

**West Virginia Water Research Institute
Annual Technical Report
FY 2017**

Introduction

West Virginia Water Research Institute

The West Virginia Water Research Institute is dedicated to the preservation and restoration of the natural environment through research and outreach with industry, government agencies, academia and the public.

Introduction

Water is one of West Virginia's most precious resources. It is essential for life and our economic prosperity, yet so many of the activities that keep our economy alive, and growing, also threaten our water resources. Energy generation, mineral extraction, agricultural production and other industrial activities all impact our water, making it increasingly necessary to find new ways to protect and restore this vital commodity as our economic activity accelerates. For over 40 years, the West Virginia Water Research Institute (WVWRI) has been leading the important work of addressing these issues and is the go-to organization for solving West Virginia's water-related problems.

While much of the work we do is focused on exploring and implementing technologies to improve and protect the quality of our State's water resources, we are also dedicated to expanding the understanding of threats and opportunities related to this critically important resource. We strive to bring together a diverse cross section of stakeholders to participate in water-related research throughout West Virginia. We encourage a constructive and respectful dialog about the future of our lakes, rivers and streams as well as our groundwater supplies.

Today, the WVWRI continues to grow its established programs and develop new initiatives to address emerging problems affecting the State's environmental and economic health. With financial support from State and Federal partners, private foundations and industry, and through the efforts of our staff and collaborating researchers, the WVWRI continues to work for real improvements to West Virginia's water resources.

Water Research for West Virginia: A Team Approach

In 1967, under Federal legislation, the United States Geological Survey established the West Virginia Water Research Institute (WVWRI) to conduct research related to water issues in the State. Today, the WVWRI develops state water research priorities with oversight and guidance from the West Virginia Advisory Committee for Water Research, a committee represented by members of Federal and State agencies, academia and industry. Our programs and projects develop strong, multi-disciplinary research teams through collaboration with West Virginia University colleges and divisions, higher education institutions across the country and industry professionals. This team approach offers the best expertise available to address West Virginia's water issues and allows the WVWRI to perform research in a number of areas at any given time. More information on WVWRI programs, research, projects, initiatives and publications can be found at www.wvwri.org.

Funding Strategy

The Institute uses funding received from the U.S. Geological Survey Clean Water Act section 104b program and State funding to develop research capabilities in priority areas and to provide service to State agencies, industry and citizen groups. Our strategy relies on using the USGS section 104b funding to develop competitive capabilities that, in turn, translate into successful proposals funded by a broad spectrum of Federal and State agencies.

Our strategy also relies on maintaining a broad cadre of researchers within WVU and other institutions within the state. We also work with faculty from institutions across the country to form competitive research partnerships. As West Virginia University is the State's flagship research institution, its researchers have played the dominant role. Our funding strategy relies on successful competition for Federal dollars while teaming with State agency and industry partners. The latter provide test sites, in-kind support and invaluable background data. The institute has fifteen full-time and one part-time staff. We are adding two more full time staff positions this year. The Institute also supports numerous students; typically 3-4 GRA's and 2-3 undergraduate students within the WWRI and more through other departmental projects. All but two positions are supported entirely on external grant funds. Roughly two-thirds of the Institute staff is directly engaged in research projects; the remaining is engaged in community economic redevelopment, outreach, and administration.

Research Program Introduction

The Environmental Science, Technology, Engineering and Math (E-STEM) Research Program: West Virginia University/Boy Scouts of America was the initial phase of a research and education project centered on the Boy Scouts of America's (BSA) Summit Bechtel Reserve located in Mount Hope, West Virginia. Led by the West Virginia Water Research Institute (WVWRI), the project set up an ecological monitoring network that provides the framework for a robust and immersive environmental education curriculum intended for scouts and other youth organizations.

During the first year of the project, efforts were focused on installation of research equipment, collection of data, and development of an E-STEM curriculum. All curriculum has been developed and will be piloted and launched during year two of the project. Research equipment installed includes: one phenocam, one climate station, and two bioacoustics sensors. Data from the bioacoustics sensors was collected, analyzed, and produced into a report to identify the various bird and anuran species which populate the Summit Bechtel Reserve. The phenocam is functional; however, troubleshooting is still being done to obtain remote access to the data. The climate station is collecting data. This data is routinely collected and entered into a spreadsheet which will be used to identify long term climactic trends. In addition, the climate data will be a valuable asset for the BSA to help them determine when inclement weather is approaching.

The outcome of this project is two-fold. The first outcome is the establishment a long-term ecological monitoring station at the SBR that will become a valuable research tool. The second, and perhaps most significant outcome, is the exposure of large numbers of diverse student groups to environmental resource education in an outdoor classroom setting. The experience that these scouts will have at the SBR is unique because, not only will they learn the importance of ecosystem services and preserving freshwater and terrestrial resources through the collection and interpretation of real data, they will do so in conjunction with other experiences, outside of this project, that relate to enjoying clean freshwater (e.g., fishing and whitewater rafting). Thus, scouts will leave the SBR with a far greater understanding and appreciation for their environment than can be learned in any indoor classroom.

Children participating in this curriculum will get a unique experience to enjoy and learn about nature and E-STEM concepts in southern West Virginia. A great deal of children do not get to learn outdoors. Some studies indicate that 95% of their time is spent indoors (Wilson 1996). This can be disadvantageous for several reasons. One being, without having those formative years exploring the outdoors, the child can lack developing positive interactions with the natural environment. Children learn best through immersive, hand-on activities (Wilson, 1996). This curriculum can give them the hands-on learning and the ability to think critically so they can see the value in various ecosystems and foster an ongoing respect for those ecosystems. The participating scouts will also get an inside look at what professions are available in the natural resource field, the research tools used in data collection, and how organizations can make a difference in natural resource management. Using the project research as the backdrop, the interpretive and curriculum parts of this project work together to develop an integrated suite of informal and formal E-STEM education components.

A presentation about this project was developed and delivered at the 2017 Mid-Atlantic Water Resources Conference in October 2017.

Information transfer was focused on phase 2 of this project, implementing the developed E-STEM curriculum at the 2017 National Scout Jamboree in July 2017.

Research Program Introduction

Wilson, A. R., (1996), *Starting Early: Environmental Education during the Early Childhood Years*, ERIC Digest, ERIC Clearinghouse for Science, Mathematics, and Environmental Education, Columbus, OH.

Phase 2: Environmental STEM (E-STEM) Research Program: West Virginia University/Boy Scouts of America Summit Bechtel Reserve 2017 National Scout Jamboree

Basic Information

Title:	Phase 2: Environmental STEM (E-STEM) Research Program: West Virginia University/Boy Scouts of America Summit Bechtel Reserve 2017 National Scout Jamboree
Project Number:	2017WV230B
Start Date:	3/1/2017
End Date:	2/28/2019
Funding Source:	104B
Congressional District:	WV-001
Research Category:	Climate and Hydrologic Processes
Focus Categories:	Climatological Processes, Ecology, Water Quality
Descriptors:	None
Principal Investigators:	Paul Ziemkiewicz, Andrew Stacy

Publications

There are no publications.

Phase 2: Environmental STEM (E-STEM) Research Program: West Virginia
University/Boy Scouts of America Summit Bechtel Reserve 2017 National Scout
Jamboree

Annual Report

Reporting Period: March 1, 2017 - February 28, 2018

Principal Authors:

Megan Kruger

Report Issued May 2018

USGS Project No. 2017WV230B

West Virginia Water Research Institute

West Virginia University

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Abstract

In 2016 with support from the US Geological Survey, the West Virginia Water Research Institute (WVWRI) began development of a research and education program centered on the Boy Scouts of America's Summit Bechtel Reserve, near Oak Hill, WV. The program introduces scouts to the environmental STEM field, particularly the aquatic sciences, while using the site as an aquatic observatory/laboratory. Over the past year, the WVWRI has developed an environmental STEM curriculum, which will be referred to as "E-STEM" from this point forward. This program engages youth by incorporating fun, hands-on educational activities and environmental science technology into a suite of curricula.

