54th Annual Meeting of the Delaware Water Resources Center

Biden Institute
44 Kent Way
University of Delaware
Newark, Del.
May 16, 2019

Gerald Joseph McAdams Kauffman, Ph.D.
Director
University of Delaware
Water Resources Center
MEMORANDUM

TO:       Advisory Panel of the University of Delaware Water Resources Center
          Undergraduate/Graduate Research Students and Advisors

FROM:     Dr. Gerald J. Kaufman, Director
          Delaware Water Resources Center

DATE:     April 19, 2019

SUBJECT:  54th Annual DWRC Advisory Panel Meeting

You are invited to the 54th Annual Meeting of the Advisory Panel of the University of Delaware Water Resources Center at 10 am on Thursday May 16, 2019 to be held at the Biden Institute at 44 Kent Way on the University of Delaware campus in Newark, Delaware. Our charge will be to review the research presentations of the FY18/19 water resources students, discuss the upcoming FY19/20 research projects, and establish water research priorities in Delaware for the upcoming year. Our business meeting will be in the morning followed by luncheon at noon. We will also discuss the exciting news about the home of the DWRC in the Biden School and joint ventures between the Delaware Water Resources Center and Delaware Sea Grant and what these initiatives mean for water policy, education, and research in the First State.

Agenda

Delaware Water Resources Center
54th Annual Advisory Panel Meeting

10:00 am May 16, 2019

1. Introductions 10:00 am

2. FY18/19 Undergraduate/Graduate Research Presentations 10:15

3. DWRC FY19/20 Budget Submittal to DOI/USGS 11:00

4. FY19/20 Undergraduate Water Internship Proposals (start Sep 2019) 11:15

5. DWRC Advisory Panel Membership 11:30

6. DWRC and Delaware Sea Grant 11:45

7. Delaware Clean Water Campaign (Martha Narvaez) 11:55

8. Luncheon noon

JOSEPH R. BIDEN, JR. SCHOOL OF PUBLIC POLICY & ADMINISTRATION

www.bishopschool.udel.edu
Delaware Water Resources Center (DWRC)
A unit of the Institute for Public Administration
within the School of Public Policy & Administration in the College of Arts & Sciences

DWRC Staff
Gerald J. Kaufman, Ph.D.
Director/Associate Professor

Andrew R. Homsey
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Nicole M. Minni
Associate Policy Scientist
(GIS Laboratory/Licensure Office)

Martha C. Narvaez
Policy Scientist

Angela Speers
Sponsored Programs Coordinator

Kelly Jacobs
M.S. Energy & Environment Policy

Jillian S. Young
M.S. Water Science and Policy

Undergraduate and Graduate Research Fellows
bachelor’s and master’s degree students funded by the DWRC

What is DWRC?
Established on campus in 1969, the University of Delaware Water Resources Center (DWRC) is one of the 54 National Institutes for Water Resources (NIWRs) at land grant universities in the 50 states, District of Columbia, and island territories of Guam, Puerto Rico, and U.S. Virgin Islands. The DWRC is supported by the U.S. Geological Survey through Section 104 of the Water Resources Research Act signed into law by Lyndon Baines Johnson in 1964. The mission of the DWRC is to: (1) support water resources research, education, and public outreach programs in Delaware and (2) sponsor training of future water scientists, engineers, managers, and policy-makers in the First State.

What is WRA?
Established in 1977 and modified in 1990 and 1997, the Water Resources Agency (WRA) is a program of the DWRC and provides regional water resources assistance to governments in Delaware and the Delaware Valley through the University of Delaware’s land-grant public service, education, and research role. The WRA is supported by federal, state, and local government partners, including the State of Delaware, New Castle County, City of Newark, and City of Wilmington.

Where is DWRC?
The DWRC is located in Newark, Delaware, on UD’s main campus at 261 Academy Street in the Delaware Geological Survey (DGS) Annex, behind Penny Hall and the UD Rain Garden.

www.wrc.udel.edu

DWRC Partners
- Brandywine Conservancy
- Brandywine Valley Association
- City of Wilmington
- City of Newark
- Delaware Nature Society
- Delaware Center for Horticulture
- Delaware Greenways
- Delaware Department of Transportation
- Delaware River Basin Commission
- Delaware Department of Natural Resources and Environmental Control
- FishAmerica Foundation
- New Castle Conservation District
- New Castle County
- National Oceanic and Atmospheric Administration
- National Park Service
- Partnership for the Delaware Estuary
- SUEZ Water Delaware
- The Nature Conservancy (Delaware)
- UD Colleges
- U.S. Environmental Protection Agency
- U.S. Geological Survey
- William Penn Foundation

- Sussex Economic Development Action Committee
- Sustainable Coastal Community Initiative
- White Clay Creek Wild and Scenic Management Committee
DWRC Faculty
and Scientists

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The Delaware Water Resources Center (DWRC) is a unit of the Institute for Public Administration (IPA), a research center within the School of Public Policy & Administration (SPPA) at the University of Delaware. Dr. Jerome Lewis is the IPA Director and can be reached at 302-831-8971.

Directions

DWRC has two Delaware offices: its main office on the University of Delaware’s Newark campus, between Penny Hall and the Perkins Student Center, and on the Hugh R. Sharp campus of the University of Delaware in Lewes. Detailed directions for both locations are at www.wrc.udel.edu.

DWRC Newark Office
DGS Annex
291 Academy Street
University of Delaware
Newark, Delaware 19716

DWRC Lewes Office
895 Pilottown Road
Pollution Ecology Lab, Room 109
Lewes, Delaware 19958

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The University of Delaware is committed to assuring equal opportunity to all persons and does not discriminate on the basis of race, color, gender, religion, ancestry, national origin, sexual orientation, veteran status, age, or disability in its educational programs, activities, admissions, or employment practices as required by Title VI of the Civil Rights Act of 1964, the Rehabilitation Act of 1973, the Americans with Disabilities Act, other applicable statutes and University policy. Inquiries concerning these matters and information regarding campus accessibility should be directed to the Affirmative Action Officer, 360 Hubbell Hall, 302-831-4493 (voice), 302-831-4905 (TDD).
Mission
The University of Delaware Water Resources Center (DWRC), established in 1985 as one of the National Institutes for Water Resources (NIWRs) at land-grant universities in the 50 states, District of Columbia and outlying territories of Guam, Puerto Rico, and U.S. Virgin Islands. The DWRC receives funding through Section 104 of the Water Resources Research Act of 1964, which was originally signed into law by Lyndon Baines Johnson in 1964. The U.S. Geological Survey administers the provisions of the Act and provides oversight of the nation's Water Resources Centers through the National Institute of Water Resources (NIWR).

As a member of the NIWR, the DWRC has two key missions related to Delaware's water resources—our rivers, lakes, and coastal waters: (1) support research, education, and public outreach programs that focus on water management issues of importance to Delaware citizens and (2) to foster and support training and education programs for the future water scientists, engineers, managers, and policy-makers.

Education
DWRC provides an important role in water resources education at the University of Delaware and to the greater public. The DWRC carries out its education role through participating in outreach activities, offering courses, seminars and forums with a water resources focus, and advising undergraduate and graduate students through funded assistantships.

Courses Offered
- UAPP 811: Regional Water Resources Management
- GEOG 432: Hydrologic Hydrology
- CEIS 440: Water Resources Engineering
- UAPP 657: Water Management Applications in Public/Nonprofit Sectors
- UAPP 852: GIS in Public Policy

Conferences
- Water Policy Forum
- Delaware GIS Conference

Community Events
- Delaware Clean Water Initiative
- Delaware GIS Day
- University of Delaware Ag Day
- University of Delaware Coast Day

Public Service
DWRC provides water policy assistance to governments in Delaware and the surrounding region. This public service role is significant to the mission of the College of Arts & Sciences and the School of Public Policy & Administration (SPPA). DWRC takes a regional, intergovernmental approach to water management, since watershed and aquifers cross many political jurisdictions.

The WRA Agency, a project of the DWRC, receives support from Delaware, New Castle County, and the cities of Wilmington and Newark to provide water resources assistance to the public with regard to water supply, water quality, and watershed planning and management.

Water Supply
- Delaware's Water Supply and Quality Control
- Office of the State Water Coordinator
- New Castle County Water Resources Protection Areas, Technical Advisory Committee
- Delaware Source Water Assessment and Protection Program

Watershed Management and Planning
- Christina Basin Clean Water Partnership
- White Clay Creek WCA and Scenic Management Committee
- Nonpoint Education for Municipal Officials (NEMO)
- Floodplain/Stormwater Management

Mapping and Data Services
- Comprehensive Plan Mapping
- Data Mapping Applications
- Public and Private Education (K-12) Assistance
- Regional Watershed Mapping, Data Creation, and Analysis

Research
DWRC seeks opportunities to collaborate with University faculty, scientists, and students to fund, conduct, and publish research on water resources.

University of Delaware Experimental Watershed
Development of an experimental watershed as an on-campus education and research laboratory.

Geospatial Analysis and Information Management
Repository of DWRC data and information collaboration for water research with other groups on campus and beyond. Advancement of GIS and remote-sensing technologies for water resources management.

Publications and Presentations
Research on topics such as water policy, watershed management, water rates, and public-private water management at regional and national conferences.
The University of Delaware is fortuitously situated on campuses ideally suited by hydrology and geography to study water resources.
JFK signs 1961 DRBC Compact

LBJ signs 1964 Water Resources Research Act

THE Water Resources Research Act of 1964, which I have approved today, fills a vital need.

Abundant, good water is essential to continued economic growth and progress. The Congress has found that we have entered a period in which acute water shortages are hampering our industries, our agriculture, our recreation, and our individual health and happiness.

Assuming a continuation of current practices, by the year 2000 there will not be enough usable water to meet the water requirements of parts of the States of Arizona, California, Colorado, Delaware, Idaho, Illinois, Indiana, Iowa, Kansas, Louisiana, Michigan, Minnesota, Montana, Nebraska, Nevada, New Jersey, New Mexico, New York, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, South Dakota, Texas, Utah, Wisconsin, and Wyoming.

