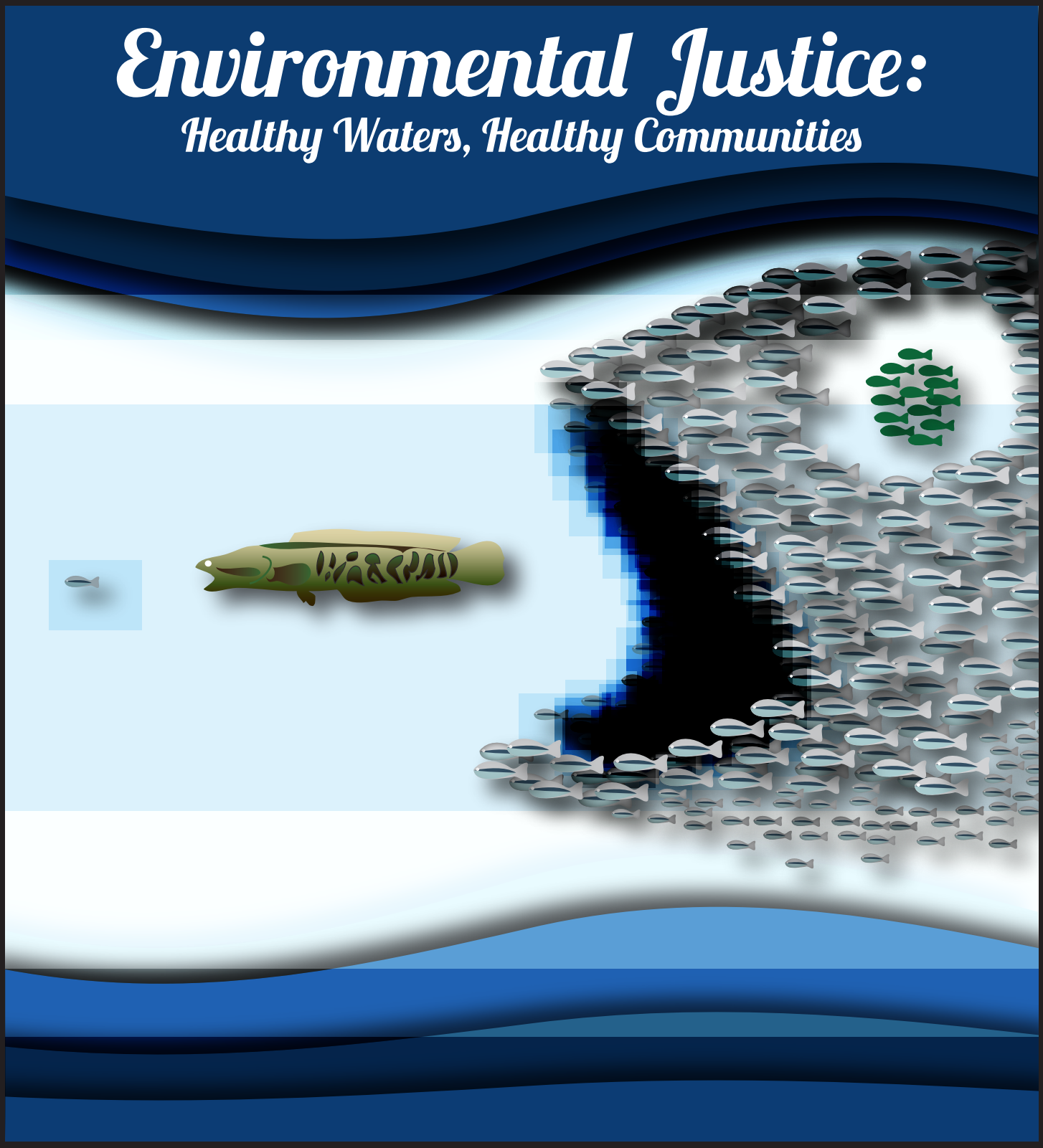
Environmental Justice:
Healthy Waters, Healthy Communities



Maryland Water Monitoring Council

MWMC

16th Annual Conference

November 18, 2010

North Linthicum, Maryland

Optical Dissolved Oxygen Technology Outperforms Traditional Methods

Three methods are generally used to measure dissolved oxygen (DO) in surface waters: Winkler titration, membrane-covered electrochemical sensors (polarographic or galvanic cell), and optical-based sensors. Optical technology for measuring DO levels in water has quickly become a well-accepted method due to many advantages over membrane sensors.

Optical DO sensors rely on lifetime-based luminescence technology to accurately measure DO levels in-situ. Optical DO sensors do not consume oxygen as part of an electrochemical reaction, and do not require membranes, electrolyte solutions, or sample flow to obtain accurate readings. Compared to oxygen-permeable membranes, optical sensors do not require warm-up time, offer improved durability, significantly reduce maintenance time, and provide longer operational life. In addition, optical sensors are especially accurate below 2 ppm—a range in which most membrane sensors routinely give poor results.

Optical sensing technology has been proven in multiple field studies to give accurate data over long deployment periods—with minimal maintenance and calibration requirements. Maintenance and material costs are drastically reduced, and site visits are minimized.

The U.S. Environmental Protection Agency has granted nationwide approval to the In-Situ® RDO optical dissolved oxygen method for analyzing BOD, CBOD, and DO in wastewater. For more information on robust, accurate RDO® sensors for groundwater, surface water, and process applications, please visit www.in-situ.com.

MARYLAND WATER MONITORING COUNCIL

16th Annual Conference
November 18, 2010

Welcome to the 16th Annual Conference of the Maryland Water Monitoring Council

The theme of this year's conference is Environmental Justice: Healthy Waters, Healthy Communities.

Environmental justice is the equal and unbiased treatment of people with respect to environmental laws, regulations, and policies. Equal and unbiased treatment towards all races, cultures, religions, incomes, and educational levels – we have a ways to go don't we? Environmental justice means that no one person or group should be forced to shoulder a disproportionate share of exposure to the negative effects of pollution due to lack of political, social, or economic strength. Today, it is no longer the 'haves' vs. the 'have nots', we are all connected in this Bay watershed and we all must take responsibility that our actions do not bring harm to others. We can learn to work together and join our voices and our strength to those who do not have them. This conference can be the start of that dialogue. We need to ask ourselves how we can join with underserved communities to work together on water issues and programs.

Our goal today is to bring together individuals from diverse groups who are interested in environmental justice, environmental issues and the application of sound science in water monitoring and decision-making. Through dialogue and cooperative learning. the conference can provide a forum where government employees, academics, business and industry, non-profit organizations, faith-based organizations, local community activists and others can begin to strengthen and achieve equality in environmental monitoring and water resource management.

We have with us for our morning plenary session Vernice Miller-Travis; Vice Chair of the Maryland State Commission on Environmental Justice and Sustainable Communities and Steward Pickett ; Director, Baltimore Ecosystem Study. There will be 5 concurrent sessions this year, reflecting MWMC members' requests for more information during the annual conference. And, at 2:30 in the Auditorium, join us for a lively panel discussion related to the conference theme.

Continuing this year, we will be presenting the Carl Weber Award as a way of recognizing 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.

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. We continue to serve as a vehicle for the effective collection, interpretation, and dissemination of environmental data related to issues, policies, and resource management objectives involving water monitoring because of your involvement. 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 and find out how the Council can help you and how you can 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 recycled and biodegradable tableware for our breaks. Also, a limited quantity of tableware will be provided to encourage attendees to save/reuse their cups and plates for each coffee break.

Have a great conference

Keith Van Ness
Maryland Water Monitoring Council Chairperson

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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.

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.

Remarks from some of us who knew Carl…

[Carl] made a strong and lasting impression on me…one of the really good guys in the stream monitoring and assessment world.

I had a great deal of respect for him since he took a rather atypical path for a university professor...placing himself squarely at the nexus of science, management and stewardship.

Carl understood that the highest potential of volunteer monitoring rested in combining its powerful educational value with scientific credibility.

[Carl] was widely known as the best teacher in the department. He had such a breadth of knowledge and passion in the classroom. He was so into the material that students couldn't help but be engaged.

He had one of those truly inviting personalities, and was a natural born teacher.

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.

2010 Annual Conference Planning Committee

Dan Boward	Maryland Department of Natural Resources (Chair)
Ken Belt	USDA Forest Service
Dave Bolton	Maryland Geological Survey
Wayne Davis	US Environmental Protection Agency
Dennis Genito	Baltimore County Department of Environmental Protection and Resource Management
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 (Vendor Coordinator)
Matt Stover	Maryland Department of the Environment
Megan Ward	Nanticoke Watershed Alliance

Plus additional thanks to:

Luke Roberson	Maryland Department of Natural Resources (MWMC Webmaster 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)

Not Quite Random Thoughts From My Always Cluttered Desk

By Ron Klauda

Finding just the right combination of words to convey a clever thought or a pithy observation or a burning conclusion is often a struggle. That's why I look for help. As a crutch, I compulsively gather clever, inspirational, motivational, or at least memorable quotations, sayings, and proverbs. From these gatherings, I shamelessly borrow and use them to flavor my efforts to communicate lucidly and succinctly. I've gathered together a few of my favorites to share with you today----some familiar perhaps but hopefully many that are new to you. Since this is a Maryland Water Monitoring Council conference, I've selected 'notable quotables' with mostly nature and environmental themes.

Native Americans Said Much Worth Remembering (and Repeating)

Listen to the voice of nature, for it holds treasures for you.
-Huron Indian proverb

Treat the Earth well. We did not inherit the Earth from our ancestors, we borrow it from our children.
-Ancient Indian proverb

We must protect the forests for our children, grandchildren, and children yet to be born. We must protect our forests for those who can't speak for themselves - the birds, animals, fish, and trees.
-Qwatsinas, Nuxalk Nation

Earth gives life and seeks the man who walks gently upon it.
-Hopi legend

Only when the last tree has died and the last river has been poisoned and the last fish has been caught, will we realize we cannot eat money.
-Cree Indian prophecy

Bumper Stickers Say It Short and Sweet

WE ALL LIVE DOWNWIND

HUMANS AREN'T THE ONLY SPECIES ON EARTH - WE JUST ACT LIKE IT!

ENVIRONMENTAL PROTECTON IS A FAMILY VALUE
INSATIABLE IS NOT SUSTAINABLE

RENEWABLE ENERGY IS HOMELAND SECURITY

GLOBAL WARMING IS SO UNCOOL!

IT'S RED, WHITE & BLUE TO BE GREEN

On the Population Bomb

The Earth provides enough to satisfy everyone's needs, but not everyone's greed.
-Mahatma Gandhi

6 BILLION MIRACLES ARE ENOUGH!
-Bumper sticker

Impact per person X Number or persons = Total Environmental Impact
-Paul R. Ehrlich

We have been god-like in the planned breeding of our domesticated plants, but rabbit-like in the unplanned breeding of ourselves.
-Arnold Toynbee

It's not because people started breeding like rabbits. It's that we stopped dying like flies.
-Nicholas Eberstadt

Six I Especially Like

A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends to do otherwise.
-Aldo Leopold

Fertilizer should be treated like a prescription drug, its use strictly limited and only by official permission.
-Anonymous EPA Chesapeake Bay official

The long fight to save wild beauty represents democracy at its best. It requires citizens to practice the hardest of virtues: self-restraint.
-Edwin Way Teale

We used to be hunter-gatherers, now we're shopper-borrowers.
-Robin Williams

Of course, the "no-build" alternative is a required consideration of all federal Environmental Impact Statements nowadays, but we seldom accord it the seriousness it deserves.
-Tom Horton

I'm not an environmentalist, I'm an Earth warrior.
-Darryl Cherney

Ouch! These Are Harsh

HUNGRY? OUT OF WORK? EAT AN ENVIRONMENTALIST!
-Bumper sticker

Suburbia is where the developer bulldozes out the trees, then names the street after them.
-Bill Vaughn

For 200 years we've been conquering Nature. Now we're beating it to death.
-Tom McMillan

Man is a complex being: he makes deserts bloom and lakes die.
-Gil Stern

Modern technology owes ecology an apology.
-Alan M. Eddison

I am the Earth. You are the Earth. The Earth is dying. You and I are murderers.
-Ymber Delecto

Man is a blind, witless, low brow, anthropocentric clod who inflects lesions upon the Earth.
-Ian McHarg

What remains of our native fauna and flora remains only because agriculture has not got around to destroying it.
-Aldo Leopold

Racial injustice, war, urban blight, and environmental rape have a common denominator in our exploitative economic system.
-Channing E. Phillips

Show Me Some Optimism, Please

Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it's the only thing than ever has.
-Margaret Mead

Conservation is the religion of the future.
-Jane Fonda

The planting of trees is the least self-centered of all that we can do. It is a purer act of faith than the procreation of children.
-Thornton Wilder

I believe in God, only I spell it Nature.
-Frank Lloyd Wright

I know the human being and the fish can coexist peacefully.
-George W. Bush

And this, our life, exempt from public haunt, finds tongues in trees, books in the running brooks, sermons in stones, and good in everything.
-William Shakespeare

I am two with Nature.
-Woody Allen

I see the day in our lifetime that reverence for the natural systems, the oceans, the rain forests, the soil, the grasslands, and all other living things will be so strong that no narrow ideology based on politics or economics will overcome it.
-Jerry Brown

One more and I'm done. When it comes to taking care of Maryland's watersheds, "An ounce of protection is worth a ton of restoration". You can quote me on that one.

October 14, 2010

MARYLAND WATER MONITORING COUNCIL

16th Annual Conference

November 18, 2010

Environmental Justice: Healthy Waters, Healthy Communities Conference Agenda

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 - Keith Van Ness; Montgomery County Dept. of Environmental Protection; Chairman, MWMC Board of Directors

8:40 Plenary Speaker – Vernice Miller-Travis; Vice Chair of the Maryland State Commission on Environmental Justice and Sustainable Communities

9:15 Plenary Speaker – Steward Pickett ; Director, Baltimore Ecosystem Study

9:45 Carl S. Weber Award - Keith Van Ness and Cathy Weber

10:00 Break/Poster Session – Authors present

Concurrent Technical Sessions

10:15-11:45 Session A-1 in Room A111/113

Citizen Science and Stewardship

Moderator: Sara Weglein (Maryland Dept. of Natural Resources)

Watershed Stewards Academy
Suzanne Etgen (Arlington Echo Watershed Stewards Academy) and Janis Markusic (Anne Arundel County Dept. of Public Works)

Characterization of Tidal Freshwater Fish Communities from the Bush River, Maryland: A Volunteer-Driven Monitoring Program
Julia Puzak and Rebecca Lang (Chesapeake Bay National Estuarine Research Reserve)

The Mill Creek Sewage Spill Monitoring and Restoration Project: Success through Local Partnerships between Government and Citizens
Kendra Scheminant (Bayland Consultants and Designers, Inc.)

10:15-11:45 Session A-2 in the Bridge Room

Environmental Justice I

Moderator: Mike Pieper (KCI Technologies, Inc.)

Reconnecting Communities with their Urban Waters
Benita Best-Wong (USEPA)
Fighting Pollution A to Z
Erin Fitzsimmons (Office of the Maryland Attorney General)
Natural Gas Drilling in the Marcellus Shale: The Issue, the People, and the Response
Julie Vastine (Alliance for Aquatic Resource Monitoring)

10:15-11:45 Session A-3 in Classroom 2

Mitigating Freshwater and Tidal-Fresh Harmful Algal Blooms in the Chesapeake Basin

Moderator: Kevin Sellner (Chesapeake Research Consortium; GEMSTONE Program)

The Use of Clay/Chitosan Flocculation to Mitigate Microcystis aeruginosa Blooms in the Chesapeake Bay
Rebecca Certner (GEMSTONE Program, University of Maryland)
The Impacts of Using Clay/Chitosan Flocculation to Mitigate Microcystis aeruginosa Blooms in the Chesapeake Bay
Hannah Miller (GEMSTONE Program, University of Maryland)
Socio-economic Assessment of Bloom Mitigation in the Chesapeake using Clays
Christine Kim (GEMSTONE Program, University of Maryland)

10:15-11:45 Session A-4 in the Auditorium

Git'ner Dun & Takin' Credit: Multiple Scales of Water Quality Restoration

Moderator: Matt Stover (Maryland Dept. of the Environment)

The Implementation of Water Quality Projects for the City of Baltimore and Its Effects
Maita Pang (Johnson, Mirmiran & Thompson, Inc.)
Using Sampling Data to Plan, Target and Monitor TMDL Mitigation Projects in Maryland
Gregorio Sandi and Quentin Forrest (Maryland Dept. of the Environment)
Taking Another Look at the EPA Watershed Reporting Measures – A Focus on Incremental Progress
Larry Merrill (USEPA)

10:15-11:45 Session A-5 in Room A307

Metals, Mud, and Sewage

Moderator: Cory Lavoie (Coastal Resources, Inc.)

Sources of Fine-Grained Suspended Sediment in Mill Stream Branch Watershed, Corsica River Basin, a Tributary to the Chesapeake Bay, Maryland, 2009
William S.L. Banks (USGS)

Pollution Source Detection in Baltimore Watersheds
Lori Lilly (Center for Watershed Protection)
Characterization of Metal Accumulation in Bioretention Media
Phillip S. Jones (Biohabitats)

11:45-1:00 Lunch/Poster Session
1:00-2:30 Session B-1 in Room A111/113

Innovative Methods for Water Monitoring

Moderator: Ron Klauda (Maryland Dept. of Natural Resources) and John Clune (U.S. Geological Survey)

Implementation of the USGS StreamStats Application for Maryland
Kernell Ries (U.S. Geological Survey)
Experiences with Whole Stream Metabolism
Mark Nardi (U.S. Geological Survey)
Measurement of Dissolved Polychlorinated Biphenyls in Rivers Using Passive Samplers
Piuly Paul (University of Maryland, Baltimore County)

1:00-2:30 Session B-2 in the Bridge Room

Environmental Justice II

Moderator: Dennis Genito (Baltimore County DEPRM)

Environmental Justice and Watershed Planning: An Assessment Methodology for Baltimore County and Baltimore City
Nicole Stern (Biohabitats) and Nancy Pentz (Baltimore County DEPRM)
Long Term Trends in Environmental Equity in Baltimore, Maryland: Social-ecological Legacies and Inherited Landscapes
Morgan Grove (USDA Forest Service)
Coal Fly Ash – A Maryland Case Study
Betty Dabney (University of Maryland) and Andy Fellows (Clean Water Action)

1:00-2:30 Session B-3 in Classroom 2

Stream Restoration

Moderator: Mark Southerland (Versar, Inc.)