The Summit Bechtel Reserve is the BSA's fourth high adventure camp and is the permanent home for the National Scout Jamboree, which is held every four years. The National Scout Jamboree was held in July of 2017. During this event, around 30,000 scouts from across the United States and World attended. This presented a unique opportunity to engage a large number of scouts and their leaders with the E-STEM curriculum.

It is anticipated that by introducing scouts to the E-STEM curriculum during their formative years will increase an interest and appreciation to the environmental sciences and furthermore increase interested in pursuit of a career in this field.

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Executive Summary

Phase 2: Environmental STEM (E-STEM) Research Program: West Virginia University/Boy Scouts of America Summit Bechtel Reserve 2017 National Scout Jamboree is an outreach and education project centered on the Boy Scouts of America's (BSA) Summit Bechtel Reserve located in Mount Hope, West Virginia. Led by the West Virginia Water Research Institute (WVWRI), phase 1 of this project set up an ecological monitoring network that provides the framework for a robust and immersive environmental education curriculum intended for scouts and other youth organizations. Phase 2 created the ability to add on additional water quality monitoring activities and created an E-STEM activity book that was able to be implemented at the 2017 National Scout Jamboree.

During phase 2, additional water quality sensors and kits were purchased, additional signage was developed, and a 41-page activity book was written, designed, printed, and distributed at Jamboree. A program patch was designed and produced for program participants and ecological interpretation of the forest was developed for the onsite canopy tour.

The project had great success, with over 2,000 scouts engaged during the 10-day National Scout Jamboree.

Site Descriptions

Sustainability Treehouse

The Sustainability Treehouse (Figure 1) is a high traffic area near Scott Summit Center. It provides visitors with an immersive, interpretive, and educational experience that echoes the importance of sustainability. Visitors walk through three floors of interactive exhibits to gain knowledge about ecological concepts and green buildings.

John Gottschalk Boardwalk & Causeway

The John Gottschalk Boardwalk & Causeway (Figure 1), frequently called the wetland boardwalk, is a high traffic area bordering Goodrich Lake. This boardwalk connects the scout's camp sites to Scott Summit Center. This boardwalk transects a created wetland that hosts traditional West Virginia flora and fauna.

Goodrich Lake

Goodrich Lake (Figure 1) is the primary water body at the SBR. It is divided into two sections (east and west) separated by a land bridge. The lake is located at the center of the SBR making it a highly frequented area for scouts. The lake is used for numerous activities including fishing, kayaking, and paddleboarding. The John Gottschalk Boardwalk and Causeway runs the length of Goodrich Lake East.

The Canopy

The Canopy consists of several canopy tours that have an average of five platforms that are elevated from the forest ground. Participants ride zip lines to each of these platforms (Figure 2). This gives them a unique perspective of the forest. Each tour has several trained guides stationed on the platforms to assist participants. The red line and yellow line tours are led by trained West Virginia University (WVU) guides. These guides will present the interpretive education curriculum to participants about forest ecosystem services.

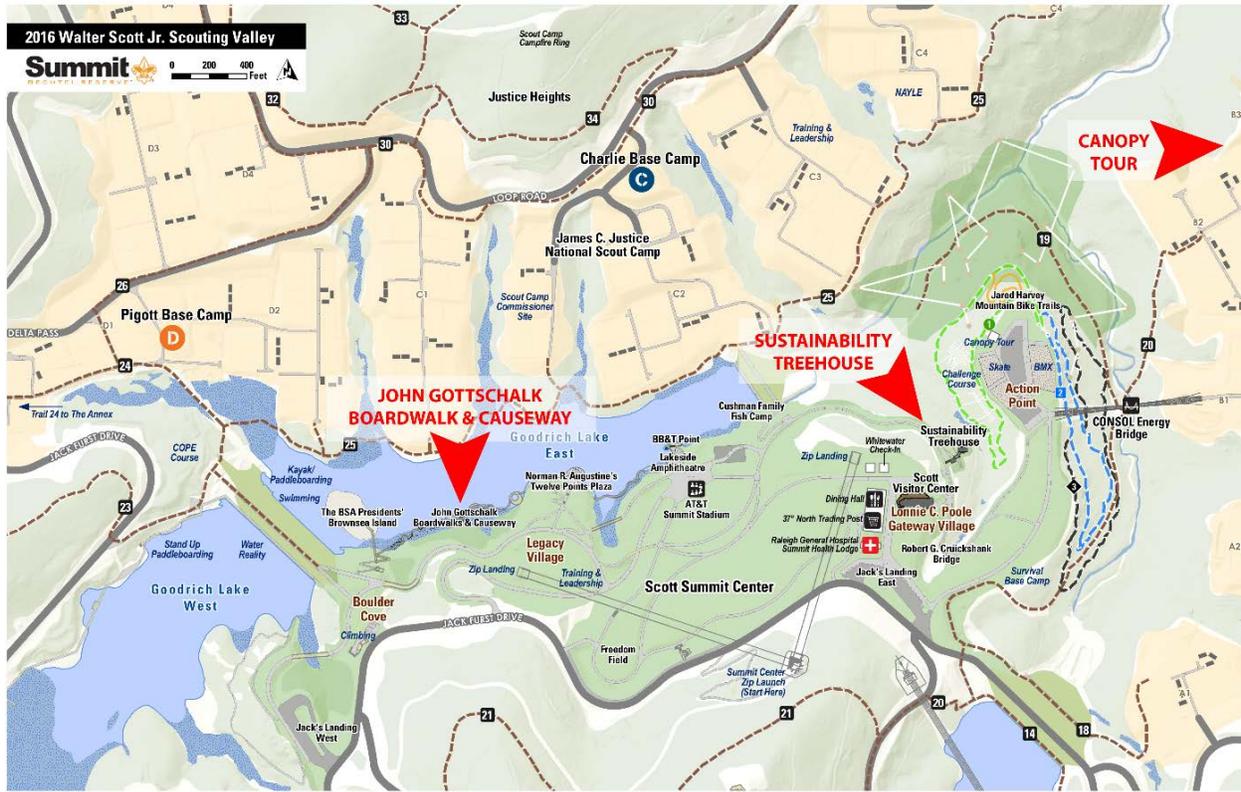


Figure 1. The location of the John Gottschalk Boardwalk & Causeway, Sustainability Treehouse, Goodrich Lake, and the Canopy (Summit Bechtel Reserve, 2016).

