56th Annual Meeting of the Delaware Water Resources Center

University of Delaware
Water Resources Center

DGS Annex 261 Academy St.
Newark, Del.
May 13, 2021

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

Martha B. Narvaez
Associate Director
University of Delaware
Water Resources Center

NIWR
THE NATIONAL INSTITUTES FOR WATER RESOURCES

JOSEPH R. BIDEN, JR. SCHOOL OF PUBLIC POLICY & ADMINISTRATION
www.bidenschool.udel.edu

VIA ZOOM Call

- **56th Annual UDWRC Advisory Panel Meeting, May 13, 2021 10:00 am – noon**

- Event details and find a time https://udel.zoom.us/j/505147266
  Gerald Kauffman is inviting you to a scheduled Zoom meeting. Join Zoom Meeting
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MEMORANDUM

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

FROM: Gerald J. Kauffman, Director *Gerald J. Kauffman*
Martha B. Narvaez, Associate Director *Martha B. Narvaez*
University of Delaware Water Resources

DATE: Center March 29, 2021

SUBJECT: 56th Annual UDWRC Advisory Panel Meeting, May 13, 2021 10 am-12:15 pm

You are invited to the 56th Annual Meeting of the Advisory Panel of the University of Delaware Water Resources Center at 10 am on Thursday May 13, 2021 to be held via ZOOM call from the University of Delaware campus in Newark, Delaware. Our charge will be to review the research presentations of the FY20/21 water resources students, discuss the upcoming FY21/22 research projects, and establish water research priorities in Delaware for the upcoming year. Students will present a 3-slide powerpoint slide that presents their research to the DWRC Advisory Panel the morning of May 13, 2021. For guidance on the contents of student research presentations, please see our website here. https://www.wrc.udel.edu/education/internships/

Agenda
Delaware Water Resources Center
56rd Annual Advisory Panel Meeting

10:00 am
May 13, 2021

University of Delaware
via ZOOM call

https://udel.zoom.us/j/505147266

1.	Introductions	10:00 am
2.	DWRC Strategic Plan for Diversity, Inclusion, & Environmental Justice	10:10 am
3.	FY20/21 Undergraduate/Graduate Research Presentations	10:30
4.	DWRC FY21/22 Budget Submittal to DOI/USGS	11:30
5.	FY21/22 Undergraduate Water Internship Proposals (start Sep 2020)	11:40
6.	DWRC Advisory Panel Membership	11:50
7.	Federal Water Research Opportunities	noon
8.	Adjourn	12:15 pm

Water Resources Research Act Program

HOME

CURRENT BUDGET JUSTIFICATION

PRIOR BUDGET JUSTIFICATIONS

AUTHORIZATIONS

PERFORMANCE MEASURES

Authorizations

Water Resources Research Act Program (WRRA) activities are conducted under the authority of various pieces of authorizing legislation. Many of the primary authorizations that allow the USGS and WRRA to serve the American people are listed below, along with descriptions of either how the authorization relates to USGS or what WRRA activities are performed under a particular authorization.

General USGS Authorizations

The **ORGANIC ACT OF MARCH 3, 1879**, (43 U.S.C. 31 et seq.) that established the Geological Survey, as amended (1962); and restated in annual appropriation acts. This section provides, among others, that the Geological Survey is directed to classify the public lands and examine the geological

(d) Mails

The Board may use the United States mails in the same manner and under the same conditions as other departments and agencies of the United States.

(e) Experts and consultants

Subject to such rules as may be prescribed by the Board, the Chairman may procure temporary and intermittent services under section 3109(b) of title 5, but at rates for individuals not to exceed the daily equivalent of the maximum annual rate of basic pay payable for GS–18 of the General Schedule.

(Pub. L. 97–425, title V, § 507, as added Pub. L. 100–202, § 101(d) [title III], Dec. 22, 1987, 101 Stat. 1329–104, 1329–121; Pub. L. 100–203, title V, § 5051, Dec. 22, 1987, 101 Stat. 1330–250.)

CODIFICATION

Pub. L. 100–202 and Pub. L. 100–203 added identical sections.

REFERENCES IN OTHER LAWS TO GS–16, 17, OR 18 PAY RATES

References in laws to the rates of pay for GS–16, 17, or 18, or to maximum rates of pay under the General Schedule, to be considered references to rates payable under specified sections of Title 5, Government Organization and Employees, see section 529 [title I, § 101(c)(1)] of Pub. L. 101–509, set out in a note under section 5376 of Title 5.

§ 10268. Report

The Board shall report not less than 2 times per year to Congress and the Secretary its findings, conclusions, and recommendations. The first such report shall be submitted not later than 12 months after December 22, 1987.

(Pub. L. 97–425, title V, § 508, as added Pub. L. 100–202, § 101(d) [title III], Dec. 22, 1987, 101 Stat. 1329–104, 1329–121; Pub. L. 100–203, title V, § 5051, Dec. 22, 1987, 101 Stat. 1330–250.)

CODIFICATION

Pub. L. 100–202 and Pub. L. 100–203 added identical sections.

TERMINATION OF REPORTING REQUIREMENTS

For termination, effective May 15, 2000, of provisions of this section relating to reporting to Congress 2 times per year, see section 3003 of Pub. L. 104–66, as amended, set out as a note under section 1113 of Title 31, Money and Finance, and the last item on page 186 of House Document No. 103–7.

§ 10269. Authorization of appropriations

Notwithstanding subsection (d) of section 10222 of this title, and subject to subsection (e) of such section, there are authorized to be appropriated for expenditures from amounts in the Waste Fund established in subsection (c) of such section such sums as may be necessary to carry out the provisions of this subchapter.

(Pub. L. 97–425, title V, § 509, as added Pub. L. 100–202, § 101(d) [title III], Dec. 22, 1987, 101 Stat. 1329–104, 1329–121; Pub. L. 100–203, title V, § 5051, Dec. 22, 1987, 101 Stat. 1330–251.)

CODIFICATION

Pub. L. 100–202 and Pub. L. 100–203 added identical sections.

§ 10270. Termination of Board

The Board shall cease to exist not later than 1 year after the date on which the Secretary begins disposal of high-level radioactive waste or spent nuclear fuel in a repository.

(Pub. L. 97–425, title V, § 510, as added Pub. L. 100–202, § 101(d) [title III], Dec. 22, 1987, 101 Stat. 1329–104, 1329–121; Pub. L. 100–203, title V, § 5051, Dec. 22, 1987, 101 Stat. 1330–251.)

CODIFICATION

Pub. L. 100–202 and Pub. L. 100–203 added identical sections.

CHAPTER 109—WATER RESOURCES RESEARCH

Sec.
10301. Congressional findings and declarations.
10302. Congressional declaration of purpose.
10303. Water resources research and technology institutes.
10304. Research concerning water resource-related problems deemed to be in national interest.
10305. Development of water-related technology.
10306. Administrative costs.
10307. Types of research and development.
10308. Patent policy.
10309. New spending authority; amounts provided in advance.

§ 10301. Congressional findings and declarations

The Congress finds and declares that—

(1) the existence of an adequate supply of water of good quality for the production of materials and energy for the Nation's needs and for the efficient use of the Nation's energy and water resources is essential to national economic stability and growth, and to the well-being of the people;

(2) the management of water resources is closely related to maintaining environmental quality, productivity of natural resources and agricultural systems, and social well-being;

(3) there is an increasing threat of impairment to the quantity and quality of surface and groundwater resources;

(4) the Nation's capabilities for technological assessment and planning and for policy formulation for water resources must be strengthened at the Federal, State, and local governmental levels;

(5) there should be a continuing national investment in water and related research and technology commensurate with growing national needs;

(6) it is necessary to provide for the research and development of technology for the conversion of saline and other impaired waters to a quality suitable for municipal, industrial, agricultural, recreational, and other beneficial uses;

(7) the Nation must provide programs to strengthen research and associated graduate education because the pool of scientists, engineers, and technicians trained in fields related to water resources constitutes an invaluable natural resource which should be increased, fully utilized, and regularly replenished; and[1]

(8) long-term planning and policy development are essential to ensure the availability

[1] So in original. The word "and" probably should not appear.

of product water, considering the amortization of all components of the demonstration plant and ancillary facilities. Such report shall be accompanied by a proposed contract (or cooperative agreement) between the Secretary and a duly authorized non-Federal entity, in which such entity shall agree to provide not less than 15 per centum and not more than 35 per centum of the total cost of the demonstration; such cost to include, without being limited to, necessary water rights, water supplies, rights-of-way, power source interconnections, brine disposal facilities, land, construction, ancillary facilities, and the operation and maintenance costs for a period of four years following final acceptance of the construction of the plant from the plant contractor. The contributions of the non-Federal entity under such proposed contract may be in-kind. During the participation by the Secretary in the construction and the operation and maintenance of such demonstration, access to the demonstration and its operating data will not be denied to the Secretary or his representatives. The period of participation by the Secretary in the operation and maintenance of any such demonstration shall be four years. The Secretary is authorized to include in the proposed contract a provision for conveying, as appropriate, and in such amounts as are appropriate, rights, title, and interest of the Federal Government in the demonstration project to the non-Federal public entity.

"(c) There is authorized to be appropriated, to remain available until expended, for the fiscal year ending September 30, 1978, and thereafter, the sum of $50,000,000 to finance the total Federal share of the cost of the demonstration plants authorized by this section; such cost to include, without being limited to, necessary water rights, water supplies, rights-of-way, power source interconnections, brine disposal facilities, land, construction, ancillary facilities, and the operation and maintenance costs for the four-year period of Federal participation in such costs.

"(d) When appropriations have been made for the commencement or continuation of design, construction, or operation and maintenance of any demonstration plant authorized under this Act [this note], the Secretary may, in connection with such design, construction, or operation and maintenance, enter into contracts and cooperative agreements for miscellaneous services, for materials and supplies, as well as for construction, which may cover such periods of time as the Secretary may consider necessary but in which the liability of the United States shall be contingent upon appropriations being made therefor."

[For termination of Trust Territory of the Pacific Islands, see note set out preceding section 1681 of Title 48, Territories and Insular Possessions.]

§ 10302. Congressional declaration of purpose

It is the purpose of this chapter to assist the Nation and the States in augmenting their water resources science and technology as a way to—

(1) assure supplies of water sufficient in quantity and quality to meet the Nation's expanding needs for the production of food, materials, and energy;

(2) discover practical solutions to the Nation's water and water resources related problems, particularly those problems related to impaired water quality;

(3) assure the protection and enhancement of environmental and social values in connection with water resources management and utilization;

(4) promote the interest of State and local governments as well as private industry in research and the development of technology that will reclaim waste water and to convert saline and other impaired waters to waters suitable for municipal, industrial, agricultural, recreational, and other beneficial uses;

(5) promote more effective coordination of the Nation's water resources research program;

(6) promote the development of a cadre of trained research scientists, engineers, and technicians for future water resources problems; and

(7) encourage long-term planning and research to meet future water management, quality, and supply challenges.

(Pub. L. 98-242, title I, § 103, Mar. 22, 1984, 98 Stat. 97; Pub. L. 101-397, § 1(a), Sept. 28, 1990, 104 Stat. 852; Pub. L. 104-147, § 2, May 24, 1996, 110 Stat. 1375.)

REFERENCES IN TEXT

This chapter, referred to in text, was in the original "this Act", meaning Pub. L. 98-242, Mar. 22, 1984, 98 Stat. 97, known as the Water Resources Research Act of 1984. For complete classification of this Act to the Code, see Short Title note set out under section 10301 of this title and Tables.

AMENDMENTS

1996—Par. (5). Pub. L. 104-147, § 2(1), struck out "to" before "promote" and "and" after "program;".

Par. (6). Pub. L. 104-147, § 2(2), substituted "; and" for period at end.

Par. (7). Pub. L. 104-147, § 2(3), added par. (7).

1990—Par. (5). Pub. L. 101-397 substituted "to promote more effective coordination of" for "coordinate more effectively".

§ 10303. Water resources research and technology institutes

(a) Establishment; designation of site by State legislature or Governor

Subject to the approval of the Secretary of the Interior (hereafter in this chapter referred to as the "Secretary") under this section, one water resources research and technology institute, center, or equivalent agency (hereafter in this chapter referred to as the "institute") may be established in each State (as used in this chapter, the term "State" includes the Commonwealth of Puerto Rico, the District of Columbia, the Virgin Islands, Guam, American Samoa, the Commonwealth of the Mariana Islands and the Federated States of Micronesia) at a college or university which was established in accordance with the Act approved July 2, 1862 (12 Stat. 503) [7 U.S.C. 301 et seq.], or at some other institution designated by act of the legislature of the State concerned. If there is more than one such college or university in a State established in accordance with such Act of July 2, 1862, the institute in such State shall, in the absence of a designation to the contrary by act of the legislature of the State, be established at the one such college or university designated by the Governor of the State. Two or more States may cooperate in the establishment of a single institute or regional institute, in which event the sums otherwise allocated to institutes in each of the cooperating States shall be paid to such single or regional institute.

