXperiment (SMARTX) in the Kirkpatrick Marsh at the Smithsonian Environmental Research Center in

Maryland, which includes two different plant communities: a C3 sedge community and a C4 grass community. SMARTX consists of plots arranged across an active heating gradient consisting of unheated ambient plots and plots that are heated to 1.7, 3.4, and 5.1 °C above ambient. In the C3 community, there are six additional plots with elevated carbon dioxide chambers, half at ambient temperatures and half heated to +5.1 °C above ambient. The warming treatment had smaller effects on leaf physiological traits than expected, which we attribute at least in part to the much higher than average precipitation that fell in 2018. The lack of water stress likely allowed plants to maintain high rates of stomatal opening since water was not limiting, and thus reduce heat stress via evaporative cooling. When we tested the effect of CO2 addition at the warming extremes (ambient and +5.1 °C) on the C3 sedge, we found significant reductions in stomatal conductance in response to both. We also found a significant positive relationship between the quantum yield of photosynthesis and stomatal conductance for both C3 and C4 species growing under ambient CO2, indicating that declines in stomatal conductance cause higher levels of thermal stress in both plant communities, likely due to reductions in evaporative heat loss.

2. Long term phenological shifts in moth communities in central New York

Emma Foster, Binghamton University
Eliza Grames, Binghamton University

Climate change has led to phenological shifts for many taxa, and insects are particularly sensitive to temperature changes. Many Lepidoptera have experienced changes in their phenology, with studies in Europe indicating shifts towards earlier emergence and longer flight periods since the 1980s, though less is known about longer-term changes. The impact of these phenological shifts may have implications for pollination, taxa that rely on moths as a food source, synchrony with host plant phenology, as well as greater community dynamics. I hypothesized that warming temperatures over the last century would result in earlier emergence of the first brood, longer flight periods, and more generations per year. Using light trap data documenting moth communities in 1919 and 1922 in Ithaca, NY (Forbes 1923a, 1923b), I compared historic moth phenology from over one hundred years ago to current (2019-2024) iNaturalist observational records for Tompkins County, NY. I recorded the week in the year that a species was first seen, climaxed, and last seen for each species that was observed historically in both 1919 and 1922. Since 1919, moth species have experienced a shift to a longer flight duration, and species are active later in the year than they were historically. This phenological shift has likely facilitated an increase in broods per year in species with plastic voltinism. I also observed the local extirpation of 6 species, which could potentially be attributed to shifting environmental and anthropogenic pressures in the Northeast. I concluded that global change associated with temperature shifts is likely influencing the flight periods of moths in the northeastern United States.

3. The influence of climate warming on flowering phenology in relation to historical annual and seasonal temperatures and plant functional traits

Richard Niesenbaum, Muhlenberg College
Cole Geisler, University of Connecticut

Climate warming has the potential to influence plant flowering phenology which in turn can have broader ecological consequences. Herbarium collections offer a source of historical plant data that makes possible the ability to document and better understand how warming climate can influence long-term shifts in flowering phenology. We examined the influence of annual, winter, and spring temperatures on the flowering phenology of herbarium specimens for 36 species collected from 1884–2015. We then compared the response to warming between native and non-native, woody and herbaceous, dry and fleshy fruit, and spring vs summer blooming species. Across all species, plants flowered 2.26 days earlier per 1 °C increase in annual average temperatures and 2.93 days earlier per 1 °C increase in spring onset average

temperatures. Winter temperatures did not significantly influence flowering phenology. The relationship of temperature and flowering phenology was not significantly different between native and non-native species. Woody species flowered earlier than herbaceous species only in response to increasing annual temperatures. There was no difference in the phenological response between species with dry fruits and those fleshy fruits for any of the temperature periods. Spring blooming species exhibited a significantly greater phenological response to warming yearly average temperatures than summer blooming species. Although herbarium specimens can reveal climate change impacts on phenology, it is also evident that the phenological responses to warming vary greatly among species due to differences in functional traits such as those considered here, as well as other factors.

4. Climate induced phenology changes of Western Pennsylvania tree and herb species over the past 125 years

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Searrah Bierker, Chatham University
Ryan Utz, Chatham University
Mason Herberling, Carnegie Museum of Natural History

Climate change potentially influences the phenology of plants, particularly flowering and leaf out. This is incredibly significant because plant species rely on climatic conditions to signal development. These changes can lead to ecological mismatch, which can affect migratory bird predator / prey interactions and insect pollination efforts, amongst other ecological factors. We used imagery and data collected from the Mid-Atlantic Herbarium, to record the flowering and tree leaf-out phenology of 19 herbs and 11 tree species common to western Pennsylvania. Records dated back as far as 125 years. To determine the changes in phenology we utilized linear regressions with various metrics to determine the species most effected by the climatic changes, and to what degree. Most assessed tree and herbaceous species appear to be flowering or leafing out earlier in the year, particularly, the species *Dicentra cucullaria*, *Dicentra canadensis*, and *Claytonia virginica*.

5. Multi-scale distribution modeling for the spotted lanternfly (Lycorma delicatula) reveals range expansion and increased risk to important viticultural regions under climate change

Samuel Owens, Temple University
Matthew Helmus, Temple University

Invertebrate agricultural pests threaten both ecological stability and food security. As a result of climate change, rising temperatures and unpredictable weather patterns will upend current climatic limits on potential invaders, especially for invertebrates. *Lycorma delicatula* (the Spotted Lanternfly or SLF) is an agricultural pest that has been transplanted into Japan, South Korea and the United States from its native range in southeast Asia. In the United States, the invasion front has expanded quickly, by hundreds of kilometers within only a decade. SLF presents a significant threat to global viticulture. As climate change shifts productive viticultural regions to higher latitudes and forces growers to consider new locations for their vineyards, it is critical that growers consider the risk of new spread and establishment by the destructive SLF. One tool for assessing the potential for SLF establishment in an area, while also considering the dynamics of climate change, is species distribution modeling (SDM). SDM is already used widely to understand how risk of invasion compounds with climate change for invertebrates. We expand upon this existing framework and apply it to the problem of SLF by performing SDM at multiple spatial scales and geographically segmenting presence data to produce more rigorous predictions of suitable areas. We predict the potential for range expansion and progression into higher latitudes for SLF. Additionally, we use our multi-scale approach to create a “stage of invasion” metric for established SLF populations and important viticultural areas. Preliminary data suggests that the total suitable area for SLF

in North America will expand greatly and shift northward under climate change. We also see evidence that the threat of SLF will worsen for globally important viticultural regions with climate change. It is imperative that viticulturalists consider ours and other assessments of the threat posed by SLF as they adapt to climate change.

Session 1F

1. Population genetics of wild lupine (Lupinus perennis), an early successional plant species of conservation concern

Isabella Petitta, Pennsylvania State University
Autumn Sabo, Pennsylvania State University
Margarita López-Uribe, Pennsylvania State University

Loss of genetic diversity is a major driver of local extinction in rare plants. Habitat management and restoration efforts are often necessary to rescue these plants but decisions need to be informed by a characterization of the population structure of the species. Wild lupine (Lupinus perennis), a plant of conservation concern, is considered an indicator species for oak savannah habitat, an endangered habitat in North America. Due to changes in its primary habitat, it persists in human-made isolated forest edges such as powerline rights-of-ways and roadsides in fragmented populations. This study aims to determine (1) genetic diversity within and among populations of wild lupine, (2) the degree of inbreeding among populations, and (3) genetic differentiation between wild lupine populations of varying size and habitat. Using eleven microsatellite markers, population genetic measures of 26 wild lupine populations were evaluated throughout its range in the United States. In our preliminary analysis, we found no populations to have statistically significant levels of inbreeding. We identified three major genetic clusters grouping mid-western, eastern and southern populations with genetic differentiation being the greatest between southern and eastern states. Results will be used to identify potential seed sources for conservation plantings although further research should be done with alternate genetic methods to support identified genetic clusters and determine adaptive potential of wild lupine populations.

2. Does genetic relatedness or management context drive tree-associated insect communities in Baltimore city?

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Nancy Sonti, United States Forest Service
Dexter Locke, United States Forest Service
Meghan Avolio, Johns Hopkins University
Karin Burghardt, University of Maryland College Park

Trees are essential to well-functioning urban systems, providing services that benefit humans and wildlife. However, the potential effects of tree genetic background and management context on the efficacy of these services remain a largely unexplored topic. Insects associated with trees in cities can perform key roles in the urban food web as both a food source and as predators, but they can also be damaging in high numbers during pest outbreaks. To investigate the genetic and environmental effects on associated insect community abundance, diversity, and composition, we first determined the genetic relatedness of 250 individual trees of 2 tree species in and around the Baltimore metropolitan area: Acer rubrum, and its non-native congener *Acer platanoides*. For both tree species, we then selected 64 focal trees by delineating 6 genetic clusters, and within each cluster, choosing trees growing in street, managed

park, urban forest, or rural forest locations. We used vacuum and visual sampling methods to collect mobile and sessile (scale and internal feeders) arthropods respectively from the lower canopy of each focal tree in June and August of 2023. We preserved vacuum samples and sessile *Sternorrhyncha* in 85% EtOH solution for identification to order. Preliminary analysis of abundance data suggests tree genetic background, management context, and their interaction do affect insect abundance, which is consistent with the results of similar studies. Analysis of possible effects on insect community diversity and composition is ongoing. Results of this study will serve to inform best practices for urban tree management and pest mitigation, as cities work to maintain and increase urban canopy cover.

3. Examining the effects of multiple stressors on Rubus allegheniensis using structural equation modeling

Katie O'Sullivan, The College of New Jersey
Janet Morrison, The College of New Jersey

Rapid urbanization and globalization have caused suburban forests to undergo changes within their understory plant communities. There has been an increase in stressors such as overabundant deer and nonindigenous invasive plants, which affect many other environmental factors. We investigated these changes over ten years in a deer-exclusion experiment across four forests in suburban central New Jersey, each with 32 to 40 16 m2 plots. Half of the plots were fenced in 2013, and seeds of the invasive grass *Microstegium vimineum* were added to an equal number of fenced and unfenced plots. We focused on the common blackberry (*Rubus allegheniensis*), an understory indigenous shrub, to examine how these stressors may affect the herb layer community. We devised a system-wide hypothesis that predicted direct and indirect effects among deer pressure, light availability, earthworm activity, soil compaction, and proportion cover of indigenous plants, nonindigenous plants, and bare soil, and tested it with piecewise structural equation modeling. The modeling revealed that nonindigenous plant cover was the only variable to have a direct effect (negative) on change in blackberry cover over the ten years of the experiment. However, it also indicated that deer pressure had an indirect (positive) effect on blackberry via a negative effect of deer on nonindigenous plants. Other indirect effects also were evident; e.g. *M. vimineum* cover decreased the amount of bare soil, which in turn led to more nonindigenous cover of other species, suggesting that nonindigenous plants will grow in places where they have the space to do so. The strongest path was the negative effect of deer pressure on cover of other all other indigenous species, which in turn decreased *M. vimineum* cover. This network of direct and indirect influences in the herb layer illustrate the complexity of factors involved even in the success of one understory species, blackberry.

4. **Clonal reproduction contributes to common milkweed (Asclepias syriaca) population dynamics in Northern Virginia, USA**

Hannah Machiorlete, College of William and Mary

Clonal reproduction is a common reproductive strategy in plants; however, the majority of population models ignore clonality entirely, limiting their usefulness for understanding both population dynamics and the evolution of clonal plants. To address this gap, we are creating an Integral Projection Model (IPM) for common milkweed (*Asclepias syriaca*), a clonal plant species, that incorporates genetic identity. Demographic data were collected from all putative individuals (ramets) in 4 common milkweed populations in Northern Virginia from 2021 to 2023. All ramets were mapped, and 75% (n=1876) were genotyped at 7 microsatellite loci to identify unique clones (genets). We analyzed milkweed spatial-genetic structure and genet size variation over space and time. Then, we performed model selection on vital rate responses (flowering and pod production) with fixed (ramet height and herbivory) and random effect (genet identity and site) structures to construct the IPM. Finally, we performed elasticity analysis to

quantify the impact of clonality on population growth. In these populations, clonal reproduction was ubiquitous (unique genotypes/individuals sampled = 0.14), and milkweed clones were large and spatially aggregated, conflicting with previous research. Genetic identity explained 7% of variation in ramet flowering probability and pod production, suggesting that clonality is linked with sexual fitness, and thus population growth. This underscores the need to investigate clonal reproduction as an important driver of plant population dynamics.

5. **Factors limiting reproduction in the Pennsylvania endangered dwarf iris, Iris verna**

Leslie Taylor, Shippensburg University
Heather Sahli, Shippensburg University

The conservation of local biodiversity has gained importance in recent years as threats from climate change increase. Multiple factors including pollinator decline, inbreeding due to isolated and small populations, irregular and unnatural fire regimes, and more, are potential reasons for why some plant species are decreasing in abundance and quality across the world. Iris verna, a state endangered wildflower at the northernmost tip of its range, has been located and studied in Michaux State Forest, Pennsylvania. Since very little is known about the species, research on the factors limiting reproduction was conducted during the spring and summer months of 2023. Hand pollination using pollen from different origins was conducted, as well as pollen viability tests. Additionally, one site had experienced a controlled burn earlier in the year, so that population's fruit and seed production was compared to the fruit and seed production of the other two populations which were not burned. The likelihood of individuals setting fruits only significantly differed between populations ($X^2 = 9$, $df = 2$, $P = 0.01$), suggesting possible resource inequality. Pollen crosses from the same and different populations overall increased the amount of fruit and seed production, but the origin of the pollen produced no difference, suggesting that bi-parental inbreeding depression likely is not causing low seed production. Effects of the controlled burn were not observed, suggesting fire does not increase fruit and seed production, at least right away. The viability of I. verna pollen from numerous individuals varied greatly, but there was no significant difference between the populations ($X^2 = 0.97$, $df = 2$, $P = 0.62$), leaving a concern for the viability of some individuals. This research improved knowledge and understanding of I. verna and has implications for how best to conserve the species.

Session 2A

1. Characterization of cyanobacteria in Blue Marsh Lake

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Increasing beach closures at Blue Marsh Lake due to Harmful Algal Blooms (HABs) have become a concern for the reservoir ecosystem. Anaerobic conditions and nutrient pollution runoff have led to consecutive instances of cyanobacteria, the microorganism that causes HABs, overgrowing, lowering dissolved oxygen levels, and producing a potent toxin leading to beach closures during the summer months. The concern of these HABs is that they may contain cyanotoxins such as microcystin (hepatotoxin) that pose a risk to both the ecosystem and public health. This study investigated the wild-type cyanobacteria population during the summer of 2023. Water samples were collected from the lake swimming area. Samples were examined microscopically, and their growth curves were analyzed. The growth curve was conducted by serially diluting the cyanobacteria and then measuring their optical density over a two-week period. Growth curve analysis gives insight into the type of cyanobacteria

present during the summer 2023 season. Microscopic investigation suggests that Anabaena and Microcystis are prevalent in Blue Marsh Lake. Determining the types of cyanobacteria present in Blue Marsh Lake may provide insight into best practices for controlling growth and minimizing their harmful impact on the local ecosystem.

2. Understanding a pH anomaly in a coastal plain lake

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Michelle Ficken, Stockton University
Quinn Griffin, Stockton University
Savannah Quick, Stockton University

Surface water in the Pinelands region of New Jersey are typically acidic (pH < 5) due to low buffering capacity of soils, large percentages of wetlands and peat in watersheds, and the influence of the pine forests. In these surface waters, pH may increase in response to hydrologic or watershed disturbance or pollution. Elevated pH (>8.5) was measured in one Pinelands lake during the summer of 2023. The spatial extent of the elevated pH indicates that the cause was not a point source pollutant, but perhaps a response to high levels of primary productivity. Understanding the influences that may stimulate these high pH events can help mitigate the in-lake and downstream impacts.

3. Impact of wave exposure on coral dispersion patterns at Rapa Nui

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Phillip Staniczenko, Brooklyn College, City University of New York
Rolando Santos, Florida International University
W. Ryan James, Florida International University
Stephen Gosnell, Baruch College, City University of New York
Kyle McDonald, City College of New York, City University of New York
Carlos Gaymer, Millennium Nucleus for Ecology and Sustainable Management of Oceanic Islands

Due to the sessile ecology of marine ecosystem engineers, wave exposure may have a major influence on the interplay between their population processes and patterns. Coral species in the genera Porites (poritid) and Pocillopora (pocilloporid) inhabit coral reefs that vary in wave exposure in the Pacific Ocean and have differing life history traits that may interact with wave exposure to impact presence and abundance. We hypothesized that wave exposure and life history traits interact to affect how reef substrate is partitioned between the two coral groups, resulting in different reefs dominated by one genus or the other. We also hypothesized that colony size would be smaller and dispersion more clustered at higher wave exposure due to coral colonies forming in localized shelters. Our results showed that percent cover of poritids and pocilloporids was similar at high wave exposure (southeast) but differed at low (north) and moderate (west) wave exposures, where poritids were highly abundant (> 90% average cover) and pocilloporids were rare (< 10% average cover). Additionally, spatial point pattern analyses showed that the dispersion of pocilloporids was clustered at low levels at low wave exposure, highly clustered at moderate wave exposure, and random at the southeast high wave exposure, although the average density of pocilloporid colonies was higher (12.5 m^-2) at the southeast, compared to the west (1.5 m^-2) and north (0.5 m^-2).

4. Plastic pollution disrupts primary production and trophic interactions in aquatic food chains

Kate Sheehan, Frostburg State University
Marykate McHale, Frostburg State University

Plastic pollution poses a significant threat to ecosystems, wildlife, and human well-being. Efforts by the public and citizen-led clean-up initiatives engage people by suggesting that plastic consumption is consistent of wildlife across different levels of the food chain. While this may seem reasonable, traditional bioaccumulation models advise that if plastic is indeed transferred and accumulated as suggested, top predators would exhibit high levels of micro and macroplastics. However, we don't know whether the recognition and avoidance/preference for consuming plastics varies among taxa. Some species might be more easily deceived than others. Here we trace the movement of high-density polyethylene particles through a controlled aquatic food web. Our investigation begins with primary producers and progresses to copepod consumers, then fish, and ultimately a simulated bird predator. Our findings indicate that plastics likely impede primary production, consequently reducing resources available to primary consumers. Additionally, the fish predators did not view plastics as suitable food items. Fish fed on copepods at comparable rates in trials with and without plastics present. However, fish that consumed more copepods exhibited greater frequency of lunging, increasing their likelihood of inadvertently ingesting plastics. Thus, our research demonstrates that plastics can unintentionally and indirectly enter fish populations. We observed copepods consuming small plastic particles, which were subsequently eaten by fish. We can extrapolate our findings to underscore the far-reaching implications of plastic pollution in aquatic environments, which can disrupt energy flow and biomass throughout an entire food web. Our study reinforces the urgent need for concerted efforts to mitigate plastic pollution, with a particular focus on understanding species-specific responses and addressing the broader ecological consequences. Eliminating plastic waste in this day and age is not possibile and documenting the impacts that this durable material is having on the systems it has infiltrated is of utmost importance for understanding the futures of humans and wildlife.

5. Oyster aquaculture supports a diverse community of fishes and macroinvertebrates

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Brendan Campbell, University of Delaware
Rileigh Hudock, University of Delaware
Edward Hale, University of Delaware
Aaron Carlisle, University of Delaware

Oyster aquaculture is considered one of the most sustainable sources of animal protein production when compared to terrestrial livestock. Further, oyster aquaculture provides a suite of associated ecosystem services. Among these services, oyster aquaculture structures provide habitat provisioning for juvenile fishes and mobile invertebrates. However, the spatial and temporal footprint of impact to the local food web by these structures remains poorly understood. The aquatic community surrounding an aquaculture installation in Delaware Bay was surveyed using eel traps and beach seines during summer 2023 to understand the ecological community associated with off-bottom oyster aquaculture. Fishes and macroinvertebrates were identified, measured, weighed, and processed for stable isotope analysis (SIA). The weights and masses were used to assess the abundance and diversity of the ecological community surrounding the reef. The carbon (∂13C) and nitrogen (∂15N) stable isotope data were used to identify different primary production pathways supporting the ecological community. We found that oyster aquaculture gear supports a diverse community of fishes and invertebrates that relied on varying sources of primary production. Among the species observed on aquaculture structures, many juveniles of commercially and recreationally fished species, including Black Sea Bass and Tautog, utilized the space. This community was a mix of generalists (ex. Mummichog and Striped Killifish) and specialists (ex.

