The 30th Annual

Maryland Water Monitoring Council Conference

MWMC @ 30:

Celebrating Successes & Tackling Emerging Challenges

NOVEMBER 21, 2024 MARITIME CONFERENCE CENTER LINTHICUM, MD

2024 MWMC Annual Conference Sponsors and Exhibitors

The Maryland Water Monitoring Council would like to recognize the support of KCI, who again have sponsored the Student Poster Contest and the after-conference social at Heavy Seas Brewery.

KCI

Many thanks to our exhibitors for their support of the conference.

TETRA TECH

MSRA

EA Engineering, Science, and Technology, Inc., PBC

Wetland Studies and Solutions, Inc. a DAVEY company

Meadville Land Service, Inc.

TOWSON UNIVERSITY Environmental Science & Studies

ecofabriks restoring nature with nature

YSI a xylem brand

GaiaXus Water quality monitoring systems for citizen science & education

STRAUGHAN ENVIRONMENTAL

SALT WATCH™ IZAAK WALTON LEAGUE OF AMERICA

EQR ENVIRONMENTAL QUALITY RESOURCES

WQDAS Water Quality Data Acquisition Solution

TechZone

Be sure to stop by their tables and thank them for their support of the 30th annual conference!

On the Cover – Original art by Claire Hirt (Carroll County Government)

Table of Contents

The 30th Annual Conference of the Maryland Water Monitoring Council
Welcome from the Chair of the MWMC Board of Directors - Matthew Stover

MWMC at 30: Celebrating Successes and Tackling Emerging Challenges

Welcome back Maryland's Water Monitoring Community! We're celebrating another milestone year for the Maryland Water Monitoring Council with this being its 30th year in existence. Keeping the Council going for that long takes a long list of dedicated volunteers whose names would fill up many pages of this program. These volunteers not only created the Council, but they organized the conferences and other events that the Council has sponsored over the years and have kept this organization running through times both easy and more challenging! The true strength of this Council has always been its members who bring their expertise, ideas, and energy to supporting the mission of sharing information on a wide range of water quality topics so that we all can benefit from this collective knowledge base. To all those before us and those currently contributing to the Council, I tip my hat to you!

This year's theme of "MWMC at 30: Celebrating Successes and Tackling Emerging Challenges" has to be one of my favorites. After all, who doesn't love celebrating successes! Given the milestone year for the MWMC, the Council was interested in revisiting some of our past successes so that we can learn and hopefully repeat them where possible. When I think of the collective water quality successes around Maryland, some that come to mind include the establishment of the Chesapeake Bay TMDL, the upgrading of all major wastewater treatment plants to enhanced nutrient removal, record cover crop enrollment, wide-scale implementation of green stormwater infrastructure, and major investments in restoration but admittedly, these are only a few. In our field of work, it's easy to lament the progress we haven't made, but these successes, and many others, deserve to be celebrated as they all required many partners and relentless collaboration to achieve. Celebrating them helps to remind us that we can accomplish great things with sustained effort and an inclusive approach.

Likewise, this year's theme also highlights the fact that we must continue to learn from each other as we face emerging threats to restoring, maintaining, and protecting water quality. The work continues as we grapple with newer concerns relating to PFAS contamination, microplastics pollution, and changes in weather patterns due to climate change, among many others. And though these emerging challenges may require different restoration techniques or even adaptation measures, the tenets of the MWMC to work collaboratively and share information still serve us well! To this end, this year's conference has several sessions discussing these issues.

To set the stage for a long list of captivating sessions and speakers and to inspire us to celebrate successes and tackle these new challenges, we have two amazing speakers in Rich Batiuk and Bob Shedlock. Rich spent 33 years working for EPA and the Chesapeake Bay Program where he led the integration of science into multi-partner decision-making. He was the principal architect of the Chesapeake Bay TMDL which shaped water quality restoration efforts of the Bay watershed, leading to record investments in improving the Bay. Since then, Rich has teamed up with Holly Greening as co-founders of CoastWise Partners to apply their combined 70+ years of experience to provide help with development and implementation of collaborative watershed management strategies. They've now worked with over 80 different partnerships, agencies, organizations, and institutions across the country and nobly, do all of this only for the cost of travel expenses! Bob Shedlock was one of the original board members of MWMC! He is a Scientist Emeritus at the U.S. Geological Survey, starting as a hydrologist in 1976 in the National Center in Reston, Virginia, and retiring as Director of the USGS Maryland-Delaware-District of Columbia Water Science Center in 2015. He has worked on interagency collaborations such as the Maryland Water Monitoring Council, the Baltimore Ecosystem Study, the Greater Baltimore Wilderness Coalition, and the Baltimore Urban Waters Partnership, for which he currently coordinates a team exploring urban flooding.

This year's conference wouldn't be complete without awarding the 18th annual Carl Weber Award to the person who most exemplifies a longstanding dedication to collaborative leadership in the field of water monitoring. We will also be awarding

the 8th Above and Beyond Award to recognize the contributions of someone who is a rising star in the field of water monitoring but who has already made a significant impact on the community through their efforts in increasing watershed awareness, advocacy, education, and stewardship. Please help me congratulate this year's winners at the conference!

The past year has been a productive one for the Council as we've ramped up the activities of many of our standing committees. In that time, we have brought you a workshop on eDNA, two webinars on data quality issues, another on best practices for continuous monitoring, and a session at this conference designed specifically for students. In addition, we have plans to hold a workshop on PFAS in January and additional webinars on a variety of data management topics. We hope that you'll consider attending these as well. These events and the conference itself would not be possible without the volunteers who make up the MWMC's Committees. As a reminder to anyone who might be interested, we welcome you to join one or more of our committees. No prior experience or qualifications are necessary; only a willingness to volunteer! We love having fresh ideas and extra hands to support the Council's mission. In addition, we're always looking for those who may be interested in joining our board of directors to help steer the Council in future years to ensure that we continue to serve the water monitoring community in relevant ways. Please consider reaching out to Katherine Hanna, our Executive Secretary, at Katherine.Hanna@maryland.gov if you have any questions about these positions.

Closing Thoughts

I believe I speak for the MWMC when I say that I am truly proud of what the Council has accomplished in 30 years. Not only has it provided a variety of learning experiences for the water monitoring community, but it has also fostered countless rewarding professional relationships that have led to even greater progress in our field. I hope that you feel the same and make the most of your time at the conference and other MWMC activities. I hope to see you there!

Cheers,

Matt Stover
Chair, Maryland Water Monitoring Council

The Carl S. Weber Awards

For Vision and Leadership in Monitoring Maryland's Waters

Our vision for monitoring in Maryland…

The MWMC envisions a time when monitoring methods, programs, projects, and data are the product of collaboration and comparability among agencies and organizations. The resulting information will be accessible for use by all stakeholders and will facilitate sound decision-making in environmental management and protection.

Dr. Carl S. Weber. Among many other things, Carl was one of the founding Board members serving a term on the MWMC Board in the mid-1990s representing the academic community. Today we honor Carl's life and work and celebrate the qualities that made him such an important part of the Maryland monitoring community with the annual presentation of the Carl S. Weber Award. Beginning in 2007, the Award has been presented annually to an individual involved in water monitoring in Maryland who exhibits the spirit, vision and leadership so exemplified by Carl. One person can make a difference!

Carl was a founding member of the University of Maryland-Baltimore County (UMBC) Biological Sciences Department and taught there for nearly 40 years. Although his training was in biochemistry, he developed an interest in stream ecology in the 1980s and became a self-taught aquatic biologist, eventually creating and teaching extremely popular courses on stream and river ecology at UMBC. Carl used Herbert Run, a Patapsco tributary that flows through UMBC, as a living classroom for his students that spurred research and restoration activities on the stream. In 2002, Carl won the UMBC 2002 Alumni Association Award for Mentoring. Many of the students Carl taught and mentored went on to internships and careers in the environmental protection field. Carl was instrumental in bringing the National Science Foundation's Long-Term Ecological Research Network to UMBC through the Baltimore Ecosystem Study. He also served as the first chair of the Patapsco Tributary Team.

Carl's entry into the monitoring world began when he got involved with the Friends of Gwynns Falls/Leakin Park in his home watershed. In 1989, he took on an amazing volunteer task—leading a unique and innovative new project for Maryland Save Our Streams and Baltimore County. "Project Heartbeat" was the first program in the United States to train volunteers to collect and analyze benthic macroinvertebrates and to assess physical habitat using EPA's 1989 Rapid Bioassessment Protocol. Carl jumped right in and became involved in every aspect of the program. Over a 10 year period, thousands of volunteers were trained to collect benthic samples and identify them to the taxonomic family level in a controlled lab setting. Through Carl, UMBC provided lab space and equipment, and for several years, Carl taught and supervised all the lab volunteers to ID 200-300 samples a year. He chaired both the community steering committee and the technical advisory committee, building a bridge among volunteers, watershed organizations, academia, the County, the State, EPA, and other stakeholders—all represented on these committees.

For years, Carl performed all the lab quality control and data analysis for Heartbeat. He co-authored Project Heartbeat's Quality Assurance Project Plan, the first of its kind for a volunteer biological monitoring program. In the 1990s, Project Heartbeat had a profound impact on volunteer water monitoring, environmental education, and watershed collaboration—not only in Maryland, but across the country. Because of this program, Baltimore County has a quality baseline data set on the health of its streams spanning more than 10 years. Project Heartbeat maintained a high level of scientific credibility and the program contributed to advances made in stream assessment and analysis methods within the Maryland Department of Natural Resources and the Maryland Department of Environment. Certainly the road to DNR's "Streamwaders" program was paved, in part, by Project Heartbeat's success. No one person is more responsible for any of these accomplishments than Carl Weber.

Through this award, we celebrate Carl's life and work by acknowledging others who share his generous spirit, his commitment to Maryland's waters, his vision for collaboration, and his leadership in advancing monitoring and assessment.

Previous Winners

2023 - Scott Phillips (US Geological Survey, retired)

2022 - Bruce Michael (Maryland DNR, retired)

2021 - Rupert Rossetti (Octoraro Watershed Association)

2020 - Dan Boward (Maryland DNR, retired)

2019 - Jim Gracie (Brightwater, Inc.)

2018 – Cathy Wiss (Audubon Naturalist Society)

2017 – Dr. Walter Boynton (University of Maryland Center for Environmental Science)

2016 – Bonnie Bick (Mattawoman Watershed Society)

2015 – Frank Dawson (Maryland Department of Natural Resources, retired)

2014 – Jim Long (Mattawoman Watershed Society)

2013 - Paul Kazyak (Maryland Department of Natural Resources)

2012 - Charlie Conklin (Gunpowder Valley Conservancy)

2011 - Bill Stack (Center for Watershed Protection)

2010 - Sally G. Horner (Magothy River Association)

2009 - Peter Bergstrom (NOAA)

2008 - Ron Klauda (Maryland Department of Natural Resources)

2007 - Susan "Abby" Markowitz (Tetra Tech) and Dr. Paul Massicot (Maryland Department of Natural Resources)

Above and Beyond Award

Many of the previous Carl Weber Award recipients have had lengthy careers and been a part of public agencies. The Above and Beyond Award will allow the MWMC to recognize someone who represents the next generation of Maryland's water monitors and the future of the MWMC. Presented annually to recognize contributions of an up-and-coming member of the Maryland's environmental community, the Above and Beyond Award is presented to a member who has volunteered time and energy towards the monitoring of Maryland's waters and has made a significant contribution to increasing watershed awareness, advocacy, education and stewardship. The MWMC is proud to include this new award in our 2016 conference and many more.

Previous Winners

2023 - Susan Simonson (Antietam-Conococheague Watershed Alliance)

2021 - Daniel Savoy (Wicomico River Creekwatcher)

2020 - Andrew Sarcinello (Trout Unlimited)

2019 - Suzanne Etgen (Anne Arundel Watershed Stewards Academy)

2018 – Joseph Davis and Matthew Budinger (Baltimore County Public Schools)

2017 – Rebecca Kenyon-Sisler (Garrett County Educator)

2016 – Ann Strozyk (Howard County Educator)

2024 Annual Conference Planning Committee

Andy Becker	KCI Technologies, Inc.
Megan Brosh	Baltimore County Department of Environmental Protection & Sustainability
Katherine Hanna (Chair)	Maryland Department of Natural Resources
Clark Howells	Washington Suburban Sanitary Commission
Ken Mack	Montgomery County Department of Environmental Protection
Mike McMahon	Maryland Department of the Environment
Becky Monahan	Maryland Department of the Environment
Mat Pajerowski	United States Geological Service
Nancy Roth	Tetra Tech, Inc.
Mark Southerland	Tetra Tech, Inc.
Mark Trice	Maryland Department of Natural Resources

Additional thanks to:

Mike Dhillon	Maryland Department of Natural Resources (Conference preparation)
Mary Genovese	Maryland Department of Natural Resources (Conference preparation)
Tomas Ivasauskas	Maryland Department of Natural Resources (Conference preparation)
Greg Mathews	Maryland Department of Natural Resources (Conference preparation)
Mike Mosser	Maryland Department of Natural Resources (Conference preparation & registration table)
Lindsay Powers	Maryland Department of Natural Resources (Registration table)
Rupert Rossetti	Octoraro Watershed Association (Registration table)
Scott Stranko	Maryland Department of Natural Resources (Conference preparation)

MARYLAND WATER MONITORING COUNCIL
30th Annual Conference - Thursday, November 21, 2024

MWMC @ 30: Celebrating Successes and Tackling Emerging Challenges

7:30 **Registration/Poster Set-up/Continental Breakfast – Registration in Room A-100**

Morning Plenary Session (8:30-10:00) in the Auditorium

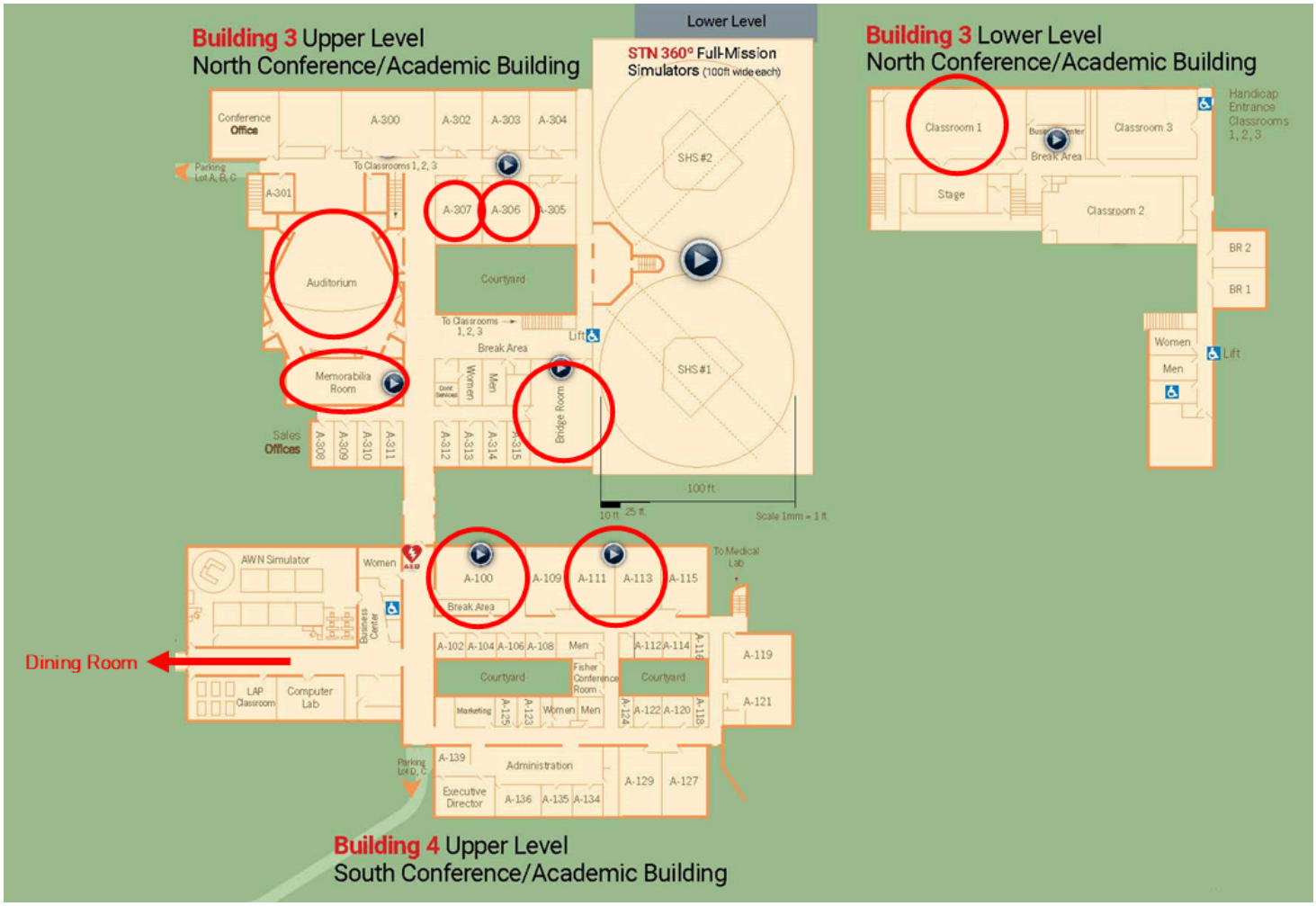
8:30 ***MWMC Board Chair's Call to Order*** **– Matt Stover – Maryland Department of the Environment; Chair, MWMC Board of Directors**

8:45 ***Plenary Speaker*** **- Rich Batiuk, Associate Director, Science, Analysis, and Implementation, U.S. Environmental Protection Agency, Chesapeake Bay Program Office (retired), Co-founder, CoastWise Partners**

9:15 ***Plenary Speaker*** **- Bob Shedlock, Scientist Emeritus at US Geological Survey, Emeritus Director of USGS MDDE-DC Water Science Center**

9:45 ***Carl S. Weber Award*** **– Clark Howells; Washington Suburban Sanitary Commission**

10:00 **Break/Poster Session – Authors Present**



Concurrent Sessions - 10:30 –12:00

AUDITORIUM – Restoration I
Moderator: Nancy Roth, Tetra Tech

TWO SAMPLING METHODS SHOW SIMILAR TRENDS IN THE BENTHIC COMMUNITY OF A RESTORED URBAN STREAM - Dennis Genito, Baltimore County Department of Environmental Protection & Sustainability

TRACKING THE CHANGES IN STREAM HEALTH FROM RESTORATION PRACTICES IN THE CHESAPEAKE BAY - Maya Sterett, Alliance for the Chesapeake Bay

WILD CELERY (*VALLISNERIA AMERICANA*) RESTORATION IN DEEP CREEK LAKE, MARYLAND - Mike Naylor, Maryland DNR

Classroom 1 - Emerging Concerns for Water Utilities
Moderator: Clark Howells, WSSC

QUANTIFYING FOUR DECADES OF CHLORIDE INPUTS FROM DEICING SALT TO THE BALTIMORE CITY REGION DRINKING WATER RESERVOIRS - Kyle Hurley, Towson University

DEVELOPING AND EVALUATING OPERATIONAL HYDROLOGICAL DROUGHT ONSET, DURATION AND INTENSITY FORECASTS FOR THE EASTERN UNITED STATES - John Hammond, U.S. Geological Survey, Maryland-Delaware-D.C. Water Science Center

UNDERSTANDING THE FACTORS AFFECTING PFAS VARIABILITY IN THE POTOMAC RIVER WATERSHED - Christina Davis, Loudoun Water

Bridge Room - Pain in my PFAS
Moderator: Mat Pajerowski, USGS

CURRENT STATUS OF USGS WATER MISSION AREA EFFORTS IN GW AND SW FIELD METHODS FOR PFAS - Gerolamo (Jerry) Casile, U.S. Geological Survey, Maryland-Delaware-D.C. Water Science Center

ENVIRONMENTAL AND MODELING APPROACHES TO ASSESS AND PREDICT PFAS FISH TISSUE CONCENTRATIONS IN VARIABLE ENVIRONMENTS - Krista Kraskura, Towson University, Environmental Science & Studies Program

NAVIGATING PFAS LITIGATION: SECURING MUNICIPAL REMEDIATION FUNDS - Michael G. Stag, Stag Liuzza

Room A-111/A-113 - Bioassessment I: What's Bugging You?
Moderator: Brian Smith, Maryland DNR

SEASONAL VARIABILITY OF BENTHIC MACROINVERTEBRATE ASSEMBLAGES IN URBAN LANDSCAPES - Chris Ruck, Fairfax County, VA, Watershed Assessment Branch

BACK RIVER NUISANCE MIDGE CONTROL PROGRAM - Kevin D. Brittingham, Baltimore County Department of Environmental Protection & Sustainability

AN ANALYSIS OF THE ADEQUACY OF THE MARYLAND BENTHIC INDEX OF BIOTIC INTEGRITY (BIBI) IN ASSESSING THE HEALTH OF SMALL STREAMS SELECTED FROM A FINER MAP SCALE - Mary Genovese, Maryland DNR

Concurrent Sessions - 10:30 –12:00 ctd.

Room A-306 - Agriculture Moderator: Ken Staver, UMD Wye Research and Education Center
MARYLAND AGRICULTURE AND WATERSHED RESTORATION – LOOKING BEYOND 2025 - Elizabeth Hoffman, Maryland Department of Agriculture
AGRICULTURE, DEVELOPMENT, AND LOCAL FISH HABITAT CONDITIONS IN CHESAPEAKE BAY - Jim Uphoff, Maryland DNR, Fishing & Boating Services
HOW THE ENDANGERED SPECIES ACT COULD DRIVE THE IMPLEMENTATION OF AGRICULTURAL CONSERVATION MEASURES - Niranjana Krishnan, University of Maryland, College Park

Room A-307 – Data Management & Modeling Moderator: Mike McMahon, MDE
ENSURING DATA QUALITY AND INTEGRITY IN ENVIRONMENTAL MONITORING - Najma Khokhar, TechZone MD
RELATING MANAGEMENT PRACTICE IMPLEMENTATION AND MODELED LOAD REDUCTIONS IN THE CHESAPEAKE BAY WATERSHED - Helen Golimowski, Devereux Consulting
VISUALIZING AND COMMUNICATING MONITORING DATA FOR POSITIVE CHANGE - Alexandra Fries, University of Maryland Center for Environmental Science

Lunch A - 12:00 – 12:45

Lunch B - 12:45 – 1:30

Poster Session – 1:00 – 1:30

Student Posters to present to judges at 1:00 in the Memorabilia Room

Concurrent Sessions – 1:30 –3:00

AUDITORIUM – Restoration II Moderator: Nancy Roth, Tetra Tech
"BUT THE STREAM LOOKS FINE TO ME." EFFORTS TOWARD COMMUNICATING AN UNDERSTANDING OF STREAM HEALTH AND WATERSHED FUNCTION - Adam Nabors, Maryland Stream Restoration Association
MAPPING EROSION: USING DEM DIFFERENCING TO GUIDE RESTORATION EFFORTS - Brennan Smith, Anne Arundel County Bureau of Watershed Protection & Restoration
A TALE OF TWO WATERSHEDS: WATER QUALITY IN FOSTER BRANCH AND PLUMTREE RUN, HARFORD COUNTY, MD - Alex Soroka and Jennifer Olszewski, U.S. Geological Survey

Classroom 1 - Stormwater Moderator: Christina Lyerly, MDE
LONG-TERM MONITORING OF SUBURBAN DEVELOPMENT AND STORMWATER MANAGEMENT IN CLARKSBURG, MONTGOMERY COUNTY, MARYLAND - Marina Metes, U.S. Geological Survey
QUANTIFYING IMPACTS OF SUMMER STORMS ON THE THERMAL REGIME OF AN URBAN STREAM SYSTEM AT THE WATERSHED SCALE - Claire Welty, University of Maryland, Baltimore County
STORMWATER AND BIORETENTION: PAST, PRESENT, AND FUTURE? - Allen P. Davis, University of Maryland, College Park

Concurrent Sessions – 1:30 –3:00 ctd.