(b) Scope of research; other activities; cooperation and coordination

Each institute shall—

Delaware Water Resources Center (DWRC)

*A unit of the **Institute for Public Administration***
*in the **Joseph R. Biden, Jr. School of Public Policy & Administration***

UNIVERSITY OF DELAWARE

DWRC Staff

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Director/Associate Professor

Andrew R. Homsey
Policy Scientist
(GIS Services Manager)

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Associate Policy Scientist
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Associate Director/Policy Scientist

Sherri D. Martinez
Senior Grants Analyst

Sophie Phillips
M.S. Energy & Environment Policy

Hayley Rost
MPA Master of Public Admin.

Undergraduate and Graduate Research Fellows

What is DWRC?

Established on campus in 1965, 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.

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

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

www.wrc.udel.edu

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 Biden School of Public Policy & Administration 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.

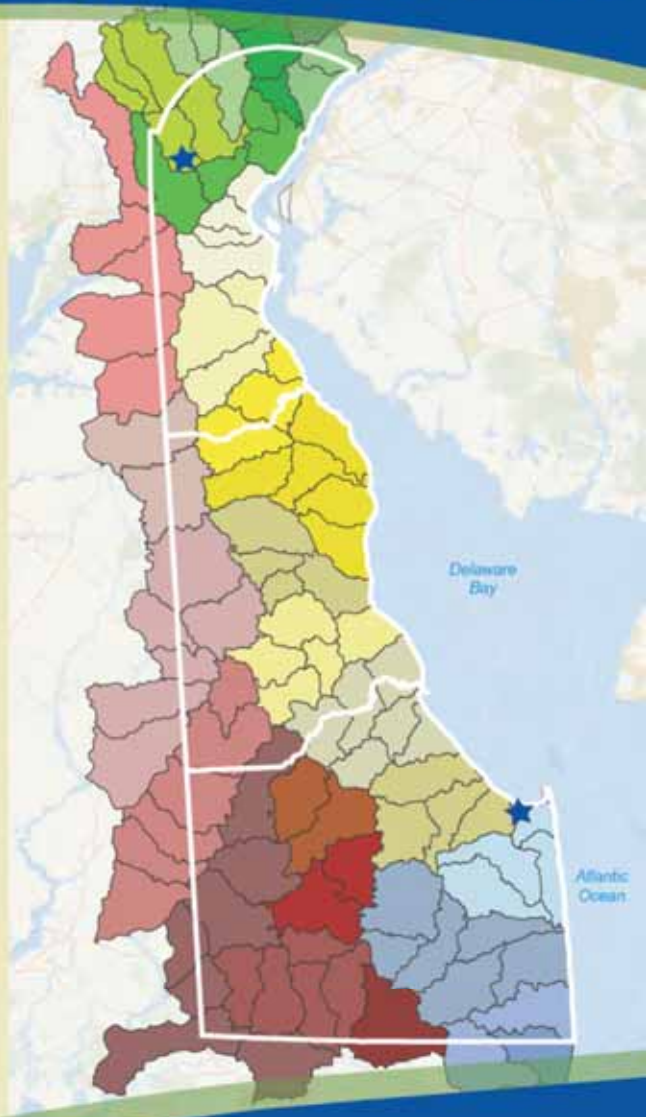
DWRC Newark Office
DGS Annex
261 Academy Street
University of Delaware
Newark, Delaware 19716

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

NIWR
NATIONAL INSTITUTES FOR WATER RESOURCES

Where to find us

Water Resources Center



UNIVERSITY OF DELAWARE

Mission

The University of Delaware Water Resources Center (DWRC), established in 1965, 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 receives funding through Section 104 of the Water Resources Research Act of 1984, 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 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.

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 611: Regional Watershed Management
- GEOG 432: Environmental Hydrology
- CIEG 440: Water Resources Engineering
- UAPP 667: GIS Applications in Public / Nonprofit Sectors
- UAPP 652: GIS in Public Policy

Conferences

- Water Policy Forum
- Delmarva GIS Conference

Community Events

- Delaware Clean Water Rally
- 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 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.

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 (NEMO)
- 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

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.

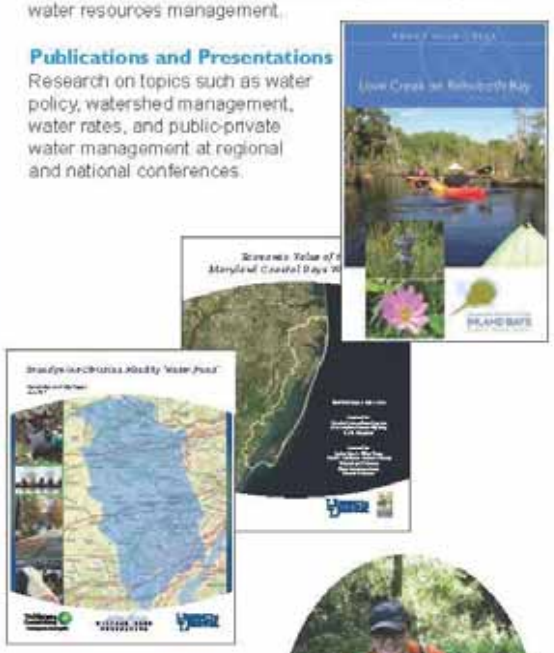
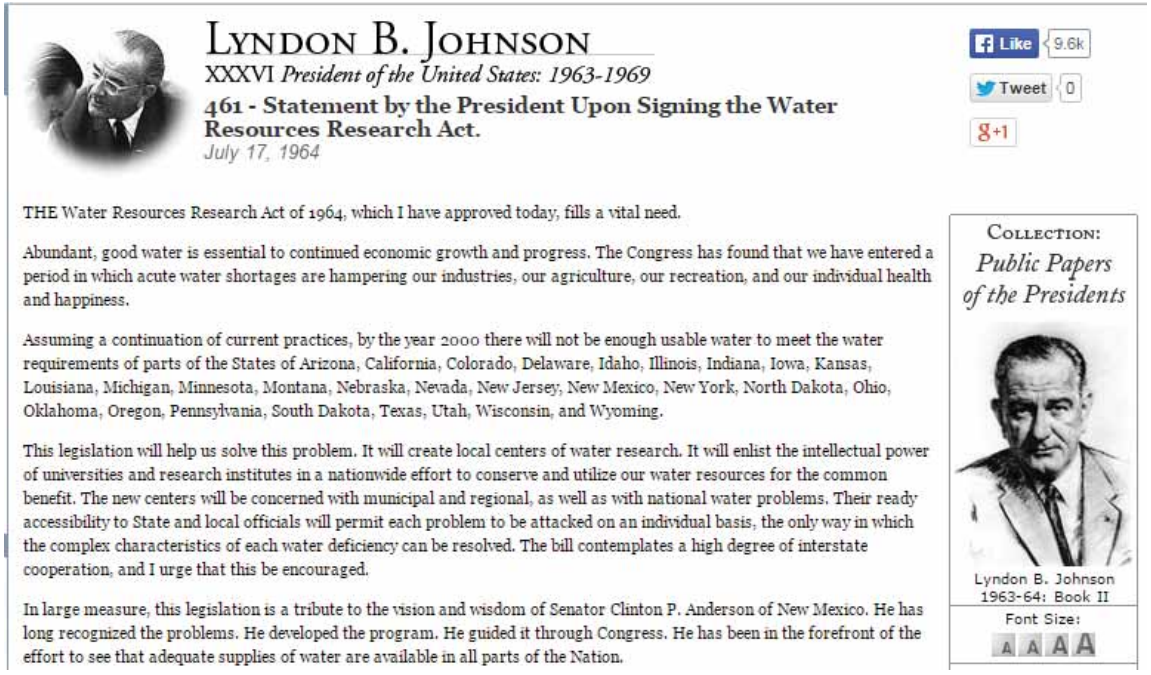


Figure 1. Map of Newark and environs (source: Water Resources Agency, Institute for Public Administration, University of Delaware, 2008)*

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



LYNDON B. JOHNSON

XXXVI *President of the United States: 1963-1969*

461 - Statement by the President Upon Signing the Water Resources Research Act.

July 17, 1964

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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.

COLLECTION: *Public Papers of the Presidents*

Lyndon B. Johnson 1963-64: Book II

Font Size: A A A A

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.

Delaware Water Resources Center
at the University of Delaware

DWRC

Undergraduate Internships In Water Resources 2015

UNIVERSITY of DELAWARE | College of Agriculture & Natural Resources

Delaware Water Resources Center (DWRC) Undergraduate Internships in Water Resources provide 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. All students must have the active support of a faculty advisor and a minimum GPA of 3.0. (If a student applies for any other UD-sponsored summer research experience s/he must indicate this on the **DWRC** application. The **DWRC** intends to award internships to only those students who have not been awarded another internship within a calendar year.)

Program Details and Deadline

The **DWRC** provides $3000 in financial support for each undergraduate internship. Students typically work two weeks full-time during the summer and additional hours during the fall and winter. Interns must submit a written report on their project and participate in a poster session at the UD spring undergraduate research conference. The application deadline for 2015 **DWRC** internships is March 27, 2015. See second page for more information. For details on past projects, current faculty advisors, application materials to submit, and requirements for reports and posters, visit the **DWRC** website:

http://ag.udel.edu/dwrc/

Delaware Water Resources Center (DWRC) interns

experience a complete research or education project. Students, in cooperation with faculty advisors, identify a topic of interest, develop

The DWRC Internship Program

All DWRC interns conduct a project consistent with the **DWRC**'s research and educational interests (listed below in the green box) with the support of a faculty advisor from one of our **co-sponsor organizations.** Internships may be available in sponsorship with the following:

University of Delaware (UD) Water Resources Agency (http://www.ipa.udel.edu/wra/): Internships are supported which focus on water resource policy and management.

UD College of Agriculture and Natural Resources (http://canr.udel.edu): Projects are supported to work with faculty in the departments of *Animal and Food Sciences, Entomology and Wildlife Ecology, Applied Economics and Statistics, or Plant and Soil Sciences*. For example, an internship in the Department of Plant and Soil Sciences could relate soils, plants, and land management to water use and quality.

UD College of Arts and Sciences (http://www.cas.udel.edu/): Students can conduct internship projects in *Biological Sciences, Chemistry, Political Science, Public Policy*, or other subjects closely related to water resources.

UD College of Earth, Ocean, and Environment (http://www.ceoe.udel.edu/): Internships are supported in the areas of *Geography, Geology, Marine Biology and Biochemistry, Marine Policy, Oceanography*, or *Physical Ocean Science and Engineering*.

UD College of Engineering (http://www.engr.udel.edu/): Projects can be developed in areas such as *Chemical Engineering, Civil and Environmental Engineering*, or *Mechanical Engineering*.

Delaware Geological Survey (http://www.dgs.udel.edu/): Researchers offer internships focusing on hydrogeology, ground water supply, and water quality.

Delaware State University (http://cars.desu.edu/): Faculty support internships in the areas of agriculture, natural resources, aquaculture, and aquatic ecology.

Delaware Department of Natural Resources and Environmental Control (http://www.dnrec.delaware.gov/): Staff in DNREC offices related to water resources occasionally offer internships on topics such as soil and water conservation, water quality, and climate change.

Topics in water resources research and education of interest to the DWRC:

- Water pollutants - their sources, fate, cycling, and transport
- Water supply, demand, and conservation
- Groundwater: identification and protection
- Nutrient management and water quality
- Management and control of storm water runoff

How to Apply for a DWRC Internship

Select your topic! **DWRC** internships are for students from a wide variety of backgrounds and research interests. Titles of past projects can be found at http://ag.udel.edu/dwrc/interns.html and http://ag.udel.edu/dwrc/publications/DWRCinternship/spotlight2009.pdf and include: *White Clay Creek Shad Restoration Project* (**Water Resources Agency**); *Developing Scientifically-Based Food Safety Metrics for Water Management and Irrigation Methods* (**Animal and Food Sciences**); *The Returns to Best Management Practices: Evidence from Early Proposals for Nutrient Trading in the Chesapeake Bay Watershed* (**Applied Economics and Statistics**); *Water Quality Management in Urban Ecosystems* (**Plant and Soil Sciences**); *The Impacts of Redefining Navigable Waters under the Clean Water Act* (**Political Science**); *Sediment Transport through Historic Mill Dams of the Christina River Basin* (**Geology**); *Characterization of Viral Diversity within the Mantle Fluid of the Eastern Oyster, Crassostrea virginica* (**Marine Biology**); *Preventing Formation of Toxic Chloramine Byproducts in Water Using Immobilized Iron* (**Civil and Environmental Engineering**); *Hydraulic Properties of the Columbia Aquifer* (**Delaware Geological Survey**); and *Aquatic Health near Wastewater Discharge in Delaware Inland Bays Tidal Canal* (**Delaware State University**).