Silversides) who's niche widths and resource utilization were inferred from SIA. Overall, we found oyster aquaculture reefs support a diverse ecological community composed of a wide range of ecological niches.

Session 2B

1. Forest understory condition is affected by interactions between invasive species and the environment

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Tree regeneration and understory diversity, cover and reproduction are used as indicators of forest condition. We explored the influence of environmental conditions (soil chemistry, aspect, topography and tree basal area) and biotic stressors (invasive plants, invasive earthworms and white-tailed deer pressure) on these forest understory metrics. We visited ten sites across Pennsylvania, USA with similar understory flora, defined by abundant Allium tricoccum (ramps), to explore the influence of biotic stressors and environmental conditions on groundlayer and midstory species and tree seedlings. Preliminary analyses indicate that lilioid monocots are associated with multiple environmental conditions as well as earthworm invasion rank, while tree seedlings are related to soil and canopy conditions. Native understory and midstory richness are negatively correlated with invasive plant abundance. Surprisingly, deer pressure (categorized into high versus low based on hierarchical cluster analysis of twig ages, proportion of palatable species and camera visitation) was not a significant predictor for any response variables tested. This may be due to deer pressure driving the other biotic stressors tested. Our findings demonstrate that invasive earthworms and plants appear to influence understory and midstory species more than tree seedlings but that all three forest layers are affected by environmental conditions, even across our fairly similar sites.

2. Assessing impacts of buckthorn (Rhamnus spp.) as invasives on vegetation distribution and species diversity within Hudson River Valley, New York, USA

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Virginia Patsun, North Central Conservation District, Connecticut

The proliferation of Common buckthorn, an invasive species, poses a significant ecological threat across the northeastern and central United States, as well as certain regions of Canada, due to its formation of dense thickets. This invasive species tends to outcompete native vegetation, suppressing undergrowth in its expanding range. Despite being a prohibited species in New York State, Common buckthorn continues to aggressively spread. To address this ecological concern, an in-depth ecological study was conducted in the Hudson River Valley, New York, focusing on vegetation distribution and species diversity within buckthorn-invaded forests. The primary objective of the research was to offer landowners a comprehensive understanding of the biodiversity on their properties and to provide guidance for implementing conservation methods that could enhance ecological services. The study concentrated on unraveling the composition, spatial patterns, and ecological significance of plant species, as well as assessing vegetation cover changes in the region. Employing various tools such as remote sensing technology, GIS mapping, and traditional field sampling methods, the research collected and analyzed data on vegetation distribution across diverse habitats. Land use and land cover changes were scrutinized to gauge the impact and extent of forest cover evolution over time. The analysis disclosed that approximately 50% of the study area is categorized as deciduous forest, with nearly 95% of that area

covered by buckthorn. Red maple (0.23) and White pine (0.21) were identified as crucial species within the study area, with the highest relative dominance. Notably, White pine exhibited the largest diameter class, suggesting its historical dominance in the primary forest. This study serves as a valuable resource for understanding and mitigating the ecological implications of Common buckthorn invasion in the Hudson River Valley.

3. Patterns of invasive plant species in urban forests vary across spatial scales

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Tara Trammell, University of Delaware

Urban areas are hotspots for the introduction and spread of non-native invasive plant species. Following human-assisted establishment, non-native species may spread into urban forest patches, facilitating further spread into rural forests and other habitat across the region. However, previous research suggests that the most invaded forests are not necessarily those that are in the most urban contexts. Additional processes other than urbanization are therefore likely to play a strong role in influencing the patterns of non-native invasion in urban forests. Furthermore, patterns of invasion may be driven by processes that originate at different spatial scales across the urban ecosystem, including the city-, patch-, and within-patch scale. We lack a unified understanding of what these processes are, whether they may act similarly between urban areas, and at what spatial scale processes may be most important in determining urban forest invasion. To address this knowledge gap, we surveyed understory vegetation within 25 urban forests across five East Coast cities from North Carolina to Massachusetts. Within 1x1 meter subplots spread across five sampling locations within each forest, we measured the % cover of each vascular plant species present. Preliminary results suggest that non-native abundance and frequency varies similarly across the city-, plot-, and patch-scale, meaning that processes across scales may have an equal impact in influencing the distribution of non-native vegetation. Japanese honeysuckle (Lonicera japonica) appeared in 4 of our 5 study cities and was the most frequent invader, while other invasive species were more variable in their frequency and abundance across all cities. Our results highlight that heterogeneity exists at all scales with respect to urban forest invasion as well as the dominant invaders. Consequently, future studies should attempt to examine processes that influence urban forest invasion by considering processes at multiple spatial scales.

4. Invasion density and soil moisture influence soil nitrogen cycling in forests invaded by the shrub Rosa multiflora

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Tara Trammell, University of Delaware

Invasive plants often alter ecosystem function and processes, especially soil N cycling. Invasive plant removal and management can alter soil N cycling by decreasing plant N uptake, but resulting soil disturbances often make soil N more available and facilitate invasions, which in turn increases N mineralization rates. In eastern United States forests, the shrub Rosa multiflora (“rose”) is a dominant invader, yet potential effects on N cycling are poorly understood. The objectives of this study were to evaluate N cycling along a gradient of rose invasion and investigate potential changes to N cycling under four different management strategies: 1) do nothing (the control), 2) invasive plant removal, 3) removal followed by native seed mix addition, 4) removal, native seed mix, and rose stem addition (chipped and mulched). We selected three forest sites experiencing a Low, Medium, or High amount of rose invasion, and measured soil N cycling in the early (June) and late (September) growing seasons. We found N was immobilized in June and mineralized in September. Across sites, soil moisture was a better predictor of N

cycling in June, while rose density was a better predictor in September. Patterns between N cycling and all non-rose plant stems were opposite those observed with rose density. One year after experimental management, removal alone had no effect on N cycling compared to control plots, but addition of native seed mix and chipped rose stems reduced early-season nitrification in our Medium invasion site. These findings suggest that rose is driving changes in N cycling, and invasion may increase N cycling when soils are dry, which may occur more frequently with future climate change. In addition, N cycling responds differentially to management in the year following invasive plant removal, but most noticeably under moderate rose invasion.

5. A potential new nemesis for garlic mustard? Exploring the range and impacts of a newly arrived specialist aphid

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Katie Stuble, Holden Forests and Gardens
Emma Watson
David Jenkins
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In the 2021 field season during routine garlic mustard (Alliaria petiolata) management, the Holden Forests and Gardens (HF&G- Kirtland, Ohio) Natural Areas Biologist noticed damaged garlic mustard plants that were infested with aphids. Affected plants produced twisted seed pods and puckered/wilted leaves. The finding was surprising; it previously had been extremely rare to find a garlic mustard plant with apparent herbivore damage. The aphid was identified as Lipaphis alliariae, a garlic mustard specialist aphid native to Europe and previously unrecorded in the United States. Given the importance of controlling garlic mustard, the novel nature of the newly discovered aphid in the United States, and anecdotal evidence that this species may negatively impact garlic mustard, the pilot project has included two components 1) to determine the local distribution of the aphid and 2) quantify how this aphid is affecting growth and productivity of garlic mustard within northeast Ohio. Our initial results suggest that 1) the aphid is distributed at least throughout the Great Lakes region and 2) garlic mustard plants with the aphid present on average are shorter, weigh less, have fewer seed pods, and have more twisted seed pods than plants without the aphid present. It is still unclear whether these differences will cause changes in garlic mustard populations.

Session 2C

1. Leaf litter quantity influences on microclimate and wildflower phenology

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Patrisha Miller, Chatham University
Mason Heberling, Carnegie Museum of Natural History
Sara Kuebbing, Yale University

The O-horizon of soil, constituting the uppermost layer, predominantly comprises organic material such as detritus and leaf litter. This leaf litter, specifically termed the Oi layer, plays pivotal roles in shaping the microclimate of the underlying soil. It functions as a mediator for both soil moisture and temperature, while also serving as a habitat for a diverse microcommunity of organisms, including bacteria and fungi, facilitating decomposition processes. The variations in soil moisture and temperature levels, coupled with the heterogeneous rates of decomposition influenced by leaf species, serve as critical cues for wildflower life cycles. Our research aimed to investigate the impact of leaf litter quantity on phenological cues in wildflowers. Utilizing leaf litter manipulation plots - comprising of control, addition, and removal

subplots - we monitored soil moisture, surface soil temperature (below any present leaf litter), subsurface soil temperature at a depth of 10 cm, and phenological stages of the wildflowers. Our findings reveal significant temperature disparities between the removal and addition of leaf litter compared to the control, alongside evidence suggesting variations in soil moisture levels among addition and removal plots relative to the control. These alterations in microclimate conditions were associated with observable advancements in wildflower emergence and first leaf phenology following litter removal, although no discernible effects were observed on flowering phenology.

2. Effects of soil fertility and moisture on soil respiration by fine roots, fungi, and prokaryotes in a tropical forest drying experiment

Lee Dietterich, Haverford College, Colorado State University
Amanda Cordeiro, Colorado State University
Karis McFarlane, Lawrence Livermore National Laboratory
Daniela Cusack, Colorado State University, Smithsonian Tropical Research Institute

Tropical forests contain roughly one-fifth of global soil carbon. Tropical soil carbon stocks are likely to be sensitive to changes in climate, leading to a strong potential for major forest-climate feedbacks, but many questions remain about the factors modulating carbon fluxes in and out of tropical forest soils. Here, we focus on soil carbon dioxide efflux due to respiration by soil-dwelling organisms (henceforth soil respiration), which is the predominant mechanism by which carbon moves from tropical forest soils to the atmosphere. As part of Panama Rainforest Changes with Experimental Drying (PARCHED), a throughfall exclusion experiment simulating chronic drying in four Panamanian forests since 2018, we used PVC columns with windows lined with different sizes of mesh to estimate fine root, fungal, and prokaryotic contributions to soil respiration. We hypothesized that drying would impact roots and fungi more strongly than prokaryotes, thereby decreasing root and fungal respiration more strongly than prokaryotic respiration. We further hypothesized that drying effects would be strongest in resource-poor sites, that is, sites with lower baseline precipitation and lower soil fertility. Preliminary results suggest that prokaryotic respiration accounted for ~50-80% of total soil respiration, and tended to increase with experimental drying in the infertile sites but decrease with experimental drying in fertile sites. In contrast, fungal respiration increased strongly with experimental drying in the fertile site, and tended to decrease with experimental drying in infertile sites. Fine root respiration usually declined with experimental drying, but seasonal effects varied by site, with respiration peaking in the wet season in infertile sites, but peaking in the dry season in the fertile site. These results improve our understanding of how abiotic conditions can affect diverse soil organisms' responses to drying, and may help improve formulations of tropical forest soil respiration in ecosystem models.

3. Gone with the wind: pre- and post-tornado comparisons of small mammal communities

Steve Sheffield, Bowie State University
Carlos Iudica, Susquehanna University

Extreme climatic events (ECEs) like tornadoes are recognized as drivers of contemporary and future ecological dynamics. An EF2 tornado associated with a derecho touched down in the eastern deciduous forest at Powdermill Biological Reserve in western PA in the summer of 2012. During initial field research examining impacts of the blowdown on the small mammal community, we confirmed that the tornado blowdown occurred in the exact area where 20 years of small mammal live-trapping data already existed. This extremely rare situation offers a unique perspective on how natural disturbances such as tornadoes impact small mammal communities. We found that pre- and post-tornado (control) communities were similar (11 and 10 species, respectively), but the tornado blowdown community (7 species) differed both structurally and functionally. Glaucomys volans, Sorex cinereus, and Mustela

frenata found in pre- and post-tornado (control) communities were absent in the tornado blowdown. Interestingly, the tornado blowdown community gained a new species, Microtus pennsylvanicus, which could be the result of their dispersal to early successional conditions created by the tornado, which they occupied until succession stage changed. Pre-tornado data indicates the loss of at least two species, Neotoma magister and Sorex dispar, and a precipitous decline in Napaeozapus insignis from this tract of E deciduous forest. Trapping success statistically was the same between pre- and post-tornado (control) areas, but declined in the tornado blowdown.

4. Pre-copulatory behavior in color polymorphic tortoise beetle, Chelymorpha alternans

Sara A. Parker, Chatham University
Lynette R. Strickland, Boston University

Chelymorpha alternans, a species of neotropical tortoise beetle, is known for its distinct color and pattern polymorphisms. Previous studies have displayed random mating in C. alternans, suggesting color phenotype is not a selective trait maintaining these polymorphisms. Rather, courtship behaviors of C. alternans may have a larger bearing on female mate choice. We conducted 50 mating trials, termed triads, in which two males were sequentially placed with one female. Males were either of the same color pattern phenotype as the female (assortative pair type) or a different color pattern phenotype (disassortative pair type) and which male was presented first was randomized across trials. Each trial was recorded for a duration of 90 minutes and through video recordings we observed the frequency and duration of specific pre-copulatory behaviors, as well as transitions between these behaviors. We examined 3 phenotypes, distributed in the Eastern region of Panama: metallic, rufipennis, and militaris-a. The recessive metallic phenotype is characterized by a red pronotum and elytra with metallic gold striping and black spots. The dominant phenotype, rufipennis, is defined by solid red elytra and a black pronotum. Militaris-a, which is heterozygous, displays a red coloration with variable black striping on the elytra and pronotum. We analyzed our results using a series of chi-squared tests, and examined the significance of behavioral transitions through a Markov-Chain analysis using the rmarkovchain package in R. Of the 50 trials, 11 trials led to 19 mating events, with only two disassortative mating events, where the phenotype of the male differs from that of the female: one pairing with a rufipennis male and metallic female and another with a metallic male and militaris-a female. In only one trial did a female mate with both male beetles in the contest, and all beetles in this were of the metallic phenotype. This study will inform future endeavors investigating the impact of precopulatory behaviors and disassortative versus assortative mating on sexual selection in polymorphic populations.

5. Using passive acoustics to assess bat activity on barrier island habitats in New York

Delaney Costante, Stony Brook University
Joseph Warren, Stony Brook University

Understanding the distribution and habitat use of bats is critical to better conserve and protect these species. While many studies focus on bats in inland habitats, relatively few examine bats' presence in coastal ecosystems. Our study measured bat echolocation activity on barrier island and inland habitats on Long Island, New York. From 31 March to 17 November 2023 we deployed AudioMoth recording devices at six locations: two sites on the ocean side of barrier island dunes, two sites in the salt marsh on the bay side of the barrier island, a nearby inland wooded area, and an inland bay. Our project goal is to determine if there are site-, season-, or species-specific differences in bat habitat use in this region. We also compared how well AudioMoths detect bats by deploying them with two well-known bat listening devices: a Pettersson D500X and a Wildlife Acoustics EchoMeter. Bats were found to be present at each site, with 1-5 calls typically heard within a 2-hour monitoring period. Six of the nine bat species known to occur on Long Island were identified: big brown (Eptesicus fuscus), silver-haired (Lasionyceris

noctivagans), eastern red (Lasiurus borealis), hoary (L. cinereus), little brown (Myotis lucifugus), and tri-colored bats (Perimyotis subflavus). Of these, eastern red and hoary bats were the most widespread, with each heard at four of the six monitoring sites. The bats with the most recorded calls across all sites were the eastern red, hoary, and silver haired bats. The three different recording devices often produced a similar number of bat calls per night, but they rarely recorded the same specific bat calls. Information from this study can inform management decisions for bat populations, including federally- or state-protected ones, which use these barrier island habitats.

Session 2D

1. ARBOREAL: A new network to support undergraduate researchers investigating temperate forest canopy biodiversity

Jason Kilgore, Washington & Jefferson College
Brianna Hoffman, Washington & Jefferson College
Mark Norris, Stevenson University
Benjamin Dolan, University of Findlay
Jonathan Martin, Northland College
Erik Olson, Northland College
Douglas Robinson, Jr., Mount Saint Mary College
Andrew Tomaskovic, Andrew the Arborist, LLC

Temperate forest canopies are an understudied ecosystem and an underutilized niche for teaching biodiversity topics and ecological research methods to undergraduate biologists. Our work simultaneously investigates species diversity and resource partitioning among insects and small mammal communities within the canopy of emergent red oak (Quercus rubra) and also serves as a pedagogical tool for teaching research methods and advanced-level tree climbing. Research to understand resource partitioning was replicated at sites in northwest Ohio, southwest Pennsylvania, and central Maryland, with aerial flight-interception traps and trail cameras strategically positioned at lower, middle, and upper canopy positions of healthy oak trees in dominant canopy positions. Arthropods were sampled during the growing season over multiple weeks at each site. Initial data indicate a high frequency of individuals in the Order Coleoptera at all sites, and Diptera and Thysanoptera well represented at two of the three sites. Similar levels of Order richness were recorded across sites, with generally lower diversity at the base of the forest canopy. Simultaneously, small mammal activity was monitored with continuous photo capture. Squirrel species temporally partitioned the canopy, with little overlap in daily activity for diurnal and nocturnal species. Squirrel activity was generally higher at the mid canopy level, with southern flying squirrels the most active of small mammals throughout the canopy. Future studies will expand to additional sites, utilizing comparative analyses to deepen understanding of canopy ecology. This project not only advances scientific knowledge but also challenges students with new skills through novel research experiences.

2. Taking course-based undergraduate research experiences (CUREs) one step further: interdisciplinary team teaching

Jacob Sewall, Kutztown University of Pennsylvania
Julie Palkendo, Kutztown University of Pennsylvania
Chris Habeck, Kutztown University of Pennsylvania

Engaging in undergraduate research is recognized as a high impact, transformative practice for students. Traditional models of undergraduate research have tended to mirror graduate-level work with a few

mentored individuals working on targeted projects. This limits the reach of research as a high impact practice. The concept of course-based undergraduate research experiences (CUREs), embeds the research within the classroom framework and makes this practice available to all students. The challenge in (and out of) the classroom is that for research to be truly high impact and transformative, it must be authentic. Research must involve discovery built around a question that matters in the "real world." For Environmental Science and other system-based sciences, authentic classroom research can be difficult. System-based sciences are inherently interdisciplinary and few faculty are expert researchers across multiple disciplines. Team-taught CUREs embrace the interdisciplinary nature of systems science and increase authenticity in the classroom. Here we share our positive experiences and challenges related to two team-taught, interdisciplinary CUREs. One is focused at the introductory level and the CURE is aligned with our overarching programmatic learning outcomes and embedded in our introductory course for majors. The other CURE is embedded at the major concentration level and enrolled students participate in ongoing, evolving research with multiple faculty over their entire university career. This temporal connection is achieved by having students enroll repeatedly in the team-taught CURE lab course. In both cases, we find that the collaborative research experience is engaging for both students and faculty and allows faculty to continue to learn and pursue new research avenues while devoting significant time to teaching the next generation of system scientists.

3. You're in my personal space! How using spatial autoregression can change a model outcome

Jenny C. Kafas, The College of New Jersey

Most, if not every, measurable variable in an ecosystem is spatially autocorrelated. However, spatial autocorrelation is often ignored in plant ecology, and many analyses are done with the assumption that every measurement is independent of others. Here, I developed two piecewise structural equation models to explore how juveniles of the shrub Lindera benzoin (spicebush) in a suburban New Jersey forest are influenced by direct and indirect effects among overabundant deer, abundance and diversity of the interspecific herb layer, and earthworms. The first model used only linear regressions and the second used spatial autoregressions, resulting in a case study that highlights how the use of these two error models can produce very different models. Both the first and second models fit the data (Fisher's C = 15, df = 10, p= 0.13 and Fisher's C = 7, df = 6, p= 0.29, respectively). The first model showed negative influences of both deer and earthworms on L. benzoin proportion cover, a negative relationship between the interspecific herb layer cover (competition) and plant diversity, and a negative effect of earthworms on plant diversity. The second model, which included spatial autoregressions, found similar relationships between L. benzoin and deer, and between interspecific competition and diversity, but also showed notable differences. Earthworms completely dropped out, both a positive relationship between diversity and L. benzoin populations and a negative effect of deer on herb layer cover were uncovered, and plant diversity was not affected by any of the measured environmental variables. This second model had much greater explanatory power, with the R2 values for both L. benzoin cover and other herb layer cover having doubled. By including spatial autoregression, the second model appears more accurate than the first, and leads to a different understanding of these ecological variables and how they interact with each other.

