Maryland Water Monitoring Council

December 5, 2013

North Linthicum

Conserving Maryland's High Quality Waters – From Monitoring to Action

MARYLAND WATER MONITORING COUNCIL

19th Annual Conference

December 5, 2013

Welcome to the 19th Annual Conference of the Maryland Water Monitoring Council

Recent annual conferences have focused on the needs to reduce nutrient and sediment loads under the Chesapeake Bay TMDL and to address "what else is in your water." This year we focus on the "flip-side" of managing Maryland's water resources.

Conserving Maryland's High Quality Waters: From Monitoring to Action

For 18 years, the MWMC annual conference has attempted to capture the latest issues and move water monitoring to the forefront in resolving them. Frequently, we have focused on obtaining the monitoring information needed to restore our degraded aquatic ecosystems. Today we give equal time to those waters that are of highest quality, our last great places and those not-yet-degraded, where protection efforts will save us the costs of restoration and ensure we leave our waters in better condition than we found them. We hope that the attendees today will be energized by talking about our high quality waters and discover new ways water monitoring can help conserve them.

What You Will Hear

We are fortunate this year to have two plenary speakers to help us move high quality waters from the "back ground to the fore front:"

• **Elizabeth Buxton**, Executive Director of Maryland Environmental Trust, will discuss the water quality benefits of land conservation
• **Tom DeMoss**, Retired U.S. Environmental Protection Agency manager and former Chesapeake Bay Program Director, will draw a picture of success for the Chesapeake Bay and discuss who paints it

Our 16 current sessions and 24 posters will expand on the "Conserving Maryland's High Quality Waters" theme with the following invited and contributed presentations addressing resources, approaches, and programs:

- Resources:
    - Drinking water
    - Ground water
    - Cold water
    - Headwaters
- Approaches:
    - Planning
    - Land conservation
    - Environmental landscapes
    - Volunteers
    - Stormwater fees
    - Dam removal

- Programs
    - Anti-degradation
    - Environmental review
    - MBSS
    - EPA Healthy Watersheds

Continuing this year, we will be awarding the **Carl Weber Award** as a way to recognize the extraordinary contributions that Dr. Carl Weber made to the field of water monitoring. The Council presents this award in Carl's name as a lasting reminder of the affection and respect that we hold for Carl and his work, and to inspire others to emulate his passion, dedication, and good humor. Additional information on Carl and his contributions to water monitoring in Maryland can be found elsewhere in this program and on the MWMC's website.

What You Can Do

Finally, the MWMC is only as successful as the sum of the individuals who participate in Council activities. The MWMC continues today as an effective statewide collaborative body because of the many contributed hours that individuals and organizations have donated to furthering the Council's goal of serving as a vehicle for the effective collection, interpretation, and dissemination of environmental data related to issues, policies, and resource management objectives involving water monitoring. We encourage you to strengthen the MWMC by getting involved, communicating your needs to us, and using the Council to enhance your water monitoring programs, resource management, and environmental stewardship initiatives.

What does it take to be a member of the MWMC? It takes only a willingness to collaborate with others outside of your organization. As a member of the Maryland water monitoring/management community you can set the agenda for the Council's activities. Talk with a MWMC member at today's conference at the MWMC table or in the halls and find out how the Council can help you help enhance water monitoring through the Council. To learn more about the MWMC, go to **www.marylandwatermonitoring.org**.

The Annual Conference is a "green" conference. The Maritime Institute has partnered with us to provide on-site recycling, motion-activated lighting in the hallways, and washable tableware for our breaks.

Let's make this a great conference.

Mark Southerland
Chair, Maryland Water Monitoring Council

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Program design - Katherine Hanna
Cover design - Luke Roberson

The Carl S. Weber Award

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.

Previous Winners

2012
Charlie Conklin

2011
Bill Stack

2010
Sally G. Horner

2009
Peter Bergstrom

2008
Ron Klauda

2007
Susan "Abby" Markowitz
and Dr. Paul Massicot

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.

2013 Annual Conference Planning Committee

Dan Boward	Maryland Department of Natural Resources (Chair)
Kevin Brittingham	Baltimore County Department of Environmental Protection and Sustainability
Clark Howells	Baltimore City Department of Public Works
Ron Klauda	Maryland Department of Natural Resources
Tom Parham	Maryland Department of Natural Resources
Mike Pieper	KCI Technologies, Inc.
Charlie Poukish	Maryland Department of the Environment
Matt Stover	Maryland Department of the Environment

Plus additional thanks to:

Katherine Hanna	Maryland Department of Natural Resources (MWMC Co-Web Master and Graphics Support)
Luke Roberson	Maryland Department of Natural Resources (MWMC Co-Web Master and Graphics Support)
Charlie Poukish	Maryland Department of the Environment (Vendor Coordinator)
Joanne Alewine and Donna Klein	Maryland Department of Natural Resources (Conference preparation and registration table)

Where's My Diatometer

By Ron Klauda

Has anybody seen my diatometer? Is there anyone out there younger than 40 who even knows what a diatometer is? Actually, I must admit that I've never owned a diatometer. But I know what it is and have always wanted one. I was reminded of this as yet unfulfilled desire when I read that Dr. Ruth Myrtle Patrick passed away on September 23, at age 105----a century plus five!

So what's the connection between Ruth Patrick and the diatometer? Well, in the 1930's, while working on her PhD at the University of Virginia, she found that sampling diatom assemblages (single-celled algae collectively called periphyton), using a simple device she invented called a diatometer, gave a much better picture of a stream's or a river's condition than collecting water samples and measuring the concentrations of many chemicals.

The standard diatometer (see photo on the next page) holds several 1" x 3" glass microscope slides arrayed vertically in a slotted box. The diatometer is deployed in the target water body and free-floated, off the bottom, in areas that receive direct sunlight for at least part of the day. The glass slides are held vertically so silt will not be deposited on these artificial substrates upon which diatoms can attach and grow. Shields are installed on a diatometer to prevent twigs, leaves, and other debris from collecting on the slides and shading the colonizing diatoms. The diatometer is deployed in the target water body long enough to allow the development of a uniform periphyton layer, yet not so long that the diatoms start to detach and slough off. Fourteen day exposures work well in most waters.

The official name of Ruth Patrick's sampling tool is the Catherwood Diatometer, and it's still being used around the world to detect pollutants in water bodies. On June 25, 1953, the Academy of Natural Sciences of Philadephia filed for a U.S. federal trademark for the Catherwood Diatomer, described as a "Measuring apparatus used to obtain an index of aquatic life in a stream." The federal trademark has expired.

When Dr. Patrick examined the exposed slides in the laboratory and identified the diatom species present, coupled with her knowledge of each species' pollution tolerance, she discovered that she could assess the health of the water bodies she studied and determine if pollutants were present. Her early studies contributed to the developing field of ecology. Working in a then male-dominated field, Dr. Patrick was in the forefront of scientists who were introducing the concept of biodiversity. The scientific view that biodiversity is a major indicator of a water body's overall health is now known as "The Patrick Principle".

Ruth Patrick was a remarkable woman, a pioneer in freshwater ecology, who developed an ecosystem approach to environmental assessments. She spent nearly 80 years with the Academy of Natural Sciences in Philadelphia, a museum and research institution now affiliated with Drexel University. Until the age of 97, she worked five days a week at the Academy, and still came to her office at age 100 to work on her book, "Rivers of the United States." Dr. Patrick's work led Congress to pass the 1972 Clean Water Act, which she helped write. President Bill Clinton gave her the National Medal of Science at a White House ceremony in 1996. She was also one of the first scientists to speak out about global warming.

Ruth Patrick once said, "My great aim has been able to diagnose the presence of pollution and develop means of cleaning things up." To pursue this aim, publish more than 200 papers, and earn the numerous accolades that were heaped upon her during her a very long and productive career, she waded into at least 850 streams and rivers worldwide. Many of us here today at this conference are following in Ruth Patrick's boot steps and pursuing her aim, whether we've ever seen a diatometer or not.

MARYLAND WATER MONITORING COUNCIL
19th Annual Conference Agenda
Thursday, December 5, 2013

CONSERVING MARYLAND'S HIGH QUALITY WATERS – FROM MONITORING TO ACTION

7:30 **Registration/Poster Set-up/Continental Breakfast**

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

8:30 **Chairman's Call to Order – Mark Southerland; Chairman, MWMC Board of Directors**

8:40 **The Water Quality Benefits of Land Conservation - Elizabeth Buxton – Director, Maryland Environmental Trust**

9:05 **A Picture of Success for the Chesapeake Bay: What It is and Who Paints It? - Tom DeMoss - Retired USEPA Manager and former Chesapeake Bay Program Director**

9:35 **High Quality Waters: From the Back Ground to the Fore Front – Mark Southerland; Chairman, MWMC Board of Directors**

9:45 **Carl S. Weber Award – Mark Southerland and Cathy Weber**

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

10:30 – 12:00 Concurrent Session 1

A-111/113	Bridge Room	Classroom 3	Auditorium	A-302	A-303
Panel Solution Session: Outlining a Path to Better Integrate Water Data and Local Planning– Christine Conn (MDNR) **Panel Members –** **Tim Goodfellow (Frederick Co.)** **Mark Richmond (Howard Co.)** **Mark Symborski (Montgomery Co.)** **Angel Valdez (MDE)**	**Influence of High Quality Source Waters on Drinking Water Resources – Clark Howells (Baltimore City)** *Understanding Impacts from Climate Change and Extreme Weather on Water Quality*– **Ben Wright (Hazen and Sawyer)** *Providing Safe Drinking Water: Making Connections Between Sources and the Tap* – **Jin Shin and Martin Chandler (WSSC)** *Handling Source Water Challenges at the Potomac Water Filtration Plant* - **Hahns S. Hairston (WSSC)**	**Land Conservation and Water Quality Benefits – Ron Klauda (MDNR)** *Land Conservation Purchase and Water Quality Protection: MDNR Programs* - Stacy Schaefer (MDNR) *Use of Land Protection to Further Water Quality and Restoration Goals in the Pocomoke River Watershed* - Steve Bunker (The Nature Conservancy) *Accounting for the Water Quality Value of Conserved Lands Under the Chesapeake Bay TMDL* – Jack Frye (Chesapeake Bay Commission)	**Maryland's Stormwater Fee: One Idea, Many Versions (or Forms, Incarnations, or Manifestations) – Kim Burgess (Baltimore City)** Panel Discussion on the Politics of the Maryland Stormwater Fee **Panel Members –** **Kim Burgess (Baltimore City)** **Craig Carson (Montgomery Co.)** **Shannon Moore (Frederick Co.)**	**Environmentally Friendly Landscapes – Michele Dobson (Harford Co.)** *Rights of Way - The Critical Role of Watershed Groups to Facilitate and Communicate with Stormwater Projects* - **Kit Gage (Friends of Sligo Creek)** *Environmentally Friendly Landscapes and Water Quality* – **Amanda Rockler (University of MD)** *Keeping your Rain Garden Beautiful* – **Christine Buckley (Harford Co.)**	**Stewardship and Beyond – Volunteer Monitors Protect Streams – Cathy Wiss (Audubon Naturalists Society)** *Using Volunteer Monitoring Data to Advocate for Stream Protections in Land Use Planning for the Ten Mile Creek Watershed* - **Cathy Wiss (Audubon Naturalists Society)** *Marcellus Shale Stream Monitoring Coalition Volunteers in the Savage River Watershed* - **Ann Bristow (Savage R. Watershed Assn.)** *Trout Unlimited's Plan for Systematic Evaluation & Monitoring of Patapsco Valley Cold Water Resources* - **Art Senkel (Patapsco Valley Chapter Trout Unlimited)**

12:00 – 1:30 Lunch

1:30 -- 3:00 Concurrent Session 2

A-111/113	Bridge Room	Classroom 3	Auditorium	A-302	A-303
Cold Water Habitat and Brook Trout – Clark Howells (Balto. City) and Kevin Brittingham (Baltimore Co.) *Profile of a Baltimore County Brook Trout Stream* - **Dennis Genito (Baltimore Co.)** *Maryland's Piedmont Brook Trout Populations* - **Mark Staley (MDNR)** *Advantages and Disadvantages of Plasticity in Maryland Brook Trout* - **Bob Hilderbrand (University of MD)**	**Environmental Review: Reactive, Proactive – Active! – Greg Golden (MDNR)** *Traditional Environmental Review: Characteristics, Importance, Challenges* - **Greg Golden (MDNR)** *The Concept of Proactive Environmental Review* – **Tony Redman (MDNR)** *Panel Discussion: Future Opportunities in Proactive Environmental Review* – **John Wald (MDNR)**	**Patapsco River Dam Removal I – William Harbold (MDNR)** *Fish Passage In Maryland* - **Jim Thompson (MDNR)** *Restoration of Alosines and American Eel in the Patapsco River Valley* - **Serena McClain (American Rivers)** *Geomorphic Monitoring of the Patapsco River Following the Removal of the Simkins Dam, Patapsco River, Maryland* - **Graham Boardman (McCormick Taylor)**	**Saving the Best of the Best - Antidegradation and Tier III Streams - It's the Law! – Ron Klauda (MDNR)** *Antidegradation and Tier III in Maryland: What it Means, How it Would Work, and Potential Challenges* - **Matt Stover (MDE)** *Let's Focus on DNR Lands: A First Step Approach to Designating Tier III Outstanding National Resource Waters in Maryland* - **Tony Prochaska (MDNR)** *Antidegradation in Virginia: Tier 3 Designation Process & Case Studies* – **David Whitehurst (Virginia DEQ)**	**Developing a Coordinated Strategy to Protect Maryland's Healthy Watersheds – Laura Gabanski (EPA)** *Overview of EPA's Healthy Watershed Initiative* - **Laura Gabanski (EPA)** *Overview of Maryland's Healthy Watershed Initiative* - **Christine Conn (MDNR)** *Mapping Maryland's Healthy Watersheds* - **John Wolf (USGS)** *Facilitated Discussion* - **Donelle Keech (The Nature Conservancy)**	**Contributed Talks – Charlie Poukish (MDE)** *Monitoring for Restoration: The Chesapeake and Atlantic Coastal Bays Trust Fund* – **Luke Roberson (MDNR)** *Quantifying Benefits of Inappropriate Discharge Elimination Activities* – **Lori Lilly (Center for Watershed Protection)** *Rapid Multi-Attribute Stream Surveys: A New Solution to Old Problems* – **James Parham (Parham and Associates)**