This legislation will help us solve this problem. It will create local centers of water research. It will enlist the intellectual power of universities and research institutes in a nationwide effort to conserve and utilize our water resources for the common benefit. The new centers will be concerned with municipal and regional, as well as with national water problems. Their ready accessibility to State and local officials will permit each problem to be attacked on an individual basis, the only way in which the complex characteristics of each water deficiency can be resolved. The bill contemplates a high degree of interstate cooperation, and I urge that this be encouraged.

In large measure this legislation is a tribute to the vision and wisdom of Senator Clinton P. Anderson of New Mexico. He has long recognized the problems. He developed the program. He guided it through Congress. He has been in the forefront of the effort to see that adequate supplies of water are available in all parts of the Nation.
The University of Delaware Water Resources Center, established on campus in 1965 at the 8th oldest institution of higher learning in the nation (est. 1743), is now a research center within the Joseph R. Biden School of Public Policy & Administration.
The DWRC Internship Program

The DWRC Internship Program is a unique opportunity for undergraduate students and faculty to become directly involved in research and education projects addressing water resource-related issues of critical importance to Delaware and the Mid-Atlantic region.

Eligibility

All undergraduate students enrolled at an institution of higher learning in Delaware may apply, except for those graduating at the end of the spring semester. Students must have the written support of at least one advisor and a minimum GPA of 3.0. A student may apply to any of the 12 sponsored summer research experiences and must notify the DWRC of their application.

Program Details

The DWRC provide USGS financial support for each undergraduate internship. Students typically work for 10 weeks full-time during the summer and 10 hours during the fall and winter. Interns must submit a written report on their experience and participate in a poster session at the fall DWRC undergraduate research conference.

The deadline for applications is March 21, 2015. Applying to the DWRC is easy. For details on how to apply, current faculty advisors, application materials, stipends, and information on reports, please visit the DWRC website.

NIWR & USGS: A Model Partnership

NIWR partners with the USGS through the provisions of the Water Resources Research Act (WRRAA) to address water-related concerns by providing a national platform for research, training, and collaboration.

USGS provides each institute with a grant to target local priorities, recruit researchers and leverage federal dollars with state money and private funding.

NIWR member institutions are housed in the country’s land-grant universities in all 50 states, three U.S. territories and the District of Columbia.

NIWR is the only federally mandated research program that focuses on applied water resource research, education, training and outreach.

MAXIMIZE FEDERAL IMPACT

NIWR's ability to attract and match non-federal funds to USGS grant-sponsored research multiplies the federal investment in local water projects. The NIWR-USGS partnership also strengthens USGS's own funding model, as NIWR members often allow funds to pass to the institutes to USGS State Water Science Centers.

IMPACT & COLLABORATION

NIWR member institutions assist public and private sector groups in their mission to protect human health, environmental resources and economic sustainability.

WANTED: INTERNS

The USGS is encouraging NIWR institutes to take advantage of its nationwide internship program, details of which follow:

- The interns are hired by the NIWR institute but work with USGS Water Science Center researchers.
SUCCESS FROM THE GROUND UP
in water-related practices and policies

The National Institutes for Water Resources (NIWR) plays a major role in addressing water-related concerns by providing a platform for research, training, and collaboration at the state level. Housed in the nation’s land-grant universities and four U.S. territories, the 54 NIWR member institutes leverage university expertise in research, education, and outreach to find solutions for the water management challenges we face. With our funding and educational services, water-related professionals and researchers receive support for the creation of local tools and policies to better manage our water. These successes start at the local level and have the ability to grow and make an impact across the United States.

In FY 2015, Congress appropriated $6.5 million in WRRA grant funding, enabling cutting-edge research on the nation’s most pressing water issues. This financial support requires matching from non-federal funded projects from the public and private sector. This local financing significantly leverages the available federal dollars for water research.

NIWR BY THE NUMBERS
in 2015

$6.5M in funds to research projects
$11.4M in match funds to research projects
214 sponsored research projects
564 sponsored researchers
285 students in training

Visit us at niwr.info

Our history started in 1964
Water Resources Research Act, USGS, and NIWR

The 1964 Water Resources Research Act (WRRA) established the nation’s Water Resources Research Institutes. Pursuant to the WRRA of 1964 as amended, the United States Geological Survey (USGS) within the U.S. Department of the Interior assumed responsibility for administering WRRA funding, which targets local, regional, and national water priorities, helps train and recruit researchers, and aids in the transfer of technology and best practices.

Coordination and interaction between the Institutes and USGS is facilitated by NIWR. A volunteer-led organization, the NIWR network represents the only authorized federal state program that focuses on applied water resource research, education, training, and outreach.

NATIONAL INSTITUTES FOR WATER RESOURCES
NIWR Board Officers
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TOOLS FOR
Annual Base Grants

The largest of the USGS-NIWR research grant programs is the 104(b) Annual Base Funding grant program. Approximately $5 million in 104(b) grants are awarded annually to NIWR member institutes to help each institute plan and conduct applied and peer-reviewed research, education, and outreach activities on water.

National Competitive Grants

The 104(g) National Competitive Grants program funds research in water issues that are of a regional or interstate nature or relate to a specific program priority identified by the Secretary of the Interior and the institutes. Approximately $1 million is available each year. In 2015, 104(g) funding was awarded to four research projects studying important national priority issues in water quality and quantity. These projects were:

- "Using hyperspectral imaging to identify terrestrial vegetation in urban environments" in Illinois
- "Human and Ecological Health Impacts Associated with Water Reuse: Engineered Systems for Removing Priority Emerging Contaminants" in South Carolina
- "Hydrologic Life Cycle Impact of Mountain Pine Beetle Beetle Infestations" in South Dakota

TRAINING OUR FUTURE LEADERS
IN WATER

The National Institutes for Water Resources supports learning opportunities for students with funded research projects. Both undergraduate and graduate students explore new ideas and learn new skills. This fosters successful entry into a competitive water resources job market and allows them to make long-term positive water resource impacts.

Student Support FY2015

38% Undergraduate
9% Graduate
6% PostDoc
Total Students: 283
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<tr>
<th>State</th>
<th>NIWR</th>
<th>University</th>
<th>Department</th>
<th>City</th>
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<th>Rank</th>
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<td>Water Resources Research Institute</td>
<td>Auburn</td>
<td>Agriculture Economics, Rural Sociology</td>
<td>Auburn</td>
<td>Dr. Samuel Fowler</td>
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<td>Institute of Northern Engineering</td>
<td>Fairbanks</td>
<td>Dr. William Schnabel</td>
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<td>Agriculture/Coop Extension</td>
<td>Fayetteville</td>
<td>Dr. Brian Haggard</td>
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<td>Institute for Water Resources</td>
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<td>Soil and Crop Sciences</td>
<td>Fort Collins</td>
<td>Dr. Reagan Waskom</td>
<td>Professor</td>
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<td>Storrs</td>
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<td>Delaware</td>
<td>Water Resources Center</td>
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<td>Public Policy and Administration</td>
<td>Newark</td>
<td>Dr. Gerald Kauffman</td>
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<td>Water Resource Research Institute</td>
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<td>Dr. Tolessa Deeksisida</td>
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<td>Florida</td>
<td>Water Resources Research Center</td>
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<td>Sustainable Infrastructure</td>
<td>Gainesville</td>
<td>Dr. Kirk Hadfield</td>
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<td>Georgia</td>
<td>Water Resources Institute</td>
<td>Georgia Tech.</td>
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<td>Atlanta</td>
<td>Dr. Aris Georgakakos</td>
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<td>Sea Grant</td>
<td>Honolulu</td>
<td>Dr. Darren T. Lerner</td>
<td>Research Faculty</td>
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<td>Purdue</td>
<td>Agronomy</td>
<td>West Lafayette</td>
<td>Dr. Ronald Turco</td>
<td>Professor</td>
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<td>Dr. Rick Cruse</td>
<td>Professor</td>
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<td>Kansas State</td>
<td>Agricultural Resources and the Environment</td>
<td>Manhattan</td>
<td>Dr. Daniel Devlin</td>
<td>Director</td>
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<td>Kentucky</td>
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<td>Lexington</td>
<td>Dr. Lindell Ormsbee</td>
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<td>Senator George Mitchell Center for Sustainability</td>
<td>Orono</td>
<td>Dr. John Peckenhall</td>
<td>Senior Research Scientist</td>
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<td>Civil and Environmental Engineering</td>
<td>College Park</td>
<td>Dr. Kaye Brubaker</td>
<td>Associate Professor</td>
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<td>Engineering</td>
<td>Amherst</td>
<td>Dr. Paula Rees</td>
<td>Director</td>
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<td>Institute of Water Research</td>
<td>Michigan State</td>
<td>Agriculture, Recreation and Resource Studies</td>
<td>East Lansing</td>
<td>Dr. Jon Bartholic</td>
<td>Professor</td>
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<td>Humphrey School of Public Affairs</td>
<td>St. Paul</td>
<td>Dr. Deborah Swackhamer</td>
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<td>Cooperative Extension</td>
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<td>Columbia</td>
<td>Dr. Baolin Deng</td>
<td>C.W. LaPierre Professor</td>
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<td>New York</td>
<td>Water Resources Institute</td>
<td>Ithaca</td>
<td>Earth and Atmospheric Sciences</td>
<td>Cornell</td>
<td>Dr. Susan Riha</td>
<td>Professor</td>
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<td>Oregon</td>
<td>Institute for Water and Watersheds</td>
<td>Corvallis</td>
<td>Water Resources Science</td>
<td>Oregon State</td>
<td>Dr. Todd Jarvis</td>
<td>Assistant Professor</td>
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<td>Pennsylvania</td>
<td>Water Resources Research Center</td>
<td>University Park</td>
<td>Ecosystem Science</td>
<td>Penn State</td>
<td>Dr. Elizabeth Boyer</td>
<td>Associate Professor</td>
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<td>Rhode Island</td>
<td>Water Resources Center</td>
<td>Kingston</td>
<td>Civil and Environmental Engineering</td>
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<td>Dr. Leon Thiem</td>
<td>Associate Professor</td>
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<td>Clemson</td>
<td>Strom Thurman Institute</td>
<td>South Dakota State</td>
<td>Dr. Jeffrey Allen</td>
<td>Assistant Professor</td>
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<td>Tennessee</td>
<td>Water Resources Research Center</td>
<td>Knoxville</td>
<td>Institute for Secure and Sustainable Environment</td>
<td>Tennessee</td>
<td>Mr. Tim Gangaware</td>
<td>Associate Director</td>
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<td>Texas</td>
<td>Water Resources Institute</td>
<td>College Station</td>
<td>Institute of Renewable Resources</td>
<td>Texas A&amp;M</td>
<td>Dr. Roel Lopez</td>
<td>Professor</td>
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<td>Utah</td>
<td>Center for Water Resources Research</td>
<td>Logan</td>
<td>Civil and Environmental Engineering</td>
<td>Utah State</td>
<td>Dr. Mac Mckee</td>
<td>Director</td>
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<td>Vermont</td>
<td>Water Resources and Lake Studies Center</td>
<td>Burlington</td>
<td>Rubenstein School of Environment Resources</td>
<td>Vermont</td>
<td>Dr. Breck Bowden</td>
<td>Patrick Professor of Watershed</td>
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<td>Virgin Islands</td>
<td>Water Resources Research Institute</td>
<td>St. Thomas</td>
<td>Water Resources</td>
<td>Univ. of Virgin Islands</td>
<td>Dr. Henry Smith</td>
<td>Director</td>
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<td>Forest Resources</td>
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<td>Dr. Kevin McGuire</td>
<td>Associate Professor</td>
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<td>Washington</td>
<td>Water Research Center</td>
<td>Pullman</td>
<td>Economic Studies</td>
<td>Washington State</td>
<td>Dr. Jonathan Yoder</td>
<td>Professor</td>
</tr>
<tr>
<td>West Virginia</td>
<td>Water Research Institute</td>
<td>Morgantown</td>
<td>National Research Center for Coal and Energy</td>
<td>West Virginia</td>
<td>Dr. Paul Ziemkiewicz</td>
<td>Director</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>Water Resources Institute</td>
<td>Madison</td>
<td>UW Aquatic Sciences Center/Sea Grant</td>
<td>Wisconsin</td>
<td>Dr. James Hurley</td>
<td>Director</td>
</tr>
<tr>
<td>Wyoming</td>
<td>Office of Water Programs</td>
<td>Laramie</td>
<td>Research/Economic Development</td>
<td>Wyoming</td>
<td>Dr. Greg Kerr</td>
<td>Director/Lecturer</td>
</tr>
</tbody>
</table>
April 3, 2019