The Floodplain Access Dilemma: Different Approaches for Reconnecting Channels and Floodplains and the Regulatory and Design Challenges They Create
Scott Lowe (McCormick Taylor, Inc.)
Regenerative Stormwater Conveyance (RSC) as an Integrated Approach to Sustainable Stormwater Planning
Joe Berg (Biohabitats, Inc.)
Sediment Dynamics and Flux in Rehabilitated Coastal Plain Streams at the Estuarine Boundary
Sean Smith (Maryland Dept. of Natural Resources)
Nutrient Dynamics and Flux in Rehabilitated Coastal Plain Streams at the Estuarine Boundary
Solange Filoso (University of Maryland) and Margaret Palmer (University of Maryland)

1:00-2:30 Session B-4 in the Auditorium

Climate Change and Adaptation: from Blacktop to the Bay

Moderator: Ken Belt (USDA Forest Service)

Climate Change and Maryland Streams: Monitoring, Management, and Mitigation
Sujay Kaushal (University of Maryland)
Monitoring Headwater Streams in Maryland to Track Short-term Natural Variability and Long-term Climate Change
Andy Becker (Maryland Dept. of Natural Resources)
Adaptation to Warming Climate and Sea Level Rise: The Plight of Tidal Wetlands in Chesapeake Bay
J. Court Stevenson (University of Maryland)

1:00-2:30 Session B-5 in Room A307

Education and Outreach

Moderator: Sally Hornor (Anne Arundel Community College)

New Products of the National Water Quality Monitoring Council for Enhancing Partnerships with State Councils and Improving Monitoring and Assessments
Tracy Connell Hancock (U.S. Geological Survey)
NOAA's National Weather Service Support of Maryland Healthy Beaches
Patti Wnek (NOAA/NWS Middle Atlantic River Forecast Center) and Heather Morehead (Maryland Dept. of the Environment)
Challenges in Educating Private Property Owners about Stormwater Management
Carrie W. Capuco (Capuco Consulting Services, Inc.)

2:30-3:15 Panel Discussion – Integrating the Tenets of Environmental Justice with Current and Future Water Quality Issues in Maryland

3:15-3:30 Break/Poster Session – Authors Present

3:30-4:30 Session C-1 in Room A111/113

Stream Health Assessments

Moderator: Tom Parham (Maryland Dept. of Natural Resources)

Status of Anne Arundel County Streams – 2004-2008
Colin Hill (KCI Technologies, Inc.)
Land Use and Benthic Macroinvertebrate Index of Biotic Integrity Scores
Daniel Miles (University of Maryland, Baltimore County)

3:30-4:30 Session C-2 in the Bridge Room

Environmental Justice III

Moderator: Megan Ward (Nanticoke Watershed Alliance)

From the In-the-Clouds to On-the-Ground: Lessons on Making Toxics Data Relevant in Environmental Justice Communities
Joseph Foti (World Resources Institute)

Blacks of the Chesapeake: Using History and Culture as an Outreach Tool to Connect Underserved and Non-traditional Populations to Water Quality Issues
Vincent O. Leggett, "Admiral of the Chesapeake" (Blacks of the Chesapeake Foundation)

3:30-4:30 Session C-3 in Classroom 2

Tools in the Toolbox: Nutrient Loads and Other Disasters

Moderator: Clark Howells (Baltimore City DPW)

Targeting Nutrient Pollution Reduction with Prices
Robert Wieland (Main Street Economics)
A Web-based Vulnerability Assessment Support System
Sabal Shrestha and Alex Coletti (S M Resources Corporation)

3:30-4:30 Session C-4 in the Auditorium

Urbanization and Eco-hydrology: Stormwater Management and Beyond

Moderator: Ken Belt (US Forest Service)

Creating "Green" Stormwater with Bioretention
Allen P. Davis (University of Maryland)
Urban Trees and the Clean Water Act
Mike Galvin (Casey Trees)

3:30-4:30 Session C-5 in Room A307

Anacostia River Updates

Moderator: Charlie Poukish (Maryland Dept. of the Environment)

Does the Anacostia have Chlordane Pollution?
Harriette L. Phelps (University of the District of Columbia)
Nash Run Trash Trap Installation and Trash Data Analysis
Masaya Maeda (Anacostia Watershed Society)

Plenary Speakers titles and abstracts

Vernice Miller - Travis

From 1619 to the present: the centrality of the Chesapeake Bay to communities of color in Maryland

From the arrival of the first Africans into the Jamestown, Virginia settlement, the Chesapeake Bay has served as an entry point for some, and the home base of many indigenous cultures. The vibrancy of the Bay and its bounty have sustained these populations over millennia. But as the Chesapeake Bay has declined, so too have most communities of color suffered a similar decline. As species have dwindled, declined or become extremely threatened within the Chesapeake Bay itself, so too have indigenous and communities of color suffered adversely. From the disappearance of most of our Native American communities, to the economic dislocation of African-Americans among the Waterman, the survivability of these communities is directly tied to the health and well-being of the Chesapeake Bay. How can we reconnect communities of color across our state to the goal of improving local waterways to help save the essential life resource that is the Chesapeake Bay?

Steward Pickett

Baltimore as a Socio-ecological system: Adaptive Processes and Sustainability

Steward will be giving an overview of what the Baltimore Ecosystem Study (BES) LTER project has found and is doing after over 13 years of local research which has created a firm foundation for understanding the structure and function of metropolitan Baltimore as a socio-ecological system. BES, with more than 45 researchers, educators, and community specialists, are using ecological theory to guide its research, with current interests spanning areas such as socio-demographic structure and dynamics, urban biodiversity, and inhabited and infrastructurally invested watersheds. He will be discussing how ecological research and human systems dovetail nicely and inform each other along a path to a sustainable city paradigm, the over-arching question being "what are the effects of adaptive processes aimed at sustainability in the Baltimore socio-ecological system?"

Posters

Note: Only Primary Authors are Listed

Fourth Maryland Streams Roundtable in February 2011
Andy Becker (Maryland Dept. of Natural Resources)

Urban Streams: The Four Dimensions of an Ecological Stream Continuum
Ken Belt (USDA Forest Service)

Relationships between Rainfall and Enterococci Counts in the West and Rhode Rivers: 2007-2010
Stacie Bender (University of Maryland)

Low surface dissolved oxygen (DO) in upper Magothy River creeks, 1991-2010
Peter Bergstrom (NOAA)

Stream Buffer Re-vegetation Inventory: Using Student-Collected GPS Data to Help Non-Profits Manage Tree Planting Sites
Erica Cress (Towson University)

Using the Toxics Release Inventory to Protect Maryland Watersheds
Wayne S. Davis (USEPA)

Comparative Stream Study and Landowner Outreach in the Patuxent River Watershed
Elaine Friebele (Jug Bay Wetlands Sanctuary)

Long-term Water Quality Changes in Deep Creek Lake, Maryland
Sherm Garrison (Maryland Dept. of Natural Resources)

Autonomous Hydrographic and Water Quality Sampling Using Vessels of Opportunity
John Hersey (SURVICE Engineering)

Bacterial Monitoring in the Jones Falls Watershed and Inner Harbor: Contamination Levels and Sources in a Highly Urbanized Watershed
Stanley J. Kemp (University of Baltimore)

Healthy Waters Decision-Making: Addressing the Biological Impacts of Chlorides Impairments
Shirley Kirby (Maryland Dept. of the Environment)

The Maryland Biological Stream Survey: Evolution of a Probability-based Monitoring Program
Ron Klauda (Maryland Dept. of Natural Resources)

The Community College of Baltimore County Bay Watershed Educational Training Project
Jeff Klein (Community College of Baltimore County)

Hall Creek: A Case Study for Combining GIS Based Modeling, Stream Pollutant Discharge Monitoring, and Citizen Stewardship Outreach to Support Development of a Watershed Implementation Plan
Steve Kullen (Calvert County Dept. of Planning and Zoning)

Biological Monitoring Plan for Northwest Branch Anacostia Stream Restoration
Cory Lavoie (Coastal Resources, Inc.)

Just Say "No" to Didymo: Tracking the Distribution and Abundance of 'Rock Snot' in Gunpowder Falls, Maryland
Katherine Laycock (Maryland Dept. of Natural Resources)

Monitoring Water Conditions in Maryland: Did Tropical Storm Nicole make an impact?
Wendy McPherson (USGS)

Quantifying the Effectiveness of Stormwater BMPs through Hydrologic Monitoring
Rob Mooney (Hydrologic Data Collection)

Isolation of MAR E. coli from Point Source and Non-point Source Waterways Found Within the D.C. Metro Area
David Morris (George Washington University)

Expanding the diversity of the Mid-Atlantic Tributary Assessment Coalition
Sara Powell (ECOCheck)

Creating Successful Outreach Programs in Your Community
Amanda Rockler (University of Maryland Sea Grant Extension)

Nutrient Removal Ability of a Stream Receiving Wastewater Effluent
Jeffrey A. Simmons (Mount St. Mary's University)

Using Biological Stressor Identification to Direct Management Actions and Refine Integrated Report Listings
Amy Svrjcek (Maryland Dept. of the Environment)

The New and Improved Eyes on the Bay
Mark Trice (Maryland Dept. of Natural Resources)

Land Development Impacts on Fish and Fish Habitat
Jim Uphoff (Maryland Dept. of Natural Resources)

Anadromous Fish Stream Spawning Responds Negatively to Urbanization
Jim Uphoff (Maryland Dept. of Natural Resources)

Maryland Fish Consumption Risk due to PCBs
Bo Wang (University of Maryland, Baltimore County)

How does the Nanticoke Watershed "Measure Up"?
Megan Ward (Nanticoke Watershed Alliance)

Freshwater Sponges in the Mid-Atlantic Region
Tonya Watts (National Park Service; Center for Urban Ecology)

Chloride Levels from Road Salt in Seven Maryland Streams Following Winter 2009-2010 Record Snowstorms
Rebecca Wolf (Johns Hopkins University)

MARYLAND WATER MONITORING COUNCIL

16th Annual Conference

November 18, 2010

SPEAKER ABSTRACTS

(Listed alphabetically by lead speaker's last name)

Sources of Fine-Grained Suspended Sediment in Mill Stream Branch Watershed, Corsica River Basin, a Tributary to the Chesapeake Bay, Maryland, 2009

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Fine-grained sediment is having an adverse effect on the living resources and habitat of the Chesapeake Bay and its watershed. In order to reduce sediment input to the Bay, it is necessary to identify the significant sources of fine-grained sediment being transported to the Bay. The U.S. Geological Survey, in cooperation with the Maryland Department of Natural Resources, began a study to trace the sources of fine-grained suspended-sediment using the sediment-fingerprinting approach in the Mill Stream Branch watershed, a 12.2 square-mile tributary to the Corsica River and Chesapeake Bay. Fingerprints are chemical signatures from sediment in potential source areas that are compared to similar chemical signatures in suspended sediment in the stream and used to determine the most likely sources of sediment. Five suspended-sediment samples representing a range of flow conditions were collected in Mill Stream Branch between April and August 2009. In addition, samples were collected in representative potential source areas: 17 samples from areas with row cropping, 12 samples in forested areas, and 33 samples from stream banks along the stream corridor. Statistical analyses of the source sediment indicated that 7 of the 38 metals (lithium, lead, potassium, titanium, uranium, chromium, and aluminum) were the most effective indicators in differentiating and classifying sediment sources. The seven tracers were used in an unmixing model and were compared to similar tracers in the suspended sediment collected from five fluvial storm samples. Results from the unmixing model indicated that for each event 100 percent of the suspended sediment could be attributed to the stream corridor. Although 74 percent of the basin is in cropland, the low gradients in the basin along with a densely vegetated riparian corridor and land-use history related to historic mill-pond construction may have led to conditions favorable for streambank erosion as the primary source of suspended sediment at this point in the stream.

Mr. Banks has been a hydrologist with the U.S. Geological Survey for nearly 22 years. He has a Masters in Business and a Bachelors degree in Geology. For the past 6 years Mr. Banks' work has focused on sedimentation and its impact on drinking water and sediment source tracking.

Monitoring Headwater Streams in Maryland to Track Short-Term Natural Variability and Long-Term Climate Change

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The Maryland Department of Natural Resources (DNR) has been conducting the Maryland Biological Stream Survey (MBSS) since 1995. In conjunction with the Maryland Water Monitoring Council, DNR staff and others in the State are developing a cooperative network of minimally-disturbed stream monitoring sites to assess short-term natural variability and also track longer-term impacts to Maryland streams associated with global climate change. Because headwater streams are especially vulnerable to disturbance and may respond to climate change sooner than larger water bodies, the vast majority of sites in the developing network will be 1st through 4th order, non-tidal streams. The core of this network will be 30-50 minimally-disturbed MBSS sites that were selected to reflect natural variability in stream biota and habitat quality in response to annual difference in precipitation and temperature. This talk will focus on how DNR is using the data generated from minimally-disturbed headwater stream sites monitored over a long time period and the role of partnerships in Maryland's developing Non-Tidal Stream Monitoring Network focused on detecting the effects of climate change.

Andy Becker is a biologist with MD DNR's Maryland Biological Stream Survey, a state-wide stream monitoring program that assesses the ecological health of Maryland's streams and rivers. Previous to working for MD DNR Andy was the Biological Monitoring Program Coordinator for Balimore County's Department of Environmental Protection and Resource Management. He received a B.S. in Biology from Towson University and a M.S. in Environmental Science and Policy from The Johns Hopkins University.

Regenerative Stormwater Conveyance (RSC) as an Integrated Approach to Sustainable Stormwater Planning

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Regenerative Stormwater Conveyance is a large name for an open-channel approach to conveying runoff from developed surfaces. The key element in this name is the term 'regenerative', which cannot be applied to grass swales, rock channels, or other features constructed with the singular intent of conveying stormwater from a developed surface to a natural area. For a practice to be characterized as regenerative, it should create resource value, function as a part of a larger system, should be self maintaining, and resilient to seasonal and annual variations. The major components of the regenerative stormwater conveyance approach include a:

- porous, carbon-rich bed material to filter runoff associated with smaller volume storms and support fungal and microbial metabolism;
- system of riffles and pools to interrupt the development of water depth and velocity along the flow path to maintain non-erosive flows; and
- native plant community that knits the site together, produces native habitat, and contributes carbon to the system.

Conventional stormwater outfalls cause erosion, conveyance structures fail, stream channels are degraded, in-stream sedimentation increases the influence of localized erosion upstream and downstream of the outfall, and an increasing spiral of degradation results. Alternatively, using stream restoration techniques to create a dependable open channel conveyance with pools and riffle-weir grade controls is a regenerative design since the use of these elements result in a system of physical features, chemical processes, and biological mechanisms that can have dramatic positive feedback effects on the ecology of a drainage area.

Joe Berg is an ecosystems ecologist with more than 25 years experience in the assessment and analysis of natural resources; development, preparation, and implementation of restoration plans; and the range of studies, documentation and permitting experience required. The focus of his efforts have been the restoration of stream, wetland and floodplain functions as a means to deliver ecosystem services to society, increase natural capital, and integrate local community needs with an appreciation of natural resource values.

Reconnecting Communities with their Urban Waters

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Throughout the country, people are coming together to transform polluted, ignored urban waters into treasured centerpieces of urban revival. EPA is launching an Urban Waters effort to support communities -- particularly underserved communities -- as they restore their neglected, polluted waterways and turn them into economic, recreational, and aesthetic assets. In Maryland, like other states, we need to integrate the needs of underserved communities in all areas of our water quality management programs. We need to increase awareness of urban waters and their potential for improving public health, economic development and the quality of life.

The Anacostia River Watershed Restoration Plan (Plan), released in spring 2010, is an example of watershed stakeholders coming together to identify problems and opportunities for protecting and restoring their urban watershed. If fully implemented, the Plan -- which focuses on eight restoration strategies including stormwater retrofits, stream restoration, and trash reduction -- will dramatically improve the health of the Anacostia River and enhance the vitality of diverse urban communities in the watershed, which encompasses Washington, D.C. and Montgomery and Prince Georges counties in Maryland.

Another example that is promising to help connect a small, diverse, working class community to the Anacostia River and the Chesapeake Bay is Project Green Street, in the Town of Edmonston, Maryland. Edmonston has received a Chesapeake Bay Trust grant to "green" its main thoroughfare with pedestrian-friendly sidewalks, native shade trees, bike paths, and clean energy lighting. Stormwater bio-retention and filtration is a critical part of this project. Permeable pavement and bio-retention cells, or rain gardens, will hold and filter rainwater runoff to the Anacostia and the Bay; they will also help stop recurrent flooding caused by recent development in neighboring larger cities. The town has adopted an open process of public engagement, welcoming community involvement in all aspects of the project.

This presentation will discuss the EPA Urban Waters effort and encourage input from the audience on connections with local urban watershed groups and water quality monitoring.

Benita Best-Wong is currently acting Deputy Director of the Office of Wetlands, Oceans, and Watersheds. OWOW promotes a watershed approach to manage, protect and restore the water resources and aquatic ecosystems of the nation's marine and fresh waters. OWOW's programs include wetlands regulation and restoration, regulation of ocean dumping and vessel discharges, monitoring and assessment, including the National Aquatic Resource Surveys, nonpoint source pollution management, TMDL oversight, and building capacity of State and local governments and watershed organizations.

Benita's permanent position is director of the Assessment and Watershed Protection Division in OWOW. Prior to joining OWOW, Benita worked in the Office of Wastewater Management's Water Permits Division where she held a number of positions including Industrial Branch Chief, Municipal Branch Chief and Acting Water Permits Division Director.

Challenges in Educating Private Property Owners about Stormwater Management

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This presentation will focus on Effective Communication of Environmental Information, particularly the Challenges in Educating Private Property Owners about Stormwater Management. There are many reasons to educate private property owners about storm water management. There are also many challenges to educating private property owners about storm water management. This presentation will look at several case studies where the presenter has been involved with public education to identify and discuss common threads, successes, failures, and good resources as the MWMC membership goes forward in educating Marylanders on stormwater management.

Initially, the presentation will review motivators for educating private property owners. Motivators examined will include:

- Protection of real property
- Protection of natural resources
- Hazard mitigation
- Total Maximum Daily Load reduction implementation
- Municipal Storm water Management Permit implementation
- Development regulations

The presentation will then briefly turn to several recent case studies throughout Maryland where efforts have been made to educate private property owners – seeking common threads. Case studies examined will include:

- City of Annapolis Storm water Education Experience
- Patuxent Reservoirs watershed's Manure Management initiatives
- Anne Arundel County's Watershed Stewards
- Columbia Association's Protecting and Restoring the Waters of Columbia
- U.S. EPA's Sustainable Infrastructure campaign
- Montgomery County stewardship initiatives
- Anne Arundel County's Rainscaping campaign

The presentation will then conclude with a recap of lessons learned -- success, failures, and valuable resources. Items to be discussed will include:

- Use of social media
- Use of field work
- Traditional marketing in contrast to environmental education
- The role of schools
- Popular culture
- Regulatory changes

Ms. Capuco has been serving clients nation-wide in stakeholder involvement, community outreach, and partnership facilitation for over 22 years. In 1985, Ms. Capuco's environmental experience began with the National Wildlife Federation. From there, Ms. Capuco was an employee of the U.S. Environmental Protection Agency as a policy analyst and Community Relations specialist. Since 1990 she has served as a consultant, assisting Federal, state and local governments. She currently operates offices in Annapolis and Hagerstown Maryland.