Bridge Room - Community Science Moderator: Rupert Rossetti, Octoraro Watershed Association
CONNECTING COMMUNITIES TO ACCESSIBLE WATER MONITORING - Matthew Kierce, Izaak Walton League of America
PERFECTING PARTNERSHIPS FOR SMART SALT SUCCESSES - Abby Hileman, Izaak Walton League of America
ASSESSING WATER QUALITY CONDITIONS IN VULNERABLE COMMUNITIES IN THE CHESAPEAKE BAY WATERSHED - Leah Staub, U.S. Geological Survey

Room A-111/A-113 - Bioassessment II: Critters (and MBSS) in the Creeks Moderator: Scott Stranko, Maryland DNR
MARYLAND BIOLOGICAL STREAM SURVEY ROUND FOUR RESULTS INVESTIGATING POTENTIAL CHANGES OVER TIME IN STREAM CONDITIONS - Kyle Hodgson, Maryland DNR
STONECAT: USING MARYLAND BIOLOGICAL STREAM SURVEY DATA TO IMPROVE OUR UNDERSTANDING - Tomas Ivasauskas, Maryland DNR
MBSS COMPLETES SIXTEEN YEARS OF BIOLOGICAL MONITORING ON THE PATAPSCO RIVER COINCIDENT WITH DAM REMOVALS - William Harbold, Maryland DNR

Room A-306 - Microplastics Moderator: Mark Southerland, Tetra Tech
FRAMEWORK FOR MONITORING PLASTIC POLLUTION IN THE CHESAPEAKE BAY - Mark Southerland, Tetra Tech
ASSESSING BIOLOGICAL EFFECTS OF PLASTIC ON STRIPED BASS - Bob Murphy, Tetra Tech
A COMPARISON OF CHESAPEAKE BAY MICROPLASTIC CONCENTRATIONS, MORPHOLOGIES AND TYPES IN FOUR MARYLAND AQUATIC ENVIRONMENTS - Mark Trice, Maryland DNR

Room A-307 – E(ww) coli and other Water Management Problems Moderator: Chris Victoria, Anne Arundel Co. DPW
COMMUNITY SCIENCE RECREATIONAL WATER QUALITY MONITORING IN ANACOSTIA TRIBUTARIES - Maureen Mitchell, Anacostia Riverkeeper
SOURCING E. COLI IN THE ANACOSTIA WATERSHED: USING WATER QUALITY MEASUREMENTS AND MORE AS A PROXY INDICATOR - Jessie Ribera, Smithsonian Environmental Research Center
IMPACTS OF CLIMATE CHANGE ON LAKE ECOLOGY - Michael Hartshorne, Princeton Hydro, LLC

3:00 – 3:30 Break/Poster Session – Authors Present

3:00 Announcement of Student Poster Award Winners in the Auditorium

Concurrent Sessions – 3:30 –4:30

AUDITORIUM – Restoration III: Biochar-ging Ahead
Moderator: Mark Southerland, Tetra Tech

BIOCHAR FOR CLEAN WATER, HEALTHY SOILS AND CLIMATE RESILIENCY - Lori Lilly, Howard EcoWorks

BIOCHAR: A MULTIFACETED TOOL FOR ENHANCING CHESAPEAKE BAY WATER QUALITY AND CLIMATE RESILIENCY - Charles Hegberg, Scaling Up Biochar & Infinite Solutions

Classroom 1 - ***Session Canceled***

Bridge Room - Water Quality
Moderator: Becky Monahan, MDE

SALTIER RIVERS IN NATIONAL PARKS ARE A GROWING CONCERN - Dan Myers, Stroud Water Research Center

CHLORIDE AND HEAVY METALS IN HCC'S STREAM SYSTEMS - Dr. Rebecca Carmody, Howard Community College

Room A-111/A-113 - Bioassessment III: Fishing for Results
Moderator: Megan Brosh, Baltimore Co. DEPS

ASSESSING MARYLAND'S LIVE BAIT TRADE AS AN AQUATIC INVASIVE SPECIES PATHWAY - Gregory Mathews, Maryland DNR

CHANGES IN THE TIMING OF MARYLAND STRIPED BASS SPAWNING RUNS - Angela Giuliano, Maryland DNR

Room A-306 - Student Lightning Talks
Moderator: Lindsay DeMarzo, Howard Co. OCS

USING STABLE ISOTOPES (δ15N, δ18O, Δ17O) TO EVALUATE SOURCES AND CYCLING OF NITRATE IN SUBURBAN MARYLAND WATERSHEDS - Grace O'Hara, University of Maryland Center for Environmental Science

CHARGED WITH CONTAMINATION: UNPACKING PFAS POLLUTION IN LITHIUM-ION BATTERIES - Neal Goturi, River Hill High School

MICROBIAL CONTAMINATION IN THE GUNPOWDER RIVER WATERSHED: ASSESSING WATER QUALITY AND PUBLIC HEALTH RISKS - Chichedo Duru, Morgan State University

BIOMIMICRY TECHNIQUES IN DESIGN OF STORMWATER MANAGEMENT WITHIN FOUR CRITICAL AREAS OF THE CHESAPEAKE BAY - Clara McKnight, River Hill High School

CHARACTERIZATION OF LIVER DNA DAMAGE IN THE ANACOSTIA RIVER USING FUNDULUS HETEROCLITUS - Hana Chytil, University of Maryland

THE IMPACT OF RAINBOW DARTER ABUNDANCE ON MICROHABITAT USE OF OTHER DARTERS IN THE MONOCACY RIVER WATERSHED - Austin Kaplan, Hood College

Room A-307 – Monitoring Water from the Depths
Moderator: Heather Quinn, Maryland DNR

DESCRIPTION OF THE USGS GW MONITORING NETWORK IN MARYLAND, DELAWARE, AND THE DISTRICT OF COLUMBIA - Samantha Woomer, U.S. Geological Survey

EVALUATING AND MITIGATING THERMAL IMPACTS OF SMALL PONDS IN MARYLAND TROUT WATERSHEDS - Jason Cessna, Maryland DNR

4:30 Adjourn – **SOCIAL AT HEAVY SEAS BREWERY STARTING AT 5:00 (registration required)**

Posters

THE NATURAL HISTORY AND LIFE OF URBAN STREAMS - Ken T. Belt, US Forest Service (Ret.), Natural History Society of Maryland, UMBC

MONITORING AND MODELING OF FECAL INDICATOR BACTERIA USING HIGH-FREQUENCY SAMPLING IN URBAN WATERS OF THE NORTHEASTERN UNITED STATES - Jason Chase, U.S. Geological Survey

AN ANALYSIS OF BEAVER DAM ANALOGS ON FISH COMMUNITIES AT LITTLE GUNPOWDER FALLS - Katherine Chase, Maryland DNR

<STUDENT POSTER> CHARACTERIZATION OF LIVER DNA DAMAGE IN THE ANACOSTIA RIVER USING *FUNDULUS HETEROCLITUS* - Hana Chytil, University of Maryland

MICROBIAL CONTAMINATION IN THE GUNPOWDER RIVER WATERSHED: ASSESSING WATER QUALITY AND PUBLIC HEALTH RISKS - Chichedo Duru, Morgan State University

IMPACTS OF REGENERATIVE STORMWATER CONVEYANCE ON IRON CONCENTRATIONS AND AQUATIC COMMUNITIES: A COMBINED LAB AND FIELD STUDY - Neil Fuller, EA Engineering, Science, and Technology Inc., PBC

IMPACT OF HIGH pH ON CYANOBACTERIA GROWTH IN THE LINGANORE LAKES - Catherine Gaudlip, Hood College - Center for Coastal & Watershed Studies

PROMOTING ADVANCES IN HYDROLOGICAL MODELING THROUGH DEVELOPMENT OF THE OPEN-SOURCE, TIME-VARIANT WATER QUALITY MODELING SYSTEM RSPARROW 2.0 - Lillian Gorman Sanisaca, U.S. Geological Survey

DEVELOPING NEW IMAGING TECHNOLOGY PROCEDURES AT MARYLAND DNR'S PHYTOPLANKTON LABORATORY - Amy Hamilton, Maryland DNR

<STUDENT POSTER> THE IMPACT OF RAINBOW DARTER ABUNDANCE ON MICROHABITAT USE OF OTHER DARTERS IN THE MONOCACY RIVER WATERSHED - Austin Kaplan, Hood College

<STUDENT POSTER> INFLUENCE OF IRON AND POTASSIUM ON THE GROWTH OF *MICROCYSTIS AERUGINOSA* AND *ANABAENA VARIABILIS* AT DIFFERENT TEMPERATURES - Alexander Koo, Mount St. Mary's University

BIODEGRADATION OF PFOS WITH A DEHALOGENATING CULTURE - Michelle M. Lorah, U.S. Geological Survey

APPROACH AND METHODOLOGY FOR CONTINUOUS *E. COLI* BACTERIA MONITORING IN THE LOWER ANACOSTIA RIVER, WASHINGTON D.C. - Jeremy Malen, U.S. Geological Survey

COMPARATIVE REPRODUCTIVE AND HEPATIC DNA DAMAGE IN ANACOSTIA RIVER *FUNDULUS* SPECIES - Sabine Malik, University of Maryland College Park

IS SALINIZATION OF FRESHWATER A DRIVER OF INVASIVE CRAYFISH SUCCESS IN MARYLAND? - Faith Matthews, Towson University

EPIBENTHIC COLONIZATION AND TEMPORAL SHIFTS IN ABUNDANCE AND DIVERSITY AT POPLAR ISLAND - Martha McCauley, EA Engineering, Science, and Technology, Inc., PBC

<STUDENT POSTER> CHESAPEAKE WATER WATCH: VOLUNTEER MONITORING OF WATER CLARITY IN TIDAL TRIBUTARIES - Rebecca McClenahan, Davis & Elkins College/ Smithsonian Environmental Research Center

<STUDENT POSTER> BIOMIMICRY TECHNIQUES IN DESIGN OF STORMWATER MANAGEMENT WITHIN FOUR CRITICAL AREAS OF THE CHESAPEAKE BAY - Clara McKnight, River Hill High School

HIGH-FREQUENCY WATER QUALITY OBSERVATIONS ALONG AN URBAN TO RURAL GRADIENT IN BALTIMORE: AN UPDATE - Mary McWilliams, University of Maryland, Baltimore County

LEVERAGING THE BENEFITS OF LONG-TERM HYDROLOGIC MONITORING OF SENSITIVE WETLANDS - Kelley Moxley, WSP

GREY TO GREEN; INCREASED URBANIZATION SUGGESTS AN ELEVATION IN PHOSPHORUS PRESENCE AND GREATER ALGAE GROWTH IN THE CHESAPEAKE BAY WATERSHED - August Mullican, Hood College

ECOLOGICAL INDICATORS: EXPLORING THE USE OF ENVIRONMENTAL DNA TO ENHANCE BROOK TROUT CONSERVATION IN MARYLAND - Patience Odeh, Towson University

ONE WATER - Rich Ortt, Maryland DNR

THE MARYLAND SAFE DRINKING WATER STUDY: AN INITIATIVE TO PROTECT MARYLAND'S WATER - Georgia Parolski, University of Maryland, School of Public Health

CHLORIDE AND HEAVY METALS IN HCC'S STREAM SYSTEMS - Dr. Hannah Pie, Howard Community College

<STUDENT POSTER> *CHLAMYDOMONAS* AND *MICROCYSTIS* GROWTH AND COMPETITION WITH TRACE AMOUNTS OF MOLYBDENUM - Callie Polanka, Mount St. Mary's University

AN AGE AND GROWTH STUDY OF BLUE CATFISH POPULATIONS IN MD TRIBUTARIES - Evangeline Sawyers, Maryland DNR

DOES THE TYPE OF DESIGN FIRM DRIVE ECOSYSTEM SERVICE BUNDLES IN STORMWATER GREEN INFRASTRUCTURE? - Rahat Sharif, University of Maryland, College Park

CHESAPEAKE WATER WATCH: VOLUNTEERS ENHANCING SATELLITE REMOTE SENSING OF WATER QUALITY - Tara Sill, Smithsonian Environmental Research Center

INTERACTIONS OF OYSTER AQUACULTURE AND SEAGRASS: EFFECTS OF FLOATING OYSTER CAGES ON LIGHT PENETRATION - Owen Skirtich, University of Maryland Eastern Shore

INNOVATIVE APPROACH FOR BIOREMEDIATION OF NITRATE-CONTAMINATED BRINE USING HALOPHILIC DENITRIFIERS FOR WATER QUALITY RESTORATION - Leonardo Soto, Institute of Marine and Environmental Technology, University System of Maryland

<STUDENT POSTER> INVESTIGATING THE IMPACT OF INCREASED FLOODING & GROUNDWATER TABLE RISE ON PATHOGEN REMOVAL IN THE SOIL TREATMENT AREA OF COASTAL SEPTIC SYSTEMS - Emily Speierman, University of Maryland

SUSQUEHANNA RIVER BASIN COMMISSION – NEW AND CONTINUING ACTIVITIES IN MARYLAND - Luanne Steffy, Susquehanna River Basin Commission

A NOVEL AQUATIC INVERTEBRATE MODEL: USING JUVENILE ODONATES TO BETTER UNDERSTAND SALINITY AND PFAS STRESSORS - Talia Tanner, Towson University

HIDDEN NEUROTOXINS IN BENTHIC CYANOBACTERIA MATS - Catherine Wazniak, Maryland DNR

THE ROLE OF UNMANNED AERIAL VEHICLES IN CHARACTERIZING STREAM FLOW DYNAMICS - Gregory Zuknick, EA Engineering, Science, and Technology, Inc., PBC

Plenary Speakers

Rich Batiuk

Associate Director for Science, Analysis, and Implementation, United States Environmental Protection Agency, Chesapeake Bay Program Office (retired)

Rich Batiuk was the Associate Director for Science, Analysis, and Implementation at the United States Environmental Protection Agency's Chesapeake Bay Program Office located in Annapolis, Maryland retiring in July 2018. In his 33 years with EPA and the Chesapeake Bay Program partnership, he led the integration of science into multi-partner policy-making and collaborative decision-making.

For the past seven years, Rich teamed up with Holly Greening, former Director of the Tampa Bay Estuary Program, as co-founders of CoastWise Partners to apply their combined 70+ years of experience to provide help with development and implementation of collaborative watershed management strategies. They worked with over 80 different partnerships, agencies, organizations and institutions across the country and around the world, all for only good food!

Besides working for good food, Rich keeps busy fly fishing, kayaking, hiking, backpacking and doing anything else to go play outdoors in addition to working as a member of the Board of Directors for both the Chesapeake Conservancy and the Appalachian Mountain Club.

He received his B.S. in Environmental Science from the University of New Hampshire in 1984 and his M.S. in Environmental Toxicology from American University in Washington D.C. in 1985.

Bob Shedlock

Scientist Emeritus at US Geological Survey, Emeritus Director of USGS MDDE-DC Water Science Center

Bob Shedlock was one of the original board members of MWMC. He is a Scientist Emeritus at the U.S. Geological Survey, starting as a hydrologist in 1976 in the National Center in Reston, Virginia, and retiring as Director of the USGS Maryland-Delaware-District of Columbia Water Science Center in 2015. His career experience and publications include regional and local investigations of groundwater, water supply, water quality, and groundwater interactions with wetlands and surface waters. He has worked in coastal zones of Lake Michigan and the Delmarva Peninsula and has also worked on coupled hydrological and ecological studies in urban areas including northwest Indiana and the greater Baltimore region. He has worked on interagency collaborations such as the Maryland Water Monitoring Council, the Baltimore Ecosystem Study, the Greater Baltimore Wilderness Coalition, and the Baltimore Urban Waters Partnership, for which he currently coordinates a team exploring urban flooding. He has a B.S. degree in geology from the University of Notre Dame and an M.S. degree in geology from the University of Michigan. He lives in Towson with his wife, Linda, and is an avid gardener and grandfather.

Oral Presentation Abstracts

BACK RIVER NUISANCE MIDGE CONTROL PROGRAM

Kevin D Brittingham, Baltimore County Department of Environmental Protection and Sustainability; kbrittingham@baltimorecountymd.gov

Session: Bioassessment I: What's Bugging You? - Room A-111/A-113, 11:00

In response to numerous complaints of nuisance midge swarms from citizens residing along Back River, Baltimore County Department of Environmental Protection & Sustainability (DEPS) began a monitoring program in the fall of 2009 to determine the extent of the midge population. Midges (Order Diptera: Family Chironomidae) are non-biting aquatic flies that tend to swarm in large numbers along open bodies of water and rest in nearby trees, shrubbery, homes, and boats. The insects spend most of their lives as larvae living underwater in the sediment, then emerge as flying insects in their last few days to mate and lay eggs on the water. These mating swarms can be a nuisance to residences and businesses near the water. In the spring of 2022 Baltimore County with collaboration from the Maryland Department of Agriculture began Bti treatments of a 1,200-acre area of the tidal Back River, which was considered the major hotspot for the nuisance midges. Monitoring data has shown that the Bti treatments are effective in lowering the numbers of midge larvae in the river sediment along with fewer nuisance midge complaints by citizens. In addition to the tidal river treatments DEPS began to treat the Back River WWTP starting in the fall of 2022 which has been highly effective in controlling the nuisance midges in the 4-acre Sand Filter Facility of the plant.

Dr. Brittingham received his doctorate in Environmental Science and Policy from George Mason University. His dissertation work involved monitoring benthic macroinvertebrate communities as indicators of reconstructed freshwater tidal wetlands along the Anacostia River. He currently works for Baltimore County DEPS as the manager of the Water Quality Management Program. His team is responsible for all water quality monitoring in Baltimore County pertaining to the NPDES MS4 permit requirements, which includes: biological, water chemistry, bacterial, geomorphological, illicit connection, stream assessments and emerging contaminants.

CHLORIDE AND HEAVY METALS IN HCC'S STREAM SYSTEMS

Dr. Rebecca Carmody, Howard Community College; rcarmody@howardcc.edu

Coauthors: Stephen Shaner, Howard Community College (currently at UMBC); Hannah Pie, Ph.D., Howard Community College

Session: Water Quality - Bridge Room, 4:00

Stream pollution caused by road runoff is a problem for stream ecosystems and the overall quality of the water. Many different pollutants accumulate on roads and can be washed into streams by storm runoff, such as trash, road salts, and metals. Our goal for this project was to measure the levels of manganese, iron, nickel, and chloride in two streams on the Howard Community College (HCC) campus in order to monitor how the overall health of the streams may be affected by road and construction site runoff. We collected monthly water samples from five locations on two campus stream systems. We examined the water quality at each site using sensors and then analyzed the concentrations of manganese, iron, and nickel using an atomic absorption spectrophotometer. Iron and manganese levels varied by location with one site (Site B) consistently having the highest concentrations of both metals. However, nickel was generally below the detection limit in most of the sites, besides notably the closest site to the ongoing campus construction project (Site D). In 2023, there was an overall decrease in average chloride concentrations across all sample locations which could be related to a decrease in road salt application during the winter of 2022-2023 due to the almost complete lack of snow.

Rebecca Carmody earned a Ph.D. in Earth and Planetary Sciences from the Johns Hopkins University in 1991. After conducting post-doctoral research at the U.S. Geological Survey and working in both stable- and radiogenic-isotope labs at the University of Hawaii, Dr. Carmody began teaching as an adjunct instructor at Howard Community College in 2008. Over the years, she taught lecture and lab courses in geology, earth and space science, astronomy, and other physical sciences at HCC. In 2017, Dr. Carmody accepted the position of Physical Sciences Lab Manager at Howard Community College where she is responsible for managing the organic and inorganic chemistry labs.

CURRENT STATUS OF USGS WATER MISSION AREA EFFORTS IN GW AND SW FIELD METHODS FOR PFAS

Gerolamo (Jerry) Casile, USGS MD-DE-DC Water Science Center; jcasile@usgs.gov

Session: Pain in my PFAS - Bridge Room, 10:30

Poly- and perfluoroalkyl substances (PFASs) are present in groundwater and surface water at greatly varied concentrations. Legacy USGS sampling protocols for low-level organic constituents as specified in the USGS National Field Manual for the Collection of Water Quality Data contain many materials that may have compatibility problems with trace concentrations of PFAS. Materials containing fluoropolymers are potential contamination sources for PFAS and other materials may sorb PFAS. USGS developed sampling protocols for use at groundwater and surface-water sites where the concentration of PFAS is expected to be low (<200 parts per trillion). These protocols have been in use since the summer of 2018 in many hydrologic settings across the United States. Further testing has been done using spike solutions to assess the suitability of equipment currently in use for sampling GW and SW for PFAS. The current status of USGS efforts to refine sampling protocols for PFAS will be presented.

Jerry is the GW Specialist in the USGS MD-DE-DC Water Science Center. He has been a field and lab hydrologist in methods of GW dating using anthropogenic tracers and managed the USGS GW Dating Laboratory in Reston for over 25 years. He is the Coordinator for the USGS National Field Manual for the Collection of Water Quality Data (NFM) and is on the team developing GW and SW sampling protocols for PFAS.

EVALUATING AND MITIGATING THERMAL IMPACTS OF SMALL PONDS IN MARYLAND TROUT WATERSHEDS

Jason Cessna, Maryland DNR; jason.cessna@maryland.gov

Coauthors: Adam Eshleman, MD DNR; Mark Staley, MD DNR; Michael Kashiwagi, MD DNR

Session: Monitoring Water from the Depths - Room A-307, 4:00

Agricultural and recreational ponds commonly impound small streams, springs, and seeps, thermally impacting downstream aquatic assemblages. Maryland DNR Freshwater Fisheries inventoried small impoundments in coldwater watersheds to better understand their influence on downstream water temperatures. Thermal loading was also directly measured from eight small impoundments in Allegany, Baltimore, Carroll, Frederick, and Harford counties using continuous data recorders. The results suggest that higher pond densities within coldwater watersheds were associated with increased stream temperatures when combined with increased development and impervious land cover. Additionally, two small ponds in the Upper Gunpowder Falls watershed and one pond in the Savage River watershed were chosen as candidates for installation of subsurface withdrawal devices to determine if thermal loading could be reduced using low-cost riser modifications. Two modification designs were tested, with continuous temperature data recorded at the inflow, outflow, and water surface of the ponds. Substantial reductions in pond effluent temperature were realized at all locations. Although complete removal of small impoundments may yield the largest improvements to downstream thermal regimes, altering pond discharge structures may also offer an immediate low-cost thermal benefit to downstream coldwater assemblages.

Jason Cessna, Adam Eshleman, Mark Staley, and Michael Kashiwagi are biologists with the Maryland Department of Natural Resources, Freshwater Fisheries Program. All have worked extensively within intact and degraded coldwater systems Maryland.