Dr. Gerald Kauffman
University of Delaware
Water Resources Center
DGS Annex, 261 Academy St
Newark, DE 19716

Dear Jerry:

I am pleased to announce that you have been elected by the delegates of the Universities Council on Water Resources to serve as a member of the Board of Directors. On behalf of the entire Board, congratulations!

Your term will commence with the UCOWR Board meeting to be held on Thursday, June 13 at 7:00 am, at the 2019 UCOWR/NIWR Conference at Snowbird, Utah. There will be an earlier Board meeting held the day before the conference begins, on Monday, June 10 at 9:00 am, which you are encouraged to attend as a guest. Your term will extend for a period of three years, ending with the 2022 Annual Conference.

We hope that you will be able to attend this year’s conference in order to formally meet the other Board members, be introduced to the delegates at the Delegate Luncheon on June 11, and attend both of the Board meetings that will be held at the conference. Registration for the conference is available at https://ucowr.org/2019-conference/registration/. If you have questions regarding the conference, please contact Staci Eakins at seakins@siu.edu.

Thank you for your willingness to assume the responsibility of serving on our Board. We look forward to working with you to further the mission of UCOWR.

Sincerely,

Karl W.J. Willard
Executive Director

UCOWR | UNIVERSITIES COUNCIL ON WATER RESOURCES

2018-2019

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Mississippi State University
johnson@eng.msstate.edu

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Oklahoma State University
kwagner@okstate.edu

Past-President
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The University of Arizona
smegdal@email.arizona.edu

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Committee Chairs/Liaisons
2019 Awards – Sharon Megdal
2019 Conference – David Stearns
2016 Tech Program – Kevin Wagner
2016 Tech Apprentice – Kelly Coburn
Board Elections – Kevin Wagner
Women in Hydrology – Kevin Wagner
Strategic Planning – Jeff Johnson
NIWR Liaison – Doug Parker
NCEO Representative – Jeff Johnson
Swedes settle at mouth of Christinakill 1638 AD
“Nation Makers”
H. Pyle
Battle of the Brandywine
1777 AD
Village
Tavernes
Batailles & Partenans

Pensylv

VAN LEN

NEW YERSEY

MA. RY LAND

Operations

de l'Armé royales britanniques, avec les ordres du General au chef, sir William Howe, commandeur de l'ordre de Bath. Depuis le depart à Ph testimony, le 28e etant jour, commençant de Philadelphia au 26e jour d'Octobre 1777.

Entre les armées américaines, commandées par Monsieur Washington & d'autres formateurs.

Signées par l'enlèvement à Charleston.
DuPont Mills
1802 AD

Lee, Mass. Nov. 3-1905

These blow up occasionally and then?

Powder Mill on Brandywine near Wilmington, Del.

PUB. BY JULIAN S. ROBINSON, WIL., DEL.
Underground Railroad between the Brandywine and Christina at Wilmington, Harriet Tubman 1830-1865 AD
1864 AD
Wilmington
1874 AD
Pusey and Jones Shipyard
1887 AD
Frederick Law Olmsted designed Central Park in NYC and Brandywine Park in Wilmington, Del. during the 19th century.
Brandywine Plant
1929 AD
Hoopes Reservoir
1931 AD
Christiana River Tunnel
1931 AD
Hoopes Reservoir
1932 AD
Brandywine Conservancy conserves King Ranch
1984 AD
Brandywine Creek
1940 AD
Brandywine Valley Association, America’s first small watershed association, est. 1945 AD
Woodlawn Trustees provide land for First State National Monument along Brandywine River, 2013 AD
Delaware Gets Its First National Monument

The National Park System finally reaches all 50 states.

2013 AD

By Brad Scriber, National Geographic News

PUBLISHED MARCH 27, 2013

Shortly after noon on Monday, with a declaration from President Obama designating the First State National Monument, the National Park Service welcomed Delaware into its fold for the first time. (Related: "Obama Declares Monuments to Preserve Pieces of U.S. Heritage.")

President Obama created the monument along with four other national monuments in an Oval Office ceremony alongside Vice President Joe Biden and Secretary of the Interior Ken Salazar, using powers designated under the Antiquities Act of 1906 to recognize historically significant...
First State National Monument
2014 AD
America’s Founding Fish

American shad - *Alosa sapidissima*
averages 14-29 inches

Hickory Shad - *Alosa mediocris*
averages 12 - 15 inches
Making strides in conservation

Demolishing historic Brandywine dams could make for healthier future

Maddy Larriff, The News Journal | USA TODAY NETWORK

Washington residents hope to remove the two Brandywine dams on the Brandywine Creek in the coming months, as part of a larger effort to remove dams on the Sassafras Creek. The Brandywine dams were built in the early 1900s and have since been identified as a source of pollution and habitat degradation.

Removal of the dams is part of an effort to restore the health of the Sassafras Creek, which is a tributary of the Delaware River. The dam removal is expected to improve water quality, restore fish habitat, and enhance recreational opportunities.

The Brandywine dams were constructed in the early 1900s to provide water for a local paper mill. However, the dams have since been identified as a source of pollution and habitat degradation. The removal of the dams is expected to improve water quality, restore fish habitat, and enhance recreational opportunities.

The dam removal is part of a larger effort to restore the health of the Sassafras Creek, which is a tributary of the Delaware River. The dam removal is expected to improve water quality, restore fish habitat, and enhance recreational opportunities.

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Figure 1. Total Economic Value

TOTAL ECONOMIC VALUE

Use values

Direct use values

- Marketed outputs
  - crops
  - meat/fish
  - timber
  - renewable energy
  - industrial

- Unpriced benefits
  - recreation
  - landscape
  - aesthetics

Ecological function values

- Benefits
  - flood control
  - carbon storage
  - water storage
  - waste assimilation
  - ecological diversity

Non-use values

Future option values

- Benefits
  - future drugs
  - potential gene pool
  - recreational options

Existence values

- Benefits
  - satisfaction from knowing the resource exists

Bequest values

- Benefits
  - passing benefits to future generations

Adapted from Hodge and Dunn (1992).
Economic Value of Brandywine Creek Watershed by Sector in $2010

Value in 2010 ($ million)

- Fish/Wildlife: 33
- Public Parks: 70
- Forests: 102
- Recreation: 133
- Water Supply: 143
- Water Quality: 153
- Agriculture: 260
The Billion Dollar Brandywine ($2013)

The water, natural resources, and ecosystems in the Brandywine Creek watershed contribute an economic value of **$560 million to $2 billion** annually to the Pennsylvania and Delaware economies.

1. The Brandywine Creek watershed contributes over **$890 million** in annual economic activity from water quality, water supply, fish/wildlife, recreation, agriculture, forests, and public parks benefits.

2. Habitats in the Brandywine Creek watershed provide **$560 million** annually in ecosystem goods and services, with a net present value (NPV) of **$18.3 billion** calculated over a 100-year period.