The Use of Clay/Chitosan Flocculation to Mitigate Microcystis aeruginosa Blooms in the Chesapeake Bay

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Although Harmful Algal Blooms (HABs) have been occurring naturally for millions of years, human-induced eutrophication has led to an increased prevalence and severity all over the world. One such example of an important and frequently toxic HAB is the annual bloom of the cyanobacterium Microcystis aeruginosa, which can be found in the upper Chesapeake Bay and its tributaries. Over the past three years, an innovative HAB mitigation technique based on the mutual flocculation of the cyanobacterium with clay and chitosan was shown to dramatically reduce the number of algal cells suspended in solution. A variety of clays were tested for their effectiveness in the flocculation process in the presence of a simulated M. aeruginosa bloom. The most successful clays were then combined with chitosan in varying ratios in order to determine the most effective mixture ratio in removing the algal cells from suspension. Both local and commercially available manufactured clays from outside the region were analyzed for their efficacy in cooperation with chitosan during the flocculation process. Many trials resulted in successful removal of algal cells (75%-97%) at very low levels of clay or clay+chitosan loading (0.25g/L – 0.5g/L). Continued monitoring of the experiments also indicated that the Microystis cells did not re-suspend to re-form the algal bloom in the water column. The results from this study can be used as a guideline in the flocculation of natural field blooms in the Chesapeake Bay and in other water bodies around the world.

Rebecca Certner is a senior at the University of Maryland studying Cellular Biology and Molecular Genetics. She is the co-founder of team Breathe, an undergraduate research project focused on the mitigation of Harmful Algal Blooms (HABs) in the Chesapeake through the use of a clay/flocculant mixture. Her work with Breathe has helped to establish a new research project, Mitigation of Microcystis in the Chesapeake (MMIC), based at IMET in Baltimore, MD. Using Breathe's preliminary findings, MMIC applied and received funding from NOAA to continue research on the control and prevention of HABs.

New Products of the National Water Quality Monitoring Council for Enhancing Partnerships with State Councils and Improving Monitoring and Assessments

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The National Water Quality Monitoring Council recently developed several products for water practitioners nationwide. In support of the Council's mission to promote water management and protection, these tools foster partnerships and collaboration, advance water science, improve monitoring strategies, and advance data integration, comparability, and reporting.

First, the Council coordinates an online biannual newsletter "National Water Monitoring News," which provides a voice for monitoring practitioners nationwide and fosters exchange of information, stewardship, and water-related success stories and challenges, as shared by State monitoring councils and other water alliances. Second, the Council hosts web seminars on topics of interest to State, regional, and tribal councils, and watershed groups and alliances; topics include the benefits of real-time monitoring, social media tools, and integration of volunteer monitoring data into statewide assessments. Third, two new technical guides for deploying aquatic sensors help maximize the quality and relevance of real-time and continuous monitoring in water management decisions. Fourth, the Water-Quality Exchange provides user-friendly web services that aid retrieval of data from multiple sources in common formats for direct use in mapping, statistical, and modeling applications. Fifth, the integrated land-to-sea assessments of the National Monitoring Network provide important information about inland influences on receiving waters and the general health of oceans and coastal ecosystems. Last, the Council is supporting development of an online system that will guide scientists and managers with a range of statistical and assessment tools for addressing the myriad of water issues at diverse scales. These products are available at http://www.acwi.gov/monitoring.

Tracy Connell Hancock is a Hydrologist with the U.S. Geological Survey in the Virginia Water Resources Division in Richmond, VA. She has served the National Water Quality Monitoring Council as Co-Chair of the Collaboration & Outreach Work, Technical Assistant to the Co-Chairs of the National Council, and as Executive Secretary of the National Water Quality Monitoring Network for U.S. Coastal Waters and their Tributaries. Tracy has been with the USGS for 17 years and has a Bachelor of Science in Geology from the University of Delaware and Masters of Science from the University of California, Santa Cruz.

Coal Fly Ash – A Maryland Case Study

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Coal fly ash is the material recovered from the flues of burning coal. It is a Coal Combustion Product (CCP) produced in huge quantities – over 70 million tons per year in the United States. Its chemical composition varies with the type of coal and burning conditions, and can be similar to common rocks. Most coal burned in Maryland is the bituminous type, which can contain up to 55 percent non-carbon material. Fly ash consists mostly of amorphous (glassy) and crystalline silica (sand), aluminum oxide (alumina), calcium oxide (lime) and iron oxide. It can also contain heavy metals and arsenic, as well as polynuclear aromatic compounds. Some fly ash is pozzolanic (cement-forming) under certain conditions. Some ash is recovered and used in commercial products such as gypsum board and cement. The rest must be disposed in landfills, and the integrity of these landfills is varied.

There are several public health issues involving CCPs. The small respirable airborne particles tend to contain more toxic materials than the non-inhalable larger ones. Secondly, the metals and organic materials can leach from the ash under landfill conditions, especially under the acidic conditions there. The acidic leachate may be damaging to wildlife. In Maryland, the Mirant Faulkner, Mirant Brandywine, Mirant Westland and BBSS Gambrills sites have contaminated nearby ground water, sometimes at concentrations exceeding the EPA's Maximum Contaminant Levels. We will discuss the history and trends of groundwater contamination from these sites. As a result of the contamination and objections from nearby residents, the Gambrills site has been closed and Anne Arundel Country has banned future CCP landfills. Yet the need for safe waste disposal remains, and there is a proposed site just over the Baltimore County line. Currently the EPA is considering whether or not to classify CCPs as hazardous waste. While Maryland has been one of the more responsible states, others are not. The issue of whether or not CCPs are hazardous waste is highly controversial.

Andrew Fellows has been Clean Water Action and Clean Water Fund's Chesapeake Program Director since 1999, and was named as Chesapeake Regional Director in 2008. He has over 25 years of grassroots organizing, lobbying, electoral, media, development, and management experience. In the 1980's he organized campaigns with Citizen Action organizations in Maryland, California, Wisconsin and the District of Columbia. In the 1990's he was a graduate student leader at the University of Maryland, and then served as deputy director of Save Our Streams, a Maryland-based environmental organization focused on community stewardship of local waters, before joining Clean Water Action. In 2009, he was elected Mayor of College Park in November of 2009, after six years of membership on the City Council. He serves on the Maryland Commission on Environmental Justice and Sustainable Communities, and the Metropolitan Washington Council of Government (COG)'s Board of Directors and Chesapeake Bay and Water Resources Policy Committee.

Betty J. Dabney is a Research Associate Professor at the Maryland Institute for Applied Environmental Health. She received a Ph.D. in Biochemistry at the University of Texas at Austin and was a post-doctoral fellow in human genetics at Baylor College of Medicine. She worked in industry for many years in environmental and occupational health, and in public health informatics. She has designed and authored large information systems in environmental health, has co-authored three books, and has obtained over $1 million in federal funding. Her interests include linking environmental public health informatics, biomonitoring, reproductive hazards, children's environmental health, and environmental justice.

Creating "Green" Stormwater with Bioretention

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As point sources become better managed and as (sub)urban growth continues to consume undeveloped land, stormwater runoff from impervious surfaces grows in importance as a contributor to water resources degradation. Bioretention (a soil/vegetation management practice) has been promoted as "low impact" stormwater management practices with a stated goal of reproducing pre-development hydrology. Fundamental, applied, and monitoring research has been completed demonstrating the performance of bioretention. Quantifying performance is problematic, however, by significant variability in design, and because of the highly dynamic flow and water quality conditions experienced by these facilities.

Bioretention systems will moderate flow rates and reduce surface discharge volumes, minimizing erosive impacts on the local environment and reducing pollutant mass discharge. Design characteristics can be related to volumetric performance and flows. Suspended solids and bacteria can be very effectively removed via filtration mechanisms. Heavy metals and hydrocarbons are adsorbed strongly on organic and inorganic fractions of the media. Accumulations of these pollutants will occur at the surface of these facilities, creating ownership challenges, but facilitating maintenance and cleanup.

Neither nitrogen nor phosphorus is very effectively removed via bioretention, yet nutrients are the key pollutants for many of our critical water systems. Novel modifications are investigated to enhance the efficacy of bioretention facilities in nutrient removal. For P, this entails increasing the level of amorphous aluminum and iron in the media. N removal may be enhanced via the use of submerged anoxic zones to promote denitrification in the bioretention media depths.

Allen P. Davis is Professor of Civil and Environmental Engineering at the University of Maryland. He has been working on water quality and treatment issues at the University of Maryland for 21 years, after earning his Ph.D. degree at the University of Delaware. For over a decade, he has been investigating sustainable ways to manage water in urban areas. Specific focus has been study of sources and treatment of pollutants in urban stormwater runoff with a focus on low impact development practices, particularly bioretention.

Watershed Stewards Academy

Suzanne Kilby Etgen[1] and Janice Markusic[2]

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The Watershed Stewards Academy is an initiative of Anne Arundel County Department of Public Works and Arlington Echo Outdoor Education Center to train community leaders, called "Master Water-shed Stewards" (MWS) to reduce the negative impacts of stormwater runoff in Anne Arundel County. The role of the MWS is to engage and educate citizens, businesses and organizations on relevant environmental issues. They coordinate small-scale restoration on private property such as installation of rain gardens, green roofs, rain barrels and septic retrofits as well as large-scale restoration efforts including bio-retention areas or shoreline restorations on community property. The goal is to reduce the pollutant load carried from the land into our waterways.

MWS participate in an intensive Certification Course, including hands on training in restoration techniques and complete a stormwater infiltration project within their community. Once certified, MWS serve as a resource for their community, coordinating efforts to infiltrate stormwater and reduce pollutant sources. MWS are supported in action by: Consortium of Support Professionals, Tool Box for Sustaining Action, Founding Board of Directors, Academy Leadership Team and Continuing Professional Development.

Working in connection with Anne Arundel County Watershed Ecosystems Restoration Services, MWS are able to record their restoration efforts via an online GIS mapping application. Via this mapping application and water monitoring efforts throughout the county, we will be able to connect MWS to changes in water quality and ecosystem health. It is hoped that the MWS efforts will be instrumental in meeting the TMDL requirements as set forth in the AA County's Watershed Implementation Plan.

Suzanne Kilby Etgen is the Coordinator of the Watershed Stewards Academy and is an employee of Arlington Echo Outdoor Education Center, Anne Arundel County Public School's Environmental Education Center. Her responsibilities include coordinating the Master Watershed Steward certification program, supporting certified Stewards in their restoration efforts and developing the many aspects of the program. Suzanne holds a BS in Environmental Science and a MA in Religion and Ecology. In addition to building and managing the Watershed Stewards Academy, Suzanne has participated in water quality monitoring efforts (chemical and macro invertebrate surveys), instructed restoration education programs, directed environmental summer camps, served as Arlington Echo's apiarist (bee keeper) and instructed low ropes team building instructor training.

Janis Markusic is the Ecological Resources Assessment and NPDES MS4 Permit program manager for the Department of Public Works, Bureau of Engineering in Anne Arundel County. Her responsibilities include management of aquatic biological monitoring programs, surface water monitoring programs, and ensuring the requirements of the County's NPDES MS4 Permit are met. Janis holds a B.S. in Biology and completed master's level coursework in aquatic ecology. She possess over 20 years of professional experience in watershed assessment, water quality monitoring, and citizen outreach.

Nutrient Dynamics and Flux in Rehabilitated Coastal Plain Streams

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In the Chesapeake Bay region, many urban stream restoration efforts are increasingly focused on reducing the downstream flux of nutrients. We report results of 3 years of work assessing the effectiveness of six Coastal Plains restored streams in reducing the annual flux of nitrogen (N) downstream. We collected data during both average- and high-flow conditions and we monitored restored and unrestored streams in the uplands regions near the headwaters vs. lowlands at the tidal boundary. Our data show that stormflow generally contributes the majority of the discharge in these urban and suburban streams and nitrogen removal efficiency varies considerably between upland and lowland streams as a function of discharge, N concentration, and potentially the type of restoration implementation. During periods of low discharge, lowland streams that receive minor N inputs from groundwater or bank seepage reduced in-stream N fluxes. Upland restored channels received significant amounts of new N from groundwater and bank seepage inputs along the entire length of the reach meaning that the reach-scale ability of restoration projects to remove N was minimal. Therefore, unless some of the N in groundwater and bank seepage is prevented from entering upland streams, the effectiveness of restoration in upland channels may be compromised by a limited capacity for in-stream N processing to compensate for groundwater inputs.

Solange Filoso, a Research Associate Scientist at the Chesapeake Biological Laboratory, is an expert in aquatic biogeochemistry and watershed science having worked on rivers, streams, lakes, wetlands and floodplains for about 20 years, both in the tropics and temperate regions. While much of her work aims to address fundamental ecological questions regarding aquatic biogeochemistry, she is particularly interested in contributing to practical issues of environmental management such as the effects of human perturbations of biogeochemical cycles (particularly that of the nitrogen cycle) at the ecosystem, regional, and global scales. In the past few years, Dr. Filoso has collaborated extensively with Dr. Margaret Palmer in the Chesapeake Bay region, where they have been working to assess the effectiveness of stream restoration at reducing loads of pollutants exported by streams and improving water quality of rivers draining into the Bay.

Attorney General's Office Perspectives – Fighting Pollution from A to Z

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From arsenic in poultry feed to zero sewage discharge from boats, Maryland Attorney General Douglas Gansler's focus is on preventing pollution, protecting the resources and prosecuting polluters. "Fighting Pollution A to Z" reviews the ongoing efforts of the Office of the Attorney General to fight pollution with an emphasis on Environmental Justice and water issues. It will also include other issues of interest such as the Little Dobbins Island Critical Area case.

Erin Fitzsimmons is the Special Assistant for the Environment in the Maryland Office of the Attorney General. Her experience includes Chesapeake Regional Director for the Waterkeeper Alliance, assistant professor at Salisbury University, environmental consultant and public interest attorney, and she served on the City Council in Ocean City, Maryland. A graduate of The American University, Erin holds a law degree from the University of Maryland School of Law, with a concentration in Environmental Law, and a Master's degree in Business Management from The Johns Hopkins University

SFrom the In-the-Clouds to On-the-Ground: Lessons on Making Toxics Data Relevant in Environmental Justice Communities

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The Toxics Release Inventory (TRI) remains EPA's flagship access to information program for facility-level pollution data. It is based on the premise that individuals and organizations, empowered with environmental information, will take steps to limit pollution by local facilities.

While TRI is often the first stop for individuals and organizations working in the environmental justice (EJ) community, interpreting the data available through existing tools is difficult for most. Reasons for this difficulty include access to communication channels, low levels of expertise, constraints on time, problems with the tools themselves and even awareness that the information exists. Once organizations and individuals have access to such data, translating it into useable information capable of informing decisions is doubly difficult. Difficulties in assessing and communicating risk, combining facility-level data with other relevant data, and influencing official processes that might result in pollution abatement can hamper efforts of communities.

The talk will highlight problems faced by two community groups - Literacy for Environmental Justice (San Francisco) and Louisiana Bucket Brigade (New Orleans) - as they carried out advocacy campaigns using TRI data over the course of the last year through three small TRI grants. The World Resources Institute will summarize common experiences and present policy-relevant advice on how EPA offices can improve access to information for environmental justice groups and members of the community to inform decisions.

Joseph Foti is a Senior Associate with the Institutions and Governance Program at World Resources Institute. He was the lead author of Voice and Choice: Opening the Door to Environmental Democracy, the second global report of The Access Initiative (TAI), and A Seat at the Table: Including the Poor in Decisions for Environment. He is currently leading work on WRI's toolkit for civil society engagement in climate change adaptation the Adaptation: Rapid Institutional Analysis (ARIA), is the regional officer for Latin America, and is spearheading work on access to information for environmental justice in the United States. He holds a B.A. from Antioch College and an M.A. in International Development Studies from The George Washington University.

Urban Trees and the Clean Water Act

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As the Chesapeake Bay program moves from voluntary to regulatory measures in order to meet desired outcomes, increases in urban tree cover are being adopted by most states as a tool for compliance. Five of seven Bay jurisdictions (DC, DE, MD, PA, WV) list increasing urban tree canopy as a compliance strategy in their Watershed Implementation Plans to meet TMDL requirements. Other jurisdictions are using tree canopy cover to meet MS4 and CSO requirements.

We will conduct a brief review of the science, policies, and practices related to the use of urban trees to meet the Clean Water Act permit objectives and requirements, and see how Maryland figured prominently in these developments.

Mike Galvin is Deputy Director at Casey Trees, a Washington, DC-based NGO whose mission is to restore, enhance, and protect the tree canopy of the Nation's Capital. Mike is a Co-PI on the Chesapeake Bay ULTRA-Ex research project and a Collaborator with the Baltimore Ecosystem Study. Prior to coming to Casey Trees he spent many years as Supervisor of Urban & Community Forestry for the MD DNR Forest Service.

Long Term Trends in Environmental Equity in Baltimore, Maryland: Social-ecological Legacies and Inherited Landscapes

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Research on environmental equity has focused primarily on the distribution of environmental disamenities and the co-occurence of these disamenties with the residential location of certain social groups. Less attention has been paid to the distribution of environmental amenities and the social process that create the inequitable distribution of both environmental amenities and disamenities. In this presentation, Grove will present long term research from the Baltimore Ecosystem Study that provides evidence for how the inequitable distribution of environmental dis/amenities have come to exist, legacies of past practices for the present, and its implications for the health of urban communities and their waters.

Morgan Grove is a social scientist and community forester for the Northern Research Station of the USDA Forest Service. Morgan is the Team Leader for U.S. Forest Service's Baltimore Field Station and has been a Co-PI for the Baltimore Ecosystem Study since its founding. Morgan's research focuses on the social and ecologic dynamics of residential landscapes and long term changes in environmental equity in the Baltimore region. Morgan is also responsible for the development of decision support applications, including tools for the assessment and prioritization of urban tree canopy. He works extensively with local agencies, NGOs and community groups. Morgan received his undergraduate and graduate degrees from Yale University.

Status of Anne Arundel County Streams – 2004-2008

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Round One of Anne Arundel County's Biological Monitoring and Assessment Program was completed between 2004 and 2008. The program monitors the biological, water quality, physical habitat and geomorphological condition of County streams at 240 sites in a 5-year period rotating-basin design. Data analysis was conducted at sites-specific, primary sampling unit (PSU), and countywide scales. Based on BIBI scores, the overall condition was considered 'Poor'. Countywide BIBI results indicate that 6% of the streams in the county were in 'Good' condition, 29% were rated 'Fair', 43% were rated 'Poor', and 22% were classified as 'Very Poor'. Physical habitat conditions were rated 'Partially Degraded' by the MBSS PHI and 'Partially Supporting' by EPA's RBP habitat assessment at the County scale. Based on the PHI, 13% of streams had 'Minimally Degraded' habitat, 43% had 'Partially Degraded' habitat, and 40% had 'Degraded' or 'Severely Degraded' habitat. Geomorphic assessment data indicate that the majority of streams assessed were classified as Rosgen 'E' type channels, which is considered a stable form, and 'G' type channels which are entrenched and are largely considered degraded. Water quality data suggest that many PSUs have mean pH values below the minimum limit of 6.5 for Use I streams. Land use analysis show 10 PSUs as predominantly developed and 14 PSUs dominated by forested land use, with percent imperviousness ranging from 3.2% to 35.4%. Pearson correlation tests found significant correlations ($p < 0.05$) between BIBI scores and several independent variables including RBP, PHI, conductivity, bankfull width, percent imperviousness, percent agriculture, and drainage area. A comparison to MBSS results from 2000-2004 found good agreement with regard to biological and physical habitat conditions, suggesting comparable data quality and results.