4. Structural equation modeling examines factors influencing suburban forest indigenous plant diversity

Kaitlin Ciuba, The College of New Jersey
Janet Morrison, The College of New Jersey

Rapid urbanization is perpetuating the success of nonindigenous plant species, overabundant deer populations, and the invasion of nonindigenous earthworms. These changes can create a network of

effects in suburban forests that influence indigenous plant communities. It is of great ecological interest to examine how these factors affect suburban forests, which have become a locus of biodiversity across large regions. We proposed that deer pressure, earthworm invasion, and the success of nonindigenous plants have caused cascading effects on forest factors (e.g. soil chemistry, mycorrhizal symbionts), and have subsequently affected indigenous plant diversity. Specifically, we proposed the following components of a connected, system-wide hypothesis: (i) deer pressure, nonindigenous plant success, and earthworm activity all have direct negative effects on indigenous plant diversity (IPD); (ii) microbial community activity and soil chemistry directly affect IPD; (iii) earthworms affect soil chemistry and the microbial community, thus indirectly affecting IPD; and (iv) forest age directly affects soil chemistry and earthworm activity, which both have direct and indirect effects on IPD. We used structural equation modeling to evaluate our system-wide hypothesis, using data collected across six closed canopy forests in suburban New Jersey. The final fitted model (Fisher's C = 26.409; P = 0.551; def = 28) revealed direct negative effects of forest age and deer pressure on IPD and direct positive effects of soil pH and overall earthworm activity on IPD. Additionally, IPD was influenced indirectly by the degree of anecic species in the earthworm community. While the tested variables overall had varying effects on indigenous plant diversity, deer pressure emerged as being most responsible for the decline of indigenous plant species' success directly and indirectly, in multiple measures. In addition to building our knowledge about the functioning of 21st century forests in the urbanizing landscape, these results could inform biodiversity management in suburban forests.

5. A stochastic individual based model of Eriophorum vaginatum growth

Wesley Mahler, Wilkes University
Marcel Vaz, Wilkes University
Ned Fetcher, Wilkes University

Eriophorum vaginatum is a tussock-forming sedge that accounts for about a third of tussock tundra plant productivity. Most of its sequestered carbon is deposited in the form of a column of dead root matter extending down below the tussock. New matter is added to this root necromass yearly as the new roots made during the growing season die during senescence. To model the growth of Eriophorum, we implemented a stochastic individual based model focusing on the behavior of individual tillers. Every year, each tiller has a probability of dying based on its current leaf surface area and distance from the center of the tussock. Surviving tillers have a probability of producing a daughter tiller, weighted by its size and its distance from the center of the tussock. Overlapping tillers are moved apart, creating an outward “flow” of tillers as older tillers are pushed farther and farther away from the center of the tussock. The model was parameterized by using gradient based descent on a distribution of modeled tussock diameters and compared to a distribution of observed tussock diameters in the field. Tussock sizes initially grew rapidly, and then reached a steady state after 40-50 years. The simulations produced accurately sized tussocks in terms of tussock diameter, height above the mineral surface, and volume. Tiller survival and tillering rates exhibited negative density dependence, along with approximate hexagonal packing due to tillers pushing each other away, both of which are consistent with previously described models. The proportion of dead to alive tillers modeled is similar to previously described models, however the overall number of tillers is much lower than what is observed . The model could be extended to predict how tussocks would respond to northern migration due to climate change, or tundra carbon accumulation as the tundra continues to warm.

Session 2E

1. Data and artwork from the forest floor: connecting ways of knowing

Janet Morrison, The College of New Jersey

Researchers represent data visually to convey findings to a scientific audience, yet data figures may be inaccessible to nonscientists, and they do not convey all of the emotional meaning scientists may find in their research. Some scientists therefore collaborate with artists or make art themselves to express scientific ideas and results. I study the drivers of plant community structure in suburban forests located within my own community. My results have both deep scientific and personal meaning for me, so I extend my work to include an artistic practice tied directly to this research. I have based an artwork series on results from one of six forests in a 10-year field experiment, consisting of 32 to 40 16 m2 plots per forest, in a factorial treatment design of deer fencing/no fencing X invasive plant addition/no addition. Each year, our team used a relevé method to measure the proportion cover of each plant species in the herb layer. In one of the years in our Rosedale Park site in central New Jersey, the indigenous plant community's Shannon-Weiner Diversity Index was greater in deer-fenced plots (ANOVA: $F(1,28)=22$, $P<0.0001$) and lesser in plots with added Microstegium vimineum ($F(1,28)=15$ $P<0.001$; the interaction was not significant, with $F(1,28)=0.9$), illustrating the dramatic negative effect that overabundant deer and invasive species have on indigenous biodiversity in suburban forests. I created three quartets of images that directly translated quantitative data from Rosedale Park that were representative of the treatment combinations. I used line drawings to explore through form, watercolor paintings to explore through color, and mosaics to explore through building piece by piece. Art-making in response to biodiversity loss in my own community has deepened my appreciation of the importance of the scientific results and also may offer viewers an effective way to connect to this knowledge.

2. Merging traditional ecological knowledge with modern organic practices: a case study in participatory research

Erin Silva, University of Wisconsin-Madison

Research in plant ecology and sustainable farming advocate for increasing crop diversity on farms over monocultures. Crop diversity provides many ecosystem services, but mainstream farming relies heavily on mechanical and chemical solutions known to degrade land quality to ensure optimal yields. For centuries, Indigenous peoples in North America maintained sustainable cropping systems characterized by crop diversity and minimal inputs, such as the Three Sisters system. To integrate this knowledge into current research, we collaborated with Indigenous corn growers in Wisconsin interested in growing their traditional corn varieties with cover crops seeded between the rows. Growers are interested in knowing which cover crop mixtures synergize well with their corns while suppressing aggressive weeds. Single and mixed plantings of winter wheat, clover, and chicory/plantain were sown after corn planting while establishing a hand-weeded and weedy control. From 2021 to 2023, we found the triple mixture to lower weed biomass at the end of the season while also having the highest total relative yield, indicating cover crops in this mixture accumulated more biomass than their single plantings. No corn yield was collected in 2022, but low nutrients impacted corn yield in 2021, which was lower overall compared to the 2023 corn yield. Within 2021, weed pressure played a significant role in reducing corn yield, but the single planting of clover and winter wheat had higher yields than the control left weedy and comparable to the control with no cover crops or weeds. In 2023 all cover crop treatments and controls did not differ significantly indicating these corn varieties have a potential higher tolerance from weed or cover crop competition. Indigenous growers now have data relevant to their corn varieties and their goals to preserve their traditional food systems. The trial and error from these experiments was integral to the relationship

building between UW-Madison and our Indigenous partners, creating a shared learning environment to better understand sustainable farming practices. From this project, we have developed a framework to guide agricultural research with Indigenous communities centered on the principles of traditional Indigenous farming.

3. Integrated urban farming: synergizing solar energy, rainwater harvesting, and sustainable agriculture for enhanced resource efficiency

Nazia Nowshin, University of the District of Columbia
Jaleel Shujath, University of the District of Columbia
Medyaf Al Rousan, University of the District of Columbia
Kibria Roman, State University of New York
Hossain Azam, University of the District of Columbia

In response to escalating urbanization and population growth, our study addresses the pressing need for sustainable urban development practices that balance ecological resilience with resource demands. We propose an innovative agricultural system integrating solar energy production with rainwater harvesting, aiming to establish a sustainable synergy supporting urban and peri-urban agriculture. This system, designed to produce triple yields - food, water, and energy, incorporates solar panels and cisterns into an agricultural framework. The key objective is to evaluate the feasibility of this system in urban contexts, particularly its ability to utilize solar energy for drip irrigation and harvest rainwater from panel surfaces. Our experimental setup consists of four treatment groups across six replicated plots, varying in solar panel angles (30°, 45°, 60°), and a control group without panels. The focus crops are high-value specialty leafy greens, including arugula, collard greens, kale, mustard greens, spinach, and Swiss chard. We are currently assessing the system's overall productivity under these different conditions. Measurements include plant growth metrics, solar energy capture in kWh/m2, and rainwater collection volumes. Preliminary results are promising. They indicate superior crop growth beneath the solar panels, especially under the 30° and 45° configurations. Furthermore, the 30° panels are most efficient in solar energy and rainwater collection. This research integrates sustainable agricultural practices, water reuse, and canopy shading into solar farming. Our approach presents a novel solution to land use competition in urban areas, aligning with the increasing demand for resources. The study contributes to the field of ecology by offering an ecologically relevant model that combines renewable energy production with sustainable agriculture, thereby promoting environmental and community resilience.

4. Environmental and landscape indicators: a pathway for improved biosphere integrity assessment

Richard R. Shaker, SUNY College of Environmental Science and Forestry
Brian Mackay, Toronto Metropolitan University

Within the 2023 planetary boundaries publication it was reiterated that current measures of biosphere integrity only partially reflect humanity’s impact on Earth systems. Through policy support, societies have embraced indicators and their composite indices as tools to create benchmark initiatives, assess current conditions, and help set future development targets. Responding, a paralyzing amount of these metrics are now available for decision-makers, practitioners, and researchers to choose from causing difficulties during their applied use. Further, the number of underlying development dimensions essential for capturing all aspects of sustainability remains undetermined. In several previous macroscale sustainability analyses, hidden dimensions of development heavily favored socioeconomic themes. In response, it was suggested that landscape ecology metrics be considered as cost-effective environmental indicators. Landscape ecology metrics can freely and relatively easily be added to existing biosphere assessments at any spatial scale. To explore their potential use as biosphere integrity assessment tools, we quantitatively assessed relationships between sixteen landscape class metrics, eleven sustainable

development axes, and a mega-index of sustainable development (MISD) across 52 African nations. Results revealed that eight urban land cover class metrics, particularly urban landcover connectedness (e.g., COHESION), had positive relationships with economic dimensions of sustainability. Additionally, urban landcover connectedness and urban landscape composition were positively associated with the peaceful society dimension. Contrarily, urban configurations were negatively related to dimensions focused on human well-being, environmental sustainability, and resilience. Eight forest land cover class metrics, particularly percent forest and forest connectedness (e.g., COHESION), were positively associated with natural resource protection, environmental, and socioenvironmental aspects of sustainability. Further, as forest area grew and became more fragmented it was also positively related to economic stability. In conclusion, landscape ecology metrics, paired with other known environmental indicators, could provide a pathway for improved biosphere integrity assessment contributing to the planetary boundary paradigm.

5. Flocking by migrant and resident birds during migratory stopover

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Birds can use social information as cues for food availability, safe habitat, and other factors when choosing stopover sites during migration. One way birds acquire this social information is by flocking with other migrant and resident birds. We studied the patterns of flocking by birds during migratory stopover by combining field surveys during migratory seasons between 2003 - 2019 at several sites along the Gulf of Mexico (Alabama, Louisiana, and Mississippi), and the Mid-Atlantic (Delaware, Maryland, Virginia) coasts. Bird numbers and species were recorded along 500 m line transects and any flocks were recorded and identified. Data were analyzed using the `cooccur` and 'vis Network' package in R to understand and visualize patterns in species co-occurrence. We also ran the same analyses after grouping birds into their seasonal feeding guild, general trophic niche, and primary lifestyle. We observed 121 species (95 migrants and 32 residents), where 101 species participated in flocks. Most of them were monospecific flocks. Less than 10% of individual migrants were observed flocking and the proportion was lower in Autumn than in Spring. During spring, migrant birds were detected in flocks more frequently during afternoon compared to morning observations. We found positive associations among species within mixed-species flocks only in the Mid-Atlantic sites during Autumn. Migrant species that showed positive associations with residents were American Redstart, American Robin, Black-and-white Warbler, Black-throated Green Warbler, Hermit Thrush, Northern Parula, Ovenbird, Scarlet Tanager, and Summer Tanager. When looking at the commonalities among them, we found generalist omnivorous birds tend to flock with omnivorous residents, while specialist migrants mostly showed negative associations with specialist residents. We suggest that during migratory stopover, specialist migrants and residents avoid flocking together instead of sharing social information, which may be due to specialized resource needs unable to be gleaned from social information.

Session 2F

1. Testing for an effect of predator body size on the relative importance of consumptive versus non-consumptive effects in streams

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Alyce Segal, Trinity College
Martina Exnerova, Trinity College
Mia Ver Pault, Trinity College

Predators affect communities both by consuming prey (i.e., consumptive effects - CE) and by modifying prey traits (i.e., non-consumptive effects - NCE), including behavior. While several organismal traits have been shown to mediate relative strength of CE and NCE, the effect of predator body size is understudied. We manipulated stonefly (Acroneuria abnormis) body size and the ability to feed (via mouthpart gluing) in a CT stream and measured effects on prey abundance and size structure. We used field enclosures with mesh sides that retained stonefly predators but allowed smaller prey to emigrate as a behavioral avoidance response. Body size had no effect on the relative strength of NC and CE - top-down effects were consistent across two stonefly predator size structures with the same biomass. Stoneflies drove a ~50% reduction in total prey abundance, but this effect occurred even when stoneflies could not feed. The same was generally true when different insect prey taxa were considered separately, or mean prey size was considered as the prey community response. Our study demonstrates that stoneflies initiate a community-wide behavioral avoidance response, and this effect is predictable based on total predator biomass.

2. Exploring tree preference of Odocoileus virginianus for antler rubbing in an urban park

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Dominic Aiello, University of Pittsburgh
Anna E. Lecrone
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Marco González Santoro
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Male white-tailed deer (Odocoileus virginianus), known as bucks, use their antlers to rub tree trunks to mark their territory visually and through scent. These rubs can negatively impact tree growth and reproductive success. Previous research suggests that bucks prefer smaller-diameter trees with smoother bark and higher branches for rubbing; however, preferences in forested urban park ecosystems with native and invasive cultivated plants are understudied and underrepresented in this area of research. We hypothesized that male white-tailed deer in a city park would exhibit the same preference as bucks in previous studies, but the intensity at which trees are rubbed will be higher. We examined how tree species frequency, diameter at breast height, distance to the first branch, and bark rugosity differed between rubbed and available trees in Schenley Park in Pittsburgh, Pennsylvania. In our study, we randomly surveyed trees along one transect following a stream in the park. We found that preference did correlate with specific physical tree attributes: on average, rubbed trees had small diameters, smoother bark, and lower first branches than available trees. The frequency at which rubs occurred was not equal among tree species. Our results aligned with previous studies, except that we found rubbed trees had lower first branches than available trees. With the increase in the abundance of white-tailed deer in recent decades, the impacts of their non-trophic interactions will only be magnified especially in the areas with minimal forest availability.

3. Modeling presence and occupancy of wildlife on the Trinity Washington University campus

Patrice Nielson, Trinity Washington University

In order to learn more about the urban wildlife near Trinity Washington University in Washington, DC, we deployed 6 Browning motion-activated trail cameras on campus from June through November 2022 in two habitat types: wooded areas and open turfgrass. The main goals of this study were to learn which wildlife species can be found on campus, what habitat types were used by different wildlife species, and what factors might influence wildlife presence. Camera images were uploaded from SD cards and wildlife was identified to the species level whenever possible. Any images not containing wildlife were removed. I modeled detection probabilities and species occupancy using the R packages unmarked and MuMin. We included habitat covariates such as time of day, habitat type, camera location, and human activity levels.

We detected a total of 22 species during the study: seven mammal species and 15 bird species. The most common species detected included gray squirrels (Sciurus carolinensis), raccoons (Procyon lotor), American robins (Turdus migratorius), and European starling (Sturnus vulgaris). Less common species detected in this study include southern flying squirrel (Glaucomys volans), red-bellied woodpecker (Melanerpes carolinus), brown thrasher (Toxostoma rufum), and migratory Swainson's thrush (Catharus ustulatus). Species occupancy varied based on camera location, habitat type, and time of day. Some species were only detected at a single camera location, while others were detected at all locations. Some species were much more common in one habitat type and uncommon in the other. Species also showed clear patterns of activity during different times of day. The results of this study indicate that a variety of wildlife, including migratory species, use Trinity's campus for food and shelter and that the habitat available affects what species are likely to be found there.

4. Age structure and window-collision mortality of avian migrants in an urban greenspace

Shang Xu, Rutgers University
Claus Holzapfel, Rutgers University

Window collision is a major factor of mortality in birds in populated areas with migrating birds, especially inexperienced young birds expected to be affected. To test this prediction, we compared data from an inner-urban migratory bird stopover site located on the Rutgers-Newark Campus in Newark, NJ, and compared the age structure and fitness parameters of mist-netted passerine birds with bird specimens collected as bird-window collision fatalities. In coastal sites, most passerines at stopovers during the fall are expected to be juveniles and this study confirms this pattern for an inner-urban stopover site. This trend is particularly pronounced in the fall, while in spring, the ratio between younger, first-time returning birds, and older birds is more balanced. Slight differences were found in average fitness conditions between young and old birds. However, older birds on average were larger than younger birds by wing chord, and birds tended to be heavier and larger in spring than in the fall. When comparing the age structure between the mist-nested birds and the birds obtained in the window collision survey, we observed that the proportion of young birds is higher among birds obtained as bird-window collisions compared to birds caught in mist nets. This supports our hypothesis that overall younger birds are disproportionately more likely to collide with windows than older birds. Our data highlight the increased vulnerability of juvenile birds during stopovers in human-dominated landscapes. The higher rate of bird-window collision in younger birds likely is due to the lack of experience compared to older birds which have already completed previous seasonal migrations. However, the mechanisms behind gaining experience and the apparent higher ability of older birds to recognize and avoid glass surfaces are not yet known.

5. Does belonging to the species matter to the bacterial leaf-cutting ant community?

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Maria Morini, Mogi das Cruzes, Brazil
Odair C. Bueno, Unesp Rio Claro
Cintia Martins, UFPI
Manuela Ramalho, West Chester University

To understand the evolutionary success of different species, it is important to prioritize the understanding of host-microbe interactions. Unraveling the relationship of the host-microbe interaction is crucial to understanding the evolution of species in their respective environments. Therefore, the present study sought to 1) investigate the associated bacterial communities in four leaf-cutting ant species most frequently found in the southern Neotropics, and 2) compare whether, despite occupying the same ecological niche and being allopatric, belonging to a distinct species is enough to rely on different

bacterial communities. Using 16SrRNA amplicon (NGS), the microbiome of different species can be determined, giving headway to potential relationships between species. Leaf Cutter ants present diversity in their native Neotropical region, including four dominant species: Atta sexdens, Atta levigatta, Atta capiguara, and Atta bispheria. Our results revealed unweighted differences among all four species. With further statistical testing, the most prominent difference was found among the microbiome of the Atta laevigatta and Atta sexdens. This study intends to use bioinformatics to further analyze the relationship between the Atta laevigatta and Atta sexdens. Our results are providing an essential closer look at potential advantages and disadvantages between each respective microbiome ant species.

Poster Abstracts

1. Beneath the aftermath: exploring soil respiration in Temple's tornado-disturbed forest

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Mariana Bonfim, Temple University
Katie A. Stevenson, Temple University
Chris LeClair, Temple University
Sasha Eisenman, Temple University
Mary Cortese
Amy Freestone, Temple University

Temple University's research forest was hit by a major tornado in September 2021 as a result of Hurricane Ida. This disturbance provided a unique opportunity to understand how windstorms affect forests and their soil. Soil respiration is a vital aspect of the carbon cycle that occurs beneath the forest floor: as leaves fall, and plants die, microbes break down the organic matter, using some of the stored energy to grow and, in the process, respiring carbon dioxide to the atmosphere. While disturbances that cause treefall can impact respiration through changes in microclimate, root damage, and altered microbial activity, the sizes of these shifts are not well characterized. The project's objectives were to characterize the rates of soil respiration across a treefall gradient and quantify the influence of temperature and moisture on respiration. During the summer of 2023 and winter 2024, respiration measurements were collected using an infrared gas analyzer in 24 subplots within Temple's research forest. Levels of disturbance ranged from heavy to minimally disturbed, and we also included a reference site (an intact forest in a nearby park) that was not struck by the tornado. Soil respiration in the disturbed forest was moderately higher than in the undisturbed site. Further, higher respiration was likely due to increased soil temperature since soil was warmer at the disturbed site. In contrast, soil moisture content differed minimally. These findings suggest that, if climate change increases the number of tornadoes in our region, it could result in a higher rate of soil carbon being released into the atmosphere, exacerbating climate change.