3. Natural resources within the Brandywine Creek watershed directly and indirectly support **50,000 jobs** with over **$2 billion** in annual wages.
**Table 1.** Economic value of agricultural operations in Chester County, Pennsylvania.  
(Chester County Agricultural Development Council, USDA National Agricultural Statistics Service)

<table>
<thead>
<tr>
<th>Industry</th>
<th>Economic Value</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy farming</td>
<td>$73 million</td>
<td>6(^{th}) in PA</td>
</tr>
<tr>
<td>Horse farming</td>
<td>$5.2 million</td>
<td>22(^{nd}) in U.S.</td>
</tr>
<tr>
<td>Nursery, greenhouse, floriculture</td>
<td>$79 million</td>
<td>1(^{st}) in U.S.</td>
</tr>
<tr>
<td>Row crops</td>
<td>$8.7 million</td>
<td>7(^{th}) in PA</td>
</tr>
<tr>
<td>Mushroom farming</td>
<td>$412 million</td>
<td>1(^{st}) in U.S.</td>
</tr>
</tbody>
</table>
Table 28. Employment in the Brandywine Creek Watershed in 2010

<table>
<thead>
<tr>
<th>County</th>
<th>County Population</th>
<th>Watershed Population</th>
<th>County Employment</th>
<th>Watershed Employment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chester County, Pa.</td>
<td>498,886</td>
<td>201,496</td>
<td>249,515</td>
<td>100,777</td>
</tr>
<tr>
<td>New Castle County, Del.</td>
<td>538,479</td>
<td>44,087</td>
<td>261,530</td>
<td>21,412</td>
</tr>
<tr>
<td>Total</td>
<td>1,037,365</td>
<td>245,583</td>
<td>511,045</td>
<td>120,983</td>
</tr>
</tbody>
</table>


Table 27. Jobs and wages directly and indirectly related to the Brandywine Creek watershed

<table>
<thead>
<tr>
<th>Sector</th>
<th>Jobs</th>
<th>Wages ($)</th>
<th>Data Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Watershed-Related</td>
<td>23,208</td>
<td>1,205,450,000</td>
<td>U.S. Census Bureau (2010)</td>
</tr>
<tr>
<td>Indirect Watershed-Related</td>
<td>27,850</td>
<td>964,360,000</td>
<td>U.S. Census Bureau (2010)</td>
</tr>
<tr>
<td>Coastal</td>
<td>781</td>
<td>15,615,496</td>
<td>National Coastal Econ. Program (2009)</td>
</tr>
<tr>
<td>Farm</td>
<td>3,453</td>
<td>136,431,483</td>
<td>U.S. Dept. of Agriculture (2011)</td>
</tr>
<tr>
<td>Fishing/Hunting/Birding</td>
<td>1,121</td>
<td>36,810,167</td>
<td>U.S. Fish and Wildlife Service (2008)</td>
</tr>
<tr>
<td>Outdoor Recreation</td>
<td>1,299</td>
<td>42,663,057</td>
<td></td>
</tr>
<tr>
<td>Watershed Organizations</td>
<td>124</td>
<td>5,952,000</td>
<td>WRA and DRBC (2010)</td>
</tr>
<tr>
<td>Water Supply Utilities</td>
<td>175</td>
<td>9,723,929</td>
<td>Delaware Tourism Office (2008)</td>
</tr>
<tr>
<td>Wastewater Utilities</td>
<td>58</td>
<td>2,322,400</td>
<td>WRA and DRBC (2010)</td>
</tr>
<tr>
<td>Total</td>
<td>&gt; 50,000</td>
<td>&gt; $2 billion</td>
<td></td>
</tr>
</tbody>
</table>
Headwaters Pale Ale

"Sixteen Delicious, Buzzy
Craft Beers..."
Feb. 16, 2011
2020 AD
Brandywine River National Wild and Scenic River?
Linked by hydrology at the crossroads of American history, the Chesapeake and Delaware megabasin stretches 400 miles along the Atlantic seaboard in the most populous watershed in the United States (Figure 1). The American Revolutionary War and Civil War were fought along its rivers and John F. Kennedy, Richard M. Nixon and Barack H. Obama adopted federal programs to protect its rivers and watersheds.

While sharing similar geography and climate, these contiguous mid-Atlantic basins have contrasting demographic characteristics (see Table 1 on page 9). The Chesapeake and Delaware megabasin covers just 2% of the contiguous United States, yet is home to 8% of the nation’s population and the nation’s fifth- and seventh-largest metropolitan economies, the U.S. Capitol and five state capitals.

The Chesapeake watershed (64,000 square miles) is four times larger than the Delaware watershed (13,500 square miles), which suggests the challenges of governing the nation’s largest estuary are correspondingly complex. The Chesapeake is home to 16 million people — twice that of the Delaware basin — but the Chesapeake’s population density (250 people per square mile) is less than the Delaware basin (980 people per square mile), which suggests less pressure per unit area from human pollution and water withdrawals.

Though each river is more than 300 miles long, the Chesapeake/Susquehanna and Delaware are merely the 42nd and 55th longest rivers in the United States. The Chesapeake is the longest estuary in the country (194 miles) and the Delaware estuary (96 miles) is the nation’s third-longest navigable tidal river. Both estuaries are drowned river systems that evolved from rising sea levels that began 20,000 years ago during the end of the last ice age. While both estuaries have similar ratios of watershed to estuary surface area (18:1), the hydraulic retention time (HRT), measured by volume divided by median flow, is quite different. The approximate HRT of the Chesapeake is 812 days and that of the Delaware Bay is 443 days.
Joint Mid-Atlantic Regional Meeting
NOAA Sea Grant College Programs & USGS Water Resources Research Institutes

Feb. 27-28, 2019
The Wharf Intercontinental Washington D.C. Hotel
Marina Room
801 Wharf St SW, Washington, DC 20024

Wednesday, Feb. 27, 2019: 1:45 PM – 6:00 PM (Reception 6:30 – 8:30 PM, Mi Vida Restaurant)
Thursday, Feb 28, 2019: 8:00 AM – 4:30 PM

Overall meeting goal: To explore connectivity, synergy, and leveraging among Mid-Atlantic region programs of the NOAA Sea Grant College Program and institutes and centers of the USGS Water Resources Research Act Program.

Meeting objectives:
- Enhance understanding of the missions and mandates of Sea Grant Programs and Water Institutes and Centers.
- Enrich knowledge of current and planned work of Sea Grant Programs and Water Institutes and Centers.
- Increase awareness of existing collaborations among Sea Grant Programs and Water Institutes and Centers.
- Foster collaboration among Sea Grant Programs and Water Institutes and Centers to enhance and amplify outcomes.

*****************************************************************************
WORKING AGENDA

Wednesday Feb. 26, 2018
1:45 – 2:00 PM: Gather: Meet and Greet
2:00 – 2:30 PM: Welcome and Introductions (Dr. Darren Lerner)
2:30 – 2:50 PM: Building Partnerships (Dr. Lerner)
2:55 – 3:10 PM: The USGS Water Resources Research Act Program (Dr. Earl Greene)
3:15 – 3:30 PM: The NOAA National Sea Grant College Program (Dr. Jon Pennock)
3:35 – 3:50 PM: The National Institutes for Water Resources (NIWR) (Dr. Daniel Devlin)
3:50 – 4:10 PM: Break
4:10 – 4:25 PM: The Sea Grant Association (SGA) (Dr. Fredrika Moser)

**Individual Sea Grant and WRRI Presentations**

4:30 – 4:45 PM: Virginia Sea Grant (Dr. Troy Hartley)
4:50 – 5:05 PM: Virginia Water Resources Research Center (Dr. Stephen Schoenholtz)
5:10 – 5:40 PM: North Carolina (NC) Sea Grant and NC Water Resources Research Institute (Dr. Susan White)

5:45– 6:00 PM: Wrap-up Day 1 (Dr. Lerner and Dr. Mary Donohue)
6:30– 8:30 PM: Networking Reception (Mi Vida Restaurant, next door to hotel)

**Thursday, Feb. 27, 2018**

8:00 – 9:00 AM: Networking Breakfast Buffet (Marina Room)
9:00 – 9:10 AM: Day 2 Welcome (Drs. Lerner and Donohue)

**Individual Sea Grant and WRRI Presentations**

9:15 – 9:30 AM: Maryland Water Resources Research Center (Dr. Kaye Brubaker)
9:35 – 9:50 AM: Maryland Sea Grant (Dr. Moser)
9:55 – 10:10 AM: Delaware Water Resources Center (Dr. Gerald Kauffman)
10:15 – 10:30 AM: Delaware Sea Grant (Dr. Kathryn Coyne)
10:30 – 11:00 AM: Break
11:00 – 11:15 AM: New Jersey Water Resources Research Institute (Dr. Christopher Obropta)
11:20 – 11:35 AM: New Jersey Sea Grant Consortium (Dr. Peter Rowe)
11:40 – 11:55 AM: Pennsylvania Water Resources Research Center (Mr. Brian Redder for Dr. Elizabeth Boyer)
12:00 – 12:15 PM: Pennsylvania Sea Grant (Dr. Sarah Whitney)
12:20 – 1:30 PM: Working Lunch (Marina Room)
WELCOME

Welcome to the AWRA 2018 ANNUAL CONFERENCE
Baltimore, MD | November 4 - 8, 2018

On behalf of National AWRA, the Conference Planning Committee, and our hosts the Delaware State Section of AWRA, in partnership with members of the New Jersey and Summer Capital York Sections, I would like to welcome you to

AWRA’s 59th Annual Water Resources Conference in exciting downtown Baltimore, MD.

As we proceed throughout our stimulating planning week we are reminded of the importance of our profession and field of study. We saw the devastations of historic hurricanes Harvey, Irma, and Maria, resulting in Florida, Georgia, and the Carolinas (the world).

And with each event that continually comes to mind, now during your program, practitioners, researchers and students alike the challenge of how to address and implement the impact of these historic events and the state of our water resources now and into the future.

This is why this year we decided to kick-off the Conference with Monday morning’s opening ceremony. Inviting New Yorkers’ Communicating Science in Today’s World: Secretary Ben Grumbles, Maryland Department of the Environment, will kick off the session followed by an interactive discussion with panels from prominent media and communication organizations including ABC News, Politico, The Baltimore Sun/Bay Journal, and even Water Words that Work, moderated by News (formerly) from the U.S. Geological Survey (USGS).

With our technical sessions and technical committee meetings, the conference will explore today’s water resources issues and challenges, including topics such as water quality, data, science, engineering, governance, public policy, communication, and education, as well as local topics such as the Chesapeake Bay and Delaware River watershed and eastern water laws. Lightning talks, a poster session, and student presentations are also part of the conference’s technical program.

