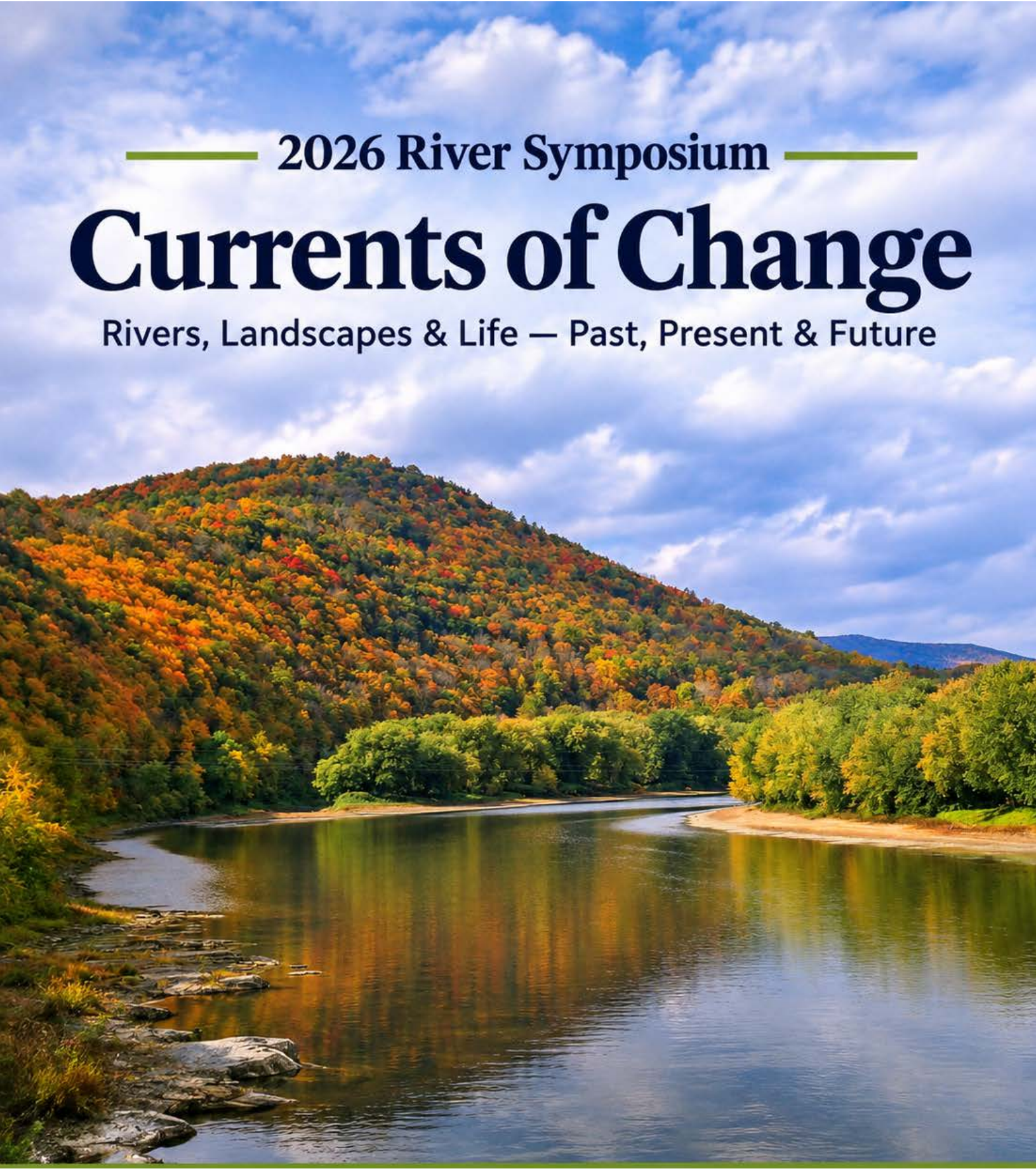
2026 River Symposium

Currents of Change

Rivers, Landscapes & Life — Past, Present & Future



November 6 & 7, 2026

Bucknell University

Program with Abstracts

www.riversymposium.scholar.bucknell.edu

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Front cover: West Branch Susquehanna River near Hyner State Park, Pennsylvania. [Photo: Benjamin Hayes].
Back cover: The Susquehanna River at Marietta, Pennsylvania. [Photo: John Beatty].
Welcome page: Pocono waterfall. [Photo: Dave Lizbinksi].

WELCOME

Welcome to the 2026 River Symposium, ***"Currents of Change—Rivers, Landscapes, and Life: Past, Present, and Future."*** This gathering brings together the public, faculty, students, scientists, engineers, consultants, watershed groups, and agency professionals to explore how rivers shape—and are shaped by—the landscapes and communities they connect.

Through keynote and plenary addresses, exhibits, and oral and poster presentations, participants will share research, exchange ideas, and discuss approaches to watershed restoration, conservation, and management. 146 unique authors represent 22 colleges and universities, 6 government agencies, and numerous conservation districts, nonprofit organizations, and research institutions from across the country.

Our goal is to encourage discovery, strengthen collaboration, and connect scientific understanding with practical stewardship. By considering rivers' past, examining present challenges, and imagining future possibilities, we hope to inspire work that sustains healthy watersheds, resilient ecosystems, and thriving communities.

All events are free and open to the public. Keynote and plenary presentations will also be streamed live via Zoom. For registration, program details, and session links, please visit:

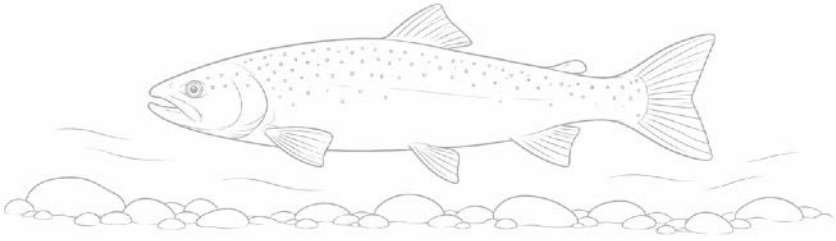
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PROGRAM WITH ABSTRACTS

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FOREWORD

Rivers connect the deep history of our landscapes with the lives and choices of the present. Over millions of years, flowing water has carved valleys, transported sediment, and shaped habitats in which life has evolved. These landscapes preserve evidence of ancient environments, changing climates, and the enduring interplay of water, rock, and life. More recently, agriculture, industry, dams, and communities have added their own legacies, altering rivers and the processes that sustain them.

This year's symposium, *"Currents of Change—Rivers, Landscapes, and Life—Past, Present, and Future,"* invites us to consider these connected histories and our responsibility for what comes next. Understanding how rivers and landscapes have evolved helps us recognize that change is fundamental to their character. Ensuring their future health requires protecting water quality, reconnecting rivers with floodplains, conserving habitats, and allowing room for natural processes as climate and land use continue to change. By bringing together science, community knowledge, and thoughtful stewardship, we can make decisions that respect the past while sustaining the ecological richness and human connections that rivers make possible. The landscapes we inherit are still evolving; the choices we make today will become part of their story.

FRIDAY, NOV. 6, 2026

KEYNOTE ADDRESS. On Friday, from 6:15 to 7:00 p.m. in the Forum (Rm. 272), **Dr. Jack Schmidt**, the Janet Quinney Lawson Chair Emeritus in Colorado River Studies, and Senior Research Scientist at Utah State University's Center for Colorado River Studies will deliver the symposium's keynote address: *"The Future of the Colorado River."* Dr. Schmidt is a 1972 graduate of Bucknell University.

RESEARCH POSTERS. From 7 to 9 p.m. in the Terrace Room (Rm. 276), 88 unique authors from 12 colleges and universities and conservation districts will present their work in 40 posters. Abstracts for all poster presentations are provided on pages 33-72.

EXHIBITS. Also from 7 to 9 p.m. in the Terrace Room (Rm. 276), will be exhibits from watershed groups, agencies, and environmental organizations. Exhibitors will be at their tables from 7 to 8:30 p.m.

EVENING SOCIAL. An evening social with deserts and refreshments will be held along with the posters and exhibits in the Terrace Room from 7 to 9 p.m.

AWARDS for Best Student Poster Presentations will be announced at 8:45 p.m. in the Terrace Room.

www.riversymposium.scholar.bucknell.edu

Above photo: Bucktail State Park Natural Area along the West Branch Susquehanna River between Lock Haven and Renovo. (Nicholas A. Tonelli, all rights reserved)

SATURDAY, NOV. 7, 2026

ON-SITE REGISTRATION AND SELF-GUIDED TOUR OF POSTERS AND EXHIBITS. The welcome desk (located at the entrance to the Terrace Room, Rm. 276) will be open at 8 a.m. on Saturday for on-site registration. Participants can pick up their name badge and symposium folder.

Coffee/tea and light breakfast snacks will be served in the Terrace Room, where you can enjoy a self-guided tour of the posters and exhibits, which will remain on display until 12 p.m.

PLENARY ADDRESSES. On Saturday, between 9:00 and 10:45 a.m., three plenary presentations will be delivered in The Forum (Rm. 272). Abstracts for each keynote and plenary presentation are provided on pages 20-25.

- **R. Craig Kochel**, Professor Emeritus of Geology at Bucknell University, will deliver a plenary address entitled "*From Bedrock to Birds: Geomorphic Inheritance and Landscape Memory of the Susquehanna.*"
- **Rick Spear**, Aquatic Biologist Supervisor in the Southwest Regional Office of the Pennsylvania Department of Environmental Protection, will deliver a plenary address entitled "*A Current of Careers, Water Quality, and Resource Protection.*"
- **Jack Hill**, Resource Manager with the Pennsylvania Department of Conservation and Natural Resources, will deliver a plenary address entitled "Improving Fish Passage and River Connectivity."

PANEL DISCUSSION. Following the plenary talks, from 11:00 a.m. to 11:30 a.m., a panel discussion, will allow the audience to interact with the plenary speakers, ask questions, and explore things in greater detail.

LUNCH. Lunch will be served from 11:30 to 1:00 p.m. in Walls Lounge (Room 213).

ORAL PRESENTATIONS. On Saturday afternoon, from 1:00 to 3:00 p.m. 63 unique authors will present their work in 18 oral presentations organized into six sessions:

- Community Engagement, and Awareness
- Flooding and River Corridor Management
- Water Quality
- Aquatic Ecology
- Restoration, Monitoring, and Mapping
- Hydrology and Stream Temperatures

A schedule of each oral presentations is provided on pages 7-9. Abstracts for all oral presentations are on pages 16-32.

WRAP-UP. From 3:00 to 3:15 pm, everyone is invited to gather in The Forum (Rm 272) to reflect upon the symposium outcomes and provide input for next year. Awards for Best Graduate Student Oral Presentations will be given first. The symposium ends at 3:15 p.m.

ACKNOWLEDGEMENTS. This symposium would not be possible without the generous support of the Office of the Provost at Bucknell University, and the Pennsylvania Water Resources Research Center at Pennsylvania State University, Dr. Jonathan Duncan, Director.

Special thanks are due the symposium committee, especially: Sean Reese, Krista Smith, Janeen Putman, Jesse Greenawalt, Jeffrey Campbell, Sid Jamieson, H. W. "Skip" Weider, Robert Wagner, and Aleece Butler.

Best wishes for a great symposium!



Benjamin R. Hayes, Ph.D., P.G.
Symposium Chair





2026 RIVER SYMPOSIUM

SCHEDULE

FRIDAY, NOVEMBER 6, 2026

THE FORUM (RM. 272) 6:00 - 6:10 p.m.

Welcome and Opening Remarks

Jonathan Duncan
Executive Director
Pennsylvania Water Resources Research Center
Executive Director, Pennsylvania Water Resources Research Center
Associate Professor, Dept. of Ecosystem Science and Management, The Pennsylvania State University

6:10 - 6:15 p.m.

Remembering Franklin Kury

Benjamin Hayes
Director, Watershed Sciences and Engineering
Ecology Center, Bucknell University

6:15 - 7:00 p.m.

KEYNOTE ADDRESS

"The Future of the Colorado River"

Jack Schmidt, Ph.D.



Zoom link: https://bucknell.zoom.us/j/91481275257?pwd=MNYNQQZB6bklEPrgLvZ2ctMNprNZbt.1

THE TERRACE ROOM (ROOM 276)

7:00 - 9:00 p.m.

Posters, Exhibits, and Evening Social

Poster presentations by students and faculty from universities and colleges throughout the central Susquehanna River region. Students will be at their posters from 7 to 8 pm. Posters will remain on display until 12 p.m. Saturday for self-guided tours. Abstracts for poster presentations are on pages 31-77

Exhibits from state and federal environmental agencies, consulting firms, watershed groups, and other organizations. Exhibitors will be at their tables from 7:00 to 8:30 pm.

Evening Social with refreshments is from 8 to 9 p.m.

Student Awards for best poster presentations will be given at 8:45 p.m.

Above photo: Delaware Water Gap. (Nicholas A. Tonelli, all rights reserved)

SATURDAY, NOVEMBER 7, 2026

8:00 a.m. - 9:00 p.m.

Registration and Self-Guided Tour of Posters and Exhibits

Terrace Room (Room 276)

9:00 - 9:10 a.m.

Welcome and Opening Remarks

ELC Forum (Room 272)

Benjamin Hayes
Symposium Chair

9:10 - 9:15 a.m.

Acknowledgements and Introductions

Benjamin Hayes
Symposium Chair

9:15 - 10:15 a.m.

Plenary Presentations

ELC Forum (Room 272)

Zoom link: https://bucknell.zoom.us/j/91481275257?pwd=MNYNQQZB6bklEPrgLvZ2ctMNprNZbt.1

9:15 - 9:45 a.m.

From Bedrock to Birds: Geomorphic Inheritance and Landscape Memory of the Susquehanna

R. Craig Kochel
Professor of Geology (Emeritus), Bucknell University

9:45 - 10:15 a.m.

Indigenous Heritage Initiative: Restoring a Cultural-Ecological Relationship with the Land

Rick Spear
Aquatic Biologist Supervisor, Pennsylvania Department of Environmental Protection

10:15 - 10: a.m.

Resilient by the River: Strengthening Flood Preparedness and Preservation in Selinsgrove Borough

Jack Hill
Resources Manager, Pennsylvania Department of Conservation and Natural Resources

10:45 - 11:00 a.m.

Intermission

11:00 - 11:30 a.m.

Panel Discussion

ELC Forum (Room 272)

"Currents of Change—Rivers, Landscapes, and Life—Past, Present, and Future"

Explore the theme of this year's symposium with the keynote and plenary speakers: **Jack Schmidt**, **Craig Kochel**, **Rick Spear**, and **Jack Hill.**

11:30 - 1:00 p.m.

Lunch

Walls Lounge (ELC Room 213)

1:00 p.m. - 2:00 p.m.

Oral Presentations 1

Session 1 — **Community Engagement, and Awareness**
ELC Forum (Room 272)

Session 2 — **Flooding and River Corridor Management**
ELC Rooms 241 A and B

Session 3 — **Water Quality**
ELC Rooms 241 C and D

2:00 p.m. - 3:00 p.m.

Oral Presentations 2

Session 4 — **Aquatic Ecology**
ELC Forum (Room 272)

Session 5 — **Restoration, Monitoring, and Mapping**
ELC Rooms 241 A and B

Session 6 — **Hydrology and Stream Temperatures**
ELC Rooms 241 C and D

3:00 - 3:30 p.m.

Wrap-Up

ELC Forum (Room 272)

3:00 - 3:10 p.m.

Graduate Student Awards for Best Oral Presentations

3:10- 3:20 p.m.

Reflection and Looking Ahead

3:30 p.m.

End of Symposium

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Sculpted bedrock pools and emergent vegetation in Susquehanna River below Holtwood Dam. [Photo by Donald Kautz, Flickr]



2026 RIVER SYMPOSIUM

ORAL SESSION SCHEDULE

Session 1

Community Engagement, and Awareness

ELC Forum (Room 272), Saturday, November 7, 1:00 p.m. - 2:00 p.m.

1:00 p.m. **People, Place, and Pro-environmental Behavior in the Pennsylvania Region of the Chesapeake Bay Watershed**
Jennie Ryan-Gisewhite*

1:20 p.m. **Prepare PA: Partners for a Resilient Pennsylvania**
Robert Nicholas*

1:40 p.m. **Heatwaves and Songbirds**
John Zaktansky*

Session 2

Flooding and River Corridor Management

ELC Rooms 241 A and B, Saturday, November 7, 2:00 p.m. - 3:00 p.m.

1:00 p.m. **Moving along, faster, with or without FEMA**
Thomas Hughes* and Cody Hoffman

1:20 p.m. **Understanding Residual Flood Risk and Adaptation in Levee Systems**
Swarnadeep Mukherjee, * Alfonso Mejia, and Cibin Raj

1:40 p.m. **Data Driven Decision Making Road Salt Management in the West Branch and Upper Susquehanna Basins**
Taryn Toner,* Kate Butzler, Camila Bogarin Cantero, and David Fedor

** denotes presenting author.*

Session 3

Water Quality

ELC Rooms 241 C and D, Saturday, November 7, 1:00 p.m. - 2:00 p.m.