2. Assessing the thermal tolerance of infected and uninfected Bombus impatiens to a variable thermal environment

Micah Lohr, Mount Holyoke College

In insect species such as the common eastern bumble bee, Bombus impatiens, the relationships between body size, temperature, and disease are closely intertwined. Given the significant selection pressure that the latter two of these stressors impose, it is critically important to understand how rising temperatures and increased temperature variation associated with climate change will impact species who carry out critical ecosystem services. This work assesses the ecophysiology of B. impatiens in a variable thermal environment. Specifically, I aim to compare the thermoregulation, behavior, and respiration of bumble bees when uninfected versus infected with a sublethal intestinal trypanosome, Crithidia bombi. Using a thermally controlled chamber, I measured thoracic body temperature, thermoregulatory behavior, and respiration rates in infected and uninfected B. impatiens workers from 24 to 36 ºC. I found a significant interactive effect of infection status and body size on thermoregulation such that in uninfected bees, there is a positive relationship between body size and the difference between ambient and core body temperature; however, in infected bees, there was no significant difference in thermoregulation based on size. Furthermore, the likelihood of an individual fanning– a physiological adaptation to heat stress–

increased at higher temperatures regardless of infection. Finally, I found that while there were no significant differences in respiration based on infection status, the respiration rate of infected replicates demonstrated a negative relationship with infection intensity. Obtaining this fine-scale understanding of interacting stressors will inform us of the outcomes for important pollinator species with respect to global climate change.

3. American ginseng's mating game: insights into pollination and reproductive success of an Appalachian icon

Seth Polich, West Chester University of Pennsylvania
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American ginseng uses a mixed mating system whereby fertilization occurs through selfing and outcrossing. While several insect species pollinate American ginseng, the importance of pollinators to reproductive success remains unclear, and prior research suggests pollinator limitation exists in some populations. Our goal was to clarify the extent to which pollinators control seed production in American ginseng. We asked: (1) Does the proportion of plants producing seeds differ depending on pollination method? (2) Does the number of seeds produced per plant differ depending on pollination method? (3) Does the number of seeds produced per bud differ depending on pollination method? Sixty reproductive plants were divided into four treatments (n=15) for the duration of the growing season: self-pollination only, outcrossing only, selfing + outcrossing, and control. The leaf area of each plant was calculated, and the number of berries and seeds on each plant were tallied prior to seed dispersal in late summer. Inflorescences bagged to prevent outcrossing were more likely to wilt than unbagged counterparts ($X^2 = 4.71$, $p = 0.030$). The proportion of plants producing berries did not differ among treatments ($X^2 = 2.75$, p-value = 0.432). However, treatment type influenced the mean number of seeds produced ($F = 3.98$, $p = 0.013$), with more seeds per plant in the no intervention group than the control. Plants incurring no intervention produced more seeds per bud than the control ($F = 4.65$, $p = 0.006$). A trend suggested a decrease in seeds per bud in plants capable only of self-pollination compared to plants capable of selfing+outcrossing. Stable seed production between the outcrossing, self-pollination, and no intervention treatment groups suggests that pollinator limitation is not present in this population of American ginseng. We observed a trend suggesting decreased seed production in plants capable only of self-pollination, which has not been reported in other studies.

4. Gas exchange of temperate and boreal tree seedlings under warming and drought

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Understanding tree species' responses to climate change is integral for the continued success of forest ecosystems. Boreal Forest Warming at an Ecotone in Danger (B4WarmED) is a long-term ecological experiment in Minnesota examining the effects of experimental warming, drought, and their combined effect on nine temperate and boreal tree species. This study measured photosynthetic rates of locally-adapted seedlings of all nine species, as well as sugar maple and bur oak seedlings that were relocated from more southern or northern latitudes. We found that photosynthetic rates varied between years, with all species showing significant declines in 2021 compared to 2022 or 2023. Minnesota experienced persistent moisture deficits combined with above-normal temperatures in 2021, causing a major drought. However, while the drought caused differences in rates of photosynthesis across years, the relative effects of warming and drought were consistent regardless of whether it was a wet or dry growing season. Photosynthetic rates of bur oak seedlings varied depending on the location from which they were sourced,

with seedlings from Illinois having higher photosynthetic rates than either Minnesota- or Oklahoma-sourced trees. Sugar maple seedlings also varied depending on source, with southern and central Minnesota populations photosynthesizing at higher rates compared to northern Minnesota populations. Both species responded to the warming treatment, but sugar maples showed enhanced photosynthesis in warmer plots, while rates in bur oaks declined. Sugar maples had reduced photosynthetic rates in drought conditions compared to ambient, while bur oaks were unaffected by the drought treatment. These findings suggest that common tree species will have varied responses to future climate conditions, and that the effectiveness of assisted migration from populations further south in their ranges may differ from species to species, and may depend on the distance between the home population and the new planting location.

5. Soil clay minerals trump fire and plant productivity to explain carbon distribution in a tropical savanna

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Lars Hedin, Princeton University
Corli Coetsee
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Edmund February

Savannas possess a dynamic carbon cycle, but little is known about the factors that control the exchange of carbon between the ecosystem and atmosphere. Of particular concern are soils, since the soil matrix harbors the largest pool of carbon in this biome. Moreover, soils can protect carbon from mineralization by fire or other surface disturbances. We here present an analysis of variation in soil carbon at the landscape-scale in a fire manipulation study in Kruger National Park, South Africa. Specifically, we are interested in the influence of four fundamental factors – fire frequency, dominate plant type, plant productivity, and soil mineral composition – in explaining the quantities of soil carbon that are stored in this savanna. Overall, our findings show that clay minerals contribute a surprisingly large amount of explanatory power — as much as 58% of total variance at the landscape scale. In addition, both vegetation type and potential plant productivity (as inferred by rainfall) contributed significantly to differences in soil carbon, while fire was only marginally significant. These results demonstrate that the iconic factor that characterizes savannas — fire — has a surprisingly small direct effect on soil carbon stored across the landscape. Instead, factors that either directly affect the quantity of carbon that can be stored in soils (i.e., minerals) or indirectly affect the quantity and type of carbon that enters the soil (vegetation) exert the dominant control on the soil carbon pool. We interpret these results to suggest that the soil carbon pool is largely protected from the consumptive effects of fire.

6. Non-timber forest products: a framework for sustainable management in small forest areas

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Humans benefit in numerous ways from ecosystems through cultural services, provisioning, supporting, and regulating. However, human and natural disturbances have been impacting ecosystem services. Furthermore, forest management primarily targets owners of large forest areas, overlooking the fact that most forest lands in the United States are family-owned and small (<200 acres). The goal of this project is to assess the potential for cultivating non-timber forest products (NTFP) while managing other ecosystem services such as food, wildlife habitat, and carbon storage in small forest areas. Our objectives are to evaluate the success of NTFP under different lighting conditions that were created through forest

thinning, to calculate forest carbon life-cycle, and identify impacts of forest thinning on carbon mitigation. We hypothesize that shiitake mushrooms inoculated in logs that are intermittently soaked in water will exhibit more abundant fruiting under greater canopy cover compared to logs that were not soaked, due to the higher moisture content created by the soaking and low light. Additionally, we hypothesize that shrubs and trees will have higher survival, growth rates, and food production under low and medium canopy cover compared to high canopy cover due to greater light availability. To achieve objectives, we will implement 24 plots (12 x 20m) in Penn State's Stone Valley Forest in Huntington County and Musser Gap in Centre County, Pennsylvania, USA, from Spring to Fall 2024. We will select plots across a range of light levels resulting from forest thinning. Within the plots, we will introduce six shiitake-inoculated logs, and plant 45 bare-root individuals of shrubs and tree species. Subsequently, we will measure mushroom biomass production and plant growth, survival, and food production in the following seasons. By exploring the potential of NTFP cultivation across different conditions, we can develop recommendations for sustainable forest management practices tailored to small forest areas.

7. Using deer enclosures to aid in forest understory restoration at Rider University

Ashley Murphy, Rider University
Kerrie Sendall, Rider University

Since the 1800s when eastern wolves were eradicated in the eastern U.S., deer overpopulation has been negatively affecting the growth and biodiversity of understory vegetation in forests. Since there are currently no natural predators for the white-tailed deer, they have been consuming understory vegetation at an unsustainable rate. Many native plants are favored by deer, including tree seedlings and herbaceous plants, and do not have a chance to reach maturity. For this study, a one-acre plot of Rider University's forest was enclosed with a ten-foot-tall fence in the spring of 2021. We hypothesize that, in the absence of deer, native understory seedlings and herbaceous plants will be restored along with the forest floor. We marked four transect lines within the fencing and identified all plants growing within 70cm on either side of each transect in 2021, 2022, and 2023. In summer 2023, we also established three transects outside the fencing and carried out similar plant surveys along each of them. We observed the growth of many hundreds of tree seedlings and wildflowers over the three years of measurements, including species that are not found in these forests outside the deer fencing. These include tree seedlings such as tulip poplar and pignut hickory, and wildflowers such as wood anemone, Jack-in-the-pulpit, and bloodroot. Along with this survey of native plants, we also took yearly counts of invasive plants, then removed them from the root when possible to prevent regrowth. We have seen a significant reduction in the number of invasive plants over the three-year period, and now observe fewer invasives inside the fencing than outside. We hope that this increase in plant biodiversity will positively impact other forest organisms such as amphibians, birds, and insects in the years to come.

8. Toxic interactions of glufosinate ammonium, co-formulants, and tank additives on the agrobiont wolf spider Pardosa milvina

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Glufosinate ammonium is an increasingly important herbicide in commercial agriculture; however, it may be toxic to spiders, an important non-target biocontrol predator in crop systems. Commercial formulations of glufosinate may vary in their co-formulants or "inert" ingredients and these may have synergistic or antagonistic effects on glufosinate toxicity as well as tank additives/adjuvants that are routinely added to

different herbicide brands. We measured the effects of different brands of glufosinate and their interactions with different tank additives on the mortality of the agriculturally important wolf spider, Pardosa milvina. Adult and sub-adult P. milvina were hand-collected from a field free of herbicide exposure. Spiders were individually housed in containers with topsoil substrates and sprayed once with field-relevant doses of either Liberty 280SL®, Surmise Pro®, Cheetah Pro® brand of glufosinate or a water control. Spiders were also treated with one of five common tank additives (Kinetics®, Hi-Yield®, Sil-fact®, Dyne-Amic®, and Southern Ag®) or a water control for a total of 24 treatment combinations (n=40-46, N=1024). Spiders were maintained on the treated topsoil for a total of 29 days while being fed weekly and monitored daily for mortality. All brands of glufosinate significantly increased mortality compared to water controls, but there was no mortality difference across brands. Among adjuvants, only Sil-fact® showed significantly higher mortality than control water. Different tank additives showed significant synergistic and antagonistic toxicity interactions with different brands of glufosinate indicating that both co-formulants and adjuvants are capable of mediating glufosinate toxicity among agriculturally important wolf spiders.

9. Analyzing earlywood and latewood tree ring width differences in response to precipitation and temperature in Nepal

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The monsoon season affects the climate of Nepal with rains from June to August and the dry season occurring from October to June. These temperature and precipitation patterns also influence tree growth, which can be measured by the widths of tree rings. Earlywood and latewood are two sections of a tree ring that are produced in the beginning of the growing season and end of the growing season, respectively. This study analyzes the differences between earlywood and latewood growth and how they correlate with spring temperature and precipitation. If earlywood and latewood correlate with different monthly climate variables, then the seasonal width measurements could provide even more insight into past climate in this region. Earlywood and latewood ring widths from long-lived Tsuga dumosa (Himalayan hemlock) and Abies spectabilis (Himalayan fir) samples were measured from high-resolution scans and correlated with April average precipitation and April maximum temperatures. The results show a positive relationship between both earlywood and latewood tree-ring widths and April precipitation, with the latewood correlation being slightly higher in both species. Additionally, a negative relationship was also found between both earlywood and latewood and April maximum temperatures, and both earlywood and latewood had similar correlation values. These results indicate that intra-ring seasonality is not particularly impactful for these species in this area and that earlywood and latewood growth are similarly affected by temperature and precipitation during the dry season. There are many ways this study could be further improved, including adding more samples, increasing the data selection sites, and correlating the growth between other months or seasons.

10. Chemically-mediated antipredator responses among neustonic prey of males and females of the semi-aquatic fishing spider Dolomedes triton

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The fishing spider, Dolomedes triton, deposits hydrophobic silk on water, rocks, and emergent vegetation. Silk cues, although used primarily for intraspecific communication, have the potential to alert prey to the presence of predators and mediate prey behavior. We compared activity level, space use, and predation avoidance of two neustonic prey species: the water strider Aquarius conformis and the wolf spider

Pardosa milvina in the presence or absence of Dolomedes and/or its associated silk. We measured Aquarius (n=152) and Pardosa (n=158) behaviors under four conditions: 1) containers with a live predator and its silk, 2) containers with Dolomedes silk cues only, 3) containers with Dolomedes and no silk, and 4) control containers without Dolomedes or silk. We recorded time on the water surface, emergent surfaces, and time climbing artificial vegetation across predator and silk treatments. We also measured time spent moving and attempted and successful predation among treatments containing a live Dolomedes. Pardosa and Aquarius moved significantly less when live Dolomedes were present and both prey responded stronger to female Dolomedes than males. Female Dolomedes were significantly more dangerous predators for Pardosa and Aquarius, killing more prey than males. Silk mediated few Aquarius behaviors, but predator silk did significantly induce climbing behavior and water avoidance in Pardosa. Dolomedes strike frequency toward Pardosa was significantly lower when silk was present and strike latency for Aquarius was significantly higher in the presence of predator silk. Both species show sex-specific predator avoidance behaviors but silk mediates antipredator responses differently among prey species.

11. Analysis of Rhodococcus rhodochrous by activity-based labeling in the presence of soil

Lindsey Adler
Michael Hyman

Quantification of bacteria involved in bioremediation processes is often achieved using quantitative polymerase chain reaction (qPCR) analyses that determine abundance of functional genes relevant to specific biodegradation reactions. A limitation of these approaches is they may not provide evidence that target genes are actively expressed by bacteria. Alternative methods that can detect and quantify expression levels of key catabolic enzymes relevant to biodegradation reactions include activity-based labeling (ABL) approaches. We have developed an ABL approach that targets non-specific monooxygenase enzymes that are frequently involved in the biodegradation of common organic contaminants. This method involves initial in vivo inactivation of monooxygenases by diyne probes. The resulting covalent enzyme:probe adduct is then detected in vitro using azide-containing flours attached using a copper catalyzed alkyne/azide cycloaddition (CuAAC) reaction. SDS-PAGE analyses and IR scanning are then used to detect fluorescently labeled proteins. This study has used Rhodococcus rhodochrous ATCC 21198 which grows rapidly on gaseous alkanes. Our aim has been to determine the efficiency of extraction of this bacterium from soils, as determined by changes in the level of the fluorescently-labeled 58 kDa polypeptide of short chain alkane monooxygenase (SCAM). We have explored the recovery of cells with varying extraction methods and investigated the time-dependent loss of SCAM labeling in microcosms. A combination of gas chromatography and ABL was also used to compare bacterial growth on propane in the presence and absence of soil. Our results provide background for ABL applications to quantify monooxygenase-expressing bacteria in soils and determine contaminant biodegradation rates.

12. The wolf spider Tigrosa helluo uses visual associative and beacon landmarks during water maze navigation tasks

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Matthew Persons, Susquehanna University

Wolf spiders can learn simple spatial navigation tasks. Previous studies have shown that the wolf spider Tigrosa helluo can use environmental edge features (reference frame landmarks) to learn the location of a dry target in flooded T-mazes; however, the relative importance of different types or numbers of landmark cues to spatial learning remains unknown. We used a modified open arena water maze and

recorded the ability of adult female Tigrosa helluo wolf spiders to find a target reward (a dark and dry cup) among cups that were identical to the target but flooded. We measured variation in spatial learning by measuring time to target with no landmark (control), with a beacon (a landmark that is part of the target), with an associative cue (a landmark associated with a specific navigational action), and with both a beacon and an associative cue (N=92, n=23 per landmark cue treatment). For each treatment, we tested females for five trials each on four consecutive days, with the last trial on the fourth day having an altered target location, totaling 19 training trials and one reversal trial (1,840 trials). We found that spiders took significantly less time to find the target over subsequent trials within a day and learned more quickly when landmark cues were present, but we found no difference in the type or number of landmark features in target acquisition time. After learning a target location, moving the landmark significantly increased target acquisition time in the beacon and associative cue treatment relative to other treatments. Results indicate that wolf spiders use visual beacons and associative cue landmarks alone or in combination and that performance improves across trials when landmarks are present and deteriorates more when multiple landmarks are moved.

13. Effects of color, pattern, and distance from a pond on predator attack rates on clay model frogs in Central Ohio

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Defensive coloration is a predator avoidance strategy used across many taxa and includes crypsis and aposematism. We used clay frog models to examine the effects of color (dark green vs. yellow), pattern (no pattern vs. black spots), and distance from a pond (near or far) on predator attack rates in central Ohio. We placed 20 clay frog models of each color and pattern combination at either near (< 1 m) or far (~ 4-6 m) from the pond edge (total number of models = 160). We examined the frog models weekly for evidence of predation for four weeks. Yellow frog models were less likely to be attacked than the green models. There was no difference in predator attack rates between frogs with and without spots. Frog models that were closer to the pond experienced a higher predator attack rate than those farther away. There was no interaction between color and pattern or between color and distance for predator attack rates. Our results suggest that local predators may avoid the novel yellow frog models and attack the dark green frog models that more closely resemble local frogs and that we thought would be more cryptic, possibly suggesting avoidance of an aposematic color even though no aposematic frogs are found in the area (although some salamanders are). Avoidance of yellow frogs may also reflect neophobia. Spots did not appear to affect predator attack rates, but different or more realistic patterns might. Frog models closer to the pond experienced higher predator attack rates, probably because they were in a more open habitat than the far models. In conclusion, color and location around a pond can influence predator attack rates in frogs.

14. Examining early plant community response to a novel tornado disturbance

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Forests face unprecedented threats from the increasing frequency and intensity of climate-driven disturbances, particularly in the Temperate zone. These disturbances can trigger significant changes in

community structure and composition, potentially preventing communities from returning to their original states depending on their resilience levels. Examining the early stages of recovery and seedling recruitment can enhance our understanding of how Temperate forests may respond to contemporary anthropogenic climate change scenarios. To investigate short-term recovery following an unusual disturbance event, we studied the diversity and abundance of mature trees, seedlings, and seeds of woody plants in an Old-Growth Eastern Deciduous Forest that was leveled by a tornado in 2021. Using high-resolution drone imagery, we quantified disturbance severity by assessing downed wood within the 4-ha study site. We further compared woody plant composition in disturbed areas (n=18) to nearby undisturbed old-growth forest (n=6), utilizing 20x20 meter plots. Additionally, we surveyed seedlings in five 1x1m subplots within the 20x20 plots and regularly collected seed samples from adjacent seed traps. Our results indicate a uniform expression of severity across the majority of the forest, with mature and seed populations showing similar patterns, particularly in areas with lower severity. The seedling population, however, exhibited dissimilarities and was most abundant in areas with higher severity, suggesting potential shifts in community organization following this novel disturbance. The urgency in understanding how this event affects plant communities within the mid-Atlantic region can assist future land managers and government agencies in organizing restoration efforts that may follow.