Just while the conference is full of technical content, we will also engage in social events that include an opening reception on Monday with a silent auction to benefit scholarships, a ‘Beverly of the East’ reception on Tuesday evening with local vendors and non-profit organizations, a fun run around the Inner Harbor on Tuesday morning, and the student and young professionals’ career night on Wednesday evening.

And in your free time, don’t forget to try famous Maryland blue crabs in the local eateries, visit the Walters Museum and the Baltimore Aquarium and check out the many local sights surrounding the Baltimore streets by bike or foot.

I look forward to meeting many of you and encouraging you to engage with your colleagues as all things water supply.

Martha C. Narvaez Conference Chair

Presidential’s Reception

AWARDS PRESENTED AT THE PRESIDENT’S RECEPTION
SUNDAY, NOVEMBER 4, 2018

2018 PRESIDENT’S AWARD FOR OUTSTANDING SERVICE
Christine McClellan
Director of Membership and Marketing
American Water Resources Association
Middleburg, Virginia

AWRA 2018 OUTSTANDING STATE SECTION AWARD
National Capital Region Section
Accepted by Elizabeth Everleigh - President and
Lara Stuller - President-Elect

AWRA 2018 N. EARL SPANGENBERG OUTSTANDING STUDENT CHAPTER AWARD
University of Delaware Student Chapter
Accepted by Maggie Capodici

AWRA BOARD OF DIRECTORS SERVICE AWARDS
Rafael E. Frias III
Past President
Noel Gollehon
Secretary/Treasurer
Betsy Cody
Director
Lauren E. Stedothar
Director
PRESIDENT’S RECESSION

AWARDS PRESENTED AT THE PRESIDENT’S RECEPTION
SUNDAY, NOVEMBER 4, 2018

2018 PRESIDENT’S AWARD FOR OUTSTANDING SERVICE
Christine McCruhin
Director of Membership and Marketing
American Water Resources Association
Middleburg, Virginia

AWRA 2018 OUTSTANDING STATE SECTION AWARD
National Capital Region Section
Accepted by
Elisabeth Eveleigh - President and
Lana Sindler - President-elect

AWRA 2018 N. EARL SPANGENBERG OUTSTANDING STUDENT CHAPTER AWARD
University of Delaware Student Chapter
Accepted by
Maggie Capocci

AWRA BOARD OF DIRECTORS
SERVICE AWARDS
Rafael E. Frias III
Past President
Noël Golileon
Secretary/Treasurer
Betsy Cody
Director
Laurel E. Stadljuhar
Director

AWRA AWARDS RECIPIENTS (continued)

OUTSTANDING STATE SECTION AWARD (continued)

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<tr>
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<td>2018</td>
</tr>
<tr>
<td>National Capital Region</td>
<td>2018</td>
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</tbody>
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N. EARL SPANGENBERG OUTSTANDING STUDENT CHAPTER AWARD
This Award is presented to the AWRA Student Chapter which has been most active in advancing water resources knowledge in their respective Chapter, State, and Section. Recipients are:

- Univ. of Wisconsin-Stevens Point: 1983
- University of Arizona: 1984
- Univ. of Wisconsin-Stevens Point: 1985
- University of Arizona: 1986
- University of Minnesota: 1987
- Northern Illinois University: 1988
- Univ. of Wisconsin-Stevens Point: 1989
- Utah State University: 1990

Pennsylvania State University... 1991
Pennsylvania State University... 1992
Univ. of Wisconsin-Stevens Point: 1993
University of Nevada-Reno... 1994
Univ. of Wisconsin-Stevens Point: 1995
University of Nevada-Reno... 1996
Calhoun/Warrior Student Chapter: 1997
University of Alabama: 1998
Penn State: 1999
Univ. of Wisconsin-Stevens Point: 2000
University of Florida: 2001
University of Washington: 2002
Salt City (SUNY-ESF): 2003
Salt City (SUNY-ESF): 2004
Virginia Tech: 2005
University of Wisconsin-Stevens Point: 2006
University of Washington: 2007
University of Wisconsin-Stevens Point: 2008
University of Florida: 2009
University of Wisconsin-Stevens Point: 2010
University of Utah: 2010
Southern Illinois University: 2011
Oregon State University: 2012
Oklahoma State University: 2013
Texas A&M University: 2014
University of Delaware: 2015
University of Florida: 2016
University of Delaware: 2017
University of Delaware: 2018

2018 AWRA BOARD OF DIRECTORS

- Brenda Bateman: President
- Lisa Beutler: President-elect
- Rafael Frias: Past-President
- Noël Golileon: Secretary/Treasurer
- Laurel Stadljuhar: Director
- Betsy Cody: Director
- Jerad Beales: Director
- Sharon Megdal: Director
- Scott Kudlies: Director
- Lisa Engelman: Director

Lunch Program
DWRC Director’s Message

Why study water? Because it’s not just good for our ecology, it’s also the foundation of our economy. Established on campus in 1965 after Lyndon Baines Johnson signed the Water Resources Research Act during the golden era of water resources in the United States, the University of Delaware Water Resources Center is one of 54 National Institutes for Water Resources (NIWR) situated at land grant universities stretching across the Atlantic and Pacific from Maine to Micronesia. The 54 NIWR institutions of higher learning have graduated over 50 million alumni who hold jobs in the sciences, engineering, arts and humanities (STEAM) that support our national economy. We’re finding that the byproducts of our NIWR universities - data and knowledge - are priced differently and worth much more now in the new economy and the old supply and demand curves just don’t quite capture the true economic value of water.

The WRRA/NIWR research program invests in water resources that support a $100 billion economy in the United States. In 2005, surface waters monitored by the USGS stream gage network totaled 260 billion gallons per day for irrigation, industry, thermoelectric power, and drinking water uses with an in-stream value estimated by the University of Delaware of over $21 billion in 2010 dollars. Ecosystem services and wetland habitat in the National Wildlife Refuges maintained by the U.S. Fish and Wildlife Service totaled $27 billion in 2008 dollars. The American Water Works Association (AWWA) calculated the U.S. gains $220 billion in economic activity and generates 1.3 million jobs by investing in water and wastewater infrastructure. Every new water sector job adds an additional 3.7 jobs to the U.S. economy and every dollar invested in infrastructure generates $6.00 in returns. The U.S. Fish and Wildlife Service estimates clean water provides $157 billion in annual expenditures including $46 billion for fishing, $35 billion for hunting, and $76 billion for bird/wildlife watching.

The Outdoor Industry Association estimates the outdoor recreation economy totals $140 billion nationally for water sports such as boating, paddling, and sailing. The University of Delaware found the Delaware River in Delaware, New Jersey, New York, and Pennsylvania supports $22 billion in annual economic activity and 600,000 direct/indirect jobs. The University of Maryland estimated the nation’s largest estuary, the Chesapeake, supports a trillion-dollar economy. The Nature Conservancy concluded the
Colorado River drives a $1.4 trillion economy and 16 million jobs in California, Arizona, Nevada, Utah, Colorado, New Mexico and Wyoming or almost 10% of the U.S. gross domestic product (GDP). Investments in NWR universities such as the University of Delaware by federal, state, and local governments are paying off handsomely in terms of jobs, careers, and GDP.

![Diagram showing supply and demand curves]

The old supply and demand curves don't quite capture the true value of data and knowledge developed by the NWR universities.

**DWRC Faculty and Scientists**

The Delaware Water Resources Center (DWRC) is a unit of the Institute for Public Administration (IPA), a research center within the School of Public Policy & Administration (SPPA) at the University of Delaware. Dr. Jerome Lewis is the IPA Director. DWRC faculty and scientists include:

- **Gerald J. Kaufman** (Ph.D. Director / Associate Professor)
- **Martha C. Narvaez** (Policy Scientist)
- **Andrew P. Hornsey** (Policy Scientist / GIS Lab)
- **Nicole M. Mies** (Associate Policy Scientist GIS Lab / Lewes Campus)
- **Angela Speers** (Sponsored Programs Coordinator)
- **Jillian Young** (Graduate Research Assistant M.S. Water Science and Policy)
- **Kelly Jablons** (Graduate Research Assistant M.S. Energy and Environmental Policy)

![Image of DWRC faculty and students]

DWRC has two Delaware offices, its main office on the University of Delaware's Newark campus, between Penny Hall and the Perkins Student Center, and on the Hugh R. Sharp campus of the University of Delaware in Lewes. Detailed directions for both locations are here.

**2018-2019 DWRC Research Interns**

DWRC works with undergraduate and graduate students studying water resources to develop research projects that reflect their unique interests. The DWRC Research Interns for the 2018-2019 school year are:
Meet the DWRC Graduate Research Fellows

Kelly Jacobs

Kelly is a first-year Master's student in the Energy and Environmental Policy program. She is from Dallas, Pennsylvania and received her Bachelor's degree in Economics from Lebanon Valley College. Kelly has worked on various projects for DWRC including the City of Newark's Source Water Assessment, field work for White Clay Wild and Scenic, and Brandywine-Christina Cluster Water Quality and Communication. She is specifically interested in research related to hydraulic fracturing and its impact on water quality.

Jillian Young

Jillian is originally from Sidney, NY where she obtained her Bachelor's degree from SUNY Oswego in Meteorology. She is currently a second-year Master's student in the Water Science and Policy program. While working on her degree, Jillian conducts research for DWRC where she interns for the White Clay Creek Wild and Scenic River Group. Leads field work projects, assists with watershed reports, and presents to groups on the importance of clean water. Outside of school, Jillian's main interest is training her horse named Ace.

The AWRA Outstanding Student Chapter Award Goes To...