Find a Faculty Advisor and Apply to the DWRC! Faculty contacts and their research interests are also listed on the **DWRC** website, under "Faculty and Staff". Contact the **DWRC** program coordinator, Maria Pautler (mpautler@udel.edu; 302-831-0847), to say that you are interested. Students should contact potential faculty advisors to discuss and identify a project topic of mutual interest and then submit their application to the **DWRC** by the deadline (**March 27, 2015**). Faculty may not advise more than two interns concurrently and must provide matching funds consistent with **DWRC** guidelines, usually by committing a percentage of their time to the intern's project.

Delaware Water Resources Center

Gerald J. Kauffman, Ph.D., Director
DGS Annex 261 Academy Street
Newark, DE 19716
Phone: 302-831-4929
E-mail: jerryk@udel.edu

...se by Danielle Quigley

50 Years of Water Research

NIWR & USGS A Model Partnership

NIWR THE NATIONAL INSTITUTES FOR WATER RESOURCES | USGS science for a changing world

PARTNERSHIP WITH USGS

- The National Institutes for Water Resources (NIWR) partners with the U.S. Geological Survey (USGS) through the provisions of the Water Resources Research Act (WRRA) 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 funds with state money and private funding.
- 54 NIWR member institutes 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.

Housed in the nation's leading research universities, NIWR

MAXIMIZING 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 institutes often allow funds to pass through the institutes to USGS State Water Science Centers. The NIWR 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 benefitted from funds that have flowed through NIWR institutes from external sources for technical assistance and scientific expertise on large-scale, multi-partner projects that address emerging water research needs.

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.

IMPACT & COLLABORATION

- NIWR member institutes assist public and private sector groups in their mission to protect human health, environmental resources and economic sustainability.
- Last year, NIWR member institutes sponsored more than 1,200 groundbreaking research projects.
- Grants from USGS and other sponsors are awarded through a competitive, peer-reviewed process.
- NIWR member institutes collaborated on projects with over 200 universities, 150 state agencies, 180 federal agencies, departments and divisions, and more than 165 local and municipal offices.

SUCCESS FROM THE GROUND UP

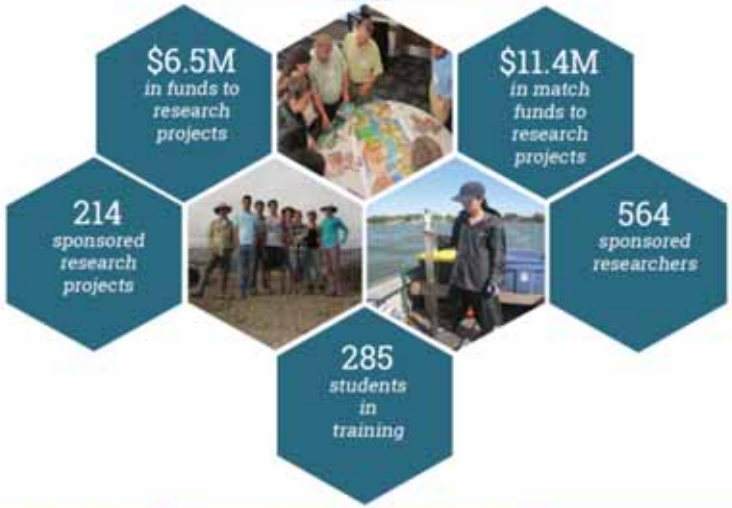
in water-related practices and policies

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 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 sourced funds from the public and private sector. This local financing significantly leverages the available federal dollars for water research.

NIWR BY THE NUMBERS

in 2015



Photos, starting clockwise at top: 2016 North Carolina Watershed Stewardship Network workshops
2016 Iowa State University PhD student holding a sediment core at East Okoboji Lake in Iowa.
2016 University of California field team assessing improvements in water quality during groundwater recharge.

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 1984 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

President: Dr. Stephen H. Schoenholtz, Virginia Tech • stephen.schoenholtz@vt.edu
Secretary-Treasurer: Dr. John C. Tracy, Texas A&M • john.tracy@ag.tamu.edu
President Elect: Dr. Alexander Fernald, New Mexico State University• afernald@nmsu.edu
Past President: Dr. Richard Cruse, Iowa State University • rmc@iastate.edu

Visit us at *niwr.info*

Fact Sheet 2017

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 Bioretention 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 Bark 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 life-long positive water resource impacts.

Total Students: 285

The Network of Water Resources Research Institutes

State	NIWR	University	Department	City	Director	Rank
Alabama	Water Resources Research Institute	Auburn	Agriculture Economics Rural Sociology	Auburn	Dr. Samuel Fowler	Associate Professor
Alaska	Water & Environmental Research Center	Alaska	Institute of Northern Engineering	Fairbanks	Dr. William Schnabel	Associate Professor
Arizona	Water Resources Research Center	Arizona	Agriculture and Resource Economics	Tucson	Dr. Sharon Megdal	Neely Endowed Professor
Arkansas	Water Resources Center	Arkansas	Agriculture/Coop Extension	Fayetteville	Dr. Brian Haggard	Professor
California	Institute for Water Resources	California	Agriculture/Natural Resourc.	Oakland	Dr. Doug Parker	Professor
Colorado	Water Institute	Colorado	Soil and Crop Sciences	Fort Collins	Dr. Reagan Waskom	Professor
Connecticut	Institute of Water Resources	Connecticut	Natural Resources	Storrs	Dr. Glenn Warner	Professor
Delaware	Water Resources Center	Delaware	Public Policy and Administration	Newark	Dr. Gerald Kauffman	Assistant Professor
District of Columbia	Water Resource Research Institute	D.C.	Agriculture/Environment	D.C.	Dr. Tolessa Deksissa	Associate Professor
Florida	Water Resources Research Center	Florida	Sustainable Infrastructure	Gainesville	Dr. Kirk Hadfield	Professor
Georgia	Water Resources Institute	Georgia Tech.	Civil and Environmental Engineering	Atlanta	Dr. Aris Georgakakos	Professor
Guam	Water Research Institute Western Pacific	Guam	Water Resources Engineering	Mangilao	Dr. Khosrowpanah	Professor
Hawaii	Water Resources Research Center	Hawaii	Sea Grant	Honolulu	Dr. Darren T. Lerner	Research Faculty
Idaho	Water Resources Research Institute	Idaho	Civil Engineering	Boise	Dr. John Tracy	Professor
Illinois	Water Resources Center	Illinois	Sea Grant	Urbana	Dr. Brian Miller	Director
Indiana	Water Resources Research Center	Purdue	Agronomy	West Lafayette	Dr. Ronald Turco	Professor
Iowa	Water Center	Iowa State	Agronomy	Ames	Dr. Rick Cruse	Professor
Kansas	Water Resources Institute	Kansas State	Agricultural Resources and the Environment	Manhattan	Dr. Daniel Devlin	Director
Kentucky	Water Resources Research Institute	Kentucky	Civil and Environmental Engineering	Lexington	Dr. Lindell Ormsbee	Raymond-Blythe Professor
Louisiana	Water Resources Research Institute	Louisiana State	Civil and Environmental Engineering	Baton Rouge	Dr. Frank Tsai	Associate Professor
Maine	Water Resources Research institute	Maine	Senator George Mitchell Center for Sustainability	Orono	Dr. John Peckenham	Senior Research Scientist
Maryland	Water Resources Research Center	Maryland	Civil and Environmental Engineering	College Park	Dr. Kaye Brubaker	Associate Professor
Massachusetts	Water Resources Research Center	Massachusetts	Engineering	Amherst	Dr. Paula Rees	Director
Michigan	Institute of Water Research	Michigan State	Agriculture, Recreation and Resource Studies	East Lansing	Dr. Jon Bartholic	Professor
Minnesota	Water Resources Center	Minnesota	Humphrey School of Public Affairs	St. Paul	Dr. Deborah Swackhamer	Professor
Mississippi	Water Resources Research Institute	Mississippi State	Cooperative Extension	Starkville	Dr. Joe E. Street	Associate. Director
Missouri	Water Resources Research Center	Missouri	Civil and Environmental Engineering	Columbia	Dr. Baolin Deng	C.W. LaPierre Professor

Montana	Water Center	Montana State	Ecology	Bozeman	Dr. Wyatt Cross	Associate Professor
Nebraska	Water Center	Nebraska	Civil Engineering	Lincoln	Dr. Chittaranjan Ray	Professor
Nevada	Water Resources Research Institute	Desert Res. Inst.	Hydrologic Services	Reno	Dr. James Thomas	Director
New Hampshire	Water Resources Research Center	New Hampshire	Environmental Science	Durham	Dr. William McDowell	Professor
New Jersey	Water Resources Research Institute	Rutgers	Environmental Resources	New Brunswick	Dr. Christopher Obropta	Director
New Mexico	Water Resources Research Institute	New Mexico State	Agriculture	Las Cruces	Dr. Alexander Fernald	Professor
New York	Water Resources Institute	Cornell	Earth and Atmospheric Sciences	Ithaca	Dr. Susan Riha	Professor
North Carolina	Water Resources Research Institute	North Carolina St.	North Carolina Sea Grant	Raleigh	Dr. Susan White	Executive Director
North Dakota	Water Resources Research Institute	North Dakota St.	Civil and Environmental Engineering	Fargo	Dr. Eakalak Khan	Professor
Ohio	Water Resources Center	Ohio State	Civil and Environmental Engineering	Columbus	Dr. Linda Weavers	Professor
Oklahoma	Water Resources Research Institute	Oklahoma State	Environmental/Natural Resources Engineering	Stillwater	Dr. Garey Fox	Orville and Helen Buchanan Chair
Oregon	Institute for Water and Watersheds	Oregon State	Water Resources Science	Corvallis	Dr. Todd Jarvis	Assistant Professor
Pennsylvania	Water Resources Research Center	Penn. State	Ecosystem Science	University Park	Dr. Elizabeth Boyer	Associate Professor
Puerto Rico	Water/Environmental Research Institute	Puerto Rico	Environmental Science	Mayaguez	Dr. Jorge Santos	Director
Rhode Island	Water Resources Center	Rhode Island	Civil and Environmental Engineering	Kingston	Dr. Leon Thiem	Associate Professor
South Carolina	Water Resources Center	Clemson	Strom Thurman Institute	Clemson	Dr. Jeffrey Allen	Assistant Professor
South Dakota	Water Resources Research Institute	South Dakota State	Agricultural Engineering	Brookings	Dr. Van Kelley	Associate Professor
Tennessee	Water Resources Research Center	Tennessee	Institute for Secure and Sustainable Environment	Knoxville	Mr. Tim Gangaware	Associate Director
Texas	Water Resources Institute	Texas A&M	Institute of Renewable Resources	College Station	Dr. Roel Lopez	Professor
Utah	Center for Water Resources Research	Utah State	Civil and Environmental Engineering	Logan	Dr. Mac McKee	Director
Vermont	Water Resources and Lake Studies Center	Vermont	Rubenstein School of Environment Resources	Burlington	Dr. Breck Bowden	Patrick Professor of Watershed
Virgin Islands	Water Resources Research Institute	Univ. of Virgin Islands	Water Resources	St. Thomas	Dr. Henry Smith	Director
Virginia	Water Resources Research Center	Virginia Tech.	Forest Resources	Blacksburg	Dr. Kevin McGuire	Associate Professor
Washington	Water Research Center	Washington State	Economic Studies	Pullman	Dr. Jonathan Yoder	Professor
West Virginia	Water Research Institute	West Virginia	National Research Center for Coal and Energy	Morgantown	Dr. Paul Ziemkiewicz	Director
Wisconsin	Water Resources Institute	Wisconsin	UW Aquatic Sciences Center/Sea Grant	Madison	Dr. James Hurley	Director
Wyoming	Office of Water Programs	Wyoming	Research/Economic Development	Laramie	Dr. Greg Kerr	Director/Lecturer

UCOWR | UNIVERSITIES COUNCIL ON WATER RESOURCES

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. Williard

Karl W.J. Williard
Executive Director

KW:se

1231 Lincoln Drive, Room 118
Southern Illinois University – Mail Code 4526
Carbondale, IL 62901
Phone (618) 536-7571 • Fax (618) 453-2671 • E-Mail ucowr@siu.edu
www.ucowr.org