CHARACTERIZATION OF LIVER DNA DAMAGE IN THE ANACOSTIA RIVER USING *FUNDULUS HETEROCLITUS*

Hana Chytil, University of Maryland; hchytil@terpmail.umd.edu

Coauthors: Danny Feliciano, University of Maryland College Park, Mallory Gray, University of Maryland College Park, Paige Keift, University of Maryland College Park, Katherine Mackie, University of Maryland College Park, Sabine Malik, University of Maryland College Park, Colin Simmons, University of Maryland College Park, Dr. Lance T. Yonkos, University of Maryland College Park

Session: Student Lightning Talks - Room A-306

The liver is important for detoxification of contaminants in fish. Understanding how livers of Fundulus heteroclitus (mummichog) respond to contaminants is key to determining the link between pollution and fish health. Previously, the Comet assay was used to identify DNA damage in sperm cells of fish sourced from polluted waters. Further development allowed identification of DNA damage in livers as well. Mummichog are known to develop adaptive chemical resistance to particular organic contaminants. Therefore, analysis of the liver is necessary to investigate whether contaminant metabolism is related to reproductive toxicity. Mature male mummichog (n=8/site) were collected from Bladensburg, Pepco Cove and Kingman Lake, contaminated sites within the Anacostia River, MD, as well as from the comparatively clean Wye River, MD. Livers were dissected from each fish, hepatocytes disaggregated, cells embedded in agarose and run via single-cell gel electrophoresis. Results were stained and imaged via fluorescence photomicroscopy. Scoring of Comet tails indicated significant DNA damage in hepatocytes of fish from contaminated sites compared to the reference population. Results demonstrate the utility of the Comet assay as a tool for in situ investigation of contaminant-induced DNA damage in mummichog liver cells and as part of a larger diagnostic toolkit for quantifying fish health.

Hana is a senior Environmental Science and Technology major at the University of Maryland, College Park. She is an undergraduate research assistant working with Dr. Lance Yonkos trying to better understand fish heath in response to environmental contaminants. Hana is also a member of Epsilon Eta, the professional environmental science fraternity at UMD that focuses on implementing service and sustainability projects throughout the campus community.

UNDERSTANDING THE FACTORS AFFECTING PFAS VARIABILITY IN THE POTOMAC RIVER WATERSHED (WRF 5269)

Christina Davis, Loudoun Water; ccdavis@loudounwater.org

Coauthor: Laura O'Donnell, WSSC Water

Session: Emerging Concerns for Water Utilities - Classroom 1, 11:30

The Potomac River is the primary source of drinking water for more than five million people in the Maryland-Virginia-DC Metro area, as well as for numerous upstream communities. Since its inception in 2005, the Potomac Drinking Water Source Protection Partnership's (DWSPP's) 15 public water systems (PWS) and 10 government agencies have collaborated on source water protection issues to ensure the safety and resilience of this source water. Over its existence, DWSPP has made substantial strides in understanding source water risks, including municipal, agricultural, and industrial threats. As a result, this voluntary coalition has become a collective knowledge center for source water protection prioritization and planning. With looming PFAS NPDWRs, utilities face high-cost capital investment decisions regarding mitigation and/or treatment. These decisions are especially difficult for PWS where monitoring has indicated PFAS levels just below MCL levels. These issues along with the high cost of treatment beg the questions: What is the likelihood of higher PFAS levels in source water? What is driving the variability in PFAS levels? Can monitoring data help to identify effective source control strategies?

Christina Davis is a Senior Environmental Engineer at Loudoun Water in Ashburn, VA. In her current role and in her previous position at the Interstate Commission on the Potomac River Basin, she led source water protection, emerging contaminants, and water quality projects. Christina is an active member of the American Water Works Association and the Potomac Drinking Water Source Protection Partnership. She holds a Ph.D., M.S., and B.S. in Civil/Environmental Engineering from Virginia Tech and is a graduate of the Water Environment Federation's Water Leadership Institute.

Laura O'Donnell is employed as an Environmental Scientist at WSSC Water. Her work focuses on source water protection and environmental management. Laura is a part of the Project Team for the PFAS watershed study in the Potomac River. She also serves as Co-Coordinator of the Patuxent Reservoirs Watershed Protection Group Technical Advisory Committee. Prior to her time at WSSC Water, Laura spent over 10 years working on environmental assessment and remediation projects. She holds a Bachelor's Degree in Mechanical Engineering and a Master's Degree in Environmental Planning and Management.

STORMWATER AND BIORETENTION: PAST, PRESENT, AND FUTURE?

Allen P. Davis, Ph.D., P.E., University of Maryland College Park; apdavis@umd.edu

Session: Stormwater - Classroom 1, 2:30

Bioretention (a soil/vegetation management practice) is a "low impact" "green infrastructure" stormwater control measure (SCM) employed to mitigate impacts of impervious surfaces. Significant progress has been made over the past three decades in understanding the unit treatment processes in bioretention to allow interpretation of water quality performance. This unit operations approach is exemplified through consideration of particulate matter, phosphorus, nitrogen, metals (copper and zinc), PCBs, and PAH in bioretention (and related SCMs). Source stormwater ievaluation and characterization/speciation of these pollutants in stormwater is necessary to understand their performance in SCMs. Particulate-bound pollutants are removed in conjunction with stormwater particulate matter, which can be very effectively removed and treated via bioretention filtration mechanisms. Managing dissolved species is more challenging and requires careful consideration of the SCM media properties and adsorption characteristics. Specific media can be identified to address removal of specific pollutants based on adsorption properties. Biological (microbial and vegetative) processes play a role in transformations of several pollutants and bioretention design conditions can be modified to exploit beneficial biological reactions. As emerging stormwater pollutants are identified, a unit operations approach will help to estimate bioretention treatment performance for these pollutants once we understand their physical, chemical, and biological properties. A treatment train approach to treatment can offer advantages in addressing stormwater quality.

Allen P. Davis is Professor and Charles A. Irish Sr. Chair in Civil Engineering in the Department of Civil and Environmental Engineering and Affiliate Professor in Plant Science and Landscape Architecture at the University of Maryland. For three decades he has been investigating sources and treatment of pollutants in urban stormwater with a focus on nature-based practices. He has co-authored over 150 journal articles and two books, most recently, Green Stormwater Infrastructure, Fundamentals and Design (2022). He is a Licensed Engineer in Maryland, a Board-Certified Water Resources Engineer, and a Fellow of the American Society of Civil Engineers and of the ASCE Environmental & Water Resources Institute.

VISUALIZING AND COMMUNICATING MONITORING DATA FOR POSITIVE CHANGE

Alexandra Fries, University of Maryland Center for Environmental Science; afries@umces.edu

Session: Data Management & Modeling - Room A-307, 11:30

Monitoring and assessment are vitally important to understanding environmental conditions and manage water resources. Monitoring data can be used in a variety of applications and to build stories to support resource management and restoration decision making. While data on its own can be used and understood by some audiences, effective data visualizations help communicate science effectively to solve environmental problems. Science communication can promote the preservation of coastal and estuarine habitats, elucidate ecosystem services and resources those habitats provide, and support cultural heritage through transdisciplinary science and inclusive stakeholder approaches. Science communication is not only important for promoting diversity and inclusion in science, but also to maintaining relationships and partnerships by communicating data in an understandable, engaging way. To achieve environmental management, successful restoration, and clean water goals means that clear communication is needed to engage with local communities. This talk will show examples of effective data visualizations and various types of communication products created by water monitoring groups in Maryland and beyond.

Alexandra Fries is a Program Manager at the Integration and Application Network (IAN) based at the University of Maryland Center for Environmental Science in Annapolis MD. Alexandra's work in environmental management has been focused on assessment, monitoring, and management of aquatic, marine, and terrestrial ecosystems. Alexandra has extensive experience in data analysis, synthesis, mapping, interpretation, and communication.

TWO SAMPLING METHODS SHOW SIMILAR TRENDS IN THE BENTHIC COMMUNITY OF A RESTORED URBAN STREAM

Dennis Genito, Baltimore County Department of Environmental Protection & Sustainability; dgenito@baltimorecountymd.gov

Coauthors: Dr. Susan Gresens, Towson University

Session: Restoration I - Auditorium, 10:30

The Cloisters Branch of Towson Run was restored in 2018 to reduce bank erosion, establish stable planform, and improve riffle and pool function. Care was taken in design to preserve the existing forest buffer to the maximum extent possible. The benthic community was sampled once pre- (2013) and twice post-restoration (2023 and 2024) at five stations. Two methods (floating chironomid pupal exuviae and d-net) were compared to assess changes in the benthic community and determine if the two methods provided complimentary information. Water quality was monitored pre- and post-restoration at Cloisters Branch and three non-restored streams to aid interpretation of biological data. Non-midge genus richness increased from 2013 to 2023 at four of 5 stations. Chironomini became dominant post-restoration. Shifts in chironomid and non-chironomid assemblages were both significant. Lower salinity/conductivity facilitated biotic recovery. We infer that restoration improved food-web complexity through improved in-stream habitat structure and protection of forested riparian buffers. This work shows a small success in response to the emerging challenge of designing and building stream restorations that are robust enough to accomplish water quality goals while still being sensitive to existing natural resources.

Dennis currently manages design, construction, and monitoring of stream restoration projects for the Watershed Restoration section of Baltimore County DEPS. He previously worked at the U.S. Department of Agriculture, Penn State University, and the PA Fish and Boat Commission. Dennis earned a B.S. in Biology from Penn State and M.S. in Biology from Indiana University of PA.

AN ANALYSIS OF THE ADEQUACY OF THE MARYLAND BENTHIC INDEX OF BIOTIC INTEGRITY (BIBI) IN ASSESSING THE HEALTH OF SMALL STREAMS SELECTED FROM A FINER MAP SCALE

Mary Genovese, Maryland DNR; mary.genovese@maryland.gov

Coauthors: Kyle Hodgson, MDNR; Tomas Ivasauskas, MDNR; Jay Kilian, MDNR; Scott Stranko, MDNR

Session: Bioassessment I: What's Bugging You? - Room A-111/A-113, 11:30

The Maryland BIBI, calibrated to assess the health of streams visible using map scales of 1:100,000 and 1:250,000, may be less reliable for assessing small streams visible on a finer scale of 1:24,000. In this study investigating BIBI scores at paired reference quality sites located in small streams, stream reaches exclusive to the 1:24,000 scale map received lower BIBI scores than downstream reaches in streams that were also visible on the 1:100,000 scale. Significantly lower numbers of mayflies and scrapers at 1:24,000 scale sites influenced these results. This was most evident on the Coastal Plain. Although a greater number of small streams were sampled using the finer map scale, significant correlations between stream size and BIBI score were not detected in this investigation. Habitat types sampled and upstream catchment land cover also did not appear to influence these results. A larger dataset, as well as the collection of data related to flow, habitat quality, and water quality, may assist in finding relationships between BIBI score and these environmental factors. Understanding these relationships will better assist the Maryland Department of Natural Resources in determining if refinements to the Maryland BIBI are necessary to adequately assess the health of all Maryland streams, including those visible on finer map scales.

Mary Genovese works as a biologist for the Maryland Department of Natural Resources (MDNR) and has been with MDNR since 2019. Mary participates in the collection, analysis, and reporting of stream biological data as part of the Maryland Biological Stream Survey.

CHANGES IN THE TIMING OF MARYLAND STRIPED BASS SPAWNING RUNS

Angela Giuliano, Maryland DNR; angela.giuliano@maryland.gov

Session: Bioassessment III: Fishing for Results - Room A-111/A-113, 4:00

Chesapeake Bay water temperatures have increased through time and under climate change are expected to continue to increase. Given previous research showing striped bass spawning is primarily triggered by water temperature, data from the Maryland Striped Bass Spawning Stock Survey (1985-2020) were used to explore whether there have been changes in the date when the water temperatures needed to initiate and end spawning have been observed. The date when specific percentages of the total female catch per unit effort data were caught was also examined to see if it had shifted with changes in water temperature and the age structure of the stock. Results of this work show average water temperatures observed on the spawning grounds during the survey have increased since the 2000s. The data also suggest the spawning season has shortened with no significant change in the date spawning begins but a significant change in the timing of the end of spawning. Supporting this is the fact that the last pre-spawn female was also observed earlier on the spawning grounds since the 2000s. Increases in water temperature could affect egg and larval striped bass survival either through direct mortality or changes in the timing of zooplankton blooms and this talk will discuss considerations for management under changing climate conditions.

Angela Giuliano has a bachelor's degree in biology from St. Mary's College of Maryland and a master's degree in aquatic resource ecology & management from the University of Michigan. She has worked for the Maryland Department of Natural Resources since 2008, first sampling streams as a seasonal for the Maryland Biological Stream Survey and then as a biologist with the Striped Bass Program in Fishing & Boating Services. Since 2014, she has worked as a research statistician, conducting stock assessments and other technical analyses for a variety of species including striped bass, cobia, and red drum, and working to improve data collection for saltwater recreational fisheries.

RELATING MANAGEMENT PRACTICE IMPLEMENTATION AND MODELED LOAD REDUCTIONS IN THE CHESAPEAKE BAY WATERSHED

Helen Golimowski, Devereux Consulting; helen@devereuxconsulting.com

Session: Data Management & Modeling - Room A-307, 11:00

The Chesapeake Bay Total Maximum Daily Load (TMDL) is a comprehensive "pollution diet" to restore the health of the Bay. The Scientific Technical Advisory Committee 2023 Comprehensive Evaluation of System Response report found that "existing implementation actions to reduce nonpoint sources of nutrients are insufficient to achieve the TMDL." Through this analysis, we create a product that highlights opportunities for water quality improvement by sector and geography. Using load and BMP data from the Chesapeake Assessment Scenario Tool, grouped by sector and BMP effectiveness, the loading rate change over time and percent BMP implementation are compared spatially at the land-river segment scale. It was expected that where there are higher percentages of BMP implementation, loading rates should be decreasing over time, and vice-versa. However, some areas of the watershed displayed unexpected results. It was found that in these areas, the most likely influence of these unexpected results is change in nutrients applied to the land. We also address how the way some common practices are modeled impacts the results of the estimated loads. We hope our findings can help identify areas for improvement in management and planning, and the way practices are modeled, to better understand the best approaches for meeting the TMDL goals.

Helen Golimowski is a Watershed Data Analyst at Devereux Consulting. Helen is a 2018 BA graduate of the Environmental Studies Program at the University of Maryland, Baltimore County and is currently pursuing an MS in Geographic Information Systems and Spatial Analysis from West Virginia University. While studying at UMBC, Helen was an intern with the Spa Creek Conservancy in Annapolis where she did ground-level data collection and supported GIS mapping projects. She supports Devereux Consulting's projects related to decision support tools for water quality improvements in major watersheds around the Mid-Atlantic region.

CHARGED WITH CONTAMINATION: UNPACKING PFAS POLLUTION IN LITHIUM-ION BATTERIES

Neal Goturi, River Hill High School; nealgoturi@gmail.com

Session: Student Lightning Talks - Room A-306

Lithium-ion batteries (LiBs) are a staple in clean and sustainable energy systems. Recent advancements in LiB technology have begun to utilize bis-perfluoroalkyl sulfonimides (bis-FASIs), a subclass of per and poly-fluoroalkyl substances (PFAS). PFAS, as a general concept, are internationally recognized as persistent contaminants. Yet, little is known about the environmental footprint of bis-FASIs throughout their lifecycle in LiB manufacturing, usage, and disposal. This talk will discuss how environmental concentrations near manufacturing sites, toxicity, and treatment challenges of bis-FASIs resemble those of regulated PFAS like perfluorooctanoic acid (C8). The presentation highlights the burgeoning clean energy sector as a potentially significant and overlooked source of PFAS contamination; it will emphasize the need to scrutinize the environmental impacts of clean energy infrastructure to ensure downstream sustainability in the energy transition. The remarks end with a call for more research into bis-FASIs such that reductions in CO2 emissions do not come with the expense of dramatically increasing releases of persistent organic pollutants.

Neal Goturi is a senior at River Hill High School who works to help solve the environment/energy problem on two fronts: research and practical applications of research. In his Sophomore year of high school, Neal researched the impacts of electrification in the American electric industry while advocating for the building electrification legislation, CB-5, in Howard County. Last year, Neal examined the effects of industrial organization in utility markets and worked to pass grid cybersecurity legislation in the Maryland General Assembly. Currently, Neal is interested in the water/energy nexus. Beyond climate advocacy, Neal enjoys co-captaining his school's debate team.

DEVELOPING AND EVALUATING OPERATIONAL HYDROLOGICAL DROUGHT ONSET, DURATION AND INTENSITY FORECASTS FOR THE EASTERN UNITED STATES

John Hammond, U.S. Geological Survey, Maryland-Delaware-D.C. Water Science Center; jhammond@usgs.gov

Coauthors: Althea Archer, U.S. Geological Survey; Jeremy Diaz, U.S. Geological Survey; Phillip Gooding, U.S. Geological Survey; Aaron Heldmyer, U.S. Geological Survey; Scott Hamshaw, U.S. Geological Survey; Ryan McShane, U.S. Geological Survey; Cee Nell, U.S. Geolog

Session: Emerging Concerns for Water Utilities - Classroom 1, 11:00

Hydrological drought, defined as abnormally low streamflows and groundwater levels, has direct impacts on agriculture, hydropower, ecosystems, public water supply, and recreation. Unlike more readily-available precipitation forecasts, forecasting streamflow drought requires accounting for storage, human modifications, and complex terrestrial processes. To address this challenge, the U.S. Geological Survey Water Mission Area Drought Program is working to advance early warning capacity for hydrological drought onset, duration, and severity using data-driven models. We use gradient-boosted decision tree and long short-term memory neural network modeling approaches to forecast 1-13 week streamflow percentiles across the conterminous United States using gridded meteorology and meteorological forecasts, modeled snow and soil moisture, and watershed properties. In this presentation we focus evaluation on the Eastern U.S. Overall, models show a strong ability to forecast severe droughts via variable streamflow percentiles in the near term, with declining model performance beyond 4 weeks. When predicting groundwater drought, initial evaluations show improvement upon persistence models for 3-12 month lead times. As we develop assessment and forecast tools, we are incorporating stakeholder input to design tools that complement existing drought and water supply prediction tools.

John Hammond is a research hydrologist with the USGS Maryland-Delaware-D.C. Water Science Center and the project manager for the Water Mission Area Data-Driven Drought Prediction project. The current focus of John's research is on forecasting hydrologic drought and better understanding headwater streamflow generation mechanisms.

MBSS COMPLETES SIXTEEN YEARS OF BIOLOGICAL MONITORING ON THE PATAPSCO RIVER COINCIDENT WITH DAM REMOVALS

William Harbold, Maryland DNR; william.harbold@maryland.gov

Coauthors: Greg Mathews, MD DNR; Kyle Hodgson, MD DNR; Michael Mosser, MD DNR; Mary Genovese, MD DNR; Allyson Bartel, MD DNR; Lindsay Powers, MD DNR; Katherine Hanna, MD DNR

Session: Bioassessment II: Critters (and MBSS) in the Creeks - Room A-111/A-113, 2:30

The MBSS has performed biological monitoring on the Patapsco River coincident with dam removals since 2009. While the earliest work was related to the removals of Union Dam and Simkins Dam in 2010 and 2011, the most recent efforts, since 2013, aimed to track the impacts of the Bloede Dam removal in 2018. Specific areas of focus included American eels, migratory fish, resident fish, and benthic macroinvertebrates. Upstream access to habitat and habitat quality seemed to be the major drivers in the observed changes to the river's biota. Removal of migration barriers allowed a range expansion for eight fish species and permitted small eels to disperse upstream. Meanwhile, the release and subsequent dispersal of impounded sediment had impacts, often temporary, on physical habitat quality, which in turn drove shifts in eel density, resident fish communities, and the distribution of sensitive benthic macroinvertebrate taxa. All monitoring work concluded in May 2024, but the results of these efforts provide data and insights to guide future monitoring that might accompany the eventual removal of Daniels Dam – if it occurs.

William Harbold is a biologist with the Maryland Department of Natural Resources. He has worked on monitoring Patapsco River dam removals as a member of the Maryland Biological Stream Survey since 2009.

IMPACTS OF CLIMATE CHANGE ON LAKE ECOLOGY

Michael Hartshorne, Princeton Hydro, LLC; mhartshorne@princetonhydro.com

Session: E(ww) coli and Other Water Management Problems - Room A-307, 2:30

This presentation will focus primarily on the role of climate change on lake ecology. Increasing water temperatures, more frequent and severe rainfall events, dissolved oxygen depletion, temporal variation in algal blooms, and latitudinal migration of invasive species will be discussed. Changes in approaches to lake management, as a result of these impacts, will be highlighted.

Mr. Hartshorne serves as Director of Aquatics with Princeton Hydro. Based out of the company's Exton, Pennsylvania office, Mr. Hartshorne oversees watershed management and lake restoration projects with particular emphasis on non-point source pollution management. Mr. Hartshorne received his bachelor of science in biology from West Chester University and conducted graduate level study at the University of Pennsylvania.

BIOCHAR:A MULTIFACETED TOOL FOR ENHANCING CHESAPEAKE BAY WATER QUALITY AND CLIMATE RESILIENCY

Charles Hegberg, Scaling Up Biochar and Infinite Solutions; chegberg@live.com

Coauthors: Jennifer Egan,PE, University of Maryland Environmental Finance Center; Carol Wong, PE, Center for Watershed Protection; Paul Imhoff, Phd, University of Delaware

Session: Restoration III: Biochar-ging Ahead - Auditorium, 4:00

This presentation will showcase biochar as a versatile and impactful tool for improving water quality and fostering climate resilience within the Chesapeake Bay watershed (CBw). The discussion will focus on biochar's diverse applications, including stormwater management, soil enhancement, and nutrient runoff reduction. It will also cover research advancements, implementation successes, and emerging opportunities that demonstrate biochar's potential to address a range of environmental challenges in the region. Central to the presentation will be the intersection of the STAC report "Using Carbon to Achieve Chesapeake Bay (and Watershed) Water Quality Goals and Climate Resiliency." and the Scaling Up Biochar project. Attendees will explore biochar research with a focus on recent research in the CBw. The role of biochar in bioretention and stormwater treatment. The presentation will further discuss emerging opportunities, such as biochar enhancement credits in BMP protocols, potential NRCS practice code expansions, and the importance of cross-sector collaboration to fully realize biochar's environmental and policy potential. This presentation will demonstrate how biochar is a multifaceted solution that addresses water quality concerns, offering a comprehensive approach to the restoration and long-term sustainability of the CBw.

Charles Hegberg is Sr. Project Consultant at RES, LLC; Mr. Hegberg has 30 Years of Experience and is a subject matter expert in circular resource management, biochar production, and its use for environmental benefits.

Dr. Egan is a program manager with the University of Maryland Environmental Finance Center.

Ms. Wong is Senior Water Resources Engineer, at the Center for Watershed Protection.

Paul Imhoff is a Professor, University of Delaware. Dr. Imhoff is in the Department of Civil and Environmental Engineering, the Associate Director of the graduate program in Water Science and Policy.