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

3:30 -- 4:30 Concurrent Session 3

A-111/113	Bridge Room	Classroom 3	Auditorium		
New Public Access Follow the Thalweg: Updates on the Maryland Biological Stream Survey – Sandy Hertz (SHA) *The Maryland Biological Stream Survey Training and Certification Program* - **Dan Boward (MDNR)** *Maryland Biological Stream Survey Round Four -- Back to the Future* - **Scott Stranko (MDNR)**	**Groundwater – Tom Parham (MDNR)** *Application of Groundwater-Flow Modeling in Support of Resource Assessment in Maryland: Lessons From Case Studies Incorporating Monitoring Data* - **Jeff Raffensperger (USGS)** *Nitrate Reduction in Riparian Buffers: Why Some Work Well and Some Don't* - **Judy Denver (USGS)**	**Patapsco River Dam Removal II – William Harbold (MDNR)** *Impacts of Dam Removal on Patapsco Diadromous Fish* - **William Harbold (MDNR)** *The Effects of Simkins Dam Removal on Benthic Macroinvertebrate and Fish Assemblages in the Patapsco River* - **Jay Kilian and Patrick Graves (MDNR)**	**Moving Headwaters to the Head of the Class – Doug Redmond (retired) and Mark Southerland (Versar)** *Effects of Transmission Line ROWs on Headwaters in Maryland* – **Ginny Rogers (Versar)** *A Practitioner's Approach to Headwater Restoration: Using the Science of Brook Trout to Motivate Conservation Actions* – **Gary Berti (Trout Unlimited)**		

4:30 Adjourn - SOCIAL IN THE LOUNGE

Posters

Note: Only Primary Authors are Listed

Relations Between Macroinvertebrates, Nutrients, and Water Quality Criteria in Wadeable Streams of Maryland, USA
Matt Ashton (Maryland DNR)

Ecohydrological Processes and Urban Water: the Role of Flora and Fauna in the Urban Watershed Continuum
Ken Belt (Baltimore Ecosystem Study)

Lead Concentrations in Harford County Piedmont Well Water: Geologic or Plumbing Source?
Kate Burgy (Maryland Geological Survey)

An Assessment of Water Quality and Phytoplankton Composition in Lake Linganore, Frederick County, Maryland
Stephen Cloud (Hood College) – STUDENT POSTER

Stream Blitz Results Indicate Watershed, Habitat Patterns
Elaine Friebele (Jug Bay Wetlands Sanctuary)

Forest Conservation Targeting
Anne Hairston-Strang (Maryland DNR)

Chemistry of Western Maryland Stream Water: A Baseline Assessment Before Possible Hydraulic Fracturing
Andrew Heyes (University of Maryland)

Development of an Equitable Standard for Stormwater Utility Fees
James Hunter (Hunter Kang Sustainable Solutions, LLC)

Using Community-level Models to Predict Patterns of Biodiversity in Maryland Streams
Miriam Johnston (University of Maryland)

Green Street Neighborhood Prioritization in Montgomery County, Maryland
Phil Jones (Biohabitats)

Citizen Scientists Wanted! Volunteers Needed for Monitoring Microbial Communities in Maryland Headwater Streams
Stephen Keller (University of Maryland)

Habitat Requirements of River Chub (Nocomis micropogon), an Urbanization Sensitive Keystone Fish Species: Relation to Functional Restoration of Urbanized Waterways
Stanley Kemp (University of Baltimore)

Prince George's County's New Stormwater Fees
Antti Koskelo (EA Engineering)

The Importance of River Chub (Nocomis Micropogon) Nests as Hubs for Mating and Feeding Activities in Maryland Streams
Stephen Lamb (University of Baltimore) - STUDENT POSTER

Mountain Ridge High School Pre-Fracking Water Quality Baseline
Addie Lauder (Mountain Ridge High School) - STUDENT POSTER

What Lurks in the SAV, Too Much of a Good Thing?
Jim Long (Mattawoman Watershed Society)

Lessons from Chesapeake Bay Restoration Efforts: Understanding the Role of Nutrient Reduction Activities in Improving Water Quality
Christina M. Lyerly (University of Maryland)

Pre-restoration Monitoring of Nutrients and Attached Algae in Tributaries of an Urban Stream
Jonathan Markovich (Towson University) - STUDENT POSTER

Effects of Integrated Stormwater Management and Stream Engineering on Watershed Nitrogen Retention
Tamara Newcomer (University of Maryland)

Integration of Oyster Aquaculture and the Algal Turf Scrubber for Increased Water Quality Improvement
Nicholas Ray (University of Maryland)

Water Quality Impacts of Agricultural Conservation Practices in the Choptank River Watershed
Tim Rosen (Midshore Riverkeeper Conservancy)

Assessment of the Effects of Emergent Plants on Benthic Algal Growth in Carroll Creek, Frederick, MD
Cassandra Schaeffer (Hood College) - STUDENT POSTER

Sea-level Rise Impacts Future Herring Bay Watershed Improvement Planning
Carmen Skarlupa (Anne Arundel Community College) - STUDENT POSTER

Piney Run Tailwater Stream Restoration Project in Sykesville, Maryland
Mark Staley (Maryland DNR)

Nanticoke River Five Year Report Card
Beth Wasden (Nanticoke Watershed Alliance)

MARYLAND WATER MONITORING COUNCIL

19th Annual Conference

December 5, 2013

SPEAKER ABSTRACTS

(Listed alphabetically by lead speaker's last name)

Geomorphic Monitoring of the Patapsco River Following the Removal of the Simkins Dam, Patapsco River, Maryland

Graham Boardman
McCormick Taylor, Inc.

Coauthors: Mary Andrews, Mathias Collins, Serena McClain

The Simkins Dam was removed in late 2010 as part of the Patapsco River Restoration Project aimed at restoring critical spawning and rearing habitat for American eel, alewife, blueback herring, yellow and white perch, and American shad. Removal of the roughly 10-foot high concrete dam exposed approximately 80,000 yds3 of coarse sand and gravel in the 10-acre impoundment area. The project team and regulators elected for passive sediment management whereby the deposit was neither dredged nor protected from natural fluvial erosion and thus much of it was transported and deposited in the downstream reaches. This approach warranted an extensive multiyear monitoring program including assessing stream channel geomorphic characteristics pre- and post-dam removal. The primary goal of the stream channel geomorphology study is to understand the upstream and downstream geomorphic response of the river to the dam removal by documenting morphologic changes, the movement and transient storage of sediment, and bed sediment grain size changes. The geomorphic monitoring has tracked the mobilization of the material from the Simkins Impoundment through the downstream reaches. Changes in channel morphology and the rates at which they occur have important implications for the project's ecologic, engineering, aesthetic, and recreation objectives. Here we discuss the geomorphic effects of the dam removal and how these geomorphic changes impacted the biological characteristics of the Patapsco River. We also discuss how the monitoring efforts completed for the Simkins Dam removal will help to inform the Bloede Dam removal, currently in the design and planning stages.

Graham Boardman is an environmental scientist with McCormick Taylor, Inc. in Baltimore, Maryland. He is responsible for the geomorphic monitoring of the Patapsco River following the removal of Simkins Dam.

The Maryland Biological Stream Survey Training and Certification Program

Dan Boward
Maryland DNR

Coauthors: Scott Stranko, Jay Kilian, Andy Becker, Ron Klauda

The Maryland Biological Stream Survey (MBSS) is a statewide, freshwater stream monitoring and assessment program begun in 1995 by the Maryland Department of Natural Resources (DNR) in partnership with staff from the University of Maryland Appalachian Laboratory. Fish, benthic macroinvertebrates, water chemistry, physical habitat and land use are evaluated at about 250 sites per year. Uses of MBSS data include status and trends in stream condition across various spatial scales, evaluation of stream restoration effectiveness, rare threatened and endangered species distributions, and water quality regulations. Since the inception of the MBSS, several state and county agencies and consultants have adopted MBSS sampling methods. To ensure consistent data quality and facilitate data sharing, DNR established an MBSS methods Training and Certification Program in 2012. Five certifications are currently offered: 1) benthic macroinvertebrate sampling, 2) benthic macroinvertebrate laboratory processing and subsampling, 3) fish sampling, 4) fish sampling crew leader, and 5) fish taxonomy. A field audit is required for benthic macroinvertebrate sampling, fish sampling crew leader, and fish taxonomy certification. Seventy-one individuals were certified in one or more protocols across both years (2012 and 2013). Benthic macroinvertebrate sampling and fish sampling were the most "popular" certifications. Twenty applicants received two or more certifications. Most applicants (56%) worked for consulting firms, 23% for local/regional governments, and 18% for state agencies. DNR staff plan to offer these certifications again in 2014 and may also expand to offer certifications in other protocols depending on demand. The MBSS Certification Program will continue to address the need for high quality stream ecological data for years to come.

Dan Boward works on the Maryland Biological Stream Survey and the Maryland Stream Waders volunteer monitoring program at MD DNR. He has a BS in Zoology from the University of Maryland and an MS from Johns Hopkins University.

Marcellus Shale Stream Monitoring Coalition Volunteers in the Savage River Watershed

Ann Bristow
Savage River Watershed Association

Coauthor: Carol McDaniel

In March 2012 a team of 32 members and non-members of the Savage River Watershed Association (SRWA) began a three-year commitment of baseline stream monitoring in the Savage River watershed in anticipation of Marcellus shale drilling in this steep, forested and sparsely populated Eastern Garrett County watershed. SRWA's team is part of the Department of Natural Resources (DNR) Marcellus Shale Stream Monitoring Coalition (MMC). Savage River is a headwater tributary for the Potomac River and Chesapeake Bay. DNR has identified the river as a conservation priority, serving as one of the few watersheds still containing intact populations of native brook trout. Against the backdrop of Maryland's on-going study of the issues surrounding Marcellus shale extraction, drilling leases have been signed throughout the watershed adding greater relevance to our activities. Baseline monitoring adheres to DNR's protocol of measuring conductivity, total dissolved solids and temperature, along with visual assessment. SRWA citizen scientist volunteers collect benthic samples (DNR's Stream Waders program) each spring and monitor thirteen streams weekly. Volunteers have logged over 15,000 miles and 1,300 hours. The stream data can be viewed on the DNR website: http://www.dnr.maryland.gov/streams/GMapVols.asp. Data will be reviewed and a photograph-based narrative of monitors' activities provided. Either in development of the protocol, training citizen scientist volunteers and/or in disseminating baseline data, SRWA has worked directly with various Trout Unlimited chapters (who funded monitoring equipment), EPA, Youghiogheny River Watershed Association, Alliance for Aquatic Resource Monitoring, and MMC student scientists of Mountain Ridge High School of Frostburg, MD.

Ann Bristow and Carol McDaniel are board members and officers of the Savage River Watershed Association (SRWA), formed in 2006. As stewards of the Savage River, the SRWA became increasingly concerned early in 2011 about the environmental impact Marcellus Shale drilling would have on the watershed. In late 2011, Carol, who has volunteered with Isaac Walton League's stream monitoring program for seven years, and Ann were trained using the Alliance for Aquatic Resource Monitoring protocol, developed by Dickinson College. Using this protocol and DNR's established Stream Waders' protocol, SRWA's first training of citizen scientist Marcellus Shale Monitoring volunteers occurred in March 2012, thus joining DNR's Marcellus Monitoring Commission (MMC). Carol and Ann are two of SRWA's three stream team leaders, tracking monitoring time and miles driven by volunteers, entering duplicate stream data (original data sheets submitted to DNR), and providing material support and substitute stream monitors as needed. Team leaders also respond to MMC notification when there are problems with stream data, thus assisting with quality assurance. As MMC volunteers, Carol monitors bi-weekly at Elk Lick, Black Lick and Blue Lick, close to the main stem of Savage River. Ann monitors bi-weekly in Mudlick and Savage River, near the headwaters.

Keeping your Rain Garden Beautiful

Christine Buckley
Harford County

Most people would agree that "Rain gardens are an attractive amenity to any landscape". But I would caution that this statement needs the additional disclaimer "if maintained properly." Left to only minimal maintenance a rain garden can quickly become an eyesore. And the cost to restore the rain garden landscaping can be quite expensive. Maryland's Stormwater Design Manual has increased the landscaping requirements for most stormwater best management practices over the past ten years. Landscaping not only improves water quality and increases habitat but also improves the appearance of stormwater management historically viewed as unattractive holes in the ground. Rain gardens if designed with long term maintenance in mind can be attractive. But unfortunately, the maintenance is typically transferred to someone after construction who was not involved in the design. Through the design, construction and hands-on maintenance of several rain gardens, Harford County project managers have learned some valuable lessons to ensure that rain garden projects are attractive amenities to the landscape.

Christine is responsible for administering Harford County's MS4 permit. She has been involved with all aspects of the permit since the inception of the program including watershed assessments and restoration, GIS mapping, and public outreach.

The Use of Land Protection to Further Water Quality and Restoration Goals in the Pocomoke Watershed

Steve Bunker
The Nature Conservancy

This presentation will focus on The Nature Conservancy's (TNC) new conservation strategy focused on identifying land protection priorities that further water quality and habitat restoration goals for the Chesapeake Bay. This presentation will describe how TNC is using high resolution LIDAR imagery to identify restoration opportunities in the Pocomoke River watershed and then applying their expertise in land protection to help facilitate projects that combine protection and restoration to achieve water quality benefits.

Steve Bunker is the Director of Conservation Programs for the Maryland/DC Chapter of The Nature Conservancy where he directs land conservation, government relations, and land management programs. He started working for the Conservancy in 1992 as Director of Protection and has also held the position of Director of Government Relations and Director of Government Relations and Land Conservation. Prior to working for The Nature Conservancy, Mr. Bunker worked for the Chesapeake Bay Foundation as Senior Staff Scientist and Assistant Director of the Lands Program. Mr. Bunker also has held positions with the University of Maryland Chesapeake Biological Laboratory and the Tri-County Council for Southern Maryland. Mr. Bunker has a Bachelors and Masters Degree in Zoology from the University of Georgia.

The Politics of the Maryland Stormwater Fee

Jim Caldwell
Howard County

Coauthors: Kim Burgess, Craig Carson, Shannon Moore

In the Spring of 2012, the State Legislature passed The Watershed Protection and Restoration Fee, and soon after, 10 Maryland MS4 Phase 1 jurisdictions began to identify methods to charge the fee as required, by July of 2013. Each jurisdiction set out a path, determined best for their community, to reach the significant financial goals necessary to meet TMDL and MS4 mandates. While the methods varied, they all shared one thing in common, a firestorm of opposition. Facing both the daunting costs of permit compliance and the varying interests of involved parties, the stormwater managers searched for common ground to define a fee and begin program implementation. During this session, the managers of three of the 10 Phase 1 jurisdictions will share their stories of moving through the political storm and toward implementation of the TMDL and MS4 programs.

No biography submitted.