FY20-21 DWRC Undergraduate Water Research Interns

FY2020/21 Delaware Water Resources Center Water Research Internships

Water Research Student	Major	Research
Hayley Rost	Master of Public Administration, Biden School	White Clay Creek Wild and Scenic River Water Quality Sampling Network.
Sophie Phillips	Master of Energy & Environ. Policy), Biden School	Environmental Justice and Water Use in Rural Delaware. Research
Anna Singer	Environmental. Studies/ Public Policy	Water Quality Trends in White Clay Creek Nat'l Wild & Scenic River, Delaware and Pennsylvania
Emily Jimenez	Environmental Engineering	Frequency of Peak Flood and High Tide Events in Delaware with Climate Change and Sea Level Rise
Karmyn Pasquariello	Environmental Engineering	Economic Value of Properties in the Coastal/Riverine Floodplain in Delaware with Sea Level Rise
Delaney Doran	Environmental Engineering	Watershed Characterization of First Order Tributaries along the Brandywine River in Delaware
Elizabeth DeSonier	Environmental Science	Stratigraphy of Valley Fill Deposits Upstream of a Small Colonial-Age Mill Dam, White Clay Creek, Pennsylvania
Lillian Peterson	Environmental Engineering	Stream Habitat Sampling along Tributaries of the Red Clay Creek in Delaware
Tommy Breevold	Environmental Engineering	Stream Habitat Sampling along Tributaries of the Red Clay Creek in Delaware
Sitlaly Avelino	Environmental Engineering	Watershed Characterization of First Order Tributaries along the Brandywine River in Delaware
Jady Perez	Environmental Engineering	Forest Hydrology and Stream Health in the Hickory Run Watershed at Mt. Cuba Center
Grace Hussar	Environmental Studies	The Effects of Reforestation and Invasive Species Removal on Stormwater Flooding Events in Baltimore
Bridgette Kegelman	Geography/Greek Roman Studies	Updating Land Use and Impervious Cover Change for the State of the Bays Report
Alexis Cervantes	Environmental Science	Historic Significance of the Brandywine River as Drinking Water Supply in Wilmington, Delaware
Brendan Benson	Environmental Engineering	The Effect of Biochar on Infiltration Rate and Soil Aggregation in Both the Field and Lab
Shannon Bushinsky	Environmental Engineering	Intergovernmental River Basin Management, the International Joint Commission Model
Patrick McGay	Environmental Engineering	White Rot Fungi with Solid State Bioreactors to Reduce Pathogens in Dairy Manure Runoff
Brielle Bianchini	Environmental Engineering	Water Quality Trends in White Clay Creek Nat'l Wild & Scenic River, Delaware and Pennsylvania

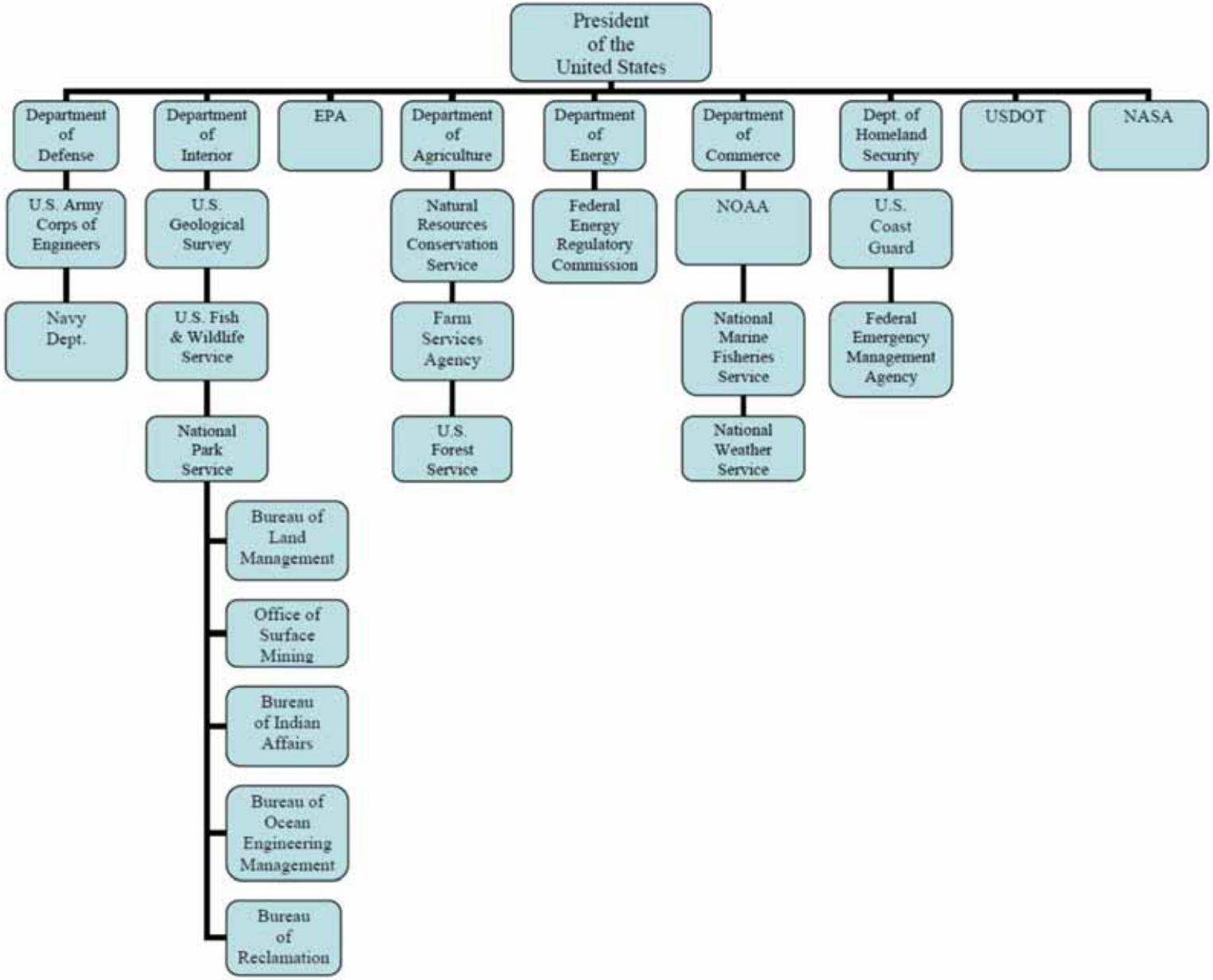


Figure 3. Federal water and climate agencies

UNIVERSITY OF DELAWARE

March 17, 2021

Congresswoman Lisa Blunt Rochester
1123 Longworth House Office Building
Washington, DC 20515

Re: Water Resources Research Act (WRRA)
Fiscal Year 2022 Interior, Environment, and Related Agencies Appropriations Bill

Dear Congresswoman Blunt Rochester:

As Director of the University of Delaware Water Resources Center, I am respectfully requesting your support of the House Subcommittee to provide $15 million for the Water Resources Research Act program in the Fiscal Year 2022 Interior, Environment, and Related Agencies Appropriations bill.

The Water Resources Research Act, signed by Lyndon Baines Johnson in 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 Virgin Islands. Through the U.S. Geological Survey in the Department of Interior, these water research and technology institutes 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 a 2:1 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 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 United States.

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. Kauffman

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

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

UNIVERSITY OF DELAWARE

March 17, 2021

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

Re: Water Resources Research Act (WRRA)
Fiscal Year 2022 Interior and Environment 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 $15 million for the Water Resources Research Act program in the Fiscal Year 2022 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. Through the U.S. Geological Survey in the Department of Interior, these institutes 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 a 2:1 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 supported the education, training, 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 Delaware Valley, and the United States.

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

Warmly,

Gerald J. Kauffman

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

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

UNIVERSITY OF DELAWARE

March 17, 2021

Senator Chris Coons
127A Russell Senate Office Building
Washington, D.C. 20510

Re: Water Resources Research Act (WRRA)
Fiscal Year 2022 Interior and Environment Appropriations Bill

Dear Senator Coons:

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 $15 million for the Water Resources Research Act program in the Fiscal Year 2022 Interior and Environment 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. Through the U.S. Geological Survey in the Department of Interior, these institutes 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 a 2:1 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 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 the significant water resources issues of the day in Delaware, the Delaware Valley, and the United States.

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. Kauffman

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

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

UNIVERSITY OF DELAWARE

184 Graham Hall
Newark, DE 19716-7380
Phone: 302-831-1687
Email: bidenschool@udel.edu

March 17, 2021

Hon. Chellie Pingree (ME), Chairwoman
Subcommittee on Interior, Environment,
and Related Agencies
House Committee on Appropriations
2162 Rayburn House Office Building
Washington, DC 20515

Hon. David Joyce (OH), Ranking Member
Subcommittee on Interior, Environment,
and Related Agencies
House Committee on Appropriations
2065 Rayburn House Office Building
Washington, DC 20515

Re: Water Resources Research Act (WRRA)
Fiscal Year 2022 Interior, Environment, and Related Agencies Appropriations Bill

Dear Chairwoman Pingree and Ranking Member Joyce:

I write to urge your continued support for the Water Resources Research Act (WRRA) program in FY 2022 and a request for an FY22 appropriation of $15 million. The WRRA is a proven and effective program 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 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 water planning and management. 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, 180 federal offices, and more than 165 local and municipal offices. In a given year, Federal dollars are leveraged to support 500 students in over 300 research projects, and more than 750 researchers and train them for jobs in the STEM market.

I appreciate the Subcommittee's support for the Water Resources Research Act and request that you continue funding this program in the FY22 Interior, Environment, and Related Agencies bill.

Warmly,

Gerald J. Kauffman

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

Cc: The Honorable Lisa Blunt Rochester

UNIVERSITY OF DELAWARE

184 Graham Hall
Newark, DE 19716-7380
Phone: 302-831-1687
Email: bidenschool@udel.edu

March 17, 2021

Senator Jeff Merkley (OR), Chair
Subcommittee on Interior and Environment
Appropriations Committee
531 Hart Senate Office Building
Washington, DC 20510

Senator Lisa Murkowski, Ranking Member,
Subcommittee on Interior and Environment
Appropriations Committee
522 Hart Senate Office Building
Washington, DC 20510

Re: Water Resources Research Act (WRRA) FY 2022 Interior and Environment Appropriations Bill

Dear Senators Merkley and Murkowski:

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 FY22 appropriation of $15 million. The WRRA is a proven and effective program 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, 180 federal offices, and more than 165 local and municipal offices. In each year, Federal dollars are leveraged to support over 500 students in training, 300 research projects, and more than 750 researchers to train them in the STEM job market. I appreciate the Subcommittee's support for the Water Resources Research Act and request that you continue funding this program in the FY21 Interior, Environment, and Related Agencies bill.

Warmly,

Gerald J. Kauffman

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

Cc: Senator Tom Carper, Senator Chris Coons

JOSEPH R. BIDEN, JR. SCHOOL OF PUBLIC POLICY & ADMINISTRATION
www.bidenschool.udel.edu

Figure 10. Congressional water and climate committees (Van Scoyoc 2021)

from:(doug.parker@ucop.edu)

Back Archive Spam Delete Mark as unread Snooze Add to tasks Move to Inbox Labels More 3 of 51

Doug Parker Fri, Apr 30, 7:50 PM (13 days ago) Reply

to brantef@auburn.edu, nmisarti@alaska.edu, smegdal@email.arizona.edu, haggard@uark.edu, Jennifer.Gimbel@colostate.edu, julie.kallenberger@

Hi all,

As per the updated bylaws, today is my last day as President of NIWR. Tomorrow, May 1, Kevin Wagner will assume the position. Attached is a list of all of your board members as of May 1. It has been a please being your President and I look forward to continuing to serve as Past-President.

In addition to our change in leadership, I'm happy to announce that our reauthorization has passed in the Senate. Thanks to some quick work from some of our supporters, our reauthorization was attached to the *Drinking Water and Wastewater Infrastructure Act of 2021* (S. 914). This Bill was passed earlier this week with a vote of 89-2. The reauthorization in the Senate includes a 1:1 match, 5 year reporting, and a $15m authorization.

We continue to work on reauthorization in the House. Our House Bill has been introduced and we will be seeking your help to create support for it soon. The House Bill is essentially the same as the Senate Bill except with an $18m authorization.

Have a great weekend,
Doug

Doug Parker, Ph.D.
Director, California Institute for Water Resources
University of California, Office of the President
1111 Franklin St., Oakland, CA 94607, (510) 418-4438 (cell)
doug.parker@ucop.edu, http://ciwr.ucanr.edu, @ucanrwater

UNIVERSITY OF CALIFORNIA
Agriculture and Natural Resources
California Institute for Water Resources

U.S. Geological Survey

Department of the Interior

WATER RESOURCES RESEARCH ACT PROGRAM

ANNUAL BASE GRANTS FISCAL YEAR 2021 REQUEST FOR APPLICATIONS

under Section 104(b) of the
Water Resources Research Act of 1984, as Amended

ANNOUNCEMENT G21AS00517
Revised October 15, 2020

CLOSING DATE
June 4, 2021
5:00 P.M. Eastern Standard Time

OMB Number: 1028-0097
Expiration Date: 1/31/2023

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.