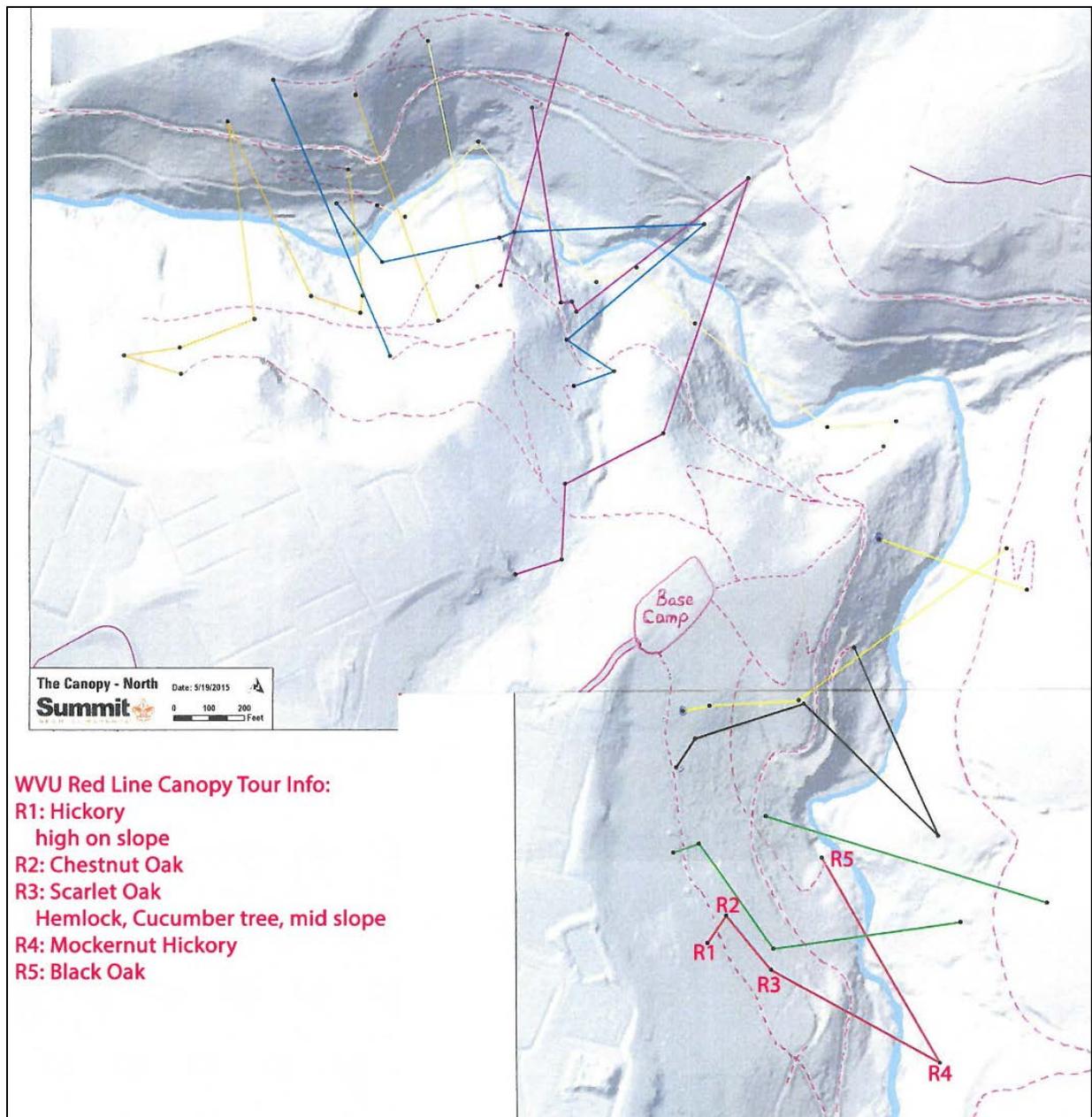


Figure 2. The various canopy tours that are available to participants. Our interpretive education curriculum was implemented on the red and yellow line tours (Boy Scouts of America, n.d.).

Problem and Research Objectives

West Virginia is primarily a rural state with mountainous terrain and a multitude of freshwater streams and rivers. These surface water and groundwater resources are in demand by a variety of interests including energy production (coal, oil, and natural gas), agriculture, residential drinking water, and recreation. Judicious, responsible uses of these water resources is critical for maintaining an adequate quantity of quality water for human consumption and economic productivity.

Laws, policy, and regulation can only do so much to protect water resources. Educating human beings to understand the balance of using water judiciously for multiple purposes is tantamount to enhancing quality of life from health to economic wealth.

In 2009, the Boy Scouts of America (BSA) announced a permanent location for the National Scout Jamboree at Bechtel Summit near Oak Hill, WV. This fully operational facility serves as BSA's fourth high adventure base and as a summer camp and leadership center. The site is adjacent to the New River Gorge National River with more than 13 miles of the property bordering the park. Scouts have access to more than 70,000 acres of managed, Appalachian highlands wilderness beyond the Summit property. Up to 40,000 scouts are expected to be on site for the 2017 Jamboree with about 20,000 cycling through the site every two weeks during the remainder of the summer.

This presents an excellent opportunity to introduce scouts to the E-STEM field by using the site as an aquatic ecology observatory/laboratory. West Virginia University's (WVU's) Water Research Institute

(WVWRI) and BSA Summit Bechtel have assembled a program to establish a long-term relationship to develop E-STEM education and research opportunities for America's next generation centered on the Summit Bechtel facility.

The following statement on the BSA Summit web site says it best: "The Summit is a training, Scouting, and adventure center for millions of youth and adults involved in the BSA. The Summit is more than just a place for Scouts; it's where future leaders are shaped" (www.summitbsa.org).

The Leadership Center at Bechtel Summit offers courses for not only youth, but also for adult volunteers and professionals for them to develop leadership and program delivery skills. Introducing an environmental education and research program to the Scouts and their adult leaders will give them hands-on training to carry back to their communities within West Virginia and nationwide. The hope is that the environmental education program will give participants a sound appreciation of our water resources, the need to use them wisely, and pass on such information to others in their lives.

In addition, this exposure of Scouts to WVU faculty and researchers will provide an opportunity to recruit high quality STEM students to WVU.

Methodology

Phase 2 expanded on the initial STEM Research curriculum by developing an activity book and connecting scouts to both water quality monitoring and technology transfer using a continuous monitor sonde and multi-parameter test kits. This project implemented the E-STEM curriculum at the 2017 National Scout Jamboree at Summit Bechtel Reserve.

We developed a 41 page E-STEM Activity Book, established a water monitoring component to the E-STEM research program and developed a self-guided curriculum for the 2017 National

Scout Jamboree An interpretive sign was also developed and placed near the stream with instructions on how to use Bluetooth to connect to the sonde and see the live water quality data.

Scouts that attended the 2017 Jamboree will completed four out of 8 self-guided E-STEM activities from the activity book, and upon successful completion were awarded a program patch. To interact with the scouts, we set up a tent near the wetland boardwalk for all ten days of Jamboree. We introduced scouts to the curriculum, and if they were interested they could take an activity book and complete it during the Jamboree. Once completed, they brought the book back to receive their E-STEM patch.

Scouts also had the opportunity to sign-up to complete water quality testing on the wetland boardwalk via Hach kits.

Principal Findings

Our program tent was in Boulder Cove at the beginning of the Conservation Trail. This was a good fit for us and exactly where we wanted to be placed. It was a high traffic area and located near the wetland boardwalk where most of our activities were focused. Overall, we handed out 2,250 activity books and 1,580 patches. We engaged with 42 female scouts and 24 international scouts. Most completed activities included the: waterbird survey, anuran survey, phenophase bingo, water quality testing, and canopy tour. This program was beneficial to scouts that had never been to West Virginia before, as they got to learn and observe a West Virginia stream, wetland, and lake. Scouts were very interested in learning about the water quality of the stream, what species lived in what habitats, and how their actions could impact these environments.

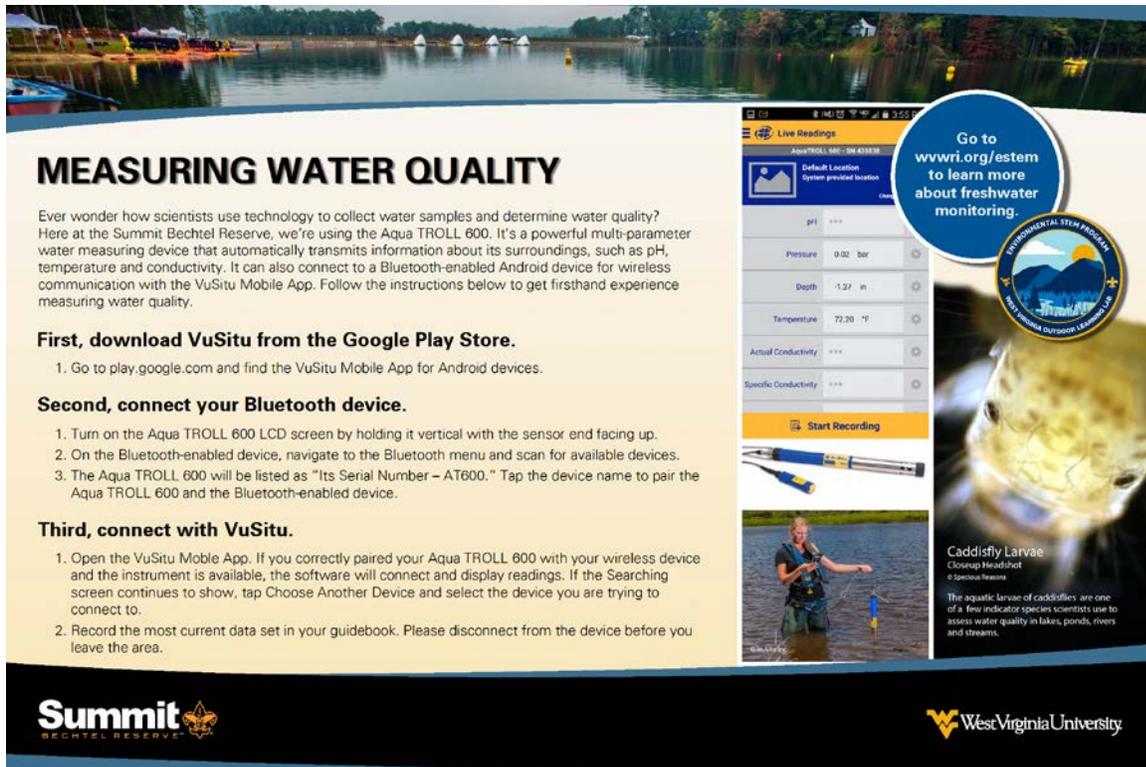


Figure 3: Interpretive sign that was developed and placed near the stream where the water quality sonde was located