Providing Safe Drinking Water: Making Connections Between Sources and the Tap

Martin Chandler, Jin Shin
Washington Suburban Sanitary Commission

Coauthor: Zohreh Movahed

Water utilities have the responsibility of protecting public health by continuously providing safe drinking water regardless of the source water quality. Often, it is expected that water treatment would address all water quality concerns. However, water treatment is only part of the answer; a multi-barrier strategy is an essential approach for providing safe drinking water. The first barrier is source water protection, followed by treatment, and then measures used in the distribution system to maintain the safety of the water delivered to the customer's tap. As the water utility responsible for serving 1.8 million customers in Montgomery and Prince George's Counties, the Washington Suburban Sanitary Commission (WSSC) is obligated to provide drinking water that meets all the requirements of the Safe Drinking Water Act. In addition to the regulated contaminants with known human health impacts and treatability, there is growing concern about "exotic" organic pollutants such as pharmaceuticals, personal care products and endocrine disruptors. These contaminants are often present at trace levels, making it difficult to monitor and treat. The human health impacts at such low levels are uncertain, yet cause unnecessary fears for the public and put unrealistic and ineffective expectations on the water utilities in considering "treatment" as the sole solution. WSSC not only pursues the multi-barrier approach, but also advocates a partnership strategy in protecting and maintaining sources of high quality water. This is essential because of the prohibitively high cost associated with treating water to a level beyond what is regulated. WSSC believes that cost-effective source water protection, combined with balanced water treatment and distribution approaches will continue to provide the necessary public health protection required by regulations.

Martin Chandler is a Senior Scientist with the Washington Suburban Sanitary Commission's Environmental Group, where he has worked on source water protection and pollution prevention programs for the past 12 years. Prior to joining WSSC, he worked for 16 years in environmental and engineering consulting firms on diverse projects including solid and hazardous waste site investigations, groundwater modeling, geochemical and water quality monitoring programs and geotechnical investigations. Mr. Chandler holds BS and MS degrees in Earth Sciences from Waikato University (New Zealand), an MS degree in Soil Mechanics and a PhD in Civil & Environmental Engineering, both from Imperial College, London. He is a registered Professional Geologist. Jin Shin is a Principal Environmental Engineer with the Washington Suburban Sanitary Commission's Environmental Group. His main focus of expertise is in drinking water quality issues, including treatment process engineering, water distribution system planning and optimization, and Safe Drinking Water Act regulatory compliance. He holds a BS in Civil Engineering from Yonsei University, Seoul, Korea, and MS and PhD in Environmental Engineering from The Johns Hopkins University, Baltimore, Maryland. He worked at Korea Institute Construction Technology for 2 years before he began his doctoral research.

Panel Solution Session: Outlining a Path to Better Integrate Water Data and Local Planning

Christine Conn
Maryland DNR

Coauthors: Angel Valdez, Mark Symborski, Mark Richmond, Tim Goodfellow

Data driven decision making is a familiar phrase, but how do we make it happen? Local government planning decisions shape our landscapes and are reflected in the health of our aquatic ecosystems. Land use, conservation, restoration, management and mitigation planning is fundamental to sustaining healthy aquatic ecosystems and should be informed by monitoring and assessment water data. In this session, we explore what kinds of water data are or could be used to inform these decisions. We discuss how best to communicate and translate this data to key staff making those decisions. We ask when, or at what point, should this information be inserted into the planning process to be most useful in decision making. County and State agency staff will provide their perspectives, needs and recommendations regarding these questions. Our goal through this solutions panel session is to develop a roadmap for improving the use of water data, provided through MWMC or through other monitoring and assessment efforts, as a local planning decision tool. Attendees can pick up a copy of the panel session agenda in the room.

Dr. Conn received a Ph.D. in Ecosystems Ecology from Old Dominion University in 1995 and has worked at the Maryland Department of Natural Resources since 2000. She develops conservation policies and strategic plans to ensure the long term protection of the State's high value natural resources and outdoor recreational assets. Dr. Conn currently is the Unit Director of the new Integrated Policy and Review Unit.

Angel Valdez, Science Services Administration, Maryland Department of the Environment (MDE): Ms. Valdez will provide information regarding MDE's use of biological data to promote antidegradation initiatives, and provide input regarding how MDE integrates local planning into the Antidegradation Implementation process on both a micro and macro scale.

Mark Symborski, Montgomery County Planning Department, The MD-National Capital Park and Planning Commission: Mr. Symborski will discuss the use of biological monitoring data in master planning in Montgomery County, and new opportunities for enhancing the process of using and communicating the data.

Mark Richmond, Howard County Storm Water Management Division: When faced with TMDL numerical limits and NPDES permit conditions that are aggressive in both their goals and schedule the selection of where to apply limited human and monetary resources is critical. Determining how and when water monitoring data can help in this selection process is just as difficult a decision.

Tim Goodfellow, Department of Planning and Development Review, Frederick County Government: Mr. Goodfellow will discuss challenges, needs, and opportunities to strengthen the link between water quality data and land use planning in Frederick County.

Nitrate Reduction in Riparian Buffers -- Why Some Work Well and Others Don't

Judy Denver
U.S. Geological Survey

Streams at base-flow typically have lower concentrations of nitrate than groundwater in a watershed and riparian zone denitrification has commonly been given credit for this difference. Denitrification occurs most efficiently in the riparian zone where aquifer sediments are thin and groundwater discharges through organic-rich sediments with reducing conditions prior to discharging into a stream, such as in areas of the Coastal Plain where most or all of the surficial aquifer has been eroded and the streambed is close to a silt or clay confining bed. Historically, one of the most difficult things to determine without extensive field work is where this hydrogeologic configuration is present and where sandy aquifer sediments are thicker and water containing nitrate can flow beneath reducing conditions associated with organic-rich sediments of the riparian zone. Almost all nitrate present in streams is from groundwater. Nitrate concentrations and the proportion of nitrate making up total nitrogen in surface water vary in the Coastal Plain of Maryland. Several studies have been done at local scales in small watersheds to help understand the processes affecting nitrate transport to streams and explain this variation. Recent advances in LiDAR provide detailed geomorphic characterization of flat Coastal Plain landscapes not previously available, and recent mapping of aquifer subcrop areas and confining beds are improving our ability to compare local-study understanding to larger sub-regional areas. These results can help target areas where riparian zone denitrification is likely to be most effective at removing nitrate from discharging groundwater.

Judy Denver has been a hydrologist with the MD-DE-DC Water Science Center of the U.S. Geological Survey since 1980. Much of her work has focused on understanding the effects of different land uses on groundwater chemistry and how hydrogeologic setting affects the transport of chemicals into groundwater, and through groundwater into surface water.

Accounting for the Water Quality Value of Conserved Lands under the Chesapeake Bay TMDL

Jack Frye
Chesapeake Bay Commission

Land conservation has been a fundamental component of the Chesapeake Bay Program Partnership throughout the 30 year restoration history of the program. With the advent of the Bay TMDL (impaired water clean-up blueprint) in 2010, nutrient and sediment reductions became the driving force for Bay jurisdictions. In June 2013, the Chesapeake Bay Commission released its report "Crediting Conservation", which looks at the value of conserving natural landscapes and offers policy change options to enable land conservation to be valued as nutrient reduction accounting systems. The policy options will be explained in this presentation, along with the next steps for evaluating and advancing those options considered to be most promising.

Jack has served as the Virginia Director of the Chesapeake Bay Commission since August 2011. The Commission was established in 1980 to lead policy development for the restoration of Chesapeake Bay. There are 21 Commission members, including 15 state legislators representing the General Assemblies of Virginia, Maryland, and Pennsylvania; 3 cabinet level Secretaries representing their Governors; and 3 citizen representatives. Prior to joining the Chesapeake Bay Commission, Jack spent 30 years with the Virginia Department of Conservation and Recreation. He received his B.S. in Geology from Virginia Tech and a M.S. in Oceanography from Old Dominion University.

Developing a Coordinated Strategy to Protect Maryland's Healthy Watersheds

Laura Gabanski
U.S. EPA

Coauthors: Christine Conn, John Wolf, Donnelle Keech

The purpose of this session is to start a dialogue on developing Maryland's healthy watersheds protection strategy. The strategy is intended to be implemented across state agencies and with local and federal agencies and other partners. EPA's national Healthy Watersheds Program which seeks to build state capacity for identifying and protecting healthy watersheds will be described. An overview of Maryland's efforts to develop a strategy will be presented including a description of how healthy watersheds were identified. Most of the session will be dedicated to obtaining input from the attendees, through a facilitated discussion, on refining healthy watershed designations and approaches to protecting healthy watersheds.

Laura Gabanski is with EPA's headquarters Office of Wetlands, Oceans, and Watersheds where she leads Healthy Watersheds Program. She created the Healthy Watersheds Program in 2008 and is now supporting healthy watersheds projects across the country. Laura has been with EPA for 22 year and her experience includes water quality monitoring and assessment, bioassessments and biocriteria, and ecological risk assessment. Prior to joining EPA, Laura worked on coastal and estuarine monitoring and assessment problems and natural resource protection in both regulatory and non-regulatory programs at the NOAA, DOI, and U.S. Army Corps of Engineers. Laura holds a BA in Biology and MS in Oceanography.

Mycorrhizae - or Maximizing County Stormwater Efforts

Kit Gage
Friends of Sligo Creek

There is tremendous pressure on counties and cities to mitigate the effects of stormwater by soaking it into the ground. Increasingly they are using big projects and neighborhood-wide projects. These latter are incredibly complex and risky processes. Expert neighbor facilitation and better communications processes are critical to making them work, but not sufficient. We will present an array of issues and some recommendations to facilitate the efforts.

Kit Gage is a long-time gardener and hiker. More recently she switched her vocation to horticulture and stormwater. She is a Master Watershed Steward (Anne Arundel County), co-founder and former co-director of the National Capital Region Watershed Stewards Academy, and co-chair, Friends of Sligo Creek Stormwater Committee. The committee has worked closely and collaboratively with Montgomery County DEP Rainscapes for 10 years. Horticulture Certificate from Graduate School USA. Past president, Takoma Horticultural Club. Most recently, Kit is facilitating the DEP Neighborhood Stormwater Project in Sligo Park Hills. She is a county green certified gardener's adviser: www.kitgage.com

Profile of a Baltimore County Brook Trout Stream

Dennis Genito
Baltimore County Department of Environmental Protection and Sustainability

A Baltimore County piedmont brook trout stream is profiled. Multiple years of benthic, fish, geomorphic, and temperature data will be presented and discussed in the context of the landscape and riparian features that allow brook trout to thrive in this stream. The system is unique because it is one of a few Baltimore area piedmont brook trout streams that maintain a high level of ecological integrity in the face of development, pollution, and non-native trout species.

Dennis works as a stream restoration project manager in the Watershed Restoration section of the Baltimore County Department of Environmental Protection and Sustainability. He was formerly an aquatic biologist in the Watershed Monitoring section of the same agency.

Traditional Environmental Review: Characteristics, Importance, Challenges

Greg Golden
Maryland DNR

Coauthors: John Wald, Charlie Gougeon

Traditional Environmental Review involves interagency participation by natural resource agencies in various regulatory and policy processes. Comments and recommendations are provided on natural resources, related technical aspects, project engineering, Best Management Practices, construction sequences, regulatory processes and policy. Comments are provided most often at the State and Federal levels, but coordination with local governments also occurs. Two distinct characteristics have been noted: 1) traditional review has many reactive aspects, as it focuses on projects being planned, or being permitted in later stages of planning, and 2) that it provides environmental consulting services that most often do not have their own specific regulatory authority. In most cases, environmental review provides information to other regulatory and policy processes. The critical role of traditional environmental review is based on the fact that society will always have projects and policies of various types moving forward, and there is the essential need to incorporate natural resource expertise, conservation recommendations, and management aspects into these activities. Commenting can occur on a project by project basis, at the programmatic level, and at policy level. To advance conservation success, traditional review activities must be melded into a larger framework which includes proactive review activities, relating review work to land use decision processes, and accelerated policy work. The target of future environmental review work is to achieve better advance strategies and success in conserving the best remaining natural habitats and their functions and values, while assisting in restoration strategies for those habitats which have suffered from past degradation.

Greg Golden received a Bachelor's Degree at the University of Maryland in Natural Resource Conservation, Fish and Wildlife Management Option, in 1983. He went directly into field jobs after college, first in surveying and then invasive plant species research and management. Greg started his MD DNR career as a coldwater fisheries technician, and then biologist, working side by side with senior fisheries biologists and managers on a variety of coldwater fisheries management issues throughout central and western Maryland. After a short stint in nontidal wetlands permitting, he settled in for over 20 years of service in DNR's long-standing Environmental Review Unit, working on a diverse variety of project reviews, programmatic comments, policy and review criteria development efforts, and interagency workgroups focused on review and permitting topics. Greg served as Director of the DNR Environmental Review Unit for four years, and now serves as a senior reviewer in the Department's newly developed Integrated Policy and Review Unit, Project Review Division.

The Effects of Simkins Dam Removal on Benthic Macroinvertebrate and Fish Assemblages in the Patapsco River

Patrick Graves, Jay Kilian
Maryland DNR

We annually sampled benthic macroinvertebrate and fish assemblages at sites in the Patapsco River from 2009 to 2013 to monitor biological responses associated with the removal of Simkins Dam (removed in late 2010). Changes in the benthic macroinvertebrate and fish assemblages were most notable at sites in close proximity to Simkins Dam where there were dramatic shifts in substrate composition. The percent of EPT (Ephemeroptera, Plecoptera, and Trichopera) insect taxa generally increased while the percent of burrowing taxa decreased at sites upstream of Simkins Dam where sand was replaced by cobble and gravel substrates. Conversely, burrowing taxa increased while the number of EPT taxa and benthic riffle fishes decreased in downstream reaches as coarse substrate was covered by sand following dam removal. Downstream sites lost a higher proportion of fish species (specifically benthic species) compared with other sites sampled in the river. Fewer young-of-year sized smallmouth bass were collected from downstream sites following dam removal. Although we documented some negative impacts to benthic macroinvertebrate and fish assemblages downstream following dam removal, we expect these assemblages will recover in time as the remaining sediment behind the former Simkins Dam is transported out of the study area, geomorphic conditions stabilize, and habitat quality improves.

Patrick Graves and Jay Kilian are natural resource biologists with the Maryland Department of Natural Resources Resource Assessment Service in Annapolis. They work as part of the Maryland Biological Stream Survey.

Handling Source Water Challenges at the Potomac Water Filtration Plant

Hahns S. Hairston
Washington Suburban Sanitary Commission

Drinking water treatment facilities have an enormous amount of pressure to meet a wide array State of regulations that fall under the Safe Drinking Water Act which includes meeting the National Primary Drinking Water Regulation Standards for hundreds of contaminants and meeting compliance for several rules (Surface Water Treatment Rule, Lead and Copper Rule, etc.). Also, we have the National Secondary Drinking Water Regulation Standards that need to be met. In addition to more stringent regulatory requirements, we have to provide safe and clean drinking water to a constantly growing region. Source water challenges make it difficult to meet all of the stringent regulations and the water demand of a growing population. I will be providing a broad overview to show how the Washington Suburban Sanitary Commission (WSSC) Potomac Water Filtration Plant overcomes unique source water challenges with our toolbox or wide array of water treatment techniques. These tools just don't allow us to meet State and Federal Regulations but allows us to exceed the standards to meet the optimization goals set by the industry. Also, I will explore some of the specific source water challenges we have to deal with along with the cost associated the respective source challenges.