PERFECTING PARTNERSHIPS FOR SMART SALT SUCCESSES

Abby Hileman, Izaak Walton League of America; ahileman@iwla.org

Coauthors: Renee Bourassa, Interstate Commission on the Potomac River Basin

Session: Community Science - Bridge Room, 2:00

Educating the public about environmental issues can be challenging, especially for pollutants like road salt where the negative effects are not common knowledge. Presenters will discuss successes of collaboration through regional salt outreach workgroups and the (sometimes unlikely) partnerships they have developed along the way. Presenters will also share how they have met people where they are in their communities, from taking groups on guided "Walks in the Woods" and providing free bilingual chloride monitoring kits, to public art projects such as painting snowplow blades. Learn how a little bit of creativity can promote environmental awareness in unlikely places and mobilize an engaged cohort of environmental advocates.

Abby Hileman is the Salt Watch Coordinator at the Izaak Walton League of America. She has a passion for connecting people to their communities and to nature and believes that small scale actions add up to make a big impact on conservation success. Abby received her BS in Biology at Allegheny College in Meadville, PA.

Renee Bourassa is the Director of Communications at ICPRB. As everyone who works in winter salt messaging experiences, she is known as the "salt bae" to her friends and family for her constant comments about our overuse of winter salt. She graduated with a BA in Law and Society and an MS in Environmental Biology from Hood College.

Maryland Biological Stream Survey Round Four Results Investigating Potential Changes Over Time in Stream Conditions

Kyle Hodgson, Maryland DNR; kyle.hodgson@maryland.gov

Coauthors: Mary Genovese, Maryland DNR; Lindsay Powers, Maryland DNR; Scott Stranko, Maryland DNR

Session: Bioassessment II: Critters (and MBSS) in the Creeks - Room A-111/A-113, 1:30

The goal was to answer the question – "are Maryland's stream conditions improving or degrading over time?". To answer this question, Maryland Biological Stream Survey sampling protocols were used to collect ecological and water quality data from the same stream sites that were sampled twice within a 14- or 20-year interval. These sites were selected randomly to represent Maryland's stream conditions. Additionally, data from a set of high-quality (reference) streams were compared over the same 14-year interval. Some aspects of the representative stream condition and/or reference stream condition improved, some appeared to have degraded, and others showed no apparent change. The results and discussions of change in stream conditions over time are intended to support environmental policies, regulations, and resource management in Maryland relating to aquatic life, water quality, rare and invasive species, climate adaptation, and other uses as appropriate.

Kyle Hodgson is a Natural Resource Biologist for the Maryland Department of Natural Resources within the Maryland Biological Stream Survey.

MARYLAND AGRICULTURE AND WATERSHED RESTORATION – LOOKING BEYOND 2025

Elizabeth Hoffman, Maryland Department of Agriculture; elizabeth.hoffman@maryland.gov

Coauthor: Alisha Mulkey, Maryland Department of Agriculture

Session: Agriculture - Room A-306, 10:30

Conservation is a cornerstone of the agricultural community in the state of Maryland where our farmers have been early adopters of practices that protect water quality, from conservation tillage to planting cover crops. Progress has been steady, and we are hopeful that by continuing to build upon proven strategies - as well as expanding our approach - we can support our agricultural community as they make strong strides towards reaching watershed restoration goals, in balance with maintaining a resilient local food system. Watershed-wide, the Chesapeake Bay Partnership has been exploring where we have not made impactful change at the pace we thought we would, what needs to be adjusted, and where we should focus efforts. While that discussion and subsequent decisions unfold, Maryland has taken the first steps with the development of the Whole Watershed Act initiative and a robust Climate Pollution Reduction Plan.

Elizabeth Hoffman serves as the Watershed Strategies Administrator for Program Planning & Evaluation at the Maryland Department of Agriculture. In that role, she manages conservation data across Resource Conservation's programs and Soil Conservation Districts, for tracking and reporting progress towards our sector and state-wide WIP goals in the Chesapeake Bay Model. This includes providing analysis to align or advance program needs and planning efforts related to BMP implementation and TMDL goals, alongside the broadening scope of environmental outcomes attributed to agricultural lands. Included in that effort are her team of Field Assessment Planners, working across the state to assess and map farms and BMPs for crediting and reporting towards the department's environmental goals, from water quality to climate initiatives.

QUANTIFYING FOUR DECADES OF CHLORIDE INPUTS FROM DEICING SALT TO THE BALTIMORE CITY REGION DRINKING WATER RESERVOIRS

Kyle Hurley, Towson University; khurley@usgs.gov

Coauthors: Joel Moore, Towson University; John Sivey, Towson University

Session: Emerging Concerns for Water Utilities - Classroom 1, 10:30

Applications of deicing salts elevate chloride concentrations ([Cl]) of freshwater streams and lakes, with implications for drinking water sources. Elevated [Cl] likely promotes quicker formation of some disinfection byproducts during drinking water treatment and increased corrosivity that increases risks of lead leaching in distribution networks. We investigated [Cl] and fluxes in the tributaries of three drinking water reservoirs – Prettyboy, Loch Raven, and Liberty Reservoirs – from the 1980s to 2023. We used a weighted regression on time, discharge, and season approach to model four decades of monthly [Cl], and high-frequency data to assess approximately two years (2022, 2023) of [Cl] and corrosivity. Across the historical record in these predominantly low-development watersheds, [Cl] doubled, fluxes nearly tripled, winter [Cl] and fluxes increased faster than non-winter (2000-2017), and reservoir specific conductance (SC) increased 30-40%. High-frequency data revealed winter spikes in [Cl] up to 1600 mg/L, exceeding US EPA Chloride Criteria, and corrosivity values ten times higher than baseline. The historical increase in [Cl] suggests that legacy effects are likely to result in [Cl] to continue increasing in the future despite a warming climate, and treatment of drinking water should be considered accordingly.

Kyle earned his Master's in Environmental Science in 2023, focusing on the fate and transport of environmental pollutants. He worked for Maryland Department of the Environment, implementing the Safe Drinking Water Act; and now works as a Data Scientist for the US Geological Survey, helping build and implement modeling tools.

STONECAT: USING MARYLAND BIOLOGICAL STREAM SURVEY DATA TO IMPROVE OUR UNDERSTANDING

Tomas Ivasauskas, Maryland DNR; tomas.ivasauskas@maryland.gov

Session: Bioassessment II: Critters (and MBSS) in the Creeks - Room A-111/A-113, 2:00

Stonecat (*Noturus flavus*) is a rare fish in MD due to its restricted range, habitat specificity, and small population. It is state ranked as S1, Highly Rare, with a state legal status of Endangered. Its distribution in MD is restricted to the Youghiogheny basin (corresponding to its global distribution), with the only extant population in the Casselman watershed. Coal mining was important throughout the Youghiogheny basin in the early 1900s, and the ecology of the Youghiogheny River and its tributaries, including the Casselman River, were altered by pervasive and severe acid coal mine drainage. The relationship of Stonecat presence with surveyed variables was investigated using MBSS data collected from 88 samples at 72 locations in the Casselman watershed. Stonecat was only detected at four sites that were in high stream orders with large catchments and were correspondingly wider with higher discharge than other sites in the watershed. Stonecat was among the most infrequently sampled species in the watershed. In a 1999 study, the MD population was estimated at ~660 individuals. In addition to the inherent vulnerability of small populations to extirpation, Stonecat is threatened by road salt runoff, a recurrence of water quality conditions that historically caused localized extinction, and other anthropogenic impacts throughout the Casselman watershed.

Tomas works for DNR's Monitoring and Non-Tidal Assessment Division. He is integral in data collection, database management, and data analysis. His hobbies include keeping and maintaining a small collection of poison dart frogs and their terrariums.

THE IMPACT OF RAINBOW DARTER ABUNDANCE ON MICROHABITAT USE OF OTHER DARTERS IN THE MONOCACY RIVER WATERSHED

Austin Kaplan, Hood College; amk24@hood.edu

Session: Student Lightning Talks - Room A-306

The Rainbow Darter, *Etheostoma caeruleum* is an introduced species that has spread rapidly in the Potomac River drainage. However, the reason for this rapid spread and the impact of *E. caeruleum* on other species of both native and nonnative darters has not been determined. This study examines how the abundance of *E. caeruleum* affects the microhabitat use of *E. flabellare*, *E. olmstedi*, and *E. blennioides*. Seven fourth-order streams and a single third-order stream within Maryland's portion of the Monocacy River Watershed were sampled for darters. At each site during a snorkeling session, darters observed were identified, their positions were recorded, and their locations were marked. Following snorkeling, microhabitat parameters including stream velocity, depth, and substrate composition were measured at each marker. The same parameters were measured in four equally spaced transects across the site to assess habitat availability. Kick-seining was used as an additional method to determine the relative abundance of *E. caeruleum* compared to other darters. Preliminary results show that the four species of darters occupy different microhabitats. The relative abundance of *E. blennioides* remained relatively consistent between each stream, but a decline in the relative abundance of *E. flabellare* and *E. olmstedi* was correlated with an increase in the relative abundance of *E. caeruleum*.

Austin Kaplan is a student at Hood College pursuing a bachelor's degree in Biology and a minor in Coastal Studies. He currently works as a student technician for the Hood Center for Coastal & Watershed Studies and helps preform water-quality monitoring services. He spent this past summer working for Montgomery County's Department of Environmental Protection as a Stream Monitoring Intern. Austin is enthusiastic about all aquatic life, but especially non-game fishes. He spends his free time as an amateur naturalist observing, identifying, and learning about aquatic organisms. He recently became interested in river snorkeling after taking a Field Biology of Fishes class.

ENSURING DATA QUALITY AND INTEGRITY IN ENVIRONMENTAL MONITORING

Najma Khokhar, TechZone MD LLC; najma.khokhar@techzonemd.com

Session: Data Management & Modeling - Room A-307, 10:30

Implementing effective data governance is essential for ensuring data quality, security, and proper management within an organization. The process starts with defining clear objectives for data governance, which will shape the development of a comprehensive framework. This framework should include the assignment of data stewardship roles, the creation of data quality management processes, and the establishment of robust data security and privacy measures. Access controls must be implemented to allow role-based access, ensuring that only authorized personnel can manage sensitive data. Providing training for data stewards and stakeholders on their roles and the governance policies is also crucial. Employing tools and technologies for data cleansing, validation, and monitoring supports these efforts. Defining key performance indicators (KPIs) for data quality—such as accuracy, completeness, and consistency—further enhances the governance framework. Fostering a data-driven culture within the organization bolsters these initiatives, while ongoing improvement ensures the framework adapts to changing needs and technologies. Utilizing appropriate technology and tools can improve governance practices and maintain regular communication. By addressing these components, organizations can build a robust data governance framework.

Najma Khokhar is the founder of TechZone MD LLC, where she leads the development of web applications focused on database management for environmental projects. With over 15 years of experience at the Maryland Department of the Environment, Najma has specialized in data management and quality assurance, and has successfully led numerous workgroups in these areas. She currently serves as the Chair of the Information and Communication Committee for the Maryland Water Monitoring Council. Najma holds a MS degree in Environmental Science from Towson University and MS in Botany. Her certifications include Oracle Database 12c Administrator Certified Associate, CompTIA Security+, and CompTIA A+.

CONNECTING COMMUNITIES TO ACCESSIBLE WATER MONITORING

Matthew Kierce, Izaak Walton League of America; mkierce@iwla.org

Session: Community Science - Bridge Room, 1:30

The Chesapeake Monitoring Cooperative (CMC) is at the forefront of making volunteer water monitoring more inclusive and accessible. This session will delve into the principles of Diversity, Equity, and Inclusion (DEI) and how they are integral to effective community science initiatives. By highlighting case studies and utilizing a community connection chart, we will explore how the CMC has successfully linked community concerns to specific monitoring parameters, fostering a deeper understanding and engagement among diverse populations. Participants will learn about the challenges and successes in making water monitoring accessible to all, and discover practical strategies for empowering their communities to take an active role in water conservation. Join us to uncover how inclusive practices in volunteer water monitoring can lead to meaningful environmental and social impacts.

Matthew Kierce is the Chesapeake Monitoring Outreach Coordinator for the Chesapeake Monitoring Cooperative (CMC), working with the Izaak Walton League of America (IWLA) at their national headquarters in Gaithersburg, MD. Growing up in the Chesapeake Bay watershed, Matthew developed a deep passion for the conservation of the Bay. He is dedicated to ensuring that communities have access to vital water quality data right in their backyards, empowering them to participate in the stewardship of their local environments. His work focuses on making volunteer water monitoring more inclusive and accessible, fostering a stronger connection between people and their natural resources.

ENVIRONMENTAL AND MODELING APPROACHES TO ASSESS AND PREDICT PFAS FISH TISSUE CONCENTRATIONS IN VARIABLE ENVIRONMENTS

Krista Kraskura, Towson University, Environmental Science and Studies Program; kkraskura@towson.edu

Coauthors: Abbi S Brown, EA Engineering, Science, and Technology, Inc.; Christopher J. Salice, Towson University, Environmental Science and Studies Program.

Session: Pain in my PFAS - Bridge Room, 11:00

Per- and polyfluoroalkyl substances (PFAS) are a diverse group of persistent contaminants found in freshwater and estuaries globally. Some PFAS can rapidly bioaccumulate in fish as a result of water and dietary uptake. It is crucial to improve understanding of PFAS bioaccumulation in fish to minimize possible harmful exposure risk to humans. Environmental assessment of PFAS contamination and reliable predictions of PFAS bioaccumulation across fish within an ecosystem are challenging because PFAS vary across spatial and temporal scales. Here, we used Maryland Department of Environment PFAS data and our own field collected data to show temporal and spatial variation in PFAS concentrations in fish, water, and sediment. Then, we adapted a mechanistic food web bioaccumulation model to predict PFAS tissue concentrations of 5 prevalent PFAS in 11 fish species across 3 seasons and 2 sites. Most model predicted fish tissue PFAS concentrations successfully fell within a 2-fold variation from the empirically measured values. The combination of synthesized empirical data and model predictions show that fish are good 'integrators' of PFAS. The adopted model may be effectively implemented to predict select PFAS concentrations in aquatic biota (fish and invertebrates) from water and sediment samples only, without direct tissue sampling in fish, and thus facilitate assessment design.

Krista Kraskura is a postdoctoral researcher at Towson University in the Applied Ecology and Ecotoxicology Lab, where her work uses field, lab, and quantitative techniques to improve understanding of PFAS bioaccumulation across food webs in heterogeneous ecosystems. Generally, Krista's work focuses on applied fish physiology that can facilitate conservation and management practices in changing environments.

HOW THE ENDANGERED SPECIES ACT COULD DRIVE THE IMPLEMENTATION OF AGRICULTURAL CONSERVATION MEASURES

Niranjana Krishnan, University of Maryland, College Park; nkrish@umd.edu

Session: Agriculture - Room A-306, 10:30

In 2022, the Environmental Protection Agency (EPA) announced they would undertake endangered species assessments prior to pesticide registrations and re-registrations. Since then, the agency has come up with work plans and strategies to estimate risk to listed (endangered/threatened) species and their critical habitat. In the Final Herbicide Strategy and Draft Insecticide Strategy released in July and August this year, the EPA has proposed mitigation measures, many of which are agricultural conservation practices, to reduce pesticide exposure to listed species. Growers and applicators would have to implement a certain number of mitigation measures prior to applying pesticides in their fields. These proposed and upcoming requirements could change agricultural and other land management practices.

Niranjana Krishnan is an assistant professor in the Department of Entomology at the University of Maryland, College Park. Her research focuses on insect toxicology and pesticide risk assessment. Niranjana is also serving as Maryland's Pesticide Safety Education Program Coordinator.

BIOCHAR FOR CLEAN WATER, HEALTHY SOILS AND CLIMATE RESILIENCY

Lori Lilly, Howard EcoWorks; llilly@howardecoworks.org

Session: Restoration III: Biochar-ging Ahead - Auditorium, 3:30

Biochar soil amendment can increase the efficiency and effectiveness of various environmental restoration efforts. Biochar can address waste issues, filter water of contaminants, improve soil health and support healthier and more vigorous plant growth. Howard EcoWorks has completed a number of research and application-based projects using biochar over the past 5 years and will share results and findings from this growing compendium of work.

Lori Lilly is a natural resource management professional with an M.S. in Marine Estuarine and Environmental Science and 20 years of cumulative experience in watershed planning and implementation, project development and management, fundraising and nonprofit management. She is a leader and an independent thinker with a passion for environmental issues and a demonstrated commitment to improving water resources through grassroots efforts. Lori founded the nonprofit Howard EcoWorks in 2016. Based out of Columbia, MD, EcoWorks engages and educates the community about environmental sustainability and restoration, while creating pathways to green jobs through workforce development programs.

ASSESSING MARYLAND'S LIVE BAIT TRADE AS AN AQUATIC INVASIVE SPECIES PATHWAY

Gregory Mathews, Maryland DNR; gregorys.mathews@maryland.gov

Coauthors: Allyson Bartell, MD DNR; Nancy Hofmann, KCI; William Harbold, MD DNR; Jay Kilian, MD DNR

Session: Bioassessment III: Fishing for Results - Room A-306, 3:30

The use of live bait is an integral component of angling culture across Maryland, however the potential risk of aquatic invasive species (AIS) dispersal through the live bait trade represents a pervasive concern facing aquatic ecosystems across the state. Maryland Biological Stream Survey (MBSS) staff, with support the of Aquatic Nuisance Species Task Force funds administered by the Fishing and Boating Service, conducted a survey of in-state live bait vendors as well as their wholesale suppliers to better understand the current state of the live bait trade and its potential as a vector for invasive species introductions. While no high-priority AIS were reported, several non-native, and potentially invasive species, such as goldfish (*Carassius auratus*), fathead minnow (*Pimephales promelas*), and Canadian nightcrawlers (*Lumbricus terrestris*), were still actively imported in the bait trade. Based on survey responses, few businesses implemented safeguards, such as freezing unwanted or unsold bait prior to disposal, to prevent inadvertent introductions. However, many bait businesses expressed willingness to help spread preventive messaging to anglers in the form of pamphlets, stickers, etc. We conclude with several management recommendations meant to better protect Maryland's aquatic ecosystems and limit the potential for AIS movement through the live bait trade.

Gregory Mathews came back to his Maryland roots when he joined Maryland DNR's Resource Assessment Service as a natural resources biologist in 2022 after stints with the University of Kansas and West Virginia Fisheries. When not sampling, he enjoys hosting Lord of the Rings movie marathons- extended versions only, of course, and camping in Western MD.

BIOMIMICRY TECHNIQUES IN DESIGN OF STORMWATER MANAGEMENT WITHIN FOUR CRITICAL AREAS OF THE CHESAPEAKE BAY

Clara McKnight, River Hill High School; clara.bean6751@gmail.com

Coauthors: Radhika Wijetunge, Howard County Stormwater Management Division; Janine Sharbaugh, River Hill High School

Session: Student Lightning Talks - Room A-306

Biomimicry is a design approach that focuses on mimicking the function and processes of biological entities to solve sustainability problems. It can be used to improve urban stormwater management by regenerating ecosystems and designing more resilient infrastructure. Numerous techniques of biomimicry are in use today: such as the log roll technique, which mimics a fallen tree, or the woody toe technique, which mimics wood that becomes jammed in an embankment. This study aims to analyze engineering plans where biomimicry techniques have been used in projects completed within the past decade in the Chesapeake Bay watershed, focusing on four regions of concern: the Susquehanna watershed, Monocacy area watershed, Anacostia watershed, and the town Creek ecosystem. These four areas are vital to water quality, habitat health, and land use change in the Chesapeake Bay. Through examining watershed management engineering plans in these areas and creating a dataset, the biomimicry techniques used least frequently can be identified. Based on the results, techniques in need of improvement will be established and recommendations will be made for the future direction of biomimicry use in the Chesapeake Bay watershed.

Clara McKnight is a senior at River Hill High School. She is in the Intern/Mentor program with her school. She is currently interning with the Howard County Stormwater Management Division where she works alongside her mentor while conducting her research in the field of environmental engineering. She is also part of the Youth Climate Institute and works in River Hill's rain garden. She hopes to pursue a career in environmental engineering and watershed restoration.

LONG-TERM MONITORING OF SUBURBAN DEVELOPMENT AND STORMWATER MANAGEMENT IN CLARKSBURG, MONTGOMERY COUNTY, MARYLAND

Marina Metes, U.S. Geological Survey; mmetes@usgs.gov

Coauthors: Natalie Hall, USGS; Kristina Hopkins, USGS; Brianna Williams, USGS; Rosemary Fanelli, USGS; Charles Stillwell, USGS; Daniel Jones, USGS

Session: Stormwater - Classroom 1, 1:30

Since the first stormwater law in Maryland was passed in 1982, stormwater management goals have evolved from a singular focus on flood mitigation, to a holistic stream ecosystem protection focus. Current stormwater practices leverage novel designs such as bioretention and treatment trains to mimic pre-development hydrologic conditions of both groundwater and surface water. In Montgomery County, agricultural land is rapidly being converted into high-density suburban development. Designs of these suburban developments incorporate these novel management practices that retain and infiltrate runoff at a high density across the landscape. To assess the effectiveness of these stormwater practices, Montgomery County and the USGS have collected and assessed over 20 years of monitoring data including physical (geomorphic stream cross-sectional surveys, lidar-derived elevation, continuous streamflow), biological (fish and benthic macroinvertebrate counts and taxa abundance), and chemical (specific conductance, pH, dissolved oxygen) indicators of stream health. As part of this work USGS is investigating new ways to monitor stream health and landscape change using remote sensing techniques and machine learning. This talk will provide an overview of completed studies and ongoing research by the USGS in Clarksburg, Montgomery County, Maryland.

Marina Metes is a physical scientist with the USGS Maryland-Delaware-DC Water Science Center in Baltimore, Maryland. Her background is in fluvial geomorphology and remote sensing. Her research focuses on understanding shifts in geomorphic processes following disturbances to the landscape, especially with the aid of remote sensing techniques. She received a B.S. in Earth Science from Michigan State University and an M.S. in Geography and Environmental Systems from University of Maryland Baltimore County.

COMMUNITY SCIENCE RECREATIONAL WATER QUALITY MONITORING IN ANACOSTIA TRIBUTARIES

Maureen Mitchell, Anacostia Riverkeeper; maureen@anacostiariverkeeper.org

Session: E(ww) coli and Other Water Management Problems - Room A-307, 1:30

In Montgomery and Prince George's County Northeast Branch, Northwest Branch, Sligo Creek, and other tributaries are recreational cornerstones for hikers, bikers, and all who play in the watershed. However, the water is not always safe for recreational contact due to high levels of E. coli which do not meet EPA recreational standards. For the past five years, Anacostia Riverkeeper has monitored water quality along these trails, educating residents on when and where water contact might be safe for themselves, their children, or their dogs. We train community-scientists to collect bi-weekly water samples from May-September, conduct outreach to provide every resident has access to this valuable data set, and work with watershed partners to coordinate water quality monitoring in the Anacostia tributaries. In this presentation, we will share results for our 2024 monitoring season, as well as share best practices and lessons learned for anyone who conducts community science water quality monitoring in Maryland's streams.

Maureen works as Anacostia Riverkeeper's Program Manager of Water Quality monitoring in DC and Maryland, as well as manages ARK's educational programming for k-12 youth in the watershed. Before joining ARK, Maureen earned her M.S. in wildlife sciences from Auburn University and worked for eight years as a middle school science teacher in DC Public Schools.

