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. Kanffman, 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  Biden Institute
           44 Kent Way
           Newark, Del.

1. Introductions

2. FY18/19 Undergraduate/Graduate Research Presentations

3. DWRC FY19/20 Budget Submittal to DOI/USGS

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

5. DWRC Advisory Panel Membership

6. DWRC and Delaware Sea Grant

7. Delaware Clean Water Campaign (Martha Narvaez)

8. Luncheon
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
Policy Scientist
(GIS Services Manager)

Nicole M. Minni
Associate Policy Scientist
(GIS Laboratory/Leaves Office)

Martha C. Navaez
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 266 Academy Street in the Delaware Geological Survey (DGS) Annex, behind Penny Hall and the UD Rain Garden.

DWRC is involved with...
- Christina Basin Clean Water Partnership
- City of Wilmington Green Jobs Program
- Delaware Flora Database
- Delaware Source Water Assessment and Protection Program
- Delaware Water Supply Coordinating Council
- Delaware Watersheds
- Economic Value of Watersheds
- GIS Services/Education/Outreach

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 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
281 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 ensuring equal opportunity to all persons and does not discriminate on the basis of race, color, gender, religion, ancestry, national origin, parental 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 state and University policies, and in accordance with applicable federal law. Inquiries concerning these matters should be directed to the Office of Equal Opportunity Programs, 302 North College Street, DuPont Hall, (302) 831-9913 (voice), (302) 831-2688 (TDD).
Mission

The University of Delaware Water Resources Center (DWRC), established in 1986, is one of 36 National Institutes for Water Resources (NIWR) at land-grant universities in the 50 states, District of Columbia and U.S. territories of Guam, Puerto Rico, and U.S. Virgin Islands. The DWRC receives funding through Section 104 of the Water Resources Research Act of 1984, which was originally signed into law by President Ronald Reagan in 1984. The U.S. Geological Survey administers the provisions of the Act and provides oversight of the nation's Water Resources Research 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 precious groundwater aquifers and our streams, ponds, lakes, and coastal waters. To (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.

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 (SPAA). DWRC takes a regional, intergovernmental approach to water management, since watersheds and aquifers cross many political jurisdictions.

The Water Resources 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.

Research

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

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 core DWRC data and information collaboration in 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.

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 Watershed Management
- GEOG 432: Environmental Hydrology
- CEIS 440: Water Resources Engineering
- UAPP 857: GIS Applications in Public/Nonprofit Sectors
- UAPP 852: GIS in Public Policy

Conferences
- Water Policy Forum
- Delaware GIS Conference

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

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

Watershed Management and Planning
- Christina Basin Clean Water Partnership
- White Clay Creek Wild and Scenic Management Committee
- Nonpoint Education for Municipal Officials (NE-1MO)
- Floodplain Stormwater Management

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

All DWRC interns conduct projects consistent with the DWRC research and educational mission. Interns work in one of the following areas:

- Water resources engineering
- Water quality
- Hydrology
- Aquatic ecology
- Water management
- Geohydrology
- Renewable energy
- Geology
- Environmental science

Internships are available in the following areas:

- Water resources engineering
- Water quality
- Hydrology
- Aquatic ecology
- Water management
- Geohydrology
- Renewable energy
- Geology
- Environmental science

The DWRC Internship Program provides an opportunity for students to gain hands-on experience in the field of water resources engineering. Interns work on projects that are relevant to the DWRC's mission and have the potential to contribute to the field of water resources engineering.

NIWRI & USGS A Model Partnership

Partnership with USGS

- The National Institutes for Water Resources (NIWRI) partners with the U.S. Geological Survey (USGS) through the provisions of the Water Resources Research Act (WRRRA) to address water-related concerns.

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

- 54 NIWRI member institutions are headquartered in the country's land-grant universities in all 50 states, three U.S. territories, and the District of Columbia.

- NIWRI is the federally mandated research program that focuses on applied water research and education, training, and outreach.

Maximizing Federal Impact

- NIWRI's ability to attract and match non-federal funds to USGS grant-sponsored research multiplies the federal investment in local water projects.

- The NIWRI-USGS partnership also strengthens USGS's own funding model, as NIWRI institutions often allow funds to pass through the institutes to USGS State Water Science Centers. The NIWRI institutes open doors for the USGS at the state-level to other funding sources that may require non-federal matching funds. In recent years, the USGS State Water Science Centers have benefited from funds that have flowed through NIWRI institutions from external sources for financial assistance and scientific expertise on large-scale, multi-partner projects that address emerging water research needs.