15. Algal community composition and response to disturbance in mid-order rivers

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Jessica Schedlbauer, West Chester University

Human induced environmental effects have increased the frequency of algal blooms in rivers, which significantly impair these ecosystems and are damaging to humans. To better understand algae that can cause harmful blooms, recent research has separated river algae into two communities based on their habitat: algae living in the water column or at the bed of a river. How these communities' composition differs, and how they may differentially affect ecosystem function is poorly understood. This project investigated these problems in two ways. First, the number of algal species and their relative diversity in the water column and riverbed was characterized during base flow conditions. This was accomplished using DNA analyses in three watersheds. Second, the community function of water column algae was studied at base flow and during rain events (high flow), when algae from the riverbed entered the water column. This was done in two rivers with an experiment examining rates of ecosystem productivity. Analysis of community composition revealed significant differences in species richness and relative diversity between the two algal communities, highlighting their differences at base flow. Net ecosystem productivity (NEP) did not vary significantly between base and high flow, suggesting that riverbed algae may not significantly alter ecosystem function at high flow. NEP significantly decreased from upstream to downstream locations in only one of the river watersheds. Although community composition differed between algal communities, further research is necessary to better quantify their effects on ecosystem function, as sample site-specific characteristics may have confounded the reported findings.

16. Monitoring harmful algal blooms: preliminary findings in assessing the accuracy of low-cost algal toxin detection methods at Spruce Run Reservoir, New Jersey

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Maria Scarpantonio, Raritan Valley Community College

Harmful Algal Blooms are challenging to monitor, with laboratory cell counts being costly and time-consuming, causing delays in management decision-making and safety restrictions. These blooms produce algal toxins such as microcystins that pose threats to drinking water, recreation, and the state's

economy. Given the funding and time requirements of lab testing, low-cost yet accurate detection methods accessible to citizen science and other volunteer efforts are critical to expanding cyanotoxin monitoring efforts. Raritan Valley Community College's Water Quality Laboratory has collected preliminary data to assess the accuracy of two inexpensive, semi-quantitative methods of cyanotoxin detection: the ABRAXIS microcystin test kit and the FlouroSense hand-held fluorometer. We tested these methods by aligning our sampling with the NJ Department of Environmental Protection's ongoing monitoring of Spruce Run Reservoir, enabling comparison with their quantitative cell counts and toxin concentrations using ELISA tests. We conducted biweekly sampling during the growing season and monthly sampling during the winter from 2020 through 2023. The handheld fluorometer was used to gather in-situ phycocyanin data and grab samples were collected for ABRAXIS kit microcystin concentration analysis in the laboratory. We experimented with combinations of filtration and freeze-thaw cycles to achieve cell lysis, thus improving the ABRAXIS kit's accuracy. We compared our ABRAXIS microcystin results and NJDEP's fluorometer measurements with DEP's quantitative cell counts and ELISA microcystin concentrations. While freeze-thaw and filtration cycles improved the accuracy of the ABRAXIS kit, further sampling is required for confirmation. Our preliminary findings show that fluorometer readings tend to overestimate microcystin concentrations, usually if cell counts are high and microcystin concentrations are low. The fluorometer data strays from the cell count data in both directions, suggesting areas for further investigation. Improved sampling coordination with the NJDEP, fluorometer sample lysis, and testing different fluorometer models are possible strategies to resolve these issues.

17. Instrument bias in measuring leaf gas exchange: a comparison among species and habitats

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The LI-COR Portable Photosynthesis System (LI-6800) is a widely-used instrument that provides a wealth of physiological data including light-saturated photosynthetic rates (Asat) and stomatal conductance (gs). However, data collection can be limited because measurements generally take 5-15 minutes depending on the species. The LI-COR Porometer/Fluorometer (LI-600) is designed for quick measurements that take only seconds, but does not measure Asat. Here we explore the potential of comparing gs measurements made on plants using both instruments, with the goal of using LI-600 gs values to obtain a more robust sample size of Asat estimates. As part of an ongoing experiment at Rider University, we measured Asat and gs of six species of tree seedlings to determine plant productivity. Seedlings were sourced from different latitudes (38°N and 44°N) to better understand how northern and southern populations respond to the current climate of central New Jersey (40°N). A total of 780 measurements were made with the LI-600, and a subset 214 plants were also measured with the LI-6800. Using a combination of statistical tests comparing bias and linear regression fits for the paired measurements, we estimated Asat values from the additional 566 LI-600 gs measurements. Estimated Asat values from the LI-600 data and Asat measured with the LI-6800 were statistically similar. Using this dataset of measured and estimated Asat values, we found that photosynthetic rates varied among species and in open vs. understory habitats. We also found that red oak seedlings sourced from 44°N had higher rates of Asat in the open habitat than seedlings sourced from 38°N, but no other population differences were observed. These results indicate that species- and habitat-specific differences in Asat can be detected using data estimated from rapid measurements made on the LI-600, but paired measures should be made for each species to check for bias.

18. Pollinia germination and hybridization in milkweed

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Joshua Puzey, College of William and Mary

Milkweed distributes its pollen as discrete packs (pollinia) that contain many individual pollen grains. These pollinia are carried by pollinators, primarily Bombus species, which insert them into stigmatic openings on donor plants into pools of nectar where they germinate. Initial research suggests that the concentration and composition of nectar sugars, particularly the ratio of fructose:sucrose:glucose, exhibits variation among plants, which influences pollen germination. Microbial communities contribute to the variation in sugar ratios and may further interact with nectar and pollinia during the germination process. In addition, recent studies have demonstrated that common milkweed (Asclepias syriaca) can hybridize with poke milkweed (Asclepias exaltata) in the eastern United States. Intriguingly, the genetic evidence points to a directional bias in introgression. Motivated by the relationship between microbial communities, nectar sugar composition, and pollen germination, as well as the observed patterns of biased introgression among milkweed species, this study seeks to begin to understand whether nectar microbe communities differ between distinct milkweed species and how nectar chemistry impacts cross-species pollen germination. Towards this end, we conducted a study on pollinia germination within the contact zone of common milkweed and poke milkweed within the Appalachian Mountains. These results have implications for our understanding of the impact of microbes and sugar composition in nectar on pollinia germination and hybridization in milkweed.

20. Methodology for the investigation of metabolic costs in M. genalis facultative sociality using stop-flow respirometry

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William Wcislo, Smithsonian Tropical Research Institute
Ummat Somjee, University of Texas

It has been postulated that sociality evolves when the costs of breeding independently outweigh the costs imposed by group living, something we sought to examine through measuring the resting metabolic rate (RMR) of social and solitary Megalopta genalis foundresses. While various benefits have been found for members of the facultatively social M. genalis who engage in sociality, the metabolic costs of sociality have yet to be studied. It is expected that intraspecific variation in RMR exists between M. genalis which may correlate to a foundress' decision to engage in sociality. By collecting M. genalis nests and keeping them at 25 °C in a dark incubator for at least 24 hours, RMR (V-O2 over 15-minute period) was recorded using Sable Systems Foxbox Integrated Respirometry System. Individual body size metrics were recorded such as mass and intertegular distance to account for potential variation in RMR due to body size. Additional metrics were recorded such as wing ware, amount of nest brood cells, and thorax contractions. While there was insufficient time for data gathering due to variation in Panamanian climate and hardware issues, RMR analysis of M. genalis shows promise in providing further understanding of the fitness costs and benefits of social behavior.

21. A preliminary comparison of two automated software measurement programs in the assessment of morphological differences in Gambusia affinis

Andrea Rodriguez, Texas A&M University
Marvin Lutnesky, Texas A&M University

Anthropogenic activities have caused changes to the characteristics of the water in which fishes live. These changes can influence the behavior and morphology of fishes. We are investigating the influence of turbidity on morphological characteristics in the Western Mosquitofish, Gambusia affinis. However, undertaking this study requires many measurements of fish morphology. Data can be acquired from

government agencies, but sometimes are only available in the form of photographs. Thus, we are pursuing a comparison of computerized methods for data collection for studies of G. affinis morphometrics. We collected and preserved 36 female G. affinis from (N 29o 20' 4.101" W 98o 27' 21.411") and used digital calipers (CALP) to take five body measurements (nearest 0.01 mm). We took 1x photographs of the same fish using an iPhone 14 pro and used ImageJ (IJ) and Amlite (AL) software to take the same measurements in pixels, converted to mm through calibration. Comparisons were made with paired t-tests and an alpha of 0.0033 was used for significance using a Bonferroni correction. No significant differences between the methods were found for Total Length and Head Length; IJ was significantly different from CALP for Standard Length; both IJ and AL were significantly different from CALP for Orbit; and AL and CALP were significantly different for Greatest Body Depth. Variances were only significantly different for Standard Length measurement (between both software and IJ and CALP). Preliminarily, we view the software as equally viable. For five measurements, each had two that were significantly different from CALP, but not each other. In the case of Orbit, both software underestimated the measurement, so a correction factor could be used. Understanding the reliability of automated measurement software will be important to reduce labor intensity for monitoring programs requiring assessment of morphology.

22. Effect of burning on the microbial composition of grassland soils in NE Pennsylvania

Victoria Brown, Widener University
Caroline Fortunato, Widener University

Grasslands host a wide range of biodiversity but are in decline due to overgrowth of forests, agriculture, and land development. Microbial communities of bacteria and archaea in the soil of grasslands are essential for ecosystem health, such as maintaining a healthy composition of soil for native plants to house and feed birds, insects, and mammals. This research project focuses on how burning to maintain grasslands affects microbial community diversity and composition as well as the environmental parameters of soil. Yearly soil samples were taken from Wanamie Reclamation Area, Ricketts Glen State Park, which was burned in April 2019, and Nescopeck State Park and State Game Lands 207 and 300, which were all burned in April 2022. Collected soil was analyzed to determine pH, percent organic matter, and water content. DNA was extracted from all soil samples and PCR was run to amplify the 16S rRNA gene to prepare them for amplicon sequencing. The 16S rRNA gene is used to determine diversity and composition of microbes because it is present and highly conserved in all prokaryotes. Soil samples from 2021-2023 are currently being sequenced. Soil pH results revealed each grassland site had a distinct pH, with a range of 3.9 to 7.5. Sequencing results from 2018-2020 showed a decrease in Shannon diversity as well as changes in the taxonomic composition of microbial communities at Ricketts Glen Site 1 after burning occurred in 2019. Overall, the results of this study may be used to provide insight on how effective burning is in maintaining the integrity of grasslands and can be used in conservation and rehabilitation of diminished grassland regions.

23. Cannibalism risk outweighs the effect of physical interference on water bug feeding rates

Mia Ver Pault, Trinity College
Moe Acee, Trinity College
Ben Toscano, Trinity College

Understanding the factors that determine a predator's feeding rate is an important goal in ecology. In cannibalistic species, feeding rate is likely determined both by the risk of being consumed by conspecifics as well as direct physical interference with conspecifics. However, the relative importance of these effects is unclear. We carried out an experiment to separate the effects of cannibalism risk and direct interference on the feeding rate of the giant water bug (Belostoma flumineum).This was achieved by matching a feeding individual with a caged conspecific that was incapable of feeding (cannibalism risk only) or an

uncaged conspecific that was incapable of feeding (cannibalism risk + direct interference). We hypothesized that feeding rates would decline most dramatically when feeding individuals were paired with uncaged conspecifics. We further hypothesized that a greater size difference between feeding and conspecific individuals would lower the feeding rate of feeding individuals. Counter to our hypothesis, we found that feeding rate declined in the presence of caged conspecifics, but not uncaged conspecifics. Further, the feeding rate of large water bugs, but not small water bugs, declined as the relative size of the conspecific increased. Therefore, our results show that cannibalism risk is a major driver of predator feeding rate independent of direct physical interference.

24. Burrowing crab effects on plant communities along a chronosequence of tidal marsh restoration

Kira Quitel, Drexel University
Julia Cherry, University of Alabama
Jacob Dybiec, University of Alabama
Shelby Rinehart, Drexel University

Tidal marshes provide crucial ecosystem services such as flood mitigation and habitat provisioning for diverse species. However, land use change is contributing to the loss of tidal marshes across the globe. To combat these losses, tidal marsh restoration and creation are commonly implemented practices. Yet, restoration efforts often fail to recover ecosystem services comparable to natural tidal marshes. One factor that may influence tidal marsh restoration success, and is commonly overlooked in restoration projects, is the activities (e.g. bioturbation and foraging) of burrowing crab communities. Here, we evaluated the effects of burrowing crabs on plant traits and community structure along a chronosequence of marsh restoration in the northern Gulf of Mexico. We deployed a caging experiment where we manipulated burrowing crabs (ambient/removal) at three sites that differ in age since restoration: mud flat (0 years old), young vegetation (1-6 years old), and old vegetation (6+ years old). The caging experiment ran from May - November 2023. At the end of the study, we harvested plant shoots to measure aboveground biomass, stem density, and stem height. We found that burrowing crabs decreased stem height at all sites and increased stem density in the vegetated (young and old) sites. We found no effect of burrowing crabs on total aboveground biomass at any of the sites. Our findings suggest that burrowing crabs can influence plant height and stem density in restored tidal marshes, which may affect the development of key tidal marsh ecosystem services such as sedimentation and wave attenuation.

25. Investigating the invasiveness of Pennsylvania non-native plant species versus native species after disturbance

Alyssa Tomb, Shippensburg University of Pennsylvania
Caroline Mastria, Shippensburg University of Pennsylvania
Kevin Castelluccio, Shippensburg University of Pennsylvania
Heather Sahli, Shippensburg University of Pennsylvania

This study aimed to observe native versus non-native plant dynamics after a disturbance around the Shippensburg University biology pond. By clearing plots of all vegetation in Fall 2022, we could observe the first species to grow in the spring. With many invasive species thriving after disturbance, we hypothesized a higher proportion of invasive species when data was collected in September 2023, which would suggest that letting disturbed sites grow naturally will lead to invasion. We found that the proportion of native versus invasive species was not significantly different from one another ($p = 0.47$, 0.59). The most abundant native species included Rubus enselii and Toxicodendron radicans, and the most abundant invasive species were Hedera helix and Microstegium vimineum. These results did not support our hypothesis. We suggest that future studies should observe these dynamics over a longer period to study native and invasive plant interactions further.

26. Phenotypic divergence is associated with urbanization in the common butterfly Pieris rapae

Catherine McManus, Temple University
Rachel Spigler, Temple University

Urban land cover is predicted to increase by over 1 million km2 by 2100 and is increasingly housing more of the world's biodiversity. Urbanization and habitat loss subdivide populations and impose intense selective pressures, potentially driving differentiation from nonurban populations through neutral and/or (mal) adaptive processes. In this study, we investigate patterns of phenotypic divergence in traits related to flight and pigmentation in Pieris rapae (the cabbage white butterfly). We collected over 500 adult P. rapae individuals in urban and non-urban populations across three metropolitan regions in the Eastern United States. We measured morphological traits related to flight and heat load, including forewing length and area, dry body and thorax mass, wing loading, and pigmentation. We tested whether these traits differed between urban and non-urban areas and whether they varied along a gradient of urbanization, defined quantitatively based on impervious surface cover, population density, and surface temperature data. Based on adaptive hypotheses, we predict to see shifts in wing size related to dispersal and reduced pigmentation associated with changes in heat load. We found decreased wing size, thorax mass, wing loading, and pigmentation on the discal cell, a wing spot relevant for thermoregulation, in urban areas. In nearly all cases, the magnitude of phenotypic change was predicted by impervious surface cover, population density, and summer temperature at the collection site. Although we cannot dismiss that these decreases may be a negative outcome of increased inbreeding, the direction of change is consistent with our predictions, suggesting potential adaptation to urban conditions. This study provides valuable insights into the phenotypic response of P. rapae to urbanization and paves the way for future research into the mechanisms driving population divergence following urbanization.

27. Fish community surveys at the Union City Dam of French Creek

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Union City Dam is a dry-bed reservoir impoundment in the Allegheny River watershed in northwestern Pennsylvania, managed as a flood-control facility by the U.S. Army Corps of Engineers. Situated on French Creek, one of the most biodiverse streams in the northeastern United States, it is known to be home to a wide variety of fish species. As the last USACE electrofishing survey at this site took place in 1989 and the invasive round goby Neogobius melanostomus have since entered the French Creek watershed, our understanding of the fish community at the dam needed updating. A 100-meter section of the dam outflow was surveyed by backpack electrofishing will all individuals sorted, identified, and enumerated. The survey reported 757 individuals across 32 species, with an Ohio IBI (Index of Biotic Integrity) score of 58, which falls into the Exceptional category and indicates a healthy fish community. The round goby was not detected, suggesting they have not yet expanded to the dam from the last known invasion front around 12 km downstream. The dam's position as a barrier between lower and upper reaches of French Creek make it especially important in containing the spread of this invader, whose further proliferation upstream could have negative impacts on threatened darter and mussel species. Future surveys at this site will be important for tracking the spread of the round goby, planning management and prevention actions, and documenting changes to the fish community if and when goby colonization takes place.

28. Effect of elevated growth temperature on photosynthetic rate in Phaseolus vulgaris

Mara Jansons, West Chester University
Jessica Schedlbauer, West Chester University

Human activities are leading to a rise in greenhouse gas concentrations in the atmosphere, causing global temperatures to increase and affecting plant physiological processes. Photosynthesis, within an optimal temperature range, is directly proportional to temperature, however, exceeding this range causes photosynthesis to decline. This range is determined, in part, by growth temperature. This study asked, do different growth temperatures lead to differential photosynthetic responses to measurement temperature? Phaseolus vulgaris plants were grown under ambient (21.1 /15.6°C) or elevated (26.1/20.6°C) daytime/nighttime growth temperatures, using growth chambers. Using an infrared gas analyzer, photosynthetic rate (Anet) for each treatment was measured at its own growth temperature and the other treatment's growth temperature to assess the thermal acclimation of each group's photosynthetic rate. Measured leaves were harvested for specific leaf area (SLA) determination. No difference in SLA was observed between treatments ($p > 0.05$), indicating that biochemical, rather than leaf morphological properties likely underly any treatment differences in Anet. Photosynthetic rate was significantly higher in plants grown under ambient temperature, compared to elevated temperature ($p \leq 0.05$), regardless of measurement temperature. Measurement temperature did not significantly affect Anet, and no growth by measurement temperature interaction was observed ($p > 0.05$). Although the Anet of the elevated treatment was reduced relative to the ambient treatment, these plants germinated earlier and grew more rapidly. This resulted in higher plant leaf area and fruit production within the experiment's timeframe. On a whole-plant level, lower Anet was counterbalanced by increased leaf area. Contrary to expectations, lower Anet in the elevated growth temperature treatment indicated no evidence of thermal acclimation in photosynthesis.

29. Targeting single-use plastics: determining impacts of location on trash amounts and effectiveness of bans

Adeline Brown, West Chester University
Victoria Moreira, West Chester University
Megan Fork, West Chester University

Since the early 1900's, when plastic production began, the disposal of single-use plastics has become an increasing environmental issue. Rather than ending up in designated waste areas such as landfills, large quantities of plastic litter make their way into freshwater and ocean systems. This plastic can pose a significant threat to aquatic wildlife and human health, especially when broken down into microplastics. As a result, many municipalities and states throughout the U.S., in addition to many countries across the world, have begun to implement bans and taxes on single-use plastics such as plastic film shopping bags and plastic drinking straws. The negative impacts of single-use plastics have been well-documented in ocean environments, but not as readily in freshwater environments. Our project focuses on plastic litter in nine urban streams in southeastern PA. Of these streams, three are located in watersheds where plastic bans have been active for at least one year, another three are in watersheds that have no plastic bans, and the remaining three are in watersheds that have had plastic bans established in January 2024. Trash has been collected on three separate occasions at each of the nine streams, between September 2023 and December 2023. Based on the data collected and categorized, we will share preliminary results on the effectiveness of bans in these areas and identify if any characteristics of the watersheds, such as population density and land use, help to explain differences in the amounts of trash present in streams.