Hahns S. Hairston received his BS from Virginia Tech in Agricultural Engineering with a concentration in Environmental Engineering. Mr. Hairston worked for the Maryland Department of the Environment, Water Supply Program for five years providing engineering and technical assistance to hundreds of water systems throughout Maryland. Mr. Hairston currently works at the WSSC Potomac Water Filtration Plant as the Plant Engineering Supervisor and holds licenses as a Class IV Water Operator and Superintendent. He has been in his current position for over ten years and assists with the management and oversight of regulatory compliance, plant operations and maintenance activities and several capital improvement projects with a combined value over 100 million dollars.

Impacts of Dam Removal on Patapsco Diadromous Fish

William Harbold
Maryland DNR

Diadromous fish--both American eels and river herring--may have the most to gain from the removal of migration barriers on the Patapsco River. Monitoring of these species focused on three such barriers--Bloede, Simkins, and Daniels dams. Sampling for American eels began in 2009 and has continued yearly through 2013. River herring sampling began in the spring of 2011 and continued through 2013. Electrofishing was used to collect both eels and river herring, with a fyke net used to sample river herring using the fish ladder on Bloede Dam. Abundance and individual size (length and weight) was recorded for eels, while river herring were only identified and counted. American eels were found throughout the river, decreasing in abundance and increasing in size upstream. After the removal of Simkins Dam in 2010, eel abundance decreased downstream of the dam while average size decreased upstream. River herring appeared more severely impacted by migration barriers. Three species--hickory shad, alewife, and blueback herring--were all encountered downstream of Bloede Dam, but none was encountered upstream. The fish ladder on Bloede Dam appeared ineffective; with no river herring observed using it during 2011-2013. The removal of Simkins Dam certainly improved fish passage, but apparent impacts of Bloede Dam on the abundance, size, and distribution of American eels and river herring indicate that this dam's removal should quickly follow. Ideally, monitoring will continue long enough to see both Bloede's removal and the benefits it may bring to the diadromous fish of the Patapsco River.

William Harbold is a biologist with the Maryland Department of Natural Resources. He has worked with the Maryland Biological Stream Survey as the principle investigator for the Patapsco River dam removal monitoring project since August 2010.

Maryland's Piedmont Brook Trout Populations

Robert H. Hilderbrand
University of Maryland Center for Environmental Science, Appalachian Lab

Coauthors: David C. Kazyak, Matthew T.Sell, Alan Klotz, Alan A. Heft

Despite being a well-studied species, plasticity in brook trout life histories complicates our abilities to better manage their populations in the face of a changing environment and recreational angling. Our work in the Savage River watershed has provided important glimpses into the behavior of brook trout populations in one of the last remaining stronghold populations in the Mid-Atlantic region. Stream reaches easily accessible to angling contain significantly fewer adults, young-of-the-year (YOY) fish, and overall biomass despite no allowable harvest of fish for the last seven years. Over the same period, populations have fluctuated erratically, but seem to be primarily driven by YOY recruitment; multiple years of poor reproduction result in declining populations regardless of how protected the fish are. Annual growth is highly variable, such that some fish can grow enough in a single, good year to equal the total grown in three below average years, and females grow more slowly than males. Movements are also variable with most fish remaining in a single stream reach, while some large fish may quickly travel 10 km to avoid rising water temperatures only to return to their original location months later as temperatures drop. High variation in life history within local brook trout is advantageous to deal with new opportunities, but may be harmful should populations become isolated due to climatic or land use change.

Bob Hilderbrand is an Associate Professor at the Appalachian Lab in Frostburg. His research interests include stream ecology, brook trout, and the effects of land use on streams.

Development of an Equitable Standard for Stormwater Utility Fees

James Hunter, Ph.D.
Hunter Kang Sustainable Solutions, LLC

Coauthor: Dong Hee Kang

Nationwide, municipalities are under regulatory pressure to upgrade their stormwater infrastructure and provide more robust stormwater utility programs. This often means fulfilling several measures and encouraging the use of best management practices. Unfortunately, setting up stormwater programs is costly, as mandatory services, maintenance, and reporting require additional revenue. The solution for many municipalities is to institute stormwater utility fees. With few alternatives and tools available to address this issue, municipalities need additional insight for sound decision making when deciding their stormwater utility strategies. Presented is an "ideal" stormwater utility fee structure that considers those factors that contribute to both stormwater quantity and quality, while crediting the use of stormwater management practices. Ultimately, stormwater utility fees should be a reflection of the related activity that occurs on the landscape.

Dr. Hunter specializes in the mitigation of detrimental water quality impacts stemming from intensified urban and agricultural activities, the use of low impact development (LID) practices, and green infrastructure for the urban environment. He has significant experience with the treatment and biotic uptake of pollutants in wetland environments, amended natural media treatment, soil and water remediation, and phytoremediation. Dr. Hunter is currently assistant professor of engineering at Morgan State University teaching undergraduate and graduate courses in environmental engineering as well as performing extensive research and scholarly writing. Dr. Hunter holds a Ph.D. and M.S., from Purdue University, Civil Engineering and Environmental Engineering and B.S., Morgan State University, Civil Engineering. Prior to founding HKSS, Dr. Hunter was a post doctoral research associate with the Department of Agricultural and Biological Engineering at Purdue University. He co-lead efforts for the development of L-THIA/LID, a web-based decision support and planning tool to assess low impact development (LID) practices on runoff volume reduction and water quality. Dr. Hunter's ongoing research also includes treatment and biotic uptake of pollutants in wetland environments, soil and water remediation, phytoremediation, and water quality impacts in watersheds.

Quantifying Benefits of Inappropriate Discharge Elimination Activities

Lori Lilly
Center for Watershed Protection

The Center for Watershed Protection and others have completed several field studies to quantify nutrient loading from dry weather discharges to storm drains and streams. These inappropriate discharges are significant contributors of pollution and their elimination can help make significant strides toward Total Maximum Daily Load (TMDL) nutrient and bacteria reduction targets. This presentation will discuss findings from recent field studies and research conducted by CWP. In addition, an Inappropriate Discharge Detection & Elimination (IDDE) Expert Panel convened in 2012 and 2013 to provide recommendations to the Chesapeake Bay Program for a crediting protocol for inappropriate discharge elimination activities. It is expected that local governments will need to invest in more robust monitoring programs and efforts based on recommendations from the Panel.

Lori came to the Center for Watershed Protection in 2009 from Astoria, OR where she served as a Watershed Council Coordinator for a Council of Governments and Director of the North Coast Watershed Association. Lori has a B.S. in Natural Resource Management from the Rutgers University and a Master's degree in Marine, Estuarine and Environmental Science from the University of Maryland Eastern Shore. Lori's expertise at the Center includes illicit discharge detection and elimination (IDDE), watershed planning and implementation and capacity building for local governments, watershed organizations and community groups.

Restoration of Alosines and American Eel in the Patapsco River Valley

Serena McClain
American Rivers

Coauthors: Mary Andrews, Jim Thompson

American Rivers, working in partnership with the Maryland Department of Natural Resources, NOAA, USFWS and other partners aims to restore diadromous species habitat through the removal of the Bloede and Daniels dams. Removal of these dams is the culmination of a larger effort to remove four mainstem dams on the Patapsco River, restoring more than 65 miles of spawning habitat for blueback herring, alewife, American shad, and more than 183 miles for American eel in an effort to ensure sustainable populations of these target species. The restoration of the Patapsco River is a cross-cutting initiative that spans state and private lands and forces project proponents to examine not only species recovery but the impact these structures have on community safety, urban infrastructure, the history and culture of the region, and recreation and park operations. This talk will outline the rationale for removing dams on the Patapsco River, the processes necessary to complete those removals and the ramifications it has on restoration projects throughout the state.

Serena McClain has worked in the river restoration field for more than twelve years, focusing largely on dam removal planning. She balances her time between strategizing how to expand and improve our national efforts to restore riverine function, providing oversight and guidance to projects funded through American Rivers' partnerships with NOAA and the EPA, and providing technical assistance to dam removal projects throughout Maryland and Virginia. McClain works with local stakeholders to demonstrate how to enhance safety, quality of life and economic development by restoring the natural function of rivers and utilizes her communications expertise to ensure that local communities and key decision-makers are aware of the opportunities available to them and are equipped with the tools necessary to aid them in those decisions.

Rapid Multi-Attribute Stream Surveys: A New Solution to Old Problems

James E. Parham, Ph.D.
Parham & Associates Environmental Consulting, LLC.

Coauthor: Brett Connell

As water resource professionals, we develop models representing stream and water quality conditions as the basis for response to many management issues. However, most of these models are based on point samples or descriptions of short (several 100m) sections of stream or rivers. By using a new multi-attribute stream survey technique that integrates GPS, video, depth, water chemistry, and side-scan sensors, it is now feasible to survey many miles of stream (10 to 15 miles typically) in a single day with data collected approximately every meter. This new surveying approach can rapidly and cost-effectively transform the data-poor stream reaches into multi-attribute, high-resolution maps of the stream, stream channel, and water quality conditions. This output allows resource managers to move from statistical assumptions about the "average condition" of a stream based on a few small samples to a census of conditions with highly accurate, site-specific data available. All of the data collected is georeferenced and can be classified in GIS software to support multiple management objectives. As an example of the application potential of the multi-attribute stream survey technique, a number of recent studies in which we have been involved are highlighted. These projects address issues associated with classifying stream bank erosion susceptibility, monitoring the effects of dam removal, assessing impacts associated with mining, and determining habitat loss for endangered species. These case studies show the range of data collected and its utility in GIS mapping, hydrologic modeling, habitat identification, and overall stream health applications.

Dr. Parham is the President of Parham & Associates Environmental Consulting (PAEC) where he develops solutions that integrate essential components of hydrology, geomorphology, and fish ecology to enable improved use of freshwaters, while protecting the natural environment. Dr. Parham has extensive experience as a hydrologist and aquatic biologist and is also an expert developer of Geographic Information System (GIS) models for use in instream flow and habitat availability studies. In addition to his work at PAEC, Dr. Parham is an Associate Fellow with the Center for Great Plains Studies at the University of Nebraska, a research hydrologist with the Bishop Museum in Hawaii, the Director of Hydrologic System Integration with Trutta Consulting, and the current President of the Tennessee Chapter of the American Fisheries Society.

Let's Focus on DNR Lands: A First Step Approach to Designating Tier III Outstanding National Resource Waters in Maryland

Tony Prochaska
Maryland DNR

Coauthor: Michael T. Kashiwagi

Maryland's water quality standards include an Antidegradation Policy with three specific tiers for protection (Tier I, II and III). Streams are designated as Tier II or Tier III waters when their existing water quality is better than the water quality standards established for them. The Maryland Department of Natural Resources (MDNR) worked closely with the Maryland Department of the Environment (MDE) to designate approximately 250 streams as Tier II waters (i.e., High Quality Waters). However, until recently, the State has not focused on designating Tier III Outstanding National Resource Waters (ONRW). Tier III waters are of the highest quality, have exceptional biological resources (e.g., rare, threatened or endangered plants and animals), and are afforded the greatest level of protection via aggressive watershed management. The MDNR recently developed an approach to identify and nominate select non-tidal streams wholly within MDNR lands for designation as Tier III waters. This presentation will review the method used to identify (based on specific criteria) candidate Tier III waters and the intradepartmental process that must be conducted prior to submitting a final list of eligible nominees to MDE for consideration.

Tony Prochaska currently serves as the Director of the Resource Policy Division within Maryland DNR's Integrated Policy and Review (IPR) Unit. IPR is charged with the development and implementation of systemic, sustainable, and consistent environmental policies and project reviews that result in better protection of the State's natural resources. Tony has spent the majority of his career as an aquatic biologist with MDNR's Resource Assessment Service. Over the past 20 years, Tony has been involved with many programs/projects at MDNR involving stream and river research, monitoring, and protection; understanding the effects of Hg deposition on aquatic habitats; and improving MD's water quality standards for streams and rivers related to temperature. Tony also served on MDNR's Environmental Review Team, a group charged with making recommendations on proposed projects to avoid, or at least minimize harm to MD's environment and natural resources.

Michael Kashiwagi is a Natural Resources Biologist working for the MDNR. Originally from Montgomery County, Michael has been working for the agency for the past six years. He currently serves as Data Manager for the Maryland Biological Stream Survey. Prior to returning to Maryland, he work for the Massachusetts Division of Fish and Game conducting fisheries research on watershed community models. He has a Masters Degree in Wildlife and Fisheries Science from Mississippi State University.

Application of Groundwater-Flow Modeling in Support of Resource Assessment in Maryland: Lessons From Case Studies Incorporating Monitoring Data

Jeff P. Raffensperger
U.S. Geological Survey

Computer models of groundwater systems simulate the flow of groundwater, including water levels in wells and discharge to and from streams and rivers. Groundwater models afford hydrologists a framework on which to organize their knowledge and understanding of groundwater systems, and they provide insights water-resources managers need to plan effectively for future water demands. Models are calibrated to observations of water levels in wells, streamflow, and groundwater age estimates, and incorporate monitoring data as model inputs, such as groundwater withdrawal rates. Recent advances in model calibration referred to as objective parameter estimation rely heavily on observations. Two case studies based on recent modeling efforts will illustrate the use and value of input and observational data in model calibration. A three-dimensional transient model of the area surrounding Fort Meade highlights the importance of accurate historical data on withdrawal rates. Inaccurate data for a short time period in one part of the model became apparent when model fit was evaluated. A steady-state model of the Anacostia River and surrounding watersheds, calibrated using parameter estimation methods, provides statistically-based information on the value of ongoing water-level monitoring and can be used to assess the potential benefit of new monitoring, in terms of the value of the information to be gained. These modeling efforts provide tools that can be used to assess groundwater availability and investigate possible approaches to sustainable use of the resource.

Jeff Raffensperger is a hydrologist with the USGS MD-DE-DC Water Science Center. He received his Bachelor's degree in Geology from the University of Maryland in 1985, his Masters degree in Hydrogeology from Louisiana State University in 1988, and his Ph.D. in Hydrogeology from The Johns Hopkins University in 1993.Jeff has worked for the USGS MD-DE-DC Water Science Center since 1999. He has been involved with several projects studying hydrologic processes and modeling.