Impact & Collaboration

- NIWRI member institutes assist public and private sector groups in their mission to protect human health, improve environmental resources, and economic sustainability.

- Last year, NIWRI member institutes sponsored more than 1,300 groundbreaking research projects.

- Grants from USGS and other sponsors are awarded through a competitive, peer-reviewed process.

- NIWRI member institutes collaborated on projects with over 200 universities, 150 state agencies, 190 federal agencies, departments, and districts, and more than 165 local and municipal offices.

Wanted: Interns

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

- Interns are hired by the NIWRI institute but work with USGS Water Science Center researchers.

- Internships are available in a variety of fields related to water resources engineering, including hydrology, geology, environmental science, and more.

- Interns will work on projects that are relevant to the NIWRI-USGS partnership and have the potential to contribute to the field of water resources engineering.

- Interns will receive hands-on experience in the field of water resources engineering and gain valuable skills that will benefit them in their future careers.
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. Located in the nation’s land grant institutions and four U.S. territories, the 52 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 dollars in WRRA grant funding, enabling cutting-edge research on the nation’s most pressing water issues. This financial source requires matching from non-federal sources from the public and private sectors. 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

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
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Visit us at niwr.info

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:

- "Trace Organic Contaminants in Urban Stormwater and Performance of Urban Runoff Treatment Systems: a Field and Modeling Study" in Colorado
- "Using bioavailability to assess pyrethroid insecticide toxicity in urban sediments" 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 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 lifelong positive water resource impacts.
<table>
<thead>
<tr>
<th>State</th>
<th>NIWR</th>
<th>University</th>
<th>Department</th>
<th>City</th>
<th>Director</th>
<th>Rank</th>
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<td>Manhattan</td>
<td>Dr. Daniel Devlin</td>
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<td>Raymond-Blythe Professor</td>
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<td>Senator George Mitchell Center for Sustainability</td>
<td>Orono</td>
<td>Dr. John Peckenham</td>
<td>Senior Research Scientist</td>
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<td>Michigan State</td>
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<td>Dr. Jon Bartholic</td>
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<td>Dr. Susan White</td>
<td>Executive Director</td>
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<td>Stillwater</td>
<td>Dr. Garey Fox</td>
<td>Orville and Helen Buchanan Chair</td>
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<td>Water Resources Science</td>
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<td>Dr. Todd Jarvis</td>
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<td>Mayaguez</td>
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<td>Dr. Jeffrey Allen</td>
<td>Assistant Professor</td>
</tr>
<tr>
<td>South Dakota</td>
<td>Water Resources Research Institute</td>
<td>South Dakota State</td>
<td>Agricultural Engineering</td>
<td>Brookings</td>
<td>Dr. Van Kelley</td>
<td>Associate Professor</td>
</tr>
<tr>
<td>Tennessee</td>
<td>Water Resources Research Center</td>
<td>Tennessee</td>
<td>Institute for Secure and Sustainable Environment</td>
<td>Knoxville</td>
<td>Mr. Tim Gangaware</td>
<td>Associate Director</td>
</tr>
<tr>
<td>Texas</td>
<td>Water Resources Institute</td>
<td>Texas A&amp;M</td>
<td>Institute of Renewable Resources</td>
<td>College Station</td>
<td>Dr. Roel Lopez</td>
<td>Professor</td>
</tr>
<tr>
<td>Utah</td>
<td>Center for Water Resources Research</td>
<td>Utah State</td>
<td>Civil and Environmental Engineering</td>
<td>Logan</td>
<td>Dr. Mac Mckee</td>
<td>Director</td>
</tr>
<tr>
<td>Vermont</td>
<td>Water Resources and Lake Studies Center</td>
<td>Vermont</td>
<td>Rubenstein School of Environment Resources</td>
<td>Burlington</td>
<td>Dr. Breck Bowden</td>
<td>Patrick Professor of Watershed</td>
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<tr>
<td>Virgin Islands</td>
<td>Water Resources Research Institute</td>
<td>Univ. of Virgin Islands</td>
<td>Water Resources</td>
<td>St. Thomas</td>
<td>Dr. Henry Smith</td>
<td>Director</td>
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<td>Virginia</td>
<td>Water Resources Research Center</td>
<td>Virginia Tech.</td>
<td>Forest Resources</td>
<td>Blacksburg</td>
<td>Dr. Kevin McGuire</td>
<td>Associate Professor</td>
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<td>Washington</td>
<td>Water Research Center</td>
<td>Washington State</td>
<td>Economic Studies</td>
<td>Pullman</td>
<td>Dr. Jonathan Yoder</td>
<td>Professor</td>
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<td>West Virginia</td>
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<td>West Virginia</td>
<td>National Research Center for Coal and Energy</td>
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<td>Dr. Paul Ziemkiewicz</td>
<td>Director</td>
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<td>Wisconsin</td>
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<td>Wisconsin</td>
<td>UW Aquatic Sciences Center/Sea Grant</td>
<td>Madison</td>
<td>Dr. James Hurley</td>
<td>Director</td>
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<td>Wyoming</td>
<td>Office of Water Programs</td>
<td>Wyoming</td>
<td>Research/Economic Development</td>
<td>Laramie</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,