Colin Hill is an environmental scientist in the Natural Resource Management group at KCI Technologies, Inc. For over ten years, he has been performing stream and watershed assessments throughout Maryland and in numerous states across the country. Colin holds a Master of Science degree in environmental science from Towson University, and a Bachelor of Science degree in Biology from Loch Haven University of Pennsylvania.

Characterization of Metal Accumulation in Bioretention Media

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Bioretention is a soil- and plant-based technology that provides source control of urban stormwater runoff, effectively reducing runoff pollutant loads. Unlike other common runoff pollutants, heavy metals do not degrade, instead remaining sequestered in bioretention cells. Management concerns include captured metals' spatial distribution in cell media, long-term environmental fate, and bioavailability.

Media samples from a bioretention cell in a heavily used commuter parking lot were examined after four years of operation. Lead, copper, and zinc concentrations are highest in the front of the cell surface and decrease with distance from the inflow point. Significant metal accumulation is limited to the top several cm of the media profile. Sequential extraction of media indicates that most metal is tightly held and environmentally inaccessible, with zinc more mobile than copper or lead. Oral bioavailability of lead in the sampled media is comparable to the generic EPA estimate for soil.

Hydraulic performance remains good and several decades of operation is likely, given the ample remaining clean media. Regulatory metal cleanup thresholds may be reached at local hotspots in the cell, requiring shallow media replacement. However, simple practices such as mulch replenishment, removal of particle deposits, and maintenance of dispersed flows should forestall the need for media replacement.

Philip Jones is a water resources engineer at Biohabitats in Baltimore, Maryland, with a focus on low impact development design and planning. Prior to joining Biohabitats, he was a research and teaching assistant at the University of Maryland, College Park, where he conducted bioretention research and received a Master's degree in environmental engineering. Phil has also worked at the Low Impact Development Center in Beltsville, Maryland.

Climate Change and Maryland Streams: Monitoring, Management, and Mitigation

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It is well known that land-use change has increased contaminant loads in streams and rivers and vastly transformed hydrologic cycles in Maryland. More recently, climate change has further altered regional hydrologic cycles and the variability of precipitation. Together, land-use and climate change may interact in unexpected ways to alter the amplitude, frequency, and duration of contaminant "pulses" in streams and rivers and contribute to long-term rising water temperatures. Impacts of climate change and variability in Maryland streams and streams will be discussed within the context of monitoring, management and mitigation approaches. Monitoring will be critical for detecting long-term changes in variability in contaminant trends which, in some cases could indicate regime shifts in water quality and signify substantial, long-lasting ecological reorganization of Maryland streams and rivers. Long-term data from local, state, and federal agencies will provide critical insights into temporal and baseline conditions from interactive land-use and climate change. Altered variability in frequency and magnitude of contaminant pulses may present challenges to future monitoring and synergistic approaches using new continuous high resolution data will be discussed. From a management perspective, nonpoint source pollution from agricultural and urbanized areas is already a major cause of water quality impairments, and accurate identification of nonpoint sources in mixed land use watersheds across climate variability will be critical; data will be discussed regarding ways to effectively trace sources of nitrogen pollution in streams and large rivers, and evaluate the long-term impacts of point source reductions across regional climate variability using advanced wastewater treatment. Finally, stormwater management, ecological engineering and watershed restoration approaches will become increasingly necessary to mitigate contaminant pulses and minimize impacts of rising water temperatures in streams. The impacts of different stream and river restoration and ecological engineering approaches on water quality at the reach and stream network scale will be discussed. Developing effective partnerships between academics, state, federal and local agencies, and nonprofit organizations will be useful for designing and implementing an effective system for monitoring, management, and mitigation strategies for Maryland streams across a changing climate.

Dr. Sujay Kaushal is an assistant professor at the University of Maryland, College Park in the Department of Geology and Earth System Science Interdisciplinary Center. He received a B.A. from Cornell in Biology and a PhD in from University of Colorado in Biology.

Socio-economic Assessment of Bloom Mitigation in the Chesapeake using Clays

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Blooms of harmful algae are characteristic of the Chesapeake and its tributaries, leading to dissolved oxygen problems, fish and crab mortalities, and in some cases, toxin production and threats to domestic animals and the public. Over the last 3 years, a technique has been developed to efficiently remove cyanobacteria from surface waters using mixtures of clays and acidified chitosan, a by-product of crab shells. The technique appears to be adaptable for field use but public willingness for field application as well as the costs for use of the technique could limit adoption as a routine mitigation strategy in regional waters. A similar effective technique for Florida's 'red tide' was not acceptable to local residents and therefore, the extensive laboratory research could not be applied to reduce impacts in regional coastal waters. We conducted a two part study, to estimate costs of using the technique in field control of blooms as well as surveying local citizens to assess the public's willingness to use the technique at some expense to each household (69¢ - $2.19). Importantly, citizens were generally supportive of routine use of the technique for field bloom mitigation, with some differences detected between social and educational groups. Those within the academic community were more likely to support general use of the technique, with approximately 87% of that community indicating they would support using the clay mixture technique for mitigating the recurring blooms. For the other respondents in the Chesapeake Bay area, 70% of those surveyed indicated that they would support use of the procedure, with this latter figure subject to change following continuing analysis. These results indicate the importance of educating the general public on all aspects of the mitigation procedure to insure citizen approval prior to application of the clay mixture on algal blooms in the Bay.

Christine Kim is a senior at the University of Maryland in College Park. She is on Team BREATHE (Bay Revitalization Efforts Against the Hypoxic Environment) in the Gemstone Honors Program and has a focus on the socio-economic aspects of the project. She will receive a Bachelor of Science degree in Supply Chain Management from the Robert H. Smith School of Business and a Bachelor of Arts degree in French Language and Literature in May 2011.

Blacks of the Chesapeake: Using History and Culture as an Outreach Tool to Connect Underserved and Non-traditional Populations to Water Quality Issues.

Vincent O. Leggett, "Admiral of the Chesapeake"

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Long before President Clinton issued Executive Order 12898, in 1994 which states "The EJ Executive Order requires federal agencies, to the greatest extent practicable, and as permitted by law, to achieve environmental justice by identifying and addressing disproportionately high and adverse human health and environmental effects, including interrelated social and economic effects, of their programs, policies and activities on minority populations and low-income populations", the Blacks of the Chesapeake (BOC) has been working with communities of color which have been adversely impacted by landfills, hazardous waste facilities, disposal of medical wastes, as well as minority youth who have suffered disproportionately with asthma and other environmental health concerns including lack of access to timely information about fishing and swimming advisories due to poor water quality.

The (BOC) has been utilizing history and culture as an outreach strategy to connect with non-traditional and underserved populations living along the reaches of the Chesapeake Bay. They have been addressing environmental equity issues in minority communities since the organization's inception in twenty-six years ago. Since 1984, they have been researching and documenting the significant contributions African Americans have made and continue to make to the regions' maritime and seafood industries. The BOC have been advocates for increasing the participation and meaningful engagement of minorities in projects, programs and strategies promoted by the federal, state, and local governments as well as those promoted by non-governmental organizations designed to improve water quality. For the BOC environmental justice and civil rights go hand in hand.

To help close this gap the BOC has written books, school curriculum, crafted legislation, testified at public hearing and organized black watermen and others who have traditionally earned their living off of the bounty of the bay.

The Blacks of the Chesapeake even spear-headed efforts to establish the Chesapeake Ecology Center in Annapolis, which is designed to teach minority youth about the connections between their personal health and the health of College Creek. This urban environmental center is an excellent demonstration site featuring native plants and shrubs, and they have installed a variety of rain gardens to help treat storm water flowing into the bay. Come and learn about the "Chesapeake Bay Through Ebony Eyes"

Vince Leggett is the Minority Engagement Coordinator for the Maryland Department of Natural Resources (DNR) and he is currently coordinating the development of a state-wide Minority Engagement Plan. Vince holds a M.S. in Public Administration and a B.S. in Urban Planning and Community Development. In his career, Vince has coordinated a state-wide task force to develop recommendations for increasing the level of participation of minorities in environmental communities. Vince has founded the Blacks of the Chesapeake Foundation (BOC), which has been designated a "Local Legacy Project" and whose research is included in the collection of the American Folk Life Museum at the Smithsonian Institute in Washington DC. In addition, he has authored two books and was honorarily appointed "Admiral of the Chesapeake Bay" for bringing to light the many significant contributions of African Americans in the maritime community.

Pollution Source Detection in Baltimore Watersheds

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The Center for Watershed Protection, City of Baltimore, Baltimore County, Jones Falls Watershed Association and Herring Run Watershed Association worked together to identify and track pollution sources from illicit discharges in Western Run, subwatershed of the Jones Falls; Moores Run, subwatershed of Herring Run; as well as a portion of the Jones Falls mainstem. Goals of the project include the following:

1) Collect data from flowing outfalls that is indicative of illicit discharges;
2) Quantify the loads of bacteria, nitrogen, phosphorus and pollutant volume; and
3) Communicate findings regarding chronic sewage discharges to watershed stakeholders.

Outfall screening was conducted May through July, 2010. Field teams walked approximately 18.2 miles of stream. In addition, manholes were sampled at strategic junctions of buried stream in Western Run and Moores Run and in-stream measurements were collected at the top, bottom and at a mid-point in these subwatersheds as well.

Five illicit discharges were confirmed in the Western Run subwatershed. If left untreated, these five discharges would contribute 10.9 million gallons per year of contaminated water to the Jones Falls, 894 lb/year of total nitrogen (TN) and 179 lb/year of total phosphorus (TP). The average E. coli count measured at these five outfalls was 53,000 CFU/100 ml. Three of these five discharges were detected in outfalls <36" in diameter, the MS4 minimum criterion set in state regulations for monitoring of illicit discharges, and one is sanitary seepage from a hillside. Additional findings from other subwatersheds will be discussed as well.

Lori Lilly is a Watershed Planner and Ecologist at the Center. Her responsibilities include watershed planning and implementation, GIS mapping and analysis, field assessments, and capacity building for local watershed organizations. Prior to joining the Center, Lori served as Director for a watershed association in northwest Oregon where, in addition to organization development and volunteer coordination, she managed multiple salmon habitat restoration projects. Lori has a B.S. in Natural Resource Management from Rutgers University and a Master's degree in Marine, Estuarine and Environmental Science from the University of Maryland Eastern Shore.

The Floodplain Access Dilemma: Different Approaches for Reconnecting Channels and Floodplains and the Regulatory and Design Challenges They Create

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A primary goal of stream restoration projects is often reconnection of the channel with its floodplain at a desirable frequency of flooding. In incised systems, this goal is typically achieved through either of two primary physical alterations (lowering the floodplain or raising the channel invert) and less frequently, through hydraulic modification (roughness increases). Each of these methods has implications for impacts to adjacent natural resources, ecological communities, neighboring infrastructure, and each requires differing design methods and implementation strategies. The author will compare the approaches and discuss the factors that should be balanced in determining the most desirable course of action. Using several projects as examples, the author will discuss his perspective on regulatory concerns regarding each approach and future research that may aid the positive evolution of these design and implementation processes.

Scott Lowe is a Senior Environmental Scientist and Associate for McCormick Taylor's Environmental Design Group. Scott has over 14 years of experience performing watershed studies, stream assessments, sediment transport evaluations, fish passage assessment and design, bioengineering and bank stabilization design, and stream restoration design and construction management services. Scott has served as restoration designer or construction manager on dozens of projects throughout Maryland, Virginia, North Carolina, West Virginia and Pennsylvania. Scott received his Bachelor of Science degree in Environmental Science from Virginia Tech and his Master of Science in Environmental Engineering from Johns Hopkins University.

Nash Run Trash Trap Installation and Trash Data Analysis

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Anacostia Watershed Society (AWS) installed a trash trap in Nash Run of the Anacostia River and collected about 1,803 lbs of trash from February 2009 through July 2010. The captured trash was bagged and brought to the AWS Headquarters. All trash bags were weighed and recorded after collection (Weight-C). Then, the trash was sorted out into 47 categories. AWS recorded the number and weight of trash after sorting (Weight-S) for each category. A producer/vendor identification survey was conducted for some trash categories for trash collected between July 2009 and December 2009. Trash volume characterization was conducted for trash collected between March 2010 and September 2010. From our trash characterization, AWS found that both the number of and the weight of Food Wrappers and Misc. Plastic Trash were among the top categories of all trash categories. An effective measure/effort to reduce these trash items should be implemented. The volume analysis indicated that if effective trash reduction measures for Bottles & Cans and Styrofoam categories, such as a bottle deposit bill or a ban on Styrofoam, were implemented, about 68% of trash by volume could disappear from all streams in the watershed. Further AWS found that all trash categories that were surveyed for Producer/Vendor Identification were dominated by only a handful companies. It could be said that the majority of public resources (tax dollars, private funders' financial resources, volunteers' time, etc) used to conduct trash cleanup efforts benefit only a handful of companies. This project was funded by District Department of the Environment.

Masaya Maeda is a graduate of WASEDA University in Japan. He majored in Chemistry with extensive work history with Mie prefecture government and the Anacostia Watershed Society in the environmental field. He and his former co-worker, Steve McKindley-Ward, installed trash trap in Nash Run with a grant from District Department of the Environment and have been conducting trash characterization since February 2009.

Taking Another Look at the EPA Watershed Reporting Measures – A Focus on Incremental Progress

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EPA's current Strategic Plan and Office of Water guidance include a set of measures that EPA and the states use to report progress on water quality restoration goals. In the past year, a combined EPA-state effort has reviewed the status of these measures with the intent to develop a set of potential supplemental measures. This work culminated in a set of proposals that are contained in the Office of Water Fiscal Year 2011 guidance. The key theme in these proposals is 'incremental progress' with the objective of capturing the considerable progress that is made over time towards a full restoration goal. The key purpose in pursuing these supplemental measures is to present a more complete picture of the significant restoration work currently underway by EPA and the states, much of which is not accounted for in the current set of measures. A brief history of the development of the current set of measures and a review of the suggested supplemental measures will be featured in this presentation.

Larry Merrill was named Acting Associate Director of the Office of Standards, Assessment and Total Maximum Daily Loads in EPA's Region III Water Protection office in November 2009. Prior to this assignment, Mr. Merrill served as the Regional Monitoring Coordinator for the Region III Water Protection Division. Mr. Merrill's current program management duties include Region III Water programs for Water Quality Standards, Monitoring and Assessment and the establishment of Total Maximum Daily Loads. The Region III Water Protection Division manages water programs for Delaware, the District of Columbia, Maryland, Pennsylvania, Virginia, West Virginia and four interstate Basin Commissions. Mr. Merrill's career at EPA began in 1974 and he has over 30 years experience in EPA's Clean Water Act programs. Mr. Merrill graduated from the University of Maryland with a B.S. degree in Resource Conservation and Development.

Land Use Change and IBI Scores

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This research utilized annual macroinvertebrate IBI data collected from multiple sites in Montgomery County, Maryland over a fourteen year period to examine how specific aspects of development, including the type, density, and location effect the stream macroinvertebrate community. The study is divided into two parts. The first part examines the relationship between land use and IBI scores using spatial econometric techniques and a panel data set. A conceptual model of the impact on stream macroinvertebrate IBI scores of changes in land use was utilized to develop the equation that were used to estimate changes in IBI scores over time as a function of land use and other factors that are expected to affect the stream ecosystem. The use of spatially and temporally referenced data and spatial econometric techniques permitted the analysis to move beyond simple correlations by allowing for the identification of the effects of different land uses on stream macroinvertebrate biotic integrity. The importance of the spatial arrangement of developed land uses was also examined.

The second part of the study examined the effect of a policy change -- the requirement to restrict impervious surface area for new development to less than ten percent of the land area of a given parcel that was imposed in certain areas of the County. The analysis attempts to isolate the effect of the policy change by utilizing dummy variables to estimate the effect of the parcel-level impervious surface cap on macroinvertebrate IBI measures.

Daniel Miles is a Public Policy Ph.D Candidate and National Science Foundation IGERT Fellow at the University of Maryland, Baltimore County. His dissertation research is in the area of land use economics. In addition, Daniel is also an Associate at Econsult Corporation, an economic consulting and litigation support firm located in Philadelphia, PA.

The Impacts of Using Clay/Chitosan Flocculation to Mitigate Microcystis aeruginosa Blooms in the Chesapeake Bay

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Algal blooms have numerous deleterious effects on the environment, including reduced levels of dissolved oxygen (DO), increased levels of nutrients upon decomposition, and shading of submerged aquatic vegetation (SAV). Additionally, certain strains of Microcystis aeruginosa are capable of producing a toxin, microcystin, which can have harmful effects on humans, domestic animals, and wildlife. We sought to monitor the impacts of a clay-and-chitosan flocculation mixture used to mitigate the blooms. Furthermore, in light of the several-decade effort to restore SAVs in the Chesapeake Bay, we hypothesized that the incorporation of SAV seeds into our mitigation method could be another advantage in removing the recurring blooms from the bay, and could possibly prove beneficial in preventing future blooms. We set up a series of mesocosm experiments in order to measure the effects of our mixture on simulated blooms, SAV growth, nutrient flux, and toxin levels, with specific measurements of SAV biomass and of concentrations of dissolved oxygen, nutrients, and microcystin through time. Our results showed an overall increase in SAV biomass in the presence of flocculated cyanobacteria compared with controls; an initial decline in toxin levels; stable nutrient concentrations; and a dramatic increase in DO levels. These findings would suggest that the clay-and-chitosan flocculation mixture was not only successful in removing the bloom, but was also successful in substantially improving the habitat and water quality in treated areas.

Hannah Miller is an undergraduate student at the University of Maryland, College Park majoring in Neurobiology and Physiology. She has been researching harmful algal bloom mitigation in the Chesapeake Bay for the last 3 years along with her fellow teammates in Team BREATHE, a research group in the Gemstone Honors Program at UMD. Within the project, Hannah specialized on incorporating submerged aquatic vegetation into the mitigation plan.