For the second year in a row, the American Water Resources Association (AWRA) selected the University of Delaware (UD) Student Chapter as the AWRA Outstanding Student Chapter for 2016. This award is presented to the AWRA Student Chapter which has been most active in advancing water resources knowledge in their respective Chapter, State, and Section. The UD Student Chapter has won the award in 2014, 2015, and now in 2016.

champions of the AWRA Outstanding Student Chapter Award:

University of Delaware - 2015, 2017, 2018

The UD Student Chapter Executive Board accepted the award on Sunday, November 4, 2018 during the AWRA President's Reception in Baltimore, Maryland. Members of the Executive Board, pictured with current AWRA President Brenda Bateman, include Maggie Capucci (President), Jillian Young (Vice President), Lauren Mosesso (Secretary), and Nathan Sienkiewicz (Treasurer).

The Student Chapter of the Delaware Section of the American Water Resources Association is a non-profit professional association dedicated to the advancement of women and men in water resources management, research, and education. The Student Chapter's objectives are to advance water resources research, planning, development, management, and education; to establish a common meeting ground for physical, biological, and social scientists, engineers, and other persons concerned with water resources on the University of Delaware's campus; and to collect, organize, and disseminate ideas and information on the field of water resources science and technology.

In addition to the UD Student Chapter winning this award for the third time, the University of Delaware Water Resources Center's policy scientist, Martha Narvaez, was this year's conference chair and also served as AWRA President in 2016.
Clean Water: A Bi-State Solution

Over 160 people joined together on May 3, 2018 to educate, learn, and celebrate the Brandywine-Christina Watershed at the Clean Water: A Bi-State Solution conference. The conference focused on the collaborative efforts made to improve the watershed health, ongoing projects, and the next steps to ensure the health of the watershed.

The conference was held by the Brandywine-Christina Cluster Partners: Brandywine Conservancy & Museum of Art, Brandywine Red Clay Alliance, Natural Lands, Stroud Water Research Center, The Nature Conservancy of Delaware and the University of Delaware Water Resources Center. These are six nonprofit organizations funded by the William Penn Foundation through the Delaware River Watershed Initiative (DRWI).

The morning started off with Andrew Johnson, the Program Director at The William Penn Foundation, speaking about the DRWI and how over the past seven years, they have distributed over $100 million dollars for clean water in the Brandywine-Christina watershed. Despite these efforts, he said, “It’s still not enough.” More funds are needed to help the water’s health.

A joint talk included the Secretary of the Delaware Department of Natural Resources and Environmental Control (DNREC), Shawn Garvin, and Secretary of the Pennsylvania Department of Environmental Protection (PA DEP), Patrick McDonnell. Together, they spoke about the importance of the watershed health because the watershed incorporates the two states. Most of the land in the watershed is in Pennsylvania, but the majority of the population in Wilmington receives their drinking water from the headwaters in Pennsylvania.

Following these talks, Dr. Gerald Kauflman, Director of the University of Delaware Water Resources Center, spoke about the important history of the watershed which supported life for early settlers. He discussed the history of the mill dams on the river and how today, people can no longer ice skate on the Brandywine because of the climate’s warming temperatures.

Two panel sessions included presentations about water quality and collaborative work in the watershed. The first panel included Dr. John Jackson, Senior Research Scientist at the Stroud Water Research Center who discussed the influences of agriculture on the watershed, showing which streams are impaired and which areas are showing reductions in sediment loads. Four more presentations followed on topics including agricultural conservation practices, stream restoration projects, municipal ordinances, and the Brandywine-Christina Healthy Water Fund.

The second panel session provided an overview of projects from the federal and local government perspective. The panel included Shane Morgan, the Watershed Coordinator for the White Clay Creek Wild and Scenic River Program, who talked about how joint projects on land protection, outreach, education, and water quality monitoring, coupled with federal funding all help protect and keep the White Clay Creek healthy. Other panelists spoke about projects to protect Wilmington, Delaware’s water source and land preservation in Honey Brook Township, Pennsylvania.

The keynote speaker was Collin O’Mara, President and CEO of the National Wildlife Federation
DWRC Water Research Students
2018-2019 DWRC Undergraduate Research Interns

- **Michaella Becker (Environmental Engineering)**, Advisor: Paul Imhoff (Civil and Environmental Engineering), Impact on New Castle County Roadway Soils Amended with Biochar
- **Nicolette Bugher (Environmental Engineering)**, Advisor: Gerald Kauffman (Biden School), Monitoring of Perfluoroalkyl Substances (PFAs) in Delaware Drinking Water Aquifers
- **Chelsea Caplinger (Political Science)**, Advisor: Gretchen Bauer (Political Science). Policy and Governance of Watershed Management
- **Alyssa Cortese (Environmental Science)**, Advisor: Gerald Kauffman (Biden School), Nitrogen Levels in the White Clay Creek National Wild and Scenic River Watershed.
- **Monica Crosby (Environmental Studies)**, Advisor: Paul Jackson (Geography), Water Policy and Wetland Ecology
- **Veronica Hill (Resource Economics)**, Advisor: Leah Palm Forster (Resource Economics) and Andrew Homsey (Biden School), Sea Level Rise along Southern Coastal Delaware.
- **Allison Kaltenbach (Environmental Engineering)**, Advisor: Gerald Kauffman (Biden School), Environmental Mitigation of Perfluoroalkyl Substances
- **Rebecca Steiner (Public Policy)**, Advisor: Nina David (Biden School), Land Use Change in the Delaware Inland Bays Watershed
- **Mia Kane, (Environmental Science)**, Advisor: Gerald Kauffman (Public Policy), Nonprofit Management of Watersheds and River Basins
- **Liam Warren (Energy and Environmental Policy)**, Advisor: Phillip Barnes (Biden School). Coastal Inundation of Delaware Infrastructure.
- **Natalie Zimmerman (Geology)**, Advisor: Gerald Kauffman (Biden School), Sediment Fingerprinting in the White Clay Creek National Wild and Scenic River Watershed.
- **Andrew Dorazio (Mechanical Engineering)**, Advisor: Gerald Kauffman (Biden School). Hydropower Potential along the White Clay Creek National Wild and Scenic River.
FY18-19 Delaware Water Resources Center
Graduate Students


## FY19-20 DWRC Undergraduate Water Research Interns

<table>
<thead>
<tr>
<th>Undergraduate Intern</th>
<th>Advisor</th>
<th>Major</th>
<th>Research Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sicily Bordick</td>
<td>Anastasia Chirnside</td>
<td>Environmental Engineering</td>
<td>Optimization of HPLC Analysis of Ergosterol to Quantify Fungal Biomass within Solid State Bioreactors utilizing Varying Support Materials</td>
</tr>
<tr>
<td>Zach Burcham</td>
<td>Anastasia Chirnside</td>
<td>Environmental Engineering</td>
<td>Optimization of HPLC Analysis of Ergosterol to Quantify Fungal Biomass within Solid State Bioreactors utilizing Varying Support Materials</td>
</tr>
<tr>
<td>Ji Zhendong</td>
<td>James Pizzuto</td>
<td>Environmental Science</td>
<td>Discriminating between Mill Dam and Flood Deposits along the White Clay Creek</td>
</tr>
<tr>
<td>Justin Leary</td>
<td>Gerald Kauffman</td>
<td>Environmental Engineering</td>
<td>Characterization and Monitoring of Headwater Streams in the White Clay Creek Watershed</td>
</tr>
<tr>
<td>Savanah Love</td>
<td>Stephanie Stotts</td>
<td>Wesley College Environ. Science</td>
<td>Interactive art exhibit focused on salinification of wetlands</td>
</tr>
<tr>
<td>Aaron Nolan</td>
<td>Gerald Kauffman</td>
<td>Environmental Engineering</td>
<td>Coastal Flood Planning and Response for Transportation Infrastructure</td>
</tr>
<tr>
<td>Polly Ni</td>
<td>Andrew Homsey</td>
<td>Environmental Engineering</td>
<td>Brandywine Piedmont Watershed Stream Monitoring and Habitat Assessment</td>
</tr>
<tr>
<td>Luke Stirparo</td>
<td>Gerald Kauffman</td>
<td>Environmental Engineering</td>
<td>Effects of Road Salt and Winter Deicing Agents on Delaware Stream Systems</td>
</tr>
<tr>
<td>Michaela Dougherty</td>
<td>Martha Narvaez</td>
<td>Energy and Environ. Policy</td>
<td>Energy Water Nexus and Water Supply Withdrawals in Delaware Watersheds</td>
</tr>
<tr>
<td>Undergraduate Student</td>
<td>Gerald Kauffman</td>
<td>Public Policy</td>
<td>Economics and Cost Effectiveness of Watershed Restoration in Delaware Coastal Plain Streams</td>
</tr>
</tbody>
</table>
WATER RESEARCH GRANTS

The state water resources research institutes authorized by section 104 of the Water Resources Research Act of 1984 are organized as the National Institutes for Water Resources. The NIWR cooperates with the U.S. Geological Survey to support, coordinate and facilitate research through the Annual Base Grants, National Competitive Grants, Coordination Grants, and in operating the NIWR-USGS Student Internship Program. The Annual Base Grants, 104(b), and National Competitive Grants, 104(g), make up the backbone of the USGS 104 program. Below is a brief explanation of these two similar, but different grants.

State Water Research Grants - USGS 104(b) Program

These grants provide competitive seed grant funding opportunities for faculty members or affiliates at institutions of higher education. Applications must be submitted through your State Water Research Institute or Center. The Institutes or Centers may only consider project proposals from faculty members or affiliates at institutions of higher education in its State. To find out where your state's Institute or Center is located visit the Institutes webpage here and click on your state.

Unique characteristics of this program include:

- Research priorities are set by each institute in consultation with its state advisory board.
- Research focuses on state and regional water resources problems that can be addressed by researchers at academic institutions in states with common problems.
- All federal funds must be matched by at least two non-federal dollars for each federal dollar.

For more information on the USGS 104 program visit the USGS Water Resources Research Institutes website here.

National Water Research Grants - USGS 104(g) Program

The goals of the National Competitive Grants program are to promote collaboration between the USGS and university scientists in research on significant national and regional water resources issues; promote the dissemination and results of the research funded under this program; and to assist in the training of scientists in water resources. The USGS 104(g) Program provides the major mechanism to meet the growing needs not filled by state or federal research programs.