[Signature]

Karl W.J. Willard
Executive Director

1231 Lincoln Drive, Room 118
Southern Illinois University – Mail Code 4526
Carbondale, IL 62901
Phone (618) 536-7571 • Fax (618) 453-2571 • E-Mail ucowr@siu.edu
www.ucowr.org
Clean Water
A Bi-State Solution
May 3, 2018 | Mendenhall, PA
Swedes settle at mouth of Christinakill 1638 AD
“Nation Makers”
H. Pyle
Battle of the Brandywine
1777 AD
Villages
Taverns
Battlefields &
Encampments

NEW
YERSEY

MA.
MARYLAND

Operations
DuPont Mills
1802 AD
Underground Railroad between the Brandywine and Christina at Wilmington, Harriet Tubman 1830-1865 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
Demolishing historic Brandywine dams could make for healthier future

Muddy Litter

Washington residents Harvey Lessig and Jan Sackers have a simple vision for the future of the Brandywine River: It should run free. The couple has been fighting to remove the Brandywine's dams for years, and they're hoping the new administration will make conservation a priority.

The Brandywine, a river that winds through the heart of the city of Wilmington, Delaware, is home to some of the state's best fishing spots. But the dams on the river have caused a variety of problems, including low water levels and impaired fish migration.

Sackers, a retired biologist, says the dams are a barrier to the river's health. "They're not just a cosmetic issue," he says. "They're a major threat to the river's ecosystem."

The new administration has signaled a shift in focus to conservation, which could lead to the removal of the dams. "We're hopeful," Sackers says. "We've been working on this for years, and we think now is the time for action."

The removal of the dams is part of the work that is underway on the Brandywine as part of the wider effort to restore the river to its natural state.

Removal of the dams is part of the work that is underway on the Brandywine as part of the wider effort to restore the river to its natural state.

Brandywine

"There's a vision that we have," says Sackers. "We want the river to run free, without any barriers to fish migration."

The removal of the dams is part of a plan to restore the river to its natural state, which will benefit the environment and the fish that call the river home.

"We're working with the state and local governments to make this happen," says Sackers. "We're excited about the potential for this to be a turning point for the river."
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

- Fish/Wildlife: $33
- Public Parks: $70
- Forests: $102
- Recreation: $133
- Water Supply: $143
- Water Quality: $153
- Agriculture: $260

Value in 2010 ($ million)
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>
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<tbody>
<tr>
<td>Dairy farming</td>
<td>$73 million</td>
<td>6\text{th} in PA</td>
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<tr>
<td>Horse farming</td>
<td>$5.2 million</td>
<td>22\text{nd} in U.S.</td>
</tr>
<tr>
<td>Nursery, greenhouse, floriculture</td>
<td>$79 million</td>
<td>1\text{st} in U.S.</td>
</tr>
<tr>
<td>Row crops</td>
<td>$8.7 million</td>
<td>7\text{th} in PA</td>
</tr>
<tr>
<td>Mushroom farming</td>
<td>$412 million</td>
<td>1\text{st} in U.S.</td>
</tr>
</tbody>
</table>
Value per Year of Natural Goods and Services by Ecosystem in the Brandywine Creek Watershed

- Farmland: $226,451,412
- Forest land: $171,461,731
- Marine: $343,552
- Saltwater wetland: $313,934
- Urban: $13,104,693
- Beach/dune: $665,605
- Open water: $1,972,881
- Freshwater wetlands: $54,600,951