The Concept of Proactive Environmental Review

Tony Redman
Maryland DNR

Coauthor: John Wald

Environmental Review activities which have traditionally focused on individual projects and programmatic coordination with regulatory programs have great potential in more proactive settings. These proactive opportunities are still being assessed and developed, but proactive review opportunities identified to date include: increased programmatic commenting to regulatory and planning agencies, outreach and information sharing with local governments, information availability for citizens and industries, policy work, and increased involvement in land use and land conservation decision-making. Related concepts include evaluation of communication processes, development of innovative tools, improvement of prioritization and efficiencies, and tapping into additional expertise and methodologies nationwide. The basic goal is to provide technical natural resource conservation and management input to various processes early enough that resource conservation becomes a stronger component in planning for all development and growth activities. Early involvement can equate to fewer surprises and less disagreement, based on the benefits of better communication of expectations and technical needs, more collaboration, and more time and resources available for complex problem solving in a beneficial manner for natural resource conservation. In this presentation, the concept of proactive environmental review will be defined, and general approaches as well as case studies and future opportunities will be provided. Information will also be provided on the Maryland Department of Natural Resources new Unit, the Integrated Policy and Review Unit, and the focus this Unit is placing on developing and accomplishing proactive review opportunities.

Tony has 35 years combined public and private sector experience in community planning, Natural Resource Protection Programs and land use management. He served as Deputy Director of Planning in Kent County and Director of Planning in Talbot County, directing preparation and implementation of comprehensive plans and administering land use regulatory programs. He established A.D. Redman Associates in July 1984 (becoming Redman/Johnston Associates, Ltd. in 1985). During 22 years in private practice he served as a consultant to the Maryland Chesapeake Bay Critical Area Commission, the EPA Chesapeake Bay Program and numerous local governments throughout the Mid-Atlantic region. He has directed preparation of comprehensive plans, growth management programs and land use regulatory ordinances for over 50 county and municipal governments in Maryland and surrounding states. His ground-breaking work designing a "density-incentive" based cluster zoning framework for Isle of Wight County, VA was published by Randall Arendt in his widely used planning reference book, "Rural by Design". Tony holds a Masters Degree in Urban and Regional Planning from the University of Virginia and is a member of the American Institute of Certified Planners. Over the past three years he has worked for MD DNR coordinating environmental review of various projects and supporting and structuring other DNR programs, policies and functions. He presently serves as Director of the Project Review Division of the Department's newly formed Integrated Policy and Review Unit.

Monitoring for Restoration: The Chesapeake and Atlantic Coastal Bays Trust Fund

Luke Roberson
Maryland DNR

The Chesapeake and Atlantic Coastal Bays Trust Fund was started in 2007 to sponsor restoration through lowering sediment and nutrient loads to the Chesapeake Bay. Monitoring is an important component to assess the efficiency of restoration efforts for future project selection. In order to standardize data collection and enhance comparability at Trust Fund sites, Maryland DNR has established standard data collection procedures in four protocols: Biology, Water Chemistry, Stream Discharge, and Geomorphology. This talk will give a short overview of each method and when and how funding applicants need to apply each.

Luke Roberson is a biologist, graphic designer, and webmaster for the Maryland Biological Stream Survey. He has two degrees from the University of Kentucky, and lives with his wife Kim and son Abe in Silver Spring, MD.

Environmentally Friendly Landscapes and Water Quality

Amanda Rockler
University of Maryland

How do environmentally friendly landscapes impact water quality and quantity? Program will highlight the Chesapeake Conservation Landscaping Council and their efforts to engaging the community around water quality, conservation landscaping, and a new Chesapeake Bay Professional Landscape Certification program that is being developed in partnership with the UMD Sea Grant Extension Program. Other successful community programs that work on small scale stormwater issues will be highlighted.

Amanda Rockler is a Regional Watershed Restoration Specialist with the University of Maryland's Sea Grant Extension Program. She received her B.A. in Environmental and Ecological Biology from the University of Colorado @ Boulder, and holds a Masters from George Washington University in Sustainable Landscape Design. Amanda loves charismatic megafauna and healthy watersheds and her dog Lucky.

Case Studies of ROW Effects on Headwater Stream Condition

Ginny M. Rogers
Versar, Inc.

Headwater streams are the smallest tributaries in the very upper reaches of a watershed. They provide essential functions to the health of the entire watershed by retaining floodwater, storing nutrients, and reducing sediment loads to areas downstream in the watershed. Recent applications to the Maryland Public Service Commission have proposed constructing transmission facilities, including substations, converter stations, and transmission line rights-of way (ROWs), which would cross or alter headwater streams in sensitive watersheds. This talk uses biological data collected by the Maryland Biological Stream Survey (MBSS) downstream of headwater streams to evaluate how current ROW maintenance practices are affecting those streams. The construction of a large substation or convertor station that channelizes or paves over several headwater streams in one watershed may also result in cumulative impacts downstream By comparing similar catchments across a range of sizes and land uses, but with and without ROW influences, the impacts of ROW vegetation management on stream benthic macroinvertebrates were examined. Additionally, several ROWs were identified upstream of more than one MBSS site allowing for the distance from the ROW to be used as a variable to assess the ROW impacts to watersheds as a whole. Approximately 10 pairs of catchments were compared in each of three regions of the state: Western, Central, and Southern.

Ginny Rogers has been an Environmental Scientist at Versar for 15 years. In that time, she has contributed to many aspects of the Maryland Biological Stream Survey. She has also assisted the Power Plant Research program with the biological aspects of power generation and transmission line licensing, especially in regard to stream crossings and watershed impacts.

Land Conservation and Water Quality Protection: MD/DNR Purchase Conservation Programs

Stacy Schaefer
Maryland DNR

This presentation will describe three purchase land conservation programs offered by MD/DNR: Program Open Space State-Side, the Rural Legacy Program, and the CREP Permanent Easement Program. Each program has unique conservation objectives. The presentation will be organized into four subtopics: (1) the conservation objectives of the programs; (2) the targeting used by each program and how water quality considerations affect decisions about proposed acquisitions by MD/DNR; (3) how each program attempts to protect and improve water quality through easement requirements and the State's fee simple ownership of land; and (4) potential indicators of water quality improvement achieved by these three land conservation programs.

Stacy Schaefer is Associate Director of the Land Conservation Group in the Maryland Department of Natural Resources' Land Acquisition and Planning Unit. She leads the team responsible for conserving properties through Program Open Space State-Side, the Maryland Rural Legacy Program, and the Permanent CREP Easement Program. Ms. Schaefer has been conserving properties with DNR for over seven years. Prior to joining DNR, she earned her J.D. from George Washington University School of Law and then practiced law for ten years in Washington, D.C.

Maryland's Piedmont Brook Trout Populations

Mark Staley
Maryland DNR

The origin, distribution, habitat, and population status of brook trout in the piedmont physiographic province of Maryland will be explored in this talk. Population trends, threats, past and present land use and landscape factors and restoration opportunities will be discussed. Brook trout declines in response to urbanization have been well documented in Maryland. How are brook trout faring in more rural landscapes in Maryland's piedmont? The piedmont portions of the Gunpowder, Patapsco, Potomac, Patuxent, and Susquehanna watersheds all have or had brook trout within the past 25 years. Data from case studies on brook trout loss, persistence, and success of reintroduction projects in Central MD will be presented. The remaining brook trout populations in Maryland's piedmont are an ecological contradiction of fragility and resilience.

Mark is a fisheries biologist, with MD DNR Fisheries Service since 1988. He has been an advocate for Central Maryland's brook trout for years and has been blessed to get paid for spending time in brook trout watersheds.

Antidegradation and Tier III in Maryland: What it Means, How it Would Work, and Potential Challenges

Matthew Stover
MDE

The Clean Water Act and Code of Maryland Regulations (COMAR) both discuss the designation of Tier III Outstanding National Resource Waters (ONRW) as a way to protect waters that provide exceptional ecological or recreational resources. Falling under Antidegradation Policy, Maryland's Tier III ONRW regulations limit water quality impacts to only those of a temporary nature and include requirements to have permanent land use protections in place. As a result, Tier III designations represent the most stringent water quality protections available. However, the process to designate Tier III waters involves a challenging set of requirements that must be met prior to official designation. To date, MDE has not formally designated any waters as Tier III but is currently seeking to pilot the Tier III designation process with willing landowners and nominating entities. This presentation will discuss the applicable regulations and the requirements for nominating waters as Tier III.

Matthew Stover is a Natural Resources Planner with the Maryland Department of the Environment's (MDE) Science Services Administration. His primary focus is on water quality standards development and water quality data analysis. Prior to joining MDE, Matthew worked for Aarcher Incorporated and before that the Maryland Department of Natural Resources. Matthew has a B.A. in Environmental Studies from Washington College and is currently pursuing a Masters of Science in Environmental Science from Towson University.

Maryland Biological Stream Survey Round Four -- Back to the Future

Scott Stranko
Maryland DNR

Coauthors: Ron Klauda, Dan Boward, Mark Southerland, Jay Kilian, Andy Becker, Michael Kashiwagi, Matt Ashton, Sara Weglein, Luke Roberson, Rebecca Bourquin, Patrick Graves, Katherine Hanna, William Harbold, Jenny Zimmerman

Over the last 20 years, substantial effort and funding have been directed toward stream restoration and conservation in Maryland. Stream ecological monitoring data can be used to evaluate the effectiveness of such efforts in the face of human population growth, climate change, and other stressors. To this end, staff with the Maryland Department of Natural Resources Maryland Biological Stream Survey (MBSS) will begin the fourth round of sampling in 2014 to characterize the ecological condition of Maryland's freshwater streams. Round four will consist of repeat sampling at subsets of sites sampled during round one (conducted 20 years ago) and round two (conducted 14 years ago). Using this approach optimizes the ability to detect potential changes in stream condition at the re-sampled sites and, since these sites provide a representative characterization of conditions, results can also be used to assess and compare statewide conditions. Round four is scheduled to take five years (2014 -- 2018) to sample 405 sites statewide. Additional re-sampling will also focus at least ten sites each year in certain high priority watersheds (e.g., Mattawoman Creek and Deep Creek Lake) so that the conditions therein can also be compared over time. Annual sampling at MBSS Sentinel Sites will continue and will be used along with round four data to assist in distinguishing natural (e.g., weather-related) influences on stream conditions from anthropogenic sources of variability.

Scott has worked at Maryland DNR on the MBSS since 1994. His goal is to make sure that the MBSS provides the best possible data that are as applicable as possible to informing resource management decisions.

Fish Passage in Maryland

Jim Thompson
Maryland DNR

Presentation will give an overview of the MD Fish Passage Program including how it began, why it's useful, and projects completed to date. The presentation will also highlight the newly created GIS based Fish Passage Prioritization Tool and how it will be used to steer fish passage efforts in the future.

Jim Thompson completed his Bachelors degree in Fish & Wildlife Management at Frostburg State in 1999 and has been working for DNR Fisheries Service ever since. He has held the position of Fish Passage Coordinator since 2004.

Panel Discussion: Future Opportunities in Proactive Environmental Review

John Wald
Maryland DNR

Coauthors: Tony Redman, Charlie Gougeon, Greg Golden

A panel discussion with audience questions and participation will be led on the topic of opportunities in proactive environmental review. This discussion will build on information and ideas conveyed in the previous two presentations on traditional and proactive environmental review. In this discussion, feedback on current and future review and communication strategies, successes, challenges, and areas for growth will be encouraged. Perspectives of regulatory agency staff, local government, citizens, non-governmental organizations and private industry will be explored. The discussion will aim to span traditional reviews, current proactive initiatives, and the spectrum of new ideas and potential future approaches. Discussion of innovative tools, communication methods, and information sharing locally, regionally, and nationwide will be included.

John Wald is a Project Manager and Team Leader at the Maryland Department of Natural Resources. Acquired skills over the years are in fostering relationships with diverse groups to seek common goals. Mr. Wald participated in numerous efforts to improve communication issues in long-term projects, to ensure the overall goals and objectives of the project were met. Currently, he works in the Integrated Policy Review Unit to develop efficient work functions, with the goal of allowing reviewers more time to guide projects which align with policy initiatives, and afford the greatest environmental protections both now and in the future.

Anti-degradation in Virginia: Tier 3 Designation Process and Case Studies

David Whitehurst
Virginia DEQ

This presentation will briefly describe the promulgation process used to designate Tier 3 waters under Virginia's anti-degradation policy. The presentation will also describe the goals of Tier 3 designations and how those goals are achieved under the purview of existing Virginia regulations. Two case studies of Tier 3 rule making will be presented to illustrate what can go right….and what can go wrong during Tier 3 rule making.

Dave joined the Virginia Department of Environmental Quality in 2000 where he works with the Water Quality Standards program. Through developing water quality standards/regulations and guiding amendments through promulgation, he has become intimately familiar with Virginia's process of designating Exceptional State Waters (Tier 3). Dave earned degrees in biology and education at Virginia Commonwealth University.

Understanding Impacts from Climate Change and Extreme Weather on Water Quality

Ben Wright
Hazen and Sawyer

Coauthors: Josh Weiss, Bill Becker

Water utilities are struggling with how best to prepare for the broad range of possible climate change impacts and are searching for new approaches to respond to an uncertain future. One important component of climate change analysis is finding the appropriate hydrologic data to use for building models. There are numerous data sources and techniques for creating a usable data set for hydrologic analyses, some of which have been utilized by other utilities for climate change studies while others remain within the academic realm. In addition to changing hydrology, is the potential for water quality degradation from climate change impacts. Maryland has many high quality water supplies, and water utilities throughout the state have historically had the luxury of generally consistent water quality. However, changing weather and hydrology, which has the potential to change the concentration, character, and seasonality of natural organic matter (NOM) in water supplies, which may require utilities to employ more advanced treatment to maintain compliance with recent disinfection byproduct regulations. In addition to NOM, climate change may exacerbate algal blooms, taste and odor problems, or other issues for utilities. This presentation will summarize the results of a number of recent and ongoing Water Research Foundation projects exploring potential drinking water utility vulnerabilities, while presenting specifics about projections for Maryland. The presentation will provide utilities and water resource managers with practical information that will prove useful for those wanting to better understand potential impacts from weather/climate variability.

Ben Wright received his BS from Virginia Tech and his MS from Johns Hopkins University. Mr. Wright has performed modeling and analysis for water resources management and water supply infrastructure projects for the past twelve years. Recently Mr. Wright has been the lead researcher on a number of climate change studies seeking to better understand climate drivers, adaptation options, and water supply/water quality impacts on water resources and utility operations.