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 2019 Funding Received:** $6.5 million
- **Fiscal Year 2020 Funding Received:** $9.0 million
- **Level of Funding Requested for Fiscal Year 2021: $ 15 million**

DWRC Undergraduate Internship Program 2021-22 Application

DUE: May 11, 2021, 12:00 PM

Student Name: [illegible]
Date: May 5, 2021
Campus/Local Address: One Easton Court
City: Newark
State: Delaware
Zipcode: 19711
Telephone: [illegible]
Email: [illegible]
Student ID#: [illegible]
GPA: [illegible]
Expected Graduation Date: Spring 2022
Major: Geological Sciences
Advisor: Dr. Neil Sturchio

Things you will need to complete the application:

1) A one-page description of the research or education project proposal
2) Resume
3) Unofficial Transcript

DWRC Undergraduate Internship Program 2021-22 Application

DUE: May 11, 2021, 12:00 PM

Student Name: Michael Axiotes
Date: 5/9/2021
Campus/Local Address: 93 Dallas Avenue
City: Newark
State: DE
Zipcode: 19711
Telephone: 973-487-6877
Email: Mikeax@udel.edu
Student ID#: 702506681
GPA: 4.00
Expected Graduation Date: Spring 2024
Major: Biochemistry
Advisor: Dr. Janet Johnson

Things you will need to complete the application:

1) A one-page description of the research or education project proposal
2) Resume
3) Unofficial Transcript

Bundle the application, one-page research description, resume, and transcript as a single pdf and email to Martha Narvaez at mcorrozi@udel.edu and Gerald Kauffman at jerryk@udel.edu by May 11, 2021 at 12:00 pm.

DWRC Undergraduate Internship Program 2021-22 Application

DUE: May 11, 2021, 12:00 PM

Student Name: Nathaniel Nicholas Lewis
Date: [illegible]
Campus/Local Address: [illegible]
City: [illegible]
State: Maryland
Zipcode: [illegible]
Telephone: [illegible]
Email: [illegible]

DWRC Undergraduate Internship Program 2021-22 Application

DUE: May 11, 2021, 12:00 PM

Student Name: Megan Jarocki
Date: 05/10/2021
Campus/Local Address: University of Delaware
City: Newark
State: Delaware
Zipcode: 19711
Telephone: 908-209-9199
Email: mjarocki@udel.edu
Student ID#: 702469882
GPA: 3.1
Expected Graduation Date: May 2022
Major: Environmental Engineering
Advisor: Jerry Kauffman

Things you will need to complete the application:

1) A one-page description of the research or education project proposal
2) Resume
3) Unofficial Transcript

Bundle the application, one-page research description, resume, and transcript as a single pdf and email to Martha Narvaez at mcorrozi@udel.edu and Gerald Kauffman at jerryk@udel.edu by May 11, 2021 at 12:00 pm.

DWRC Undergraduate Internship Program 2021-22 Application

DUE: May 11, 2021, 12:00 PM

Student Name: [illegible]
Date: [illegible]
Campus/Local Address: [illegible]
City: Newark
State: Delaware
Zipcode: [illegible]
Telephone: [illegible]
Email: [illegible]
Student ID#: [illegible]
GPA: [illegible]
Expected Graduation Date: [illegible]
Major: Environmental Engineering with Concentration in Water Resources and Water Quality
Advisor: [illegible]

Things you will need to complete the application:

1) A one-page description of the research or education project proposal
2) Resume
3) Unofficial Transcript

DWRC Undergraduate Internship Program 2021-22 Application

DUE: May 11, 2021, 12:00 PM

Student Name: Brian Kennedy
Date: 5/9/2021
Campus/Local Address: 17 Willow Creek Lane
City: Newark
State: Delaware
Zipcode: 19711
Telephone: [illegible]
Email: [illegible]
Student ID#: [illegible]
GPA: [illegible]
Expected Graduation Date: June 1st, 2023
Major: Energy and Environmental Policy
Advisor: Ismat Shah

DWRC Undergraduate Internship Program 2021-22 Application

DUE: May 11, 2021, 12:00 PM

Student Name: [illegible]
Date: [illegible]
Campus/Local Address: [illegible]
City: [illegible]
State: DE
Zipcode: 19711
Telephone: [illegible]
Email: [illegible]
Student ID#: [illegible]
GPA: [illegible]
Expected Graduation Date: May 2023
Major: Environmental Engineering
Advisor: Gerald Kauffman

Things you will need to complete the application:

1) A one-page description of the research or education project proposal
2) Resume
3) Unofficial Transcript

DWRC Undergraduate Internship Program 2021-22 Application

DUE: May 11, 2021, 12:00 PM

Student Name: [illegible]
Date: [illegible]
Campus/Local Address: [illegible]
City: Newark
State: Delaware
Zipcode: [illegible]
Telephone: [illegible]
Email: [illegible]
Student ID#: [illegible]
GPA: [illegible]
Expected Graduation Date: [illegible]
Major: Environmental Science with Public Policy Minor
Advisor: Dr. Gerald Kauffman

DWRC Undergraduate Internship Program 2021-22 Application

DUE: May 11, 2021, 12:00 PM

Student Name: [illegible]
Date: [illegible]
Campus/Local Address: [illegible]
City: Newark
State: Delaware
Zipcode: 19711
Telephone: [illegible]
Email: [illegible]
Student ID#: [illegible]
GPA: [illegible]
Expected Graduation Date: Dec 2022
Major: Environmental Engineering
Advisor: Dr. Kauffman

DWRC Undergraduate Internship Program 2021-22 Application

DUE: May 11, 2021, 12:00 PM

Student Name: [illegible]
Date: May 10, 2021
Campus/Local Address: [illegible] South College Ave
City: Newark
State: Delaware
Zipcode: 19716
Telephone: [illegible]
Email: [illegible]
Student ID#: [illegible]
GPA: 4.0
Expected Graduation Date: May 2024
Major: Marine Science - Oceanography
Advisor: [illegible]

DWRC Water Resources Research and Education Priorities

- Water quality (nutrients, pathogens, public health), harmful algal blooms, PFOA contamination
- Storm water runoff (management and control)
- Water supply, demand, and conservation (infrastructure/technology)
- Water policy (governance and economics)
- Climate change, sea level rise, riverine/coastal flooding
- Groundwater (remediation and treatment)
- Watershed management
- Wetlands (protection and restoration)
- Wastewater management (treatment and reuse)
- Water, food, and energy nexus

UNIVERSITY OF DELAWARE

184 Graham Hall
Newark, DE 19716-7380
Phone: 302-831-1687
Email: bidenschool@udel.edu

March 27, 2020

Dr. Asia Dowtin
Department of Forestry
Natural Resources Building
Michigan State University
480 Wilson Rd. East
Lansing, MI 48824

Dear Asia:

As Director and Associate Director of the University of Delaware Water Resources Center, we are pleased to invite you to serve on the DWRC Advisory Panel for a two-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 that was begun by my predecessor Deputy Dean Dr. Tom Sims and has supported over 300 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 us at 302-831-4929 or jerryk@udel.edu/mcorrozi@udel.edu. Thank you for your consideration.

Warmly,

Gerald J. Kauffman

Gerald J. Kauffman, Director
University of Delaware
Water Resources Center
Newark, DE 19716

Martha B. Narvaez, Associate Director
University of Delaware
Water Resources Center
Newark, DE 19716

DWRC Advisory Panel

Jayme Arthurs
USDA Natural Resources Conservation Service
Dover, DE 19904

Mr. Chris Bason
Center for the Inland Bays
39375 Inlet Rd.
Rehoboth, DE 19971

Mr. Ethan Robinson, Public Works Director
City of Newark
220 S. Main St.
Newark, DE 19711

Mr. Jeff Downing
Mt. Cuba Center
3120 Barley Mill Rd.
Wilmington, DE 19707

Dr. Asia Dowtin
Department of Forestry, Natural Resources Building
480 Wilson Rd.
East Lansing, MI 48824

Dr. Mingxin Guo
Department of Agriculture and Natural Resources
Delaware State University, 1200 N. DuPont Highway
Dover, DE 19901

Ms. Kate Hutelmeyer
Partnership for the Delaware Estuary
110 S. Poplar St., Suite 202
Wilmington, DE 19801

Ellie Mortazavi
Dept. of Public Works, New Castle County
87 Reads Way
New Castle, DE 19720

Dr. Shreeram Inamdar
Department of Plant & Soil Science
University of Delaware, Townsend Hall
Newark, DE 19716

Dr. Paul Imhoff
Department of Civil and Environmental Engineering
University of Delaware, 344A DuPont Hall
Newark, DE 19716

Dr. Thomas McKenna
University of Delaware
223 Delaware Geological Survey
Newark, DE 19716

Ms. Kristin Travers
Delaware Nature Society
P.O. Box 700
Hockessin, DE 19707

Ms. Chris Oh
City of Wilmington, Dept. of Public Works
City/County Building
Wilmington, DE

Ms. Betzaida (Betzy) Reyes
U.S. Geological Survey
1289 McD Drive
Dover, DE 19901

Mr. Kash Srinivasan
603 E. Matson Run
Wilmington, DE 19802

Mr. Jim Jordan
Brandywine Valley Association
1760 Unionville-Wawaset Rd.
West Chester, PA 19382

Ms. Jennifer Volk
Kent County Cooperative Extension, University of Delaware
69 Transportation Circle
Dover, DE 19904

Mr. Steve Williams
Delaware DNREC, Division of Watershed Stewardship
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

Delaware Water Resources | Water News

April 2021 | Volume 19 | No. 1 View the newsletter online

UDWRC Director's Message

Everyone is Equal on this Blue Earth

Dr. Gerald Joseph McAdams Kauffman, Jr., Director
University of Delaware | Water Resources Center

Back during the pandemic summer, Martha, Nicole, Andrew, and I crafted an FY21 work plan to direct our efforts at maximum efficiency in this time of great challenges during the global pandemic and at long last our racial awakening. I am writing here from the Biden School, a place of great hope and feeling that if we stick together and learn about the social and physical sciences and treat people with decency, civility, and diversity in background and opinion that this world will be alright again.

As school resumed last fall, the health of everyone we work with is of paramount importance as we fight this pandemic. Our fieldwork along the White Clay Creek National Wild and Scenic River near Newark and Brandywine River in Wilmington has been safely conducted by our research students distancing and with masks. With support from Sec 104b of the Water Resources Research Act of 1984 and the appropriation by Congress this fiscal year through the U.S. Department of the Interior and U.S. Geological Survey we are able to provide for the funded water resources research of 17 undergraduate and graduate students to examine the critical water issues of the day in Delaware and the mid-Atlantic region. In Delaware and on campus we receive excellent guidance from the offices of the Governor and UD President about safe practices to stay healthy and we are committed to following these practices and most importantly wear masks when inside and out.
Now the UD nursing school is conducting vaccinations on campus looks like there is light at the end of our watershed that is the home of Jennersville, Pennsylvania after the young physician from Oxford who developed the smallpox inoculation in 1776 and saved the world!

With regard to our racial awakening and indeed my own personal reckoning, I have thought about this every day and looked into the mirror and we need to do better--much, much better. The scales are off my eyes now and at long last the stage is set for true racial equality where indeed all of humanity is created equal with certain unalienable rights endowed by our creator under the laws of nature. The UDWRC will become more diverse, we will bring on more scientists and students of every color from Delaware and America and from every corner of the globe.

Four years ago I requested that our homepage fly the message from Amos 5:24 and MLK, Jr. that reminds us to "let justice roll on like a river, righteousness like a mighty stream" and these are the words that we live by and will continue to live by. I was taught to fight racism wherever it reared its ugly head up but it's not enough

And so now I look back on my life almost a half century ago when as a young guy learned about true courage from the amazing Olympians of Mexico City 1968. During the summer of 1977 my track coach was Larry James (the Mighty Burner) who ran at Villanova and was the AD at Stockton State down near Atlantic City and in the 1968 Mexico City Olympics he ran 43.97 and won the silver in the 400m and gold in the world record 4x400 relay and his teammates were three amazing men, Lee Evans, John Carlos, and Tommie Smith. I met them one day at a training camp in the Pine Barrens and they told me how they were ostracized and banned from their sport after raising their fists on the medal stand in 1968 and I was in awe of the world class athletes sitting with me but the beautiful thing is that they took this young white guy in and tried to tell me how it felt to be black and speak their minds while paying the ultimate price and banned from doing what they loved which was to run. These good men were a half century ahead of their time and their story is beautiful and right and true. I have their photo in my office at UD from 50 years ago with the Australian silver medalist Peter Norman who stood on that stand with them and opposed racism and supported his competitors and friends the black Americans and he too was ostracized when he went back to his country and never ran in the Olympics again. These young men black and white stood up to end racism and the old men took away the gift that God gave them, the ability to run fast! So I never fully appreciated the lessons of warmth and inclusion and forgiveness that Larry, Lee, John, and Tommie taught me during that brief time in the summer at the turn of the 80s but I look back to that lesson to help me understand now.

What is clear to me is that everyone is equal on this blue Earth and that the only way forward is to stick together and choose love over hate. Our office at UD stands as a welcoming place of peace and tolerance and safety and I ache for my Black countrymen and those of all races who suffer from racism and bigotry in ways that I cannot begin to understand. I wish you all peace, health, and love.