1:00 p.m. **When does phytomining pay off? Crop and water-quality trade-offs of drawing down legacy phosphorus in an agricultural watershed**
Jesna Ismail,* Anthony Buda, Amy Collick, and Raj Cibin

1:20 p.m. **Bridging the Sampling Gap: Integrating Sensors, Grab Samples and Deep Learning for Regional Nitrate Management**
Ashok Jacob* and Raj Cibin

1:40 p.m. **Characterizing the Transport of Neonicotinoid Insecticides and s-triazine Herbicides in Riparian Buffers**
Henry Kibuye,* Tamie Veith, and Heather Preisendanz

Session 4

Aquatic Ecology

ELC Forum (Room 272), Saturday, November 7, 2:00 p.m. - 3:00 p.m.

2:00 p.m. **Whole-community translocation shows high survival potential of pollution-sensitive benthic macroinvertebrate taxa in restored streams.**
Ibrahim Fagbohun,* Daniel Allen, Jon Sweetman, and Bob Hildebrand

2:20 p.m. **Aridity is associated with smaller-bodied macroinvertebrate communities in U.S. streams**
Higgins, Kierstyn,*Gill, Brian, Ruhi, Albert, Atkinson, Carla, Shogren, Arial, Neeson, Thomas, Hong, Yang, Malish, Megan, Busch, Michelle, Smith, Chelsea, Mims, Meryl, Silknetter, Samuel, Apgar, Travis, Mohammadi, Rose, Gao, Shang, Emmons, Sean, Leathers, Kyle, Cook, Stephen, and Allen, Daniel

2:40 p.m. **Using remote sensing to assess the ecological condition of the Molochnyi Lyman**
Viktoriia Skyba*

Session 5

Restoration, Monitoring, and Mapping

ELC Rooms 241 A and B, Saturday, November 7, 1:00 p.m. - 2:00 p.m.

2:00 p.m. **Cost-Effectiveness of Floodplain Wetland Restoration as a Best Management Practice for Sediment and Nutrient Abatement in the Chesapeake Watershed**
Jake Lamb,* Patrick Fleming, Joe Sweeney, and Logan Lewis

2:20 p.m. **Drone-Based Visible Light, Multi-Spectral, and Thermal Imaging of Bucknell's Campus for Vegetation and Soil Water Content Monitoring**
Rob Jacob* and Mark Mulhern

2:40 p.m. **Fabridam Fish Ladder: Getting the Fish Out When the Dam Comes Down**
Daniel Ressler* and Sara Ashcraft

Session 6

Hydrology and Stream Temperatures

ELC Rooms 241 C and D, Saturday, November 7, 2:00 p.m. - 3:00 p.m.

2:00 p.m. **Spatial and Storm-Level Drivers of Thermal Surges in a Karst, Mixed Land Use Stream Network of Central Pennsylvania**
Lexie Orr,* Daniel Curtis, and Elizabeth Boyer

2:20 p.m. **Streams as Water Table Indicators: Mapping Dynamic Ecohydrologically Active Areas**
Kathy Boomer*

2:40 p.m. **After the Storm: The Importance of Post-Peak Dynamics for Watershed Nitrate Export**
Melinda Marsh,* Jonathan Duncan, and Anthony Buda

INVITED SPEAKERS

John (Jack) Schmidt



Dr. John "Jack" Schmidt '72 is the Janet Quinney Lawson Chair in Colorado River Studies, Emeritus, and Senior Research Scientist at Utah State University's Center for Colorado River Studies. A fluvial geomorphologist, he has devoted more than four decades to understanding how dams, diversions, and changing water supplies affect the Colorado River and other rivers of the American West. His research connects river processes and ecosystem health with practical approaches to restoration and water management.

Schmidt joined Utah State University's faculty in 1991. From 2011 to 2014, he served as Chief of the U.S. Geological Survey's Grand Canyon Monitoring and Research Center, the principal applied science organization supporting the Glen Canyon Dam Adaptive Management Program. His research has helped inform controlled floods designed to restore aspects of the Colorado River ecosystem in Grand Canyon. Beyond his scholarly publications, Schmidt has contributed scientific expertise to public policy and federal river-management decisions. Through the Colorado River Research Group, policy briefings, and collaboration with agencies, Tribal interests, and conservation organizations, he has helped address the challenge of balancing human water demands with the environmental, cultural, and recreational needs of rivers.

In 2009, he received the National Park Service Director's Award for Natural Resource Research for his work on large regulated rivers. He also participated in the Minute 319 Binational Partnership, recipient of the Department of the Interior's 2013 Partners in Conservation Award for work leading to an environmental pulse-flow release into the Colorado River delta in Mexico.

A Bucknell political science graduate whose interest in geology developed during his undergraduate years, Schmidt has built a career bridging river science and public policy.

Dr. Schmidt will deliver the symposium's plenary address entitled ***"The Future of the Colorado River"*** on Friday, Nov. 6, from 6:15 -7:00 p.m. in Room 272 (The Forum).

R. Craig Kochel



R. Craig Kochel is Professor Emeritus of Geology at Bucknell University, whose research explores how rivers and landscapes respond to floods, climate change, and human activities. His early research with John Moss at Franklin & Marshall College examined the geomorphic effects of the 1972 Hurricane Agnes flood in Pennsylvania's Conestoga drainage basin and his longstanding collaboration with Victor Baker helped advance paleoflood hydrology, using sedimentary and geomorphic evidence to reconstruct floods beyond the historical record.

Kochel's academic career spanned nearly four decades, with faculty appointments at the University of Virginia, SUNY Fredonia, and Southern Illinois University Carbondale before joining Bucknell in 1990, where he taught and conducted research until his retirement in 2019. His scholarship encompasses fluvial geomorphology, stream restoration, hillslope and coastal processes, geologic hazards, and planetary geology. He is co-author of Process Geomorphology, co-editor of Flood Geomorphology, and author or co-author of numerous scientific publications.

Kochel helped establish Bucknell's Environmental Center and served as its co-director, advancing interdisciplinary watershed research and field-based education in the Susquehanna River basin. His interests also connect science with environmental ethics through collaboration with Mary Evelyn Tucker and John Grim and Yale's Forum on Religion and Ecology. He served as special consultant for the Emmy Award-winning documentary Journey of the Universe and appeared in its companion educational series, Conversations. An avid astrophotography, birder and raptor enthusiast, he has served as a volunteer migration counter at Jacks Mountain Hawkwatch and taught Appalachian geology workshops at Hawk Mountain Sanctuary.

Craig will co-present a plenary address entitled ***"From Bedrock to Birds: Geomorphic Inheritance and Landscape Memory of the Susquehanna"*** on Saturday, Nov. 7, from 9:15 - 9:45 a.m. in the ELC Forum (Room 272).

Rick Spear



Rick Spear brings 30 years of experience as an Aquatic Biologist with the Pennsylvania Department of Environmental Protection (PA DEP), where he now serves as Aquatic Biologist Supervisor in the Southwest Regional Office in Pittsburgh. His career reflects a lifelong commitment to Pennsylvania's rivers, streams, and the aquatic life that depends on them.

Rick's path to environmental science began with service in the United States Navy aboard the aircraft carrier USS Coral Sea (CV-43). He went on to earn a B.S. in Marine Biology from Stockton University and briefly worked in environmental education in Virginia and South Carolina before returning to Pennsylvania. He then spent several years with the Pennsylvania Fish and Boat Commission (PFBC), advancing from Fish Culturist to Fisheries Biologist while helping develop a statewide fish index of biological integrity.

Since joining PA DEP, Rick and his team have conducted extensive stream, lake, and river sampling across western Pennsylvania — monitoring water chemistry, habitat, harmful algal blooms, bacteria, macroinvertebrates, fish, fish tissue contamination, and freshwater mussels. He has served as an expert witness for Commonwealth Court and Environmental Hearing Board cases and led a multi-year grant-funded study of the Monongahela and Allegheny rivers. Rick's team has also responded to major pollution events, including the 2009 Dunkard Creek Aquatic Life Kill and the 2023 East Palestine Train Derailment.

Rick partnered with the U.S. Fish and Wildlife Service from 2016 to 2025 to raise and stock freshwater mussels in PA waters, and he currently leads a three-year study with the Western Pennsylvania Conservancy evaluating mussel stocking and relocation success.

Rick is President of the PA Biological Survey Mollusk Technical Committee, and a member of the PA Biological Survey Fish Technical Committee. He holds Society for Freshwater Science certifications in EPT taxa and PA fish taxonomy, is an American Fisheries Society Certified Fisheries Professional, and a Freshwater Mollusk Conservation Society Certified Malacologist.

Rick will present a plenary address entitled ***"A Current of Careers, Water Quality, and Resource Protection "*** on Saturday, Nov. 7, from 9:45 - 10:15 a.m. in the ELC Forum (Room 272).

Jack Hill

Jack Hill is Resource Manager with the Department of Conservation and Natural Resources, where he leads wetland, stream, and floodplain restoration in Pennsylvania's 125 state parks.

Jack's passion is forging diverse partnerships that improve aquatic resources and strengthen connections between people and nature.

His successful projects range from localized habitat enhancement to multi-million-dollar river corridor restoration. Prior to DCNR, Jack served as a biologist with the Department of Environmental Protection's regulatory and dam safety programs.

He's worked extensively with migratory fish passage on the Susquehanna River and began his career with the US National Park Service, studying and restoring native brook trout populations in the Southern Appalachian Mountains. In his free time, Jack is an avid whitewater kayaker and ice hockey goaltender.



Jack will present a plenary address describing efforts underway by the Department of Conservation and Natural Resources toward ***"Improving Fish Passage and River Connectivity"*** on Saturday, Nov. 7, from 10:15 -10:45 a.m. in the ELC Forum (Room 272).

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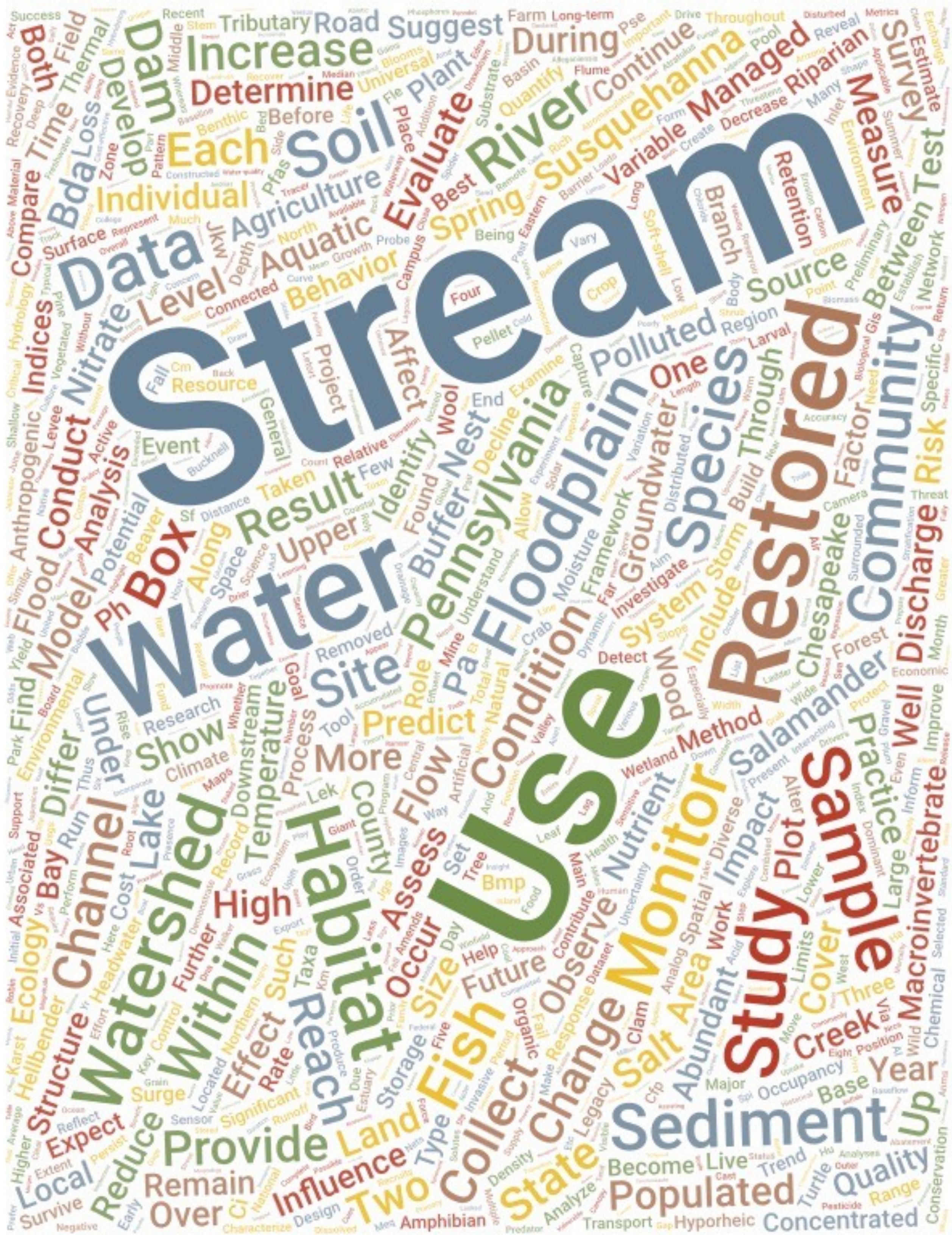
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A "word cloud" visualization of the oral and poster abstracts contributed to this symposium (pages 16-67).
Their relative size denotes greater prominence to the words that appear most frequently.
A total of 13, 742 words were analyzed.



2026 RIVER SYMPOSIUM

ORAL PRESENTATIONS

STREAMS AS WATER TABLE INDICATORS: MAPPING DYNAMIC ECOHYDROLOGICALLY ACTIVE AREAS

Boomer, Kathy, Foundation for Food & Agriculture Research, Washington, DC, kboomer@foundationfar.org.

Rivers are typically treated as downstream receptors of watershed processes. This work reverses that perspective: in humid, gaining systems, perennial and intermittent streams represent observable outcrops of the water table, and the extent of the flowing network can provide an integrated indicator of shallow groundwater conditions. Building on this premise, the ecohydrologically active area (EHA) model applies Height Above Nearest Drainage (HAND) to high-resolution LiDAR topography to identify where groundwater is likely to occur within the plant rooting zone (1.5 m). Rather than fixing channel heads, stream lengths were varied to represent wetter and drier water-table conditions arising from climate variability and watershed management. Land-surface slope further distinguishes groundwater discharge zones, inundation zones, and incised reaches where groundwater may bypass the biologically active root zone. Applied across Maryland's Ridge and Valley, Piedmont, and Outer Coastal Plain, the model reproduces expected transitions in river-corridor form and reveals extensive hydrologic alteration, including artificial drainage across Delmarva. Network contraction produces disproportionate losses of shallow-groundwater-influenced area, with the largest changes occurring during transitions from wetter to drier conditions. Comparisons with intensive water-table observations, mapped wetlands and hydric soils, and spatial patterns in crop yield provide independent lines of evidence consistent with model predictions. The approach reframes intermittent stream extent as an indicator of changing conditions beyond the channel itself, providing a simple framework for investigating how climate variability and water management propagate across connected terrestrial, wetland, and river systems.

shallow groundwater, intermittent streams, hydrologic connectivity

REFLECTIONS FROM THE NEPAL FLOODS

Etter Longenecker, Laurel, RiverStewards Collaborative, Lititz, PA, laurel@riverstewards.info.



A few months ago, I was in Nashville at the National Stream Restoration Conference hearing from experts and professionals from all over the country talk about design innovations for stream and floodplain systems, macroinvertebrate monitoring, hydrologic and hydraulic modeling, mitigation, and much more.

Meanwhile, on the other side of the world villages in Nepal were literally being washed away by flooding rivers. In 2013, I spent several months living in this area impacted by the flooding, and so this was an especially poignant time for me to be at the National Stream Restoration Conference. Physically, I was in Nashville, but mentally I was on the riverbanks in Nepal. It forced me to take pause, take a step back and reflect on how the lifeblood of a community, like a river, can also be the very thing that destroys a community. While this is an extreme example, I believe it is a universal truth.

This presentation is intended to be part personal reflection and reminder of how central rivers and waterways are to life – and part 'call-to-action' to think globally and act locally. Let catastrophes like this serve as a reminder of the importance to keep doing the work that we are doing to protect our waterways, our ecosystems and our communities. This includes learning from the past, observing the present, and studying future climate projections. How do we do this? Science, innovation, collaboration, merging Western science with Indigenous knowledge, etc.

I will end my presentation with words of encouragement.

WHOLE-COMMUNITY TRANSLOCATION SHOWS HIGH SURVIVAL POTENTIAL OF POLLUTION-SENSITIVE BENTHIC MACROINVERTEBRATE TAXA IN RESTORED STREAMS

Fagbohun, Ibrahim, Pennsylvania State University, State College, PA, irf5076@psu.edu; **Allen**, Daniel, Pennsylvania State University, State College, PA, daniel.c.allen@psu.edu; **Sweetman**, Jon, Pennsylvania State University, State College, PA, jfs6745@psu.edu; and **Hildebrand**, Bob, University of Maryland Center for Environmental Studies, State College, MD, rhilderbrand@umces.edu.

Despite decades of investment, stream restoration often fails to recover diverse benthic macroinvertebrate communities, as restored reaches tend to remain dominated by pollution-tolerant taxa. This shortfall in recovery is commonly attributed to either poor habitat quality or dispersal limitation of aquatic macroinvertebrate taxa, yet these hypotheses are rarely tested directly. Here, we tested whether restored streams can support pollution-sensitive taxa when dispersal barriers are removed.