MARYLAND WATER MONITORING COUNCIL

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POSTER ABSTRACTS

(Listed alphabetically by lead author's last name)

Relations Between Macroinvertebrates, Nutrients, and Water Quality Criteria in Wadeable Streams of Maryland, USA

Matt Ashton
Maryland DNR

Coauthors: Scott Stranko, Ray Morgan

In an ongoing effort to propose biologically protective nutrient criteria, we examined how total nitrogen (TN) and its forms were associated with macroinvertebrate communities in wadeable streams of Maryland. Taxonomic and functional metrics of an index of biological integrity (IBI) were significantly associated with multiple nutrient measures; however, the highest correlations with nutrients were for ammonia-N and nitrite-N and among macroinvertebrate measures were for Beck's Biotic Index and its metrics. Since IBI metrics showed comparatively less association, we evaluated how macroinvertebrate taxa related to proposed nutrient criteria previously derived for those same streams instead of developing nutrient-biology thresholds. We identified one tolerant and three intolerant taxa whose occurrence appeared related to a TN benchmark. Individually, these taxa poorly indicated whether streams exceeded the benchmark, but combining taxa notably improved classification rates. We then extracted major physiochemical gradients using principal components analysis to develop models that assessed their influence on nutrient indicator taxa. The response of intolerant taxa was predominantly influenced by a nutrient-forest cover gradient. In contrast, habitat quality had a greater effect on tolerant taxa. When taxa were aggregated into a nutrient sensitive index the response was primarily influenced by the nutrient-forest gradient. Multiple lines of evidence highlight the effects of excessive nutrients in streams on macroinvertebrate communities and taxa in Maryland, whose loss may not be reflected in metrics that form the basis of biological criteria. Refinement of indicator taxa and a nutrient sensitive index is warranted before thresholds in aquatic life to water quality are quantified.

Ecohydrological Processes and Urban Water: the Role of Flora and Fauna in the Urban Watershed Continuum

Ken Belt
USDA Forest Service

Coauthors: Sujay Kaushal, Richard Pouyat, Christopher Swan

Our understanding of aquatic and forest ecosystems has evolved over the decades, revealing an ever-greater complexity and connectivity of ecohydrological systems where water flow and ecological processes are highly coupled. This coupling interacts with engineered urban water systems in complex ways that are important to the management and delivery of ecosystem services (e.g., provision of water, retention of nutrients). This complexity goes far beyond the simple conveyance and rudimentary treatment functions of stormwater management, and so current efforts to transform stormwater control measures (SCMs) into green stormwater infrastructure (GSI) are likely to transform the urban water landscape in many important, unappreciated ways. In fact, the widespread implementation of GSI facilities promises to turn back the "sanitary city" view of stormwater as wastewater by restoring many diverted surface flows to groundwater and soil ecosystems. This will greatly change the present engineering-dominated urban watershed continuum (UWC) by shifting biogeochemical and hydrological functions into the upland landscape. Such a shift will pose important questions regarding ecosystem services and disservices that will, more than ever before, be based in the workings of the socio-ecohydrological System (SES) where people, ecological processes and hydrology will be more intermingled than ever before. We discuss how ecohydrology and forestry needs to be a prominent part of facilitating interdisciplinary discussions to both advance GSI science, and just as importantly, to integrate these into the SES connections needed to create ecologically based, sustainable pathways to the "humane metropolis" of the future.

Lead Concentrations in Harford County Piedmont Well Water: Geologic or Plumbing Source?

Kate Burgy
Maryland Geological Survey

Coauthors: John Resline, Peter Smith

The Maryland Geological Survey, in cooperation with the Harford County Health Department, sampled 80 domestic wells in the Piedmont area of Harford County to evaluate lead concentrations in well water. Additional constituents sampled include pH, specific conductance, chloride, and nitrate. The study was prompted in response to reports of elevated lead concentrations from water samples collected from several wells in Harford County that exceeded the U.S. Environmental Protection Agency's Action Level of 15 micrograms per liter (ug/L). Elevated lead concentrations have proven uncommon in previous studies of Maryland counties with similar hydrogeologic conditions; however, corrosion of plumbing materials that comprise the distribution system of a home is a known lead source. Two water samples were collected from an internal faucet at each home: a "first-draw" sample (collected immediately after turning on the faucet), and a sample collected after running the water from the same faucet for 30 seconds. An additional "purge" sample was obtained from a point prior to interaction with any treatment system(s) within the home. Results of this study indicate six first-draw samples and none of the 30-second flush samples exceeded the US EPA Action Level of 15 ug/L. All purge water samples were below the Action Level and 79 of 80 samples were below the laboratory reporting limit of 5 ug/L. The data suggest that elevated lead levels found within the sampled homes of this study are derived from leaching of lead from the plumbing materials of the distribution system and not from geologic sources.

An Assessment of Water Quality and Phytoplankton Composition in Lake Linganore, Frederick County, Maryland - STUDENT POSTER

Stephen Cloud
Hood College

Coauthors: Cassie Shaeffer, Max Ruehrmund, Dr. Drew Ferrier

Lake Linganore is a reservoir in Frederick County, MD used for recreation and as a drinking water source for Frederick City. Residents of the Lake Linganore Homeowners Association are concerned with the algal growth in the lake and the reservoir's suitability for recreation. We undertook an assessment of the lake's water quality and algal community from June to September 2013. Vertical profiles were taken to a depth of 9.1 m to monitor temperature, light intensity, and dissolved oxygen. Secchi depth, levels of total nitrogen and total phosphorous, and the identification of predominate algal species were also conducted. The reservoir exhibits a distinct thermocline by early June, with nearly the entire water column warming over the remainder of the summer. Irradiance is sufficient for algal growth to a depth of 4.0 m. Surface dissolved oxygen levels consistently exceeded 100% saturation. Throughout the summer, an increasing amount of the bottom waters exhibited anoxia. Under anoxic conditions phosphorus was released into the bottom waters from the sediments. Cyanobacterial taxa predominated the phytoplankton in early June, but were replaced to some extent later in the summer by green algal forms. Secchi depths throughout the summer indicated a Trophic State Index (TSI) for the lake of 58 to 63. This is a considerably higher TSI than the goal of 53 which was established for the lake in its phosphorus/sediment TMDL document.

Stream Blitz Results Indicate Watershed, Habitat Patterns

Elaine Friebele
Jug Bay Wetlands Sanctuary

A "Stream Blitz" was held on 18 June 2011 at Jug Bay Wetlands Sanctuary, a 1600 acre preserve bordering the Patuxent River. Staff and volunteers surveyed the three coastal plain streams flowing through the Sanctuary: Galloway Creek, Two Run Branch and Pindell Branch. The surveys began at 7:00 am and ended at 10:00 pm. The goals of the Blitz were: (1) to catalogue as many species associated with the streams as possible in a 15 hour period, and (2) compare the stream communities, taking into account differences in floodplain habitat and watershed land use patterns. Volunteers were organized into six search teams: Riparian Birds, Macroinvertebrates, Fish and Crayfish, Riparian Plants, Reptiles and Amphibians, and nocturnal calling animals (Frogs, Toads and Birds). The three stream watersheds vary in size: 1357 acres (Galloway); 846 acres (Two Run); and 513 acres (Pindell). Although the streams flow through the Sanctuary and empty into the Patuxent River, their headwaters lie beyond this publicly owned, protected land. Galloway Creek watershed is home to over 1,000 people, with both commercial and residential development, while the Two Run and Pindell watersheds are sparsely populated. Human activities upstream in the watersheds can contribute to habitat degradation and reduced water quality. Stream Blitz data show that the streams and their riparian habitats support a diversity of species in each category. Differences in the streams' habitat characteristics and water quality can shape different species assemblages.

Forest Conservation Targeting

Anne Hairston-Strang
Maryland Forest Service

Coauthors: Timothy Culbreth

The Maryland Forest Service has been targeting forest conservation in specific areas of the state for many years. Recent Federal guidelines triggered the Maryland Forest Action Plan and development of the Forest Service Stewardship Priority Areas. Water quality improvement has been a cornerstone of all targeting efforts; Healthy Forests for Healthy Watersheds and Forest Legacy Program draft Forest Legacy Areas are no exception. Significant overlap between the targeting maps shows a strong commitment to forest conservation for water quality improvement using the best available science. Major data elements include, but aren't limited to: forested buffers, saturated hydraulic conductivity, hydrogeomorphic region nitrogen and phosphorus rankings, headwater streams and wetlands, and groundwater protection areas. These maps were developed to guide forest conservation to where it will do the most to protect water quality.

Chemistry of Western Maryland Stream Water: A Baseline Assessment Before Possible Hydraulic Fracturing

Andrew Heyes
University of Maryland Center for Environmental Science

Coauthors: Laura Lapham, Johan Schijf, Michael Gonsior, Jenna Luek, Caroline Coulter

As part of a multiagency effort, we have begun a detailed examination of the water chemistry of Western Maryland streams located in watersheds where hydraulic fracturing may occur in the future. There are concerns over the release of chemicals, used in the fracturing process and those naturally occurring in shale-groundwater, to aquifers and streams. Also of concern is the potential for surface spills and the release of contaminants from the many other associated activities. In order to detect any changes in stream water quality during the period of fracturing and gas withdrawal, detailed temporal background chemistry of area streams is required. Some of these parameters, such as strontium and calcium, mainly serve as sentinels to detect changes in groundwater sources entering streams, while others will also help to appropriate source, such as the isotopic signature of methane. Other compounds such as PAHs and surfactants will also have a direct impact on the environment if concentrations are increased, thus these measurements will provide a baseline of current exposure as well as being indicators of change. Here we present early results from our 2013 collections. The concentrations of Sr and Ca vary seasonally. The sum of the polycyclic aromatic hydrocarbon measured in all the stream waters are low, as expected, but the distribution of the detectable compounds appears watershed specific. Methane concentrations also varied over space and time, with highest concentrations (~3 µM) in the summer, and had à3B413C-CH4 values averaging -54.8±1.5â030 in April, indicating a mixed thermogenic and biogenic source.

Using Community-level Models to Predict Patterns of Biodiversity in Maryland Streams

Miriam Johnston
Appalachian Lab, University of Maryland Center for Environmental Science

Coauthors: Matthew C. Fitzpatrick, Andrew J. Elmore, Steven Guinn

Aquatic ecosystems are considered among the most vulnerable and endangered in the world, with the projected future extinction rate of freshwater fauna rivaling estimates for tropical rainforest species. Though it is clear that freshwater ecosystems warrant conservation attention, management decisions often are challenged by a lack of spatial data on the condition and distribution of biological resources. Community-level modeling is a promising technique that provides a means to model and map patterns of biodiversity while considering all species regardless of how infrequently recorded and, unlike indices of biological integrity, without reliance on reference conditions. Here, we use generalized dissimilarity modeling (GDM), a novel, nonlinear community modeling technique, and the Maryland Biological Stream Survey (MBSS) to model fish and invertebrate community turnover along environmental gradients in Maryland. Preliminary research suggests that important predictors vary by physiographic region and response taxa, but that measures of stream steepness and stream length are consistently among the variables that best explain assemblage turnover. Adding information about the non-response taxa (i.e. invertebrates, if modeling fish) and the geographic separation of survey sites improves models, indicating that biotic processes and stream connectivity are also important considerations. Future research will focus on the comparative abilities of proximal, field-based predictor variables and distal, remotely-derived predictors to explain patterns in turnover, with the goal of informing the management application of model predictions.

Green Street Neighborhood Prioritization in Montgomery County, Maryland

Phil Jones
Biohabitats, Inc.

Coauthors: Craig Carson, Don Dorsey, Ho-Ching Fong, Krystal Kliger, Meghan Gloyd

Green street neighborhood retrofit projects are an important aspect of Montgomery County, Maryland's watershed restoration and MS4 compliance efforts. Green street projects typically consist of bioretention and other LID retrofits in the public right-of-way. With over 1,100 neighborhoods, the County requires a rapid, straightforward, and objective process to prioritize neighborhoods for implementation. The Rock Creek and Anacostia watersheds, covering 25% of the County's area and containing 473 neighborhoods, were selected to pilot the process. Eight physical and watershed restoration factors were selected that can be analyzed and scored on a neighborhood level through a GIS and spreadsheet approach. Physical factors include common feasibility constraints such as the typical road width, ROW width, road slope, and tree canopy of each neighborhood. Planning-level restoration factors include stream condition and the presence and type of existing stormwater management. The resulting scores for each neighborhood allow it to be prioritized according to its physical feasibility for green street retrofits and its need for watershed restoration. The prioritized list provides the County with a transparent and adaptable approach for focusing its resources on the most promising neighborhoods. The project team field-verified selected neighborhoods and determined that the process successfully identified areas with high and low physical feasibility. From this prioritized list, the County will select specific neighborhoods that will be issued as projects to design consultants, who will begin the process of detailed analysis and design to identify specific sites and retrofit each neighborhood to the maximum extent practicable.

Citizen Scientists Wanted! Volunteers Needed for Monitoring Microbial Communities in Maryland Headwater Streams

Stephen Keller
University of MD Center for Environmental Science

Coauthors: Robert Hilderbrand, Alyson Santoro

Microbes drive many ecosystem processes, including nutrient cycling, and thus their diversity have great potential to assess and possibly mitigate impacts on aquatic ecosystems. However, little is known about the microbial communities in headwater streams and how they respond to watershed alterations. With funding from the Maryland Sea Grant, we are recruiting "citizen scientists" from local watershed associations to sample microbial diversity throughout Maryland streams. Our goal is to engage citizens with a keen interest in water quality, and work with them to understand the vital role that microbes play in maintaining healthy ecosystems. We aim to recruit volunteers from 4 watershed associations who will participate in a short workshop following the 2014 MWMC meeting. There, our research team will work hands-on with volunteers to (i) identify an environmental stressor (e.g., acid mine drainage, agriculture, impervious surface runoff, sewage treatment plant, etc.) of interest within their local watershed, (ii) design a sampling scheme to estimate the effect of the stressor on microbial communities, and (iii) train volunteers on sampling protocols and provide them with field supplies. During spring/summer 2015, each group will conduct their field work and send in stream samples for microbial analysis. Then our researchers will process the samples, summarize the microbial communities at each site, and provide results back to the groups during a final "wrap up" workshop at the 2015 MWMC meeting. There we will work with each group to discuss the implications for future monitoring efforts and resource stewardship within their watersheds.

Habitat Requirements of River Chub (Nocomis micropogon), an Urbanization Sensitive Keystone Fish Species: Relation to Functional Restoration of Urbanized Waterways

Stanley Joseph Kemp
University of Baltimore

Coauthor: Stephen Lamb

Urbanization poses a growing threat to the integrity of aquatic ecosystems and has been shown to severely impact ecosystem function and services. Recent reviews have indicated that attempts to restore biodiversity in urbanized waterways have frequently been unsuccessful. One possible impediment to successful restoration of ecosystem function is that the mechanisms through which urbanization impacts specific organisms remain incompletely known. Lacking this information, restoration practitioners are hampered in designing and implementing successful restoration plans. This paper focuses on determining specific nesting habitat requirements for River chub (Nocomis micropogon), a species which has largely disappeared from Baltimore's urbanized waterways. Males construct large pebble mound nests which are critically used by a number of other species as an ideal nesting habitat. Local streams which continue to harbor River chub populations (Little Gunpowder Falls, Winters Run) as well as those which do not have River chub (Gwynns Falls, Jones Falls) were surveyed focusing on nesting habitat. Streams with extant populations were surveyed for nesting activity during 2012- 2013. Nest dimensions, substrate availability, stream velocity and flow rate, water depth, and erosion rates were measured for natural nests. An experiment using artificial nests was conducted (2013) to compare nest survival rates between urbanized streams and areas with extant populations. Results indicate presence of suitable substrate and conditions in urbanized streams, but reduced nest survival due to flashy hydrology. Future research will focus on linking specific habitat requirements with population persistence and impacts of restoration efforts.