Figure 4: E-STEM Patch that was developed and given out to scouts that completed the program

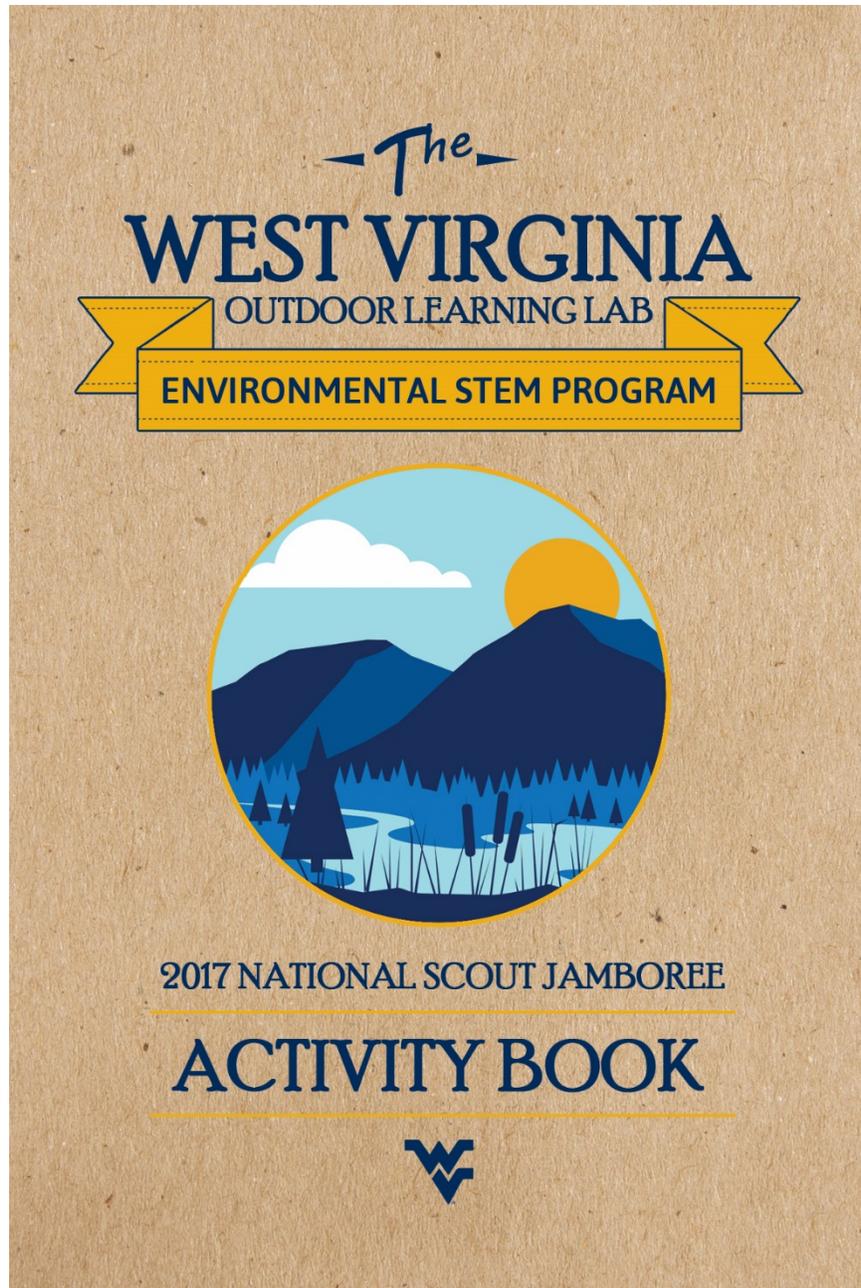


Figure 5: The front cover of the E-STEM Activity book that was developed and distributed at the 2017 National Scout Jamboree



Image 1: Our tent at Jamboree



Image 2: Our staff helped scouts complete activities to earn their patch. This gave scouts the opportunity to interact with environmental professionals

Significance of the Project

This project had a significant impact due to the reach of impact. Over 2000 national and international scouts were engaged and were educated about West Virginia's aquatic resources, climate, and wildlife. Scouts were also able to see how scientists study the environment and what careers they hold.

This project gained wide attention from WVU and BSA. After jamboree, BSA wanted more E-STEM programming at Summit Bechtel that was geared to the K-12 schools. Funding was found and allocated to develop a field trip version of this program in May 2018.

References

Boy Scouts of America. (n.d.). Canopy Tour Map. Retrieved from WVU 2017 Jamboree Canopy Tour planning meeting on January 19, 2017.

Summit Bechtel Reserve. (2016). 2016 Walter Scott Jr. Scouting Valley Map. Retrieved from <http://www.summitbsa.org/wp-content/uploads/2016/04/2016-04-19-SummerProgramsMapSet.pdf>

Publications

No publications were produced during the first year.

Information Transfer Program

This program was able to reach over 2000 scouts during the 10-day Jamboree. Media attention was also gained, a clip of our tent and program aired on local news and the Summit posted a live feed of our phenocam and a description of our program on their website.

Notable Achievements and Awards

Notable achievements include being asked to speak at the groundbreaking of the Summit Bechtel Reserve's new Steven A. Antoline Family Conservation Center that will be built onsite and used to educate scouts and youth about the environment and conservation. Our work is intended to be present in this building in some capacity. Other achievements include being personally thanked by a handwritten letter by the former Director of the Summit Bechtel Reserve about the work we are doing there. Lastly, we were awarded additional monies from the BSA to develop and implement a two-week long STEM camp for 5th and 6th grade at Summit Bechtel reserve. Additional funds are currently being sought after to continue the K-12 STEM camps at Summit Bechtel Reserve.

Information Transfer Program Introduction

Most years, the WVWRI either holds an independent state water conference or teams with one or more of the other Mid-Atlantic Region WRI's.

In October 2017, the WVWRI teamed with the other Mid-Atlantic WRI's to host a Mid-Atlantic regional conference in Shepherdstown, WV.

This collaborative effort serves to expand knowledge of Mid-Atlantic region water issues and research and strengthens the partnership between the participating WRI's.

2017 Mid-Atlantic Water Resources Conference

Basic Information

Title:	2017 Mid-Atlantic Water Resources Conference
Project Number:	2017WV228B
Start Date:	3/1/2017
End Date:	2/28/2018
Funding Source:	104B
Congressional District:	WV-001
Research Category:	Not Applicable
Focus Categories:	Education, Management and Planning, Law, Institutions, and Policy
Descriptors:	None
Principal Investigators:	Tamara Vandivort, Andrew Stacy

Publications

There are no publications.

**2017 Mid-Atlantic Water Resources Conference
October 12-13, 2017**

USGS Project No. 2017WV228B

Final Report

The West Virginia Water Research Institute partnered with the other Mid-Atlantic region WRRIs to hold the two-day Mid-Atlantic Water Resources Conference.

The conference theme was *Water Research: Building Knowledge and Innovative Solutions* and was held at The National Conservation Training Center in Shepherdstown, West Virginia.

A request for abstracts was sent out via email from the participating Institutes. Seventy three abstracts were received. These consisted of 56 oral and 17 poster abstracts. Two keynote speakers were selected and invited to attend.