Ongoing assessment of microplastic pathways in the Chesapeake Bay

Bob Murphy, Tetra Tech; Bob.murphy@tetratech.com

Coauthor: Ryan Woodland, UMCES

Session: Microplastics - Room A-306, 2:00

Plastic pollution is a pervasive and ubiquitous problem in the aquatic landscape that can impact the environment and economy. It is estimated that 80% of trash pollution in waterways comes from land-based sources of trash. The potential human health and environmental impacts of plastic pollution is being studied both nationally and globally. Its effects on aquatic resources and the food chain could have lasting impacts. As part of the CBP Plastic Pollution Action Team charges, source tracking and risk assessment for a sentinel species (Striped Bass) has been undertaken. We present the status of assessing microplastic sources, based on land use in the Potomac River estuary. We will also present on the status of understanding the dynamics of trophic transfer of microplastics via prey (mysid shrimp) to YOY striped bass.

Bob is a marine ecologist with over 28 years experience working in the Chesapeake Bay watershed in addition to the Great Lakes and the Caribbean. His expertise is in fish ecology, submerged aquatic vegetation, and how habitat alterations affect biological communities. He began working with microplastics in 2016 collaborating with DC DOEE, co-chairing a workshop on microplastics for the Chesapeake Bay Program, and leading efforts in risk assessment modeling, monitoring designs, and studies on microplastics affecting living resources.

SALTIER RIVERS IN NATIONAL PARKS ARE A GROWING CONCERN

Dan Myers, Stroud Water Research Center; dmyers@stroudcenter.org

Coauthors: Diana Oviedo-Vargas, Stroud Water Research Center; John Paul Schmit, National Park Service National Capital Region Network

Session: Water Quality - Bridge Room, 3:30

Protected areas such as National Parks are critical for freshwater conservation. Yet, streams and rivers in protected areas can be vulnerable to degradation by freshwater salinization, especially when watersheds extend into developed areas with lots of deicing salts, sewage, and urban stormwater pollution. We used water quality data from the National Capital Region of the U.S. National Park Service to investigate whether salinization is affecting park streams. All study sites are in the Chesapeake Bay Watershed (parks in Maryland, D.C., Virginia, and West Virginia). We found that streams with watersheds that extended beyond park boundaries were more vulnerable to salt pollution, such as deicing salts, than those with watersheds contained in parks. We next provide guidelines using the RAD (Resist-Accept-Direct) framework for decisions to manage stream salinization within parks or in collaboration with watershed stakeholders. Many parks are already taking action and following best practices to reduce salinization. National Parks and other protected areas can constitute considerable proportions of watersheds throughout the region, and as efforts are underway to protect and restore Maryland's water quality, have a critical role in protecting streams from salinization. For more information: https://www.nps.gov/articles/000/salinity.htm.

Dan Myers is a postdoctoral associate at the Stroud Water Research Center. The Stroud Center is a global leader in freshwater science, education, and watershed restoration. Dan is collaborating with the National Capital Region Inventory & Monitoring Network of the National Park Service to develop data quality controls, update protocols, and analyze trends in watershed health for streams in ten parks in Maryland, D.C., Virginia, and West Virginia.

"BUT THE STREAM LOOKS FINE TO ME." EFFORTS TOWARD COMMUNICATING AN UNDERSTANDING OF STREAM HEALTH AND WATERSHED FUNCTION

Adam Nabors, Maryland Stream Restoration Association (MSRA President); anabors@amtengineering.com

Coauthors: Will Weaver (MSRA President-Elect)

Session: Restoration II - Auditorium, 1:30

The MSRA has recognized that a knowledge gap exists amongst Maryland residents regarding restoration efforts tied to streams, wetlands, and overall water quality projects. To help bridge that gap the MSRA has worked to develop publicly available presentations to inform concerned citizens regarding why ecological restoration projects are necessary. Using those tools we aim to provide a foundational understanding of stream health and a historical context for our watersheds, following which the delta between existing and ideal conditions become apparent. The content has been curated from input provided by Regulators, Non-profits, County/Municipalities, Engineers, Designers, and Restoration Contractors to account for the diverse perspectives that these projects bring together. We will be sharing the MSRA's *final* iterations of our educational tools with the MWMC Community for initial reactions, responses, and feedback prior to beginning our outreach and engagement efforts.

With over 15 years working towards ecological restoration goals across the Mid-Atlantic and beyond, Adam currently serves as the MSRA President collaborating with the organization's Officers, Board, and nearly 400 members to advocate for healthy streams through the advancement of stream restoration science.

WILD CELERY (*VALLISNERIA AMERICANA*) RESTORATION IN DEEP CREEK LAKE, MARYLAND

Mike Naylor, Maryland DNR; mike.naylor@maryland.gov

Coauthors: Mark Lewandowski, MD DNR; Stephanie Hall, MD DNR

Session: Restoration I - Auditorium, 11:30

The Arrowhead Cove Wild Celery Restoration project was undertaken as a mitigation measure for the dredging activities in Arrowhead Cove within Deep Creek Lake, Maryland. Wild celery (Vallisneria americana) is a native aquatic plant that provides essential habitat for aquatic organisms and serves as a significant food source for waterfowl. Maryland Department of Natural Resources, Resource Assessment Service (RAS) collected seeds for, raised and planted approximately 1,000 plants into 20 founder colonies in Arrowhead Cove.

Mike is the Special Projects manager with the Maryland Department of Natural Resources (DNR) Tidewater Ecosystem Assessment. Mike's three decades at DNR have included studying submerged aquatic vegetation, being a Senior Policy Advisor, managing Maryland's Shellfish Program and managing the State Lakes Program. Mike has co-authored dozens of reports and publications on everything from haul seining the Susquahanna Flats to mute swan management to light requirements for seagrasses in Chesapeake Bay. Mike splits his time between his home in Ellicott City and his future home on the Nanticoke River while wrangling four teenage boys.

USING STABLE ISOTOPES (Δ15N, Δ18O, Δ17O) TO EVALUATE SOURCES AND CYCLING OF NITRATE IN SUBURBAN MARYLAND WATERSHEDS

Grace O'Hara,University of Maryland Center for Environmental Science; grace.ohara@umces.edu

Coauthors: David Nelson, Director and professor at University of Maryland Center for Environmental Science Appalachian Laboratory; Keith Eshleman, Professor at University of Maryland Center for Environmental Science Appalachian Laboratory

Session: Student Lightning Talks - Room A-306

Urbanization and suburbanization is rapidly occurring and can contribute to a host of negative environmental consequences, including excess nutrient loading into water bodies and in the rapid routing of stormwater through impervious infrastructure. Green stormwater infrastructure (GSI) is used to attempt to mitigate nutrient pollution to receiving surface waters and downstream ecosystems by promoting temporary storage of water through enhanced soil infiltration. GSI has proven to be effective at reducing storm event peak flows and reducing stormflow volumes, but pollutant removal is less clear. Better understanding is needed regarding the effectiveness of GSI at improving water quality by promoting physical and biogeochemical processes that retain and/or remove pollutants during varied hydrological conditions especially during storm flows. We used stable nitrogen (δ15N) and triple oxygen (δ18O, δ17O, and Δ17O) isotopes of nitrate (NO_3^-) to distinguish stormwater NO_3^- sources and infer nitrogen cycling processes in samples collected from 2020-2024 in two adjacent suburban Baltimore watersheds and some adjacent highway swales. Overall, this research aims to clarify the functionality of GSI and impacts on water quality and nitrate pollution to inform future management decisions regarding the implementation of best stormwater management strategies in urban and suburban areas.

Grace O'Hara is a graduate research student pursuing her master's degree in marine estuarine environmental sciences through the University of Maryland Center for Environmental Science. She is conducting research at the Appalachian Laboratory in Frostburg MD, to evaluate the effectiveness of best stormwater management practices on nitrogen dynamics using stable isotopes.

SOURCING E. COLI IN THE ANACOSTIA WATERSHED: USING WATER QUALITY MEASUREMENTS AND MORE AS A PROXY INDICATOR

Jessie Ribera, Smithsonian Environmental Research Center; riberaj@si.edu

Coauthors: Rebecca Hale, Smithsonian Environmental Research Center; Maureen Mitchell, Anacostia Riverkeeper; Carey Pelc, Smithsonian Environmental Research Center

Session: E(ww) coli and Other Water Management Problems - Room A-307, 2:00

Increased streamflow from rainfall and associated storm water runoff is linked to higher levels of E. coli, a key indicator for fecal contamination, in urban streams. In the Anacostia watershed, fecal material can be introduced into the surrounding streams by sewage overflows and stormwater runoff during heavy rainfall events. Advisories warn against recreating in urban streams for three days following a significant rain event due to increased presence of potentially harmful bacteria and other pollutants. However, analyzing data collected at 15 sites by the Anacostia Riverkeeper during 2023 and 2024, we found that nearly all sites experienced unsafe concentrations of E coli during dry weather. Streamflow was a better predictor of E. coli than rainfall (R^2 =0.68), but correlations between streamflow and E. coli varied significantly among sites. We tested whether dissolved organic matter quality (DOM) and nutrients could help predict E. coli concentrations during base flow. Preliminary results suggest that microbial DOM metrics, which can be correlated to sewage inputs, might explain some variation in E coli concentrations in baseflow. While water quality measurements cannot replace traditional E. coli testing, it can potentially serve as a preliminary and rapid indicator of fecal contamination in conjunction with topography, and land use.

Jessie Ribera is a research technician at the Smithsonian Environmental Research Center (SERC), where she spends her days knee deep in watershed ecology and turning data into important insights. She is deeply invested in how land use impacts water quality and ecosystem health, using a variety of monitoring techniques to paint a clearer picture of our freshwater systems. When she is not "mucking" about on the banks of the Anacostia, you can find her analyzing water samples and engaging in community-based research.

SEASONAL VARIABILITY OF BENTHIC MACROINVERTEBRATE ASSEMBLAGES IN URBAN LANDSCAPES

Chris Ruck, Fairfax County (VA) Watershed Assessment Branch; christopher.ruck@fairfaxcounty.gov

Session: Bioassessment I: What's Bugging You? - Room A-111/A-113, 10:30

Beginning in 2016 Fairfax County (VA) began fall benthic macroinvertebrate monitoring at five (5) fixed locations as part of new regulatory requirements. At the time of implementation, the county was only conducting annual (spring) benthic monitoring. After three years of semi-annual data a trend emerged indicating the fall samples had a mean increase of 19 and 24 points on the family-level Virginia Stream Condition Index (VSCI) and the genus-level Fairfax Benthic Index of Biotic Integrity (B-IBI), respectively. This study evaluates seasonal differences at additional long-term trend locations that represent a) "least disturbed" or reference conditions, and b) the sub-urban to urban gradient. Results generally indicate that reference sites have a reduced biological quality (IBI scores) in the fall, while the opposite occurs in suburban and urban drainages. This study examines the seasonal assemblage composition and attempts to identify correlated water quality and habitat shifts that may affect benthic invertebrate assemblages.

Chris Ruck is an aquatic ecologist leading a team conducting water quality monitoring and analyses. With over 20 years of experience in physical, chemical and biological assessments, Chris strives to communicate science-based information to the public while maintaining experimental rigor.

MAPPING EROSION: USING DEM DIFFERENCING TO GUIDE RESTORATION EFFORTS

Brennan Smith, Anne Arundel County Bureau of Watershed Protection and Restoration; pwsmit32@aacounty.org

Session: Restoration II - Auditorium, 2:00

Comparing Digital Elevation Model (DEM) raster data across years can identify and quantify erosion, guide restoration planning, and provide estimates of potential MS4 impervious credit and TMDL pollutant load reductions for channel restoration projects. Anne Arundel County's Bureau of Watershed Protection and Restoration has gathered valuable insight into this DEM differencing process and seeks to share these experiences with other jurisdictions to enhance their workflows. This GIS-focused talk will cover key aspects such as data preparation and analysis, addressing systematic errors and artifacts in the DEM, defining channel extents using geomorphon landforms, comparing results to field-verified BANCS analyses, and summarizing data to support project planning and credit estimation.

Brennan Smith graduated from UMBC with a B.S. in Environmental Science. With a background in soil science, stormwater management, and natural resource planning, Mr. Smith has experience in academia, the private sector, and public service. Currently serving as a Watershed Analyst at Anne Arundel County, he specializes in MS4 permitting and compliance, with a strong focus on GIS, and an interest in streamlining workflows to support watershed protection and restoration efforts.

A TALE OF TWO WATERSHEDS: WATER QUALITY IN FOSTER BRANCH AND PLUMTREE RUN, HARFORD COUNTY, MD

Alex Soroka, USGS; asoroka@usgs.gov

Coauthors: Alexander Soroka, USGS; Jennifer Olszewski, USGS

Session: Restoration II - Auditorium, 2:30

The Foster Branch watershed in Harford County is small (less than 2 square miles) and until recently the land cover was split between forest and suburban residential communities. Between 2014 and 2018, Harford County implemented stream restoration and stormwater mitigation projects to reduce sediment transport in Foster Branch. In 2015, the USGS installed a stage/discharge and continuous water quality monitoring station (USGS 01585075) and started collecting fixed frequency and storm samples that were analyzed for suspended sediment and other water-quality parameters. In 2022, a large deforestation event and subsequent development occurred in the upper portion of the Foster Branch watershed which coincided with increases in suspended sediment concentrations and turbidity. This presentation will discuss preliminary analysis of flow and sediment data collected from Foster Branch and compare them with data from Plumtree Run (USGS 01581752), a nearby developed watershed that experienced no large land use changes during the period of record.

Alex Soroka is a USGS physical scientist working in Maryland to answer the question: How is our water quality changing and why? Alex began studying isotope chemistry in small-forested catchments of New England but realized, that's not where most of America lived. After a few years learning about soil fertility and nitrogen in Delaware's farmland, Alex moved to Baltimore where he now studies nutrient and sediment dynamics in the Chesapeake Bay watershed.

FRAMEWORK FOR MONITORING PLASTIC POLLUTION IN THE CHESAPEAKE BAY

Mark Southerland, Tetra Tech; mark.southerland@tetratech.com

Coauthors: Robert Murphy, Tetra Tech; Paige Hobaugh, Tetra Tech; John Roberts, Tetra Tech; Nancy Roth, Tetra Tech; Kelly Somers, US EPA Region 3

Session: Microplastics - Room A306, 1:30

Monitoring of plastic pollution can provide data to reducing its adverse impacts, such as annual loadings, high areas of accumulations (hot spots), common plastic types, and long-term status and trends. This Framework builds upon the foundational work of the Plastic Pollution Action Team (PPAT)'s monitoring subcommittee and recommends monitoring strategies across various media, such as surface water, sediment, and key living resources, as well as scale, frequency, and locations for application throughout the Chesapeake Bay watershed. The Framework focuses on leveraging existing programs to limit the resources required and includes both a Field Sampling Reference Guide and a Laboratory Reference Guide. These guides provide the specifics of microplastic monitoring needed to implement the framework and will help streamline methods and leverage resources across stakeholder groups. Fortunately, field collection of water and sediment samples for laboratory analysis of microplastics is straightforward, with careful handling to avoid contamination the most important concern. Water can be collected in bulk or as volume-reduced (pump) samples and analyzed or archived similar to chemical samples. Therefore, adding microplastics sampling to existing monitoring programs should not significantly increase field efforts, though laboratory access and analysis is an additional cost to consider.

Mark Southerland has a Ph.D. in ecology and has spent the last 35 years working as a consultant to monitor, assess, and restore ecosystems in the Chesapeake Bay watershed. He was the primary author of the EPA national program guidance on biological criteria and has been supporting healthy watersheds and stream health projects for EPA and CBP for the last 10 years. He has also been the lead consultant on the Maryland Biological Stream Survey for the Maryland Department of Natural Resources (DNR) since its inception in 1993. Mark has chaired the Maryland Water Monitoring Council, Patapsco Heritage Greenway, and Howard County Environmental Sustainability Boards.

NAVIGATING PFAS LITIGATION: SECURING MUNICIPAL REMEDIATION FUNDS

Michael G. Stag, Stag Liuzza; stag@stagliuzza.com

Coauthors: Ashley M. Liuzza, Stag Liuzza; Merritt Cunningham, Stag Liuzza; Matthew D. Rogenes, Stag Liuzza

Session: Pain in my PFAS - Bridge Room, 11:30

This session offers an in-depth look at the legal strategies and landscape of PFAS litigation, emphasizing how municipal attorneys can secure funds for remediation efforts in their communities. As environmental challenges and regulatory demands grow, it's crucial for municipal lawyers to be well-versed in key legal matters, such as statute of limitations, recent regulations, and the progress of national PFAS litigation. Michael G. Stag, a court-appointed member of the Plaintiff's Executive Committee for the AFFF MDL, will provide insights into current and forthcoming PFAS settlements valued at over $12.5 billion. Attendees will learn about the role of municipal attorneys in securing these funds, essential deadlines, and best practices for safeguarding public health through effective legal action. Case studies of municipal successes in securing funds through PFAS litigation will also be discussed.

Michael G. Stag is the Chief Executive Officer and Managing Partner of Stag Liuzza, with a focus on complex environmental and toxic tort cases. A pioneering attorney in Technologically Enhanced Naturally Occurring Radioactive Material (TENORM) litigation, Mike has secured over $300 million in settlements and more than $1 billion in jury verdicts for clients. As an executive committee member in multiple MDLs, including the national PFAS litigation, he continues to champion public health by holding corporations accountable and advocating for the rights of communities across the U.S.

ASSESSING WATER QUALITY CONDITIONS IN VULNERABLE COMMUNITIES IN THE CHESAPEAKE BAY WATERSHED

Leah Staub, USGS; lstaub@usgs.gov

Coauthors: Tristan Mohs, USGS; Andrew Sekellick, USGS

Session: Community Science - Bridge Room, 2:30

The conditions that affect public health often disproportionately impact historically neglected and marginalized communities. The social vulnerability index (SVI) is a measure used by the Centers for Disease Control to quantify the factors that increase a community's vulnerability to disasters or environmental hazards. This index was used alongside an existing SPAtially Referenced Regression On Watershed attributes (SPARROW) water quality model to examine stream health in vulnerable communities within the Chesapeake Bay watershed. The vulnerability factors were downscaled to NHDPlus V2 catchments using Dasymetric mapping techniques to allow for a spatially congruent comparison of SPARROW water quality predictions. Areas above the 90th percentile for select SVI vulnerability factors, including minority status and English proficiency, were found to have degraded water quality conditions (in-stream nutrient loads). With enduring historical influences, present-day challenges, and anticipated future effects from climate change, identifying and addressing environmental justice issues is a priority topic for the federal government and science agencies. Assessing the relationship between water quality impairments and vulnerable communities is an essential step towards reconnecting people to their local waterways.

Leah Staub, Andrew Sekellick and Tristan Mohs are all Physical Scientists with the USGS at the MD-DE-DC Water Science Center and are all members of the Justice, Equity, Diversity, and Inclusion committee. Leah primarily has experience handling remotely sensed data and preparing model input datasets. Andrew's current work focuses on developing and implementing innovative water quality modeling techniques, enhancing monitoring network design, and spatial data development. Tristan has a background in geomorphology, habitat ecology, and flood science and is interested in work related to the pairing of biotic and abiotic factors in an ecosystem.

TRACKING THE CHANGES IN STREAM HEALTH FROM RESTORATION PRACTICES IN THE CHESAPEAKE BAY

Maya Sterett, Alliance for the Chesapeake Bay; msterett@allianceforthebay.org

Session: Restoration I - Auditorium, 11:00

As restoration projects continue to be implemented, it is critical to assess whether these practices are working and improving the quality of local streams to ensure the investments are helping to meet Chesapeake Bay restoration goals. The National Fish and Wildlife Foundation (NFWF) implements numerous restoration practices aimed at reducing the impact of agricultural practices and urban/suburban land uses on the rise across the Chesapeake Bay. NFWF partnered with the Alliance and our Chesapeake Monitoring Cooperative (CMC) partners, Dickinson College's Alliance for Aquatic Resource Monitoring, the Izaak Walton League of America, and Stroud Water Research Center to fund the development of a Community-Based Restoration Monitoring Project aimed at tracking changes in stream health conditions as a result of stream restoration, riparian forest buffers, and cattle exclusion fencing practices implemented through NFWF's Chesapeake Bay Stewardship Fund (CBSF). Together, we identified the appropriate indicators to monitor, developed the protocol pulling from approved EPA and CMC methods, and piloted the implementation of the protocol on stream restoration and buffer project sites in PA, MD, and VA. Our monitoring team's main goal is to assess and share the impact of stream restoration and stream health practices aimed at improving local water quality and habitat for aquatic life.

Maya Sterett grew up between Colorado and Virginia, establishing her passion for exploring both rugged mountains and sandy beaches. She graduated from Mount Holyoke College in Massachusetts, with a B.A in Environmental Studies. In 2020, Maya served as an AmeriCorps member in Massachusetts with the Merrimack River Watershed Council. While there, she became interested in pursuing a career in urban sustainability and water quality monitoring. Maya is currently the Alliance's Water Quality Monitoring Projects Coordinator based out of their DC office. She coordinates the DC Citizen Science Water Quality Monitoring program and the Alliance's new Community-Based Restoration Monitoring program.

A COMPARISON OF CHESAPEAKE BAY MICROPLASTIC CONCENTRATIONS, MORPHOLOGIES AND TYPES IN FOUR MARYLAND AQUATIC ENVIRONMENTS.

Mark Trice, Maryland DNR; mark.trice@maryland.gov

Coauthors: Chelsea M. Rochman, Jelena Grbic, Arielle Earn, Keenan Munno, Hannah De Frond, Natasha Djuric, Samantha Santoro, and Ashima Kaura, University of Toronto; Paul A. Helm, Ontario Ministry of the Environment; Elizabeth A. Hasenmueller, Saint Louis University;

Session: Microplastics - Room A-306, 2:30

The presentation will focus on the Chesapeake Bay, Maryland-specific results from a recent microplastic manuscript that detailed concentrations, particle morphology and proportion of microplastic types found in samples collected from agricultural runoff, urban stormwater runoff, treated wastewater effluent, and ambient mainstem Bay waters. The manuscript entitled, "Local Monitoring Should Inform Local Solutions: Morphological Assemblages of Microplastics Are Similar within a Pathway, But Relative Total Concentrations Vary Regionally", compared four regions across North America: the Sacramento Delta, the Mississippi River, Lake Ontario, and Chesapeake Bay. The study was led by Dr. Chelsea Rochman of the University of Toronto. Mark Trice of Maryland DNR helped coordinate elements of the Chesapeake Bay portion. The manuscript and supplemental data can be found at: https://pubs.acs.org/doi/abs/10.1021/acs.est.2c00926

Mark Trice is a program manager at Maryland DNR where he leads tidal water quality monitoring and database management programs, and is a co-creator of the Eyes on the Bay website. He is also involved in efforts to further incorporate emerging technologies and areas of concern, such as microplastics, coastal acidification & remote sensing, into research efforts and operational monitoring. In the early part of his 30-year State of Maryland career, he was an UMCES Senior Research Assistant on projects related to anadromous fish, HABs, and nutrient dynamics. He holds a BS in natural resources management from the University of Maryland and a master's in spatial analysis/GIS from SUNY-Buffalo.