30. Exploring biodiversity over a vertical gradient in two red oak trees

Shania Hyatt, Stevenson University
Mark Norris, Stevenson University

Tree canopies have been shown to provide habitat that supports substantial biodiversity and provide a multitude of resources, especially in tropical forests. However, there has been limited canopy studies done in temperate deciduous forests. This study examined two red oak trees in a temperate deciduous forest, one on the forest edge and one in the forest interior during mid-summer. Observations were made at four canopy positions: understory, lower, middle, and upper canopy, approximately 5, 10, 15, and >20m aboveground, respectively. Arthropods were collected using flight-interception traps, beat sheets, and collection of water and detritus from dendrotelms. Access of the canopy was done by stationary rope system climbing to install trail cameras at each canopy position for detecting vertebrates. Temperature loggers collected temperature data every 30 minutes at each canopy position. Results showed more than 2,500 individual arthropods in 41 different families were found from the flight interception traps, dendrotelms and beating sheets. 41% of the arthropod families were found exclusively at one canopy position. The middle canopy was found to have the highest abundance of flying squirrels, the most frequent vertebrate captured by trail camera. The tree in the forest interior had higher arthropod species richness than the tree at the forest edge. Temperature data showed a relative increase of daily average temperature from the understory to upper canopy. These different canopy positions within a single tree can be beneficial for arboreal species in the midst of climate change, as they can migrate to lower canopy positions with lower temperatures. Microhabitats at each canopy position cater to different species, supporting a breadth of biodiversity in temperate tree canopies and clearly demonstrate the significant role that these canopies play as habitat.

31. The impact of milkweed nectar microbes on the reproduction of common milkweed (Asclepias syriaca)

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Hannah Machiorlete, William & Mary
Kurt Williamson, William & Mary
Joshua Puzey, William & Mary
Harmony Dalgleish, William & Mary

While many studies have been performed on the plant-pollinator interactions of common milkweed (Asclepias syriaca), few have acknowledged the important role that microbes play in these relationships. This study focuses on how nectar microbes introduced by pollinator visitation affect reproduction success of milkweed, specifically focusing on the growth of pollen tubes in the pollination stage of plant reproduction. Since milkweed pollinia (packages of pollen grains) can only grow pollen tubes in nectar with specific sugar concentrations, nectar microbes that alter sugar concentrations have the ability to influence pollinia germination vigor. The effect of nectar microbes on pollinia germination was studied by examining the effect of excluding the pollinator vectors that introduce microbes to nectar and the effect of removing microbes by filtration. At a field site in Blandy Experimental Farm, nectar was sampled from 40 randomly selected milkweed ramets over the season. Half of these ramets were bagged to prevent pollinator access while the other half were left open. In the second experiment, six pools of nectar were collected from varying locations at Blandy and half of each pool was filtered to remove microbes. Pollinia were then allowed to germinate in nectar samples from both experiments. Pollinia germination vigor was higher in nectar from bagged ramets than un-bagged ramets and it was also higher in filtered nectar than unfiltered nectar. These results indicate that microbes have an inhibitory effect on pollinia germination.

32. Effects of reservoir morphometry on phytoplankton community dynamics during the fall transition

Michael Rose, Susquehanna University
Jack Holt, Susquehanna University

Middle Creek is a tributary of the main stem of the Susquehanna River, and its watershed is confined mostly to Snyder County, Pennsylvania. The stream's upper reaches are defined by two major branches, the North Branch, and the West Branch, each interrupted by a reservoir, Walker Lake and Faylor Lake, respectively. Despite similar discharge rates, there are significant differences in the volumes and depths of these reservoirs. Walker lake contains a volume approximately ten times greater than that of Faylor Lake, with respective volumes of 4.1x106 m3 and 0.7x106. Moreover, the mean depth of Walker Lake is 4.20m, while Faylor Lake has a mean depth of 1.24m. Although Walker Lake has a larger volume, Faylor Lake surpasses it in terms of drainage basin size, with Faylor's having nearly twice the area at 86.0 km2 compared to Walker's 45.6 km2. These variations in volume and depth have pronounced effects on the thermal dynamics of the reservoirs. Walker lake undergoes thermal stratification in early June followed by a turnover in late October. In contrast, Faylor lake does not exhibit thermal stratification, staying thermally uniform throughout the year. This study focuses on the phytoplankton community dynamics of the two reservoirs through the months of September to November in 2023. As both reservoirs cooled through the fall, Cyanobacteria dominated their respective phytoplankton communities. Then, as the surface water cooled throughout October, both communities shifted from Cyanobacteria to diatoms. However, the reservoir that never stratified showed a decline in plankton biomass while Walker, the reservoir that turned over, showed a ten-fold increase in plankton biomass.

33. Effects of water availability and simulated herbivory on extrafloral nectaries in Vicia faba

Morgan Thomas, Susquehanna University
Alissa Packer, Susquehanna University

Climate change is known to cause increases in temperature and greater fluctuations in the intensity and frequency of precipitation. Consequently, the habitat distribution of plants and animals and their resource allocation patterns are also subject to change. With plants, this may manifest as alterations to their investments in growth, reproduction, and defense, as well as shifts in plant-herbivore interactions. Anticipated changes to precipitation patterns resulting from climate change may affect plant defenses such as extrafloral nectaries (EFNs). EFNs are specialized plant glands that secrete nectar from structures other than the flowers and attract "natural enemies" to defend the plant from herbivory. To examine the effect of water availability on EFN number, nectar volume, and nectar concentration, Vicia faba (Broad Beans) were grown under high- and low-water conditions. V. faba plants in the high-water treatment grew taller and produced more leaves and EFNs than the low-water group, but there were no differences in nectar volume or concentration between groups. To explore whether water availability affects how plant defensive traits change in response to herbivory, a subset of plants grown under high- and low-water conditions were damaged. Pre-damage nectar volume and concentration were compared to that of nectar produced 48-hours post-damage. While there were no significant differences in volume or concentration in response to simulated herbivory, there was a significant change in concentration of nectar collected pre- and post-damage ($p = 0.007$). Plants in the high-water treatment had increased nectar concentration post-damage, while those in the low-water treatment had decreased nectar concentration post-damage. Studies like this demonstrate how environmental changes associated with climate change may affect not only plant defenses (e.g. EFN number), but also plant-herbivore interactions.

34. Does color morphology influence water retention in Plethodon cinereus?

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Tyler Hauk, Susquehanna University
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Resistance to water loss is essential to survival for species with permeable skin. With growing climate change, it is important to understand to what extent species can cope with reduced water availability. The lungless Eastern Red-backed salamander has two main color morphs and there is evidence that the morphs inhabit locations with different climate regimes. The lead phase is noted to occur more often in drier and warmer locations; thus, we predicted that the lead phase would lose water at a slower rate than the striped phase. Using live trials and plaster models, we quantified the rate of water loss per cm2 for individuals of different color morphs in a laboratory setting. The models did not show any significant difference in water loss between color morphs. Similarly, there was no significant difference in water loss between the living lead and striped morph salamanders. However, water loss was increased with lower humidity and for juvenile individuals. These results are contrary to our expectations and suggest that lead phase salamanders do not have an advantage over the striped phase salamanders with regards to water retention ability. Instead, other biological mechanisms are likely shaping patterns of morph abundance within populations in varying climatic conditions.

35. Burning questions in food web ecology

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Jacob O'Boyle, Wilkes University
Cally Erickson, Wilkes University
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Jeff Stratford, Wilkes University

Prescribed burning is primarily used to create habitat suitable for game species. However, the effect of burning on the larger food web is largely unknown, particularly in deciduous forests. Here, we present our preliminary findings from using carbon and nitrogen isotopes to infer trophic interactions from several burn sites. We compared these results with nearby reference sites, where burns have not occurred within several decades. We focused on omnivores (white-footed mice (Peromyscus leucopus), ants (Formicidae), spiders (Araneae) and predators (ground beetles (Carabidae), and harvestmen, (Opiliones)) that foraged in the leaf litter, which we predicted would have larger niches (more variability) and higher niche positions (more animal-based diet) in burned areas as a result of increased plant productivity. We found that only harvestment (Opiliones) were at a higher trophic position in burned areas. None of the focal species were more variable along either carbon or nitrogen axes. These results demonstrate diet conservatism in epigeal species even after the leaf litter is completely removed after a prescribed burn.

36. Assessing changing carbon pool dynamics and species composition in a Pennsylvania broadleaf forest fragment

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Temperate forests are critical carbon sinks, sequestering carbon from the atmosphere. Assessing the ability of a carbon sink to operate at optimum levels under the pressures of changing forest dynamics is critical to the maintenance of these carbon sinks over time. This study quantified aboveground carbon storage in a southeastern Pennsylvania forest fragment, known as the Gordon Natural Area (GNA), while also assessing changing species composition and its implications in future carbon sink capacity. Three 0.2

ha plots in a 100-year-old forest were censused every 5 years since 2013, most recently in 2023. Diameter at breast height was measured for live woody stems in all plots. All measured individuals were identified to species/genus and allometric equations were used to determine carbon storage. Dead wood in each plot was also measured to determine carbon storage. Live wood carbon storage did not vary significantly from 2018 to 2023 ($p > 0.05$). This is contrary to the trend observed from the 2013-2018 census interval, where a significant increase in the GNA's live tree carbon storage was documented; thus demonstrating a shift in carbon accumulation is occurring in the forest. Carbon storage in dead wood did not vary significantly from 2018 to 2023 ($p > 0.05$), a pattern consistent with the 2013-2018 census interval. Species composition analysis revealed that the stem density of many native canopy species has declined. These changes were likely driven by a combination of stressors, namely non-native invasive tree and insect species, as well as deer browsing. Monitoring trends of declining species richness is paramount to mitigating future carbon emissions from degrading sinks, as biodiversity is important in maintaining ecosystem resilience in the face of change.

37. Are single-use plastic bans effective? A preliminary look at urban streams in southeastern Pennsylvania

Victoria Moreira, West Chester University
Adeline Brown, West Chester University
Megan Fork, West Chester University

Plastic pollution is an issue of growing concern within the US and worldwide. In urban environments, plastic pollution finds its way into streams, where it can disrupt ecosystems and decrease the aesthetic value for those who live there. Rivers and streams are also known conduits for plastic to enter the ocean. One method that municipalities have used to address this concern is the enactment of targeted bans on single-use plastic items such as shopping bags, straws, and cutlery. However, the effectiveness of such bans in reducing the amount of these items in streams is still unclear. The purpose of this study is to determine if there is a difference in the amount of plastic, and specifically banned items, between sites with and without targeted plastic bans. Between September 2023 and December 2023, we collected all anthropogenic litter (trash) from within four haphazardly selected 25m² plots along the stream bank, with two plots on each side of the stream. This process took place monthly at nine stream sites in southeastern PA: three sites within municipalities with active plastic bans, three sites within municipalities with plastic bans passed in 2023 but not enacted until January 2024, and three sites within municipalities without plans of enacting plastic bans. Any trash collected was washed, dried, and cataloged. We will present preliminary results on the effectiveness of single-use plastic bans at these sites. Additionally, we will investigate whether other characteristics of the surrounding watersheds, such as impervious surface cover and proximate land use (e.g. sports fields or major roadways) contribute to the differences in amounts and diversity of trash in these urban streams.

38. Tracking the eastern expansion of the coyote (Canis latrans var.) on Long Island

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Eastern coyotes (Canis latrans var.) are currently expanding their range in New York State. There were no known breeding populations on Long Island prior to 2015. Presently there are at least eleven coyotes known to inhabit Nassau County and at least one breeding pair. Camera traps were set on the campus of SUNY Old Westbury, in eastern Nassau County, to track the expansion of coyotes on Long Island in partnership with the Long Island Coyote Monitoring Project. The SUNY OW campus is heavily wooded and could provide coyotes an attractive habitat. A single male coyote was captured on camera between

December 2021 and December 2023. At the beginning of the study period, it was observed only in the southeastern portion of campus but gradually expanded its activity into the northwestern area as well. The cameras also captured potential coyote prey and commensal species. The most numerous were white-tailed deer (Odocoileus virginianus), eastern gray squirrel (Sciurus carolinensis), eastern cottontail (Sylvilagus floridianus), northern raccoon (Procyon lotor), Virginia opossum (Didelphis virginiana), red fox (Vulpes vulpes), and feral cat (Felis catus). It is hoped that future work will elucidate the coyotes' effect on these species' populations as well as contributing to our knowledge of the genetic origins of eastern coyotes.

39. Diatom assemblages of the Ridley Creek watershed over 114 years of observations

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Diatoms are routinely used as water quality indicators in inland waters, but long-term trends in their assemblage composition in lotic environments have not been investigated. Understanding long-term shifts in diatom assemblages is however important for separating the effects of environmental conditions from biogeographic processes such as spread of invasive species or extinction of native taxa. Historical diatom data are also essential for revealing secular trends in stream water quality associated with land-use transformation and climate change. This project seeks to compare historical diatom samples to recently collected samples from the Ridley Creek (Pennsylvania) watershed, which has been periodically sampled by the diatomists from the Academy of Natural Sciences of Philadelphia since 1909. Archived mounted specimens were enumerated alongside samples collected in 2023. Our results indicate a decrease in beta-diversity in recent samples, representing a progressive homogenization of diatom flora. The modern assemblages are dominated by eutraphentic diatoms characteristic for hard-water streams and vary depending on water temperature, dissolved oxygen content and to a lesser degree on substrate or season. In the past, assemblages varied dramatically among the sites indicating either very clean water or, alternatively, a pronounced organic enrichment. The current increase of some brackish and warm-water species appears to be a trend common for most streams of the Eastern Seaboard. These findings suggest dramatic differences in habitat quality over the last 114 years and could inform local and global conservation practices.

40. Treatments for managing the invasive grass Microstegium vimineum differ in effectiveness, effort required, and regeneration of native plants over time

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Restoration of native biodiversity often requires management of invasive species. Methods for controlling invasive plants in restoration vary in cost and effectiveness, so evaluation of management techniques is needed that integrates labor and cost, effectiveness, and benefits to biodiversity. The annual grass Microstegium vimineum invades forests of the U.S. with negative impacts on native species richness, cover, and regeneration. Few studies have examined long-term effects of methods used to control this species on plant communities, and none have examined inputs of management effort over time. We compared the efficacy of chemical, mechanical, and manual methods commonly used to control Microstegium and examined their effects over time on Microstegium cover, plant community composition, and effort required. Cutting, hand pulling, and pre-emergent and post-emergent herbicides

were applied annually using a randomized block design in forest patches in southeast Pennsylvania. After two years of treatment, early results indicate that different management strategies are successful by different metrics and that effectiveness varies over time. One treatment with pre-emergent herbicide decreased Microstegium cover while increasing native cover and non-native diversity, and two treatments also increased native richness. One treatment with post-emergent herbicide decreased Microstegium cover and increased non-native diversity, and two treatments also increased native cover, richness, and diversity. One treatment by cutting increased non-native richness and diversity, and two treatments also decreased Microstegium cover and increased native richness and diversity. One treatment by pulling increased native richness and diversity, and two treatments also decreased Microstegium cover and increased native cover. In untreated control plots, after two years the Microstegium cover had decreased, but richness and diversity did not significantly change at any point. Chemical and mechanical methods were approximately four to eight times faster to implement than manual. As this long-term study progresses, we will evaluate how effects change over time.

41. Soil moisture and temperature in forest gaps across multiple eastern U.S. cities

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Urban forests are essential for mitigation of urban heat island effects and further climate shifts, yet disturbances may alter environmental conditions for plant growth. Canopy gaps are known to increase tree growth in response to increased sunlight, temperature, and soil moisture. However, patch structure and isolation of urban forests also expose edges and gaps to greater weather extremes making them more vulnerable to climatic changes. Increased disturbances in urban forests may elevate soil temperature and increase gap exposure to variable temperature and moisture regimes. Therefore, soil temperature and moisture response to gap formation may differ in urban forests compared to responses found in rural forests. The aim of this research is to investigate changes in soil temperature and moisture in urban temperate forests across varying gap size and urbanization intensities. In four Northeastern cities, soil moisture and temperature data were collected from 40 forest gaps across Baltimore, MD, Philadelphia, PA, New Haven, CT, and Springfield, MA. Soil subsurface (10-cm depth), soil surface, and air temperature along with soil moisture (10-cm depth) were collected using TMS 4-dataloggers from March 2023 through January 2024 at 15 min intervals. Soil moisture and temperature data will be correlated with gap size and % impervious surface surrounding each forest patch. Variation of soil conditions in response to urban canopy gaps can influence soil nutrient levels and tree, shrub, and herbaceous growth rates. Changes in plant growth can also influence future forest stand composition and soil C and nutrient levels. Therefore, by understanding how urban soils respond to gap size and environmental conditions surrounding the forests, we can better inform future urban forest management practices. Future directions for this research include analyzing changes in soil C, N, and C:N ratio within and between canopy gaps to determine disturbance effects on nutrient levels within urban forests.

42. Do winners lose, too? Investigating the success of Prunus serotina in a long-term deer exclosure study

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Janet Morrison, The College of New Jersey

The effects of deer overabundance on plant population structure and productivity over time differs based on site characteristics such as deer density and forage area, as well the functional traits of individuals

within the population. Due to species-level trends in functional traits related to the plant's ability to escape, defend or recover from the disturbances caused by deer, some species are expected to suffer more negative consequences than others. In this study, we attempt to understand the effects of long-term deer overabundance on the success of a population of wild black cherry (Prunus serotina) in the herbaceous layer of a suburban forest in central New Jersey. Structural equation modelling allowed us to test the hypotheses that that 1) P. serotina population size and structure differ between deer access and exclosure plots, 2) deer overabundance directly causes these changes, and 3) deer indirectly cause these changes by affecting broader plant community dynamics and nutrients that contribute to P. serotina success. The SE model indicated that deer had direct negative consequences for P. serotina by reducing its percent cover and height, but did not influence P. serotina abundance. Deer indirectly promoted P. serotina success by causing a direct increase of earthworm abundance, which in turn promoted greater total herbaceous cover, leading to a positive effect on P. serotina height. Understanding the effects of deer overabundance on P. serotina can aid land managers and forest ecologists to better prioritize conservation in suburban forests, where trees face multiple co-occurring threats.

43. Evolving partnerships: a multi-stage analysis of host-microbe dynamics in the life cycle of the spotted lanternfly (Lycorma delicatula)

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The Spotted Lanternfly (Lycorma delicatula) is a novel invasive insect native to southeast China, now established and spreading throughout the United States. The rapid spread of the Spotted Lanternfly (SLF) has been facilitated by the prevalence of its preferred host plant, the Tree of Heaven (Ailanthus altissima) as well as many other host plants. It is a voracious feeder that reduces plant food sources directly through feeding and indirectly through mold that grows on their excrement and blocks photosynthesis. In addition, the SLF's high potential to spread through human-mediated transport poses an economic challenge, threatening several areas of commerce. Current efforts to stop the spread of SLF involve the use of insecticides, harmful to both humans and a multitude of insect species, as well as the mechanical removal of host plants. To date, few studies have endeavored to tackle this issue through the perspective of host-microbe interactions, meaning there is still much to discover. This study aims to gain a deeper understanding of the abundance and composition of the bacterial community associated with this invasive insect at all stages of its development, potentially revealing environmentally safer alternatives for controlling the spread of the SLF. Our preliminary results reveal to be a crucial first step in evaluating the potential of exploring any symbiotic interactions between the SLF and its bacteria. Our understanding of these host-microbe interactions will help guide future research attempting to manage pests through symbiotic relationships.

44. The long and salty road: understanding the consequences of road salt deposition on native plant community restoration practices

Emily Conway, Michigan State University
Lars Brudvig, Michigan State University

Road networks are extensive globally. Furthermore, the environmental conditions along them are often hot, dry, and polluted which can result in an altered ecology for many species, including native plant communities. This is especially so in regions where de-icing salts are applied seasonally for winter road management. To ameliorate the detrimental effects of road pollution, restore connectivity between green spaces in urban areas, and enhance ecosystem services there has been increasing interest in roadside

restoration. However, we don't currently know how specific stressors associated with roadside environments, such as salt deposition, influence establishing plant communities during restoration. Moreover, we currently lack understanding of how different species and genotypes within species vary in their tolerance to roadside soil conditions, limiting the capacity to conduct restoration in the face of these conditions. Here, we experimentally investigated the effects of winter road salt application on the emergence and establishment of prairie plant communities. Additionally, we tested the effects of road salt concentration on both Midwest and coastally sourced genotypes of some seeded species, which we hypothesized to vary in tolerance due to adaptation to natural salt deposition for the coastal source. There were clear effects of salt deposition for plant community establishment and on the seeded prairie plant species. Although prairie plants were able to establish at all levels of salt deposition, even low levels of salt deposition had negative impacts which magnified at intermediate to high levels of salt deposition. We did not find any evidence that coastal seed sourcing mitigated these effects, and, in fact, there was at least some evidence that coastal sources performed worse. This study suggests that prairie communities, and particular prairie species which established reliably across salt treatments, are good candidates for roadside restoration. But efforts to reduce salt deposition on roadside vegetation will lead to improved outcomes.