Unique characteristics of this program include:

- Research priorities are set jointly by the National Institutes for Water Resources and the U.S. Geological Survey.
- The program focuses on regional and interstate water resources problems beyond those of concern only to a single state.
- All federal funds must be matched by at least one non-federal dollar for each federal dollar.

For more information on the USGS 104 program visit the USGS Water Resources Research Institutes website here.
U.S. Geological Survey
Department of the Interior

STATE WATER RESOURCES RESEARCH INSTITUTE PROGRAM
ANNUAL BASE GRANTS FISCAL YEAR 2019 REQUEST FOR APPLICATIONS
under Section 104 of the
Water Resources Research Act of 1984, as Amended

ANNOUNCEMENT G19ASXXXXX
Revised November 01, 2018

CLOSING DATE
JANUARY 17, 2019
5:00 P.M. Eastern Standard Time

OMB Number: 1028-0097
Expiration Date: 2/29/2020

PAPERWORK REDUCTION ACT STATEMENT: In accordance with the Paperwork Reduction Act (44 USC 3501), an agency may not conduct or sponsor and a person is not required to respond to a collection of information unless it displays a currently valid Office of Management and Budget control number. OMB has reviewed and approved this information collection and assigned OMB Control Number 1028-0097. You may submit comments on any aspect of this information collection, including the accuracy of the estimated burden hours and suggestions to reduce this burden. Send your comments to: Information Collections Clearance Officer, US Geological Survey, as-info_collections@usgs.gov.
Water Resources Research Act Program
National Competitive Grants Program

Fiscal Year 2019 Announcement

Announcement No. G19ASXXXX
under Section 104(g) of the
Water Resources Research Act of 1984, as Amended
November 1, 2018

Closing Dates
5:00 PM, Eastern Time, February 15, 2019 (Preproposals)
5:00 PM, Eastern Time, May 31, 2019 (Institutes)

Department of the Interior
U. S. Geological Survey

National Institutes for
Water Resources

OMB Number 1028-0007
Expiration Date: Pending: 2/29/2020

PAPERWORK REDUCTION ACT STATEMENT: In accordance with the Paperwork Reduction Act (44 USC 3501), an agency may not conduct or sponsor and a person is not required to respond to a collection of information unless it displays a currently valid OMB control number. Management and Budget control number. OMB has reviewed and approved this information collection and assigned OMB Control Number 1028-0007. You may submit comments on any aspect of this information collection, including the accuracy of the estimated burden hours and suggestions to reduce this burden. Send your comments to: Information Collections Clearance Office, US Geological Survey, gsib_collections@usgs.gov.
TITLE: Measurements and modeling to improve prediction of vulnerability of coastal water resources and ecosystems to salinization by storm surges and sea-level rise

PROPOSED INITIATION DATE: September 1, 2018

PROPOSED COMPLETION DATE: August 31, 2021

WATER RESOURCES RESEARCH INSTITUTE OR CENTER: University of Delaware

FUNDING LEVEL (Cap of $250,000 federal funds and a maximum of a 3 year duration)

(A) FEDERAL FUNDS REQUESTED: $195,215

(B) PROPOSED COST SHARING: 195,215

FOCUS CATEGORIES. GROUNDWATER, WATER QUALITY, MODELS

RESEARCH CATEGORY. Climate and Hydrologic Processes

KEYWORDS. Coastal groundwater quality, seawater intrusion, storm surges, variable-density groundwater modeling, sea-level rise

PRINCIPAL INVESTIGATOR(S). Holly A. Michael, Associate Professor, University of Delaware, h michael@udel.edu, 302-831-4197

CO-PRINCIPAL INVESTIGATOR(S). Xuan Yu, Postdoctoral Researcher, University of Delaware, xuan@udel.edu, 302 831-1393; Glen Carleton, Hydrologist, USGS NJ Water Science Center, carleton@usgs.gov, 609-771-3921.
Delaware FY 19 Sec 104g Pre-proposals

1. Draining the landscape: Will dam removals result in increased nitrogen leakage and exports from watersheds? (Dr. Inamdar)

2. Paradigm Shift: Groundwater as a point source of pollutants to Piedmont streams (Dr. McKenna)


4. Evaluation of the Design and Operational Characteristics of a Fungal Bioreactor as a Novel Technology to Remove Pathogens and Antibiotics From Dairy Waste Streams (Dr. Chirnside)
SUNDAY, FEBRUARY 25, 2018

5:00 to 7:00 pm  Board meeting with light dinner provided

MONDAY, FEBRUARY 26, 2018

7:00 am to 5 pm  Registration Desk Open

7:30 am  Breakfast Buffet Available

8:00 am  New Directors’ Breakfast
Sam Fernald (NM), NIWR President
All NIWR directors are welcome

9:00 am  Welcome, Meeting Overview, Introductions and NIWR Update
Meeting Overview and Introductions: NIWR President-Elect Dan Devlin (KS)
NIWR Update: NIWR President Sam Fernald (NM)
Reflections on NIWR 2016-2017: NIWR Past-President Stephen Schoenholtz (VA)

10:00 am  Coffee Break

10:15 am  Comments and Update from Van Scyoc Associates
Leslee Gilbert, Van Scyoc Associates

10:45 am  United States Senator Jerry Moran (KS)
(invited)

11:15 am  UCOWR-NIWR Partnership Update
Doug Parker (CA) and Sharon Megdal (AZ)

11:30 am  National Water Priorities
Panel Discussion: Reagan Waskom, Water Priorities in the West
Rick Cruse, Water priorities in the Midwest
John Fear, Water priorities in the Southeast
Gerald Kauffman, Water priorities in the Northeast

12:30 pm  NIWR Networking Lunch – Regional Groups

1:30 pm  USGS Opportunities and Priorities

Understanding and Working with Your USGS Water Center
Eric Reichard, California Center Director
Stephen Anthony, Pacific Islands Center Director
Mark Bennett, Virginia/West Virginia Water Center Director

Overview and Priorities of USGS Programs
Gary Rowe, Program Coordinator for the National Water Quality Program
Mike Woodside, Acting Program Coordinator for the Groundwater and Streamflow Information Program
Mindy Dalton, Acting Program Coordinator for the Water Availability and Use Science Program

3:15 pm  Coffee Break

3:30 pm  US House of Representative Ken Calvert (CA)
(invited)

4:00 pm  USGS WRRI Program Updates
Earl Greene, Program Coordinator, Water Resources Research Act Program, USGS

4:45 pm  NIWR Net Update
Earl Greene (USGS) and Mark Newman (FL)

5:50 pm  Wrap-Up and Adjourn for the Day
MEMO

To: Dan Devlin, NIWR Board President
From: Leslee Gilbert, VSA
Date: December 17, 2018
RE: Action Plan for 2019

The following represents an action plan for NIWR for the coming year and Congress.

Goals
Secure an authorization for the WRRA program at USGS.
Increase FY2020 appropriations for the WRRA program. Aim at $10 million in FY20, $15 million in FY21, and $20 million in FY22.

Objectives
Authorization Objectives
Determine if the current text of the WRRA authorization needs further changes, including goals and funding amount. Draft revised text
Work with previous sponsors and potential new sponsors to introduce and advance the legislation.
Build on existing relationships with House Democratic Members on the Natural Resources Committee to advance the legislation. Garner support from new Members.
Continue current strong support in Senate to advance the legislation.

Appropriations Objectives
Prepare FY20 appropriations’ request for WRRA program.
Garner support from new House Majority Members and staff for program. Build on existing relationships.
Educate new Members on the value of WRRA in their states and districts.
Partner with coalitions to work to increase USGS baseline.

Action Items
Authorization Action Items
Draft potentially new WRRA reauthorization to reflect desire of the NIWR board for programmatic and funding changes. This needs to be done by late January.
In Senate, meet with Sen. Boozman and Cardin’s offices about reintroducing the authorization. Discuss with the office the possibility of increasing the authorization amount in the bill.
March 8, 2019

Senator Tom Carper
515 Hart Senate Office Building
Washington, DC 20510

Re: Water Resources Research Act (WRRA) Fiscal Year 2020 Interior, Environment and Related Agencies Appropriations Bill

Dear Senator Carper,

As Director of the University of Delaware Water Resources Center, I wish to thank you for your continuing support of the Water Resources Research Act (WRRA) program and respectfully request your support of the Senate Subcommittee to provide $10 million for the program in the Fiscal Year 2020 Interior, Environment, and Related Agencies Appropriations Bill.

The Water Resources Research Act, signed by Lyndon Baines Johnson in 1964, establishes the National Institutes for Water Resources (NIWR) at 54 land grant universities (such as the University of Delaware) in the 50 states, Washington D.C., and three island territories of Guam, Puerto Rico, and Virgin Islands. These institutes provide a FEDERALEY-funded and state-based network dedicated to solving problems in partnership with universities, local governments, water industry, and the public. Each state contributes a minimum of a $2 to 1 match, thus ensuring that local, state, and regional priorities are addressed and the impact of federal dollars is maximized. The University of Delaware Water Resources Center was established on campus in 1965 and since then we have trained and research of thousands of students (many from Delaware) in the significant water resources issues of the day in Delaware, the Delawar

Please don't hesitate to contact me at jerry@udel.edu or cell 302-893-1571 if you have any questions regarding this important appropriation concerning our state and national water resources.

Warmly,

Gerald J. Kaufman, Director
University of Delaware
Water Resources Center
Newark, Del. 19716

March 8, 2019

Senator Chris Coons
137A Russell Senate Office Building
Washington, DC 20510

Re: Water Resources Research Act Fiscal Year 2020 Interior, Environment and Related Agencies Appropriations Bill

Dear Senator Coons,

Delaware Water Resources Center, I wish to thank you for your Water Resources Research Act (WRRA) program and respectfully request your support of the Senate Subcommittee to provide $10 million for the Water Resources Research Act Interior, Environment, and Related Agencies Appropriations Bill.