AGRICULTURE, DEVELOPMENT, AND LOCAL FISH HABITAT CONDITIONS IN CHESAPEAKE BAY

Jim Uphoff, MD DNR, Fishing and Boating Services; jim.uphoff@maryland.gov

Session: Agriculture - Room A-306, 11:00

Human population growth since the 1950s added a suburban landscape layer to Maryland's Chesapeake Bay watershed, while land in agriculture has been relatively stable but is used and managed intensively. During 2003-2023, we investigated the impact of land use on fluvial and subestuary fish habitat of 31 Bay watersheds. Agricultural coverage and development were strongly and inversely correlated. In general, fish habitat conditions in agricultural watersheds were better than in developed watersheds. Proportion of stream samples with herring eggs and-or larvae were consistently high in watersheds dominated by agriculture, while they declined with development. The proportion of samples in tidal subestuaries with yellow perch larvae was positively influenced by forest and agriculture, and negatively influenced by development. A dome-shaped quadratic model of median bottom DO during July-September and agricultural coverage for mesohaline subestuaries (r 2 = 0.55, P < 0.0001) indicated an ascending limb (comprised entirely of western shore subestuaries) of median DO from near 0 to 5 mg/L when agricultural coverage went from 6 to 39%. Predicted median bottom DO peaked at 5.4 mg/L at 50% agriculture and declined to 4.2 mg/L at 72% agriculture; these measurements were from eastern shore subestuaries.

Jim Uphoff is a native Marylander and avid fisherman. He has lived on the mid-Shore since 1991 and helped raise three daughters and is a grandad twice over. He received his B.S. at the University of Maryland, College Park in 1976. He started with MD DNR in 1973 as a summer assistant and began his professional career there in 1978. During his career, he has sampled and analyzed most everything that moves in Chesapeake Bay and a few things that don't. He is currently the Fisheries Ecosystem Assessment Division Chief.

QUANTIFYING IMPACTS OF SUMMER STORMS ON THE THERMAL REGIME OF AN URBAN STREAM SYSTEM AT THE WATERSHED SCALE

Claire Welty, UMBC; weltyc@umbc.edu

Coauthors: Andrew J. Miller, UMBC; John J. Lagrosa IV, UMBC; Nick Simeone, UMBC; Mary McWilliams, UMBC

Session: Stormwater - Classroom 1, 2:00

We have deployed and maintained a high-density, high-frequency network of temperature sensors in a local Use Class Use IV stream in suburban Baltimore since December 2021, providing a rich data set for evaluation of the stream thermal regime as a function of space and time. This type of data is of interest to local policy makers in consideration of setting stream temperature TMDLs. The 21 million data points collected per year (5-minute data from 204 sensors) enhance statistical power for use in quantitative analysis. Here we focus on summer storms (June 1 – August 31) and address the question of whether the effect of storm runoff entering the stream between sensor pairs has a significant impact on stream temperature. As a screening tool, 5-minute stream temperature and discharge time series were evaluated for the entire summer period at USGS stream gages to identify individual storms that were thermally impactful, i.e., showing a thermal spike occurring at storm discharge peaks. For each of the identified thermally-impactful storms, the change in temperature dT between the onset of the thermal spike (pre-storm T value) and the peak of the thermal spike were calculated from sensor records upstream (dT_upstream) and downstream (dT_downstream) of discharge outfalls of interest, including outfalls from stormwater management facilities as well as storm drain outfalls, swale outfalls, and direct runoff not connected to stormwater management facilities. A Student's t-test was run to determine whether differences between the means of the dT_upstream values and the dT_downstream values for a group of evaluated storms was zero (H0). In addition, a two-sample Kolmorgorov-Smirnov test was used to compare the distributions of dT_upstream and dT_downstream values for a group of evaluated storms to determine whether the two data sets followed the same distribution (H0). Example results across a variety of outfall types will be presented to illustrate the methodology. This work has been sponsored by Chesapeake Bay Trust.

Dr. Claire Welty is Director of the Center for Urban Environmental Research and Education and Professor of Chemical, Biochemical, and Environmental Engineering at University of Maryland, Baltimore County (UMBC). Her research focuses on quantifying the urban water cycle and biogeochemical fluxes at multiple scales, using a combination of mathematical modeling and field observations. She hosts the field headquarters of the Baltimore Ecosystem Study. Dr. Welty is the lead PI on the Urban Critical Zone Cluster in NSF's Critical Zone Collaborative Network and co-PI on the DOE's Baltimore Social- Environmental Collaborative Integrated Field Laboratory.

Dr. Welty has served as Chair of Water Science and Technology Board of the National Research Council and Chair of the Board of Directors of the Consortium for the Advancement of Hydrologic Science Inc.

DESCRIPTION OF THE USGS GW MONITORING NETWORK IN MARYLAND, DELAWARE, AND THE DISTRICT OF COLUMBIA

Samantha Woomer, USGS; swoomer@usgs.gov

Session: Monitoring Water from the Depths - Room A-307, 3:30

The USGS MD-DE-DC Water Science Center, in cooperation with partners, maintains a groundwater monitoring network of wells within the two states and the District of Columbia. These wells provide continuous and discrete water-level data for surficial and confined aquifers covering all the physiographic regions and aquifers of each area. The water-level data produced is used by water suppliers, the MD Department of Environment (MDE), MD Geological Survey (MGS), and DE Department of Natural Resources and Environmental Control (DNREC) to craft management practices for the long-term health and sustainability of the aquifer systems. The data is available to the public through the USGS Water Data for the Nation Dashboard. A review of the network partnerships, monitored aquifers, well types, amounts, and some of the data will be presented.

Samantha Woomer is a hydrologic technician who has been with the U. S. Geological Survey for 6 years, working in the Dover, Delaware field office. She works in groundwater, water quality, and surface water disciplines doing data collection, analysis, and approval.

Poster Presentation Abstracts

THE NATURAL HISTORY AND LIFE OF URBAN STREAMS

Ken T. Belt, US Forest Service (Ret.), Natural History Society of Maryland, UMBC; belt@umbc.edu

Coauthors: Joe McSharry, Bronwyn Mitchell-Strong, Natural History Society of Maryland

Though urban streams most often rank at the bottom of bioassessment surveys (fish, macroinvertebrates, etc.) due to what is known as the "urban stream syndrome." We argue that this impoverished state is not a "fait-accompli" and that there is an impressive array of organisms in these ecosystems that suggest a need to reevaluate the feasibility of helping the public to appreciate them as a community amenity and resource. We describe the "Go with the Flow" program of the Natural History Society of Maryland is described. Dead Run, located in Leakin Park in Baltimore City has been the focus of hands-on learning about urban streams. Visitors to the stream sampled the stream biota and learned about the ecology of urban streams. The number of macroinvertebrate and fish taxa found was a pleasant surprise given the amount of urbanization in the watershed. The interactions with folks from a wide range of backgrounds and ages were the real core and success of the activity. Seeing the various "critters" using microscopes that were thriving in this old urban park stream contributed greatly to the experience.

MONITORING AND MODELING OF FECAL INDICATOR BACTERIA USING HIGH-FREQUENCY SAMPLING IN URBAN WATERS OF THE NORTHEASTERN UNITED STATES

Jason Chase, USGS; jhchase@usgs.gov

Coauthors: Jeremy Malen, USGS; Brian Banks, USGS; Joseph Duris, USGS; Shawn Fisher, USGS; Daniel Skulski, USGS; Ashley Smith, USGS; Trevor Needham, USGS

Fecal indicator bacteria (FIB) indicate the likely presence of fecal contamination in water, which is often associated with a variety of pathogens. Water resources managers depend on time-consuming traditional FIB sampling methods to make decisions regarding recreational access of waterways. Because FIB concentrations can change considerably after sample collection, high-frequency sampling methods can better inform management decisions. Statistical modeling can also be used to identify hydrologic factors associated with FIB contamination, which can aid in the decision-making process. High-frequency bacteria sampling was conducted at four US Geological Survey sites throughout the northeastern United States from 2021-2023 to assess relationships between FIB concentrations and hydrologic variables. FIB concentrations were converted to a binary bacteria risk variable based on an established Environmental Protection Agency statistical threshold value of 410 MPN/100 mL, and logistic regression modeling was used to correlate factors with bacteria risk. Factors related to precipitation and tidal dynamics were found to be highly correlated with bacteria risk, including turbidity, specific conductance, and cumulative two-day precipitation. High-frequency FIB sampling and statistical modeling can support water resources managers in monitoring and predicting fecal contamination.

AN ANALYSIS OF BEAVER DAM ANALOGS ON FISH COMMUNITIES AT LITTLE GUNPOWDER FALLS

Katherine Chase, Maryland Biological Stream Survey; katherine.chase@maryland.gov

Stream restorations in Maryland are a common method of reducing sediment and nutrient loads in the Chesapeake Bay Watershed. The Maryland Department of Natural Resources, Maryland Biological Stream Survey (MBSS) monitors select stream restoration projects funded by the Chesapeake and Atlantic Coastal Bays Trust Fund. One such project, located at Little Gunpowder Falls, on the border of Baltimore and Harford County, was chosen for restoration due to its severe erosion and incised channel. Beaver Dam Analogs (BDAs) were constructed in 2023 by Ecotone Inc. using local woody debris to mimic natural beaver dams and reduce erosion while reconnecting the stream to its floodplain. MBSS collected biological and water quality data in the restoration reach and control sites throughout the stream. This poster investigates the impacts of the project on fish communities by comparing pre- and post-restoration data at sites within the restoration reach, downstream, and upstream. Pre-restoration monitoring (2020-2022) used MBSS and National Rivers and Streams Assessments (NRSA) protocols for fish sampling, while post-restoration monitoring (2023-2024) only used NRSA protocols due to logistical constraints of sampling deep pools that formed because of the BDAs. Fish communities are analyzed using species richness, evenness, Simpson's diversity index, and total fish abundance.

<STUDENT POSTER> CHARACTERIZATION OF LIVER DNA DAMAGE IN THE ANACOSTIA RIVER USING *FUNDULUS HETEROCLITUS*

Hana Chytil, University of Maryland; hchytil@terpmail.umd.edu

Coauthors: Danny Feliciano, University of Maryland College Park, Mallory Gray, University of Maryland College Park, Paige Keift, University of Maryland College Park, Katherine Mackie, University of Maryland College Park, Sabine Malik, University of Maryland College Park, Colin Simmons, University of Maryland College Park, Dr. Lance T. Yonkos, University of Maryland College Park

The liver is important for detoxification of contaminants in fish. Understanding how livers of *Fundulus heteroclitus* (mummichog) respond to contaminants is key to determining the link between pollution and fish health. Previously, the Comet assay was used to identify DNA damage in sperm cells of fish sourced from polluted waters. Further development allowed identification of DNA damage in livers as well. Mummichog are known to develop adaptive chemical resistance to particular organic contaminants. Therefore, analysis of the liver is necessary to investigate whether contaminant metabolism is related to reproductive toxicity. Mature male mummichog (n=8/site) were collected from Bladensburg, Pepco Cove and Kingman Lake, contaminated sites within the Anacostia River, MD, as well as from the comparatively clean Wye River, MD. Livers were dissected from each fish, hepatocytes disaggregated, cells embedded in agarose and run via single-cell gel electrophoresis. Results were stained and imaged via fluorescence photomicroscopy. Scoring of Comet tails indicated significant DNA damage in hepatocytes of fish from contaminated sites compared to the reference population. Results demonstrate the utility of the Comet assay as a tool for in situ investigation of contaminant-induced DNA damage in mummichog liver cells and as part of a larger diagnostic toolkit for quantifying fish health.

MICROBIAL CONTAMINATION IN THE GUNPOWDER RIVER WATERSHED: ASSESSING WATER QUALITY AND PUBLIC HEALTH RISKS

Chichedo Duru, Morgan State University; d.chichedo@gmail.com

Coauthors: Theaux Le Gardeur, Gunpowder Riverkeeper; Samendra Sherchan, Morgan State University

Waterborne pathogens significantly threaten public health by contaminating drinking and recreational water and causing illness in exposed populations. This study investigates microbial contamination in the Gunpowder River Watershed, a vital source of drinking and recreational water for over 1.5 million residents in Baltimore City. The primary objective was to evaluate fecal indicator pathogens, such as *E. coli* and PMMoV, along with other enteric viruses, including Norovirus, at five locations within the watershed during the summer swimming season. Weekly water samples were collected and analyzed using Colilert for *E. coli* and qPCR for viral detection. Results showed *E. coli* levels frequently exceeded the EPA's recommended threshold of 235 MPN/100ml, with peak levels of >2419.6 MPN/100ml following rainfall events. Viral analysis revealed high concentrations of PMMOV and Norovirus GI and GII, especially at Monkton and Pot Rocks, with PMMOV and Norovirus concentrations reaching up to 10^5 GC/L. These findings highlight the significant microbial contamination in the watershed, emphasizing the role of stormwater runoff in spreading contaminants and affecting the ecosystem and public health. The study underscores the need for continuous monitoring and the implementation of mitigation strategies to reduce waterborne disease risks and ensure water safety for the local population.

IMPACTS OF REGENERATIVE STORMWATER CONVEYANCE ON IRON CONCENTRATIONS AND AQUATIC COMMUNITIES: A COMBINED LAB AND FIELD STUDY

Neil Fuller, EA Engineering, Science, and Technology Inc., PBC; nfuller@eaest.com

Coauthors: Megan Gaesser, Virginia Tech University, Christopher J. Salice, Towson University, Michael K. Chanov, EA Engineering, Science, and Technology Inc., PBC, Michelle Hudson, EA Engineering, Science, and Technology Inc., PBC, Jamie Suski, EA Engineering, Science, and Technology Inc., PBC

Globally, stream ecosystems are at risk from stressors relating to urbanization, including nutrient pollution and habitat alteration. Restoration techniques have been proposed as effective management tools for mitigating degradation in urbanized streams; however, changes to water quality parameters such as iron levels have been documented in restored streams. Consequently, the present study aimed to assess iron levels and potential impacts on biota in streams restored with regenerative stormwater conveyance (RSC) and non-restored. Eighteen streams were surveyed for water quality parameters and iron concentrations, with macroinvertebrate and fish diversity monitored in a smaller subset. A laboratory study was conducted to elucidate the survival of stream macroinvertebrates following chronic exposure to iron under acidic and basic pH conditions. The laboratory study indicated reduced survival of the amphipod, *Hyalella azteca*, following exposure to iron under elevated pH. For the field studies, significantly higher iron was recorded in RSC streams relative to non-restored streams. However, no significant effect of elevated iron on the diversity of macroinvertebrates or fish was observed. Given the role of RSCs in mitigating the ecological degradation of streams, the findings of this study will be incorporated into watershed management and implementation of stream restorations.

IMPACT OF HIGH pH ON CYANOBACTERIA GROWTH IN THE LINGANORE LAKES

Catherine Gaudlip, Hood College -Center for Coastal & Watershed Studies; gaudlip@hood.edu

Coauthors: Kevin Sellner, Hood College -CCWS; Drew Ferrier, Hood College -CCWS; Karen Cappiella, Center for Watershed Protection; Jordan Fox, Center for Watershed Protection.

As the ever-changing climate induces climbing water temperatures, harmful cyanobacteria blooms are more common and pose a hazard to human and animal health due to toxins released from many species. However, temperature is only one factor contributing to the initiation of these blooms. Nutrient availability has a direct impact on cyanobacteria growth, with creek inputs, bottom anoxia, and pH>9 leading to lake nutrient enrichment. Using the ModelMyWatershed tool and performing several diel sampling profiles, the Center for Watershed Protection and the Center for Coastal & Watershed Studies at Hood College estimated external and internal nutrient loads for 4 Linganore lakes in Frederick County, MD as well as changes in pH from sunrise to sunset. It was concluded that internal supplies of phosphorus and nitrogen often dominated external inputs into the lakes in the summer. Higher pH, due to photosynthetic reactions, induces phosphorus release from phosphorus-rich minerals while anoxia from bacterial decomposition of settled organic matter releases organically bound phosphorus. As the lakes are phosphorus-limited (N/P>7), the accumulation of phosphorus in surface waters provides a source of nutrients for growth of both algae and cyanobacteria.

PROMOTING ADVANCES IN HYDROLOGICAL MODELING THROUGH DEVELOPMENT OF THE OPEN-SOURCE, TIME-VARIANT WATER QUALITY MODELING SYSTEM RSPARROW 2.0

Lillian Gorman Sanisaca, USGS; lgormansanisaca@usgs.gov

Coauthors: Richard Alexander, USGS; Kyle Hurley, USGS

RSPARROW is an open-source system of R scripts to execute and evaluate SPARROW models with graphical, map, and tabular outputs. Designed for novice users, a single control script loads both input files and RSPARROW functions.

The 2.0 version of RSPARROW, available on USGS GitLab, extends the capabilities of the 2019 USGS SPARROW water-quality model and adds new capabilities to execute dynamic models for annually and/or seasonally varying data. An interactive interface enables a Decision Support System (DSS) to evaluate the effects of changes in explanatory variables on water quality and is enhanced to allow changes in explanatory variables (sources and/or land-water delivery) to be expressed as percentages of base conditions used to calibrate the model, or forecasted conditions (e.g., land use, climate) input from an external file. Enhancements to the output include annual/seasonal diagnostic maps and plots as well as interactive multi-panel stream and catchment water-quality prediction maps in unique timesteps. User tutorial resources allow users to explore features of static and dynamic SPARROW models and can be used as templates to guide the setup and execution of user developed models. Detailed documentation provides an informative guide for developers to support the use of SPARROW methods in multi-modeling approaches and collaborative development of sharable functions.

DEVELOPING NEW IMAGING TECHNOLOGY PROCEDURES AT MARYLAND DNR'S PHYTOPLANKTON LABORATORY

Amy Hamilton, Maryland Department of Natural Resources; amy.hamilton@maryland.gov

Coauthors: Amy Hamilton, MD DNR; Brianna Hutchins, Chesapeake Conservation and Climate Corps; Catherine Wazniak, MD DNR; Elizabeth Larson, MD DNR; Katherine Lamkin, Chesapeake Conservation and Climate Corps

Maryland DNR has been conducting routine phytoplankton monitoring at over 55 stations in the Chesapeake Bay, Coastal Bays, and tributaries since 1985. The program also monitors potentially Harmful Algal Blooms statewide, including in freshwater lakes. Previously, taxonomic analysis and quantification of these water samples had been conducted using only traditional light microscopy. Recently, DNR's Phytoplankton Lab has acquired a FlowCam Cyano 8400 that enhances analysis capabilities and speed. FlowCam is an imaging microscopy instrument that combines a flow cytometer's fluidic architecture with a microscope's spatial resolution to provide morphometric analysis and automated imaging of phytoplankton suspended in water. FlowCam's real-time results and rapid species concentration estimates reduce the time and taxonomic skill burden of existing microscopy protocols. The instrument compares reference image libraries against captured sample images to filter for and quantify target genera. To date, DNR has developed over 17 new libraries and is collaborating with regional partners to develop others. In partnership with St. Mary's College of Maryland and UMD at Horn Point Laboratory, DNR is creating FlowCam libraries and comparing their output with two other types of automated imaging microscopy instruments through a Maryland SeaGrant-funded project entitled Imaging Technologies.

<STUDENT POSTER>THE IMPACT OF RAINBOW DARTER ABUNDANCE ON MICROHABITAT USE OF OTHER DARTERS IN THE MONOCACY RIVER WATERSHED

Austin Kaplan, Hood College; amk24@hood.edu

The Rainbow Darter, *Etheostoma caeruleum* is an introduced species that has spread rapidly in the Potomac River drainage. However, the reason for this rapid spread and the impact of *E. caeruleum* on other species of both native and nonnative darters has not been determined. This study examines how the abundance of *E. caeruleum* affects the microhabitat use of *E. flabellare*, *E. olmstedi,* and *E. blennioides*. Seven fourth-order streams and a single third-order stream within Maryland's portion of the Monocacy River Watershed were sampled for darters. At each site during a snorkeling session, darters observed were identified, their positions were recorded, and their locations were marked. Following snorkeling, microhabitat parameters including stream velocity, depth, and substrate composition were measured at each marker. The same parameters were measured in four equally spaced transects across the site to assess habitat availability. Kick-seining was used as an additional method to determine the relative abundance of *E. caeruleum* compared to other darters. Preliminary results show that the four species of darters occupy different microhabitats. The relative abundance of *E. blennioides* remained relatively consistent between each stream, but a decline in the relative abundance of *E. flabellare* and *E. olmstedi* was correlated with an increase in the relative abundance of *E. caeruleum*.

<STUDENT POSTER> INFLUENCE OF IRON AND POTASSIUM ON THE GROWTH OF *MICROCYSTIS AERUGINOSA* AND *ANABAENA VARIABILIS* AT DIFFERENT TEMPERATURES

Alexander Koo, Mount St. Mary's University; a.f.koo@email.msmary.edu

Coauthors: Amy King, Research Partner

Microcystis aeruginosa and *Anabaena variabilis* are cyanobacteria that form harmful algal blooms (HABs), which are predicted to increase in frequency and severity with rising temperatures. While the roles of nitrogen, phosphorus, and temperature in bloom formation are well studied, we sought to understand how other essential elements affect the growth of these two cyanobacteria species at different temperatures. In this study, *M. aeruginosa* and *A. variabilis* were grown in varying concentrations of iron (Fe; 0.5-20 mg/L) and potassium (K; 8.6-90 mg/L) at 22ºC and 30ºC. Under low Fe conditions (≤ 2.5mg/L), *A. variabilis* outgrew *M. aeruginosa* at both 22ºC and 30°C. Above 2.5mg/L Fe, no difference between *A. variabilis* and *M. aeruginosa* growth was observed at either temperature. In contrast, elevated K concentrations favored *M. aeruginosa* growth. Therefore, iron and potassium concentrations may differentially alter community dynamics and HAB severity. Further investigations may aid in predicting, preventing, and managing future HABs.

BIODEGRADATION OF PFOS WITH A DEHALOGENATING CULTURE

Michelle M. Lorah, U.S. Geological Survey; mmlorah@usgs.gov

Coauthors: Ke He, University of Maryland Baltimore County; Lee Blaney, University of Maryland Baltimore County; Denise Akob, U.S. Geological Survey; Cassandra Harris, U.S. Geological Survey; Andrea Tokranov, U.S. Geological Survey; Zachary Hopkins, U.S. Geological Survey; Brian Shedd, U.S. Army Corps of Engineers

Perfluorooctane sulfonate (PFOS) is one of the most frequently detected per- and polyfluoroalkyl substances (PFAS) occurring in soil, surface water, and groundwater near sites contaminated with legacy aqueous film-forming foam and has proven to be recalcitrant to many destructive remedies. We conducted anaerobic laboratory experiments with soil from an area containing PFAS contamination to determine if known dehalorespirers, bacteria that are able to degrade chlorinated organic compounds, could also degrade fluorinated organic compounds such as PFOS. A substantial decrease in total mass of PFOS (about 46 percent) was observed over 45 days in the batch microcosms amended with the dehalorespiring culture WBC-2. Initial presence of chlorinated volatile organic compounds, common co-contaminants with PFAS, enhanced PFOS removal. Only low concentrations of potential degradation products of PFOS were identified, indicating some degradation to non-fluorinated compounds. The predominant change in the microbial populations linked to PFOS removal was in sulfate-reducing bacteria, rather than in the known dehalorespirers in the culture. These results have important implications for development of bioremediation methods for PFAS, and additional research on the metabolites and degradation pathways is warranted.