Keynote speakers included:

- Austin Caperton, Cabinet Secretary, West Virginia Department of Environmental Protection
- Dr. Thomas Graziano, Director of the Office of Water Prediction, National Weather Service

Day 1 of the conference started with a 90 minute panel session with the participating State Water Institute Directors. The directors were asked to speak to how their water research institutes address water issues through research.

After a 30 minute networking break, WVWRI director Paul Ziemkiewicz introduced the first keynote speaker, Austin Caperton, Cabinet Secretary for the WV Department of Environmental Protection.

Following a lunch provided to all participants, three 70 minute concurrent sessions were held on:

- Using Models for Watershed Management (3 speakers);
- Reducing the Impacts of Stormwater Runoff (3 speakers); and
- Insights into Groundwater (3 speakers).

Directly following, another three 70 minute concurrent sessions were held on:

- Understanding the Water Budget (3 speakers);
- Quantifying Stormwater Treatment (3 speakers); and
- Gaining Insights from Invertebrate Organisms (3 speakers).

After a 30 minute networking break, three 90 minute concurrent sessions were held on:

- Forecasting Droughts and Floods (4 speakers);
- Monitoring and Managing Pollution from the Urban Environment (4 speakers); and
- Gaining Insights from Vertebrate Organisms (4 speakers).

Following a provided dinner, a networking reception and poster session was held from 7:00 pm – 9:00 pm. Appetizers were provided from 8:00 pm – 9:00 pm.

Day 2 of the conference began with a keynote address by Dr. Thomas Graziano, Director of the Office of Water Prediction within the National Weather Service.

Following a networking break, three 110 minute concurrent sessions were held on:

- Monitoring Water Quality (5 speakers);
- Improving Watershed Management (5 speakers); and
- Water-Energy Nexus: Meeting Challenges and Finding Solutions (5 speakers).

After a lunch provided to all participants, two 110 minute concurrent sessions were held on:

- Innovative Technologies for Data Collection and Management (5 speakers); and
- Networks and Partnerships with a Focus on Water Research (4 speakers)

A conference website with a specific URL was developed to host information on the event, agenda, online registration, information on the facility, lodging, and other pertinent information. Presentations from the event were made available on the conference website at: midatlanticwrc.org

In addition to support from the USGS, additional sponsorship support came from:

- West Virginia Department of Environmental Protection – Water Use Section;
- West Virginia Oil and Natural Gas Association;
- Environmental USA;
- Xylem, Inc.;
- Innovyze;
- Geo Decisions;
- Eastern Panhandle Conservation District;
- Acer Environmental LLC; and
- Pennsylvania Water Research Institute.

Registration fees were charged to cover food and venue costs associated with the event. Some of the sponsorship money was used to provide scholarships to students and non-profit professionals. We received 33 applications, and 17 were selected to receive scholarships. This covered their conference registration fee. Out of the 17 awarded, 10 attended the conference.

There were 153 attendees, including presenters. Attendees included academia, industry, regulatory agencies, city, municipal, state and federal government agencies,

legislators, watershed associations, private non-profits, and others. Several students played active roles in presenting research in oral and poster sessions.

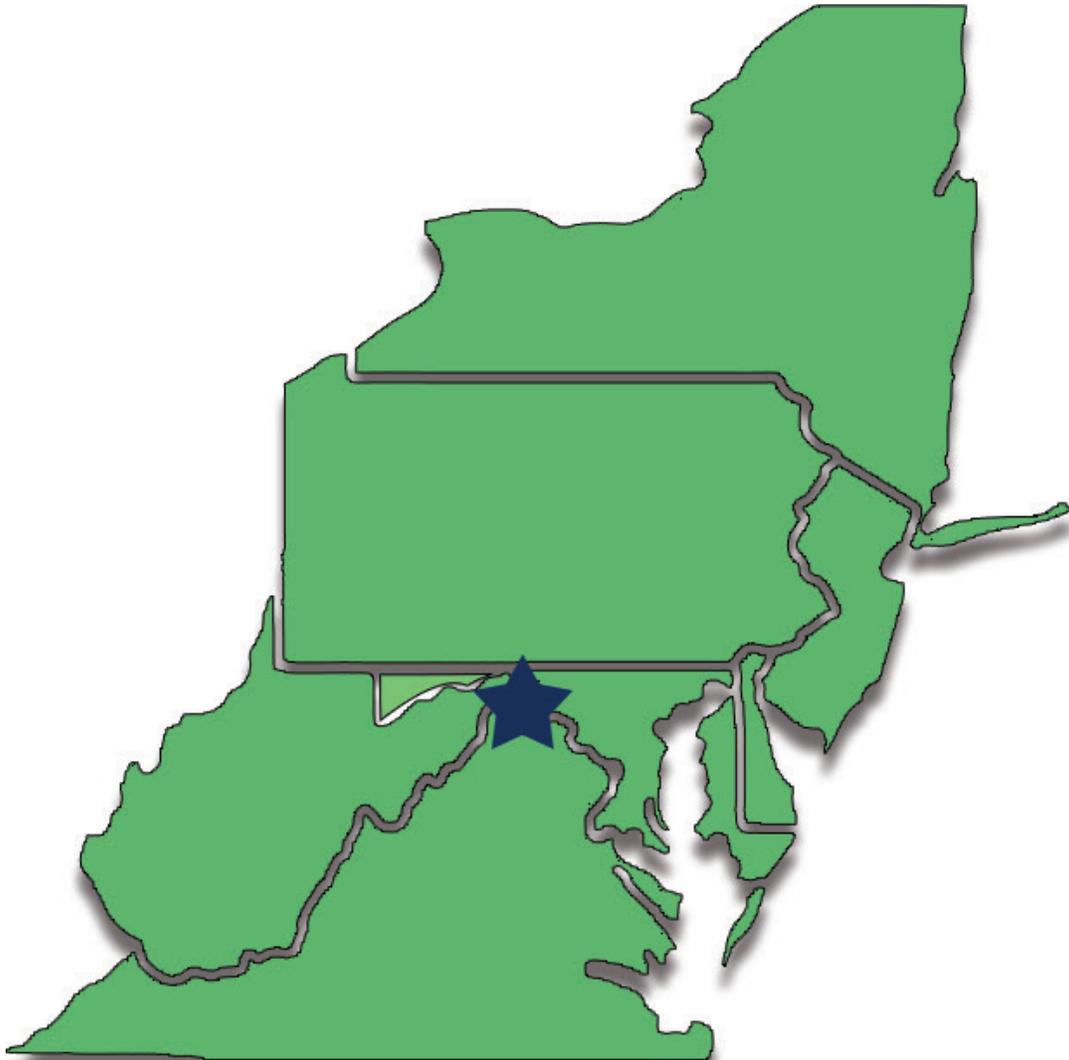
A 14 question follow-up survey was sent to all participants and the overall response was positive. When asked to rate the conference overall, 46.5% answered “excellent” and 51.2* answered “good” on a scale of “poor” to “excellent”. Participants enjoyed the networking opportunities the conference provided, knowledge of the speakers, and the research topics.



2017

Mid-Atlantic Water Resources Conference

PROGRAM



October 12th & 13th
National Conservation Training Center
Shepherdstown, West Virginia

YOUR HOSTS

The 2017 Mid-Atlantic Water Resources Conference is hosted by the Mid-Atlantic Water Resources Research Centers, the U.S. Geological Survey, and the West Virginia Department of Environmental Protection. Join the directors of these water research centers as they take part in the panel session 'Addressing Water Issues Through Research' on Thursday from 8:30-10:00am in the Entry Auditorium. Thanks for attending and we hope you enjoy the conference!



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Cornell University



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Penn State



KAYE BRUBAKER, PH.D.
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Maryland Water
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University of Maryland



STEPHEN SCHOENHOLTZ, PH.D.
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PAUL ZIEMKIEWICZ, PH.D.
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TOLESSA DEKSISSA, PH.D.
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D.C. Water
Resources Research Institute
University of the District of Columbia



CHRISTOPHER OBROPTA, PH.D.
Director
New Jersey Water
Resources Research Institute
Rutgers University



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Brian A. Carr
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Extension 1757

Meet the DEP Water Use Section

The West Virginia Water Resources Protection and Management Act identified the need for the protection and conservation of our state's water resources. It recognizes that a comprehensive assessment of the availability and use of our state's water will benefit the citizens of West Virginia: WV Code §22-26.