The Water Resources Research Act, signed by Lyndon Baines Johnson in 1964, establishes the National Institutes for Water Resources (NIWR) at 54 land grant universities (such as the University of Delaware) in the 50 states, Washington D.C., and three island territories of Guam, Puerto Rico, and Virgin Islands. These institutes provide a FEDERALEY-funded and state-based network dedicated to solving problems of water supply and quality in partnership with universities, local governments, water industry, and the public. Each state contributes a minimum of a $2 to 1 match, thus ensuring that local, state, and regional priorities are addressed and the impact of federal dollars is maximized. The University of Delaware Water Resources Center was established on campus in 1965 and since then we have trained and research of thousands of students (many from Delaware high schools) who have focused on the significant water resources issues of the day in Delaware, the Delawar Valley, and the Nation.

Please don't hesitate to contact me at jerry@udel.edu or cell 302-893-1571 if you have any questions concerning our state and national water resources.

Warmly,

Gerald J. Kaufman, Director
University of Delaware
Water Resources Center
Newark, Del. 19716
March 8, 2019

Senator Lisa Murkowski, Chair,
Subcommittee on Interior and Environment Appropriations Committee
SD-131, Dirksen Senate Office Building
Washington, DC 20510

Dear Senator Murkowski:

Thank you for your continued support for the Water Resources Research Act (WRRA) program. I write to urge your continued support for the WRRA and a request for an FY20 appropriation of $10 million. The WRRA is a proven and effective program in effect since 1964 and is a vital resource for many constituencies, regional water managers, and local business leaders. The Water Resources Research Act (32 USC 109 et seq.) established National Institutes for Water Resources (NIWR) at 54 land grant universities in the 50 states, District of Columbia, and island territories of Guam, Puerto Rico, and Virgin Islands to research water-related phenomena, aid the entry of new research scientists into water resources fields, train future water scientists and engineers, and distribute the results of sponsored research to water managers and the public.

The U.S. Geological Survey administers the program that provides valuable support for water research critical to local, state, and regional communities. These state programs match federal funds with a 2:1 match that leverages federal support to address regional needs. These funds support long-term water planning and management and foster the next generation of water scientists, managers and engineers. Although the WRRA program is responsive to water needs of states and regions, it also addresses major national concerns related to drought, harmful algal blooms, flooding, and water contamination. The institutes collaborate with over 150 state agencies, 100 federal offices, and more than 165 local and municipal offices. In each year, Federal dollars are leveraged to support nearly 300 students in training, over 200 research projects, and more than 550 researchers. Such support fosters successful entry into the STEM job market nationally.

I appreciate the Subcommittee’s support for the Water Resources Research Act and request that you continue funding this program in the FY20 Interior, Environment, and Related Agencies bill.

Warmly,

[Signature]

Gerald J. Kaufman, Director
University of Delaware
Water Resources Center
Newark, Del. 19716

Cc: Senator Tom Carper, Senator Chris Coons
115th Congress
Senate Committee on Environment and Public Works

Majority Members
John A. Barrasso (R-WY) Chairman
James M. Inhofe (R-OK)
Shelley Moore Capito (R-WV)
John Boozman (R-AR)
Roger F. Wicker (R-MS)
Debra S. "Deb" Fischer (R-NE)
Jerry Moran (R-KS)
M. Michael "Mike" Rounds (R-SD)
LTC Joni K. Ernst, ARNG (Ret) (R-IA)
Daniel S. "Dan" Sullivan, USMCR (R-AK)
Richard C. Shelby (R-AL)

Minority Members
Thomas R. "Tom" Carper (D-DE) Ranking Member
Benjamin L. "Ben" Cardin (D-MD)
Bernard "Bernie" Sanders (I-VT)
Sheldon Whitehouse (D-RI)
Jeff Alan Merkley (D-OR)
Kirsten Elizabeth Gillibrand (D-NY)
Cory A. Booker (D-NJ)
Edward J. "Ed" Markey (D-MA)
LTC Ladda Tammy Duckworth, ARNG (Ret) (D-IL)
Christopher "Chris" Van Hollen, Jr. (D-MD)
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Shelley Moore Capito (R-WV)
John Boozman (R-AR)
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Daniel S. "Dan" Sullivan, USMCR (R-AK)
Richard C. Shelby (R-AL)
John A. Barrasso (R-WY) Ex Officio, Non-Voting

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Kirsten Elizabeth Gillibrand (D-NY)
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LTC Ladda Tammy Duckworth, ARNG (Ret) (D-IL)
Thomas R. "Tom" Carper (D-DE) Ex Officio, Non-Voting
115th Congress
Senate Committee on Appropriations

Majority Members
William Thad "Thad" Cochran (R-MS) Chairman
Addison Mitchell "Mitch" McConnell (R-KY)
Richard C. Shelby (R-AL)
Lamar Alexander (R-TN)
Susan M. Collins (R-ME)
Lisa Murkowski (R-AK)
Lindsey O. Graham, USAFR (Ret) (R-SC)
Roy Blunt (R-MO)
Jerry Moran (R-KS)
John H. Hoeven, III (R-ND)
John Boozman (R-AR)
Shelley Moore Capito (R-WV)
James Lankford (R-OK)
Steve Daines (R-MT)
John Neely Kennedy (R-LA)
Marco Rubio (R-FL)

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Patty Murray (D-WA)
Dianne Feinstein (D-CA)
Richard J. "Dick" Durbin (D-IL)
John F. "Jack" Reed (D-RI)
Jon Tester (D-MT)
Thomas S. "Tom" Udall (D-NM)
Jeanne Shaheen (D-NH)
Jeff Alan Merkley (D-OR)
Christopher A. "Chris" Coons (D-DE)
Brian E. Schatz (D-HI)
Tammy Baldwin (D-WI)
Christopher S. "Chris" Murphy (D-CT)
Joe Manchin, III (D-WV)
Christopher "Chris" Van Hollen, Jr. (D-MD)
Program Name: Water Resources Research Act Program (WRRA)

- **Program Purpose:** The Water Resources Research Act (32 USC 109 et seq.) established university-based institutes to research water and water-related phenomena, aid the entry of new research scientists into the water resources fields, train future water scientists and engineers, and distribute the results of sponsored research to water managers and the public. The U.S. Geological Survey administers the program that provides valuable support for water research that is critical to local, state and regional communities. In turn, these state programs match the federal funding—in some cases with a 2:1 match—that leverages federal support to address regional needs. These funds support superior long-term water planning and management, and foster the next generation of water scientists, managers and engineers.

- **Fiscal Year 2018 Funding Received:** $6.5 million
- **Fiscal Year 2019 Funding Received:** $6.5 million
- **Level of Funding Requested for Fiscal Year 2020:** $20 million
Water Resources Research Institute
Program
Funding History

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<th>Fiscal Year</th>
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<th>Senate Bill</th>
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DWRC Water Resources Research and Education Priorities

- Water quality (nutrients, pathogens, and public health)
- Storm water runoff (management and control)
- Water pollutants (sources, fate, cycling, and transport)
- Water supply, demand, and conservation (infrastructure/technology)
- Water policy (governance and economics)
- Climate change, sea level rise coastal flooding (variability)
- Groundwater (remediation and treatment)
- Watershed management
- Wetlands (protection and restoration)
- Wastewater management (treatment and reuse)
- Water, food, and energy nexus
- Riverine/coastal flooding
- Algal blooms
- PFOA contamination
Figure 6.4 Tide levels at NOAA gages, Delaware Bay and River, Superstorm Sandy (October 2012)
Sussex town's residents told not to drink or cook with water because of PFC contamination

PFCs found in the drinking water in Blades Jason Minto/The News Journal/USA TODAY

A tiny town in southern Delaware is facing a major water crisis.

Residents and businesses in Blades, a Sussex County town just south of Seaford, have been told not to use their tap water for drinking and cooking after perfluorinated compounds, or PFCs, were
Algae bloom prompts swimming prohibition at Newark Reservoir
No impact on drinking water, officials say

By Josh Shannon jshannon@chespub.com  Aug 19, 2017  0

A triathlete swims in the Newark Reservoir during last year’s Top of Delaware Triathlon. This year’s triathlon had to be converted to a duathlon because of algae in the reservoir.
DWRC Advisory Panel

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Dover, DE 19901

Ms. Jennifer Walls  
Delaware DNREC, Division of Watershed Stewardship  
89 Kings Highway  
Dover, DE 19901

Christian Hauser, Associate Director, Delaware Sea Grant College Program  
College of Earth, Ocean, and Environment, University of Delaware  
102 Robinson Hall  
Newark, DE 19716
March 26, 2019

Dear:

As Director of the University of Delaware Water Resources Center, I am pleased to invite you to serve on the DWRC Advisory Panel for a three-year term through May 1, 2022 based on your expertise in water issues of importance to Delaware and the Mid-Atlantic region. Established on campus in 1965, the DWRC is one of the 54 National Institutes for Water Resources (NIWR) supported by the U.S. Geological Survey at land grant universities in the 50 states, District of Columbia, and three island territories of Guam, Puerto Rico, and U.S. Virgin Islands. Responsibilities of the NIWR include: (1) innovative research that fosters entry of new research scientists into water resources fields, training of future water scientists and engineers, exploration of new ideas that address water issues, dissemination of research to water managers and the public and (2) cooperate with other colleges to develop a statewide program designed to resolve state/regional water problems.

We are proud of our water research program begun by my predecessor Deputy Dean Dr. Tom Sims that has supported over 250 undergraduate interns and graduate fellowships since 2000. In accordance with the Water Resources Research Act of 1964, the DWRC Director appoints an advisory panel to assist in the review and ranking of research projects and establish priorities for center activities. We meet annually in the spring where our interns present the results of their research projects. In your role as an advisory panel member you would have responsibilities to: (1) provide input to the Director regarding the successful mission of the DWRC, (2) assist in review of DWRC graduate fellowship and undergraduate internship applications, and (3) help promote interaction of the DWRC with other organizations in the state, region, and nation.

Please let me know if you wish to serve on the DWRC Advisory Panel and don’t hesitate to contact me at 302-831-4929 or jerryk@udel.edu. Thank you for considering.

Warmly,

Gerald J. Kauffman, Ph.D., Director
University of Delaware
Water Resources Center
Newark, DE 19716
Future University of Delaware Water Resources Center Building
Questions?