We translocated whole macroinvertebrate communities from three nearby reference streams into three restored streams using standardized habitat substrates and quantified macroinvertebrate survival after 28 days. We also assessed how effective leaf vs rock substrates were for accumulating diverse and abundant macroinvertebrate communities for translocation.

Across all sites, 77% of translocated individuals and 16 of 22 taxa sensitive and moderately sensitive to pollution persisted under restored stream conditions, demonstrating that restored reaches can support short-term survival of pollution-sensitive taxa that typically fail to recover. Substrate comparisons revealed that leaf packs accumulated higher macroinvertebrate abundances, whereas both substrates accumulated macroinvertebrate communities with similar taxa richness, EPT richness, and Shannon Diversity.

This work suggests that dispersal limitation, rather than unsuitable habitat, may be an underappreciated constraint limiting macroinvertebrate recovery in restored streams. These findings challenge the assumption that habitat restoration alone is sufficient for biological recovery and highlight the potential for whole-community translocations to accelerate recovery and ecological uplift as part of stream restoration practices.

Stream Restoration, Macroinvertebrate Recovery

MOVING ALONG, FASTER, WITH OR WITHOUT FEMA

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The Commonwealth of Pennsylvania's PEMA Recovery Office will provide an update on how the agency Is moving forward with a "smaller" FEMA support force. Presentation will update attendees on the state's Positioning for the non-federally declared and federally declared disasters. Will highlight the recent Pennsylvania Executive Order that provides extra support for Disaster Response and Recovery activities and several ways the state is assisting survivors and local municipalities through the use of technologies, platforms and state funding. Examples: Crisis Track and Disaster Recovery Assistance Programs.

PEOPLE, PLACE, AND PRO-ENVIRONMENTAL BEHAVIOR IN THE PENNSYLVANIA REGION OF THE CHESAPEAKE BAY WATERSHED

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The dimensions of place, and how they may impact people's willingness to engage in pro-environmental behaviors in the context of watershed pollution must be studied to understand how people are interacting with their environment. The Chesapeake Bay is currently in poor ecological condition, failing several benchmarks for environmental improvement, and many of its sub-watersheds are under threat (Chesapeake Bay Foundation, 2022). Polluted water from the thousands of Pennsylvania streams and rivers that make up a significant portion of the Chesapeake Bay Watershed threatens the Chesapeake Bay ecosystems, fisheries, and multi-billion-dollar bay-related economy (Mueller, 2024). From an environmental standpoint, the bay is among the most studied estuaries in the world; researchers collect up to 10 million data points annually from the bay (Carey, 2021). Yet, place theory and place, or the cultural, social, and emotional connections people have with a locale, are often overlooked in the search for collective mitigation solutions. This presentation will provide a discussion of the framework and critical dimensions of Place Theory and propose its role in behavior, motivation to challenge the status quo, and ability to shape future discussions surrounding watershed-scale collective action, policy, and local solutions.

Watershed Pollution, Social Solutions, Place Theory

BRIDGING THE SAMPLING GAP: INTEGRATING SENSORS, GRAB SAMPLES AND DEEP LEARNING FOR REGIONAL NITRATE MANAGEMENT

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Water quality managers rely on both high frequency sensors and grab sampling data to assess stream nitrate concentrations and export. Conventional grab sampling covers more locations and provides longer records, but observations are typically taken on a bi-weekly to monthly scale, limiting their ability to capture event-driven nitrate dynamics. We are developing a deep learning framework that integrates monitoring networks and biophysical attributes to predict daily nitrate concentrations at grab-sampling sites across the Mississippi River Basin and Chesapeake Bay watersheds. High-frequency sensor observations are used to inform deterministic predictions from a long short-term memory (LSTM) model and probabilistic predictions from a diffusion model, allowing predictive uncertainty to be characterized. Initial simulations using the deterministic LSTM models show promising predictive accuracy in temporal testing (median NSE = 0.61 across 93 sites), even when only one observation is available every two months. We will compare the models against WRTDS-K using site level concentration accuracy, nitrate-load estimates, and water-quality threshold exceedances. By demonstrating how continuous sensors and periodic grab sampling can complement each other, this framework could inform strategic placement of sensors and grab-sampling sites and improve nitrate-load estimates. The resulting daily nitrate dataset could also support further water-quality management and research.

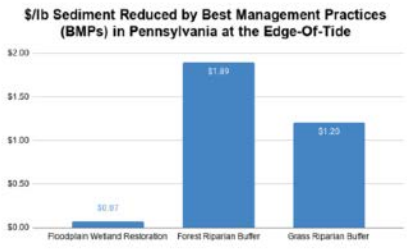
Deep Learning, Water Quality, Stream Nitrate

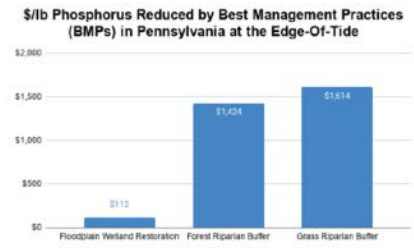
COST-EFFECTIVENESS OF FLOODPLAIN WETLAND RESTORATION AS A BEST MANAGEMENT PRACTICE FOR SEDIMENT AND NUTRIENT ABATEMENT IN THE CHESAPEAKE WATERSHED

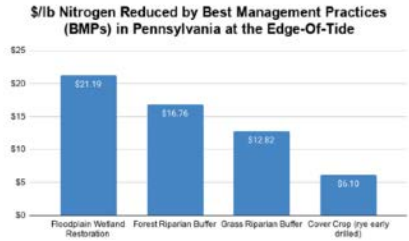
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To clean up the Chesapeake Bay, the regional Chesapeake Bay Program (CBP) partnership targets sediment, phosphorus, and nitrogen as the key pollutants to be reduced in the upstream watershed. The CBP and various other local, state, and federal sources provide funding to implement best management practices (BMPs) that will reduce the levels of these three key pollutants. Cost-effectiveness is a method of economic analysis that identifies the least-cost method of achieving a goal-here, to clean the Chesapeake Bay. High price tags for floodplain wetland restoration projects can make grantors and other key players hesitant to support and fund these projects. In this study, we perform a cost-effectiveness analysis that compares the cost per pound of pollution reduced by floodplain wetland restorations with forest riparian buffers, grass riparian buffers, and cover crops (the agricultural BMPs typically modeled to be least cost). For floodplain wetland restoration projects, we obtained cost and abatement data from practice implementation in southcentral Pennsylvania. For the agricultural BMPs, we obtained abatement data from the Chesapeake Assessment Scenario Tool (CAST) and costs from NRCS payment schedules in PA. Results of our research indicate that floodplain wetland restoration is the most cost-effective of these BMPs for sediment and phosphorus abatement in the Bay by an order of magnitude, approximately 17 and 13 times more cost effective respectively than the next most cost effective practice, while being cost competitive for nitrogen. Overall, our research indicates that floodplain wetland restoration is a highly cost-effective BMP for cleaning the Chesapeake Bay.

Legacy Sediment, Stream Restoration, Chesapeake Watershed







CHARACTERIZING THE TRANSPORT OF NEONICOTINOID INSECTICIDES AND S-TRIAZINE HERBICIDES IN RIPARIAN BUFFERS

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Riparian buffers are widely implemented to mitigate non-point source pollution of nutrients and sediments to nearby surface waters, and provide co-benefits in reducing pesticide transport. However, different factors, including runoff regimes (sheet flow - SF versus concentrated flow pathways - CFPs) and pesticide application modes, could influence the transport and retention of pesticides within buffers. We surveyed 12 riparian buffers within agricultural headwaters of the Susquehanna River Basin for the occurrence of CFPs and quantified topsoil contamination of two surface-applied s-triazine herbicides (atrazine and simazine) and four neonicotinoids commonly coated on seeds (clothianidin, imidacloprid, thiamethoxam, and thiacloprid). Soil samples were taken within CFPs and areas of SF at three locations along the buffer width (edge-of-field, midpoint, and delivery point), and composited at 0-5 cm and 5-15 cm depths. Across sites, atrazine, simazine, imidacloprid, and clothianidin were the most frequently detected, present in 65%, 39%, 20%, and 12% of samples, respectively. CFPs were relatively more important to the mobilization of clothianidin, given higher mean and median concentrations in CFP samples, while SF largely contributed to retention of atrazine and simazine. Detection frequency and concentrations were generally lower at delivery points, showing that most retention occurred in the upper sections of the buffer. Buffer vegetation structure, width, and micro-depressions were observed to influence CFP trajectory, redistribution, and delivery into stream. These results indicate the role of runoff conditions and buffer characteristics in influencing pesticide mobilization to streams, emphasizing the need for continued buffer maintenance post-establishment to reduce the risk of flow channelization.

DATA DRIVEN DECISION MAKING FOR ROAD SALT MANAGEMENT IN THE WEST BRANCH AND UPPER SUSQUEHANNA BASINS

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Pennsylvania House Bill 664 amends State Highway Law by directing PennDOT, in consultation with PA DEP, to develop a Road Salt Management Best Practices Guide. HB 664 is based on concerns that PennDOT's 5-year average use of over 800,000 tons of road salt contributes to contaminating freshwater streams. To better understand where road salt use may have a greater impact on Pennsylvania's waterways, a secondary spatial research study of HU6 020502 West Branch Susquehanna River and HU6 0202501 Upper Susquehanna River was conducted. These adjacent basins drain to the same point near Northumberland, PA, but have differences in the states they cover, drainage area sizes, land uses, and soil conditions. Specific conductance was used as a proxy for chloride presence in water. GIS data were collected from PennDOT Open Data and NYS GIS Clearinghouse datasets, USDA gSSURGO, USGS estimated road salt use and MRLC annual NLCD rasters, and USGS specific conductance CSV files. To visualize the differences between the basins, estimated road salt usage, specific conductance departure, and average SCS curve number maps were created using QGIS 4.2.3. Specific conductance discrete samples and continuous monitoring data were downloaded and plotted using the USGS dataRetrieval R package code executed in Positron 2026.06.1 for localized comparison to spatial analysis. Results may help inform if a uniform or a discretionary road salt management policy is right for the diverse communities and habitats in these river basins and identify tools that can be used to make evidence-based decisions.

USING REMOTE SENSING TO ASSESS THE ECOLOGICAL CONDITION OF THE MOLOCHNYI LYMAN

Skyba, Viktoriia, Dmytro Motornyi Tavria State Agrotechnological University, Zaporizhzhia, skiff.vika@gmail.com.

Molochnyi Lyman (22,000 ha), the largest lagoon on the northern Azov Sea coast, is Ramsar Site No. 770, hosting up to 35,000 common shelducks (13.5% of the Black Sea population) during migration. Closed and ultrahaline until 1943, it now depends on an artificial inlet that sand and shell keep infilling. When the inlet closes, the lagoon shallows, salinity rises from 17–25 to 30–100 g/L, and prolonged hypersalinity reduces benthic invertebrate species richness from 88 to 29–30. Periodic dredging ceased in 2003; the inlet was last reopened in late 2019. Under Russian occupation since 2022, it can be neither cleared nor surveyed on site.

We aimed to assess lagoon condition and separate war-related changes from climate-driven desiccation. Using Google Earth Engine, we mapped surface water in Landsat (1975–2026) and Sentinel-2 (2017–2026) images, classified inlet status in 436 Sentinel-2 images by least-cost path analysis (80.3% agreement with blind visual checks), and compared the war years with the unoccupied Tylihul Lyman (BACI design).

River runoff fell from 48 to 19 million m³/yr (1984–1996 vs. 2022–2026). Water area held at 21,500–22,300 ha in 2022–2026 owing to the 2019 reopening. Closed-inlet images rose from 9–12% in 2021–2023 to 42% in 2024 and 66% in 2026; in August–October 2026, a sandbar blocked the inlet in 18 of 19 images. The share of nighttime coastal fire detections rose from 13% to 44%. Thus, remote sensing reveals early signs of ecosystem destruction.

coastal lagoon, Ramsar wetland, inlet closure



Molochnyi Lyman. [Photo: Wikipedia]

ARIDITY IS ASSOCIATED WITH SMALLER-BODIED MACROINVERTEBRATE COMMUNITIES IN U.S. STREAMS

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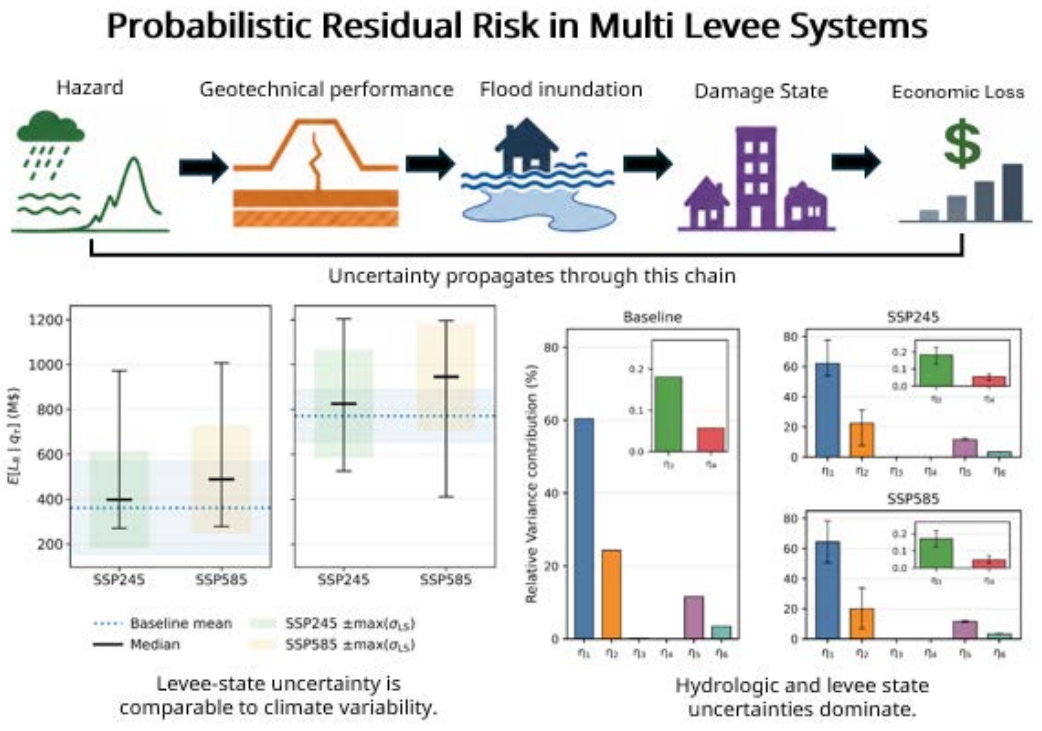
The relationship between individual body size and abundance is one of the most foundational ecological concepts; it is recognized that smaller organisms are generally more abundant than larger organisms. We can express this relationship as an individual size distribution (ISD), in which the slope (λ) may be used as a proxy for quantifying energy transfer within a food web. Steep λ can represent harsh environments where few large individuals survive, while flat λ represent more stable or resource-rich environments that support greater biomass at higher trophic levels. Benthic macroinvertebrates are a model organism to test this relationship because they are abundant, easy to collect, and exhibit a wide range of size classes. While macroinvertebrate λs have been shown to become steeper with temperature across a broad latitudinal gradient, other abiotic factors may also influence the distribution of individual body size. Here, we estimate λ of macroinvertebrate communities across 95 stream reaches in the southern contiguous United States. We found that λ ranged -2.58 to -1.43 and was best predicted by aridity index and canopy cover, with λ becoming steeper in more arid streams with less vegetative cover. These results suggest that energy transfer from the base of the food web may be less efficient in more arid basins that are more prone to disturbances and resource scarcity, which will become increasingly relevant with global climate change.

UNDERSTANDING RESIDUAL FLOOD RISK AND ADAPTATION IN LEVEE SYSTEMS

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Levee systems protect communities from riverine flooding, yet residual risk persists because levees can be overtopped or fail during extreme events. Climate change further complicates risk assessment by altering flood hazards and introducing uncertainty into future flood consequences. This study develops an end-to-end probabilistic framework to quantify residual flood risk across interconnected levee systems while explicitly accounting for uncertainty in hydrologic, geotechnical, hydrodynamic, building damage, and economic loss processes. Using a Markov-chain representation and the laws of total expectation and total variance, the framework propagates uncertainty through the modeling chain and quantifies the contributions of individual components to regional economic losses. A beta-distribution mixture model is incorporated to characterize building damage uncertainty. The framework is demonstrated using the Wyoming Valley Levee System along Pennsylvania's Susquehanna River under historical and future climate scenarios. Results reveal that uncertainties in levee performance and building damage substantially influence residual flood losses. Accounting for statistical dependence in damage across buildings substantially increases the variability of regional economic loss estimates. In some cases, uncertainty in levee system performance contributes as much to the variability in estimated economic losses as uncertainty associated with future flood projections. Under future climate scenarios, median expected annual losses increase by approximately 15% under SSP245 and 31% under SSP585 relative to historical baseline conditions. These findings demonstrate that understanding residual flood risk requires not only estimating inundation and expected losses but also identifying the sources of uncertainty that govern their magnitude and variability.