APPROACH AND METHODOLOGY FOR CONTINUOUS *E. COLI* BACTERIA MONITORING IN THE LOWER ANACOSTIA RIVER, WASHINGTON D.C.

Jeremy Malen, U.S. Geological Survey; jmalen@usgs.gov

Coauthors: Jason Chase, USGS MD-DE-DC Water Science Center, Brian Banks, USGS MD-DE-DC Water Science Center, and Dr. Trevor Needham, USGS MD-DE-DC Water Science Center

The lower Anacostia River is a tidally influenced urban waterway in Washington, D.C. that has been closed to recreational swimming since 1971 due to bacterial pollution and the potential of microbiological pathogens in the water. In collaboration with the District of Columbia Department of Energy and the Environment (DOEE), several research gaps have been identified that limit understanding of how fecal indicator bacteria (FIB), *Escherichia coli* (*E. coli*), is transported, including sampling frequency and tide cycles. Traditional FIB sampling approaches may not adequately capture daily tidal influences on bacteria transport in this challenging hydrodynamic system. An increased understanding of how the tidal cycle impacts the transport of bacteria within the lower Anacostia could better predict the risk to human health. Two U.S. Geological Survey gages were installed in 2024 along the lower Anacostia River to measure spatiotemporal trends of *E. coli* with tides. Baseflow *E. coli* measurements will be collected for five days prior to sampling a tide cycle. *E. coli* will be measured using an in-situ, high-frequency bacteria analyzer during four baseflow daily tidal cycles and three storm flow daily tidal cycles, and locations between gages will be measured using a mobile bacteria analyzer. More details about data-collection approach and methodologies will be presented.

Comparative Reproductive and Hepatic DNA Damage in Anacostia River *Fundulus* Species

Sabine Malik, University of Maryland College Park; smalik21@umd.edu

Coauthors: Tyler Frankel, University of Mary Washington; Carys Louise Mitchelmore, University of Maryland Center for Environmental Science (CBL); Candice Duncan, University of Maryland College Park; Lance T. Yonkos, University of Maryland College Park

Genetic resistance to aquatic contaminants has been documented in various *Fundulus* species related to changes in the hepatic protein complex cytochrome P450 (CYP). However, the secondary consequences to the fish are unknown. Because important endocrine-associated genes are regulated in the CYP, it is plausible that resistance can cause reproductive impairment. The Comet assay is a common toxicological tool used to quantify DNA damage. Our adapted method allows us to perform the Comet assay not only on traditional liver samples, but also sperm from *Fundulus heteroclitus* and *Fundulus diaphanus*. To better understand the relationship between liver and sperm DNA damage, both species were collected during the spawning season from six sites in the Anacostia River and control sites for each species for sperm analysis. Three Anacostia sites were resampled in the fall for liver analysis only in *F. heteroclitus*. There was significant sperm DNA damage at all Anacostia sites for *F. heteroclitus*, though the impact was reduced in *F. diaphanus*. DNA damage was also observed in livers collected in the Anacostia, comparing well with sperm DNA damage. Results suggest that sites with elevated sperm DNA damage also have liver DNA damage, indicating that resistance may cause secondary reproductive effects in fish living in contaminated waters, threatening fish populations in contaminated systems.

IS SALINIZATION OF FRESHWATER A DRIVER OF INVASIVE CRAYFISH SUCCESS IN MARYLAND?

Faith Matthews, Towson University; fmatthe1@students.towson.edu

Coauthors: Krista Kraskura, Towson University; Christopher Salice, Towson University.

Freshwater salinization primarily due to chloride-based road salt use has become an environmental concern affecting Maryland streams. Streams are also getting warmer due to various anthropogenic impacts including climate change. Therefore, this study aimed to compare the combined effects of salinity and temperature on the metabolism in two common Maryland species, the native Common crayfish (*Cambarus bartonii*) and invasive Virile crayfish (*Faxonius virilis*) to assess the potential physiological mechanisms behind the notable success of Virile crayfish invasiveness. Specifically, we evaluated the maximum and resting metabolic rates in crayfish acclimated to the EPA-defined acute chloride ([Cl-]) threshold at two different temperatures 20 and 24ºC. We hypothesized that the metabolic capacity of Common crayfish will experience greater decreases when exposed to high levels of salinity and higher temperature, while the invasive Virile crayfish will show greater resilience under the same conditions. Results from this study provide valuable insights on metabolic demands and capacity on the distribution and success of invasive crayfish species in Maryland and may inform future environmental management strategies to improve Maryland's natural resources.

EPIBENTHIC COLONIZATION AND TEMPORAL SHIFTS IN ABUNDANCE AND DIVERSITY AT POPLAR ISLAND

Martha McCauley, EA Engineering, Science, and Technology, Inc., PBC; mmccauley@eaest.com

Coauthors: Michael Powell, EA Engineering, Science, and Technology, Inc., PBC; Peggy Derrick, EA Engineering, Science, and Technology, Inc., PBC

Epibenthic invertebrates are important indicators of anthropogenic and environmental influences in aquatic systems since they are relatively sedentary and can integrate the effects of environmental conditions over long periods of time. The installation of new near-surface permanent substrate, such as rock dikes, creates opportunities for epifauna to grow and thrive. Epibenthic colonization, abundance, and diversity has been monitored since 2000 at the reconstructed Poplar Island in the Chesapeake Bay, Talbot County, Maryland, as the island was designed to beneficially use dredged material to restore wetland, upland, embayment, and aquatic habitat. Island construction phases were completed in 2000, 2002, and 2021, which included placement of in-water rocks to form the perimeter dikes of the island. To monitor success of in-water habitat creation, routine biological collection of infaunal and epifaunal invertebrates was performed in 2000, 2002, 2005, 2008, 2011, 2014, 2017, and 2021. This ongoing study investigates epibenthic colonization and community changes over an approximately 20-year period at Poplar Island. The goal is to identify early colonizing taxa and note shifts in abundance and diversity as the dike sections age. Water quality and weather events are also investigated, as epibenthic taxa can be sensitive to rapid environmental changes.

<STUDENT POSTER> CHESAPEAKE WATER WATCH: VOLUNTEER MONITORING OF WATER CLARITY IN TIDAL TRIBUTARIES

Rebecca McClenahan, Davis & Elkins College/ Smithsonian Environmental Research Center; rebeccamcclenahan@outlook.com

Coauthors: Tara Sill, Smithsonian Environmental Research Center; Patrick Neale, Smithsonian Environmental Research Center; Alison Cawood, Smithsonian Environmental Research Center; Maria Tzortziou, The City University of New York

Monitoring water quality in tidal tributaries is vital for assessing estuary health. This study investigated how turbidity relates to the diffuse attenuation coefficient for photosynthetically available radiation (KdPAR) —a critical measure for sustaining submerged aquatic vegetation (SAV). Chesapeake Water Watch, a participatory science project, engages volunteer scientists in monitoring water quality using smartphone apps and simple instruments, enabling data collection for comparison with satellite images across varied tributary conditions. Volunteers gather water samples and measure turbidity using both an AquaFast Turbidimeter and the HydroColor app, which calculates turbidity based on images of the sky, water, and a gray card. To test the relationship with turbidity, KdPAR was estimated from light profiles gathered in four tributaries (Patuxent, South, Rhode, and Gunpowder Rivers) of the Upper Chesapeake Bay using a Licor radiometer. Analysis revealed a strong linear correlation between AquaFast turbidity readings and KdPAR across tributaries, demonstrating that volunteer-collected data can reliably support estuarine health assessments. This study highlights the potential of participatory science in water quality monitoring. Future work will explore relationships between KdPAR and additional variables, such as chlorophyll.

<STUDENT POSTER> BIOMIMICRY TECHNIQUES IN DESIGN OF STORMWATER MANAGEMENT WITHIN FOUR CRITICAL AREAS OF THE CHESAPEAKE BAY

Clara McKnight, River Hill High School; clara.bean6751@gmail.com

Coauthors: Radhika Wijetunge, Howard County Stormwater Management Division; Janine Sharbaugh, River Hill High School

Biomimicry is a design approach that focuses on mimicking the function and processes of biological entities to solve sustainability problems. It can be used to improve urban stormwater management by regenerating ecosystems and designing more resilient infrastructure. Numerous techniques of biomimicry are in use today: such as the log roll technique, which mimics a fallen tree, or the woody toe technique, which mimics wood that becomes jammed in an embankment. This study aims to analyze engineering plans where biomimicry techniques have been used in projects completed within the past decade in the Chesapeake Bay watershed, focusing on four regions of concern: the Susquehanna watershed, Monocacy area watershed, Anacostia watershed, and the Town Creek ecosystem. These four areas are vital to water quality, habitat health, and land use change in the Chesapeake Bay. Through examining watershed management engineering plans in these areas and creating a dataset, the biomimicry techniques used least frequently can be identified. Based on the results, techniques in need of improvement will be established and recommendations will be made for the future direction of biomimicry use in the Chesapeake Bay watershed.

HIGH-FREQUENCY WATER QUALITY OBSERVATIONS ALONG AN URBAN TO RURAL GRADIENT IN BALTIMORE: AN UPDATE

Mary McWilliams, University of Maryland Baltimore County; mmcwill1@umbc.edu

Coauthors: Claire Welty, UMBC/CUERE; Andrew Miller, UMBC/CUERE; Jon Duncan, PSU; Peter Groffman, CUNY/CARY

We have deployed six high-frequency water quality stations spanning an urban to rural gradient along the Gwynns Falls and a forested reference site, co-located with USGS stream gaging stations. This setup complements 26 years of weekly stream chemistry sampling by the Baltimore Ecosystem Study. Data are collected at a 5-minute frequency using YSI EXO2 sondes outfitted with specific conductance, temperature, turbidity, pH and dissolved oxygen sensors. Initial studies include quantification of old-water/new-water using specific conductance and calculation of estimates of sediment loads using correlations with turbidity. The old-water/new-water analysis over a range of storm sizes shows that the fraction of groundwater comprising streamflow is greatest for smaller storms, and that for a given storm size, this fraction varies across watersheds. Suspended sediment loads exhibit spatial variability across the urban to rural gradient. Future deployment of S-can SpectrolyserV3 sensors to collect TOC, DOC, and nitrate data will be used to calculate loads of carbon and nitrate across a range of space and time scales. The sensor data can be used to inform regulatory policy on Total Maximum Daily Loads and as calibration targets for coupled groundwater-surface water transport models. This work is part of the Baltimore Social-Environmental Collaborative Urban Integrated Field Laboratory.

LEVERAGING THE BENEFITS OF LONG-TERM HYDROLOGIC MONITORING OF SENSITIVE WETLANDS

Kelley Moxley, WSP; kelley.moxley@wsp.com

Coauthors: Kelly Lennon, PE, WSP; Kyle Spendiff, WSP; and Julie McCarthy, MDTA

A long-term hydrologic monitoring network was developed to monitor the potential construction impacts on sensitive wetland habitats where federally and state threatened plants occur as part of an on-going roadway project. An extensive hydrologic monitoring network was installed in 2021 with agency input to determine the groundwater levels pre-construction, during construction, and post-construction associated with the key wetland areas. The monitoring was requested by the Department of Natural Resources (DNR) and US Fish and Wildlife Service (USFWS). Monitoring includes deep monitoring wells, piezometers, and precipitation gauges. Monitoring is on-going during construction and will continue post-construction for five (5) years. Groundwater seep surveys are conducted bi-annually. Pre-, during, and post-construction data analysis are being completed to document changes in hydrology of the sensitive wetland sites. The monitoring has allowed field teams to view the potential impacts of various site conditions and activities such as evapotranspiration, construction stream pump-around activities, and extreme cold temperatures on wetland water levels. This poster will highlight key findings, both naturally occurring and/or due to construction activities during the 3-year monitoring history.

GREY TO GREEN; INCREASED URBANIZATION SUGGESTS AN ELEVATION IN PHOSPHORUS PRESENCE AND GREATER ALGAE GROWTH IN THE CHESAPEAKE BAY WATERSHED

August Mullican, Hood College; amm42@hood.edu

Coauthor: Sean Sharp, Hood College

Eutrophication, the accumulation of excess nutrients, has been identified as the largest issue facing the Chesapeake Bay since the 1980s. In the Bay, agricultural runoff alone contributes 48% of the nitrogen and 27% of the phosphorus. Here, we investigate the role of stream eutrophication on the growth and composition of benthic algae in first-order streams within the Chesapeake Bay watershed in the late Summer and early Autumn seasons. We compared benthic algae in both a high-intensity land use watershed and a low-intensity, more rural watershed. We used 12 5x5cm ceramic tiles attached to 4 cinderblocks (n= 48) and submerged these in either a sunny or shaded location within each of the 2 streams. On a biweekly basis, surface water &, air temperature, light intensity, canopy cover, and water depth were measured at each site. We also sampled surface water and removed 2 tiles from each cinderblock to be analyzed in the lab for water chemistry and concentrations of green algae (chlorophyll-A), phycocyanin (cyanobacteria), phycoerythrin (diatoms). We found that the more developed watershed had greater phosphorus concentrations and directly correlated to a greater abundance of benthic green algae (chlorophyll-A). This suggests excessive nutrients can alter the community structure of benthic producers in headwater streams while also contributing to Chesapeake Bay eutrophication.

ECOLOGICAL INDICATORS: EXPLORING THE USE OF ENVIRONMENTAL DNA TO ENHANCE BROOK TROUT CONSERVATION IN MARYLAND

Patience Odeh, Towson University; podeh1@students.towson.edu

Coauthors: Caitlin Fleming, Towson University; Jose Andres, Cornell University; Krista Kraskura, Towson University; Christopher J Salice, Towson University

Eastern brook trout, *Salvelinus fontinalis*, are the only native salmonids in Maryland and are important indicator species of freshwater water quality. Brook trout provide crucial biological insights due to their sensitivity to environmental changes, especially temperature and conductivity both of which has increased in streams due to a variety of anthropogenic activities. This study aims to explore the relationship between the presence or absence of brook trout and stream water quality using environmental DNA (eDNA) technology. We sampled 20 streams in Baltimore County alongside water quality parameters such as temperature, dissolved oxygen, conductivity, pH, and nitrate/nitrite levels. Water samples were analyzed by an eDNA laboratory at Cornell University. This study investigated the feasibility of using eDNA to enhance conservation research by providing a more precise method of tracking brook trout without physically catching the fish. Preliminary results confirm brook trout in streams with historical occurrence based on Maryland Biological Stream Survey data. Additionally, brown trout were the most common salmonid in the sampled Baltimore County streams. Preliminary findings suggest that eDNA could play a pivotal role in closing existing gaps in conservation strategies focused on brook trout, potentially leading to more effective environmental monitoring and preservation.

ONE WATER

Rich Ortt, Maryland DNR; richard.ortt@maryland.gov

Coauthors: Scott Stranko, Maryland DNR; Tom Parham, Maryland DNR

To better manage and protect Maryland's waters while addressing emerging environmental challenges, the Maryland Department of Natural Resources (DNR) is proposing the "One Water" plan. Our vision is to enhance the monitoring and understanding of the interconnected components of the water cycle. We aim to create a more refined, integrated, and comprehensive approach to water management, one that is crucial for achieving Maryland's diverse and critical water resource goals.

Water exists in many forms and is essential to a variety of uses—from supporting environmental health and agriculture to providing drinking water and sustaining aquatic life in the state's habitats. Historically, water has been studied and monitored within distinct categories, often based on spatial, temporal, or user-based boundaries. However, we recognize that water—whether in the ground, freshwater streams, tidal bays, or the atmosphere—is an interconnected and continuous resource.

Therefore, effective research, monitoring, conservation, and management of water resources must adopt a more holistic approach. By considering all forms and locations where water exists, we can improve scientific understanding and more effectively protect and restore both water quality and quantity.

THE MARYLAND SAFE DRINKING WATER STUDY: AN INITIATIVE TO PROTECT MARYLAND'S WATER

Georgia Parolski, University of Maryland, School of Public Health, Department of Global, Environmental, and Occupational Health; parolski@umd.edu

Coauthors: Rianna Murray University of Maryland, School of Public Health, Department of Global, Environmental, and Occupational Health; Leena Malayil University of Maryland, School of Public Health, Department of Global, Environmental, and Occupational Health; Paul Turner University of Maryland, School of Public Health, Department of Global, Environmental, and Occupational Health; Allen Davis University of Maryland, Department of Civil and Environmental Engineering

Approximately 5.1 million Marylanders are served by public drinking water systems while over 1 million rely on private wells for their water. Recent studies detected *E. coli* in both private & public drinking water supplies in MD, & per & polyfluoroalkyl substances (PFAS) in approximately 1.3% of Marylanders' public water. The objective of the Maryland Safe Drinking WATER Study is to characterize the drinking water quality of public drinking water systems & private wells in MD using a combination of citizen science, field-based research, & laboratory analyses. 785 Marylanders enrolled in the study to date, with participants from each county & Baltimore City. We mailed water testing kits to all participants who enrolled to test their water for key drinking water contaminants. 68% of participants (n=536) reported their water testing results, with many reporting results that exceeded at least one EPA specification for the 9 parameters measured. All 536 participants will be invited to submit water samples for laboratory analysis of additional microbiological & chemical contaminants such as *E. coli*, lead, arsenic, nitrate, PFAS, & pesticide residues. Water sample collection from participants' homes (across 9 counties) began in May '24. Samples are currently undergoing laboratory analysis to yield important data on water quality from MD's private wells & public treatment plants.

CHLORIDE AND HEAVY METALS IN HCC'S STREAM SYSTEMS

Dr. Hannah Pie, Howard Community College; hpie@howardcc.edu

Coauthors: Rebecca Carmody, Ph.D., Howard Community College; Stephen Shaner, Howard Community College (currently at UMBC)

Stream pollution caused by road runoff is a problem for stream ecosystems and the overall quality of the water. Many different pollutants accumulate on roads and can be washed into streams by storm runoff, such as trash, road salts, and metals. Our goal for this project was to measure the levels of manganese, iron, nickel, and chloride in two streams on the Howard Community College (HCC) campus in order to monitor how the overall health of the streams may be affected by road and construction site runoff. We collected monthly water samples from five locations on two campus stream systems. We examined the water quality at each site using sensors and then analyzed the concentrations of manganese, iron, and nickel using an atomic absorption spectrophotometer. Iron and manganese levels varied by location with one site (Site B) consistently having the highest concentrations of both metals. However, nickel was generally below the detection limit in most of the sites, besides notably the closest site to the ongoing campus construction project (Site D). In 2023, there was an overall decrease in average chloride concentrations across all sample locations which could be related to a decrease in road salt application during the winter of 2022-2023 due to the almost complete lack of snow.

<STUDENT POSTER> CHLAMYDOMONAS AND MICROCYSTIS GROWTH AND COMPETITION WITH TRACE AMOUNTS OF MOLYBDENUM

Callie Polanka, Mount St. Mary's University; c.j.polanka@email.msmary.edu

Coauthor: Dr. Rachel Hartnett, Mount St. Mary's University

This experiment focuses on Daphnia grazing patterns and feeding preferences when presented with a mixture of phytoplankton species (Chlamydomonas, Microcystis) and added Molybdenum levels. In this experiment, Daphnia were presented with the same amount of food with different treatments (Std. Mix, or Mo Mix). We determined Daphnia preferences by measuring the clearance of the water after a 24-hour feeding period. Results from this experiment will further the scientific communities' understanding on Daphnia feeding. In addition, the study will help provide environmental solutions to problems like an abundance of Mo in the environment and the presence of harmful algal blooms.

AN AGE AND GROWTH STUDY OF BLUE CATFISH POPULATIONS IN MD TRIBUTARIES

Evangeline Sawyers, MDNR; evangeline.sawyers@maryland.gov

Coauthor: Branson Williams, MDNR Fisheries

The blue catfish (*Ictalurus furcatus*) is the largest species of catfish in North America, and is considered invasive to the Chesapeake Bay watershed. The species now occupies every major tributary to the Chesapeake Bay and has raised concern about their ecological effects. Blue catfish populations vary between systems and tributary-specific management is a regional goal. This study examines the age and growth of blue catfish populations in two Maryland rivers, and compares them to those of established populations of Virginia rivers. Otoliths collected from blue catfish in the Potomac and Patuxent rivers in Maryland were aged and growth rates and other population parameters were estimated and compared. These findings support the goals for tributary-specific blue catfish management in the Chesapeake Bay Program's Invasive Catfish Strategy and other regional or state-wide management plans in the Chesapeake Bay.

DOES THE TYPE OF DESIGN FIRM DRIVE ECOSYSTEM SERVICE BUNDLES IN STORMWATER GREEN INFRASTRUCTURE?

Rahat Sharif, University of Maryland - College Park; rahats@umd.edu

Coauthor: Mitchell Pavao-Zuckerman, University of Maryland - College Park

Green infrastructure that provides multiple ecosystem services have been implemented as a way to meet the growing demand of cities, including reducing air temperatures and providing green space. These structures have to mitigate stormwater to comply with federal law, but no requirements for other benefits. While many studies explore how these structures provide ecosystem services, few have looked at how design impacts ecosystem service multifunctionality. This study investigates if design firm type impacts multifunctionality using sites within Rock Creek, Anacostia, and Paint Branch watersheds. Ecosystem services were characterized using soil properties, field measurements, and surveys. Preliminary data show sites designed by engineering firms have higher average bulk density but lower organic matter content than architectural firms. Differences in bulk density may impact infiltration, low organic matter can lead to suboptimal nutrient removal. Understanding how design impacts the provision of these ecosystem services can better guide placement and function of these structures.

CHESAPEAKE WATER WATCH: VOLUNTEERS ENHANCING SATELLITE REMOTE SENSING OF WATER QUALITY

Tara Sill, Smithsonian Environmental Research Center; sillt@si.edu

Coauthors: Rachel Terracina, Smithsonian Environmental Research Center; Patrick Neale, Smithsonian Environmental Research Center; Alison Cawood, Smithsonian Environmental Research Center; Maria Tzortziou, The City University of New York; Jieun Park, The City University of New York; Tong Lin, The City University of New York

Water quality monitoring programs employ a variety of indicators to track ecosystem conditions. However, certain regions in the Chesapeake Bay lack comprehensive coverage. While satellite remote sensing provides a valuable synoptic monitoring tool, in-situ measurements are needed for algorithm validation. The Chesapeake Water Watch project leverages the efforts of participatory (volunteer) scientists who use smartphone apps and basic instruments to gather data for comparison with satellite images, focusing on variations in tidal tributaries. Over the past three years, we recruited volunteers to sample tidal tributaries in the upper and lower Bay through direct outreach to interested individuals and working with Riverkeepers, community organizations, and environmental non-profits. We have successfully validated participatory science methodologies for assessing chlorophyll a, colored dissolved organic matter (CDOM), and turbidity by comparing a subset of volunteer data with standard laboratory measurements. Data has been acquired by repeated sampling at selected locations and periodic Bay-wide synoptic sampling that coincides with the passage of high-resolution satellites (Landsat 8/9 & Sentinel 2A/B). Using volunteer data, we have improved satellite remote sensing algorithms for monitoring chlorophyll a, CDOM, and turbidity in Bay tributaries.