Experiences with Whole Stream Metabolism

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Nutrient (nitrogen and phosphorus) enrichment is a leading cause of water-quality and ecological impairment in the United States. Streams that flow through agricultural areas generally carry higher levels of nutrients than those found in undeveloped areas and tend to exhibit problematic ecological effects such as increased biomass production. The relation between nutrients and primary productivity is poorly understood in streams and rivers because of the variety of physical, chemical, and biological processes acting on and in these systems. The U.S. Geological Survey's National Water-Quality Assessment (NAWQA) Program has been studying nutrients in streams and rivers for 15 years for the purpose of understanding relationships among land-use practices, loadings, and effects on stream biota. In response to the need for more detailed research investigating the effects of nutrient enrichment on stream ecology, NAWQA began in 2002 intensive field studies of reach-scale nutrient-biota interactions in streams throughout the Nation. Independent reach-scale sites were selected for sampling based on a number of criteria including wadeability, stream placement along a nutrient gradient, and hydrologic suitability. Protocols applied to this study used a two station in-situ dissolved oxygen measurement method coupled with custom-developed software to calculate stream metabolism over a diurnal period. In conjunction with the oxygen measurements, water chemistry and algal biomass were sampled and reach habitat assessed. Seasonal samplings were repeated at selected sites. An understanding was developed of the interrelations between nutrient conditions, algal communities, and stream metabolism. The information generated by this study will permit a more accurate understanding of the interplay between nutrients and physical settings in agricultural streams and their influence on biological communities and water chemistry.

Mark Nardi is a geographer and has been with the U.S. Geological Survey's MD-DE-DC Water Science Center in it's Dover Delaware for 12 years. Mark's work with water-quality has largely been as a team member on various aspects of the National Water Quality Assessment (NAWQA) . Mr. Nardi has spent considerable time in the field as part of a team setting up and running stream metabolism experiments in various part of the country.

NOAA's National Weather Service Support of Maryland Healthy Beaches

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Maryland Department of the Environment (MDE) works with local health departments to enhance beach water quality monitoring and maintain the public notification process for beach water quality in Maryland. Maryland's Beaches Program was established to protect the health of Marylanders at public bathing beaches.

Good beach water quality is important for the safety and health of swimmers. Water quality can deteriorate due to pollution caused by runoff after storm events, trash, debris, or even sewage. Other sources that may cause poor water quality at beaches include failing septic systems, boat waste discharges, and wastes originating from pets, wildlife and farm animals that may run off into the waters after storm events.

Since storm water runoff is a major source of bacteriological contamination, MDE is working to notify beachgoers of rainfall events at local beaches with the help of the National Oceanic and Atmospheric Administration's (NOAA), National Weather Service (NWS). NOAA's NWS Middle Atlantic River Forecast Center (MARFC) is providing rainfall information to an MDE contractor who posts the rainfall information on MDE's www.MarylandHealthyBeaches.com website. This helps to notify beachgoers of conditions in which bacteria concentrations may be elevated at the beach due to storm water runoff.

MARFC's rainfall information is a combination of data collected from rain gages and from NWS Doppler Weather Radars. The data is quality controlled by MARFC Hydrometeorologists. It has a spatial resolution of 4km and a temporal resolution of 1 hour.

This talk will illustrate the collaborative exchange and use of precipitation information, through examples from this year's bathing beach season.

Joe is a hydrologist at the NWS Middle Atlantic River Forecast Center, located in State College, PA, since 1993 and is in charge of the technical and scientific issues at the Center. He has been working with the Maryland Department of the Environment since 2004 in providing precipitation estimate data for the Shellfish Harvesting Regulation program. He has a BS in Civil Engineering from Penn State, an MS in Civil Engineering from UMd, and has a tenure with the NWS longer than many in the crowd have been alive. As a Maryland resident from 1974-1993, he regularly partook in the feasting of the Bay's celebrated crustacean, and his departure from MD left him longing, so time is found at every opportunity to sit and pick in the time-honored fashion.

Heather Morehead Merritt is the Beaches Coordinator for Maryland Department of the Environment (MDE) in the Science Services Administration (SSA). Heather has a B.S. degree in Wildlife Science from Virginia Tech in Blacksburg, VA, and an M.S. degree in Environmental Science from Marshall University in Huntington, WV. She worked for KEMRON Environmental Services, Inc. near Charleston, WV for 3 years, and has worked as the Beaches Coordinator for 4 years. She works with local health departments to enhance beach water quality monitoring and maintain the public notification process for beaches in Maryland.

The Implementation of Water Quality Projects for the City of Baltimore and Its Effects

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While possessing an MS-4 permit, the city of Baltimore is an ultra urban area possessing unique characteristics of impermeable regions of city development to permeable regions of streams and undeveloped terrain. The Baltimore City Department of Public Works has assessed its numerous watershed plans works in order to evaluate if federal and state water quality requirements put in place will be currently met. In addition, the assessment of these watershed plans will serve to direct how the city can choose specific projects in their region, thereby efficiently utilizing their financial resources to bring the maximum water quality improvements of the city as a whole. The criteria of these projects chosen will be discussed as well as its effects on water quality, community and social well being of the city as a whole.

No bio submitted.

Measurement of Dissolved Polychlorinated biphenyls in Rivers Using Passive Samplers

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Persistent, bioaccumulative, and toxic chemicals like polychlorinated biphenyls (PCBs) and chlorinated pesticides accumulate in the aquatic food chain and pose harm to animals at the top of the food chain and humans. Monitoring these hydrophobic pollutants in natural waters using active sampling approaches is an analytical challenge because of their low aqueous concentration in the environments. Recent work by several researchers has focused on passive sampling approaches using calibrated sorbent phases like polyethylene and polyoxymethylene that is allowed to equilibrate with the water phase and then sampled to estimate the water phase concentrations. Passive sampling measurement provides a time-averaged concentration of the freely dissolved chemical in the water phase. Also, passive sampling techniques can provide lower detection limits compared to direct water extraction techniques and at a lower cost. In an effort to track potential hot spot areas and sources of PCBs in Lower Beaverdam Creek, a tributary of Anacostia River, passive samplers were deployed in the creek and stormwater pipes in Spring 2010. The aqueous PCB concentrations obtained helped eliminate some stormwater pipes as a potential source of PCBs while indicating that PCBs might be sporadically released from other sampled pipes. Deployment of passive samplers along with clam cages in August 2009 showed elevated aqueous PCB concentrations in the sampled location.

This paper will present an overview of the emerging passive sampling techniques, challenges associated with calibrating passive samplers, and preliminary results from the use of passive samplers to measure dissolved PCB concentrations in an impacted stream in Maryland.

No bio submitted.

Does the Anacostia have Chlordane Pollution?

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Chlordane is a toxic Persistent Organic Pollutant that was widely used in the Anacostia watershed for household termite control until its ban in 1983. Our Anacostia watershed (DC, MD) 2000-2010 active biomonitoring study at 54 sites for 21 EPA Priority Pollutant pesticides using translocated clams (Corbicula fluminea) found chlordane was 80% of detected pesticides. No centralized chlordane sources were expected. However, upstream sites in four Anacostia tributaries and one tidal Anacostia site had "hotspots" with clam tissue chlordane up to 2000 ppb. Active biomonitoring at downstream sites often found clam chlordane exceeding the USFDA limit of 300 ppb. The Anacostia tributary "hotspots" were in nonindustrial suburban or park settings, suggesting they could be abandoned chlordane dump sites. The presence of high levels of heptachlor epoxide, a chlordane breakdown product, indicated weathering. Active biomonitoring by the Maryland Department of the Environment using a different laboratory was unable to confirm chlordane contamination of clams placed in the Anacostia. MDE has submitted a split clam sample for chlordane analysis to three laboratories including ours (TestAmerica). Recently TestAmerica reported high (1400 ppb) chlordane in a minnow sample collected near the Sligo Creek chlordane "hot spot". Results of the MDE split sample chlordane analysis should be available by the date of the Maryland Water Monitoring Conference. There is as yet no TMDL being proposed for chlordane contamination in the Anacostia River. Stay tuned.

Dr. Harriette Phelps is Professor Emeritus of the Biology Department, University of the District of Columbia. Her research involving students has used molluscs for active biomonitoring of power plant effluent (Cu), nearshore estuaries (TBT), the Potomac River (Al), and the Anacostia River watershed (sources of EPA Priority Pollutants). Also effects of the introduced Corbicula fluminea clam population on Potomac River ecology.

Characterization of Tidal Freshwater Fish Communities from the Bush River, Maryland: A Volunteer-Driven Monitoring Program

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The Anita C. Leight Estuary Center, located in Harford County, in collaboration with the Maryland Department of Natural Resources' Fisheries Program and the Chesapeake Bay National Estuarine Research Reserve in Maryland started in 2001 a volunteer-driven monitoring effort to track fish populations in the tidal freshwaters of the Bush River as well as increase ecological awareness. Participating volunteers gain valuable hands-on experience conducting scientific-based field sampling, collecting data on environmental parameters, and learning about fish identification. Fish sampling occurs six times from July through September. A 100 foot seine net is used to sample the shallow near shore habitat while a 25 foot trawl net is used to sample fish offshore of the seining sites. Water quality parameters are also recorded in conjunction with fish trawling and seining. Data collected between 2005 and 2010 was analyzed for species abundance. The most common species found per family included Dorosoma cepediamum (Gizzard Shad, Clupeidae), Fundulus diaphamus (Banded Killifish, Cyprinodontidae), Lepomis gibbosus (Pumpkinseed, Centrarchidae), Perca flavescens (Yellow Perch, Percidae), Morone americana (White Perch, Moronidae), Notropis hudsonius (Spottail Shiner, Cyprinidae), and Leiostomus xanthurus (Spot, Sciaenidae). Over the five year sampling period, total abundance of White Perch increased while Yellow Perch and Banded Killifish remained relatively constant. Spot total counts were low from 2005 through 2009, but increased by 63.5% from 2008 to 2010. Due to the strong volunteer interest, this monitoring program will continue to monitor the tidal freshwater fish communities of the Bush River but its goals will be revisited to answer new questions.

Julia Puzak is a research intern with the Chesapeake Bay National Estuarine Reserve system based at the Maryland Department of Natural Resources in Annapolis, MD. She has done monitoring projects on water quality, submerged aquatic vegetation and emergent vegetation in both fresh tidal marshes and salt marshes. Julia graduated from St. Mary's College of Maryland in May 2010 with a Bachelor's degree in biology.

Rebecca Lang is a Research Intern with the Chesapeake Bay National Estuarine Research Reserve (CBNERR) based at the Maryland Department of Natural Resources. She focuses on biological monitoring of emergent vegetation, submerged aquatic vegetation, water quality and marsh surface elevation tables among three reserves within CBNERR. She graduated from Salisbury University in May 2010 with an Environmental Science degree and Biology minor.

Implementation of the USGS StreamStats Application for Maryland

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StreamStats (http://streamstats.usgs.gov) is a U.S. Geological Survey (USGS) Geographic Information Systems-based Web application that was developed to provide users with streamflow statistics, basin characteristics, and other information for USGS data-collection stations and for ungaged sites. Users can select USGS data-collection station locations shown on a map interface in a Web browser window to obtain previously published information for the stations. Users also can select any location along a stream to obtain the drainage-basin boundary, basin and climatic characteristics, and estimated streamflow statistics for the location. This information is needed for use by engineers, land and water-resource managers, biologists, and many others to help guide decisions in their everyday work.

StreamStats is implemented on state-by-state basis, usually in cooperation with local agencies. StreamStats was first implemented in 2007 for the Gunpowder and Patapsco River basins in Maryland. The implemented area was expanded in August 2010 to cover all river basins along the western shore of the Chesapeake Bay from the Patuxent River in the south to the Chester River in the north. In addition to the expanded area, several new analysis tools were added, including the ability to obtain water-use summaries for user-selected points on streams. This presentation will describe the new tools that are available for Maryland StreamStats and an effort that is now underway to implement StreamStats for the rest of Maryland.

Kernell Ries, is a hydrologist with the U.S. Geological Survey's Office of Surface Water, and works at the Maryland-Delaware-DC Water Science Center, in Catonsville, MD. Kernell has a B.S. degree in hydrology from the University of New Hampshire, and has worked for the USGS for 31 years.

Kernell is the national coordinator for the StreamStats Program, which he will discuss today, and is a past national coordinator for the National Flood-Frequency Program. Kernell also serves as an instructor for various USGS courses on statistical hydrology. During his career, Kernell has authored or co-authored more than 50 publications on various aspects of surface-water hydrology, and has given numerous presentations at national and international conferences. Several of Kernell's reports describe studies that he completed while he was assigned as a hydrologist to the Maryland-Delaware-DC Water Science Center between 2003 and 2009.

Using Sampling Data to Plan, Target and Monitor TMDL Mitigation Projects in Maryland

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The Maryland Department of the Environment's (MDE) Water Quality Protection and Restoration (WQPR) Program is tasked with TMDL Implementation and removing waterbodies from Maryland's 303(d) list of impaired waters. Supporting this group is the Maryland Department of Natural Resources Monitoring and Non-Tidal Assessment (MANTA) group and the MDE Field Services Division (FSD) both out of Annapolis. The data they provide is used to target watersheds with the greatest potential for removal from the 303(d) list, find potential stressors/sources, to suggest mitigation technologies and conduct pre/post monitoring of restoration project implementation.

The WQPR has made impairments to benthic and fish populations a priority in the non-tidal freshwater streams of Maryland as part of its strategy to meet TMDL goals with the logic that improvements in biological communities should reflect reductions in overall stressors. The MDE field office has been conducting synoptic surveys of the Corsica and other major rivers throughout the state in an effort to monitor successful mitigation of nutrients as well as conducting bacteria source tracking to determine which source sectors are responsible for loads in tidal shellfish harvesting areas.

Gregorio has been a Natural Resources Planner with MDE's Water Quality Protection and Restoration Program since 2008. Before his time at MDE, he spent five years as a consultant in groundwater monitoring and remediation.

The Mill Creek Headwaters Sewage Spill Monitoring and Restoration Project: Success Through Local Partnerships Between Government and Citizens

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Mill Creek, located off the Magothy River near Annapolis, Maryland, is an urban waterway that has experienced decades of development and deforestation. In addition to runoff and sedimentation from the highly impervious watershed, a 36-inch wastewater main collapsed in December 2005 just upstream of the Creek discharging approximately three million gallons of wastewater and 1,700 cubic yards of soil slurry into the floodplain, stream and tidal headwaters of Mill Creek.

The Anne Arundel County Department of Public Works coordinated and managed emergency restoration of the flood plain and stream immediately after the collapse and developed a comprehensive recovery and monitoring plan for the creek in co-operation with the Magothy River Association, a local watershed watchdog. The plan included tidal and nontidal water quality monitoring, hydrographic surveys, sediment sampling and analysis, watershed evaluations and submerged aquatic vegetation (SAV) surveys. A paired watershed approach was used for the monitoring with a neighboring creek not affected by the sewage spill. Extensive monitoring lasted one year and tidal water quality monitoring is ongoing through the help of the Magothy River Association and local citizens. Citizen monitoring will continue through the completion of an innovative multifaceted headwaters restoration project to be completed in Fall 2010.

This presentation will summarize the comprehensive monitoring, recovery strategies, enhancement plans, innovative funding used for this urban waterway and adjacent floodplain corridor enhancement. It will also address the extensive community outreach and education necessary to ensure citizen knowledge of the health and safety issues related to the waterway.

Kendra Scheminant leads BayLand's Technical Services Team that consists of Environmental Scientists and GIS Specialists. This team is actively involved in current BayLand projects including stream assessments, water quality monitoring, watershed evaluations and permitting. Most notably, Ms Scheminant has led over 900 submerged aquatic vegetation surveys performed in various counties throughout the Chesapeake Bay watershed and created a usable GIS databases for analysis. She earned her degree in Environmental Science with a special focus on Aquatic Resources from Virginia Tech.

A Web-based Vulnerability Assessment Support System

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There is a growing concern in the costs of natural disaster, climate change and the vulnerabilities they expose us to. In order to tackle these concerns, there is a need for a support system capable of delivering basic vulnerability assessments while minimizing the need for costly expert participation during the preliminary phases of studies.

In order to alleviate the tedious and costly issues brought by the regular collaborative involvement of the experts, we designed a Vulnerability Ranking Tool to help make ranking Vulnerabilities more interactive, efficient, quick, and result driven. This tool takes advantage of Web 2.0 technologies to make remote collaboration successful. We designed this tool to be intuitive with no training requirements for both the experts ranking the vulnerabilities and the project manager who is organizing the vulnerability ranking. All the project manager will be doing will be simply inputting the vulnerabilities in the database. After that, the experts will rank the vulnerabilities just by dragging and dropping. The tool will then compile all the experts input and come up with one final collaborative report.

In conclusion, the objective of the Vulnerability ranking tool is to help you prioritize vulnerabilities. It will run on any popular web browser and operating system. Its interactive and intuitive interface will allow anyone with basic computing experience to use it. The vulnerability ranking tool will help tackle concern related to vulnerabilities in a more efficient way.

The vulnerability ranking tool was developed under NOAA – Climate Program Office Grant in support of the Vulnerability Assessment Support System program. The VASS program is a joint collaboration between the Department of Geography at Penn State, SMRC, and USGS.

Sabal Shrestha is currently a senior at University of Maryland, Baltimore County (UMBC) majoring in Information Systems with a concentration in Web and Database Development. He is also working as a System Engineer Intern at S M Resources Corporation. His current project includes developing a web-based Vulnerability Assessment Support System.

Dr. Alex Coletti is Senior Scientist at SMRC, Lanham - Maryland office. He has several years of experience as experimental physicists conducting research in optics and remote sensing. Before joining SMRC, he spent about twenty years doing university research at Georgia Institute of Technology, School of Geophysical Sciences, and the University of Rome in Italy. His activities included laboratory work, numerical data analysis, and modeling of light diffusion/absorption through a variety of planetary and interstellar media. Presently, Dr. Coletti is serving as Co-PI to a grant of the NOAA Climate Project Office. In addition he is supporting algorithm development activities for the NOAA GOES-R program and Independent Validations and Verification analysis efforts for the NASA's JUNO probe to Jupiter. He published over forty articles in such international scientific journals as Applied Optics, Journal of Geophysical Research, Aerosols, Science and Technologies.

Sediment Dynamics and Flux in Rehabilitated Coastal Plain Streams at the Estuarine Boundary

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Interest in restoring native plant communities in Maryland's Coastal Plain has inspired several projects that involve the rehabilitation of valley systems immediately upstream from the estuarine tidal boundary. Several such projects have occurred in locations previously containing small ponds. The effect of the valley reconfigurations on the supply of sediment to small tidal tributaries on the Western Shore is important to management efforts attempting to moderate watershed sediment yield, explain nutrient dynamics, and optimize restoration investments. Three years of extensive monitoring at one of the sites in Anne Arundel County provides a dataset to quantify sediment flux in a rehabilitated valley receiving flows from a suburban watershed. The results are able to be considered in conjunction with site observations of flow conditions and morphological adjustments that occurred during the monitoring period.

Sean Smith is a geomorphologist with the MDDNR, Ecosystem Restoration Service. He has worked on river management and science issues for over two decades, most of which has involved applied geomorphology and monitoring related to stream and watershed assessment. His education includes a BS from the College of Agriculture at UMD, an MS in fluvial geomorphology from UMD, and nearly a PhD in geomorphology from JHU.