45. Dispersal-mediated resilience to altered pH in aquatic arthropods

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While anthropogenic acidification of aquatic environments is worrisome, taxa will likely vary in their response to these alterations. Ponds can naturally differ greatly in their pH due to factors such as incoming leaf species and amounts, bedrock, and plant growth. In the laboratory, we investigated whether aquatic arthropods with high dispersal potential (damselfly larvae) were more resilient to pH alterations than those with low dispersal ability (isopods). Using pH treatments of 5, 7, and 10, we monitored survivorship over the span of one week. Surprisingly and fortunately, neither species showed much mortality to any of the pH's tested.

46. Patterns of leaf traits, herbivory, and photosynthesis in the canopies of mature red oak canopies

Elisabeth Stevens, The Bryn Mawr School
Mark Norris, Stevenson University

Leaf traits and functioning vary considerably across taxa but we know much less about the variation within individuals or what the patterns of herbivory look like, especially in mature trees. This gap in our knowledge is largely due to the difficulty in accessing the tree canopy. Here, we used arborist tree climbing skills to access the canopies of two mature red oaks (Quercus rubra), one on the forest edge and the other away from the edge, in a highly fragmented suburban forest. Leaves were collected from different canopy positions where these positions were divided both horizontally (interior of canopy vs exterior) and vertically (lower, middle, and top canopy). Leaf max photosynthesis was measured with a portable IRGA under ideal conditions (full sun) and then these leaves were measured for specific leaf area (SLA). Additional leaves were assessed for herbivory damage and characterized by damage type. Every leaf of the >600 examined had herbivory damage. The majority of leaves had 2 or 3 different types of herbivory but half of all leaves had less than 5% damage and only 11% of leaves more than 25% damaged. The most common feeding guild was leaf-mining (37% of feeding traces), then sap-sucking (32%) and leaf-chewing (23%). The tree on the forest edge had double the average rate of photosynthesis as the forest interior tree, likely reflecting acclimation to a less shaded environment. This tree

demonstrated expected patterns with increasing photosynthesis moving towards the outer canopy, whether vertically or horizontally. The forest interior tree showed the opposite pattern. There was a modest negative relationship between photosynthesis and SLA which may help explain leaf functioning. These results demonstrate considerable variation in leaf traits and function in the mature oak canopy and also that leaf herbivory is extensive but at low intensities.

47. Gene expression in eastern oak species is impacted by underlying site geology

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Climate adaptation has emerged as a priority in forest management as projected changes in climate are expected to impact forest ecosystems. Typically, climate adaptation strategies do not account for interactions with belowground environments, including nutrient availability, pH, and water availability which may impact the success of species in addition to climatic factors Previous studies have suggested that some trees accumulate more biomass on sites with higher or lower nutrient availability depending on survival and growth strategies. This experiment explores the interactions of two prevalent Pennsylvania bedrocks, sandstone and shale, with native and introduced tree species. One thousand seedlings from a mixture of five native species and four new species projected to thrive in Pennsylvania in the next 100 years were planted across four different common garden sites, two overlying sandstone and two overlying shale bedrock. We assessed seedling health survivorship and growth twice a year for three growing seasons between spring 2021 to spring 2024. In August 2021, leaf material was collected for gene expression analysis from three native oak species northern red oak (Q. rubra), , black oak (Q. velutina) and white oak (Q. alba), and one novel, future climate adapted species (southern red oak - Q. falcata) at one site overlying shale and one site overlying sandstone. A Weighed Gene Correlation Network Analysis was performed to evaluate patterns of co-expression among the most differentially expressed genes. Across the two bedrock types genes associated with regulation of cellular processes and stress responses, as well as mechanisms for regulation of ion-binding and photosynthesis in response to site-specific challenges were differentially expressed. Quantifying variation in gene expression across different species under varying geology will aid in identifying the genetic mechanisms underlying adaptation to belowground environments. Ultimately, this work will be critical to development of assisted seed transfer guidelines under climate change.

48. The role of transportation and environment in shaping the spread of spotted lanternfly invasion dynamics

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The Spotted lanternfly (Lycorma delicatula, hereafter SLF) is a newly introduced invasive species to the United States, causing devastating economic and ecological impacts in infested regions. Its spread can be facilitated by unintentional transportation via road vehicles, along with other suitable environmental factors that could contribute to its establishment in invaded ranges. Using the transportation logs of an infested area that serves as central hub for military training, Fort Indiantown Gap (FTIG) National Guard

Training Center, we modelled risk of invasion of SLF to other counties throughout North America. We hypothesized that more FTIG vehicle traffic in areas with suitable environmental conditions may increase invasion risk. Preliminary findings reveal that a significant number of convoy trips during the mobile stages of the Spotted Lanternfly (SLF) life cycle (May - December) are directed towards areas already infested or quarantined. . We further observed that most destinations are located in temperature ranges which fit the ideal conditions for SLF (10-15 ºC), serving as potential recipient regions for the invasive insect to thrive and with potential low environmental resistance. Overall, while risk of new introductions is lower, the FTIG network can contribute to sustain propagules pressure in already infested areas, making eradication cumbersome. Understanding these routes and pathways can substantially aid in containment of their invasion and provide insights in how road vehicles can serve as vectors of spotted lanternfly spread.

49. The effects of multiple stressors on green ash

Saima Mirza, The College of New Jersey
Janet Morrison, The College of New Jersey

Forest community structure in the northeastern USA is undergoing change due to overabundant deer and rapid canopy loss caused by introduced herbivores such as the emerald ash borer (EAB). These changes are apparent in forests containing juvenile and canopy ash species. Green ash (Fraxinus pennsylvanica), an abundant canopy tree in central New Jersey, is undergoing major population decline. We investigated the roles that ash canopy loss and overabundant deer play in the success or failure of green ash juveniles over a period of ten years, using data from five forests in central New Jersey, each with 32 to 40 16 m2 plots, half of which were deer-fenced in 2013. We used piecewise structural equation modeling (SEM) to test a system-wide hypothesis of how deer pressure and the abundance of canopy ash affected the change in juvenile ash, along with direct and indirect effects among the interspecific herb layer plant community, light availability, and soil compaction. The final model (Fisher's C = 13.845, df = 10, P = 0.18) indicated that the strongest predictor for change in juvenile ash abundance was abundance of canopy ashes, which all died over the course of the study. Plots in forests with more canopy ash had more juveniles and exhibited the greatest negative proportion change over time, likely connected to decreased seed rain. Although deer had no direct effect on juvenile ash change, the SEM further helped to identify both positive and negative indirect effects of deer – and the other variables. The observed patterns suggest a gradual but inevitable shift in the herb layer community. With rapid death of canopy ashes, juvenile ash numbers decline, leaving more space for other species. The predominantly negative effects of the major ecological stressor of EAB in the region will have permanent and unknown long term consequences for the future.

50. Avian foraging habits in aquaculture: insights from parasite community analysis

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The intersection between human food production and wildlife behavior has become increasingly complex in recent years, particularly with the rapid expansion of the aquaculture industry. As natural habitats are converted into aquaculture ponds, wading birds such as herons, egrets, and grebes have become frequent visitors, drawn in by abundant and readily accessible food resources. The extent to which wild birds rely on these facilities as a food source, however, remains unclear. In order to better understand the foraging habits of wild birds in aquaculture ponds, we used gastrointestinal helminthic parasite communities as a tool for analysis. This approach allows us to gain insight into the prey that birds consume over time, providing valuable information on their foraging behaviors and to what extent they rely on farmed foods. We conducted parasitological assays on 105 birds harvested from freshwater shrimp farms in Alabama

and Florida by USDA/APHIS/Wildlife Services and used morphological and molecular techniques to verify parasite taxonomy. Our results demonstrate that three species of wading birds and one pursuit diver include farmed shrimp into their diets. The use of endoparasite community analysis as a tool for revealing the time-integrated foraging behaviors of wildlife provides indisputable insights into the potential impact of aquaculture facilities on local wildlife. This study highlights the importance of understanding the complex interactions between human food production and wildlife behavior in order to minimize negative impacts on local ecosystems and promote sustainable practices.

51. Correlating social factors and species biodiversity within a historically redlined part of Philadelphia

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This project studied how the built form of a city determines biodiversity. Previous work has shown that social factors, like average annual income, impact the biodiversity of urban areas. By focusing on a specific portion of the City of Philadelphia, we investigated how the nuance of both social and ecological factors impacted biodiversity. We divided an area south of Center City, from Walnut Street to Washington Avenue, into four quadrants, split along Broad Street and South Street. These quadrants cover the extent of the historic Black neighborhood, the 7th Ward. All four quadrants were "redlined"–considered "hazardous"–in the 1937 assessment for the Homeowners' Loan Corporation. A history of redlining in urban areas has been shown to explain 21% of current gaps in biodiversity between areas classified as "hazardous" versus "best." By focusing on an area where redlining was consistent, we looked at other factors that lowered biodiversity. We hypothesized that on this local scale, factors like average annual income and amount of greenspace still correlate with species diversity. We used existing online databases like iNaturalist and OpenDataPhilly to answer these questions. There were 6,969 observations of species within our quadrants. These data were mapped, which showed differences in biodiversity existing between quadrants. Even on this small scale, we could rank quadrants according to which had the most park space and street trees, younger average building age, higher average household income, and higher average property value. These distinctions correlated with biodiversity, e.g., areas with lower average income had less park space and less biodiversity. Our hypothesis was upheld; the larger patterns of social-ecological factors were replicated on the small scale. These data can help us figure out more ways to understand the complexity of the impact of the social world on ecological function in urban areas.

52. Baseline mammal surveys before strip mine reclamation using camera traps and environmental DNA

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Traditional techniques for wildlife monitoring, such as biotic surveys and dietary analyses, rely on invasive methods that may disturb the species being studied. Noninvasive sampling through camera trapping and collection of environmental DNA (eDNA) serves as an alternative to these techniques. Each

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

53. Spatial distribution of arbuscular mycorrhizal fungi diversity and heavy metal soil concentrations as a function of urban structure in Philadelphia, PA

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To mitigate the impacts of climate change and urbanization, multifaceted solutions that are underpinned by our understanding of biodiversity patterns and ecosystem functions within cities are needed. Arbuscular mycorrhizal fungi (AMF), obligate symbionts to over 80% of plants known for their critical role in ecosystems, are promising candidates for simultaneously addressing multiple challenges borne of urbanization and human activity. However, few studies have investigated the relationship between AMF, urban structural components and organization, and heavy metals, a common environmental pollutant threatening biodiversity and potential targets for AMF-assisted remediation. In this study, we analyze the distribution of AMF and total heavy metals (THM) and bioavailable heavy metals (BHM) as a function of the urban landscape in Philadelphia, PA using the Structure of Urban Landscapes (STURLA) Classification. A random spatially stratified sampling method was used to collect a total of 75 composite soil samples, 15 samples for each of the top 5 STURLA classes equally distributed across the 5 major regions in Philadelphia. A metagenomic analysis was done using Illumina MiSeq to identify soil AMF, and bioinformatics was completed using the DADA2 pipeline. Soil THM was analyzed using an Xray fluorescence spectrometer (XRF) and BHM was analyzed using inductively coupled plasma mass spectrometry (ICPMS). We present a preliminary analysis of AMF taxonomy and diversity metrics as well as the relationship between STURLA, THM, BHM, and AMF.

54. Burrowing crabs do not affect decomposition rates along a tidal marsh chronosequence

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The degradation of wetlands worldwide is an increasing concern, mainly due to their critical role in providing essential ecosystem services. Although there have been attempts to address wetland degradation and loss by investing more in restoration projects, such endeavors often fail to restore the

biological structure and ecosystem functions to the levels observed in natural, reference wetlands. One possible reason for such failures is the limited focus on recovering abiotic conditions and dominant plant communities, while neglecting other critical factors such as burrowing animals. Therefore, we evaluated the connection between burrowing crab communities and ecosystem attributes to assess how burrowing animals may influence wetland restoration along a gradient of age since tidal wetland restoration at Greenwood Island in Pascagoula, Mississippi. We conducted a caging experiment to compare decomposition in environments with ambient and reduced crab burrow densities at three locations along a restoration chronosequence. This chronosequence included unvegetated tidal mud flats (0 years old), young (1-6 years old) vegetated, and old (≥ 6 years old) vegetated habitats. In March 2023, we buried two tea bags (rooibos and green) in the top 5cm of sediment within all cages. We removed the tea bags in November 2023 and dried them to determine the total mass loss over the study. We found that burrowing crab communities did not affect the decomposition rate of the green tea at any location (unvegetated, young vegetated, or old vegetated). However, the locations with vegetation (young and old) had lower decomposition rates than unvegetated tidal flats, possibly due to tidal flats having sandy, low organic matter sediments. Our study suggests that burrowing crabs do not affect decomposition processes; rather, age since restoration and the presence of vegetation play key roles in the development of tidal wetland decomposition.

55. Surveying salamanders' presence and absence to determine the health of local forests

Mark Norris, Stevenson University
Eve Vickery, Stevenson University

Terrestrial salamanders are one of the best indicator species when analyzing the health and biodiversity of forest habitats because they are very sensitive to adverse factors of an unhealthy environment. Due to thier abundance across the state of Maryland, Plethodon cinereus have been the target of our research in the forests of Owings Mills, MD on the campuses of Stevenson University and Irvine Nature Center. After several seasons of salamander surveys using artificial cover board transects, this study was conducted in hopes to relate forest characteristics to salamander presence and abundance in the forest. A modified version of the USFS Forest Inventory and Analysis was used to describe the forest habitat surrounding the salamander survey transects. The following variables were studied to analyze the health of the forest: Tree density, Tree basal area, Canopy cover percentage, Large coarse woody debris average, Herbaceous cover average, forest floor mass, soil organic matter and moisture percentage average. Plots 1 and 2 at Irvine are where we've discovered the highest salamander abundance. The only stand out in these two plots are Tree basal area from Irvine's plots ranged from the lowest of 149.5 m2 in plot 2 and 4, to the highest of 957.4 m2 in plot 1. Transects 1 & 2 at Irvine represent 97% of all individuals captured to date (128 of 132 salamanders). Comparatively, none of the forest traits measured appear to correspond with salamander presence, although anecdotally, we noted a positive correlation of dense shrub cover (spice bush) in plots where salamanders have been found. More research needs to be done in order to figure out why there is no conclusive results to finding P. cinereus within our research plots.

56. Defense mechanisms of bumblebees (B. griseocollis and B. impatiens) against conopid fly parasitism

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Parasitism is a prevalent and influential aspect of life, affecting the fitness and resource allocation of many living organisms. In response to this, some hosts have defense mechanisms that they can deploy to combat parasitism, including both physiological and behavioral immunity. However, each mechanism has certain reproductive trade-offs associated with it, so an organism must weigh the benefit of prolonged life

against the loss of reproductive availability. In bumble bees both physiological and behavioral defense mechanisms have been described for combating the successful development of conopid flies, a common parasitoid that frequently attacks and kills them. We asked whether bumble bee species lacking one type of defense system were more likely to use another. The North American bumble bee Bombus griseocollis frequently kills developing conopid flies by using a strong physiological response, but other species, such as Bombus impatiens, show much weaker physiological responses. The European species B. terrestris has been shown to combat conopid infections with a strong behavioral response where infected individuals often stay out of the colony at night and suppress infections through cooler nighttime temperatures. We tested whether B. impatiens, lacking a strong physiological response, was more likely to stay outside at night than B. griseocollis and in doing so could suppress conopid infections with cooler temperatures. Results revealed that B. impatiens exhibited higher levels of staying-out behavior compared to B. griseocollis. However, contrary to expectations, staying out was not correlated with conopid fly infection in either species. Furthermore, it was found in a lab experiment that cool temperatures, simulating those experienced by bees staying out at night, did not significantly reduce conopid fly development or success in either species. The study suggests that while staying-out behavior is exhibited in bumble bees it does not directly affect the success of conopid parasitism.

57. Exploring Wolbachia diversity in the global ant genus Pheidole: implications for biogeography and ecological success

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Manuela Ramalho-Sanchez, West Chester University
Kenya Lovell, West Chester University of Pennsylvania

Ants, including the genus Pheidole, often harbor a core microbiome, a stable consortium of microorganisms found across populations. Within Pheidole's core microbiome, Wolbachia is notably abundant bacteria. Given Pheidole's global distribution and hyper-diversity, it likely hosts a diverse array of microbes. Our study aims to investigate whether the diversity of Wolbachia in Pheidole is linked to the ant genus's biogeography, diet, or other ecological factors contributing to its success. We screened 150 samples of Pheidole spp. (representing 47 species) from around the world for Wolbachia using the wsp amplification gene. Of these samples, only 25 tested positives for Wolbachia using wsp gene through PCR. In our future work, we plan to further characterize these single infections using Multilocus Sequence Typing (MLST), targeting 5 genes (gatB, coxA, hcpA, ftsZ, and fbpA). Sequencing these genes will provide insights into the extent of Wolbachia diversity within this genus. This research will not only enhance our understanding of host-microbe interactions in ants but also contribute to broader ecological and evolutionary studies of symbiotic relationships in diverse ecosystems.

58. The influence of feather mite load on body condition of four songbirds

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We examined the relationship between vane-dwelling feather mites (Acariformes) and their songbird hosts at French Creek State Park, Pennsylvania in 2023. Among the twenty-six species captured, mite prevalence was 90%. Species with a capture rate of five or more showed a mite prevalence between 80 – 100%. Average mite infestation scores ranged from 2 – 19.3. On average, higher mite scores were found on the primary feathers of all species exhibiting any level of mite infestation. Four birds with the highest capture rates became the focal species; Gray Catbird (Dumatella carolinensis), Veery (Catharus fuscescens), Wood Thrush (Hylocichla mustelina) and Ovenbird (Seirus aurocapilla). These four species showed a mite prevalence between 91 - 100%. We examined whether mite load influenced the overall body condition of the bird, mass (g) / wing chord (mm). For each of these four species, there was no

significant relationship between mite load and body condition. Thus, we found no evidence that feather mites cause harm to these four hosts, which is similar to other studies on different species of songbirds.

59. Evidence for Aegopodium podagraria's complex effects on soil quality and biodiversity in Southwestern Pennsylvania

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Invasive species can have a wide range of adverse ecological effects, such as decreasing biodiversity both directly via competition and indirectly via changes to nutrient cycling. Bishop's goutweed is an herbaceous invasive plant that can be found in numerous northern and midwestern areas of the United States. In certain environments, this perennial can form pervasive patches that rapidly cover deciduous and coniferous forests. In this study, we aim to understand the impacts of goutweed, or Aegopodium podagraria, on soil composition and biodiversity in urban forested parks in Pittsburgh, Pennsylvania. We combined paired observations in areas with and without goutweed with the analysis of collected soil samples to understand the relationship between goutweed cover, native plant abundance, and soil nutrient content in our designated areas. High goutweed density decreased the availability of the essential nutrients phosphorus and potassium. Higher abundances of goutweed were also associated with dry soil. Our results allow for a further understanding of the mechanisms which allow goutweed to be such a fierce competitor, leading to improved efficacy of conservation efforts in the Appalachian area.

60. Engaging students in introductory ecology through iNaturalist

Kevin Barry, West Virginia University

In large introductory lectures it can be challenge for students to engage with ecological concepts. I utilize the citizen science app iNaturalist to require students to observe organisms from around campus, homes, and their everyday lives. In their reflections students report positively on their ability to notice and begin to identify the myriad organisms they discover. My data also show that a portion of students continue to use the app even after the semester is over. My goal is to continue challenging students to become better observers of organisms and their environments.