Flood Risk, Levee System, Damage and Uncertainty



DRONE-BASED VISIBLE LIGHT, MULTI-SPECTRAL, AND THERMAL IMAGING OF BUCKNELL'S CAMPUS FOR VEGETATION AND SOIL WATER CONTENT MONITORING

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Drone-based geophysics / remote sensing is a developing application that can allow for the non-intrusive monitoring of Earth processes. We have collected thermal, multispectral, and visible light imaging data using a drone over three years on Bucknell's campus and at specific times before and after a rainstorm. The multi-year data allow for monitoring changes and provide students local datasets to explore in introductory level courses. The datasets collected before and after a rainstorm may show superficial groundwater flow, as analyzed by Abolt et al. (2018), without the need for ground-invasive methods such as soil sampling or non-invasive but time-intensive ground-based geophysics, e.g., electrical resistivity imaging. In this presentation, we will share the results of the multi-year datasets which are available thru the Bucknell GIS system and provide preliminary analysis on the temporal thermal effect of the rainstorm. The thermal results align with expected temperature differences between anthropogenic and vegetated surfaces. Normalized Difference Vegetation Index (NDVI) of the campus also reveals the campus's vegetation is in relatively good standing (Yoon et al., 2025). The visible light camera also produced surface elevation for the areas surveyed. Preliminary temperature differences due to the rainstorm show potential evidence for superficial flow downhill. However, ground truthing and further analysis will be completed to confirm the analysis and explore the entire dataset. The data collected and the characterized changes provide additional evidence for the method, as well as provide up-to-date and comprehensive remote sensing data for Bucknell University to use in the future.

PREPARE PA: PARTNERS FOR A RESILIENT PENNSYLVANIA

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Prepare PA is a recently-launched effort to equip Pennsylvania communities with the knowledge, tools, and resources they need to adapt, respond, and thrive in the face of a changing climate. Sponsored by the Commonwealth of Pennsylvania and coordinated by a transdisciplinary team at Penn State, Prepare PA brings together a statewide network of partners -— including state and local government, higher education institutions, businesses, and nonprofit organizations -- that can share knowledge and leverage resources to reduce risk and adapt to environmental change. By building local resilience, Prepare PA helps protect the social and economic well-being of communities across the state and strengthens Pennsylvania's readiness for the future.



FABRIDAM FISH LADDER: GETTING THE FISH OUT WHEN THE DAM COMES DOWN

Ressler, Dan, Susquehanna University, Selinsgrove, PA, resslerd@susqu.edu; and **Ashcraft**, Sara, Freshwater Research Institute, Susquehanna University, Selinsgrove, PA, ashcraft@susqu.edu.

The Adam T. Bower Memorial Dam (Sunbury Fabridam) is the world's longest inflatable dam and sits below the confluence of the West Branch and the North Branch of the Susquehanna River at Sunbury, Pennsylvania. The dam was constructed in 1967 and is 2,100 feet (640 m) long and can be inflated to create 3,000 acre (12 km2) Lake Augusta. In 2024, a fish ladder was added to allow fish passage across the dam. Photos of the ladder in October 2024 show 4 distinct pools in the ladder which provide deeper refuge areas for fish in the passage. When the dam is lowered at the end of the boating season, water flow in the passage ceases and fish become trapped in these four pools. The Freshwater Research Institute at Susquehanna University has partnered with the Middle Susquehanna Riverkeeper Association and PA Dept. of Conservation and Natural Resources at the Shikellamy State Park to conduct “fish rescues” after the dam is lowered. Fish are recovered using dip nets during electrofishing, counted, identified, and mass and length are determined on a subset of each species. Between 500-1000 fish have been captured during most visits and returned to the river. Rapid decline of dissolved oxygen in the water is a significant threat during the drawdown, and recommendations for adjusting the drawdown schedule are presented.

Aquatic Passage, Fish, Susquehanna River



AFTER THE STORM: THE IMPORTANCE OF POST-PEAK DYNAMICS FOR WATERSHED NITRATE EXPORT

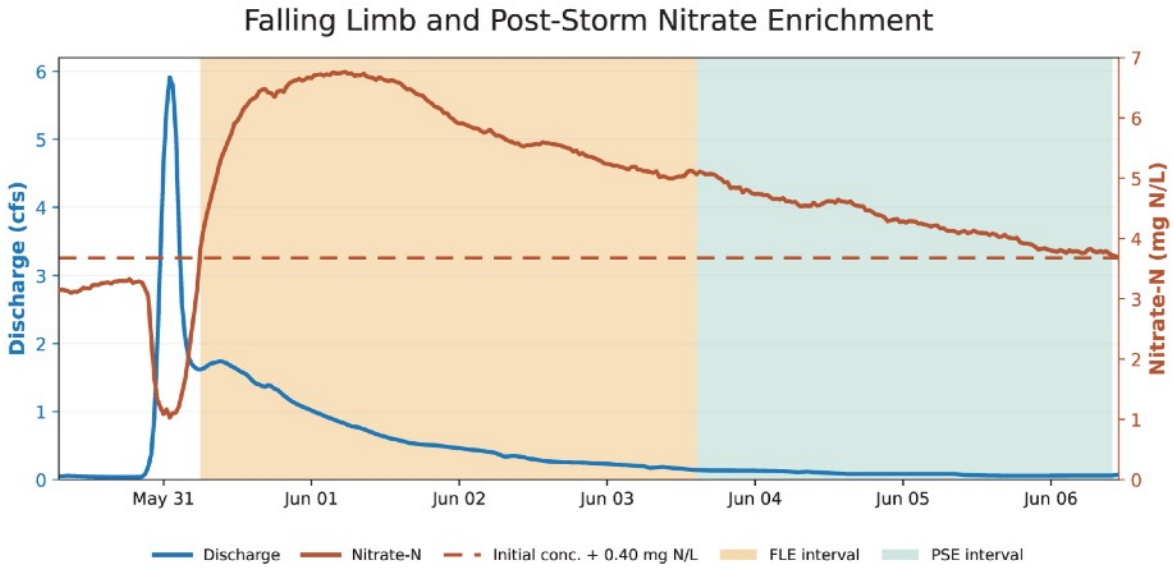
Marsh, Melinda, The Pennsylvania State University, University Park, PA, mjm9109@psu.edu; **Duncan**, Jonathan, The Pennsylvania State University, University Park, PA, jxd523@psu.edu; and **Buda**, Anthony, USDA Agricultural Research Service, University Park, anthony.buda@usda.gov.

Nitrate export from agricultural watersheds has been extensively studied. However, there is a phenomenon in which concentrations can increase above pre-storm and peakflow concentrations, and the drivers and mechanisms of this enrichment following storm events remain poorly understood. We examined storm-driven nitrate-N export in the Mahantango Creek watershed in Pennsylvania, distinguishing between falling-limb enrichment (FLE), occurring after peak discharge but before return to near-baseflow conditions, and post-storm enrichment (PSE), defined as occurring after the stream returns to baseflow.

Across 67 storms from January 2025 through June 2026, FLE occurred in 20 events (30%), while PSE occurred in 29 of 58 events (50%). PSE persisted for a median observed duration of 51 hours and exceeded 210 hours in one event; 79% of PSE events persisted for at least 24 hours. Most PSE episodes ended only because of subsequent storms, rather than recovering to pre-event concentrations. In 2025, FLE- and PSE-associated periods accounted for 53% of observed nitrate-N export including 15% during PSE-associated periods alone.

Storm rainfall magnitude was positively associated with both FLE ($p < 0.001$) and PSE ($p = 0.005$). Examination of groundwater levels and groundwater seeps yielded mechanistic insights. Large shallow-to-deep groundwater head differences coincided with many enrichment events, while groundwater seep chemistry suggests possible contributions from shallow subsurface pathways.

These findings highlight the importance of post-peak nitrate dynamics to watershed nitrate export and the need to better understand the hydrologic mechanisms of enrichment.



SPATIAL AND STORM-LEVEL DRIVERS OF THERMAL SURGES IN A KARST, MIXED LAND USE STREAM NETWORK OF CENTRAL PENNSYLVANIA

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Spring Creek (Centre County, PA) is a cold, spring-fed trout stream draining a karst watershed shaped by a century of land development. Groundwater keeps summer baseflow cold in many tributaries and reaches, but runoff from heated impervious surfaces can rapidly warm the stream, generating acute thermal surges that stress aquatic life. Using continuous temperature and flow records from 14 network sites (2020-2024), we identified 199 thermal surges, with the largest exceeding 12°C. We then modeled 586 storm events, 103 of which produced surges, with a spatial stream network model fitted in a Bayesian framework to identify their drivers. Impervious cover was the primary predictor of baseline risk, and surges were most likely during midsummer storms, when warm air overlies cold baseflow; each 4°C increase in the difference between air temperature and pre-storm stream temperature roughly doubled the odds of a surge. Urban tributaries downstream of State College emerged as surge hotspots, while one lightly developed site had far more surges than predicted, indicating that site-specific factors beyond watershed-scale impervious cover also influence risk. Scenarios indicate that further development and hotter storm days would raise risk most in moderately developed reaches where surges are not yet common. Together, these findings show that surge risk is shaped by both watershed development and the thermal contrast between warm air and cold, groundwater-fed baseflow, offering a framework for prioritizing stormwater management to protect coldwater habitat.

stream temperature, karst

WHEN DOES PHYTOMINING PAY OFF? CROP AND WATER-QUALITY TRADE-OFFS OF DRAWING DOWN LEGACY PHOSPHORUS IN AN AGRICULTURAL WATERSHED

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Legacy phosphorus (P) in agricultural soils continues to supply P to streams long after inputs are reduced or eliminated. Legacy nutrients are a major barrier to meeting water-quality goals in the Chesapeake Bay watershed. Phytomining offers one way to draw down these nutrient reserves in soil by removing P inputs or removing P through biomass harvest or cover crops. However, the long-term effects of phytomining on both water quality and crop production remain unclear. This study uses a 100-year watershed simulation of the Mahantango Creek watershed in Pennsylvania to evaluate P drawdown, corn silage harvest, and winter cover crop scenarios and their combinations. Under current management, soil P continues to build up over time. P drawdown reverses this trend and greatly reduces P losses, but crop nutrient stress and yield decline appear after about two decades. Fields with high legacy soil P sustain drawdown much longer than fields with low soil P. Combining drawdown with P removal practices changes both the rate of drawdown and the timing of yield loss. The results show that the win-win window of phytomining depends on starting soil P and on how practices are combined.

Legacy phosphurus, Agricultural best management practices,, Chesapeake Bay

HEATWAVES AND SONGBIRDS: A DIVE INTO DATA COLLECTED THIS PAST SUMMER ON HOW BIRD ACTIVITY IS IMPACTED BY EXTENDED HEAT

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In a partnership with the University of Michigan, we collected data via some of our birdnet units as well as caterpillar interaction to look at how heatwaves potentially affect a wide number of common bird species in our region. Which species were impacted the most? Which had the steepest decline in song activity? Which actually had an increase? And what can we learn from this?



POSTER PRESENTATIONS

EVALUATING THE POLLOCK FRAMEWORK WITHIN BEAVER DAM ANALOG RESTORATION IN HUMAN-IMPACTED STREAMS

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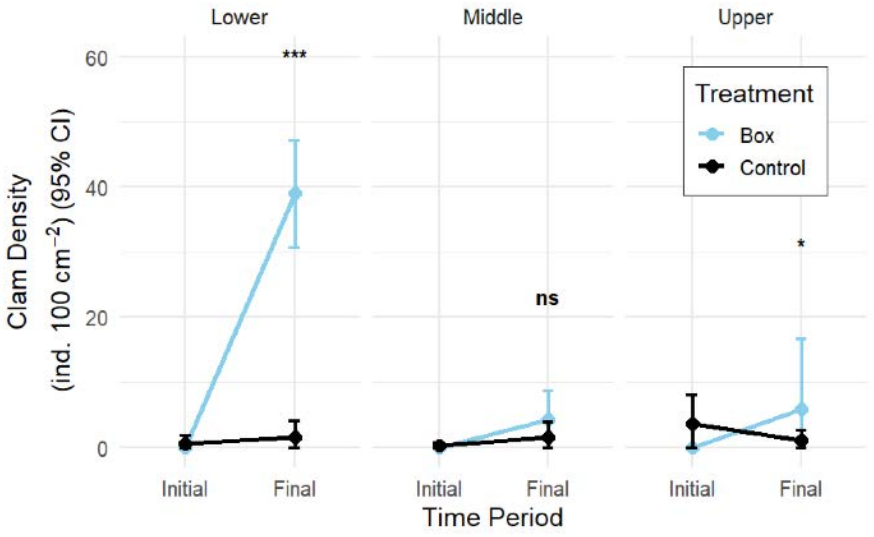
Beaver dam analogs (BDAs) are a tool for stream restoration with the goal of reducing scour and incision, promoting sediment deposition, and reconnecting the stream to its floodplain. The widely accepted 2014 Pollock framework predicts that successful structures should create pools behind BDAs, slow flow, improve sediment deposition, and increase floodplain connection. However, many of these expectations are based on systems within perennial flow, whereas our study reach is ephemeral and stormwater-driven, with runoff influence by agricultural and suburban land use. This study evaluates whether changes in channel width, depth, and floodplain moisture retention follows the Pollock framework; and if not, what adjustments must be made to accommodate ephemeral, human-impacted streams. Cross section measurements above and below each BDA have been taken using a total station to measure both width and depth. Slope measurements were taken immediately adjacent to each BDA and 3 m up and downstream of each structure. Soil moisture and temperature sensors were installed on the floodplain to assess moisture retention. Preliminary channel measurements show that the upper-reach BDAs have more consistent sediment deposition, while lower-reach BDAs are experiencing less sediment deposition, and more erosion. The upper reaches are consistent with the Pollock framework, while lower-reach responses suggest that BDA effectiveness may vary by position. Ongoing monitoring will test sediment deposition and the formation of pools, as well as floodplain moisture retention. Further results in these areas will allow us to assess whether the BDAs in our stream system are acting as expected within the Pollock framework.

stream restoration

QUANTIFYING VARIATION IN LARVAL SUPPLY AND POST-SETTLEMENT MORTALITY OF SOFT-SHELL CLAMS (*MYA ARENARIA*) THROUGHOUT THE PLUM ISLAND ESTUARY, MA

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Population declines in culturally and economically important marine species can have drastic ramifications on coastal community livelihoods and ecosystem functions. Thus, understanding the drivers that influence population dynamics of harvested marine organisms is a critical step for stock management and marine policy. The soft-shell clam (*Mya arenaria*) is a commercially important infaunal bivalve in the northwest Atlantic Ocean. Beginning in the 1940s, soft-shell clam populations began to plummet throughout the northeast United States. Local stakeholders in the Plum Island Estuary have raised concerns over soft-shell clam scarcity, where the drivers of population decline remain largely unknown. Therefore, this study investigates variation in larval supply and post-settlement mortality across the Plum Island Estuary, in Essex County, Massachusetts, and the possible mechanisms impacting the observed spatial variation. Mesh-covered boxes were set out along an estuarine gradient for two-months (May-July) to collect settling soft-shell clam larvae, which were then counted and measured. Soft-shell clam recruits were then outplanted throughout the estuary to observe possible mechanisms of spatial variation in recruitment. We found that post-settlement mortality played a significant role in soft-shell clam abundance in the lower and upper estuary zones, whereas minimal larval supply was a major driving force in the middle estuary. Potential mechanisms for the observed spatial variation include habitat suitability, temporal variation in recruitment, and differential predation pressures. These findings highlight that variation in larval supply and post-settlement mortality drive differential soft-shell clam recruitment throughout the estuary, and can help local stakeholders protect and revitalize the regional soft-shell clam industry.



Estuary, Recruitment

DOES TRANSIENT STORAGE CONTROL NUTRIENT UPTAKE? EVIDENCE FROM MULTI-STREAM TRACER EXPERIMENTS

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Streams retain nutrients in two ways. Physical retention, where water exchanges with transient storage zones such as pools, back eddies, and hyporheic sediments, slows solutes without removing them. Biological retention, where algae, microbes, and biofilm take nutrients up, removes them for good. Together these determine how far a nutrient travels before uptake, a question that matters in agricultural watersheds with high nutrient loads. We conducted slug injection tracer tests across three reaches of the Bald Eagle Creek Watershed in Centre County, Pennsylvania, spanning different riparian settings and a wide range of flows, pairing a conservative sodium chloride tracer with a reactive nitrate or phosphate tracer, and calibrated the One-dimensional Transport with Inflow and Storage (OTIS) model to the resulting breakthrough curves. Relative storage (As/A) varied nearly threefold among reaches (0.18 to 0.49), yet nitrate uptake lengths stayed far more similar (794 to 1165 m), suggesting biological demand rather than physical storage controls nitrate removal; storage was reach-specific rather than tied to riparian buffer presence. The Damköhler number rose roughly tenfold from 2025 to 2026 (about 0.01 to 0.26) even as flows increased, suggesting that flow conditions altering stream hydrology and floodplain or streambank interactions, rather than discharge itself, drove this shift. Phosphate was retained more efficiently than nitrate at both sites, by about three times at one reach, likely because sorption to sediment ties its removal to storage capacity in a way nitrate's is not. Managing stream nutrients requires attention to biological processing, not only to channel structure.

transient storage, nutrient uptake, tracer tests

CHARACTERIZING NUTRIENT RELEASE AND AGRONOMIC BENEFITS OF SHEEP WOOL PELLETS FOR REGENERATIVE AGRICULTURE

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Waste wool presents a significant disposal challenge for sheep farmers, yet it offers an intriguing opportunity for repurposing in agricultural settings. In its raw form, waste wool decomposes slowly due to the resilient keratin proteins within its fiber structure; however, shredding and pelletizing the material significantly accelerates its breakdown. Wool pellets show great potential as a soil amendment, a key component of regenerative agriculture, thanks to their high water-holding capacity and ability to act as a slow-release fertilizer with average NPK values around 12-0-4.