Important Links:

WV Department of Environmental Protection
www.dep.gov

For access to the Water Use Section page and the Water Withdrawal Guidance Tool.

WV Water Plan

<http://www.dep.wv.gov/WWE/wateruse/WVWaterPlan/>

For access to the WV Water Resources Management Plan



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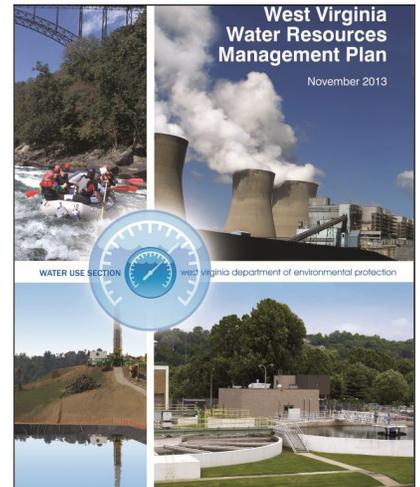
- Current Projects:**
- West Virginia Water Resources Management Plan Implementation
 - Arc View GIS Internet Based Water Information Tool
 - Large Quantity Water Users Survey (electronic submission)
 - Consumptive Water Use Study
 - Water Management Plans for Horizontal Wells
 - Geophysical Well Logging - Ground Water Aquifer Study
 - Mine Pool Study - Location, Quantity, Quality and Sustainability
 - Above Ground Storage Tanks ZCC, ZPC and SWPA's

DEP Water Use Section
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Charleston, WV 25304
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Email: DEP.Water.Use@wv.gov



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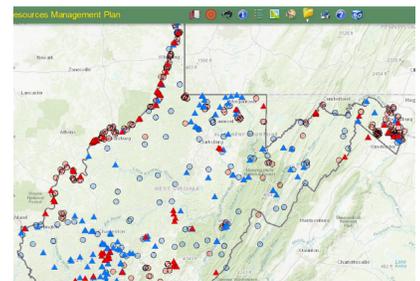
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To access the GIS Map Tool
<http://tagis.dep.wv.gov/WVWaterPlan/>



KEYNOTE SPEAKER



AUSTIN CAPERTON

Cabinet Secretary
West Virginia Department of
Environmental Protection

PLENARY SESSION

Entry Auditorium
Thursday, October 12, 2017
10:30 am - 11:30 am

ABOUT CABINET SECRETARY CAPERTON

In January 2017, Austin Caperton was appointed by Governor Jim Justice as Cabinet Secretary for the West Virginia Department of Environmental Protection.

Combining extensive executive experience with engineering and law degrees, Cabinet Secretary Caperton has provided strategic direction, acquisition, disposition, financing, workout, and project-oriented services to clients primarily in the coal, energy and related fields. Since 1989, Cabinet Secretary Caperton has generated and managed transactions for clients and consulted on a wide range of management functions, including operations, sales and finance.

Cabinet Secretary Caperton is a graduate of the WVU College of Law (1976) and Virginia Tech Mining Engineering (1973).

DIRECTORSHIPS

Beckley Area Foundation (Past)

Beckley - Raleigh County Chamber of Commerce (Past)

Forward Southern West Virginia Inc. (Non-Profit Economic Development)

Raleigh County (WV) Solid Waste Authority

United Bank WV (Past)

West Virginia Council for Community & Economic Development (Past)

West Virginia Golf Association Foundation (Past)

West Virginia Public Energy Authority, Vice Chairman (Past)

West Virginia Graduate College Foundation (Past)

West Virginia Kids Count Fund (Past)

MEMBERSHIPS

Eastern Mineral Law Foundation (Past)

Governor's Partnership for Progress Council, Co-Chairman (Past)

National Coal Association (Past)

United Way Southern WV, Campaign Chairman (Past & 2017)

West Virginia Coal Association (Past)

West Virginia Coal Mining Institute

West Virginia Land & Mineral Owner's Association

West Virginia State Bar

KEYNOTE SPEAKER



THOMAS GRAZIANO

Director
Office of Water Prediction
National Weather Service

PLENARY SESSION

Entry Auditorium
Friday, October 13, 2017
8:30 am - 9:30 am

ABOUT DR. GRAZIANO

Dr. Thomas Graziano is the Director of the Office of Water Prediction within the National Weather Service. The OWP collaboratively researches, develops and delivers state-of-the-science national hydrologic analyses, forecast information, data, decision-support services and guidance to support and inform essential emergency services and water management decisions nationwide.

Dr. Graziano has held numerous leadership roles over 30 years of Federal service, most recently serving as the Chief of Staff for the National Weather Service from November 2013 to January 2016.

From 2000 to 2013, Dr. Graziano worked in hydrologic services, most notably as the Chief of the Hydrologic Services Division at NWS Headquarters. He was responsible for leading the development of NWS plans, policies, and procedures for hydrologic warning and forecast operations. Dr. Graziano was also deeply involved in the implementation of the Advanced Hydrologic Prediction Service, the establishment of the Integrated Water Resources Science and Services Consortium with the U.S. Geological Survey, U.S. Army Corps of Engineers, and the Federal Emergency Management Agency, and the programmatic plans and construction of the new National Water Center in Tuscaloosa, Alabama.

Dr. Graziano holds a Ph.D. in Atmospheric Science from North Carolina State University (1995), a Master of Science degree in Meteorology from Penn State (1985), and a Bachelor of Science degree in Meteorology from Northern Illinois University (1981).

THURSDAY, OCTOBER 12, 2017

6:30-8:00am BREAKFAST

Commons (Included with conference registration)

7:30am-4:30pm REGISTRATION

Entry Auditorium

8:30-10:00am PANEL SESSION

Entry Auditorium

WELCOME

Stephen Schoenholtz, Virginia Water Resources Research Center

PANEL SESSION

Moderator: Paul Ziemkiewicz, West Virginia Water Research Institute

Water Institutes: Addressing Water Issues Through Research

Mid-Atlantic State Water Research Institute Directors

10:00-10:30am NETWORKING BREAK AND EXHIBITOR EXPO

Instructional West

10:30-11:30am KEYNOTE SESSION

Entry Auditorium

INTRODUCTION

Paul Ziemkiewicz, West Virginia Water Research Institute

KEYNOTE SPEAKER

Austin Caperton, Cabinet Secretary,
West Virginia Department of Environmental Protection

11:30am-12:40pm LUNCH

Commons (Included with conference registration)

12:30-2:00pm WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION ROUNDTABLE

Instructional East - Room 111

****Intended for WV State Agency Representatives****

WELCOME AND OPENING STATEMENTS

Brian Carr, West Virginia Department of Environmental Protection

INTRODUCTIONS

COMPILING THE TOP TEN WATER RESOURCE ISSUES FACING WEST VIRGINIA

ADJOURN

THURSDAY, OCTOBER 12, 2017

12:40-1:50pm BREAKOUT SESSION I TRACK 1A - USING MODELS FOR WATERSHED MANAGEMENT

Entry Auditorium

Moderator: Luke Juran, Virginia Water Resources Research Center

- 1) **Prioritizing Lands to Protect Our Waters: A Strategic Approach with Virginia ConservationVision**
Kirsten Hazler – Virginia Department of Conservation & Recreation
- 2) **Impacts of Interpolation Schemes on Critical Source Areas Identification for Non-Point Source Pollution Control Based on SWAT Model**
Ali Alnahit – Clemson University
- 3) **Nutrient Modeling Tools and Training to Empower States to Meet Their Modeling Needs**
Amanda Howell – U.S. Environmental Protection Agency Region 4