Joseph R. Biden, Jr. School of Public Policy & Administration

200M Medal Stand, 1968 Mexico City Olympics

About the UDWRC

Mission:
Established in 1965 as one of the 54 National Institutes for Water Resources (NIWR) at land grant universities in the 50 states, District of Columbia, and three island territories of Guam, Puerto Rico, and U.S. Virgin Islands. The DWRC is Congressionally-mandated by Section 104 of the Water Resources Research Act of 1984 and 1964 administered by the U.S. Department of the Interior and U.S. Geological Survey. As part of the NIWR network, the mission of the DWRC is to: (1) support research, education, and public outreach programs that focus on water supply, water management, and water quality
- issues important to Delaware citizens and (2) foster/support training and education programs for future water scientists, engineers, managers, and policy-makers who will lead the water resources research, planning, and management efforts in our state.

Staffing: The UDWRC hosts the following faculty, scientists and students to fulfill our

mission: Gerald J. Kauffman -- Director/Associate Professor
Martha R. Narvaez -- Policy Scientist/Associate Director
Nicole M. Minni -- Associate Policy Scientist/GIS Laboratory Lewes Campus
Andrew R. Homsey -- Policy Scientist/GIS Manager
Sherri Martinez -- Sponsored Programs Coordinator
Sophie Philips -- Graduate Research Fellow (M.S. Energy & Environmental Policy) Hayley Rost -- Graduate Research Fellow (Master of Public Administration)
Kelly Slabicki -- Graduate Student (M.S. Water Science and Policy)

Public Health:
In accordance with the Governor's and UD administration's directives concerning the pandemic, the DWRC will move toward a phased reopening of the office during Summer 2021 with more extensive reopening in the fall semester. The ongoing pandemic has borne out the fact that the DWRC is able to maintain a high degree of efficiency and efficacy through the recent disruptions to the physical parameters of the work environment. Most of the work undertaken has been and can continue to be effectively achieved from remote locations, using technology to remain in contact with co-workers, funders, colleagues, and students. All components of the phased reopening with regard to the pandemic will be closely guided by the University's own policies and time-table published here: https://www.udel.edu/home/coronavirus/ud-campus-phased-reopening/guidelines/

Diversity:
Diversity is essential in civil society and in our scientific mission at the University of Delaware. The DWRC will redouble efforts to reach out and recruit talented minority and economically disadvantaged students and researchers. In the scientific world diversity is necessary for the evolution of knowledge and thus protection of the environment which everyone's well-being depends. The UDWRC has long been dedicated to this ideal taking a leadership role with youth in Wilmington through the Green Jobs program to develop the skills of tomorrow's leaders. Certainly more can and needs to be done. Through the recruitment of an increasingly diverse population of faculty, policy scientist, and undergraduate and graduate research students, this diversity can be strengthened. In accordance with our mission as designated by Congress under the Water Resources Research Act of 1984, the DWRC will reach beyond the University of Delaware to strengthen partnerships across the state at research institutions of higher-learning at Delaware State University, Wesley College, and Delaware Technical Community College. In this way DWRC will strengthen and broaden its research and scientific reach and enhance its ability to serve the needs of Delaware and all Delawareans, to whom water is a crucial resource and a prerequisite to health and happiness. We will focus on:

- Correspond with leadership of University of Delaware, Delaware State University, and Delaware Tech requesting nominations of diverse students for DWRC undergraduate water research internships.
- Re-examine UDWRC Advisory Panel for diversity and request feedback from the DWRC Advisory Panel on ways DWRC may be increase inclusiveness among its students, board and project work.
- Revisit with our UDWRC student alumni and celebrate their stories and their background, see https://www.wrc.udel.edu/about-wra/student-research-assistants/.
  Incorporate demographics of race, ethnicity, gender, and income of the study area into our research reports. Assess how existing and future projects may be enhanced to improve diversity and inclusiveness through the University of Delaware Office of Diversity and Inclusion and Coalition for the Delaware River Watershed (CDRW). UDWRC has two Delaware offices, its main office on the University of Delaware 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.

UDWRC Research Interns

FY19 Student Support

The University of Delaware Water Resources Center supported 11 undergraduate and graduate water research internships during FY19 through the annual base (104b) grants. The DWRC research students presented their research findings at the 55th annual meeting of the DWRC Advisory Panel on May 14, 2020 at the University of Delaware:

FY19 Delaware Water Resources Center Undergraduate/Graduate Internships

Last	School	Major	Research Advisor	Title of Proposed Research
Sicily Bordrick	UD	Environmental Engineering	Anastasia Chirnside	Optimization of HPLC Analysis of Ergosterol to Quantify Fungal Biomass within Bioreactors
Zach Burcham	UD	Environmental Engineering	Anastasia Chirnside	Optimization of HPLC Analysis of Ergosterol to Quantify Fungal Biomass within Bioreactors
Ji Zhendong	UD	Environmental Science	James Pizzuto	Discriminating between Mill Dam and Flood Deposits along White Clay Creek
Justin Leary	UD	Environmental Engineering	Jerry Kauffman	Hercules Red Clay Creek Watershed Monitoring Plan
Savanah Love	Wesley	Environmental Science	Stephanie Stotts	Interactive art exhibit focused on salinification of wetlands
Aaron Nolan	UD	Environmental Engineering	Jerry Kauffman	Duck Pond Creek Watershed Plan at Winterthur Gardens, Wilmington, Del.
Polly Ni	UD	Environmental Engineering	Jerry Kauffman	Brandywine Piedmont Field Monitoring Plan
Emily Symes	UD	Geological Sciences	James Pizzuto	Sediment Fingerprint Red Clay Creek Watershed
Mary Kegelman	UD	Environmental Engineering	Jerry Kauffman	Water Quality Trends in New Castle County (Delaware) Streams, 2000-2020
Matt Kirchman	UD	M.S. Energy & Environ. Policy	Andrew Homsey	White Clay Creek Water Quality Modeling
Kelly Jacobs	UD	M.S. Energy & Environ. Policy	Martha Narvaez	Effect of Marcellus Shale Gas Drilling on the Delaware River Watershed.

FY20 Student Support

Beginning in June 2020, the DWRC has supported 18 undergraduate and graduate water research internships during FY20 through the annual base (104b) grants. The DWRC research students are scheduled to present their research findings at the 56th annual meeting of the DWRC Advisory Panel on May 13, 2021 at the University of Delaware:

FY20 Delaware Water Resources Center Water Research Internships

Water Research Student	Major	Research
Hayley Rost	Master of Public Administration, Biden School	White Clay Creek Wild and Scenic River Water Quality Sampling Network.
Sophie Phillips	Master of Energy & Environ. Policy, Biden School	Environmental Justice and Water Use in Rural Delaware. Research
Sitlaly Avelino	Environmental Engineering	Watershed Characterization of First Order Tributaries along the Brandywine River in Delaware
Brendan Benson	Environmental Engineering	The Effect of Biochar on Infiltration Rate and Soil Aggregation in Both the Field and Lab
Brielle Bianchini	Environmental Engineering	Water Quality Trends in White Clay Creek Nat'l Wild & Scenic River, Delaware and Pennsylvania
Tommy Breedveld	Environmental Engineering	Stream Habitat Sampling along Tributaries of the Red Clay Creek in Delaware
Shannon Bushinsky	Environmental Engineering	Intergovernmental River Basin Management, the International Joint Commission Model
Alexis Cervantes	Environmental Science	Historic Significance of the Brandywine River as Drinking Water Supply in Wilmington, Delaware
Elizabeth DeSonier	Environmental Science	Stratigraphy of Valley Fill Deposits Upstream of a Small Colonial-Age Mill Dam, White Clay Creek, Pennsylvania
Delaney Doran	Environmental Engineering	Watershed Characterization of First Order Tributaries along the Brandywine River in Delaware
Grace Hussar	Environmental Studies	The Effects of Reforestation and Invasive Species Removal on Stormwater Flooding Events in Baltimore
Emily Jimenez	Environmental Engineering	Frequency of Peak Flood and High Tide Events in Delaware with Climate Change and Sea Level Rise
Bridgette Kegelman	Geography/Greek Roman Studies	Updating Land Use and Impervious Cover Change for the State of the Bays Report
Patrick McGay	Environmental Engineering	White Rot Fungi with Solid State Bioreactors to Reduce Pathogens in Dairy Manure Runoff
Karmyn Pasquariello	Environmental Engineering	Economic Value of Properties in the Coastal/Riverine Floodplain in Delaware with Sea Level Rise
Lily Peterson	Environmental Engineering	Stream Habitat Sampling along Tributaries of the Red Clay Creek in Delaware
Jady Perez	Environmental Engineering	Forest Hydrology and Stream Health in the Hickory Run Watershed at Mt. Cuba Center
Anna Singer	Environmental. Studies/ Public Policy	Water Quality Trends in White Clay Creek Nat'l Wild & Scenic River, Delaware and Pennsylvania

DWRC Undergraduate Intern Research

Watershed Characterization of 1st Order Tributaries along Brandywine River in Delaware
Sitlaly Avelino and Delaney Doran
Home Watersheds: Santa Ana; Brandywine River

By focusing on 14 first order tributaries that flow into the Brandywine River, the study aims to better understand and characterize the waters that constitute a major source of drinking water for the state of Delaware. Field studies conducted at reaches along the tributaries will be analyzed to assess variables such as the flow and velocity of the tributaries as well as nitrogen, turbidity, and conductivity. The overall goal of the study is to examine the data to assess the ecological health of each tributary that drains to the Brandywine River.

The Effect of Biochar on Infiltration Rate and Soil Aggregation in Both the Field and Lab
Brendan Benson
Home Watershed: Raritan River

The study seeks to simulate biweekly artificial storm events to evaluate the response of laboratory soil columns with and without the presence of biochar. The samples are examined in order to measure steady-state runoff and percolation rates that result from each storm event as well as the cracking and swelling of each soil column before and after each storm event. The overall goal of the project is to determine, based on these factors, what the differences are between soil samples where biochar is present and samples where there is no biochar present.

Watershed Characterization of 1st Order Tributaries along the Red Clay Creek in Delaware
Tommy Breedveld and Lily Peterson
Home Watershed: Passaic River Basin; White Clay Creek

By assessing stream geomorphology, stream habitat, and water quality, this research seeks to characterize the watershed of first order tributaries of the Red Clay Creek in Delaware. The study will classify each stream reach according to the EPA rapid stream bioassessment technique and collect water samples along each tributary to be analyzed for changes in turbidity, nitrogen, and conductivity over time.

Intergovernmental River Basin Management: The International Joint Commission Model
Shannon Bushinsky
Home watershed: Lehigh River

Analysis of the International Joint Commission (IJC), including its structure and policies, will provide an overview of how a large international agency can oversee several extensive river basins. Examining the role of the organization in river basin protection and international treaties concerning water quality and aquatic ecosystem health between Canada and the United States gives insight into how Canada and the United States negotiate policies based upon different views and regulations of water quality and environmental health. The overall goal of the study is to determine whether the organizational structure of the IJC would be successful if applied in other river basins such as the Delaware River and Chesapeake Bay basins.

Historic Significance of the Brandywine River in Wilmington, Delaware
Alexis Cervantes
Home watershed: Manasquan River

The Brandywine River is the largest river and sole drinking water supply for the city of Wilmington, Delaware and as such it is the goal of this project to determine its historic significance in context. The 2020 Brandywine Shad Project has identified resources listed by the National Register of Historic Places (NRHP) and properties that might be considered eligible for listing, located within the geographic area of the potential effect (APE) relevant to identifying the River's historic significance. The study found that based on existing information Dam 2 and Dam 4, in particular, have contributed to the historical significance of the Brandywine River.

Milldam Deposits in White Clay Creek
Liz DeSonier
Home Watershed: Skippack Creek Watershed

By examining the sediments in White Clay Creek, the project works to identify how the soil profile of the area has changed since human settlement. The study looks to identify the presence of Milldam deposits, which are an indicator of the arrival of humans in the area. By noting the presence and location of Milldam deposits within soil layers, the study will be able to determine the characteristics of soil layers since the presence of Milldam deposits were detected and note the changes. These changes indicate how the soil has changed since humans entered the area and would provide insight for creek management going forward.

Environmental Justice & Stormwater Mitigation Through Reforestation in West Baltimore
Grace Hussar
Home Watershed: White Clay Creek

The purpose of this study is to utilize hands-on experience and a series of interviews to assess the positive impacts of forest restoration on a community in West Baltimore that has historically suffered the negative effects of stormwater. The study focuses on the 10-acre plot of land behind the West Baltimore Stillmeadow Community Fellowship Church. Hands-on experiences will include assisting in the establishment of a tree nursery and planting native species, clearing the plot of dead and fallen trees, invasive species, and litter. Interview subjects will include residents of the neighborhood, members of the Stillmeadow Church, and U.S. Forestry employees (the project is in partnership with the U.S. Forest Service).