This study aims to quantify the nutrient release curve of wool pellets while evaluating their surrounding biotic and abiotic interactions. Through deionized (DI) water dissolution testing, soil incorporation trials, and greenhouse plant growth studies, we evaluate the viability of wool pellets in agricultural systems. Additionally, leachate analysis helps identify environmental impacts by measuring pH, electrical conductivity (EC), ammonium (NH4+), and primary inorganic anions (nitrate, phosphate, sulfate, chloride). Using comparative trials against Osmocote, a synthetic slow-release fertilizer, we will further assess the benefits of sheep wool pellets as supplemental fertilizer and evaluate impacts on plant biomass and yield. This study establishes a comprehensive understanding of wool pellet dynamics, progressing from basic water interactions to greenhouse-scale agricultural applications.

wool pellets, soil amendment, repurposed wool

ASSESSING COST-OPTIMAL RESTORATION PLANTING METHODS AT TWO NATURAL AREAS IN LYCOMING COUNTY, PA

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In the Miyawaki reforestation method, native species are densely planted with soil amendments to accelerate growth compared to conventional methods. In Lycoming County, Pennsylvania, Rider Park and Robert Porter Allen Natural Area (RPANA) have used the Miyawaki method, but its cost and success have not been tracked. We established plots to evaluate the efficacy of multiple planting methods at Rider Park and RPANA and compared cost relative to ecological results. In Spring 2026, nine plots of 25 shrubs (five individuals of each: *Alnus serrulata*, *Cephalanthus occidentalis*, *Ilex verticillata*, *Swida sericea*, and *Viburnum dentatum*) were constructed at each park. Each plot had three variables at one of three levels: planting density (high, medium, low), soil amendment (biochar, wood mulch, or none), and mycorrhizal inoculant (multi-strain, single-strain, or none). From June to September, we tracked survival and measured height and diameter at root collar of all shrubs in each plot, 450 shrubs total. Linear regression analysis was used to examine the relationships between densities, inoculants, and amendments on shrub survival and growth. Plots at Rider Park exhibited no significant response to any soil amendment or mycorrhizal inoculant. This may be due to established soil fertility and mycorrhizal communities. At RPANA, plots with biochar had higher average percent survival (p-value=0.0458) than other soil amendments. Planting density did not affect early mortality, but its long-term impact is unknown. Plots will be monitored over the next five years, and the results will help guide restoration planting practices at these parks.

Habitat restoration, Reforestation

FINE-SCALE HABITAT SELECTION OF WOOD TURTLES (*GLYPTEMYS INSCULPTA*) PRIOR TO RIPARIAN HABITAT RESTORATION

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Wood turtles (*Glyptemys insculpta*) are semi-aquatic Emydid turtles endemic to the northern United States and Canada that are currently proposed for USFWS listing. Despite high overlap of stream restoration projects and wood turtle populations in Pennsylvania, the effects of riparian restoration practices on turtle spatial ecology are poorly understood. In this study, we used radio telemetry to evaluate wood turtle fine-scale habitat selection on a property slated for future riparian restoration including Japanese knotweed removal and native vegetation planting. We captured wood turtles (n = 8; ♂ = 4, ♀ = 4) using standardized protocols and tracked turtles using radio telemetry every 1-2 weeks in spring/summer 2025-2026. We measured restoration-relevant habitat variables within each "used" location and paired "random" plots and evaluated factors influencing habitat selection via paired-plot logistic regression and AICc model selection. Conditional model-averaged odds ratios indicated positive associations between habitat use and food availability (OR = 4.95, 95% CI = 2.05–11.82) and knotweed presence (OR = 3.74, 95% CI = 1.30–10.91). Canopy cover showed a negative, non-significant association (OR = 0.56, 95% CI = 0.28–1.11) with habitat use. Pre-restoration wood turtle habitat use is most strongly associated with food availability in locations with Japanese knotweed. However, the knotweed association likely reflects the dominance of invasive vegetation at our study site rather than true selection. This ongoing work will be valuable in identifying shifts in wood turtle resource use in response to common riparian restoration practices and inform future habitat management protocols.

Wood Turtle, Riparian Restoration, Habitat Selection

TIME IS A FACTOR: LONG-TERM PATTERNS OF OCCUPANCY IN HELLBENDER (*CRYPTOBRANCHUS ALLEGANIENSIS*) ARTIFICIAL NEST BOXES

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The Eastern Hellbender (*Cryptobranchus alleganiensis*) is a declining stream-obligate salamander endemic to the eastern U.S. Hellbenders are notoriously difficult to observe, creating challenges for monitoring populations. Artificial nest boxes are cement structures that mimic natural habitat and provide a method to monitor demography and reproductive ecology. In this study, we conducted nest box surveys to evaluate factors influencing occupancy rates of nest boxes in multiple historically monitored hellbender populations across Pennsylvania. We monitored nest boxes (N = 215) across four waterways in western and northcentral Pennsylvania from 2018-2026. We used underwater cameras to assess occupancy before capturing hellbenders, collecting morphometrics, and releasing them at the site of capture. We evaluated factors influencing nest box occupancy using beta-binomial GLMMs and AICc model selection. From 2018-2026, we conducted 3400 surveys of individual nest boxes (range: 3 – 31) and detected occupancy by hellbenders 817 times (range: 0 – 20). Deployment duration was positively associated with nest box occupancy (OR = 1.73, 95% CI: 1.23–2.43), indicating a 73% increase in the odds of occupancy for each 2.39-year increase in time-since-deployment. While increasing distance between nest boxes negatively influenced occupancy, this trend was not statistically significant (OR = 0.93, 95% CI: 0.78–1.10). Our results suggest that deployment duration is the major contributing factor to improve occupancy in artificial nest box monitoring programs. Provided nest boxes are properly installed adjacent to known hellbender populations, this conservation tool can provide effective, minimally-invasive access to hellbenders for a variety of long-term monitoring initiatives.

Eastern Hellbender, Nest Box, Occupancy

RECENT CHANGES IN WATER QUALITY TO INFORM THE CONSERVATION OF A CULTURALLY SIGNIFICANT STREAM: THE LETORT SPRING RUN

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Streams cover over 80,000 miles across Pennsylvania, and are often intertwined with the state's culture, history, and recreation. Impacts such as human activity and climate change are incrementally changing these environments. Long-term water quality monitoring provides invaluable data that can be used to assess the impacts of these changes over time, and empowers communities by providing them with quantitative data that can be used to justify management to improve stream health.

The Alliance for Aquatic Resource Monitoring has collaborated with the Letort Regional Authority since November 1992 to collect monthly baseline data at the Letort Spring Run, which is a source of drinking water and a nationally recognized fly-fishing stream. Seven sites along the stream are monitored for eight parameters: water temperature, dissolved oxygen, conductivity, pH, nitrate-nitrogen, orthophosphate, total dissolved solids, and turbidity.

For this study we analyzed data from 2017-2025 for all eight parameters and found that while the pH was decreasing across the entire stream, the most upstream site is decreasing the fastest (-0.075 pH/yr). We also observed that baseline levels of nitrate are high, but values are increasing quickly, while orthophosphate levels are low and stable. Phosphate is likely the limiting nutrient in the Letort preventing eutrophication and excess algal growth. This case study shows the importance and value of long-term monitoring data, and how otherwise unknown trends can be illuminated through collaboration and involvement of local stakeholders.

DO SOLAR FARMS CREATE UNIQUE SPIDER ASSEMBLAGES?

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Conversion of commercial agriculture to utility-scale solar facilities has increased rapidly over the past decade, yet the ecological consequences of this land-use transition remain poorly quantified. Solar farms contain repetitive structures that create habitat distinct from agricultural, natural, and urban systems while incorporating features of early successional fields, forest understories, and managed landscapes. We evaluated spider abundance, taxonomic diversity, and assemblage composition within a solar farm established in 2018 on Susquehanna University property and compared these metrics with adjacent goldenrod fields, early successional deciduous forest, and maintained hayfields. Five 5 x 8 m plots were established within each habitat type. Each plot was sampled by two observers for 60 min during both daytime and nighttime within a 24-h period using hand collection, sweep netting, and head-lamping. Specimens were preserved in 70% ethanol and identified using standard taxonomic keys. Spider diversity did not differ significantly among habitats at the family or genus level but differed at the species level. Total spider abundance also differed significantly among habitats, with forest plots supporting the greatest abundance. Bray–Curtis pairwise PERMANOVA with Benjamini–Hochberg correction further demonstrated significant differences in assemblage composition among all habitat types at the family, genus, and species levels. These results indicate that recently established solar farms can support levels of spider diversity comparable to surrounding habitats while developing compositionally distinct assemblages. Thus, solar development may alter arthropod community structure without necessarily reducing local taxonomic diversity and may provide a biodiversity conservation function beyond its role in energy production.

biodiversity, land use, spider



CONSERVATION OF IMPERILED GIANT SALAMANDERS: IS LOCAL ECOLOGICAL KNOWLEDGE RELIABLE?

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Integration of local ecological knowledge (LEK) and citizen science into the monitoring of rare or threatened species has become a popular approach in conservation biology. Yet, the accuracy of LEK has rarely been assessed. Japanese Giant Salamanders (*Andrias japonicus*) are fully aquatic, stream salamanders, endemic to Western Japan. Despite federal protection as a special national monument, it is threatened with extinction, and the declining trend continues due to habitat destruction, such as dam and concrete bank construction, as well as hybridization with Chinese Giant Salamanders. Wara in Gifu Prefecture, Japan, is one of the critical habitats for *A. japonicus*. However, information about the species is still largely based on local LEK, and only a few preliminary surveys have been conducted. To test the accuracy of LEK, we (1) conducted formal interviews with the locals, (2) investigated the fine-scale distribution of *A. japonicus* via environmental DNA (eDNA) and nighttime surveys, and (3) evaluated the accuracy of LEK based on the comparison between the interview results and the field surveys. With IRB approval, we distributed 200 surveys across Wara during the summer of 2025, yielding 96 responses. We collected water samples from various streams and estimated eDNA concentration of each sample using qPCR. With a few discrepancies, the interview results largely agreed with the field surveys. Our findings contribute to conservation biology and provide insights into the accuracy of LEK as a tool to assess the status and location of endangered species.

Andrias japonicus, LEK

ANALYSIS OF THE MICROBIAL COMMUNITY AND POTENTIAL FOR CYANOBACTERIAL TOXIN PRODUCTION IN LAKE WALLENPAUPACK.

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Cyanobacteria are photosynthetic bacteria that serve as primary producers in aquatic food webs. While generally beneficial members of a community, some genera produce toxins that are harmful to humans and wildlife. Toxin producing cyanobacteria are particularly problematic when they form blooms (harmful algal blooms or HABs). CyanoHABs occur in nutrient rich, warm water. Excess nutrient loading of nitrogen and phosphorus fuels these blooms alongside anthropogenic influences of global climate change and eutrophication.

The goal of this project is to understand and analyze the general microbial content in a non-bloom situation on Lake Wallenpaupack. This location is unique because it is an artificially constructed lake that has increasingly gained popularity in ecotourism. The lake has a history of algae blooms, often driven by warmer temperatures and nutrient loading from surrounding farm land. Especially in the summer months and early fall, the lake turns a bright green from algae blooms. At this time we do not know if these blooms contain harmful forms of cyanobacteria. We will use our microbiome data to determine which cyanobacteria are most prevalent in the lake even in non-bloom conditions and then use PCR to determine if these strains contain toxin genes. This data will help establish whether or not the frequent blooms that occur in Lake Wallenpaupack are a threat to those using the lake recreationally.

HAB, cyanobacteria

THE INFLUENCE OF DISCHARGE ON CHANNEL MORPHOLOGY AND SEDIMENT DYNAMICS TO BEAVER DAM ANALOGS IN A FLUME

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Beaver dam analogs (BDAs) are used to impact channel morphology and for stream restoration, yet questions remain in how hydraulic discharge changes the bed response. This study investigates how a channel bed responds to a BDA under controlled flume conditions across discharge treatments. Using a constructed BDA model with a known hydraulic conductivity, we evaluated the behavior of a channel bed of pea gravel across multiple runs with differing discharges to observe sediment motion and bedform evolution. Repeat photographs before and after 4-hour experimental runs, were processed in Agisoft Metashape using structure from motion to generate digital elevation models of the channel surface. From these, we quantify the erosion, aggregation, and bedform development. Preliminary results indicate that BDAs increase sediment motion downstream of the structure, with higher discharges increasing bedform development and sediment redistribution. These findings suggest that discharge plays an important role in controlling the magnitude and spatial pattern of geomorphic response to BDAs. By isolating discharge under controlled conditions, this study provides insight into how BDA's impact stream channel beds, and how they may function in an actual stream environment.

EVALUATING SALT VARIABILITY IN THE SUSQUEHANNA RIVER DURING A 100-YEAR STORM

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Road salt application changes sodium chloride concentrations in surface waters, mobilizing nutrients and increasing the risk of eutrophication in rivers. Continuous monitoring of salinity via specific conductance in tributaries such as the Susquehanna River could help to track the total chemical mass moving downstream toward the Chesapeake Bay. Because precipitation can trigger salt washouts from water and soils, this study selected Tropical Storm Lee to evaluate salt dilution and flushing trends in the riverine system. To understand the chemical mass mobilized in the river and the volume of salt moving downstream, specific conductance and discharge data were retrieved from the U.S. Geological Survey National Water Information System for the Susquehanna River at Danville, sampled between January 2011 and December 2011. To show the trigger for washed salts accumulating in the water, the precipitation data were obtained from the EPA National Stormwater Calculator for the Shickshinny rain gauge, upstream from Danville. Using aerial imagery and GIS mapping tools, the detention basins' surface areas near the gage of interest were measured to quantify the extent of stormwater storage infrastructure in the watershed near the gage location. Results showed post-winter specific conductance spikes long after the original salt application, and in the absence of salt application. Concentration spikes during storm events pose a risk to surface water ecosystems. Results can be used to evaluate potential impacts of best management practices on groundwater recharge near the gage location to help avoid generating unintended water contamination in the future.

GROUNDWATER DECLINE, DROUGHT SENSITIVITY AND WELL VULNERABILITY IN ARIZONA

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Groundwater serves as the primary water source for communities across Arizona, and in many rural areas the only reliable one. It supplies roughly 40% of the state's water use, yet population growth, aridification, and a warming climate are placing it under stress. This
study characterizes groundwater depletion in Arizona, and its associated factors. Daily water-level records (2015–2024) from 24 USGS monitoring wells were analyzed with the Mann-Kendall test and Sen's slope estimator. Each well was linked to surrounding well uses within a 10 km buffer using Arizona Department of Water Resources records. Precipitation response was assessed through lagged cross-correlation (0–365 days) and drought sensitivity by regressing water levels on the 3- and 6-month Standardized Precipitation Indices (SPI-3, SPI-6). Sixteen of the 24 wells showed significant declines ($p < 0.05$). Shallow wells were the most vulnerable, and deep wells were the only class in which rising trends outnumbered declines. Response lags ranged from under 15 days in shallow, unconfined wells in Cochise County to 365 days in a deep, confined well, with half exceeding 180 days. Drought coupling was strongest in six shallow, declining Cochise County wells (SPI-6 R^2 up to 0.52), while deeper wells appeared buffered. Domestic use dominated the surrounding of most declining wells, whereas rising wells, mostly deep, were associated more with irrigation and livestock use. The findings identify where Arizona's groundwater resource is most vulnerable and provide a basis for extending this screening across the other States.

Keywords: Well trend, Well depth, Drought Sensitivity, Lag Analysis

Well Depth, Well Type, Lag Analysis

INVESTIGATING CHANGES IN FLOODPLAIN SOIL CARBON AT AN UNNAMED TRIBUTARY OF PINE CREEK IN WOODWARD, PA SEVEN YEARS AFTER STREAM RESTORATION AND LIVE STAKING

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Livestaking is a popular stream restoration method wherein cuttings are taken from trees and planted with the goal of revegetating stream banks to reduce floodplain and bank erosion. However, long-term monitoring of live staked sites is limited, and the extent to which they improve sediment storage is unclear. Here we investigate the impact of live stakes on sediment storage at an unnamed tributary of Pine Creek in Woodward, PA: a first-order stream that was previously channelized through agricultural land, causing stream impairment. From 2018 to 2020, live stakes were planted on the floodplain and hard structures were placed along the channel. In 2021 and 2026, soil cores were collected along five transects perpendicular to the tributary to determine soil type and collect samples for soil organic carbon (SOC) analysis (completed on a LECO CHN 628 analyzer at Bucknell University). We also collected RTK-GPS data using a Trimble TSC510 to measure changes in floodplain elevation and channel slope. Soil observations and topography data are similar to data recorded in 2021. CHN results show that the average SOC is 2.04% site-wide, which is a 0.27% increase from 2021 and brings floodplain soil into the expected range of 2% to 5%. However, increase is inconsistent between channels and could be related to livestake survival or to the initial conditions at the transects. We will need to revisit the site again as it continues to develop.