TRACK 1B — REDUCING THE IMPACTS OF STORMWATER RUNOFF

Instructional West - Room 161

Moderator: Gerald Kauffman, Delaware Water Resources Institute

- 1) **Retrofitting Stormwater Management Facilities - Benefits and Challenges**
Juni Shahjabin Alam - Greenman-Pedersen, Inc.
- 2) **Effects of Semi-Permanent Structures (HabiTubes & Habi-Mats) on Benthic Populations in Restored Streams**
Thomas Dombrowski, Prince William County Environmental Services
J. Patrick Barber, Acer Environmental, LLC
- 3) **Pervious Concrete for Impervious Landscapes: Hydrologic Function and Regulatory Credit**
Stu Schwartz - University of Maryland Baltimore County

TRACK 1C - INSIGHTS INTO GROUNDWATER

Instructional West - Room 160

Moderator: Tamara Vandivort, West Virginia Water Research Institute

- 1) **Borehole Geophysical Characterization of Fractured-Rock Aquifers in West Virginia**
Mark Kozar - U.S. Geological Survey
Mitch McAdoo - U.S. Geological Survey
- 2) **Emerging Information on Groundwater of the Virginia Eastern Shore**
E. Randolph McFarland - U.S. Geological Survey
- 3) **Transport and Transformations of Nitrogen in Groundwater Seeps Along the Stream Corridor of an Agricultural Watershed**
Brian Redder - Penn State

THURSDAY, OCTOBER 12, 2017

2:00-3:10pm BREAKOUT SESSION 2 TRACK 2A — UNDERSTANDING THE WATER BUDGET

Entry Auditorium

Moderator: Stephen Schoenholtz, Virginia Water Resources Research Center

- 1) Analysis of Seasonal-to-Annual Accumulating Precipitation Distribution Across the Mid-Atlantic United States, 1987-2016
Michael Marston – Virginia Tech
- 2) Water Budget Estimation Using In-situ and Remote Sensing Products in the Chesapeake Bay Watershed
Venkat Sridhar - Virginia Tech
- 3) The Freshwater and Liquid Waste Impact of Unconventional Oil and Gas in Ohio and West Virginia
Ted Auch - The FracTracker Alliance

TRACK 2B - QUANTIFYING STORMWATER TREATMENT

Instructional West - Room 161

Moderator: Jane Walker, Virginia Water Resources Research Center

- 1) Developing a National Stormwater BMP Testing and Verification Program: An Update on the Stormwater Testing and Evaluation of Products and Practices (STEPP) Initiative
Chris French – Water Environment Federation
- 2) Stormwater and Water Efficiency (A Global Perspective)
Scott Blossom - Blossom Consulting and Engineering
- 3) Making Urban Trees Count: A Stormwater Crediting Framework for Urban Tree Planting
Karen Capiella – Center for Watershed Protection

TRACK 2C — GAINING INSIGHTS FROM INVERTEBRATE ORGANISMS

Instructional West - Room 160

Moderator: Megan Kruger, West Virginia Water Research Institute

- 1) The Effects of Artificial Substrates Containing Magnesium on Juvenile Oyster Recruitment and Fitness
Matt Elder - James Madison University
- 2) Chesapeake Bay Basin-wide Index of Biotic Integrity
Zachary Smith - Interstate Commission of the Potomac River Basin
- 3) Innovative Approaches to Improve Macroinvertebrate Communities Through Stream Restoration
J. Patrick Barber – Acer Environmental, LLC

THURSDAY, OCTOBER 12, 2017

3:10-3:40pm NETWORKING BREAK AND EXHIBITOR EXPO

Instructional West

3:40-5:10pm CONCURRENT SESSION
TRACK 3A - FORECASTING DROUGHTS AND FLOODS

Entry Auditorium

Moderator: Jennifer Hause, West Virginia Water Research Institute

- 1) Evaluation of Near-real Time Drought Forecasting using VIC and SWAT Models in the Contiguous U.S.
Hyunwoo Kang - Virginia Tech
Venkat Sridhar - Virginia Tech
- 2) Investigation of Urban Flooding using the National Water Model in Southeast Virginia
Prasanth Valayamkunnath - Virginia Tech
Venkat Sridhar - Virginia Tech
- 3) Ensemble Flood Forecasting in the U.S. Middle Atlantic Region
Sanjib Sharma - Penn State
- 4) Ensemble Flood Forecast Maps: A Case Study in the Delaware River Near Philadelphia
Michael Gomez - Penn State

TRACK 3B - MONITORING AND MANAGING POLLUTION FROM THE URBAN ENVIRONMENT

Instructional West - Room 161

Moderator: Alan Rafló, Virginia Water Resources Research Center

- 1) Residents' Preferences in Adopting Water Runoff Management Practices: Examining the Effect of Behavioral Nudges in a Field Experiment
Kent Messer - University of Delaware
- 2) Beyond Runoff Reduction - Through Green Infrastructure Design
Zach Sample - XP Solutions
- 3) Tracking Illicit Discharges in Urban Stormwater Systems with Real-time 3G Wireless Sensors
Thomas Westfall - Virginia Tech
- 4) 2-Dimensional Tidal Dispersion Coefficients and Total Suspended Solids Flux Characterization in the James River
Jaewan Yoon - Old Dominion University

THURSDAY, OCTOBER 12, 2017

3:40-5:10pm **CONCURRENT SESSION**
TRACK 3C - GAINING INSIGHTS FROM VERTEBRATE ORGANISMS

Instructional West - Room 160

Moderator: Megan Kruger, West Virginia Water Research Institute

- 1) **Effects of Unconventional Oil and Gas Development on Brook Trout Occupancy within an Actively Developing Watershed**
Eric Merriam - West Virginia University
- 2) **Revealing the Current Relationship between Stream Acidification and Fish Species Richness: What is the Status after Two Decades of Recovery in Appalachian Streams?**
Christine May - James Madison University
- 3) **Temporal Distribution of Cyanotoxins and Environmental Estrogens Within the Upper and Middle Potomac River Drainage, USA**
Ryan Braham - West Virginia University
- 4) **Fish and Amphibian Response Trajectories in Reconnected Coastal Plain Stream Floodplain Valleys**
Will Saffell - Environmental Systems Analysis, Inc.

5:30-7:00pm **DINNER**

Commons (*Included with conference registration*)

7:00-9:00pm **NETWORKING RECEPTION AND POSTER SESSION**

Roosevelt Room/Commons

Moderator: Luke Juran, Virginia Water Resources Research Center

LIST OF POSTER PRESENTERS

OF SPACE AND PURITY, COST, AND CONVENIENCE: BARRIERS TO LATRINE ADOPTION IN COASTAL SOUTH INDIA
Shaifali Prajapati and Luke Juran - Virginia Tech

EVALUATION OF THE POTENTIAL EXPOSURE TO NATURALLY OCCURRING RADIOACTIVE MATERIAL SPILL INTO A RIVER

David McCready - EnviroCalc, PLLC

REMOTE SENSING TECHNIQUES FOR THE VALLEY CREEK WATERSHED'S HEADWATERS

William Akin - Pennoni

FORESTED BUFFERS A NATURAL AND MANAGED BMP

William Akin - Pennoni

LIST OF POSTER PRESENTERS (continued):

CHANGES IN BEST MANAGEMENT PRACTICES MONITORING AND ENFORCEMENT AND THEIR IMPACT ON FOREST HARVESTING EFFORTS

William McCormick - West Virginia University

CAUSES OF CHANGE IRRIGATION IN THE EASTERN UNITED STATES

Lauren Glinko - University of Delaware

USING ENVIRONMENTAL DNA TO ASSESS APPALACHIAN STREAM SPECIES COMPOSITION

Yvette Halley - West Virginia University

MONITORING SURFACE WATER QUALITY IN THE MARCELLUS SHALE REGION

Joseph Wickline - West Virginia University

ACID MINE DRAINAGE SEEPAGE ANALYSIS AND SLOPE STABILITY IN A COARSE COAL REFUSE RECLAMATION

Luri Lira Santos - West Virginia University

EXPLORING THE USE OF SHORT PAPER FIBER AS A SOIL AMENDMENT IN COAL REFUSE

Levi Cyphers - West Virginia University

CHARACTERIZATION OF GROSS SOLIDS FROM HIGHWAY STORM INLET CLEANING FOR TMDL COMPLIANCE

Saliha Kahn and Hossein Pezeshkan - Morgan State University

POWER DYNAMICS IN COLLABORATIVE MANAGEMENT: AN ALASKAN CASE

Rob Alexander - James Madison University and the Institute for Constructive Advocacy and Dialogue