Legend:
- Freshwater wetlands
- Marine
- Farmland
- Forest land
- Saltwater wetland
- Barren land
- Urban
- Beach/dune
- Open water
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>
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<tr>
<td><strong>Total</strong></td>
<td><strong>1,037,365</strong></td>
<td><strong>245,583</strong></td>
<td><strong>511,045</strong></td>
<td><strong>120,983</strong></td>
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</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>
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</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>
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<tr>
<td>Indirect Watershed-Related</td>
<td>27,850</td>
<td>964,360,000</td>
<td>U.S. Census Bureau (2010)</td>
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<tr>
<td>Coastal</td>
<td>781</td>
<td>15,615,496</td>
<td>National Coastal Econ. Program (2009)</td>
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<tr>
<td>Farm</td>
<td>3,453</td>
<td>136,431,483</td>
<td>U.S. Dept. of Agriculture (2011)</td>
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<tr>
<td>Fishing/Hunting/Birding</td>
<td>1,121</td>
<td>36,810,167</td>
<td>U.S. Fish and Wildlife Service (2008)</td>
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<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><strong>Total</strong></td>
<td><strong>50,000</strong></td>
<td><strong>&gt; $2 billion</strong></td>
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</table>
“Sixteen Delicious, Buzzy
Craft Beers…”
Feb. 16, 2011
2020 AD
Brandywine River National Wild and Scenic River?
The Great American Megabasin
Chesapeake and Delaware

Gerald J. Kaufman and Carol Collier

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. Capital and five state capitals.

The Chesapeake watershed (64,000 square miles) is four times larger than the Delaware watershed (15,500 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 (98 people per square mile), which suggests less pressure per unit area from human pollution and water withdrawals.

Throughout 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 (1:1), 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 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, we invite you to join us in Baltimore’s beautiful Inner Harbor. The conference will be held at the Baltimore Convention Center with opening sessions at the Maryland Department of the Environment. We are also excited to have a variety of preconference events featuring prominent leaders in the water resources field.

As we prepare for our annual meeting, we are facing challenges. We are facing challenges on all fronts, including the impacts of climate change and the state of our water resources. Today, we will discuss how we can address these challenges and develop solutions.

With so many technical sessions and technical committee meetings, the conference will explore today’s water resources issues and challenges, including climate change, water quality, and water infrastructure. We are honored to have keynote speakers and panelists on a wide range of topics, including water management, water quality, and water policy.

And while the conference is full of technical content, we also engage in social events that include an evening reception on Monday with a short auction to benefit AWRA student scholarships. A “Beauty of the Bay” reception on Tuesday, with local cuisine and nonalcoholic beverages, can be found around the Inner Harbor on Tuesday morning.

And in your free time, don’t forget to try famous Maryland blue crabs at the local restaurants visit the National Aquarium and check out the many local sites surrounding the Baltimore-Washington Metro Area. We hope you enjoy the conference as well as all the other water-related activities.

Martha C. Narvaez, Conference Chair
Water Resources Center
University of Delaware, Newark, DE

Kathy Hale
Technical Program Chair
New Jersey Water Supply Authority
Clayton, NJ

Kelly Mott Lee
Technical Program Chair
U.S. Forest Service
Virginia

President’s Reception

Awards Presented at the President’s Reception
Sunday, November 4, 2018

2018 President’s Award for Outstanding Service

Christine McCraken
Director of Membership and Marketing
American Water Resources Association
Middletown, Virginia

AWRA 2018 Outstanding State Section Award

National Capital Region Section

AWRA 2018 N. Earl Spangenberg Outstanding Chapter Award

University of Delaware Student Chapter

AWRA Board of Directors Service Awards

Rafael E. Prias III
Past President
Noel Collembe
Secretary/Treasurer
Betsy Cody
Director
Laurel W. Steckhahn
Director
PRESIDENT’S RECEPTION

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
Noel Gololehon
Secretary/Treasurer
Betsy Cody
Director
Laurel E. Stadijumar
Director

AWRA AWARDS RECIPIENTS (continued)

OUTSTANDING STATE SECTION AWARD

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2018 AWRA BOARD OF DIRECTORS

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<th>Position</th>
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<td>Brenda Bateman</td>
<td>President</td>
</tr>
<tr>
<td>Lisa Beutler</td>
<td>President-Elect</td>
</tr>
<tr>
<td>Rafael Frias</td>
<td>Past-President</td>
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<tr>
<td>Noel Gololehon</td>
<td>Secretary/Treasurer</td>
</tr>
<tr>
<td>Laurel Stadijumar</td>
<td>Director (2016-2018)</td>
</tr>
<tr>
<td>Betsy Cody</td>
<td>Director (2016-2018)</td>
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<td>Jerad Bailes</td>
<td>Director (2017-2019)</td>
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<td>Sharon Megdal</td>
<td>Director (2017-2019)</td>
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<td>Scott Kudiel (2018-2020)</td>
<td>Director</td>
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<tr>
<td>Lisa Engelman</td>
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</tr>
</tbody>
</table>

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 instream 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.