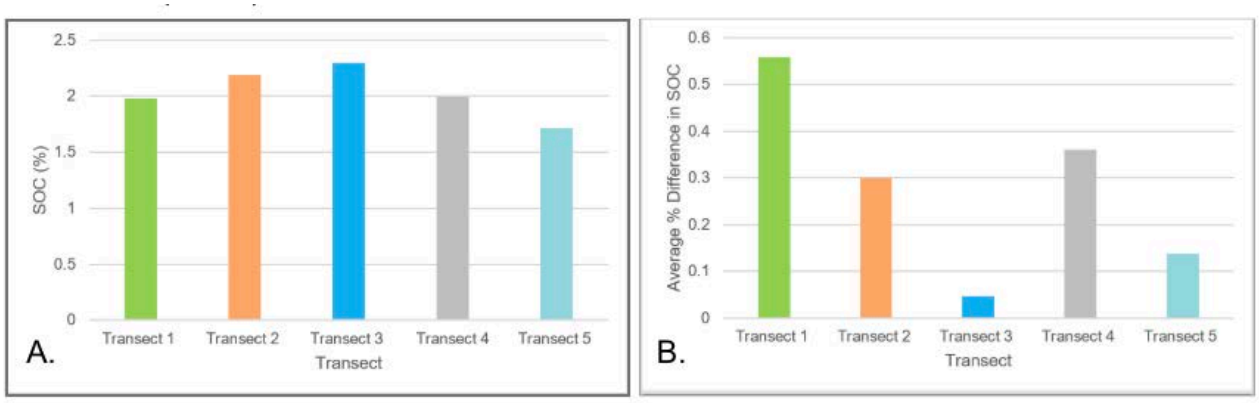


Figure 7. Bar graphs showing average transect SOC (A) and the difference in SOC between 2021 and 2026 (B).

DENSITY DEPENDENT EFFECTS ON INTERACTIONS BETWEEN TWO MINNOW SPECIES (*SEMOTILUS ATROMACULATUS* AND *RHINICHTHYS ATRATULUS*) IN AN ARTIFICIAL STREAM SYSTEM

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Creek chub (*Semotilus atromaculatus*) and Eastern Blacknose Dace (*Rhinichthys atratulus*) are two species in the Leuciscidae family commonly found throughout streams in central Pennsylvania, especially along agricultural land. While *S. atromaculatus* is a predator of *R. atratulus* when fully grown, the two species utilize similar food sources and habitats within streams as juveniles or when they are similar in size. In this study, we are conducting a laboratory experiment with individuals of both species using artificial stream channels. Two source populations are used: 1) *R. atratulus* are the dominant species in the fish community, and 2) both *R. atratulus* and *S. atromaculatus* have relatively even populations in a co-dominant role. Varying proportions from each source population are used within each channel and individuals within each channel will be uniquely identified using Visible Implant Elastomer (VIE) tags. Behavioral observations of individuals in each stream channel will be recorded, such as time spent schooling versus solitary, position in channel (riffle, pool, etc.), and feeding behavior/interactions. We expect that both source population density and density of individuals/species within the stream channels will affect behavior. *R. atratulus* that come from a source population where they are dominant will behave in a more dominant manner (remain solitary, occupy the best habitat, and feed freely) than *S. atromaculatus* from the same source population. However, we predict that over time, the species behaving in the most dominant manner will reflect the species of higher density within each channel, regardless of source population.

Behavioral ecology, Stream Ecology, Fish Ecology

LEPOMIS GONE WILD: EXAMINING POTENTIAL HYBRIDIZATION OCCURRING AMONG SUNFISH SPECIES

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Fish of the genus *Lepomis*, generally referred to as sunfishes, tend to prefer warmer, deeper waters than those found in most streams throughout northern Pennsylvania. However, during wet seasons, these fish can move into streams from connected lakes or ponds, and even end up trapped when the weather becomes drier. In the Loyalsock watershed, a tributary to Pigeon Creek called Flag Marsh Run is one such area where *Lepomis* end up in flowing water. The individuals observed at this stream display intriguing characteristics that make them difficult to identify to species, such as having defining traits of multiple different species. For this reason, we believe that the *Lepomis* fish in this stream may be hybridizing. In this study, we will use photos taken of fish caught in Flag Marsh Run, as well as vouchered specimens from the site, in an attempt to provide evidence that the fish are in fact hybridizing. We intend to sequence the vouchered individuals to compare them to known genomes of purebred fish we believe are the parent species. Additionally, we will complete a statistical analysis of morphological traits to see if the vouchered individuals fall between expected species norms for these observable traits. If there is significant evidence of hybridization further research can determine why this is occurring and to what extent. If no evidence of hybridization is found, we will aim to offer another explanation for this observed variation in appearance of the fish.

Fish Ecology, Population Genomics, Fish Morphology

EXPLORING URBAN FORESTRY: UPDATING THE SUSQUEHANNA UNIVERSITY CAMPUS TREE INVENTORY

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Landscape trees on college campuses play a vital role in providing environmental services such as carbon sequestration, stormwater buffering, and overall campus aesthetics. Initiatives like college campus tree inventories can be used to quantify and evaluate these services and create opportunities for community engagement. A campus tree inventory is being conducted at Susquehanna University using traditional forestry practices with the goal of becoming a Tree Campus Higher Education institution through the Arbor Day Foundation. Roughly 500 trees have been catalogued so far, and their species, general health, size, and potential flaws have been recorded using ArcGIS. Preliminary problems such as pests, overcrowding, and hazardous branches have been identified and flagged for maintenance mediation. We hope to use the data from this survey to identify educational opportunities and investigate biodiversity on campus.

Urban forestry, Biodiversity

EFFECTS OF INVASIVE RIPARIAN VEGETATION ON GROWTH, DEVELOPMENT, AND SURVIVAL OF LARVAL AMPHIBIANS

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Invasive plants can have a strong negative effect on aquatic ecosystems by altering habitat structure, water quality, and food-web dynamics. Japanese Knotweed (*Fallopia japonica*, JKW hereafter) is a widespread invasive species that dominates many terrestrial and riparian habitats across the United States. Amphibians are the most imperiled vertebrate group, with 41 % being threatened with extinction, and many of them breed in aquatic habitats encroached by invasive plants. Previous studies found that a few invasive plants (e.g., Purple Loosestrife) have negative impacts on larval amphibians. To our knowledge, no studies examined the effects of JKW on growth and development of larval amphibians. JKW is a highly invasive plant rich in phenolic compounds and oxalic acid. Thus, we hypothesized that JKW leaves accumulating in aquatic habitats would negatively impact growth, development, and survivorship of Wood frog larvae (*Lithobates sylvaticus*), a locally common pond-breeding amphibian. During this spring, we conducted an outdoor mesocosm experiment with six experimental treatments combining three leaf types (JKW, native, and both) and two pond hydrological conditions (constant and water reduction). Preliminary analyses indicated that JKW leaves added to mesocosms significantly reduced larval survival and development. Leaf-litter types and pond hydrology also interactively affected amphibian development. These results suggest that JKW leaf litter can negatively affect wild amphibian populations that have already been exposed to various biotic (e.g., chytrid fungus) and abiotic (e.g., pesticides) stressors. As invasive JKW continues to spread, understanding its main and interactive effects with other stressors on various pond-breeding amphibians is imperative.

Invasive , Native , JKW

EXPERIMENTAL INVESTIGATION OF BUBBLE BARRIER TECHNOLOGY FOR MICROPLASTIC REMOVAL IN THE SUSQUEHANNA RIVER

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Microplastic pollution in oceans is becoming a growing issue on the planet. A company based in the Netherlands developed a solution called the Great Bubble Barrier. The concept is to reduce microplastic flow into the ocean by catching them in waterways. The process involves a bubble curtain at the bottom of a river or canal. As microplastics flow into the curtain, bubbles push them towards the surface for collection. The unique advantage of this system is its ability to allow aquatic life and waterway activities, including boating, to continue without physical obstruction.

Through lab experimentation and future field work we are applying this process to the Susquehanna River. To examine feasibility, two different sized lab flumes are used to conduct experiments under controlled flow conditions, with a target river velocity of 1 ft/s. Efficiency is analyzed by testing different bubble barrier designs and investigating the capture rate of three types of microplastics: polypropylene (PP), low-density polyethylene (LDPE), polyester. Preliminary results showed that the 12 inch zig zag configuration performed best, capturing 53% of PP, 100% of LDPE, and 20% of polyester.

Various outreach activities will be created to promote the project emphasizing pollution prevention and reducing plastic at its source. Future fieldwork will involve assessing microplastic presence and river conditions in the Susquehanna River to further evaluate feasibility of bubble barrier technology.

PFAS MONITORING IN THE BUFFALO CREEK WATERSHED: IMPLICATIONS FOR WATER QUALITY

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Perfluoroalkyl and polyfluoroalkyl substances (PFAS) are a broad class of human-made chemicals that have grown to a level of global concern over the past several years. Often referred to as "forever chemicals," these chemical pollutants have the potential to persist in the environment and living organisms, causing adverse effects. This research looked at PFAS occurrence within the Buffalo Creek Watershed, which encompasses approximately 120 square miles primarily in rural Union County.

In the summer of 2026, surface water samples were collected from six sites over the course of five weeks with the sites spanning from Mifflinburg, PA to right before it converged with the Susquehanna River in Lewisburg, PA. The goal of this study was to expand PFAS measuring over time on a local scale, contributing to monitoring efforts of the Buffalo Creek Watershed, as well as to establish PFAS quantification protocols at Bucknell University. The four PFAS compounds measured included PFOA, PFOS, PFHxS, and PFBS in addition to other water quality parameters.

Samples were concentrated via solid phase extraction and quantified using an LC-MS/MS. All samples from this monitoring process fell below the detection limits of 10 ng/L for all four of the PFAS compounds with internal standards falling within acceptance limits. This research will provide foundational steps for future PFAS research at Bucknell University.

PFAS, Water Monitoring

RESPONSES OF NON-GAME FISHES TO STREAM RESTORATION IN WARMWATER PENNSYLVANIA STREAMS

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Water chemistry and sediment size influence the occurrence and relative success of fish species within warmwater Pennsylvania streams. Stream restoration efforts are chosen for an intended change to water velocity, flow depth, and water chemistry, and thus should alter fish habitats in ways that could benefit some species while reducing the competitiveness of others. Susquehanna University's Freshwater Research Institute conducts aquatic surveys (by electrofishing) of fish on sites where stream restoration has been attempted. Populations and body condition of 22 fish species were used with 8 metrics of the fish habitat (discharge, pH, alkalinity, water temperature, inorganic carbon, loss on ignition, average gravel size, and average grain size) to identify species of interest. Creek chub (*Semotilus atromaculatus*) and tessellated darter (*Etheostoma olmstedi*) were chosen because they represent opposite grain size preferences and are common fish species in most streams across central Pennsylvania. Statistical analyses demonstrated tessellated darter body condition was significantly negatively associated with mean grain size, indicating a preference for sandy substrate. Meanwhile, creek chub body condition was positively associated with mean grain size, indicating a preference for silty substrate. The success of stream restoration efforts can be measured using the prevalence or relative biomass of specific indicator fish identified in these analyses. The use of indicator fish as tools for measuring the success of restoration efforts represents an effective and practical method for evaluating restoration success for watersheds where repeated fish surveys are being conducted.

Stream Restoration, Body Condition, Fish

DETERMINING GEOGRAPHIC GAPS IN VOLUNTEER WATER QUALITY MONITORING IN THE CHESAPEAKE BAY WATERSHED

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Community science (c-science), also called citizen science, is where community members participate in the scientific process, most commonly through data collection. C-science often allows for greater quantities of data to be collected inexpensively since participation is almost always volunteer based. This type of data collection is becoming increasingly mainstream, especially with the rise of programs such as iNaturalist, Audubon's Christmas Bird Count or Zooniverse. The Alliance of Aquatic Resource Monitoring (ALLARM), located at Dickinson College in Cumberland County, Pennsylvania, is a technical assistance provider for community-based water quality monitoring programs. Data collected by water quality organizations across the Susquehanna watershed, including ALLARM's volunteer program (named Stream Team), are uploaded to the Chesapeake Monitoring Cooperative (CMC) Data Explorer, a publicly accessible database. These data include multiple water quality parameters, including conductivity, pH, and nitrate. This study aims to evaluate the data uploaded by ALLARM volunteers to the CMC Data Explorer. In particular, the distribution of monitoring groups, stations, and samples across the Susquehanna watershed will be described. This will be used to determine geographic monitoring deficiencies, especially in relation to areas of high concern, based on land use and population density. Additionally, this study will investigate the prevalence of monitoring stations and the number of samples collected over time to determine the rate of change and frequency. Ultimately, the goal of this study is to identify areas of most concern, which would benefit the most from increased monitoring.

community science, volunteer monitoring

DISTRIBUTION AND POTENTIAL ECOLOGICAL ROLES OF AQUATIC BRYOPHYTES IN THE HEADWATER STREAMS OF THE UPPER DELAWARE RIVER WATERSHED

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Aquatic bryophytes are found in many headwater streams, yet little is known about the environmental factors that determine their community composition, distribution, and how they impact stream health. The purpose of this study was to determine what environmental variables affect aquatic bryophyte distributions and potential ecological roles in headwater streams of the upper Delaware watershed. We looked at groundwater contributions, canopy cover, dissolved oxygen, and pH. In streams where aquatic bryophytes were found, a PAM fluorometer was used for rapid light curves to determine the photosynthetic capacity of aquatic bryophytes. If applicable, samples were randomly sampled for identification, and additional samples were taken for further analysis. Nutrient composition was determined for carbon, nitrogen, and phosphorus to find CNP ratios within the streams. Chlorophyll-a was also determined after lyophilizing the sample and using 90% ethanol to extract the chlorophyll. With random selection for identification, the majority was Fontinalis sp., with other common northeastern aquatic mosses and a few liverworts. The overall role of bryophytes appeared to be affected by groundwater contributions, canopy cover, and pH.

PRELIMINARY EXAMINATION OF AMERICAN ROBIN (*TURDUS MIGRATORIUS*) NESTS FOR ANTHROPOGENIC NEST MATERIALS (ANMS) AND LEGACY SEDIMENTS ALONG THE SUSQUEHANNA RIVER FLOODPLAIN, SELINSGROVE, PA.

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Anthropogenic debris and legacy sediments incorporated into American robin (*Turdus migratorius*) nests have been documented in central Pennsylvania. This study evaluates anthropogenic nest materials (ANMs) along the Susquehanna River floodplain, from the Isle of Que (Selinsgrove, PA). Twelve nests were analyzed to determine how ANMs and sediments are distributed within the nest's three-part structure: an outer coarse layer, an interior mud cup, and an inner lining.

Grain-size, petrographic, and vegetation analyses were used to evaluate material provenance. The exterior layer contained natural plant material (white pine twigs, corn leaves, grasses, roots) alongside ANMs, including synthetic fibers, tarp, twine, a zip tie, ribbon, plastic binding, clear sheeting, and Easter grass. The mud cup contained fragments of quartz sand and silt, muscovite, brick, and shell shards (possibly *Corbicula*). Magnetic separation revealed coal, slag, garnet, magnetite, and quartz with magnetite inclusions, alongside organic earthworm castings and grass fragments. The innermost padding consisted strictly of natural fine grasses, fine twigs, and pine needles, containing no ANMs.

Preliminary sediment analyses suggest that mud from at least one nest was derived from modern river and floodplain deposits. The presence of slag, brick fragments, and plastics reflects localized human impacts on the Susquehanna River floodplain. Because robins incorporate materials collected from their immediate surroundings, nest sediments may provide a useful record of both natural sediment sources and anthropogenic materials present within the floodplain environment.

Legacy Sediment , Robin Nests, Anthropogenic Material

RECONNECTING FLOODPLAINS WITH BEAVER DAM ANALOGS: ANALYZING THE EFFECTIVENESS OF BDAS AT RETAINING SOIL MOISTURE.

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Restoring floodplain connectivity is imperative in incised streams, where stormflow is often confined to the channel rather than spread across the floodplain. Floodplains reduce downstream flooding by slowing water velocity, trapping sediment, and increasing water storage. However, land development, agriculture, and channelization have contributed to widespread floodplain disconnection across the United States. Beaver dam analogs (BDAs) are cost-effective structures designed to reduce stream velocity, increase groundwater recharge, and ultimately improve channel-floodplain connectivity. This study investigates how floodplain soil moisture responds to a sequence of eight BDAs and explores how different factors influence soil moisture retention.

At the Center for Environmental Education and Research in Selinsgrove, Pennsylvania, we installed 45 soil moisture probes along a 66 m stretch of floodplain neighboring a BDA restoration reach. Soil moisture measurements are compared with floodplain elevation, distance from individual BDAs, and local soil properties to determine which factors best explain patterns in moisture retention. Each probe records the volumetric water content and temperature at 10-minute intervals. These data will be analyzed alongside topographic surveys to evaluate how elevation impacts floodwater retention and how saturation trends differ between upper and lower reach BDAs. In addition, we have collected soil samples where each of the soil probes were installed to perform grain-size analyses. These analyses will allow us to determine whether soil composition affects moisture retention along the floodplain. Ultimately, this work informs how soil moisture and microtopography can be used to evaluate episodic floodplain reconnection and guide adaptive management of BDAs in incised, ephemeral streams.