Environmental Justice and Watershed Planning: An Assessment Methodology for Baltimore County and Baltimore City

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Environmental Justice (EJ) arose as a critical cross-cutting theme for all watershed planning and water quality related actions during the development of the Baltimore Watershed Action Agreement Phase 1 Action Plan (BWAAP) - an effort by Baltimore County, Baltimore City, and local NGOs to improve water quality in shared watersheds. The BWAAP requires the County and City to jointly "ensure environmental justice indicators are taken into consideration during major planning efforts." As a consultant in this effort, Biohabitats prepared a white paper on environmental justice indicators and assessment methods in February of 2010. Besides interviewing local experts, Biohabitats reviewed peer programs to evaluate linkages between environmental justice and clean water, at the community, state, and local government levels. In July 2010, Biohabitats drew from this initial research and suggested an assessment methodology to integrate environmental justice principles into watershed planning. This methodology would use GIS software to layer relevant EJ and watershed health indicator data including: demographic characteristics, public health indicators, watershed health indicators, and community engagement indicators. Biohabitats is in the process of further development of this model for Baltimore County and City. The resulting maps will be used in small watershed action plans (SWAPs) as well as other watershed planning efforts to prioritize projects in neighborhoods with environmental injustice and poor water quality.

Nicole Stern, an ecological landscape designer with Biohabitats, has been involved with efforts to improve the health of Baltimore's watersheds, considering ecological systems as well as resulting human health, since 2008 through the Baltimore Watershed Agreement Action Plan, the Healthy Harbor Initiative, and other local stream restoration. Ms. Stern holds a B.L.A in Landscape Architecture from California Polytechnic University, San Luis Obispo and a M.L.A in Landscape Architecture from Pennsylvania State University. She has worked on watershed restoration and sustainable community design projects at a variety of scales in both Maryland and California since 1999, specializing in both the ecological and social aspects of watershed and community health.

Nancy Pentz has been a Natural Resource Specialist with Baltimore County Department of Environmental Protection and Resource Management since 1988. She is currently supervisor for the Environmental Planning Program. She is engaged with the development of Small Watershed Action Plans that are focused on meeting the County's TMDL requirements and involves community stakeholders in the process. She has previous experience with the implementation of the Chesapeake Bay Critical Area Program and forest conservation and buffer regulatory programs. Nancy has a bachelor's degree from Bucknell University and a Master's degree from the University of Iowa both majors in geography.

Adaptation to Warming Climate and Sea Level Rise: The Plight of Tidal Wetlands in Chesapeake Bay

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Global sea-level rise over the last several thousand years has been relatively slight (less than 1 mm per year) which helped to promote marsh growth and survival of tidal wetlands worldwide. In addition, marshes appear to have initially benefited in areas such as Chesapeake Bay, where sediment inputs were elevated due to extensive land clearance in the 18th and 19th centuries. The 20th century marked a transition period, however, as sea-levels began to accelerate to between 3-4 mm per year in the Chesapeake Bay. Furthermore, riverine sediment sources were curtailed by extensive dam building and forestation of old fields. When deprived of inorganic sediments, tidal marshes are forced to depend increasingly on organic deposition to accrete vertically, in order to stay abreast of sea-level rise. Though successful over the short term in accreting material, there is a down side to organic marshes. These wetlands contained very low bulk density sediments and are at elevated risk when they dry out during periodic low stands of sea-level or low precipitation during summer months. For example, as highly organic marshes containing pyrite dry out, they oxidize. After storm events sulfuric acid can then be generated, causing a phenomenon sometimes called "sudden marsh death." There are many alternative ways that "sudden marsh death" may occur, but it seems to be especially prevalent in areas where there is widespread low tidal amplitude, such as in the brackish wetlands of Blackwater National Wildlife Refuge on Maryland's Eastern Shore. One of the initial strategies for adapting to increasing sea-level at Blackwater, where marsh losses are in excess of 1% per year, is to artificially add sediments to the system using dredged materials. The estimated cost for complete restoration of marshes at Blackwater ranges from 1 to 2 billion dollars, which seems prohibitive at present. A less expensive strategy appears to be the construction of tidal wetlands on islands which have suffered from long term erosion in the Upper Bay. We have begun to utilize this approach at Poplar Island, but it remains to be seen whether we can create tidal marsh systems that have increased resistance to projected sea-level rise – which could be over a meter by the end of the century, if little is done to reduce current greenhouse gas emissions. The widespread loss of tidal wetlands would not only limit habitat for many organisms at the bay-upland interface; but would also have profound impacts on the water quality of the Chesapeake Bay and significantly set back the overall restoration strategy.

No bio submitted.

Targeting Nutrient Pollution Reduction with Prices

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Based on research funded by UMD's Center for Agro-Ecology, (Wieland and others, "Least Cost Supply of Nitrogen Reduction from two Important Agricultural Non-point Source Best Management Practices in Maryland", forthcoming) we compare expected nutrient load reductions when BMPs are bought by the acre with a scenario wherein they are bought by the pound N reduced. We show that buying nitrogen load reductions by the pound results in greater load reductions per dollar spent and that, in the aggregate, the additional load reductions that could be achieved at current budgets are quite significant. We explain the pricing tool required to buy nutrient load reductions by the pound and show a prototype based on Chesapeake Bay Model (version 5.3) delivered loads and BMP N load reduction efficiencies by land use and hydro-geomorphic region.

Pricing nutrient load reduction by the pound would also make it easier to know how many pounds of nutrients have been kept from the Bay by the BMPs (i.e., quantity reduced = total expenditure/price). This would simplify efforts to map between expected nutrient load reductions and water quality monitoring data.

Copies of the draft paper are available upon request.

Robert Wieland is a resource economist with Main Street Economics. His recent work includes estimates of the harvest and ecosystem service values of oysters in the northern Chesapeake Bay under different management scenarios, market and non-market values from state-owned forestland in Maryland, and cost efficiencies for some important non-point source pollution reduction practices. Robert earned his Masters in Agricultural and Resource Economics from the University of Maryland.

MARYLAND WATER MONITORING COUNCIL

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POSTER ABSTRACTS

(Listed alphabetically by lead author's last name)

Fourth Maryland Streams Roundtable in February 2011

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The Fourth Maryland Streams Roundtable sponsored by the Maryland Water Monitoring Council will take place in early February of 2011. The spirit of the Maryland Water Monitoring Council is to develop partnerships and to foster collaboration between monitoring groups. Several agencies, consultants and watershed organizations monitor streams throughout Maryland and this gathering will provide an excellent opportunity to learn where monitoring is being done and what's being sampled. With that in mind we would like to invite you to attend the Maryland Water Monitoring Council's Fourth Stream Monitoring Roundtable. This is an opportunity for you and your group to tell your colleagues what and where you will be monitoring in Maryland's streams in 2011. Each group in attendance will be asked to give a short (10-15 minute) presentation about the types and locations of their monitoring activities in 2011. Either at lunch, or at the end of the roundtable, a large map will be available that will highlight monitoring locations close to one and another that may provide opportunities to collaborate to reduce duplication of sampling effort. A formal announcement will arrive via email in December.

Urban Streams: The four dimensions of an ecological stream continuum

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Urbanization is rapidly increasing in many areas of the world, and has greatly changed hydrologic connectivity at the landscape scale. Moreover, the extent of these areas continues to increase to the point where a new conceptual approach to urban stream ecology is needed. An "urban stream continuum" framework that goes beyond the "effects" on aquatic ecosystems and beyond a focus on the "urban stream syndrome" approach must first adopt a perspective that the urban landscape actually extends headwater streams in a pervasive three-dimensional incision of the urban landscape. These "new" upland streams, as well as their associated hyporheic and parafluvial compartments, are engineered streams with hydro-ecological functions in important ways, and have important implications for downstream ecological systems. By considering these complex systems worthy of study in their own right, we will be better prepared to put urban hydrology into a context that allows for greater eco-hydrological synthesis as well as the cascading effects on more traditional downstream continuums. Importantly, this perspective also promises to set the stage for a truer integration of the "land-water" interface concept with ecologically based modeling and management efforts, improving the potential for the remediation of detrimental behaviors and infrastructure on downstream systems. We will discuss upstream-downstream patterns in stream data from Baltimore that support this idea of an ultra connected aquatic-terrestrial interface and how urban headwater effects can reach far downstream, likely with more intensely in the future as population densities increase and civil infrastructure ages.

Relationships between Rainfall and Enterococci Counts in the West and Rhode Rivers: 2007-2010

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Stormwater runoff has been identified as one contributor to elevated bacteria levels in waters that receive runoff. Such bacteria can cause illness in people via contact with contaminated water, especially people with immune system deficiencies. To help prevent these kinds of illnesses, public health organizations, government offices, and community organizations generally advise against water contact for 48 hours after rain falls on a watershed.

West/Rhode Riverkeeper (WRR) and their volunteer water quality monitoring teams carry out a bacteria monitoring program in May through August, when people are most likely to be swimming, boating, and fishing in the West and Rhode Rivers. The program is in its fourth year, with data available for 2007-2010. Dr. Sally Hornor and her lab staff at Anne Arundel Community College analyzed the weekly WRR water samples for *Enterococcus faecalis*, the presence of which can signal fecal contamination of marine waters. The Environmental Protection Agency (EPA) sets certain thresholds of bacteria counts that indicate unsafe levels and when water contact should be avoided. These thresholds are 104 bacteria colonies per 100 ml of water for heavily used beaches and 158 colonies per 100 ml for less frequently used beaches.

The primary objective of our study is to see how closely the 2007-2010 bacteria counts in the West and Rhode Rivers follow the general "No Water Contact for 48 Hours after Rain" rule by comparing precipitation data with the WRR bacteria counts in order to see, when there was precipitation, what time window prior to sampling gives the highest bacteria counts. Our poster will summarize results of this investigation into the relationships between precipitation and bacteria counts.

Low Surface Dissolved Oxygen (DO) in Upper Magothy River Creeks, 1991-2010

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Most dissolved oxygen problems in estuaries concern low levels in bottom waters, where algae fall when they die and decompose. However, in small tidal creeks with intense algae blooms, low dissolved oxygen (DO) can occur throughout the water column after the bloom organisms die, including the surface layer (only 0.3 m deep). I have measured DO in two creeks near my house on the upper Magothy River as a volunteer since 1991. At first, low surface DO events (DO < 5 mg/l) were rare, occurring in less than 6% of samples from April-October, but later their frequency rose in some years, rising to 19% of samples in 2002-2003. In 2006, I changed from monthly to twice monthly sampling, and the frequency of low surface DO shot up to 25%, and stayed at 18% or more since then. Some of this increase must be due to sampling more often. However, I sampled weekly from 1991-1994 and twice-monthly in 1995 and 1997, and all of those years had low frequencies of low surface DO (8% or less). The other possible explanation is that the intense blooms and subsequent die-offs that cause these conditions are becoming more frequent. This poster will show how the frequency of low surface DO has increased in Magothy creeks since 2006, and compare this to the frequency of anoxic bottom waters (DO < 0.2 mg/l). Data on some of the phytoplankton causing the blooms, from MDE, will also be shown.

Stream Buffer Re-vegetation Inventory: Using Student-Collected GPS Data to Help Non-Profits Manage Tree Planting Sites

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I am working with the Gunpowder Valley Conservancy (GVC) to create a stream buffer re-vegetation inventory for a 6 acre pilot site in Hydes, MD. The GVC currently does not keep an inventory of the trees they plant and relies on estimates for the acreages planted. GPS/GIS inventories will allow them to better manage their sites by keeping track of tree species, health, growth rate, and maintenance needs.

I have created an inventory of the trees planted at Hydes Field Park in Hydes, MD. Data collected includes the species, health and height of the trees planted, maintenance requirements at each tree, and the dominant invasive plant species within 1 meter radius of each tree. Correlation analyses will eventually be performed to identify any significant relationship between tree health (by species) and soil type, dominant invasive, etc.

I worked with the GVC to create a list of data to be collected, including a list of possible native tree species planted at the site. Data was collected by volunteers, including a GPS class from the Community College of Baltimore County (CCBC), using Trimble GPS units equipped with a data dictionary to streamline the data collection process. Involving students in this type of data collection is a great way to provide them with real-life experience and scenarios, and it allows non-profits such as the GVC to meet and expand their data collection needs at minimal cost. Jaime Alvarez teaches GPS and GIS at CCBC and will continue this project with his classes long-term once the pilot is complete.

Furthering Involvement of Maryland Citizens in Stream Monitoring: a Comparison of Maryland Department of Natural Resources Stream Waders and Virginia Save our Streams Protocols

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The Maryland Department of Natural Resources (DNR) Stream Waders Program is a volunteer stream sampling component of the Maryland Biological Stream Survey. Volunteers fill many of the information gaps that exist on the quality of Maryland's streams by sampling aquatic invertebrates in watersheds across Maryland. Stream Waders samples are identified by professional DNR taxonomists. The Virginia Save our Streams (SOS) Program is a non-profit volunteer water quality monitoring program. Virginia SOS volunteers identify aquatic invertebrates in the field and calculate the Benthic Index of Biological Integrity (BIBI) for their sampled streams. In the spring of 2008 and 2009, DNR conducted a pilot study with the Maryland Conservation Corps (MCC) to determine how Virginia SOS Streamside Identification data collected by MCC volunteers compared to Maryland Stream Waders data at the same sites. The purpose was to determine whether the Virginia SOS protocol could be used as a meaningful, informative tool for Stream Waders volunteers. The SOS and Stream Waders BIBI scores were calculated and statistically compared for 31 sites. Sixteen (51.6%) of the SOS and Stream Waders BIBI scores differed by less than 0.99 (the BIBI ranges from 1-5). Fourteen sites had BIBI ratings that were in agreement: six sites were rated as Good (or Acceptable), one as Fair (or Partially Acceptable), and seven sites as Poor (or Unacceptable). Twenty-four (77.4%) ratings agreed or disagreed by only one category. These results provide DNR the necessary information to determine if the SOS protocol can be used to provide a more scientific, educational experience for Stream Waders volunteers.

Using the Toxics Release Inventory to Protect Maryland Watersheds

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The Toxics Release Inventory (TRI) is an annual collection of State information on releases and transfers of 581 individually listed chemicals and 30 chemical categories from over 20,000 industrial facilities. The Emergency Planning and Community Right-to-Know Act (EPCRA) was enacted in 1986 which requires EPA to collect this information and make the data available to the public. Releases are reported annually for air, land and water, as well as underground injection and can be a valuable screening tool when considering human and environmental health effects in communities and watersheds.

In Maryland almost 50 million pounds of toxic chemicals are reported in the 2008 TRI to be released and over 40 million pounds are released to the air and over 2.5 million pounds are released to surface waters. Over 32 million pounds of hydrochloric acid is released to the air from 19 industrial facilities and over 2.3 million pounds of nitrate compounds are released to Maryland's surface waters. A description of the tools available to the public and government agencies will be presented along with additional information on toxic chemicals released to Maryland's watersheds. By creating greater awareness of the TRI and tools to access the information, communities will be better informed to support decisions protecting Maryland's watersheds.

Comparative Stream Study and Landowner Outreach in the Patuxent River Watershed

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Degraded stream conditions are often caused by human activities that may take place many miles away. We have begun an environmental assessment of local watersheds and the streams that flow through the Jug Bay Wetlands Sanctuary (Anne Arundel County) and empty into the Patuxent River. The watersheds under study are 433, 740, and 1,400 acres in size. Land use varies from predominantly forest/agricultural to mixed residential/forest/agricultural. One watershed receives highway runoff and effluent from a small wastewater treatment plant, while another is very sparsely inhabited.
Assessment data will establish a baseline of information we can use to educate local landowners about the environmental status of the streams. Landowners will learn how they can reduce erosion, runoff, nutrient loading, and how they can restore stream banks and riparian habitat. Workshops on governmental assistance, rain gardens, rain barrels, stream buffers, and reducing fertilizer use will be held.

In 2009 and 2010 we gathered water chemistry and macro-invertebrate data. Fish data were collected from each stream in June and July. Nitrate/nitrite levels are near or above the 1mg/L threshold in two of the streams. Although these waters flow through a protected Sanctuary, upstream activities in the watersheds contribute to habitat degradation and reduced water quality. Indices of Biotic Integrity indicate that Galloway Creek, the most developed watershed, contains mostly pollution-tolerant macro-invertebrates, while pollution-sensitive organisms have been found in the other two, less developed streams.

Long-term Water Quality Changes in Deep Creek Lake, Maryland

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Deep Creek Lake (Garrett County) is the State's largest reservoir and is a focal point for recreational activities in western Maryland. Recent data from water quality monitoring efforts in the lake designed to assess possible nutrient impairments (MD Dept. Environment, 2008) and to characterize water quality conditions (MD Dept. Natural Resources, 2009-2010) suggest that productivity in the reservoir is moderate (mesotrophic). Comparing these data with equivalent measures from the same sites and seasons in monitoring studies that are 10 to 35+ years older appear to show only slight increases in lake productivity over that period. Other water quality measures (pH, specific conductivity) show more significant changes that likely reflect changes in the lake watershed over that period (mine drainage abatement and increased population, recreational use and impervious runoff).

Autonomous Hydrographic and Water Quality Sampling Using Vessels of Opportunity

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This poster outlines a joint development effort of SURVICE Engineering and the Center for Environment and Society (CES) at Washington College in Chestertown, MD to integrate a water quality monitoring instrumentation suite with SURVICE's Autonomous Remote Global Underwater Surveillance (ARGUS) system.

ARGUS has been developed under NOAA and Navy research grants and SURVICE R&D funding as a means to autonomously acquire bathymetric data using the chartplotters of vessels of opportunity. Through a partnership with Sea Tow International, ARGUS beta units have been deployed in the Chesapeake Bay and Barnegat Bay (Coastal New Jersey) since July 2010. From July to August 2010, in excess of 250,000 depth and water temperature measurements were acquired. The data processing application currently being developed will report tide-corrected statistical summaries of the acquired data. The ARGUS bathymetric data acquired throughout the Bay is intended to supplement the detailed shipping channel surveying efforts of NOAA and the U.S. Army Corps of Engineers.

ARGUS beta testing can be followed at http://argus.survice.com/betatesting.html.

As a supplement to Washington College classroom academics, CES will also sample water quality metrics during field exercises aboard CES research vessels. The data will be acquired and time/geo-referenced using the ARGUS system. The Geographic Information Systems (GIS) laboratory of CES will assimilate the depth and environmental data for use by researchers studying the Bay. Washington College, also heavily involved in Eastern Shore community and K-12 education regarding the Chesapeake Bay watershed, will also use the integrated system and resulting data to supplement these teaching opportunities.