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

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**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. Narrasc** (Policy Scientist)
- **Andrew P. Horner** (Policy Scientist / GIS Lab)
- **Nicole M. Mingo** (Associate Policy Scientist GIS Lab / Lewes Campus)
- **Angela Speers** (Sponsored Programs Coordinator)
- **Allan Youn** (Graduate Research Assistant M.S. Water Science and Policy)
- **Kelly Jakobos** (Graduate Research Assistant M.S. Energy and Environmental Policy)

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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.

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**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 Brandyswine-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 Sciences and Policy program. While working on her degree, Jillian conducts research for DWRC where she interned 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 2018. 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 also won the award in 2017. In 18 years, there have been 16 first-place 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 Capocci (President), Jillian Young (Vice President), Lauren Mosesso (Secretary), and Nathan Siemkiewicz (Treasurer).

The Student Chapter of the Delaware Section of the American Water Resources Association is a nonprofit 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 Kaufman, 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: 2/28/2020

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 1028-0007. 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 Officer, US Geological Survey, geolisbo_collection@usgs.gov.
National Competitive Grant (104g) Preproposal Form – RFP G18AS00009

Number assigned by USGS: ________

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, hmichael@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)
2018 ANNUAL MEETING
"Determining Priorities and Finding New Opportunities"
February 25 – 28, 2108
All events take place at the Phoenix Park Hotel Ballroom unless otherwise noted

PROGRAM

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
Leslie 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
Mindi 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 October 1964, established the National Institutes for Water Resources at 54 land grant universities (such as the University of Delaware) in the 50 states, Washington, D.C., and Puerto Rico to address water problems in their regions. Through the U.S. Geological Survey, the National Institutes for Water Resources provide a Federally-supported 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 2% of its budget to the program, ensuring that local, state, and regional priorities are addressed. The Water Resources Research Act was reauthorized in 2016, and since then we have supported the education, training, and research of thousands of students (many from Delaware high schools) who have focused on solving the significant water resources issues of the day in Delaware, the Delaware Valley, and the Nation.

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

Warmly,

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

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March 8, 2019

Senator Chris Coons
127A Russell Senate Office Building
Washington, D.C. 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 continued support of the Water Resources Research Act (WRRA) program and respectfully request your continued support of $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 October 1964, established 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 the Virgin Islands. The National Institutes for Water Resources provide a Federally-supported 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 2% of its budget to the program, ensuring that local, state, and regional priorities are addressed. The University of Delaware Water Resources Center was established in 1965 and since then we have supported the education, training, and research of thousands of students (many from Delaware high schools) who have focused on solving the significant water resources issues of the day in Delaware, the Delaware Valley, and the Nation.

Please don’t hesitate to contact me at jerryk@udel.edu or cell 302-893-1571 if you have any questions about 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 Lisa Murkowski, Chair,
Subcommittee on Interior and Environment
Appropriations Committee
SD-131, Dirksen Senate Office Building
Washington, DC 20510

Senator Tom Udall, Ranking Member,
Subcommittee on Interior and Environment
Appropriations Committee
SH-125 Hart Senate Office Building
Washington, DC 20510

Dear Senators Murkowski and Udall:

Thank you for the Subcommittee’s continuing 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 regionally and 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,

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

Cc: Senator Tom Carper, Senator Chris Coons

March 8, 2019

Hon. Betty McCollum, Chairwoman
Subcommittee on Interior, Environment, and Related Agencies
2051 Rayburn House Office Building
Washington, DC 20515

Hon. David Joyce, Ranking Member
Subcommittee on Interior, Environment, and Related Agencies
1016 Longworth Office Building
Washington, DC 20515

Dear Chairwoman McCollum and Ranking Member Joyce:

I write to urge your continued support for the Water Resources Research Act (WRRA) program in FY 2020 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, including 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.

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I appreciate the Subcommittee’s support for the Water Resources Research Act and request that you continue funding this program in the FY19 Interior, Environment, and Related Agencies bill.

Warmly,

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

Cc: The Honorable Lisa Blunt Rochester
### 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)
SUBCOMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE

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

Minority Members
Benjamin L. "Ben" Cardin (D-MD) Ranking Member
Bernard "Bernie" Sanders (I-VT)
Sheldon Whitehouse (D-RI)
Jeff Alan Merkley (D-OR)
Kirsten Elizabeth Gillibrand (D-NY)
Edward J. "Ed" Markey (D-MA)
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)

**Minority Members**
- Patrick J. Leahy (D-VT) *Vice Chairman*
- 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

Jayme Arthurs
USDA Natural Resources Conservation Service
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89 Kings Highway  
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?