Watershed/Stream Restoration, Floodplain Connectivity, Beaver Dam Analogs

ANTI-PREDATOR BEHAVIOR OF JAPANESE FRESHWATER CRABS, *GEOTHELPUSA DEHAANI*, TO EFFLUENT CHEMICAL CUES OF A MAJOR PREDATOR

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Predator-prey dynamics drive the evolution of defensive behavioral strategies in a prey species. Intraspecific variation in anti-predatory behavior can occur if populations of a single prey species have different exposure histories to the same predatory threat. Aquatic prey animals often detect threats using effluent chemicals released by predators and adjust their behavior in response. Here we investigated whether different antipredatory responses exist across populations of freshwater crabs (*Geothelpusa dehaani*) when exposed to olfactory cues of their prominent predator, the Japanese giant salamander (*Andrias japonicus*, JGS hereafter). We hypothesized that crabs from vulnerable populations (JGS presence) when exposed to effluent JGS chemical cues would spend more time exhibiting antipredatory behaviors than crabs from historically JGS-free populations. We collected crabs from the Gifu (JGS populated, n = 74) and Nagano (JGS free, n = 40) prefectures of Japan. We collected body size measurements for each crab, then exposed them to two water types: spring water with or without effluent salamander chemicals. We videorecorded all trials and scored time spent on land, freezing and rock manipulating behaviors. To date, we examined ~50% of videos, and preliminary analysis shows no significant effects of population origins, water types, and body size on the scored behaviors in freshwater crabs. An analysis of the full dataset is needed to validate our current findings.

predator response, freshwater crab, effluent chemicals

ENVIRONMENTAL VARIABLES INFLUENCE THE STRUCTURE AND FUNCTION OF FUNGAL COMMUNITIES IN THE HEADWATER STREAMS OF THE UPPER DELAWARE RIVER BASIN

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Headwater streams serve as the interface between terrestrial and aquatic environments, regulating downstream health through temperature-dependent, fungus-mediated nutrient cycling. Thus, protecting headwater streams from anthropogenic stressors that raise stream temperatures is crucial for preserving the health of entire watersheds. This study examines how the structure and function of fungal communities in 42 headwater streams throughout the upper Delaware

River watershed respond to anthropogenic change. Subtle differences in environmental factors such as stream temperature and nutrient concentrations were found to influence fungal enzymatic activity and the overall decomposition rate of wood in the streams. These results suggest that even subtle changes in headwater stream chemistry can affect the structure and function of the fungal community, therefore disrupting critical processes for maintaining downstream health.

USING BEAVER DAM ANALOGS IN A FLUME TO DETERMINE WATER LEVEL AND SEDIMENT MOVEMENT

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Beaver dam analogs (BDAs) are used to slow flow, promote sediment storage, and increase channel complexity, but the effects of design variables such as structure shape, permeability, and spacing remain difficult to isolate in the field. We used controlled flume experiments to evaluate how BDA spacing influences backwater development and affects sediment transport. Experiments were conducted in a 6m long, 42 cm wide flume, with a discharge of 1.763 L/s and a slope of 3.125%. We quantified sediment redistribution by processing top-down photographs in Agisoft and analyzing the data in R. Photos were taken with angled and parallel camera positions to evaluate the structure from motion in the gravel. The spacing experiment was set up with a pair of close together BDAs spaced 0.8m apart, and the further apart set spaced 1.4m apart. Water depth varied with the spacing between two BDAs. Compared to our baseline experiment, which stored 32 L, the close together BDAs stored 84 L, and the far apart set stores 105 L. The water depth returned to the baseline after the second BDA for both sets. Our work suggests that structure shape and spacing between BDAs change flow and the distribution of water depth, both are expected to affect where sediment is eroded, transported, and deposited. Analysis of data reveals patterns that will allow for a more in-depth analysis of the bedforms and sediment movement. This work may inform restoration practitioners on the impact BDA restoration spacing may have on the stream channel.

Stream restoration, environmental science

FROM RESTORATION TO RECOVERY: ASSESSING WINFIELD CREEK THROUGH SUSQUEHANNA UNIVERSITY STREAM MONITORING

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In 2023, the Union County Conservation District (UCCD) and Natural Resources Conservation Service (NRCS) initiated targeted implementation of best management practices (BMPs) across agricultural properties located on the sediment-impaired waterway within Winfield Creek headwaters, Winfield, PA. Four farms received BMPs including heavy use area protection, roofed manure stacking structures, walkway and access lane improvements, streambank exclusion fencing, riparian buffer plantings, and stream stabilization work with Pennsylvania Fish and Boat Commission. Once BMP work in the headwaters was funded, UCCD contacted U.S. Fish and Wildlife Service (USFWS) to assess 1.67 miles of mainstem Winfield Creek for installation of streambank stabilization and fish habitat structures. This large-scale project was designed and split into 3 phases with USFWS completing the in-stream construction, followed by forested riparian buffer plantings in each section (2025-2029). In 2022, Susquehanna University began stream monitoring by conducting stream ecology surveys to characterize the biological communities and habitat within the headwaters and mainstem of Winfield Creek. Surveys include fish, amphibian, and macroinvertebrate communities, water quality and chemistry, discharge, substrate and sediment, and habitat mapping. Temperature loggers were deployed (Fall 2023) and continue to be monitored year round. Recent sampling on June 3, 2026, in a restored mainstem reach showed early improvements: fish density increased over 10% from 2025 to 2026, and abundance was more evenly distributed across species. Stream monitoring will continue through 2031. We expect to have continued gains in biological communities, and water quality based on additional stream habitat restoration.

LOCAL IMPACTS OF A RESERVOIR AND TRIBUTARIES ON A LOW ORDER STREAM IN SNYDER COUNTY, PA

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The north branch of upper Middle Creek begins as a 1st order stream west of the village of Penns Creek and grows to a 3rd order stream before it merges with the west branch, east of Beaver Springs, PA. The north branch is located within Snyder County, PA and is influenced by local agricultural fields and forested state game lands, with habitat scores ranging from 142 to 221. The main stem of the north branch is highly variable in chemical makeup, acid neutralizing capacity, and diatom diversity from site to site. In our study, we sampled aquatic sites above Walker Lake, the main stem of the north branch of Middle Creek, and the tributaries that flow into the main stem. Prior to stratification of the reservoir, the upper north branch of Middle Creek was influenced most by first and second order tributaries, but after stratification, Walker Lake had a greater influence. For instance, the alkalinity in the main stem of Middle Creek ranges from 720 μeq/L to 1067μeq/L before stratification and 1460 μeq/L to 1093 μeq/L after stratification. Walker Lake stratified at the end of June and remained stratified during the rest of the study. Phosphate was high in the upper reaches but dramatically decreased downstream. Ammonium also showed a similar trend but was more gradual in its decline. Nitrate, however, showed an increase below Walker Lake and remained high (2-3 mg/L) through the rest of the main stem of the north branch. Diatom-generated metrics showed a mix of responses below the reservoir. The sedimentation index decreased downstream, and the pollution tolerance index suggested a decrease in organic pollution. The percent agricultural guild showed a major increase throughout the stream after stratification. The diatom community similarity was impacted by stratification of the reservoir. However, the stream at the respective sampling sites changed from site to site downstream. The overall patterns of nutrients and diatom communities suggested that Walker Lake had an impact both before and after stratification. Also, our results indicate that the two major tributaries had an impact that was as great as the reservoir, especially before stratification.

stream ecology, discharge, diatom metrics

LONG-LASTING EFFECTS OF ACID MINE DRAINAGE ON BENTHIC MACROINVERTEBRATE COMMUNITIES

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The McIntyre wild area was originally a bituminous coal mining town from 1870-1886 operated by the McIntyre coal mining company. While the town no longer remains, the effect of mining persists within the wild area. Streams affected by acid mine drainage (AMD) suffer from decreased buffering capabilities and high concentrations of dissolved metals. Polluted streams cannot provide habitat for benthic macroinvertebrates intolerant of pollutants. The purpose of this study was to test how far-reaching the effects of AMD are on benthic macroinvertebrate communities within the McIntyre wild area and whether community recovery has occurred since mining has ceased. Macroinvertebrates were collected using Surber sampling from streams categorized from most to least affected by mining efforts, with control samples taken outside of the McIntyre wild area. All the tributaries flow into Lycoming Creek or Rock Run. Samples were preserved in ethanol and subsampled using a gridded bin to reach ≥ 200 individuals. Individuals were identified by placing them into four-walled dishes then sorting them to order and identifying them to family. The samples will be analyzed using indexes of biotic integrity, showing the taxonomic diversity found within each sample and comparing the pollution tolerance of families in each sample. We are expecting that macroinvertebrates sampled from highly affected streams will have lower taxonomic diversity and pollution-intolerant taxa will be less abundant within the sample. If the control samples were to not show any difference from the experimental samples, it may suggest recovery or farther-reaching effects of AMD than predicted.

Acid Mine Drainage , Benthic Macroinvertebrates

BIOGEOCHEMICAL UPLIFT AFTER STREAM RESTORATION OVER SPACE AND TIME

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Situated within the heart of the Chesapeake Bay watershed, the largely agricultural Lancaster County has often been looked to as a critical pollutant source causing eutrophication and increased sediment loads in Bay waters. In Lancaster much of this pollution can be attributed to the heavily impaired streams that are found across the county as a result of hundreds of mill dams whose construction dates back to the early 1700s. In recent years a new method of restoration coined legacy sediment removal has been developed to combat the environmental consequences of mill dams, effectively returning these streams to their pre-colonial state. In legacy sediment removal stream restorations, floodplains are reconnected to stream channels to promote denitrification, springs are exposed to regulate temperature, soils buried for more than 200 years are exposed and native plants are planted into their natural habitat. Our study aims to understand how this type of restoration changes the quality of its environment over both space and time. To accurately measure environmental uplift, multiple variables were simultaneously analyzed to paint a more clear picture of how restorations are performing over space and time. This research monitored eight floodplain restorations in Lancaster County for soil and water health metrics along with upstream unrestored areas. These metrics included nitrate, bulk density, organic matter, temperature and pH. Restored areas generally showed significant improvement, with increased gravimetric water content and lower temperatures measured within restored reaches indicating successful reconnection of the floodplain and increased hyporheic exchange.

HOW IS ABUNDANCE, CONDITION, AND HABITAT QUALITY OF STREAM SALAMANDERS NORTHERN TWO-LINED (*EURYCEA BISLINEATA*), NORTHERN DUSKY (*DESMOGNATHUS FUSCUS*), AND NORTHERN SPRING (*GYRINOPHILUS PORPHYRITICUS*) INFLUENCED BY A STREAM'S DISTANCE TO ANTHROPOGENIC ADDITIONS?

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Amphibians, and especially salamanders, are becoming more threatened, with 41% of amphibians and 40% of salamanders being listed by the IUCN Red List as either critically endangered, endangered, or threatened. These rising percentages are perpetuated by increasing urbanization and changing land uses. Anthropogenic changes enhance runoff, erosion, and alter water quality. This study measured distances of streams to roads and buildings to compare to aquatic salamander abundance and condition, more specifically the Northern Two-Lined (*Eurycea bislineata*), Northern Dusky (*Desmognathus fuscus*), and Northern Spring (*Gyrinophilus porphyriticus*) salamanders. Measures of water quality and substrate type were also taken to compare to aquatic salamander abundance, condition, and distance to an anthropogenic addition. Water quality measurements were taken using a Hanna probe, and substrate size was determined using a gravel board. Electrofishing backpacks and dip nets were used to shock and collect salamanders during each 100-meter stream pass. We surveyed 58 sites in North Central Pennsylvania, doing 1-3 passes at each stream site. Each salamander's length (mm) and weight (g) was measured, and they were examined for injuries, missing limbs, or if they were gravid. Distances from downstream starting points to roads or buildings were plotted and measured (m) using ArcGIS digital mapping software. [GJE1] We predict that salamander abundance will decrease as anthropogenic influences get closer to their habitat in and around the stream, as well as their weights and lengths. As dissolved oxygen percentage and gravel size of streams decreases, it is predicted that salamander abundance and size will decrease as well.

HOW IS THE PRESENCE OF EASTERN HELLBENDER (*CRYPTOBRANCHUS ALLEGANIENSIS ALLEGANIENSIS*) POPULATIONS CONNECTED TO THE ANTHROPOGENIC LAND-USE OF TRIBUTARIES IN THE UPPER/MIDDLE SUSQUEHANNA REGION?

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Anthropogenic effects can reduce water quality, habitat viability, and species diversity and abundance in aquatic systems, altering ecosystem function. Amphibians, like eastern hellbender salamanders, are sensitive to changes in their environment and require specific habitat conditions to successfully reproduce and thrive in streams and rivers. Hellbenders are an indicator species of stream health because they are highly adapted to their environment, requiring large boulders for protection and colder, fast-flowing streams to avoid hypoxia. These giant salamanders are fully aquatic and cryptic, so relying on physical capturing techniques may prove difficult to assess their occupancy in watersheds throughout the Upper/Middle Susquehanna Region. Instead, we collected water samples from the Loyalsock, Plunketts Creek, Rock Run, and Pine Creek streams to test for environmental DNA (eDNA), which is a cost and time effective method to gather population occupancy data. Anthropogenic disturbance will be assessed by measuring the distance from each stream site to disturbances such as roads and buildings using ArcGIS. Local variables were measured at each stream site such as water quality, substrate size, and flow rate. We will examine how these site and landscape variables impact hellbender presence. We expect to find that as anthropogenic disturbance draws closer to the stream sites, there will be poorer water quality, and decreased eastern hellbender occupancy.

environmental DNA, *Cryptobranchus*

SPYING ON BLUEBIRDS

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Nest boxes are commonly used in bird conservation. Despite their wide use, relatively few studies have explored real-time behaviors inside the boxes. The Eastern Bluebird (*Sialia sialis*) is the species that humans most frequently attract to nest boxes. We developed a simple camera system for bluebird nest boxes that captures real-time behaviors inside the boxes. While commercial cameras are available for recreational observation inside boxes, these cameras rely on Wi-Fi and cellular signals for transmitting data, options often limited in remote settings. Our design employs wildlife trail cameras within boxes that record data on SD cards and are powered by batteries. Additionally, the use of a "dead slide" divider decreases disturbance of the birds during the exchange of SD cards and batteries.

nest box, bluebird

FLOW-CONNECTIVITY IMPROVES STREAM TEMPERATURE PREDICTIONS IN A KARST WATERSHED: A SPATIAL STREAM NETWORK APPROACH

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Stream temperature drives chemical and biological processes, so accurate predictive models are essential for stream-network management. However, karst systems are challenging to model because cool-spring groundwater discharge affects downstream surface water via flow connectivity. Previous regression and Euclidean modeling techniques do not explicitly represent this directional thermal transport. This study applies a moving-average, flow-connected stream network model to Spring Creek, a mixed-land-use karst watershed in central PA, and compares its performance with Euclidean and nonspatial regression approaches under high thermal variability. This model uses long-term temperature observations and available site and watershed-level predictors, including groundwater controls. Among the models we evaluated, the tail-up model using upstream spring distance, spring count, and spring discharge had the strongest fit and predictive performance, reducing RMSE prediction error by ~17% for both nonspatial and Euclidean models. These results highlight the value of incorporating flow-connected thermal transport when predicting thermal conditions in karst stream networks and provide a foundation for identifying thermally important reaches for targeted monitoring and management.

Stream temperature, Karst hydrology, Spatial stream network

FEELING GROOVY--AGAIN? SALAMANDER USE OF ARTIFICIAL COVER OBJECTS IN A RIPARIAN FOREST

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Artificial cover objects (ACOs) are a common method used to study terrestrial salamanders. We designed and deployed an experiment in 2024 and 2026 to investigate use of ACOs by Red-backed Salamanders (*Plethodon cinereus*) given the choice of plywood boards that were either smooth or grooved on their ventral surfaces. Our preliminary data revealed greater numbers of salamanders beneath grooved boards in both sample years (36% more in 2024 and 40% more, thus far, in 2026). Because our study area is also home to the lead-back morphotype of this species, a morphotype with significant behavioral differences, we have an opportunity to investigate differences in board use by the morphs. While more salamanders of both morphotypes were observed beneath grooved boards in both years, noticeably greater numbers of the lead-back morphotype were observed beneath grooved boards during both survey years. Our study continues to determine if these results are maintained through 2026.

Salamanders

FROM CHANNEL FORM TO FLUVIAL PROCESS: PHYSICAL MODELING TO INFORM STREAM RESTORATION

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Stream restoration requires understanding how channels respond to changing flows, sediment supplies, and interactions among water, sediment, vegetation, and structures. This faculty–undergraduate research project uses a Little River EM3 stream table to investigate fluvial processes, sediment transport and storage, and channel response to floods while exploring the distinctions between form-based and process-based restoration approaches.

Experiments incorporate scaled representations of natural channel design cross-vanes and J-hooks, mudsills, riprap, bridge crossings, large wood additions, logjams, and beaver dam analogs. Discharge and sediment inputs are carefully scaled to represent selected watershed conditions, including logging-related gravel accumulations and legacy sediment deposits. Repeat lidar surveys before and after selected experimental runs document channel adjustment and provide estimates of cross-sectional change, erosion and deposition volumes, and the spatial distribution of sediment storage. Model responses are compared with observations from inspections of restoration projects throughout Pennsylvania, connecting controlled experiments with field conditions.