Modeling the Water Quality Benefits and Costs of BMP Opportunity Sites in the Anacostia River Basin, Prince George's County, Maryland

Antti Koskelo
EA Engineering, Science, and Technology, Inc.

Coauthors: Ali Abbasi, Mike Powell, Jim Morris

We conducted a cost-benefit study of BMP opportunity sites in an urbanized subwatershed (65 acres with 25% impervious) of the Anacostia River in Prince George's County, Maryland. We utilized the Watershed Treatment Model to estimate existing pollutant loads in the watershed and the projected load reductions resulting from BMP implementation. Twenty three potential BMP opportunity sites were identified, including both structural BMPs (e.g., regenerative stormwater conveyance [RSC], bioretention) and non-structural BMPs (e.g., rain barrels, curb removals). Based on the model results, the BMPs individually had only a minor impact on water quality with the exception of the RSC, which was predicted to reduce loads by 11%, 40%, and 61% for nitrogen, phosphorus, and sediment, respectively. The fraction of the watershed population with illicit connections was also determined to be an important factor, resulting in a 34% reduction in nitrogen when the fraction was reduced from 5% to 1%. The most cost-effective BMP for controlling nutrients was permeable pavement ($279/lb nitrogen removed; $1,410/lb phosphorus removed), and for controlling sediment was the RSC ($7/lb sediment removed). In general, the structural BMPs tended to be less cost-effective because they achieved only a marginally better load reduction at much greater cost. Overall, the model results suggest that pollutant reductions can be maximized by implementing 1) a RSC to stabilize the stream and reduce channel erosion (effective for phosphorus and sediment control), and 2) an Illicit Discharge Detection and Elimination program to control nitrogen loads resulting from illicit connections in the watershed.

The Importance of River Chub (Nocomis Micropogon) Nests as Hubs for Mating and Feeding Activities in Maryland Streams - STUDENT POSTER

Stephen Lamb
University of Baltimore

Coauthor: Dr. Stanley Kemp

River chub (Nocomis micropogon) are a keystone fish species whose nests as well as their activities surrounding their nests facilitate breeding activities by other fish species (nest associates). The large pebble mound nests constructed by the males of this species also act as focal points for the fish community for feeding activities. This paper focuses on identifying and quantifying River chub nest associates as well as the behavior of other non- breeding fish found in proximity to the nest. River chub are intolerant to the effects of urbanization and therefore can be valued not only as a keystone species but also as an indicator of waterway health. This paper will help to determine the extent of river chub nest use by other species and the importance of River chub as a keystone species in Maryland waterways. During summer 2013, underwater photos and videos were taken at River chub nests at Winters Run and Little Gunpowder Falls. Analysis of the material collected revealed a number of nest associates using River chub nests for breeding purposes, as well as a number of other species drawn to the area for feeding or other activities. Both male and female River chub were also observed in the vicinity of the nest, engaged in various behaviors related to spawning activity. These results suggest that loss of the River chub from urban areas in Maryland may have had a substantial negative impact on stream ecosystem function.

Mountain Ridge High School Pre-Fracking Water Quality Baseline - STUDENT POSTER

Addie Lauder
Mountain Ridge High School

Coauthors: Daryl Griffiths and MRHS Environmental Science Students

Mountain Ridge High School students are collecting pre-hydraulic fracturing water quality data once a month from eight sites, all sources for the town's municipal water supply. They have also installed HOBO continuous conductivity data loggers. The sites include the Frostburg Reservoir and Tributary T1, which are a half mile or less from the nearest proposed fracking site. Students use the YSI Pro30, ProODO, and pH10 meter to measure specific conductivity, dO, and pH. They also gather sample bottles for barium, strontium, and bromide analysis at Summit Labs in Ohio. Each site has shown its own unique natural variability for each analyte. However, maximums and minimums range from 20 to 70 ppb for barium and strontium. Bromide has always been below the detection limit of 10ppb. These concentrations are 20,000 times less that those found in pure frack fluid. Some other interesting anthropocentric effects have also been noticed over the past 21 months. The project has been funded by a $78,000 grant from the State Farm Youth Advisory Board.

What Lurks in the SAV, Too Much of a Good Thing?

Jim Long
Mattawoman Watershed Society

Coauthors: Margaret McGinty, Jim Uphoff

The Mattawoman Creek estuary has been described "as what a restored Chesapeake Bay would look like." [1] This description is possible because especially high-quality habitat provides headroom in a waterway that is experiencing decline from overdevelopment. A critical habitat component of a restored Bay, and a Mattawoman asset, is submerged aquatic vegetation (SAV). However, the Maryland Fisheries Service noticed surprising dips in dissolved oxygen (DO) recorded by a continuous monitor located within a dense SAV bed, contrary to expectations that photosynthesis would enhance oxygenation. To better understand the scope of the DO suppression, the Service enlisted volunteers with the Mattawoman Watershed Society to weekly paddle the SAV beds and record DO levels near Smallwood State Park. Measurements were taken over eight weekends from July 10 to September 19, 2011. Transects were placed across SAV beds of varying density and included open water. Bottom DO levels could exhibit very low values in dense beds near shore (< 3 mg/L), and were often suppressed below 5 mg/L in the SAV beds. This work suggests that less-than-optimal conditions may occur when SAV is restored under eutrophic conditions, and emphasizes the need for additional research. [1]The Case for Protection of the Watershed Resources of Mattawoman Creek: Recommendations and Management Initiatives to Protect the Mattawoman Ecosystem, The Interagency Mattawoman Ecosystem Management Task Force (2012).

Lessons from Chesapeake Bay Restoration Efforts: Understanding the Role of Nutrient Reduction Activities in Improving Water Quality

Christina M. Lyerly
University of Maryland Center for Environmental Science

Coauthors: Ana L. Hernández Cordero, Katherine L. Foreman, William C. Dennison

The degradation of water quality and habitat conditions within the Chesapeake Bay and its tidal waters led to the development of the Chesapeake Bay Total Maximum Daily Load for Nitrogen, Phosphorus and Sediment (TMDL). TMDL requirements have reinforced the need to understand the effectiveness of best management practices (BMPs) to ensure compliance with local and regional water quality load allocations and targets. Historically, the Chesapeake Bay scientific and management community's understanding of the effectiveness of these BMPs has largely relied on estimates used in ecosystem models that predict load reduction. Given the performance driven structure of the TMDL, the Tidal Monitoring and Analysis Workgroup and the Nontidal Water Quality Workgroup of the Chesapeake Bay Program Partnership took on the task of connecting BMP operations with real-world water quality monitoring data. We conducted a literature review of over 40 case studies to synthesize information from existing watershed studies of BMP effectiveness at improving water quality across the Chesapeake Bay and its Watershed; three major themes emerged: 1) what works; 2) the challenges that have impeded progress; and 3) the need for targeted practices. Data revealed that: 1) upgrades to wastewater treatment plants, decreases in atmospheric nitrogen deposition, and reductions in agricultural nutrient inputs directly improve water quality; 2) delays between BMP implementation and observable water quality improvements may impede progress; and 3) identifying all nutrient sources and targeting BMPs accordingly, as well as improving stormwater management to accommodate population growth are necessary to improve water quality and habitat conditions.

Pre-restoration Monitoring of Nutrients and Attached Algae in Tributaries of an Urban Stream - STUDENT POSTER

Jonathan Markovich
Towson University

Coauthors: Corinne Glover, Sarah Johnson, Dana Rogers, Susan E. Gresens

Restoration of "Cloisters Branch," a tributary of Towson Run in Towson, MD, is planned to reduce transport downstream of nutrients and sediment by reconnecting the stream channel with its floodplain and stabilizing the channel. One goal is to increase nutrient uptake and retention by benthic biota. Since fall 2012, Towson University students have gathered pre-restoration data for nutrients, attached algal biomass, and insect emergence. Monthly baseflow sampling of total nitrogen (TN), total phosphorus (TP) and total dissolved carbon (TC) is conducted at 3 stormwater outfalls and at 5 additional sites along Cloisters Branch. Reference sites on three other tributaries of Towson Run are monitored to distinguish between effects of restoration and natural variation. We hypothesized that algal blooms, tree foliage leaf out and autumn leaf fall would cause seasonal variation in nutrient concentrations. Peak algal biomass occurred in spring but decreased over 50% after leaf out. Early spring samples have shown longitudinal stream nutrient concentrations ranging from 2.66-4.35 mg/L TN, 6.82-39.22 à3BCg/L TP, and 5.09-13.56 mg/L TC. From summer through early fall, there was a trend for increasing TC and decreasing TN along Cloisters Branch which was not obvious in the stormwater outfalls. During summer through early fall longitudinal samples ranged from 2.0-3.9 mg/L TN and 12 -- 24 mg/L TC. Regular monitoring was valuable in detecting apparent leaks / discharge from infrastructure that would obscure the stream's response to future channel restoration.

Effects of Integrated Stormwater Management and Stream Engineering on Watershed Nitrogen Retention

Tamara A. Newcomer
University of Maryland

Coauthors: Sujay S. Kaushal, Paul M. Mayer, Melissa M. Grese

Restoring urban infrastructure and managing the N cycle are major challenges in urban ecosystems. We hypothesized that hydrologically connected floodplains and stormwater best management practices (BMPs) are "hot spots" for N retention through denitrification because they have ample organic carbon, low dissolved oxygen levels, and high residence time. We compared N retention metrics in 2 urban stream networks with stormwater BMPs and a forested reference watershed in Baltimore, Maryland. We used: 1) monthly stream reach scale mass balances of N conducted for 2 years (n=250), 2) in-stream tracer injection studies to measure nitrate uptake (n=6), and 3) 15N in situ push-pull tracer experiments to measure N removal via denitrification in stormwater BMPs and floodplain features (n=72). The stormwater BMPs consisted of inline wetlands installed below a storm drain outfall at Spring Branch and a wetland and wet pond configured in an oxbow to receive water during high flow events at Gwynns Run. Total dissolved nitrogen (TDN) concentrations declined significantly as water traveled through stormwater BMPs; TDN concentrations decreased from 1.26 mg/L at Spring Branch and 1.68 mg/L at Gwynns Run. Mean TDN retention at Spring Branch was higher in a stream reach with connected floodplains, 2.01 ± 0.77 kg/day, than in the stormwater BMPs, 0.053 ± 0.025 kg/day. Similarly, at Gwynns Run, mean TDN retention (and export) were higher in the stream reaches, 2.00 ± 1.6 kg/day, than in the stormwater BMPs, 0.005 ± 0.597 kg/day. Mean 15N in situ denitrification rates were high in both BMPs and floodplain areas.

Integration of Oyster Aquaculture and the Algal Turf Scrubber for Increased Water Quality Improvement

Nicholas Ray
University of Maryland

Coauthors: Patrick Kangas, Daniel Terlizzi

The algal turf scrubber (ATS) is an ecologically designed system used to "scrub" excess nutrients from polluted waters. Factors limiting large-scale implementation of the ATS are rates of productivity and nutrient removal. Experiments during the summers of 2012 and 2013 testing ATS at an oyster aquaculture facility on the Choptank River exhibited productivity and nutrient removal rates higher than those previously recorded in the Chesapeake Bay. Implications of increased productivity will be discussed in terms of nutrient removal and biomass production efficiencies.

Water Quality impacts of Agricultural Conservation Practices in the Choptank River Watershed

Timothy Rosen
Midshore Riverkeeper Conservancy

Coauthors: Drew Koslow, Dr. Thomas Fisher, Dana Bunnell-Young, Hasan Wilson

The Choptank River is one of the few Chesapeake Bay tributaries with increasing nutrient loads. The watershed's largest land use is agriculture making this the greatest source of nutrient pollution. Midshore Riverkeeper Conservancy along with various academic, state, and federal partners has implemented and tracked the impacts of agricultural conservation practices on water quality. The Harleigh Farm study looked at how conservation practices (CRP and CREP) implemented on traditional row crop fields over a 17 year period impacted shallow groundwater nitrate. This study demonstrated that after approximately 3 years nitrate levels dropped below 1.0 mg/l. The Collier Farm project implemented 3 water control structures in a ditch to help slow down water and potentially reduce nutrient concentrations. Results from this study demonstrate that the water control structures reduced nutrient concentrations by 45% between upstream and downstream sampling locations. The Oakland View Farm project was a multi-agency partnership to install the first woodchip bioreactor and denitrification wall in Maryland. This project was completed in mid-November 2013. The woodchip bioreactor is a trench of woodchips that is connected to a drainage tile line treating runoff from the farm. It works by creating a favorable environment for denitrification to occur. The denitrification wall works in a similar fashion, but instead of tying into the drainage tile line it is a trench that is dug into the water table to intercept shallow groundwater. The trench is filled with a 1:1 mixture of sawdust and the parent soil matrix.

Assessment of the Effects of Emergent Plants on Benthic Algal Growth in Carroll Creek, Frederick, MD - STUDENT POSTER

Cassandra Schaeffer
Hood College

Coauthors: Stephen Cloud, Max Ruehrmund, Drew Ferrier

Carroll Creek, a tributary of the Monocacy River, is located in Frederick, Maryland. Due to nutrient enrichment and sufficient irradiance, the creek has experienced nuisance filamentous algal growth for many years. A local non-profit, Color and the Creek, planted a portion of the stream channel with water lilies and other emergent aquatic vegetation in an effort to reduce algal growth by restricting incident benthic irradiation. Our study assessed the efficacy of this effort. Nutrient concentrations, benthic chlorophyll, and light intensity were monitored from June to October 2013. Over the growing season chlorophyll a concentration was consistently less in areas with emergent plants and decreased further as the vegetation matured. Comparing nutrient levels upstream and downstream of the planted portion of the stream channel, the concentrations of nitrate, total nitrogen, and total phosphorus were generally less downstream of the lilies, indicating that the presence of the lilies, although in fertilized pots, did not exacerbate the levels of these nutrients in the creek. Average light intensity was also diminished in the areas underneath the plants. Based on these data, emergent plants appear to be effective in mitigating the growth of nuisance benthic algal communities in the creek.