61. Does varying predator biomass impact non-consumptive interactions?

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Samiha Uddin, Baruch College
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King Agustin, Baruch College

Non-consumptive effects have become a major focus of research in ecology, but the overall impact of these effects on prey populations remains disputed. Although many lab studies have demonstrated trait alteration in prey populations in response to perceived risk, far fewer studies have shown the effects of predator presence on prey population dynamics. Additionally, many studies oversimplify the reality of variation in predator biomass to only the presence or absence of predator effects on prey populations. Biomass can vary both in individuals due to organism size and in a community due to changes in the number of predators. Understanding how non-consumptive effects are influenced by predator biomass is

essential to determining the impacts of these effects on prey and ecological communities. We addressed this issue through a meta-analysis. We identified studies where prey traits were measured under sublethal treatments of varying predator biomass that included a control. We assessed over 3000 papers, finding less than 200 that met these criteria. We are currently in the process of extracting data from these papers. Preliminary analysis indicates that increasing predator biomass typically negatively impacts prey growth, but increasing predator biomass may increase or decrease prey behavior due to the suite of behaviors predator presence invokes in prey. Understanding the relationship between predator biomass and prey responses may have important implications for managing or restoring natural communities.

62. Assessing impact of current management practices on female spotted lanternfly populations

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Christopher Leclair, Temple University

The Spotted Lanternfly (Lycorma delicatula), or SLF, is a rapidly spreading invasive species in the United States, causing economic and ecological damage throughout the infested regions. The SLF exhibits a strong preference for the invasive Tree-of-Heaven or TOH (Ailanthus altissima). Further exploring foraging patterns and distribution of female SLF across trees and locations is essential for future strategic management practices. To test whether SLF adult populations vary across native and nonnative trees, we conducted field observations and monitored insect collection bags (circle traps) at two infested locations. Individual trees at the Temple Ambler campus and the Fort Indiantown Gap (FIG) National Guard Training Center were selected for monitoring based on native and non-native classifications, including treated and untreated TOHs. We hypothesized that there will be a higher proportion of SLF on untreated TOH, and a lower proportion on both native trees and treated TOH. Our results indicate a higher proportion of SLF occurring at FIG and fewer individuals at Ambler. Preference for the TOH relative to native focal trees was higher at both locations, indicating that it remains a preferred food source for SLF. Finally, preliminary assessment of distributions of female and male SLF across the focal trees demonstrated a distinct concentration of female SLF on TOH on Ambler campus. After adult emergence, the TOH individuals hosted near exclusively all adult female SLF collected from the environment during the presence of adult SLF during the season. Other less commonly inhabited tree species had high proportions of males. Female SLF dispersed less discriminately at FIG, as adult female SLF were observed consistently on adjacent native trees in addition to the TOH.

63. Climate-driven disturbances alter carbon dynamics in mature temperate forests

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Forests play a significant role in the global carbon cycle, sequestering large amounts of carbon in soils and woody biomass. As the global climate continues to change, however, large-scale disturbances have increased in intensity and frequency, resulting in an increase in chronic stress and reducing the climate buffer effect of forests. To investigate the impact of a recent high-severity wind disturbance on the net carbon structure of a mature temperate forest, we used allometric equations to calculate the aboveground biomass and carbon stock of all standing and living woody stems (diameter at breast height > 1 cm) pre- and post-disturbance in 2.56 ha. Given that high severity windstorms have the potential to affect forest successional patterns, we hypothesized that wind disturbance initiated a significant shift in forest structure and composition, potentially transitioning the ecosystem from a carbon sink to a carbon source. Our

results suggest that 60% of individuals were damaged during the storm, creating an overall substantial loss of carbon stock throughout the entirety of the plot. With specific species exhibiting varying levels of resilience, those that exhibit higher resilience will become essential to ecosystem recovery and regeneration. Overall, understanding the effects of disturbances on carbon flux patterns is crucial for informing ecosystem management and predicting recovery trajectories. This research underscores the importance of mitigating climate-driven disturbances to preserve forest carbon stocks and ecosystem resilience in the face of ongoing environmental change.

64. Are native bee foraging behaviors changing in the urban ecosystem?

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Urbanization alters wild habitats, leading to concerns of possible declines. Multiple studies have assessed the potential decline of wild bees but less focus has been made on structural and behavioral changes within the urban bee community. Changes in the tendency to be collected in sweep netting vs. pan traps or changes in pan trap color preference may indicate adaptations to a changing ecosystem. Therefore, we investigated the abundance of bees found in different color pan traps and sweep nets to observe changing foraging behaviors. Sampling occurred at six different sites from 2016-2021, ranging from suburban to urban landscapes with 15,008 bees included in the analysis. Bee genera with an abundance <100 were excluded from this study along with domesticated Apis mellifera. Of the 18 different genera in this analysis, eight displayed >40% of their total abundance found in one pan trap color or sweep net (Blue: Agapostemon spp & Peponapis spp; White: Calliopsis spp & Hopilitis spp; Sweep net: Augochlora spp, Bombus spp, Hylaeus spp, & Megachile spp). Specialist bees Peponapis and Calliopsis displayed a significant effect of sample method on abundance ($p<0.05$) and demonstrated loyalty to one pan trap color, however, Peponapis was found in a pan trap color (blue) inconsistent with their established flower color preference (Cucurbita spp: yellow), but demonstrated some variability in pan trap preference. In 2016, 24% of Augochlora were caught in nets, increasing to 91% by 2021, and a similar trend occurred with three other genera (Andrena spp, Augochlorella spp, & Lasioglossum spp). Augochlora's dramatic shifted from pan traps to net capture and Peponapis' shift in variability in color preference suggests the potential for rapid behavioral adaptation of the urban wild bee community.

65. Fecal matter preservation: examining the effects on microbial composition 5-years later

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Diversity and abundance of microorganisms in an individual's gut can notably impact one's health. Antibiotic treatments can significantly lower microbial diversity in the gastrointestinal system leading to opportunistic infections such as C diff. For individuals suffering from such problems, patients can undergo treatment called fecal matter transplant using fecal matter supplied by a donor or stool bank. Fecal matter stored by stool banks may change over time, decreasing their ability to preserve microorganisms. This study analyzes fecal matter stored four different ways over 5 years to determine which treatment best preserved the original microbial community. Fecal matter samples, from dogs, were homogenized with either sterile deionized water or 0.85% NaCl. The homogenized mixtures were then partitioned for immediate DNA extraction or long-term storage. Samples for long-term storage were further partitioned for preservation with or without 25% glycerol prior to -80˚ C storage. In this study, DNA extraction will be performed after 5 years of sample storage. Extracted DNA for the four treatments (i.e., water, water & glycerol, saline, saline & glycerol) and two sample dates (fresh samples and 5yrs) were sequenced and analyzed. The Fusobacteriota, Firmicutes, and Bacteriodota were the most abundant

phyla in all fecal matter samples. Preliminary results showed the least amount of change in these three phyla when stored in water and glycerol compared to the original water samples. Contrarily, fecal matter stored with just saline preserved most similar bacteria compared to the sample with saline and glycerol. This information may be used to inform best practices for long-term storage of fecal matter.

66. Human presence does not elicit spatiotemporal responses in mammals at Hawk Mountain Sanctuary, Pennsylvania

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Disturbance from human presence can cause changes in wildlife behavior, physiology, and fitness. Wildlife in conservation areas that also serve as recreational areas for people are especially vulnerable to these disturbances. Animals may try to avoid human presence spatially, by moving to new locations, or temporally, by becoming more active at times when human activity is low. We examined spatial and temporal changes to mammal occupancy and detection probability in a park that provides both wildlife conservation and hiking trails. We placed 15 camera traps at random locations in the park and captured images from March to November 2022. We used the distances to trails and roads as covariates representing human presence, time of day (dawn, day, dusk, or night) to estimate temporal response, and distance to streams and elevation as environmental covariates that can affect occupancy. Fifteen mammal species were detected over 2,837 trap nights, with number of detections varying from 605 for white-tailed deer (Odocoileus virginiana) to 1 for striped skunks (Mephitis mephitis). Eastern chipmunks (Tamias striatus) were the only species to show potential spatial avoidance of human presence. Time of day did not affect occupancy for any species, but it did affect detection probability for most species. Detection probabilities generally aligned with each species' expected diel patterns. Our study did not show spatiotemporal avoidance of human presence, but since recreational activity in the park varies throughout the year, a multi-season approach would be warranted.

67. Seasonal variation in movements and home rang sizes of white-tailed deer (Odocoileus virginianus) in a suburban habitat

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This study investigated the space use patterns of white-tailed deer (Odocoileus virginianus) in a suburban area north of Philadelphia, Pennsylvania, USA, encompassing the Pennypack Ecological Restoration Trust (PERT) preserve. High-density radio-tracking technology (5-minute fix intervals) was employed to monitor 67 deer (30 females and 37 males). Minimum convex polygon at 90% utilization (MCP90), kernel utilization distribution areas at 80% utilization (KER80), and daily traveled distances (DTD) were calculated for 24-hour periods. Daily MCP90 exhibited no significant monthly variations in females but differed significantly across months for males. Similarly, female daily kernel sizes lacked significant monthly differences, while males displayed significant variation. Daily traveled distances differed significantly across months for both sexes, with females peaking in June and males peaking in fall-winter. The potential biological explanations for these observed sex-specific and seasonal variations in white-tailed deer territory use within a suburban habitat is discussed.

68. A metabarcoding approach to analyze the diet of the Yucatán black howler monkey from Toledo District, Belize

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The Yucatán black howler monkey (Alouatta pigra)is an endangered primate that inhabits the Yucatán regions of Mexico, northern Guatemala, and Belize. It is believed to be a keystone species in the area. In this project, we used a metabarcoding approach to describe the seasonal plant diet composition of howler monkeys from a tropical forest in Belize through the amplification and sequencing of the chloroplast rbcL gene from fecal samples collected during the winter and summer seasons. Bioinformatic analysis using data set containing reference sequences for the rbcL marker generated for the plant community surveyed in the area showed that nine plant species dominate the diet of the Howler Monkeys in both summer and winter but their abundance in the fecal samples changes between the seasons. When the data set was expanded to include all rbcL sequences present in the Genebank database system, the results were different. Most species were identified at the family level only, and included plant species which are not present in the area. This might be because multiple species in the rbcL library, especially the tropical plant species, are inaccurately assigned the same operational taxonomic unit (OTU). Thus, our data show that the rbcL marker by itself might not sufficient to accurately identify and differentiate plant species in fecal samples from areas where plant diversity is intrinsically high, such as the tropical forest of Belize.

69. Isolation and identification of soil fungi with ovicidal activity against pig parasites

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Gastrointestinal parasites are a perpetual challenge in organic pig farming because they result in low productivity and efficiency for farmers. There is an urgent need to develop an approach to prevent and manage parasites in organic pig production to protect farmers from the negative impacts associated with swine parasites. Some soil fungi can kill nematodes either by trapping them or by feeding on their eggs. Nematode-trapping fungi are not very effective against livestock parasites since they can easily be destroyed in the digestive track. Egg parasitic fungi, on the other hand, can destroy eggs present in the environment where pigs are grown, thus leading to a reduction in infection. In this project, we isolated fungi from the soil of seven organic pig farms in Pennsylvania and tested them for their ovicidal activity against two different species of common pig parasites Ascaris suum and Trichuris suis. We successfully isolated 38 fungi from the soil of these farms. When tested against pig parasites, eight of these isolates showed significant ovicidal activity in vitro. These eight fungi could be used as potential biocontrol agents in organic pig farming.

70. Comparing carbon footprints of organic and conventional farming systems in Pennsylvania

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Andrew Smith, Rodale Institute
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Agriculture is a major contributor to climate change and there is an urgent need to reduce greenhouse gas (GHG) emissions from agriculture for mitigation purposes. Regenerative organic agriculture has been

proposed as a solution with the potential for climate change mitigation, but results on the impacts of regenerative organic agriculture on GHG emissions have been few and show inconsistent results. We conducted a carbon footprint (CF) analysis comparing organic and conventional arable cropping systems at Rodale Institute's Farming Systems Trial (FST) in Pennsylvania. We used multiple models to construct CFs for three agricultural systems (two organic and one conventional) for four emissions sources: soil/fertilizer N2O and CO2; CO2 associated with fertilizer and pesticide production; CO2 emissions associated with farm operations. We also conducted sensitivity analyses on the effects of soil carbon sequestration and emissions from composting manure on CFs. Emissions per hectare in the baseline analysis were highest for conventional system (2.0 – 2.2 tonnes CO2-eq ha-1), whereas emissions were 31-40% lower in the organic manure-based system (1.2 – 1.5 tonnes CO2-eq ha-1) and 70% lower in the organic legume-based system (0.6 tonnes CO2-eq ha-1). Emissions per kg of maize in the baseline analysis were highest in the conventional system (0.3 kg CO2-eq kg-1), followed by the organic manure (0.2 kg CO2-eq kg-1) and organic legume (0.1 kg CO2-eq kg-1). Including soil carbon sequestration reduced the CF of all three systems, but was most substantial in the manure-based organic system compared to the baseline (-50 – -64%). By contrast, including CO2 emissions due to composting increased emissions for the manure-based organic system substantially (+109 – +138%). Our results imply that regenerative organic farming can help mitigate climate change depending on system boundaries. Future research should focus on conducting a full LCA of these systems and verify the results using in-situ field measurements.

71. Lehmann lovegrass (Eragrostis lehmanniana) removal and black grama (Bouteloua eriopoda) restoration in the Chihuahuan desert

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Restoration of native grasses in the North America desert southwest has become a rangeland management priority, but restoration has been challenging for numerous reasons including persistent invasive grasses and water limitations. The invasive Lehmann lovegrass (Eragrostis lehmanniana) may interfere with restoration of the important native rangeland forage grass species, black grama (Bouteloua eriopoda). Superabsorbent polymers (SAP) absorb, retain, and slowly release large amounts of water with their cross-linked structure, and when used as soil amendments, they can increase plant available soil water. To determine if B. eriopoda cover could be increased through E. lehmanniana removal and subsequent restoration practices, we tested the effects of herbicidal E. lehmanniana removal, B. eriopoda seeding, and SAP soil amendment on B. eriopoda cover over 3 years at two sites in the northern Chihuahuan Desert, New Mexico. Neither SAP soil amendment nor seeding were effective. Bouteloua eriopoda cover change was positively correlated to E. lehmanniana cover reduction. Successful removal of E. lehmanniana and resulting changes in B. eriopoda cover differed by site and land use history. Overall, results indicate that despite challenges of restoration, herbicidal removal of a dominant invasive grass may lead to increases in desired native species.

72. "Won't you be my neighbor?": An ecological and community rehabilitation project

Elizabeth Landis, Kutztown University

"Won't you be my neighbor?" This question not only holds a warm nostalgia but these five words also act as an extended hand to do better for ourselves and our environment. To convey this project of neighborly effort one must know the area of interest for rehabilitating.This project includes two connecting properties on the left and one adjacent property on the right (my own home), together this conglomerate of households provide approximately 10 acres of woods and shrub land located on either side of Hemphill street in Alburtis, PA and to the East bordering the base of the hill is Alburtis Gun Club which also

preserves habitat from impending development. In the 1830s, Hemphill, named so after the German family who settled here and cleared a vast amount of acreage of old growth forest, toiling at its stone ground for their families, now all is split up as residential land and scrubby stony woodland and bordering wetlands. I often see an abundance of wildlife in and around these grounds including service berries, oaks, hickory, salamanders, owls, hawks, turkeys, and so on.Today relatives and neighbors with deep roots to Hemphill predecessors aim to create a strong base of biodiversity by drawing in endemic species and subsequently providing a protected playground for generations to come. To fulfill this goal the land will be studied in more detail prior to disturbance, then following a biological survey we would like to actively re-vegetate the land with native trees, wild flowers and shrubs of Eastern PA all along the available 10 acres among other small habitat building projects. By utilizing human power, a tractor, local businesses, plant nurseries, and prior ecological restoration research my neighbors and I would like to combine efforts in order to elevate our community and bolster biodiversity.

73. Determining the biodiversity of heterotrophic bacterial species and overall water quality of remote and populated lake locations in eastern Pennsylvania

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Heterotrophic bacterial counts, proportional to photosynthetic bacterial counts, reflect the health and overall quality of lake ecosystems. Human population centers contribute nutrients that may shift this balance. Understanding the degree of imbalance and specific characterization of heterotrophic versus photosynthetic populations will enable water quality control professionals to predict and diagnose issues near cities. We propose to characterize microbial populations in an isolated versus populated setting to explore the factors and variations that can contribute to bacterial biodiversity. The heterotrophic bacterial diversity was determined through Eco-plating, aerobic plate counts (APCs), and fecal coliform to fecal streptococci ratios. Antibiotic resistance was also tested between lake locations on isolated bacterial species. We propose that the remote lake locations will exemplify an increase in heterotrophic bacterial diversity compared to more populated lake regions and that populated lake locations will have higher selective growth of heterotrophic bacteria.

74. Rates of distribution increase in two Asian plant species in North America over a 120-year period

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The negative impacts of invasive species are contributing to the global crisis of biodiversity loss. A preliminary step to avoid the damaging effects of invasive species on ecosystems is to understand the relative rate of spread among species in relation to their specific life history traits. Here, we used digital repositories of species occurrence to evaluate potential disparities in the distributional increase of invasive species. We attempted to understand these disparities by exploring differences in life history strategies (e.g., dispersal mode, reproductive mode) between species. For this preliminary analysis, we chose tree-of-heaven (Ailanthus altissima) and autumn olive (Elaeagnus umbellata). Within the framework of a CURE-based BCEENET-sponsored lab experience, we retrieved all occurrence data for these two species in Noth America from iDigBio (https://www.idigbio.org/) and GBIF (https://www.gbif.org/) and removed cases that lacked date of occurrence or location accuracy above 1000 meters. We used QGIS software to project the data points onto a georeferenced map. We used a concave hull tool in QGIS to calculate distribution area in 10-year increments. We used linear regression analysis to calculate log rate of distributional increase and differences in rate between the two species. Our analysis shows that tree-of-

heaven (Ailanthus altissima) and autumn olive (Elaeagnus umbellata) differ in their rate of distributional increase over a 120-year period. Tree-of-heaven increased its distribution 0.011 km2-yr ($R2 = 0.84$, $df = 11$, $p = <0.05$), whereas autumn olive increased by 0.076 km2-yr ($R2 = 0.90$, $df = 11$, $p = <0.05$). A regression analysis of the log difference in area between Autumn olive and tree-of-heaven showed that autumn olive increased significantly faster than tree-of-heaven over the last 120 years ($\beta = 0.065$, $R2 = 0.87$, $df = 11$, $p = <0.05$). We hypothesize that autumn olive spread faster than tree-of-heaven because its seeds are primarily bird dispersed whereas the seeds of tree-of-heaven are winged samaras that are primarily wind dispersed. Future work should explore the potential trends in distribution rates among plant species that differ in dispersal strategy.

75. BCEENET: Creating inclusive CUREs using digitized natural history collections

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Biological Collections in Ecology and Evolution Network (BCEENET) is a community of collections professionals, undergraduate educators, researchers, and data experts committed to increasing equity in undergraduate research experiences through Course-based Undergraduate Research Experiences (CUREs). Engaging undergraduates in research embedded in coursework has been shown to reduce barriers to participation, such as time and financial limitations. The BCEENET community has created four inclusive CUREs using digitized natural history collections data, a unique and growing resource that can help to expand opportunities for research in ecology and evolution. BCEENET CUREs have been implemented at 41 institutions, including 8 community colleges and 12 minority serving institutions in online, hybrid, and in-person formats, engaging over 3000 undergraduates in research experiences. Preliminary CURE assessment findings suggest students that participated in a BCEENET CURE gained in student outcomes related to research and science identity. In this presentation, we present preliminary assessment data on the impact of BCEENET CUREs on student science identity and belonging. We also discuss support and resources for new BCEENET CURE implementers and opportunities to collaborate in assessment activities.