The Relationship between the Severity of Peak Delaware Flood Events and Climate Change
Emily Jimenez
Home watershed: Chesapeake Bay

The goal of this project is to examine peak flood events and high tides and assess whether riverine and coastal flood conditions are increasing in severity, in terms of frequency and magnitude, over time in Delaware as a result of climate change. Utilizing data values collected from literature, as well as long-term precipitation data from three DEOS weather stations in New Castle, Kent, and Sussex counties, annual peak streamflow data from USGS stream gages, and annual peak high tide data from USGS and NOAA tide gages, the study will conduct statistical analysis to determine if peak streamflow and coastal high tides are changing with precipitation levels in Delaware watersheds.

Updating Land Use and Impervious Cover Change for the 2016 State of the Bays Report
Bridgette Kegelman
Home watershed: Brandywine Creek

By collecting data and create updated graphs and charts, this study works to make updates to the 2016 State of the Bays Report. Based on the findings yielded from the latest available data, a decision will be made regarding which available data (collected from the National Oceanic and Atmospheric Administration (NOAA) or the state) would be the most appropriate. Utilizing various GIS tools, the report will generate buffers around bodies of water, agricultural areas, and developed areas to update the 2016 State of the Bays Report and datasets for variables such as bacteria levels, land use, nutrient concentration, dissolved oxygen levels, nutrient loads, and submerged aquatic vegetation (SAV).

Modification of Peroxidase Enzyme Analytical Methods for Solid State Bioreactors use to Reduce Pathogens in Dairy Manure
Patrick McGay
Home Watershed: White Clay Creek

The white rot fungi (WRF) Pleurotus ostreatus grown in small bench-scale bioreactors was able to reduce the number of E. coli naturally present in aqueous dairy manure. Currently, bioreactors containing both P. chrysosporium and P. ostreatus are being evaluated for their ability to degrade E. coli and antibiotics within aqueous dairy manure. The objective of this research is to monitor the fungal bioreactors during treatment of dairy manure containing E. coli for both Lignin Peroxidase and Manganese Peroxidase. Once the tests are confirmed successful, the assays will be performed on samples taken from the bioreactors during the E. coli degradation experiments.

Economic Value of Properties in Delaware Coastal /Riverine Floodplain with Sea Level Rise
Karmyn Pasquariello
Home watershed: Pompton Lakes

By conducting research into the economic value of properties in the coastal/riverine floodplain in Delaware with sea level rise, this study assesses the real-estate value of properties in Delaware and how the value has changed since 1975 in relation to sea level rise and flooding. The study examines flood insurance premiums, claims, and coverage in Delaware to find high-flood risk areas and determine whether the flood insurance program is adequately funded or subsidized by FEMA. ArcGIS will be used to overlay FEMA and NOAA flood inundation maps with parcel/property value maps to estimate the value of real estate at risk for flooding, given that nearly 20% of Delaware rests in the 100-year floodplain.

Forest Hydrology and Stream Health in the Hickory Run Watershed at Mt. Cuba Center
Jady Perez
Home watershed: Panama Canal

In partnership with Mt. Cuba Center, this study works to conduct field studies, streamflow, and water quality monitoring along the Piedmont tributary of Barley Mill Run that flows east and joins Red Clay Creek near Hoopes Reservoir in Ashland, Delaware. The objective of the watershed-based research program is to quantify the benefits of reforestation at Mt. Cuba Center on the water quality and water quality of Barley Mill Run by analyzing field data collected at monitoring stations where the creek flows by roadway and railroad crossings. At the four water quality monitoring stations, water quality samples are tested for a base (low) flow and a storm (high) flow event.

Water Quality Trends in White Clay Creek National Wild & Scenic River, Delaware and Pennsylvania
Anna Singer
Home watershed: Lake Champlain

The goal of the project is to evaluate the benefits of reforestation and other land cover changes on the creek and also to design best management practices (BMPs) to restore the watershed and the stream. The study will conduct water quality monitoring and analyze trends along the White Clay Creek in Delaware and Pennsylvania by establishing stream flow and water quality monitoring stations at 6 locations. Once per week and during storms over a 6-month period, flow depth and velocity will be recorded to estimate streamflow.

Water Resources Graduate Research Assistant Research

Diversity in National Parks: How Understanding our Past Can Help Us Create an Inclusive Experience
Sophie Phillips
Home Watershed: Croton Watershed

Throughout the year, National Parks are busy with activity. From hiking and camping, to museum visits and ranger-led tours, there are options for everyone to enjoy. In 2019 alone there were 327,516,619 visitors to the National Parks (NPS, 2020). On the surface, it appears the National Parks are doing very well, but looking deeper, there are concerns about the demographics of visitors and employees. A survey by the National Park Service in 2016 showed only 7% of park visitors are African American, and only 20% of visitors are minorities, even though African Americans make up 13% of the U.S. population and minorities make up 40% (Rott 2016). The history of African American experiences with nature, forests, and national lands provides some insight as to why National Park engagement within this population is so low.
The history of segregation in the United States national lands, the lack of representation of African Americans in the National Parks workforce, and a system that pushes kids out of environmental fields leave us with a lot of work to do. Creating programs within the park system that invite youth to become part of that space is an important first step. The creation of an app and podcast series about black history can build understanding and help address the knowledge gap around the history of this nation, while the hiring of more African American
employees in leadership positions will allow for the increase of that vital representation. We are far from solving this problem, but those in leadership positions of our national lands are ready to make the changes needed to truly show that we all have ownership in this land.

Critical Steps to Mitigating Climate Change and Addressing Climate Change Based Environmental Racism
Hayley Rost
Home Watershed: Perkiomen Creek

An analysis of the global average surface temperature conducted by the National Aeronautics and Space Administration (NASA) found that 2020 was the warmest year on record. Earth's average temperature has increased by more than 2°F since the 1880s as a result of human activity, in particular, actions that release greenhouse gasses (GHGs) such as carbon dioxide and methane into the atmosphere (NASA, 2021). States which border an ocean, such as Delaware, will be the first and most significantly impacted and many coastal communities have already been affected. It is critical that the Biden administration prioritizes the development of an effective and efficient plan to combat climate change by addressing GHG emissions in the United States.
New environmental policies should focus on determining which industries and practices are the most significant sources of GHG pollution and creating regulations to ensure these sectors become environmentally sustainable in the near future. In the state of Delaware 27% of the state's emissions are produced by industry, 23% by electricity production, and 31% by the transportation industry (ICF International, 2020). By transitioning towards the use of renewable energy resources in these three areas in particular, the United States, and the state of Delaware, will be able to reduce the amount of GHG emissions on a large scale. While it is critical to establish policies to reduce GHGs and mitigate future climate change, it is also vital that communities already affected by climate change are addressed such as communities that have been displaced due to climate change and communities that are impacted by environmental racism. President Biden must ensure that the policies and regulations enacted by his administration guarantee that environmental protections are afforded to all citizens and that policy changes are made so that communities of color are no longer disproportionately affected by climate change.

About the UDWRC Undergraduate Internship Program

How to Apply

***Applications for the 2021-22 Academic year are DUE May 11th, 2021!**

Eligibility: For the spring 2021 application period, all undergraduate students enrolled at the University of Delaware, Delaware State University, or Delaware Technical and Community College may apply, except for those graduating at the end of the spring 2021 semester. All students must have the support of a faculty or scientist advisor and a minimum GPA of 3.0.

Program Details and Deadlines: Supported by the Water Resources Research Act of 1964 and 1984 through the U.S. Department of Interior and U.S. Geological Survey, the DWRC will pay up to $3,000 per undergraduate intern, paid as hours worked at $10 per hour, up to a maximum of 300 hours. Internship projects are expected to start with the fall semester in September 2021 and will be paid through May 31, 2022 with the final research report and poster presentation presented to the UDWRC Advisory Panel in May 2022. Some students may begin during the summer 2021 with the support of their research advisor.

To apply for this program, you must establish a water research topic and project with a faculty or scientist advisor at your school and agree on this research topic over the 2021 fall and 2022 spring semesters. Bundle the application, transcript, resume, and one page research proposal as a single pdf and submit by email to Martha Narvaez at mcorrozi@udel.edu and

Gerald Kauffman at jerryk@udel.edu by May 11, 2021 at noon.

1. **Completed application**
2. Copy of current unofficial transcript
3. Current resume mentioning any special skills or experiences such as prior internships, research or education projects and laboratory or technical experiences
4. Brief description (1 page) of the research project proposal

Water faculty and scientists who may wish to advise your research are listed at https://www.wrc.udel.edu/faculty-and-staff/ and

http://www1.udel.edu/watersciencepolicy/faculty.html.

~~For questions, please contact Ms. Martha Narvaez at mcorrozi@udel.edu or Gerald Kauffman at jerryk@udel.edu and 302-893-1571.~~

UDWRC Water Resources Research and Education Priorities

- Water quality (nutrients, pathogens, public health), harmful algal blooms,
- PFOA) Storm water runoff (management and control)
- Water supply, demand, and conservation (infrastructure/technology)
- Water policy (governance and economics)
- Climate change, sea level rise, riverine/coastal flooding
- Groundwater (remediation and treatment)
- Watershed management
- Wetlands (protection and restoration)

Wastewater management (treatment and reuse)

Water, food, and energy nexus

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The Nation's Founding Fish Returns to America's Most Historic Small Watershed

Gerald Kauffman

With stories in the New York Times and NPR, word is getting out about Brandywine Shad 2020. Just a decade and a half ago the Brandywine Conservancy reinvigorated a 300-year old quest to bring back our nation's founding fish to the Brandywine, the river that National Geographic called America's most historic small watershed. In 2005, the Conservancy (est. 1971) conducted a river reconnaissance and explored the feasibility of restoring the American shad to the Brandywine by removing 11 dams that impeded their ancestral spawning runs since the precolonial days of the Swedes in Delaware. In 2012 the Conservancy was able to remove two dams that reopened 18 miles of the East Branch of the Brandywine up near West Chester, PA to fish passage.

Alosa Sapidissima (savory fish) is an anadromous species that lives in the ocean for much of its adult life and returns after 4 to 5 years to spawn in the freshwater rivers of their birth. The nation's founding fish swam up the Delaware and the Schuylkill in the spring of 1778 at just the right time in American history to feed George Washington's starving troops at Valley Forge. The American shad was so numerous in the Delaware Valley that the Brandywine was known as Fishkill by the Dutch who noted the glistening fish stacked from bank to bank and in 1880 hotels in Gloucester, NJ served 10,000 planked shad dinners to Victorian era diners. Stocks of this "poor man's tarpon" were decimated in the early 20th century due to overfishing, pollution from the Industrial Revolution, and precolonial dams that impede their ancestral spawning runs.

But with management of fish stocks and improved water quality from the 1970s Clean Water Act, a group known as Brandywine Shad 2020 is bringing the fish back to the river to swim in places they haven't been in three centuries. Brandywine Shad 2020 was founded in 2017 by river-side residents Hunter Lott and Jim Shanahan of Wilmington with a consortium of the City of Wilmington, Delaware DNREC, Brandywine Conservancy, Hagley Museum and Gardens, Brandywine Red Clay Alliance, Conservation Fund, The Nature Conservancy, and the University of Delaware Water Resources Center. Using science from the Brandywine Conservancy 2005 recon study, the City of Wilmington removed century-old West St Dam No. 1 and remnants of a circa 1740s dam on the Brandywine River last fall and this spring shad are being caught in downtown Wilmington (the shad capital of Delaware) right underneath the main artery of the megalopolis the I-95 bridge.

With the momentum now regained, Brandywine Shad 2020 has secured a grant from the National Fish and Wildlife Foundation and Delaware River Basin Conservation Act to restore fish passage to the remaining 10 dams in Delaware and eventually allow the shad to swim up to Pennsylvania and reopen 24 miles of the river to spawning up past the Brandywine River Museum in Chadds Ford and the forks of the Brandywine to West Chester, PA. The goal is for the shad to swim through the First State up to the Keystone State for the first time since the three lower counties of Delaware were part of the Pennsylvania colony. When this occurs the two states will indeed once again be joined by a common river.

The Brandywine River renaissance is falling into place. The remaining Delaware Dams 2 through 11 are numbered moving upstream from downtown Wilmington up past Hagley Museum to Rockland. The plan is to remove deteriorating Dams 3, 4, 6, and 11 in 2020 and install bypass fishways at structurally intact Dams 2 and 5 in 2021. Work on Hagley Dams 7 through 10 is slated for 2022. Fish passage at lower dams 2 through 6 will allow the shad to spawn from sea level 5 miles inland to 70 ft above sea level in the Piedmont (Italian for foot of the mountains) to the circa 1802 Hagley dams by 2021.

But the Brandywine Shad 2020 effort is not just about the fish it's also about the history, culture, and environmental recovery of the beautiful and bounteous Brandywine. A cultural resources survey with the State Historic Preservation Office unwraps the fascinating names and places in American history that took place along this river. Canby, Baldwin, Williams, and Maynard all wrote about the Brandywine and told these fascinating stories about the river.