Sea-level Rise Impacts Future Herring Bay Watershed Improvement Planning - STUDENT POSTER

Carmen M. Skarlupka
Anne Arundel Community College

The Herring Bay Watershed is a major watershed in Anne Arundel County, Maryland. Located along the lower western shore of the Chesapeake Bay in southernmost Anne Arundel County, Herring Bay it consists of 21 subwatersheds, covering, 14,682 acres. Herring Bay is one of two major watersheds in the County that lack a written watershed improvement plan (WIP) scheduled for completion in 2015 (AACo 2013). This holistic watershed plan will address development and land use planning in addition to proposing restoration and preservation improvements, encompassing a systematic watershed perspective. The County provides open access to an online Watershed Ecosystem and Restoration Services (WERS), a geographical information systems (GIS) mapping program denoting watersheds targeted for restoration and preservation. However, there is a critical flaw in WERS, it lacks the ability to display sea-level rise datasets for this low laying coastal watershed like Herring Bay. MERLIN, Maryland's Environmental Resources and Land Information Network GIS mapping application, provides very detailed imagery of sea-level rise impacts from two feet to ten feet that are vital to effective planning and executing of restoration and preservation projects within Maryland's watersheds. There are entire Herring Bay subwatersheds identified in WERS for restoration and preservation WERS that will be completely inundated by standing flood waters according to MERLIN. Cross functionality of sea-level rise and watershed improvement projects must be incorporated into any WIP in order to capitalize on the planning, budgeting and execution of watershed restoration and preservation projects to reach their life expectancy.

Piney Run Tailwater Stream Restoration Project in Sykesville, Maryland

Mark Staley
Maryland DNR

Coauthor: Art Senkel

The search for a meaningful project by the Patapsco Valley Chapter of Trout Unlimited (PVTU) evolves into a multimillion dollar stream restoration. PVTU approached MD DNR Inland Fisheries looking for a potential project for the chapter to adopt within the Patapsco watershed. DNR suggested the portion of Piney Run on State of MD property at Sykesville, MD. Stream issues such as fish passage barriers; inadequate riparian buffers, land use, and elevated water temperature were noted on the property. A coalition of stakeholders was built and MD DNR Watershed Services was approached and a stream restoration plan was developed. Pre-restoration data on macroinvertebrates, fish, habitat, and water quality and water temperature will be presented. The ultimate goal of PVTU is to restore the Piney Run tailwater to its highest and best use as a coldwater ecosystem. PVTU is working with state and local government agencies to secure a dedicated coldwater release from Piney Run Reservoir which will be vital to restoration of the coldwater fishery in Piney Run.

Nanticoke River Five Year Report Card

Beth Wasden
Nanticoke Watershed Alliance

The Nanticoke Watershed Alliance examines key indicators and trends obtained from the first five years of the Nanticoke Creekwatchers program, a citizen water monitoring program.

MARYLAND WATER MONITORING COUNCIL

19th Annual Conference

December 5, 2013

ANNUAL AND STANDING COMMITTEE REPORTS

Maryland Water Monitoring Council
2012 Annual Report

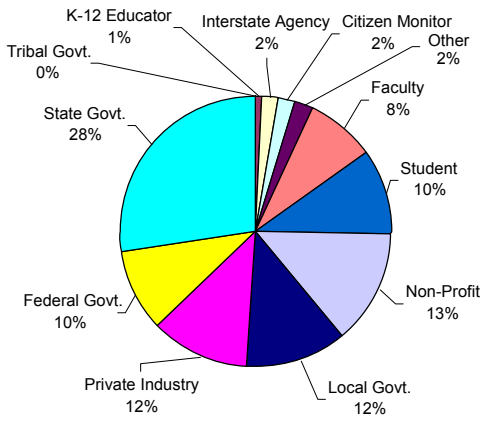
2012 was another good year for the Council. The Board of Directors continued to guide the Council toward its goals and new members provided fresh ideas that helped move the Council forward. The Annual Conference drew about 370 and 2012 was the first year for the new Student Poster Award. Committee work continued in earnest, including outreach to local government planners; a plan to develop a new, online access tool for water quality indicators, and new efforts to reach out to watershed associations. The Council enters 2013 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, Chaired by Mark Southerland (Versar), welcomed new members Jim Caldwell (Howard Co.), Kevin Brittingham (Baltimore
Co.), Caroline Wicks (EcoCheck), and Bill Richardson (US EPA Region 3). Megan Ward (Nanticoke Watershed Alliance) stepped down as Board Vice-Chair and Clark Howells (Baltimore City) agreed to serve in this position. Megan was replaced by Shelley Baird (Nanticoke Watershed Alliance). Outgoing members Wayne Davis, Ken Belt, and Dennis Genito, and Megan Ward were sent off with a bang. Mark Southerland (Versar), Cathy Wiss (Audubon Naturalists Society), and Michele Dobson (Harford Co.) all agreed to serve another term of three years.

2012 Annual Conference

The Annual Conference was once again held at the Maritime Institute in Linthicum and the 18th MWMC Annual Conference was bigger and better than ever. The event's theme was "What Else is in your Water? From Arsenic to Zinc" emphasizing pollutants other than nutrients and sediments. Plenary speakers were Cliff Mitchell (Maryland Dept. of Health and Mental Hygeine) and Bob Perciasepe (US EPA). Charlie Conklin (Gunpowder Conservancy) received the 6th Annual Carl Weber Award. About 370 attendees attended sessions on such diverse topics as bacteria, headwaters, citizens united, mercury, Marcellus shale, fish tumors, and road salt. Forty-four talks, 32 posters, ten vendors and 15 "special interest" exhibits all contributed to a diverse and well-rounded agenda.



MWMC 2012 Annual Conference attendee affiliations

MWMC on the Web

MWMC Webmasters Katherine Hanna and Luke Roberson continue to improve the MWMC's web presence. They diligently update job announcements, conference and workshop events, Board and committee activities and links to agency and organizations monitoring water in Maryland and regionally. Additions to the website included several job postings and conferences, and miscellaneous announcements. The Annual Conference is well-covered on the site with the Conference Program, links to Power Point presentations, and photos from the events. Users can find a talk of interest, click on the talk title in the Program, and download a complete pdf version of the presentation. Talks given at Board meetings, Board meeting agendas, and minutes are also available on the MWMC website. Find everything you wanted to know about the MWMC at www.marylandwatermonitoring.org.

Workshops

MWMC sponsored the Fifth Maryland Stream Monitoring Roundtable at the USGS Water Science Center in Catonsville. The goals of the February 9th 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 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 2012. This map was displayed during the event so participants could examine site overlap, gaps, and sampling protocols to be used during 2012. Maryland DNR benthic laboratory staff also provided a mini-workshop on specific lab protocols used for MBSS and Stream Waders benthic processing and taxonomy. For more information about the Roundtable, contact Dan Boward at dboward@dnr.state.md.us.

Committees

The MWMC Indicators Committee was chaired by Charlie Poukish (MDE). During 2012, the Committee explored a limited number of water quality indicators to investigate the feasibility and utility of eventually organizing as many as possible into a central online depository. This effort began by developing a categorical prototype of MDE water quality standards.

The MWMC Information Management Committee was chaired by Ed Doheny (USGS) in 2012. Wayne Davis and Bill Richardson (USEPA), and Mark Southerland (Versar) continued to explore potential resources and sources of funding for initiating a data finder pilot project for Maryland. The Committee began investigating and compiling web links for online data resources, such as online water monitoring data, publications, and maps, from different government agencies with a goal of sharing the information on the MWMC web site.

The Community Outreach and Citizen Science Committee was co-chaired in 2012 by Michelle Dobson (Harford County), Sonja Schmitz (Comm. College of Balto. County), Cathy Wiss (Audubon Naturalists Society), and Caroline Wicks (Eco-Check). The Committee completed a draft an on-line survey through survey monkey to reach out to Maryland watershed organizations so that the MWMC can better serve the citizen scientists.

Led by Co-Chairs Ron Klauda (MDNR) and Jim Cummins (ICPRB), the MWMC Monitoring and Assessment Committee was quite active in 2012. Member Andy Becker (MDNR) assisted with the Stream Monitoring Roundtable held on February 9. To follow-up the questionnaire that the Committee prepared and distributed to directors of
County planning and zoning departments in 2011 and 2012, the Committee organized a session at the summer MACo meeting held in Ocean City on August 15. Mark Southerland (Versar; MWMC Board Chair) talked about the MWMC and also Montgomery County's Special Protection Area zoning efforts. Dave Brownlee (Calvert Co.) talked about Calvert County's use of water monitoring data to guide their land use decisions. The lunchtime session was attended by about 45 people. Ron Klauda and Committee members, Cherie Miller (USGS) and Rob Mooney (Sutron) also attended this MWMC-sponsored session at MACo. With help from Committee members Andy Becker, Paul Kazyak (MDNR), Rob Mooney, and Mark Southerland, Anna Baker (USGS), and Ron Klauda co-chaired a workshop focused on "Water Resources Monitoring and Marcellus Shale Gas Development in Maryland: What Do We Need and What Do We Have?". Sponsored by the MWMC and held at Garrett College in McHenry MD, the workshop drew over 100 attendees. Power Point presentations were posted on the MWMC website.

Submitted by Dan Boward
MWMC Executive Secretary
December 5, 2013

Maryland Water Monitoring Council
Monitoring and Assessment Committee
2012 Annual Report

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Andy Becker	MD DNR
Jim Cummins	ICPRB
Sherm Garrison	MD DNR
Clark Howells	Baltimore City RNRS
Paul Kazyak	MD DNR
Stanley Kemp	University of Baltimore
Ron Klauda	MD DNR
Cherie Miller	USGS
Rob Mooney	Sutron Corporation
Marian Norris	National Park Service
Doug Redmond	M-NCPPC (retired)
Tatiana Roth	Coppin State University
Hany Sobhi	Coppin State University
Mark Southerland	Versar, Inc.

2013 Accomplishments

Since the 2012 MWMC Annual Conference, the M&A Committee met on January 24, April 12, and September 26 in 2013.

The Committee welcomed a new member, Dr. Stanley Kemp (University of Baltimore) at the Jan. 24 meeting.

The Committee is still interested in finding the most effective way to communicate with county agency planning staffs and ask how the MWMC can help them better integrate water monitoring data into their land use decisions and policies. Mark Southerland volunteered to lead this effort.

Cherie Miller volunteered to Chair a Steering Committee to plan and host a climate change information exchange in early 2014. Ron Klauda, Andy Becker, and Clark Howells will serve on the Steering Committee. The title of the gathering is "Monitoring for Climate Change in Maryland's Non-tidal Streams". The information exchange will briefly summarize what was learned at the MWMC-sponsored climate change workshop held in 2009 plus talk about what's been learned since then and come up some recommendations for the future.

Mark Southerland and Doug Redmond organized and will moderate a technical session at the 19th Annual MWMC Conference on "Moving Headwaters to the Head of the Class". They will also organize and host a workshop on headwater streams for fall 2014.

Ron Klauda organized and will moderate two technical session at the 19th Annual MWMC Conference: "Land Conservation and Water Quality Benefits" and "Saving the Best of the Best – Antidegradation and Tier III Streams – It's the Law".

Clark Howells organized and will moderate a technical session at the 19th Annual MWMC Conference on "Influence of High Quality Source Waters on Drinking Water Resources". Clark also co-organized and will co-moderate another technical session "Cold Water Habitat and Brook Trout" with Kevin Brittingham.

Ron Klauda and Clark Howells served on the 2013 MWMC Annual Conference Program Planning Committee.

The Committee welcomed two more new members at the Sept. 26 meeting: Drs. Tatiana Roth and Hany Sobhi (Coppin State University).

2014 Goals

Organize and host a Climate Change information exchange/workshop in March or April.

Organize and host a Headwater Streams workshop in the fall.

Ron Klauda and Stanley Kemp will participate on the steering committee for a STAC-sponsored workshop on stream restoration tentatively scheduled for May.

Serve on the Program Planning Committee for the 2014 Annual MWMC Conference and organize one or more technical sessions.

Submitted by Ron Klauda, November 12, 2013.

Maryland Water Monitoring Council
Information Management and Communication Committee
2012 Annual Report

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Active Committee Members	**Organization**
Tom Parham	Maryland DNR
Bill Richardson	U.S. EPA

Committee Goals

The goals of the committee include (1) exploring existing data management procedures employed in Maryland and developing recommendations for data management and quality assurance; (2) creating and maintaining an interactive map of current and past monitoring activities, with appropriate contact information for all data sets and activities; (3) developing an inventory of web links where Maryland-related water-monitoring data, reports, and maps can be easily located online; and (4) encouraging people in the local water resources community to make data and reports available online so they can be easily accessed by the Maryland water-resources community.

2013 Accomplishments

Maryland DNR completed work on an online mapping tool that that will be used to track current and past water monitoring activities in Maryland. The tool will be made available on the MWMC web site.

The IMC Committee began exploring the feasibility of an online tool on the MWMC website that would store basic information on monitoring activities in Maryland. The dataset would be searchable by parameter, and would provide a link or contact information to the agency or office responsible for the monitoring. The tool would increase networking opportunities among researchers and promote the sharing of datasets.

The IMC Committee continued to compile web links for online data resources, such as online water monitoring data, publications, and maps, from different government agencies with a goal of sharing the information on the MWMC web site.

2014 Goals

Following implementation of the online mapping tool on the MWMC website, increase its value by expanding the number of collecting organizations and monitoring activities included in the data base.
Evaluate the feasibility and value of developing a listing of Maryland monitoring activities that would be searchable by parameter.

The IMC Committee will continue to compile online data resources and will begin posting an organized list of key web links on the MWMC web site.

The IMC Committee would like to expand membership, particularly in the skill areas of Geographical Information Systems and web design.

Submitted by M.G. Pajerowski, November 13, 2013

Maryland Water Monitoring Council
Indicators Committee
2012 Annual Report

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2013 Accomplishments

During 2013, the Indicators workgroup explored the development of a water quality standards database that would allow users to easily search water quality standards. Initial versions went through several iterations before the group settled on using a GIS-based search application. The GIS application created makes use of ESRI's ArcGIS Online cloud computing platform to provide users with a visual representation of Maryland's Surface Water Use Classes (e.g. I, I-P, II, II-P, etc). This application is currently in the beta phase but will ultimately allow users to find waters of interest, the applicable use classes, relevant water quality criteria, and any available assessment methodologies. Please visit our new map (hosted on MDE's website) to test it and provide feedback.

Link to the Water Quality Standards Map - http://bit.ly/17tMpkI

Submitted October 31, 2013.

Maryland Water Monitoring Council
Communication and Outreach Committee
2012 Annual Report

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Accomplishments

Completed and distributed an on-line survey through survey monkey to reach out to Maryland watershed organizations so that the MWMC can better serve the citizen scientists.

Synthesized survey data and continue to assess to meet needs of watershed organizations and citizen scientists

Developed Facebook page! Like us on Facebook!

Develop/include feature articles from MWMC board members and post news / video clips from speakers from the annual conference/success stories

Include updated volunteer watershed organizations/what is available to citizens

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Index of Presenters, Speakers, and Affiliations

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