The experiments provide a framework for examining how restoration structures interact with sediment continuity, channel mobility, and floodplain connectivity under varying flow and sediment regimes. They also support discussion of the objectives and limitations of approaches that emphasize prescribed channel geometry compared with those that accommodate or restore fluvial processes. Although physical models simplify natural systems, their observable and repeatable responses offer valuable opportunities for undergraduate research and practitioner education. Linking experimental measurements with field observations helps participants evaluate restoration in terms of channel adjustment and sediment dynamics as well as constructed form.

physical modeling; fluvial response; sediment transport; process-based restoration

USE OF LARGE WOODY DEBRIS FOR IMPROVED FLOODPLAIN RECONNECTIVITY AND HYPORHEIC EXCHANGE, LITTLE ARNOT RUN, ALLEGHENY NATIONAL FOREST, PENNSYLVANIA

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Little Arnot Run, a 9.51km^3 watershed in the Allegheny National Forest, Pennsylvania, is typical of forested headwater streams in the Allegheny Plateau region — narrow alluvial valleys surrounded by steep valley sides that were clearcut during the 19th-century, with managed silviculture and oil and natural gas operations continuing today. The streams remain relatively straight and incised, confined by relic railroad berms, and disconnected from abandoned side channels and floodplain.

Beginning October 2019, detailed geomorphic surveys were combined with hydrologic data collected at a network of 1 weather station, 4 stream gages. and 16 piezometers installed along a 2km reach of the valley floor, show hyporheic exchange potential (HEP) to be approximately 1 x 10^{-4} , suggesting excellent potential for valley-wide groundwater storage and hyporheic uplift. Lidar and field survey data suggested a pre-logging geomorphic grade line (GGL) of 0.012 could be achieved if large wood debris (LWD) and sediments from relic railroad berms were returned to the channel Prior to restoration, little to no hyporheic exchange occurred during summer and fall months, with riffles in the middle and lower reaches becoming completely dry.

Following restoration in August 2021, the lateral extent of hyporheic zone remained greatest during wet winter and spring months, but increased to as much as 30 m from the channel. Hyporheic flux rates from the stream to the adjacent alluvial aquifer remained high 0.23 m3 s^{-1}) during the spring months, when water levels in the stream are high. During the driest period of the year (August - October), water levels are 0.2m higher across the valley and hyporheic exchange rates increased from 0 to 0.19m3 s^{-1} Because of the bedrock-alluvium architecture, groundwater gradients continue to be greatest down the axis of the valley and down-valley flow estimated to be 3 to 5 times greater than lateral flow rates. However, increased lateral hyporheic exchange during the hot, dry summer and fall months has consistently decreased stream temperatures during the summer by 2-4°C for the past five years. Side channels, now reconnected and flowing year round, provide refugia for native brook trout during spring floods and spawning habitat in the fall.

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River Symposia

2006 to 2008

From The Branches to The Confluence

October 18-19, 2006



1st

Pennsylvania Abandoned Mine Drainage Remediation

September 28, 2007



2nd

The Susquehanna and Agriculture

September 12-13, 2008



3rd

River Symposia

2009 to 2011

Cultures At The Confluence - Native Americans

September 26, 2009



4th

October 22-23, 2010

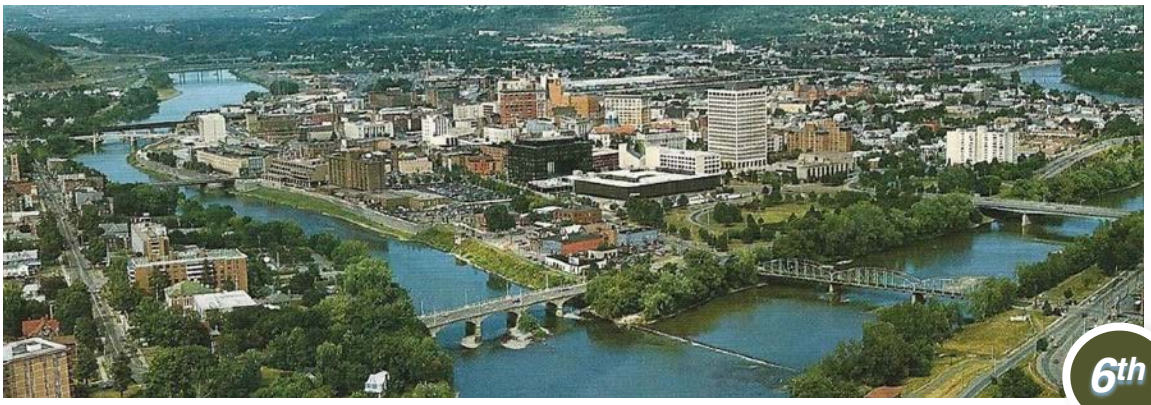
River Health and The Chesapeake Bay



5th

River Towns in the 21st Century

October 18-19, 2011



6th

River Symposia

2012 to 2014

Wasn't That A Mighty Storm! Flooding In The Susquehanna

October 12-13, 2012



7th

A Fragmented Systems - Dams On The Susquehanna

October 18-19, 2013



8th

Science and the River

November 21-22, 2014



9th

River Symposia

2015 to 2017

The River, Its Landscape and Our Lives

November 13-14, 2015



10th

A Tale of Two Rivers: The Susquehanna and Delaware

November 11-12, 2016



11th

The Spirit of Two Great Rivers

November 10-11, 2017



12th

River Symposia

2018 to 2020

Science, Conservation, and Heritage

November 26-27 2018



13th

Healthy Rivers, Healthy Communities

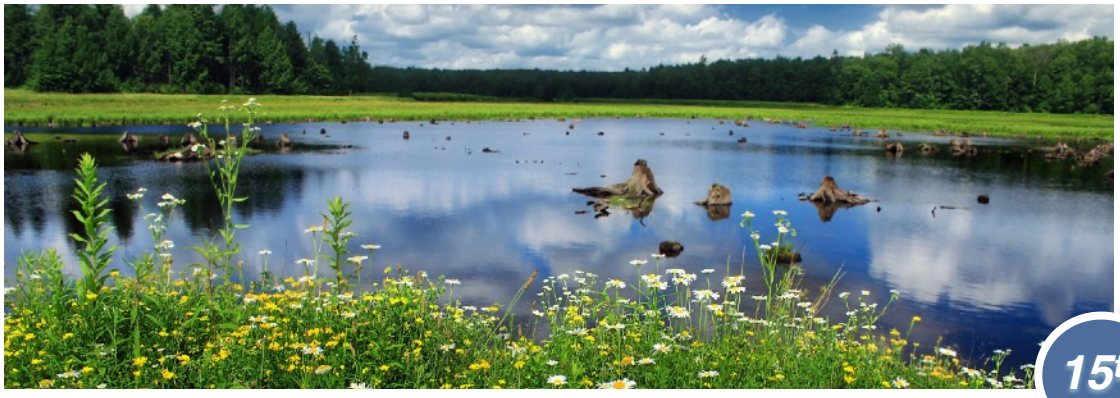
October 18-19, 2019



14th

Watersheds, Ecosystems, and Sustainability

November 6-7, 2020



15th

River Symposia

2021 to 2023

Restoration to Resilience: Creating Partnerships

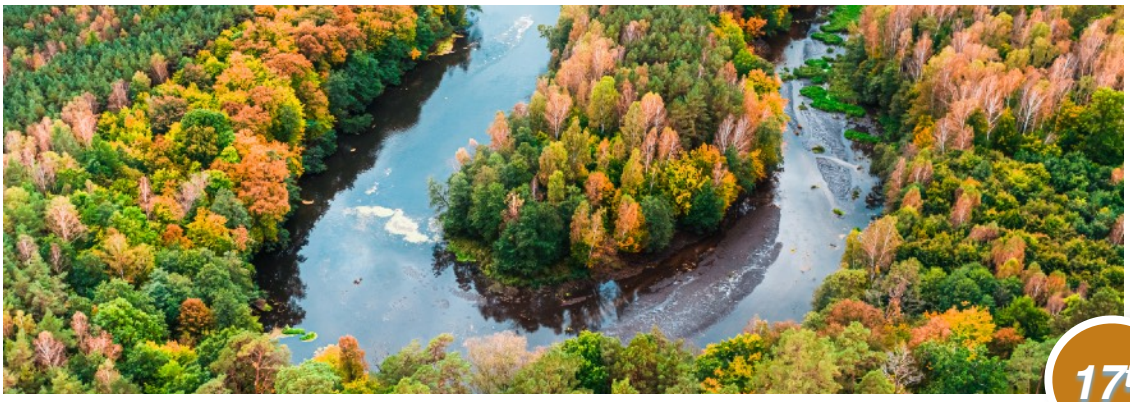
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16th

The River is Everywhere

November 4-5, 2022



17th

Navigating the Flow

November 3-4, 2023



18th

River Symposia

2024 to 2026

Abandoned Mine Discharge and The Susquehanna River

November 8-9, 2024



19th

Water and Rivers: What Does The Future Hold?

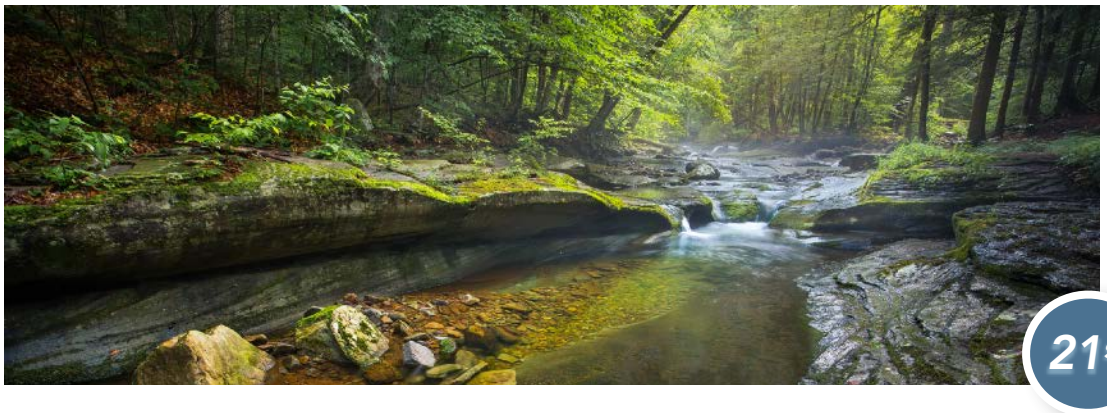
November 7-8, 2025



20th

Currents of Change: Rivers, Water, and Life

November 6-7, 2026



21st



Photo: Student researchers collecting water samples on Fishing Creek near Bloomsburg, PA under the supervision of Dr. Steven Rier, Professor of Biology.

SRHCES

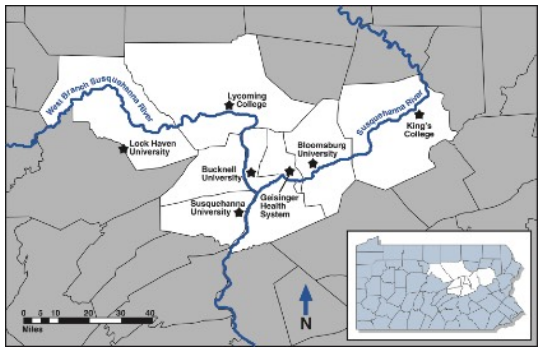
The **Susquehanna River Heartland Coalition for Environmental Studies** has played a major part of the River Symposium since its beginning 21 years ago. Established in 2005, the SRHCES is a unique collaboration of regional universities, environmental agencies, watershed groups, and the Geisinger Health System, all working together on interdisciplinary research projects in the "heartland" of the Susquehanna River waters.

Its members meet quarterly to discuss ongoing research projects, opportunities for collaboration, and emerging issues in the watershed.

The Coalition creates educational opportunities that promote student interest and involvement in the natural resources of the Susquehanna watershed.

It creates a unique collaboration that connects post secondary students attending institutions in the Susquehanna heartland region with local communities and environmental organizations.

Members present their findings at the Susquehanna River Symposium, professional conferences, and public events.



www.srhces.org



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The **Pennsylvania Water Resources Research Center (PAWRRC)**, founded in 1964, is authorized by Congress as one of the nation's 54 water resources research centers and institutes comprising the National Institutes of Water Resources. The program is administered by the U.S. Department of the Interior through the U.S. Geological Survey, in a unique Federal-State-University partnership. The institutes emphasize the role of University research, education, and outreach in advancing problems related to water quality and quantity. The PAWRRC is located at Penn State University, the primary land-grant University within Pennsylvania. At Penn State, PAWRRC is resides within and is administered by the Institutes of Energy and the Environment (IEE), organized under the Office of the Vice President for Research.

The Pennsylvania Water Resources Research Center cooperates with the National institutes of Water Resources, the U.S. Geological Survey, and Penn State Institutes of Energy and the Environment to support, coordinate and facilitate research through several programs:

Annual State Base Grants via USGS 104b. The PA-WRRC receives USGS 104B federal base funding from the USGS 104B program that is distributed via a small grants competition to researchers at academic institutions across Pennsylvania. Each federal dollar received through the program is matched with two non-federal dollars, and federal funds are not to used to pay indirect costs. PAWRRC uses the base grants to facilitate research on water resources issues, to help train new scientists, disseminate research results, and to cooperate with other colleges and universities and with other NIWR institutes to promote regional coordination. The FY 2019 USGS draft 104b and final 104b request for proposals describe the nationwide program and the role of PAWRRC. For applications from colleges and Universities in Pennsylvania, see the PA-WRRC 104b request for proposals.

Annual National Competitive Grants via USGS 104g. The U.S. Geological Survey in cooperation with the National Institutes for Water Resources supports an annual call for proposals to focus on water problems and issues that are of a regional or interstate nature or relate to a specific program priority identified by the Secretary of the Interior and the Institutes. The goals are to promote collaboration between the USGS and university scientists in research on significant national and regional water resources issues, promote the dissemination and results of the research funded under this program, and to assist in the training of scientists in water resources. See the FY 2019 104g request for proposals.

The PWRRC is a proud sponsor of this year's River Symposium.

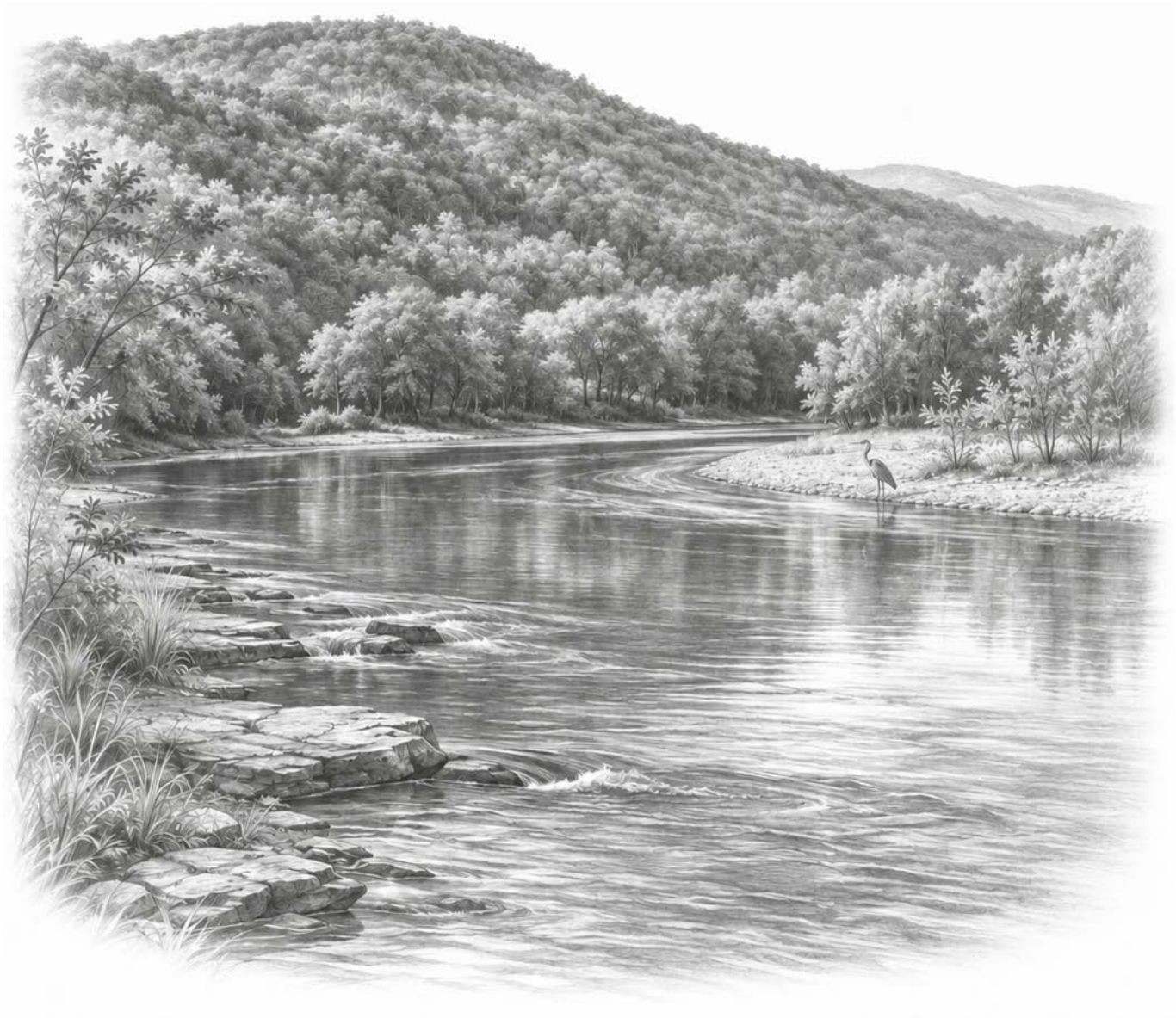
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Rivers, Landscapes & Life
Past, Present & Future

November 6–7, 2026



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