Bacterial Monitoring in the Jones Falls Watershed and Inner Harbor: Contamination Levels and Sources in a Highly Urbanized Watershed

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Bacterial monitoring data by three nongovernmental entities working independently are combined here to provide a broadscale, spatially explicit view of coliform bacterial contamination within the Jones Falls (JF) watershed and the Inner Harbor (IH). The main stem of the JF and its tributaries and perennial outfalls, as well as the IH, were tested for the presence and quantity of fecal coliform bacteria during the years 2009- 2010. Measurements along the main stem of the JF show bacterial levels accumulating with distance downstream. A survey of perennial outfalls (storm drains, buried streams, etc.) emptying into Jones Falls revealed a wide range of bacterial contamination, ranging from 0 MPN/100 ml to 60,000 MPN/100ml. This indicates continuing system- wide issues with contamination of the JF by sewerage and storm drain systems. Repeated measurements of bacterial contamination upstream and downstream of one of the largest known sources of sewage contamination to the JF showed significant elevation of total coliform bacteria and E. coli downstream of the outfall ($P < 0.0021$). This survey detected several previously unknown substantial sources of bacterial contamination to the JF. Bacterial levels in the IH ranged over several orders of magnitude at the same station, depending directly on rainfall events. Outfall location combined with citywide storm drain and sewer maps provided information relevant to location of infrastructure deficiencies, and also highlighted the predominant location of contaminated outfalls in economically challenged sections of Baltimore. It is hoped this information may be used profitably by entities in charge of repairing this infrastructure.

Healthy Waters Decision-Making: Addressing the Biological Impacts of Chlorides Impairments

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In 2002, the State of Maryland began listing biological impairments in Category 5 of the Integrated Report of Surface Water Quality (IR). These listings for biological impairments represent degraded biological conditions for which the stressors, or causes, are unknown. In 2009 the MDE developed a biological stressor identification (BSID) process, which used the MDDNR MBSS (2000-2004) dataset. The BSID process determines the predominant cause of degraded biological conditions, thus enabling MDE to most effectively direct corrective management action(s). For each 8-digit watershed with a biological impairment listing, the BSID process will identify specific stressor(s), which are causing failure of the watershed to attain its designated use and also quantify the extent of this impact. The original biological impairment listing will then be replaced with the specific stressor(s) identified.

Chlorides can have a critical impact on freshwater biological communities. The BSID process has identified elevated concentrations of chlorides as potential cause(s) of biological impairment at several watersheds within Maryland. These watersheds are typically associated with urban areas and/or major transportation routes. In total, the BSID process has identified approximately 26 chlorides impairment listings at the 8-digit watershed scale. Chlorides were first listed in the 2010 IR; the IR included 7 listings for this biological stressor. The MDE is working on pilot studies, in coordination and collaboration with VIMS and UMCES, to develop chlorides Total Maximum Daily Loads (TMDL) and/or Water Quality Analyses. Addressing biological impairments will be a critical focus of the TMDL program over the next several years.

The Maryland Biological Stream Survey: Evolution of a Probability-based Monitoring Program

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The Maryland Biological Stream Survey (MBSS) is a probability-based monitoring program that provides unbiased estimates of stream conditions with known precision at spatial scales ranging from watersheds to river basins to the entire state. As of 2009, water quality, biology, physical habitat, and land use/land cover data were compiled from almost 3,500 stream sites. MBSS data were used to develop multi-metric biological indices that support biocriteria. Based on benthic macroinvertebrate and fish community indices, streams are placed on the State's 303d list of impaired waters or designated as Tier II (high quality) waters. During the first statewide round of the MBSS (1995-1997), 95% of the sampled sites were randomly selected. The second round (2000-2004) sampling design was modified to continue a core of randomly-selected sites plus targeted sites for special studies. A network of 25 minimally-disturbed Sentinel Sites was established in 2000 to track weather-related changes in stream conditions and responses to climate change. By 2004, 81% of the MBSS sites were randomly selected and 19% were targeted. The MBSS sampling design continued to evolve to address new management questions. With completion of the third round in 2009, 43% of the sampled sites were randomly-selected and the rest targeted.

The CCBC BWET Project

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The Bay Watershed Educational Training (B-WET) is an interdisciplinary education program which incorporates environmental science, geography, remote sensing, GPS and biology and uses the urban streams as a living laboratory to explore environmental issues facing the Chesapeake Bay watershed. One of the goals of this NOAA funded grant is to develop sustainable relationships between public schools, non-profit environmental groups and community colleges to create a continuous, seamless pipeline of teachers and students at the middle, high school and college levels who are able to collect field data and integrate it with geospatial, remote sensing technology.
So far in the initial phase of the program, the CCBC BWET program has reached eight schools and over 300 students have participated in collecting stream and vegetation data. Students collected stream macro invertebrates, identified them in lab and calculated an index of biological integrity (IBI) using metrics and protocols from MBSS and Virginia Save Our Streams. The data was quality controlled by an MBSS taxonomist and will be used by DNR and DEPRM. In order to explore the relationship between riparian buffers and stream quality, vegetation data were collected at permanent transects from which stem density, basal area, canopy closure and species diversity were assessed. The data will be uploaded to National Geographic's FieldScope website so that students can interpret the implications for the health of the Chesapeake Bay watershed.

Hall Creek: A Case Study for Combining GIS Based Modeling, Stream Pollutant Discharge Monitoring, and Citizen Stewardship Outreach to Support Development of a Watershed Implementation Plan.

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Calvert County's efforts to develop watershed implementation plans (WIPs) have initially targeted five sub-watersheds, including the drainage basin for Hall Creek which empties into the Patuxent tributary of Chesapeake Bay. Here we describe our multi-faceted approach to best assess Hall Creek restoration needs and water quality issues, including modeling, monitoring, and citizen outreach. While the large scale EPA watershed model for the Chesapeake Bay has provided guiding numbers for pollutant loading goals (e.g. for nitrogen and phosphorus), we also explored a web-based modeling tool developed at Purdue University and used to initiate a Long Term Hydrologic Impact Analysis (L-THIA model) of the Hall Creek system. L-THIA uses local climate data, land use, and soil type to predict runoff and pollutant loadings. Most importantly, it is more easily accessible to managers and planners and is very flexible in its capacity for exploring various scenarios of restoration. Ongoing efforts to measure nutrient and sediment loading and stream macroinvertebrate populations from Hall Creek are presented both in the context of establishing baseline, pre-restoration conditions, as well as a robust dataset for testing the L-THIA model. The use of this monitoring/modeling program for citizen outreach is also described.

Just Say "No" to Didymo: Tracking the Distribution and Abundance of 'Rock Snot' in Gunpowder Falls, Maryland

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Didymosphenia geminata (aka 'Didymo' or 'rock snot') is a freshwater diatom native to the far northern regions in cold, oligotrophic waters of North America, Europe, and Asia. For unknown reasons, Didymo's range has recently expanded south into several 'lower 48' states in the U.S. In January 2008, a 'strange-looking growth' was observed by alert anglers in the middle Gunpowder Falls, a popular trout fishery below the 610 hectare Prettyboy Reservoir, in north-central Maryland. The growth was confirmed to be Didymo by Maryland Department of Natural Resources (MDNR) staff. A monthly survey at nine stations in the middle Gunpowder was started by July 2008. A tenth station upstream from Prettyboy Reservoir was added in July 2009. Didymo presence was confirmed at the nine stations below the reservoir by visible inspection and microscopic examination of substrate samples, but not upstream from the reservoir. Didymo abundance was highest at the five stations closest to the reservoir, with peak growth from February through May. Average daily water temperatures during the months of peak Didymo abundance ranged from 3 to 16 C. Didymo peak abundances were higher during winter-spring of 2008-2009 compared to 2009-2010, due in part to the scouring effects of higher current velocities and peak monthly discharges during 2009-2010. Effects of Didymo growth on benthic macroinvertebrates are being evaluated. MDNR installed six wader wash stations along the middle Gunpowder, as part of a public education/outreach campaign. MDNR is considering a statewide ban on the use felt-soled waders and boots.

Biological Monitoring Plan for Northwest Branch Anacostia Stream Restoration

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Coastal Resources, Inc developed a comprehensive monitoring plan for a total of 19,000 linear feet of stream restoration on the Northwest Branch of the Anacostia, completed as mitigation for the Intercounty Connector Project. The primary objectives of the restoration were to increase roughness to induce aggradation and flooding, improve habitat diversity through addition of woody debris in low flow areas, increase zones of flow separation, increase riffle lengths, and increase depth and frequency pools. As a result of these physical enhancements to the stream channel, a corresponding increase in more suitable aquatic habitat for benthic macroinvertebrates and fish communities is expected. Typical monitoring of stream restoration sites using an IBI to assess the biological communities at limited sampling locations yields limited data that can be directly linked to the goals of the restoration. Our monitoring plan is designed to capture changes in trophic structure and ecological diversity associated with the habitat changes that occur as the result of restoration.

In order to detect trophic and community changes in taxa composition the standard MBSS protocols were modified to eliminate subsampling during genus identification and to treat riffle and woody habitats as independent samples. Multimetric and multivariate analysis techniques will be applied to community data to investigate changes in functional groups over time, and relating those changes in functional groups and community structure to likely stressors, habitat changes, or functional lift associated with the restoration.

Monitoring Water Conditions in Maryland: Did Tropical Storm Nicole make an impact?

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Record-setting snowfall was followed by snow-melt and high water levels in March. Since then, most of the region had little rainfall and streamflow and groundwater levels water levels dropped to below normal. September 2010 had little rainfall until the last day of the month, when Tropical Storm Nicole descended on the Mid-Atlantic region for more than a day. Rainfall from this storm varied between 2 and 10 inches. Many streams overflowed their banks, and roadways in the Baltimore area flooded had to be closed temporarily. How did this deluge of rainfall affect the water levels?
The U.S. Geological Survey (USGS) compiles a monthly water summary based on streamflow, groundwater, precipitation, and reservoir levels. Not all regions of the state received an abundance of rainfall from Tropical Storm Nicole. Water levels continue to be below normal in western and southern Maryland, and the southern Delmarva region. In September, groundwater levels were at record monthly lows in 4 wells used by the USGS to assess the response to climatic conditions in Maryland. This poster describes the process used to compile the monthly water summary and the current status of water conditions in Maryland.

Quantifying the Effectiveness of Stormwater BMPs through Hydrologic Monitoring

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This poster will give an overview of a planned study to measure the effectiveness of a Regional Stormwater Facility (RSF) in the treatment of stormwater runoff. The RSF is designed to treat more than 55 square miles (3,583 acres) of the Phillippi Creek Watershed in Sarasota County, Florida. The treatment Best Management Practices (BMPs) consist of a series of four cascading wet detention ponds and a large wet retention/wetland area. The southern portion of the project is a 30-acre wet detention pond that will also serve to treat and re-route water into the RSF during high flow periods. The wet detention system includes treatment cells planted with a variety of emergent wetland plants. The site will also serve as a passive recreational use facility where educational displays about stormwater treatment and flood control will be constructed. HDC and VHB will conduct continuous hydrologic (stage and discharge) monitoring at multiple locations over a 24-month period as well as a time of travel study. Flow-weighted storm event and baseflow sampling will also be conducted using refrigerated samplers at 2 inflow, 2 internal and 3 outflow stations during 7 – 10 storm/baseflow events. Samples will be analyzed by the County's laboratory for ammonia nitrogen, NOx nitrogen, TKN, organic nitrogen, total nitrogen, orthophosphorus, total phosphorus, total suspended solids and BOD. VHB will review the data, conduct the BMP effectiveness evaluation and produce the final report. The study will help to improve future estimates for nutrient load reductions resulting in better management decisions and BMP designs.

Isolation of MAR E. coli from Point Source and Non-Point Source Waterways Found Within the D.C. Metro-area

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We present a rapid and accurate procedure that generates Multiple Antibiotic Resistance (MAR) E. coli profiles of selected sites along the Anacostia River including point sources (PS) and non-point sources (NPS). Isolation of fecal contaminants was accomplished using filtration methods, MPN monitoring and inoculation of specifying media Hektoen Enteric, Desoxycholate, Simmons citrate, MacConkey's, and eosin Methylene blue (lactose) agars. In addition, growth on antibiotic inoculated LB media yielded a PS assay of MAR E. coli organisms showing on average 47% resistance to several commonly used β-lactams, synthetic quinolines, and aminoglycosides generally distributed by clinicians to treat such infections. Drugs tested include Streptomycin, Neomycin, Ampicillin, Chlortetracycline, Oxytetracycline, Tetracycline, Kanamycin, Chloramphenicol, Nalidixic Acid, and Quinoline. Follow-up studies from NPS loci yielded an assay of E. coli isolates with an average MAR level of 43%. Market saturation of antibiotics and their misuse has further increased the selective pressure for MAR organisms; therefore, drugs known to have recent and increased success in treatment for E. coli infection were used to differentiate isolates suspected to have plasmid transference of antibiotic resistance factors for specific drug groups such as β-lactams (i.e. β-lactamase producers). These drugs include Piperacillin, Ofloxacin, Nitrofurantoin, Cefoxitin, Geneticin, and Aztreonam. Our methodology may prove to be a valuable tool for identifying and monitoring sources of significant fecal (and non-fecal) contaminants of the capital waterways. Furthermore, the methods we have devised are ideally suited for the training of undergraduate students and will focus necessary interest on the microbiological ecology of our capitol waterways.

Expanding the Diversity of the Mid-Atlantic Tributary Assessment Coalition

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Following the release of the first Chesapeake Bay report card in 2006, environmental report cards have increasingly gained popularity and recognition as a public-friendly and scientifically sound method for reporting the health of a waterway. Recently, a number of watershed organizations in the Mid-Atlantic region have begun producing their own tributary-specific report cards. In 2009, the Mid-Atlantic Tributary Assessment Coalition (MTAC) was formed to foster collaboration among watershed organizations and fully develop the potential of region-specific environmental report cards. This is done through standardization of indicators, monitoring and sampling protocols, data analysis methods, and science communication techniques. A protocol document that describes these steps, from report card conception to production for tidal regions, will be available in late 2010, with a similar document for non-tidal regions to follow.

Current MTAC members represent a diverse range of systems and economic and social groups, but would like to expand further to incorporate more groups. For example, all of the current members are from groups that are primarily based in Maryland. A number of the groups are located in Anne Arundel County, one of the wealthiest counties in the state. Less wealthy counties are also represented, but not to the same degree. The types of systems represented are also uneven; currently MTAC encompasses a number of river systems, one coastal bays system, and one lake system.

Planned expansion of MTAC to include groups in other states and different types of ecosystems would allow for increased collaboration and knowledge-sharing pertinent to the region.

Creating Successful Outreach Programs in Your Community

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State and local government, and watershed groups need help controlling storm water runoff and Maryland residents can help. In order to improve water quality and quantity, Maryland residents need to become active stormwater stewards and control non-point source pollution at the source. Creative outreach and education programs engage citizen stewards beyond the classroom, and get them involved with residential storm water through incentive based and grant funded programs. This poster is meant to inform local government and non-profit staff and decision makers about how to engage citizens in watershed restoration and protection. It is important to develop awareness about successful outreach and education programs implemented across Maryland so that programs can be replicated. Programs include, "Rainscapes" programs, raingarden and rainbarrel programs and the Watershed Stewards Academy. Find out what these programs are about, how these programs were developed, and how to implement effective stewardship programs in your community.

Nutrient Removal Ability of a Stream Receiving Wastewater Effluent

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Although most nutrient management programs focus on nutrient sources, most stream channels have the capacity for substantial nutrient processing. Furthermore, for TMDL models it is important to know how in-stream processes can alter nutrient concentrations and for management purposes it is desirable to know if a stream is acting like a "sink" (able to absorb its load of nutrients) or like a "source" (nutrients transported through the system). The objective of this study was to determine the capacity of a stream, which is receiving WWTP effluent, to remove nitrogen and phosphorus.

Stream water and fine sediment were collected at 6 points along the length of St. Mary's Run on several dates. Stream water was analyzed for dissolved reactive and total phosphorus (DRP and TP, respectively), ammonium, nitrate, and sulfate. Sediments were analyzed for P buffering capacity and total P concentration.

The WWTP discharge dramatically increased nutrient concentrations just downstream. From there TP concentrations generally decreased to the mouth of the stream but did not reach pre-effluent levels indicating that the stream has some capacity to remove P. Ammonium-N concentrations also decreased steadily with distance from the WWTP while nitrate-N concentrations increased, suggesting rapid conversion of ammonium into nitrate. Inorganic-N remained elevated across the entire length of the stream suggesting that the stream was saturated with N. Estimates of P removal per unit length of stream channel (0.03 to 0.75 g m-1 d-1) varied with season.

Using Biological Stressor Identification to Direct Management Actions and Refine Integrated Report Listings

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In 2002, Maryland began listing biological impairments in category five of the Integrated Report of Surface Water Quality (IR). The 2008 IR lists seventy watersheds as having biological impairments that need to be addressed by 2015. Since these listings do not identify specific stressors or causes, Maryland Department of the Environment has developed a biological stressor identification (BSID) analysis that uses a case-control, risk-based approach to determine the predominant stressors and causes. The BSID uses data from the statewide Maryland Department of Natural Resources Maryland Biological Stream Survey to assess the condition of Maryland 8-digit watersheds. Upon BSID completion, stressors are identified as probable or unlikely causes of poor biological conditions within the watershed. These findings are used to direct management actions and refine biological listings on future IRs.

In 2009, a BSID was completed for the Cabin John watershed. The 2008 IR identified the watershed as biologically impaired with unknown sources. The BSID revealed three key findings. The BSID identified flow and sediment stressors related to urban sources. This finding supports the 1996 listing for total suspended solids and confirms that development of a TMDL for sediment is an appropriate management action. The analysis identified inorganic pollutant stressors related to urban sources. This finding revises the 2010 IR listing and requires the development of a TMDL. The analysis did not identify phosphorus as an impairing substance in the watershed and thus confirms that development of a Water Quality Analysis, and subsequent delisting, for phosphorus was the appropriate management action.

Development of a Relative Measure of Impervious Surface Based on Tax Data

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Fisheries managers are challenged by the prospect that regional climate change will exacerbate the impact of land development on the quality of fish habitat and associated fisheries resources. A recurring problem impeding management for quality fish habitat is the lack of a standardized, readily updated, and accessible land-use data set. Currently, impervious surfaces (IS; concrete, asphalt, and roofs) are used to measure watershed impact. However, the remote sensing methodology and update schedule for development of IS data sets is inconsistent. This data deficiency has lead to the development of alternate measures of watershed change. State tax data is one possible alternate measure since it reflects changes in how land is used, is annually updated, and is readily accessible. Here we present an analysis suggesting that tax data can be used as a relative measure of IS within a watershed. Additionally, we present two approaches for development of this index: linear regression and geographically weighted regression.

The New and Improved Eyes on the Bay

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The Eyes on the Bay web site (www.eyesonthebay.net) was launched in September 2003 by Maryland DNR to provide a simple map-based interface for citizens, managers and scientists to access Maryland's tidal water quality data. Over time, the web site has evolved to include satellite maps and data, water quality lesson plans, and a harmful algal bloom mapping application. In November of 2010, DNR will be launching a redesigned Eyes on the Bay that will include new Google Map-based applications, providing more direct access to data and analytical products such as dynamic current condition maps and a water quality status and trends application. The first phase of the re-launch will include a new tab-based home page interface linking to the new and existing map-based content. Over time, secondary levels of data charting will be redesigned to provide more dynamic and insightful presentations of data.