NUTRIENT UPTAKE IN DEGRADED VERSUS RESTORED SECTIONS OF URBAN STREAMS WITHIN THE CITY OF NEWPORT NEWS, VIRGINIA

Brendan Player, Christopher Newport University

STATISTICALLY EVALUATING WATER CONSUMPTION HISTORICALLY AND ACROSS MULTIPLE USERS IN VIRGINIA

Morgan DiCarlo - Virginia Tech

ENHANCING WATERSHED NITROGEN AND PHOSPHORUS REMOVAL THROUGH DUAL TREATMENT TECHNOLOGIES

Christine Lepine - The Conservation Fund's Freshwater Institute

CONSTRUCTION AND APPLICATION OF A CONTEXTUALIZED, MULTISCALAR WATER POVERTY INDEX IN COASTAL INDIA

Breeanna Prince and Luke Juran - Virginia Tech

A NEW MODEL FOR VERTICAL SEEPAGE IN KARST LAKE ENVIRONMENTS

Chris Slater - University of South Florida



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EXHIBITORS:

USGS - VIRGINIA WEST VIRGINIA WATER SCIENCE CENTER
EASTERN PANHANDLE CONSERVATION DISTRICT
NIWR - MID-ATLANTIC REGION
ACER ENVIRONMENTAL
GEODECISIONS

FRIDAY, OCTOBER 13, 2017

6:30-8:15am BREAKFAST

Commons (*Included with conference registration*)

8:30-9:30am KEYNOTE SESSION

Entry Auditorium

WELCOME AND INTRODUCTIONS

Stephen Schoenholtz, Virginia Water Resources Research Center

KEYNOTE SPEAKER

Dr. Thomas Graziano, Director,
Office of Water Prediction, National Weather Service

9:30-10:00am NETWORKING BREAK AND EXHIBITOR EXPO

Instructional West

10:00-11:50pm CONCURRENT SESSION
TRACK 4A - MONITORING WATER QUALITY

Instructional West - Room 161

Moderator: Tolessa Deksissa, D.C. Water Resources Research Institute

- 1) **Inputs of Pollutants to Watersheds via Atmospheric Deposition, with Implications for Human Health and Aquatic Life**
Elizabeth Boyer – Pennsylvania Water Resources Research Center
- 2) **Watershed-scale Impacts on Microbial Indicators of Water Quality**
Catie Capplein – Virginia Tech
Meredith Steele - Virginia Tech
Brian Badgley - Virginia Tech
- 3) **ColiFind: A Digital Image Analysis Application to Identify E. Coli Colonies in Coliscan Easygel Water Quality Tests**
Ana Humphrey – T.C. Williams High School
- 4) **Reservoirs: Could they be Indicators of Climate Change?**
Carolyn Thomas – Ferrum College
Delia Heck - Ferrum College
- 5) **20 Years of Measured Changes in the Shenandoah River Quality**
Wayne Webb – Lord Fairfax Soil and Water Conservation District and Friends of the Shenandoah River

TRACK 4B - IMPROVING WATERSHED MANAGEMENT

Entry Auditorium

Moderator: Anna Withrow, Northern West Virginia Brownfields Assistance Center

- 1) **Flood, Droughts, and Interstate Conflicts: Why Eastern States Need to Worry about Water Quantity and Water Law**
Robert Caccese – Penn State
Lara Fowler - The Nature Conservancy
Brian Richter - University of Virginia
- 2) **Anatomy of the 2016 Drought in New York State: Implications for Agriculture and Water Resources**
Shannan Sweet - Cornell University and The Nature Conservancy
- 3) **Water Infrastructure Planning Under Uncertain Climate Change: Risk and Robustness-based Approaches**
Julie Shortridge – Virginia Tech
- 4) **Designing the Next Generation of Inland Hydrography Data - Results of the National Hydrography Requirements and Benefits Study**
Stephen Aichele - U.S. Geological Survey
- 5) **Identifying Key Issues in Water Quality Perceptions in Northern West Virginia**
Jonas Leveque - West Virginia University
Robert Burns - West Virginia University

TRACK 4C - WATER-ENERGY NEXUS: MEETING CHALLENGES AND FINDING SOLUTIONS

Instructional West - Room 160

Moderator: Melissa O'Neal, West Virginia Water Research Institute

- 1) **Downstream Drinking Water Impacts of Fossil Fuel Extraction and Utilization Choices**
Jeanne VanBriesen - Carnegie Mellon University
- 2) **Metal Reclamation Units (MRUs, Wetlands in a Box) Treating Acid Mine Drainage**
Colin Lennox - BioMining Products
- 3) **Lambert Run: A Watershed Scale Approach to Remediation**
Jason Fillhart - West Virginia Water Research Institute
- 4) **DMME TMDL Program Success: Restoring Impaired Coalfield Streams**
George Joey O'Quinn - Virginia Department of Mines, Minerals, and Energy
- 5) **Design and Construction of a Micro-scale Anaerobic Digester/Power Process**
Steve Cox - Virginia Tech

FRIDAY, OCTOBER 13, 2017

11:50am-1:00pm LUNCH

Commons (Included with conference registration)

1:00-2:50pm CONCURRENT SESSION

TRACK 5A - INNOVATIVE TECHNOLOGIES FOR DATA COLLECTION AND MANAGEMENT

Instructional West - Room 161

Moderator: Jason Fillhart, West Virginia Water Research Institute

- 1) **New Monitoring Technologies for Managing Water Quality**
John Hochheimer - Tetra Tech
- 2) **Determining Bank Erosion Hazard Index Using Unmanned Aerial Systems**
Christine Casole - Skelly and Loy
- 3) **Remote Sensing Techniques for the Valley Creek Watershed's Headwaters**
William Akin - Pennoni
- 4) **USGS Streamgaging and Innovative Approaches to Data Delivery**
Jeremy White - U.S. Geological Survey
- 5) **Citizen Science Improves Stream Climate Change Forecasts**
Nathaniel Hitt - U.S. Geological Survey

TRACK 5B - NETWORKS AND PARTNERSHIPS WITH A FOCUS ON WATER RESEARCH

Entry Auditorium

Moderator: Allison Truhlar, New York State Water Resources Research Institute

- 1) **From Coal Country to the Chesapeake: USGS Water Science in West Virginia and Virginia**
John Jastram - U.S. Geological Survey
- 2) **Three Rivers QUEST - Managing and Displaying Water Quality Data throughout the Upper Ohio River Basin**
Melissa O'Neal - West Virginia Water Research Institute
- 3) **Sensing and Educating the Nexus to Sustain Ecosystems (SENSE): A Kentucky-West Virginia Partnership**
Mindy Armstead - Marshall University
- 4) **Water Environment and Reuse Foundation Agricultural Sector Research**
Kristan VandenHeuvel - Water Environment & Reuse Foundation
- 5) **West Virginia Outdoor Learning Lab: Using Research to Create Environmental STEM Outreach**
Megan Kruger - West Virginia Water Research Institute

Join us in the Roosevelt Room of the Commons building from 7:00-9:00pm on Thursday, October 12 for a networking reception and poster session with refreshments and hors d'oeuvres.

Support the presenters and mingle with colleagues!



The West Virginia Oil and Natural Gas Association is the proud sponsor of the networking breaks and exhibitor expos. Food and beverages are available during each break in Instructional West. Thanks for attending!



We want to hear from you!

Please share your thoughts on the conference with us. A short survey will be sent to your email address soon. Fill out the survey and receive the conference attendee list.

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USGS Summer Intern Program

None.

Student Support					
Category	Section 104 Base Grant	Section 104 NCGP Award	NIWR-USGS Internship	Supplemental Awards	Total
Undergraduate	2	0	0	0	2
Masters	0	0	0	0	0
Ph.D.	0	0	0	0	0
Post-Doc.	0	0	0	0	0
Total	2	0	0	0	2

Notable Awards and Achievements