INTERACTIONS OF OYSTER AQUACULTURE AND SEAGRASS: EFFECTS OF FLOATING OYSTER CAGES ON LIGHT PENETRATION

Owen Skirtich, University of Maryland Eastern Shore; oskirtich@umes.edu

Coauthors: Matthew Gray, University of Maryland Center for Environmental Science; Stephen J. Tomasetti, University of Maryland Eastern Shore

Bivalve aquaculture is one of the most sustainable forms of blue food production available and is increasing across the United States. While it is generally considered low impact, under an expansion scenario, there is an increasing probability of spatial overlap between oyster aquaculture activities and important benthic habitats such as seagrass. Yet, it is unclear how current oyster farm practices may impact light availability to submerged grasses. This study aimed to understand the effects of oyster aquaculture gear on light availability for seagrass habitat in a tidal mesohaline estuary of Chesapeake Bay, Maryland. To quantify light intensity Onset HOBO pendant light loggers were deployed at the same depths in a series of quadrats located along transects that were either beneath floating oyster bags or in open water, for a week-long duration each month from May through August. Percent surface light, light attenuation rates, and time below specific low-light thresholds were quantified. Partnering with a Maryland oyster farm, this case study will help to better understand the effects of aquaculture gear on the light requirements of submerged aquatic vegetation (SAV), one of a multitude of factors to consider regarding SAV – aquaculture interactions. The findings may be used to inform future aquaculture practices, management, and policy for Maryland.

INNOVATIVE APPROACH FOR BIOREMEDIATION OF NITRATE-CONTAMINATED BRINE USING HALOPHILIC DENITRIFIERS FOR WATER QUALITY RESTORATION

Leonardo Soto, Marine, Estuarine, and Environmental Sciences Program, University System of Maryland; Institute of Marine and Environmental Technology, University System of Maryland; lsoto1@umd.edu

Coauthors: Priya DasSarma, Department of Microbiology and Immunology, University of Maryland Baltimore; Institute of Marine and Environmental Technology, University System of Maryland; Shiladitya DasSarma, Marine, Estuarine, and Environmental Sciences Program, University System of Maryland; Department of Microbiology and Immunology, University of Maryland Baltimore; Institute of Marine and Environmental Technology, University System of Maryland

Nitrate is a toxic pollutant found in municipal drinking water and well water, especially with farmland conversion to residential use. It poses significant health risks, including methemoglobinemia and gastrointestinal cancers. We have developed an efficient, low-cost, environmentally friendly way to bioremediate nitrate-contaminated water using salt-loving microorganisms (halophiles) with denitrifying capabilities. In this approach, nitrate is initially removed through affinity chromatography using ion exchange resins, followed by column regeneration with concentrated sodium chloride solution. The resulting brine, containing high levels of nitrate anions, is treated using halophilic microbes to convert nitrates into harmless nitrogen gas. This method offers an efficient, scalable solution for nitrate removal. Halophilic microbes, which are non-pathogenic and non-toxic, grow optimally in salt concentrations found in the spent brine. Besides purifying drinking water, this technology may be used to reduce nitrate levels in contaminated wastewater, protecting natural water bodies by helping to prevent eutrophication—a major cause of dead zones in aquatic environments in Maryland. Our approach supports environmental and public health goals by improving water quality, protecting aquatic life, and integrating into existing infrastructure for long-term ecological and health benefits.

<STUDENT POSTER> INVESTIGATING THE IMPACT OF INCREASED FLOODING & GROUNDWATER TABLE RISE ON PATHOGEN REMOVAL IN THE SOIL TREATMENT AREA OF COASTAL SEPTIC SYSTEMS

Emily Speierman, University of Maryland, Department of Civil & Environmental Engineering; espeierm@umd.edu

Coauthors: Dr. Birthe Kjellerup, University of Maryland Department of Civil & Environmental Engineering

In Maryland, at least 52,000 septic systems have been installed within 1,000 feet of the Chesapeake Bay and its tidal tributaries. Conventional septic systems have two main components: the septic tank, where primary clarification occurs, and the soil treatment area (STA), where the remainder of nutrient, pathogen, and organic matter removal occurs. The EPA and MDE recognize 4-ft of unsaturated soil as necessary in STA's for proper treatment of wastewater. Changing hydraulic conditions associated with climate change, primarily increased flooding and rising groundwater tables, are saturating STA's in coastal areas with increasing frequency. A sand column study will investigate how these changing hydraulic conditions are impacting pathogen removal in STA's. Synthetic wastewater containing a model pathogen will be used as column influent; removal of culturable bacteria will be the primary treatment metric. After normalization, the columns will run continuously for 4-weeks. Experimental columns will be subjected to 24-hour flood simulations to investigate the impact of flooding, while the impact of groundwater table rise will be evaluated by comparing treatment after 2-ft vs. 4-ft of treatment depth. Findings will inform future policy regarding the viability of septic systems in coastal areas and improve models estimating bacterial loads to the Chesapeake Bay.

SUSQUEHANNA RIVER BASIN COMMISSION – NEW AND CONTINUING ACTIVITIES IN MARYLAND

Luanne Steffy, Susquehanna River Basin Commission; lsteffy@srbc.gov

Coauthors: Dawn Hintz, Susquehanna River Basin Commission

About 1%, or 280 square miles of the Susquehanna River Basin (SRB) lies within the state of Maryland and as such sometimes the work of the Susquehanna River Basin Commission (SRBC) in MD is overlooked. However, SRBC has some exciting recent activities in Maryland that we would like to share with local stakeholders and colleagues. The Commission has been operating a continuous instream monitoring network with the SRB for over a decade but will be installing our first real-time continuous monitoring station in Maryland in Fall 2024. The site will be in Deer Creek in Rocks State Park. High frequency water quality data; temperature, pH, dissolved oxygen, conductance and turbidity, will be collected at 15 minute intervals and data will be linked to our website for public viewing. Quarterly lab chemistry samples will be collected as well as biological data. Since 2019, SRBC staff have also been using eDNA sampling to monitor the spread of invasive fish species in the lower Susquehanna River, specifically northern snakehead and blue catfish. SRBC is in the third year of pilot freshwater salinization study, looking at sites where we have a long record of historical water quality data, specifically chloride, to evaluate potential salinization trends, including the headwaters of Deer Creek near the MD-PA border. Deer Creek does seem to be getting saltier over the past 30 years.

A NOVEL AQUATIC INVERTEBRATE MODEL: USING JUVENILE ODONATES TO BETTER UNDERSTAND SALINITY AND PFAS STRESSORS

Talia Tanner, Towson University; ttanner1@students.towson.edu

Coauthors: Krista Krascura, Towson University; Christopher Salice, Towson University

Per and Poly-fluoroalkyl substances (PFAS), are environmental toxicants used in a variety of industries and products. Some PFAS have been linked to harmful human health effects. The persistence and prevalence of PFAS in the environment, particularly in aquatic systems, highlight the importance of researching their bioaccumulation in a wide range of organisms. Additionally, it is still unclear how environmental parameters, such as salinity, might interact with PFAS bioaccumulation. Further, freshwater salinization is an increasing issue in Maryland streams, where macroinvertebrates serve as indicator species. Dragonflies are understudied aquatic invertebrates that can have high biomass and are important in both aquatic and terrestrial environments. This study aims to establish dragonflies as a novel model species to evaluate PFAS fate and transport in natural ecosystems. The research has two objectives: 1) to better understand the impacts of salinity stress on nymph growth and respiration, and 2) to examine PFAS bioaccumulation in nymphs. Only one study thus far has examined PFAS interactions with salinity in aquatic organisms. This research will add to the current literature and inform environmental management by providing novel information on salinity and PFAS effects and bioaccumulation in an important emergent aquatic insect.

HIDDEN NEUROTOXINS IN BENTHIC CYANOBACTERIA MATS

Catherine Wazniak, MD Department of Natural Resources; catherine.wazniak@maryland.gov

Coauthors: Chris Luckett, MDE; Amy Hamilton, MD DNR; Judy O'Neil, UMD; Allison Samuel MDE, Elizabeth Larson, MD DNR

Excessive algal growth is a key impact of eutrophication in aquatic ecosystems. Efforts to decrease nitrogen have led to decreased water column phytoplankton, increased light penetration and proliferation of filamentous benthic algae, especially diazotrophic cyanobacteria mats in many areas. The potential for cyanotoxin production, specifically neurotoxins, within these mats is an emerging concern. Saxitoxin detection has been measured in benthic cyanobacteria mats dominated by *Microseira wollei* (formerly *Lyngbya*). Freshwater saxitoxins were detected in Maryland lakes (0.48 - 906 µg/g saxitoxin), Maryland tributaries (Potomac 4.1-928 µg/g, North East River 0.21µg/g) and in the Susquehanna Flats region of the upper Bay (0.03-81.22 µg/g saxitoxin). These levels are similar to those observed in other areas (CA, NY, NZ, SC, Canada, and Great Lakes). Anatoxins were detected in mat samples dominated by *Microcoleus* (formerly *Phormidium sp.*) in two lakes (Urieville 0.078 µg/g and St Mary's Lake 2.44 µg/g) and the Potomac River (2023 >1,000 µg/g and in 2024 1–90 µg/g). Anatoxin was also found in water samples from four other lakes related to plankton blooms (Hunting Creek Lake, Wye Mills, Lake Elkhorn and Wilde Lake) and two grab samples on the Susquehanna Flats. To date, these toxins have not been detected in correlating water samples.

THE ROLE OF UNMANNED AERIAL VEHICLES IN CHARACTERIZING STREAM FLOW DYNAMICS

Gregory Zuknick, EA Engineering, Science, and Technology, Inc., PBC; gzuknick@eaest.com

Coauthors: Luke Flores, EA Engineering, Science, and Technology, Inc., PBC; Micheal Powell, EA Engineering, Science, and Technology, Inc., PBC; Conor O'Hara, EA Engineering, Science, and Technology, Inc., PBC; Michael Durbano, EA Engineering, Science, and Technology, Inc., PBC

Unmanned aerial vehicles (UAV) have had an increasing role in monitoring environmental conditions. We performed a pilot study to characterize stream dynamics using large-scale particle image velocimetry (LSPIV) on a video recording from a UAV. The open-source python library pyOpenRiverCam was used to perform the analysis and post-process the results. Utilizing high-resolution aerial video, surveyed ground control points, and open-sourced python libraries we were able to test and evaluate a methodology for capturing and quantifying data on water flow patterns, velocity, and discharge volume. Stream flow velocity estimates obtained from the LSPIV analysis were compared to those obtained from a flowmeter and USGS float method. Preliminary results suggest that the LSPIV approach provides estimates of stream flow velocity that are comparable to traditional methods. This study demonstrates several benefits compared to traditional hydrologic measuring techniques. For example, the UAV's capability to record stream flow without having to enter the stream is safer and likely more cost-effective. Our findings demonstrate the effectiveness of UAVs in detecting changes in flow direction, velocity, and discharge. This innovative approach has significant implications for environmental monitoring by providing a tool to understand surface flow patterns and surface flow velocities.

Maryland Water Monitoring Council

2023-2024 Annual Report

This report summarizes MWMC activities from November 2023 through November 2024.

2024 marked the 29th year for the Council. The Board of Directors continued to guide the Council toward its goals and new members provided fresh ideas that helped move the Council forward. The 2023 Annual Conference drew 400 attendees. Included were a host of exciting talks and posters, and the post-conference social was held at Heavy Seas Brewery in Halethorpe. The MWMC partnered with the Maryland Stream Restoration Association (MSRA) in organizing the conference. Committee work continued in earnest, including a number of workshops and webinars. The Council entered 2024 with a renewed commitment to pursue the three Cs – Communication, Coordination and Cooperation - among water monitoring agencies and organizations throughout the State.

Board of Directors

The MWMC Board of Directors continued its work under the leadership of Matt Stover (MDE) and Mat Pajerowski (USGS) serving as Chair and Vice-Chair, respectively. On the Board, Ken Mack (Montgomery Co. DEP), and Lindsay DeMarzo (Howard Co. OCS) have elected to continue for a second term, and Mat Pajerowski (USGS) was approved by the Board to continue another term. Jason Dubow (MDP), Bob Hilderbrand (UMCES), and Matt Stover (MDE) will be leaving their seats on the Board at or before the end of 2024. Nominations of prospective Board members to fill five vacant seats have been submitted to Josh Kurtz, DNR Secretary, for approval: Heather Quinn (MDNR), Tom Guay (Severn River Association), Greg Voigt (EPA), Angel Valdez (MDE), Becky Monahan (MDE).

Although not a Board member, the Board welcomed Brock Reggi (VADEQ) in July. Brock has agreed to Chair the Stream Restoration Subcommittee. Additionally, Board member Rupert Rossetti has taken on leadership of the Citizen Science Committee and is assembling a committee of volunteers hailing from a wide range of backgrounds and experiences.

Information on the MWMC Board of Directors can be found at http://dnr.maryland.gov/streams/Pages/MWMC/BoardofDirectors.aspx.

2023 Annual Conference

The 29th Annual Conference was once again held at the Maritime Institute on November 17 in partnership with the Maryland Stream Restoration Association (MSRA). With 400 in attendance, the event's theme was *Stepping Up Our Efforts - Now Is The Time*. An informative plenary session started with a talk by Dr. Dorothy Merritts (Franklin & Marshall College), who discussed restoration of streams to their historic valleys. Adam Ortiz (US EPA Region 3) discussed experiences in encouraging collaboration and communication with the EPA and with his prior positions at Montgomery County DEP and Prince George's County DOE. Scott Phillips (USGS, retired) received the 17th Annual Carl Weber Award for his efforts as Chesapeake Bay Coordinator to coordinate monitoring to fill data gaps and to further the communication of scientific information to non-scientific audiences. Susan Simonson (Antietam Conococheague Watershed Alliance) received the 7th annual Above and Beyond Award for her work to monitor the watersheds, educate students and the public about ways to protect and improve local habitats, and organize efforts to improve water quality. Session topics included Polychlorinated Biphenyls (PCBs), Harmful Algal Blooms, Thermal Impacts, Groundwater, Reintroduction Projects, Stormwater, Student Lightning Talks, and more. Fifty-two talks, 22 posters (including 3 student posters), and 13 vendor or sponsor exhibits all contributed to a diverse and well-rounded agenda.

Workshops and Webinars

eDNA Workshop

On December 8th, 2023, the Monitoring and Assessment Committee held a hybrid eDNA Workshop at the USGS Water Science Center. Six researchers shared their experiences, knowledge, and wisdom on a range of topics that included development of eDNA as a monitoring tool, field and lab best practices, eDNA results interpretation and how to communicate them, and case studies of how eDNA is/can be used for natural resource management.

Stream Monitoring Roundtable

MWMC sponsored the 16th Maryland Stream Monitoring Roundtable at the USGS Water Science Center in Catonsville. The goals of the February 26th event were to 1) discuss who is doing what, where, when and how; 2) avoid potential duplication of effort by sampling at the same stream site; and 3) facilitate data sharing. The Roundtable drew 22 participants and at least 47 total attendees from state, federal, and local agencies, watershed associations, and consulting firms. Prior to the gathering, presenters provided georeferenced site information to DNR to produce a statewide map of sampling sites in 2024. This map was displayed during the event so participants could examine site overlap, gaps, and sampling protocols to be used during 2024. For more information about the Roundtable, contact Andy Becker at andy.becker@kci.com.

Information Management and Communication Committee Webinars

The IMC Committee organized three data management webinars in 2024: Quality Assurance in the Office of Water, EPA: Perspectives on Best Practices to Ponder on January 30th, The Three Rs of QAPPs – wRiting, Reviewing, and Realization (Implementation) on February 27th, and Best Practices For Continuous Monitoring on September 12th. Each event drew more than 80 attendees.

What's in store for 2024?

2024 will be the 30th year for the Council and this year's annual conference will continue the tradition of offering an excellent opportunity for anyone in the water community to share their research, ideas and contacts. The Conference Planning Committee began planning the November 21 conference in January and the event will feature plenary talks by Rick Batiuk (Associate Director, Science, Analysis, and Implementation, U.S. Environmental Protection Agency, Chesapeake Bay Program Office (retired), Co-founder, CoastWise Partners) and Bob Shedlock (Scientist Emeritus at US Geological Survey, Emeritus Director of USGS MDDE-DC Water Science Center).

The Monitoring and Assessment Committee plans to hold another Stream Monitoring Roundtable in early spring and the newly-Chaired Citizen Science Committee and Stream Restoration Sub-committee will be exploring pathways forward. Several webinars are in planning stages and will be announced in early 2025.

Full committee reports can be found following the MWMC Annual Report.

Submitted by Katherine Hanna
MWMC Executive Secretary
November 14, 2024

Maryland Water Monitoring Council

Citizen Science and Community Stewardship Committee
2024 Annual Committee Report

Committee members and affiliations
Rupert Rossetti, Octoraro Watershed Association, Board Member, Chair
Andy Grosko, GPCA Small Watershed Conservation Committee
Lolita Kiorpes, Charles Co. Public Schools
Phillip Mariscal, ANSI National Accreditation Board
Kathy Martin, University of Maryland (retired)
Robbie Roemer, Maryland DNR

The Citizen Science and Community Stewardship Committee is rebuilding after a period of inactivity. We have five people interested in joining the committee, and held an Introductory Meeting via Zoom on Wednesday October 9, 2024 to introduce the members of the Committee and to better understand MWMC's expectations.

What bubbled to the surface - with a lot of energy from all - was to revisit the topic of "What happens to Citizen Science data once it has been collected? - or "Data quality and how our data is presented and used".

We are envisaging doing a webinar or series of webinars rather than a face-to-face workshop.

We agreed to get together at the upcoming conference to meet in person for the first time and to better define our goals.

We welcome input and active participation from other citizen scientists. If interested, please contact Committee Chair Rupert Rossetti at rupertrossetti@gmail.com.

Maryland Water Monitoring Council

Groundwater Committee
2024 Annual Committee Report

Chair

Mat Pajerowski
U.S. Geological Survey, MD-DE-DC Water Science Center

No report submitted.

Maryland Water Monitoring Council

Information Management and Communication Committee
2024 Annual Committee Report

Committee Chair
Najma Khokhar
TechZone MD

In 2024, the Information and Communications Committee successfully organized three webinars for Maryland Water Monitoring Council members. Topics covered included QAPPS, quality assurance, and continuous monitoring, featuring presentations from the EPA. Each session drew over 80 attendees.

Looking ahead, the committee plans to host additional webinars on various topics, including transitioning from paper to digital formats, addressing drift issues in continuous monitoring, and standardizing qualifier codes across Maryland and more. Additionally, the committee aims to initiate an academic program to integrate quality assurance topics into laboratory coursework. This initiative will help students understand the importance of quality assurance and quality control from the outset. We also plan to create a master list of qualifier codes used by different agencies and groups for reporting flagged data, whether for informational purposes or exclusion requests. This initiative will enhance standardization and consistency across all participating agencies.

The Information and Communications Committee is actively seeking new members who have ideas for future projects. We encourage you to consider volunteering to help advance our mission.

Maryland Water Monitoring Council

Monitoring and Assessment Committee
2024 Annual Committee Report

Committee Chair

Byrin Madigan, Carroll Co. Government

2024 Activities and Accomplishments

A workshop specific to eDNA sampling techniques was held as a hybrid event on December 8, 2023 at the USGS Water Science Center. The objectives of this workshop, which had over 300 registrants attend either in person or virtually, was to provide a basic overview of the technologies and techniques used in eDNA sampling, as well as show examples of how this assessment technique is being used and its potential in Chesapeake Bay natural resource management. There were 6 presentations given related to the state of eDNA science and its application in Maryland Watersheds, as well as a roundtable to identify data needs, challenges, and new applications. This workshop was organized by Chris Victoria.

The 16th (mostly) Annual Maryland Stream Monitoring Roundtable was held as a hybrid event on February 26, 2024 at the USGS Water Science Center. There were 64 people registered for the roundtable, and with people dropping in and out of the virtual meeting throughout the day, an exact count of attendees was not taken. There were 22 presentations given overall by federal, state, and local representatives, as well as academia and non-profits regarding the 'what, where, and when' of planned 2024 monitoring. Mark Trice (DNR) and Andy Becker (KCI) collaborated to produce an online map of all submitted data points for 2024 monitoring. The roundtable was organized by Andy Becker.

Currently, the Monitoring and Assessment subcommittee is also in the process of organizing a PFAS workshop. This workshop is being planned for late January, 2025 and aims to cover many different aspects from regulatory updates on PFAS, to monitoring and transport, as well as municipal points of view related to water supply design changes and challenges for PFAS treatment.

Maryland Water Monitoring Council

Student Committee
2024 Annual Committee Report

Committee Chair

Lindsay DeMarzo, Howard Co. OCS

The committee hosted the first ever student lightning round talks during a conference session at the 2023 conference. This provided an opportunity for a less intimidating presentation setting for students new to conference presenting. Four students shared 5-minute presentations on their various research topics and then all students were invited to sit together for a Q&A with the audience. The students and audience were very engaged, and students even flipped the tables to ask the audience members insightful questions regarding their presentations, research, and potential future careers. The committee also assisted in providing outreach for the student poster session and poster judging during the conference.

Given the success of the first year, the student committee will host a lightning round of student talks during the 2024 conference as well.

The committee met to discuss and brainstorm ideas for other career development and engagement with students. The committee welcomed several new members this year as well.

Maryland Water Monitoring Council

2024 Board of Directors

Andy Becker
KCI Technologies, Inc.
andy.becker@kci.com

Megan Brosh
Baltimore County DEPS
mbrosh@baltimorecountymd.gov

Lindsay DeMarzo
Howard Co. OCS
ldemarzo@howardcountymd.gov

John Denniston
Maryland Dept. of Transportation
jdenniston@mdot.maryland.gov

Jason Dubow
Maryland Dept. of Planning
jason.dubow@maryland.gov

Matt Harper
M-NCPPC
matthew.harper@montgomeryparks.org

Bob Hilderbrand
UMCES
hilderbrand@al.umces.edu

Ken Mack
Montgomery Co. DEP
kenny.mack@montgomerycountymd.gov

Byron Madigan
Carroll County Bureau of Resource Management
bmadigan@ccg.carr.org

Mat Pajerowski - Board Vice Chair
United States Geological Survey
MD-DE-DC Water Science Center
mgpajero@usgs.gov

Rupert Rossetti
Octoraro Watershed Association
rupertrossetti@gmail.com

Nancy Roth
Tetra Tech, Inc.
nancy.roth@tetratech.com

Brian Smith
Maryland DNR
brianr.smith@maryland.gov

Ken Staver
Univ. of MD Wye Research & Education Center
kstaver@umd.edu

Matt Stover - Board Chair
Maryland Department of the Environment
matthew.stover@maryland.gov

Chris Victoria
Anne Arundel Dept. of Public Works
pwvict16@aacounty.org

Michael Williams
University of Maryland College Park
miwillia@umd.edu

Katherine Hanna - Executive Secretary
Maryland Department of Natural Resources
katherine.hanna@maryland.gov

Mentorship Program

This program is designed to foster your personal and professional growth, help you navigate your career path, and achieve your goals. A mentor in your field of interest can provide profession-specific expert advice, skill development, career planning, and networking opportunities.

fall through the end of the academic year

mentors and mentees will create their own schedule with the expectation of 3-4 meetings/year (video calls or in person)

Students who:

- have a membership with MSRA;
- are interested in entering the stream restoration field; and
- are a current college student

Find more information and register at:
https://marylandstreamrestorationassociation.org/