Land Development Impacts on Fish and Fish Habitat

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Many studies have documented the impacts of development on aquatic resources. Impacts range from localized effects that stress small streams (i.e. increased sedimentation in a first order stream), to cumulative effects downstream which can impact whole rivers or estuaries (i.e. increased runoff contributing to harmful algal blooms). These impacts are far reaching and the MD DNR Fisheries has compiled information and conducted studies that document these impacts to fish and fish habitat. These efforts support the understanding that healthy fish populations and habitats are dependant on rural landscapes. Because of this, we are supporting planning and zoning that considers aquatic resource needs and promotes fish and fish habitat protection. This poster is designed to communicate to anglers the importance of planning and zoning to for the future of fishing.

Anadromous Fish Stream Spawning Responds Negatively to Urbanization

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Stream sites in Mattawoman and Piscataway creeks where anadromous fish (yellow perch, white perch, and herring) eggs and larvae were collected during 1971 and 1989-1991 were surveyed during 2008-2009 to evaluate changes in spawning associated with urbanization. These creeks are adjacent watersheds in the path of development from Washington, DC. In 1973, urban cover accounted for 24% of Piscataway's watershed (closest to DC) and 12% of Mattawoman's. By 2000, urban land had increased to 40% of Piscataway Creeks' watershed and 26% of Mattawoman Creek's. Trained citizen volunteers sampled water quality and ichthyoplankton each weekend during March-May. Anadromous fish spawning declined in both systems between 1971 and 2009. Anadromous fish eggs and larvae, originally found at 6 Mattawoman Creek sites, were present at 3 sites in 2008 and 2 sites in 2009. Eggs and larvae of all three species groups were found in Mattawoman Creek during 2008, but only herring were collected in 2009. Five sites on Piscataway Creek had white perch or herring eggs and larvae in 1971, but only a single herring larva was found at 1 site during 2008-2009. Elevated conductivities in non-tidal Mattawoman and Piscataway creeks during 2008-2009 indicated that urbanization has impacted both spawning streams. Decreased spawning in Mattawoman Creek during 2009 may have reflected road salting after snowfall in March. Preliminary analysis of 2010 sampling in Mattawoman Creek indicates spawning may have take place at 4 sites.

Maryland Fish Consumption Risk due to PCBs

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The work presented is an effort to assess human health risks associated with carcinogenic chemicals found in fish caught in Maryland. The Maryland Department of the Environment (MDE) collects fish samples from Maryland waters annually. This study has targeted 2 years of sampling collected in 2008 and 2009. In the first year of study, polychlorinated biphenyl (PCB) congeners were measured in 35 composite fish tissue samples, from 13 fish species-collected from major Maryland waters in 2008. PCB concentrations in fish tissues were compared across geographical regions and to Maryland fish consumption advisory levels. Most samples have concentrations of PCBs<313ng/g (wet weight) which is Maryland's "no consumption" threshold. The greatest PCB concentrations were measured in white perch from the Patapsco River (369ng/g), which exceeded the MDE "no consumption" concentration level. The PCB congener concentrations in fish are used to track PCB transport and bioaccumulation patterns throughout Maryland waters. Fish consumption advisories usually recommend limiting or avoiding consumption of certain fish from specific water bodies. The data presented here are being used to help develop and update fish consumption advisories for Maryland waters.

How does the Nanticoke Watershed "Measure Up"?

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The Nanticoke Watershed Alliance has been monitoring at sites throughout the Nanticoke River system since 2007 and each year the data is published in a "State of the River Report." In 2009, the organization partnered with Chesapeake EcoCheck to create the first Nanticoke River Report Card. This new publication style provides a more meaningful interpretation of water quality data and can have more of an impact as a tool to promote river education and stewardship. See how the grades for the Nanticoke measure up compared to other rivers in the Chesapeake Bay, and where there is "a need for improvement."

Freshwater Sponges in the Mid-Atlantic Region

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A better understanding of freshwater sponges and their habitat in Mid-Atlantic States is needed. Spongillidae, the family of sponges (Porifera) that includes freshwater types are obscure, sessile, benthic, filter-feeding invertebrates that live in various freshwater systems. They filter organic particles from the water and also serve as a food source for other benthos. Freshwater sponges are potentially a biological control of the invasive Zebra mussel, *Dreissena polymorpha*. Water monitoring staff with the National Capital Region Network's Inventory and Monitoring Program (National Park Service) recently discovered colonies of freshwater sponges in Prince William Forest Park, Virginia. Klaus Ruetzler (Smithsonian Institute) identified it as Mueller's freshwater sponge, *Ephydatia muelleri*. Other recent observations indicate that these sponges may be more common than we know in Virginia and Maryland.

Little is known about these organisms due to the lack of research, specimens and published literature. Further study of freshwater sponges is necessary, including basic inventories of species and locations, as well as habitat and chemical characterization of where freshwater sponges are found. Because little is known about the presence and distribution of freshwater sponges, not only in the MD, DC, VA area but across the United States, this information should be widely distributed among natural resource professionals within the water monitoring community.

Chloride Levels from Road Salt in Seven Maryland Streams Following Winter 2009-2010 Record Snowstorms

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The use of road salt (NaCl) for deicing has led to heightened chloride in freshwater streams and negative impacts on their ecosystems. In this short-term study I determined chloride levels of four urbanized and three reference streams in three Maryland watersheds after two record-breaking snowstorms in February 2010. I hypothesized that chloride levels in the urban streams would be detrimental to aquatic biodiversity.

Methods: Water samples were collected twice (16 to 21 days after last snowfall) from a "most-impacted" and "least-impacted" stream in three watersheds – Lock Raven north of Baltimore and Anocostia 0822 and 8014 between Greenbelt and Cheverly. A seventh stream of moderate impact also was sampled. Stream selection was based on landscape and the number of road lanes crossing the stream within one mile upstream. Most-impacted streams had the greatest number of road-lane crossings in a watershed, whereas reference streams lay in forested areas with the least lane crossings. Conductivity readings were converted to chloride concentration using Morgan et al.'s equation (2007).

Results: Five sites had chloride concentrations ranging from 99.0 mg/L to 826.3 mg/L – levels detrimental to the diversity and community structure of aquatic biota. All streams had concentrations high enough to affect algal populations. Reference streams also incurred heightened chloride.

Implications: Road-salt use negatively affects biota in both urban and forested streams. If stream ecosystems are to be restored and protected, salt usage will need to be assessed, altered, and monitored. Watershed groups could adopt these procedures to monitor impacts to their local streams.

MARYLAND WATER MONITORING COUNCIL

16th Annual Conference

November 18, 2010

STANDING COMMITTEE REPORTS

Maryland Water Monitoring Council
Monitoring and Assessment Committee
2010 Annual Report

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2010 Accomplishments

1. Because of other work assignments given to the M&A Committee Co-Chairs and key Committee members, the Committee has not yet met in 2010 to follow-up on the Recommendations and Action Items that emerged from the

successful workshop held on November 17, 2009, at Arlington Echo Outdoor Education Center and titled Planning for the Future: Designing and Implementing a Climate Change Monitoring Network in Maryland's Non-tidal Waters. The workshop goal was to design and build a framework for a long-term (multi-decadal) statewide monitoring network focused on ephemeral aquatic habitats (e.g., vernal pools) and headwater streams---a network that can be used to detect/track the responses of these freshwater systems to climate change. About 60 people attended the workshop. The morning Plenary Session included talks from a US Department of Interior perspective (by Peter Murdoch, USGS), from EPA's perspective (by Britta Bierwagen, US EPA), from the Chesapeake Bay Program perspective (by Peter Claggett, USGS), from a state perspective (by Zoe Johnson, MD/DNR), and from a headwater streams/ephemeral pools perspective (by Robert Brooks, US Forest Service). The afternoon session included talks by Robert Hildebrand (UMD/AL) on thermal regimes for Maryland streams and by Andy Becker (MD/DNR) on the MBSS Sentinel Site Network. Bob Shedlock (USGS) facilitated a panel discussion and group brainstorming session.

2. Ron Klauda and other M&A Committee members attended the Stream Monitoring Roundtable held on March 3, 2010, at the USGS Water Science Center.

3. Ron Klauda and several DNR colleagues completed a technical report titled "Maryland Biological Stream Survey's Sentinel Site Network: A Multi-purpose Monitoring Program". The major goal of this report is to describe the temporal variability in conditions at 27 Sentinel Site Network (SSN) streams sampled annually by MD/DNR between 2000 and 2009. The secondary goal of this report is to present biological indicators as parts in a tool box of assessment parameters that could be used to track climate change effects on Maryland's non-tidal streams, and to conduct exploratory analyses of SSN date from the 10-year baseline of stream conditions against which future climate influences can be assessed.

4. Ron Klauda and Ken Belt organized a technical session at the 2010 MWMC Annual Conference titled "Climate Change and Adaptation: from Blacktop to the Bay".

5. Ron Klauda and John Clune organized a technical session at the 2010 MWMC Annual Conference titled "Innovative Methods for Water Monitoring".

6. Ken Belt organized a technical session at the 2010 MWMC Annual Conference titled "Urbanization and Eco-hydrology: Stormwater Management and Beyond".

2011 Goals

1. In 2011, the M&A Committee will work to find partners who can collectively implement a long-term monitoring network to track climate change effects in non-tidal streams, in response to recommendations and Action Items from the November 17, 2009, workshop. Committee member participation in this activity may include membership on specific work groups, planning/conducting training sessions, checking out proposed long-term network monitoring sites, etc.

2. The M&A Committee will also plan a workshop tentatively scheduled for early fall 2011 on integrated monitoring and planning. Workshop speakers and attendees will be asked to address this overarching question: "How can water resource scientists/managers help to ensure that safeguarding the suite of ecological services provided by healthy water bodies is mainstreamed into appropriate land use planning framework/policies and is reflected in the day-to-day activities of governmental planning and zoning organizations?"

Submitted by Ron Klauda and Jim Cummins, October 14, 2010.

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Index of Presenters, Speakers, and Affiliations

Speakers

Poster Presenters

Index of Presenters, Speakers, and Affiliations (Continued)

Affiliations

Glossary of Acronyms Used in this Program

AACC	Anne Arundel Community College
ABM	Active Biomonitoring
ACT	Agricultural Chemical Transport
ANNA	Assessment by nearest neighbor analysis
ANS	Audubon Naturalistic Society
AWS	Anacostia Watershed Society
BIBI	Benthic Index of Biotic Integrity
BMAP	Biological Monitoring and Assessment Program
BMP	Best Management Practice
BOD	Biological Oxygen Demand
BRM	Bureau of Resource Management
CAFO	Concentrated Animal Feeding Operation
CBF	Chesapeake Bay foundation
CBOS	Chesapeake Bay Observing System
CBP	Chesapeake Bay Program
CDC	Center of Disease Control
CWP	Centers for Watershed Protection
CERCLA	Comprehensive Environmental Response Compensation and Liability
CIPS	Chesapeake Inundation Prediction System
CO	Company
COMAR	Code of Maryland Regulations
CRA	Chester River Association
CUAHSI	Consortium of Universities for the Advancement of Hydrologic Science Inc.
CV	Curriculum Vitae
CWA	Clean Water Act
DEP	Department of Environmental Protection
DEPRM	Department of Environmental Protection and Resource
DMC	Data Management Committee
DMC	Data Management Committee
DNA	Deoxyribonucleic Acid
DNR	Department of Natural Resources
DO	Dissolved Oxygen
DO	Dissolved Oxygen
DOC	Dissolved Organic Carbon
DVD	Digital Video Disk
ED	Executive Director
EDCs	Endocrine Disrupting Chemicals
EMC	Event Mean Concentration
EPA	Environmental Protection Agency
EPA	Environmental Protection Agency
EPT	Ephemeroptera, Plecoptera, Tricoptera
ERP	Environmental Results Program
ESRI	Environmental Systems Research Institute
FPOM	Fine Particulate Organic Matter
GIS	Geographic Information Systems

Glossary of Acronyms (continued)

GPS	Global Positioning Systems
HAB	Harmful Algal Blooms
IBI	Index of Biotic Integrity
ICPRB	Interstate Commission on the Potomac River Base
IMR	Infant Mortality Rate
IOOS	Integrated Ocean Observing System
IS	Impervious Surface
ISC	Impervious Surface Cover
LIDAR	Light Detection and Ranging
LTB	Long-term Benthic
MACOORA	Mid Atlantic Costal Ocean Observing Regional Association Management
MARFC	Middle Atlantic River Forecast Center
MBSS	Maryland Biological Stream Survey
MDE	Maryland Department of the Environment
M-NCPPC	Maryland National Park and Planning Commission
MPA	Maryland Port Administration
MRA	Magothy River Association
MWMC	Maryland Water Monitoring Council
MWMC	Monitoring Assessment Committee
MWS	Master Water-shed Stewards
MYSQL	Structured Query Language
NAWQA	National Water- Quality Assessment
NBII	National Biological Information Infrastructure
NCRN	National Capital Region Network
NEPA	National Environmental Policy Act 1969
NOAA	National Oceanic & Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NSF	National Science Foundation
NSF-FUNDED	National Science Foundation
NTU	Nephelometric Turbidity Units
O/E	Observation/Expectation
OM	Organic Matter
OSDS	Onsite Sewage Disposal System
OSDS	On-site Sewage Disposal System
PAH	Polycyclic Aromatic Hydrocarbon
PBC	Polychlorinated Biphenyls
PC	Personal Computer
PCSWMM	Storm water Management Software
PELS	Probable Effects Levels
POM	Particulate Organic Matter
POTW	Publicly Owned Treatment Works
PTRC	Port Tobacco River Conservancy
QA	Quality Assurance
QC	Quality Control
RBP	Rapid Bioassessment Protocol

Glossary of Acronyms (continued)

RIVAPACS-STYLE	River Invertebrate Prediction and Classification System
RSC	Regenerative Stormwater Conveyance
SAV	Submerged Aquatic Vegetation
SCA	Stream Corridor Assessment
SHA	State Highway Administration
SMCRA	Surface Mining Reclamation and Control Act
SOP	Standard Operating Procedures
SPA	Special Protection Act
SRA	Sassafras River Association
SRP	Soluble Reactive Phosphorus
STORET	Storage and Retrieval
STP	Sewage Treatment Plant
TIR	Thermal Infrared Imaging
TMDL	Total Maximum Daily Loads
TN	Total Nitrogen
TND	Total Dissolved Nitrogen
TP	Total Phosphorus
TRI	Toxic Release Inventory
TSS	Total Suspended Solids
UMBC	University of Maryland Baltimore County
UMBC/CUERE	University of Maryland Baltimore County Center for Urban Environmental Research
UMCES	University of Maryland center for Environmental Science
USC	Urban Stream Continuum
USGS	United States Geological Survey
VADEQ	Virginia Department of Environmental Quality
VOC	Volatile Organic Compound
WB-WWTP	Western Branch Wastewater Treatment Plant
WQMO	Water Quality Management Office
WQX	Water Quality Exchange
WRAS	Watershed Restoration Action Strategy

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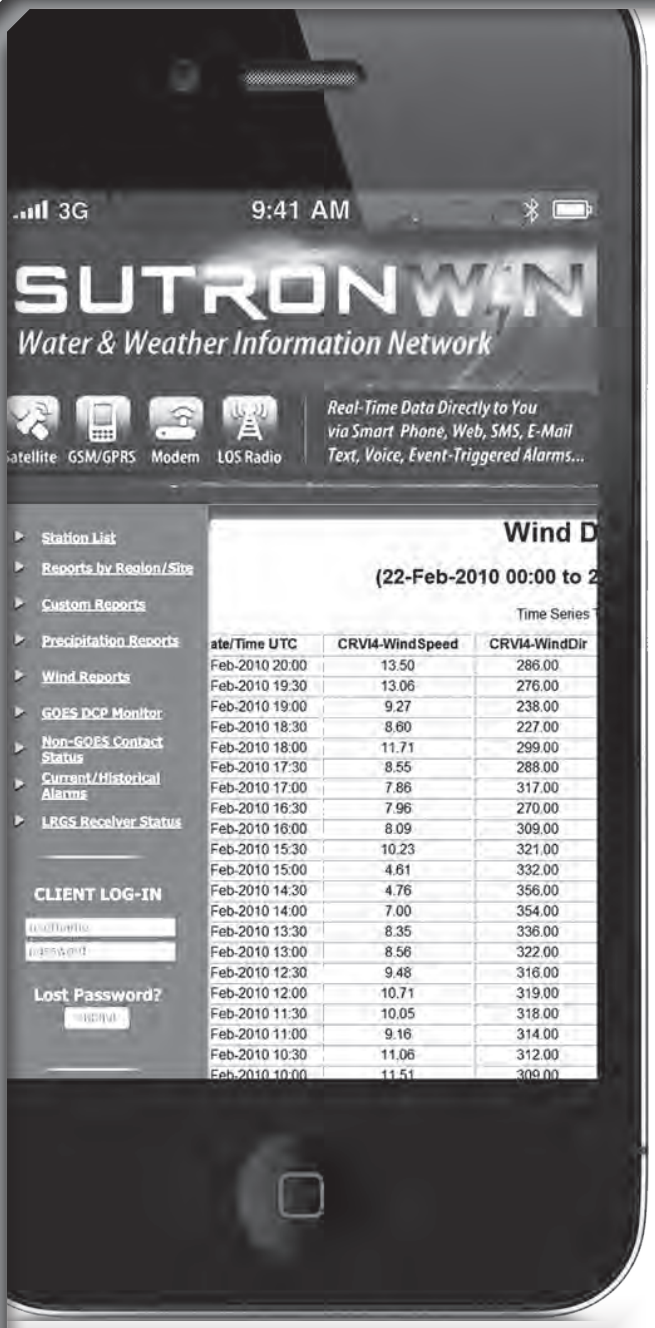

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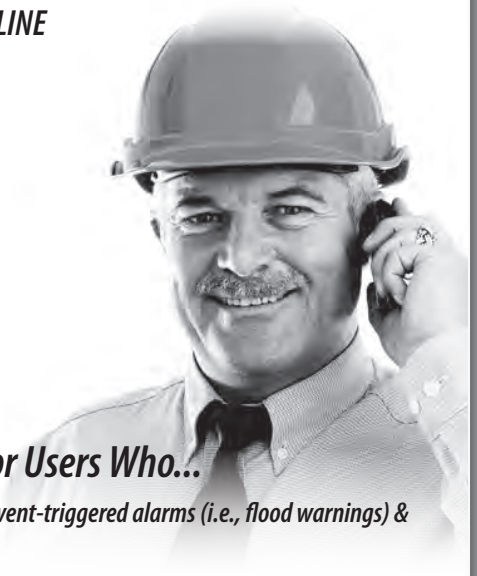

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