For millennia long before the Europeans set foot in the New World the indigenous people the Lenni Lenape knew the Brandywine as the river of the long fish (the Atlantic sturgeon). In 1688 the village of Queonemysing stood along the river near William Penn's 1682 circular arc boundary near the present day covered bridge is today.

The steep gradient of the Brandywine close to sea level was the ideal place for the Colonists to construct their mills to transport their goods on the scallops and sailing ships that would moor at the docks just yards away from the mills. In 1687 Swedish surgeon Dr. Tyman Stidham built the first barley mill along the Brandywine at the head of tide near the old Dam No.
1. By 1727 dozens of mills were along the lower Brandywine in Wilmington and the Lenape petitioned the British Governor to remove the dams to allow the shad to spawn again. In 1742 Oliver Canby sold his flour mill to Joseph Tatnall and the lower reach had 6 dams with 12 mills, 6 on each bank. By 1756 the Brandywine Commission began removed dams to restore the fishery in one of the first riparian water rights actions under British common law. In 1787 at the end of the American Revolution, Gilpin of Chadds Ford built the first grist mill. By 1793 Maynard recorded that the Brandywine was packed to the gills with 50 flour mills milling 91,500 barrels, 50 saw mills sawing 1000 plank feet, 8 forges, 4 grist mills, 4 paper mills, and one snuff mill.

In 1802 the DuPonts searched up and down the Eastern seaboard and settled on the Brandywine as the site of their gunpowder mills as the river fell from 160 ft above sea level to tidewater (higher than Niagara Falls) in just a few short miles. In 1825 the Marquis DeLafayette returned to the 1777 Battle of the Brandywine and toured the Hagley Mills with the DuPonts and marveled at the intricacies of American engineering. In 1883, the William Bancroft textile mills above Wilmington were thriving and with foresight the proceeds were used to secure open land in the upper valley for the workers on the Woodlawn

Trustees land that became Delaware's first national park in 2015 when Barack Obama designated First State National Monument by Executive Order under the 1906 Antiquities Act. The Brandywine is the valley of Pyle and Wyeth and in the late

19th century the Wilmington commissioners asked Frederick Law Olmsted's firm to weigh in on the design of Brandywine Park near Dam 2. The American Industrial Revolution began right here with hydropower from centuries old mill dams along the Brandywine, it was the Silicon Valley of their day.

Now the shad restoration effort envisioned by the Brandywine Conservancy in 2005 is fully underway. Dam removals spurred by Brandywine Shad 2020 will allow the shad to spawn there and their progeny will be born there and they in turn will return to the Brandywine of their birth for first time in centuries.

Alosine survey along Brandywine River, July 2020

Field recon at Brandywine River Dam 3 (May 2020)

City of Wilmington Green Jobs Internship Program

Martha Narvaez

Until the ten youth stepped into the van on July 6, 2020 I was never quite sure we would have a program the summer of 2020. Like all things in 2020 I figured we just had to cut our losses and continue when Covid released its ugly grip on all of us. Yet, we were fortunate that through a lot of hard work on behalf of the City to ensure a safe program and many willing host organizations who reimagined a hands-on program virtually, we successfully and safely employed ten youth in the City's Green Jobs Internship Program for the tenth successive year! The youth were as excited as we were to be able to get the program off-the-ground as this was a reprieve from the past four months of virtual schooling and they were now actively engaged with program hosts both virtually and outside doing hands on work in a safe environment.

For those unfamiliar with the program, the Green Jobs Internship Program engages the City of Wilmington's youth by providing green-collar work opportunities. The youth participate in hands-on work experience, environmental career exploration and classroom environmental and civics education. Hands-on work may include activities such as: labeling storm drains to prevent pollution; installing rain gardens; removing invasive plant species; gardening in community gardens; canoeing and water quality sampling. The youth also learn about potential careers such as environmental engineering, environmental opportunities at nonprofit organizations, wastewater and drinking water employment and a variety of others. In order to be eligible for the program, youth must be city residents that are 14-18 years old. The program is six weeks at 25 hours/week and participants earn minimum wage. The backbone and success of the program can be attributed to the organizations that host the youth over the six-week internship. After ten years, the program has had over twenty organizations involved in hosting the youth. These host organizations range from private firms, local and national nonprofit organizations, and local academic institutions.

This coming July (2021) will mark the eleventh year of the City of Wilmington's Green Jobs Internship Program which has provided 138 youth with in-depth environmental hands-on activities and learning opportunities. Typically, the program hosts 14 youth but due to Covid restrictions the program will, Ilike last year, host 10 youth in 2021. Like last year, this year's program will be unique in that the program will be a hybrid of virtual and in-person activities. The City has developed safety protocol that ensures all youth are safe and participation is contingent on adhering to the safety protocol established by the City. If you or someone you know is interested in the program, the program application process is run through the City of Wilmington's Department of Parks and Recreation. Applications are available on the City's website and are typically due in mid-April. In late April/early May interviews are conducted to choose the program participants. In late May/June the selected program participants are processed which includes drug screening and background checks. The 2021 program will begin on

June 21st and will run until July 30th.

If you have any questions regarding the program, please contact Martha Narvaez (mcorrozi@udel.edu).

New Castle County Cares 4 Seniors

Nicole Minni

Through a grant provided by New Castle County Coronavirus Aid, Relief, and Economic Security (CARES) Act funding, professional staff members; IPA Policy Scientist's, Marcia Scott and Julia O' Hanlon worked with IPA's GIS Specialist, Nicole Minni and Public Administration Fellow Christine Moore partnering with the Delaware Aging Network (DAN) and Delaware's senior centers to create an online HUB. This HUB connected older adults with essential services designed to maintain their health, wellness, and independence during the pandemic. The team worked together to accomplish three key phases of research and development to improve health and equity for older adults in the county.
First the project team surveyed county-area senior centers and other DAN affiliates on the primary challenges in serving older community members during COVID-19. A review of preliminary results indicated comparisons to national challenges (May 2020 National Council on Aging survey).

Second, the team gathered resources from across the county and integrated them into an Esri GIS HUB site called **"New Castle County CARES 4 Seniors."** This HUB site integrates multiple interactive maps along with additional resources to help older adults and service providers better identify and coordinate essential services throughout the county. The site focuses on Food Security, Health and Wellness, Social Activities, Transportation Services, and Senior Services and is a one-stop-shop for providing older adults in New Castle County the information they need to stay connected and stay healthy. This information, combined with updated demographic data from the US Census; such as where higher concentrations of the 65 and older population are located, where older adults living in deep poverty are, and where the most vulnerable populations are. Mapping this information helps identify service and program gaps among the county's older adults.

Third, a map-based survey (using Survey123 and ArcGIS technology) ask county community-based originations to identify current in-person and virtual services being offered. Preliminary results from this survey can be found here as well as mapping of the results which can be found here.
This HUB site directly supports the in-person and virtual social services of NCC nonprofits and social service providers affiliated with DAN agencies and other organizations. This includes the county's senior centers, which provide critical, community-based services. Understanding and reaching the vulnerable senior population in New Castle County will help them through the pandemic and hopefully into the future.

New Castle County Cares 4 Seniors

Mapping Delaware's Inland Bays

Andrew Homsey

Delaware's Inland Bays—Rehoboth, Indian River, and Little Assawoman—form one of the state's most diverse, fascinating, and fragile ecosystems. The area is well-known as the center of the world-renown beach communities (sometimes known as the "Summer Capital" of the US for its popularity with many in the DC political elite), as well as a popular retirement and recreational destination for Delawareans and others. Host to a thriving poultry industry, the region is host to two of Delaware's top economic sectors: agriculture and recreation. In the midst of this lie the estuarine bays, fed by a single, narrow inlet and home to countless creatures and their habitats, from nesting gulls, herons, and many other species of birds, to migratory fish, shellfish, and even a nascent but rapidly expanding commercial oyster fishery.

Fringing this aquatic ecosystem is a complex of tidal marshes--important engines of ecological diversity and production, supporting rich populations of flora and fauna. Given the heavy human use of the bays, there are a number of stressors that imperil the tidal marshes of the Inland Bays. Sea level rise, human development, and other factors such as historical marsh ditching can cause degradation and loss of function of the marshes. A loss of function means a loss of their value as fish nurseries, protection against coastal floods, water purifiers, and critical habitat for birds and other creatures.

The Water Resources Center (WRC) has partnered with the Delaware Center for the Inland Bays (CIB) to determine the current status and understand the trends in these highly vulnerable yet critical habitats. Through support from the Delaware Sea Grant program, WRC, with the Center developed a project using GIS and Remote Sensing to map and quantify the extent and condition of these critical wetland habitats.

After a highly competitive search process, an undergraduate UD intern, Katherine (Kat) Warner was chosen to perform the mapping and analysis using a combination of historic and current aerial photography, existing data layers, and many specialized techniques and procedures. The work, an extension of a previous study undertaken by WRC with the Center in 2009, seeks to map the extent of salt marsh (among other land cover types), and assess the degree to which the marsh remains intact.

Part of the problem with the marsh is not merely its total extent, but (perhaps more importantly) its condition. If the marsh platform (the "ground" layer of a wetland) cannot keep up with sea level rise and subsidence, the interior portions can begin to exhibit "pooling" as interior open water areas expand, and its ecosystem function declines. The assessment of marsh condition was undertaken using 2017 aerial imagery to delineate the areas of marsh collapse. This information was then compared with data derived from the 2007 imagery upon which the previous study was based. Andrew Homsey of the WRC and Andrew McGowan of the CIB supported Kat in her efforts, and helped in the development of the tools and procedures used in the mapping process. Currently the data are being analyzed and a report written, the conclusions of which will help develop the upcoming State of the Inland Bays report, due for release later in 2021. Even given the challenges of working during a pandemic (which precluded the ability for in-person collaboration), Kat exhibited a resilience and ability that resulted in an exemplary data product, providing an invaluable snapshot in the evolution of the marshes of Delaware's Inland Bays.

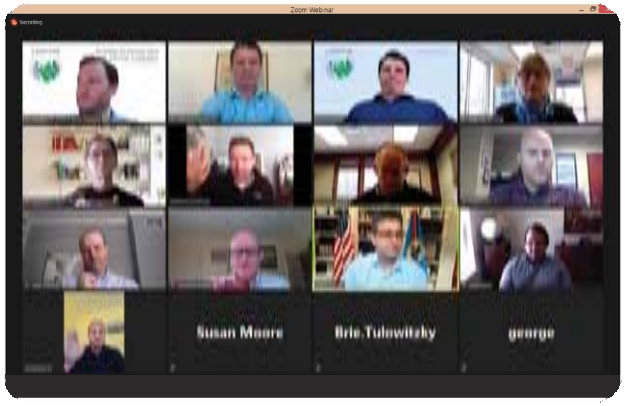
Working on this project has shown me just how much the little things add up. Detailing the change in marsh condition through GIS took many hours of hard and systematic work but is still only a small part of the restoration and conservation efforts yet to come to help protect this critical ecosystem.

Kat Warner

DWRC Photogallery

UDWRC Director Dr. Gerald Kauffman was elected to the Board of the Universities Council on Water Resources (UCOWR) at the annual meeting in Little Cottonwood Canyon, Utah in June 2019.

In February 2021 at the annual meeting, UDWRC Director Dr. Gerald Kauffman was elected to the Board of National Institutes for Water Resources (NIWR) Board to represent the mid-Atlantic Region joining water institute directors from the universities of California, Alaska, Rhode Island, Wisconsin, New Mexico. Texas A &M, and Hawaii.



Andrew Homsey was appointed by County Executive Matt Myers to the New Castle County Resources Protection Area Technical Advisory Committee.

Andrew Homsey was elected as the 75th President of the Board of the Brandywine Red Clay Alliance (Est. 1945) as the oldest small watershed association in the nation.

Matt at University of Delaware Coast Day, Lewes, Delaware, October 2019

Matt and Kelly meet with Delaware Representative Lisa Blunt Rochester with members of the Coalition for the Delaware River Watershed, Choose Clean Water Coalition, American Sustainable Business Council, National Parks Conservation Association, Partnership for the Delaware Estuary, and Delaware Nature Society, March 19th, 2020.

Matt and Kelly at Delaware River Watershed Hill Day March 2019

Kelly Jacobs (MS Energy & Environmental Policy) receives UD Biden School Excellence in Water Resources Scholarship Medal May 2020.

GEOG 453/653 Environmental Hydrology Field Survey of Fairfield Run in White Clay Creek Valley (Oct 2020)

Jobs and Internships in Water Resources

UD College of Agriculture and Natural Resources - Jobs and internships are listed here.

UD College of Earth, Ocean, and Environment - Jobs and internships are listed here.

Delaware Environmental Institute (DENIN) - Jobs and internships are listed here.

Water Resources Information and Training

The Delaware Section of the American Water Resources Association events information can be found here.

The University of Delaware Section of AWRA - activities can be found here.

The DENIN events calendar is found here.

The State of Delaware public meeting and workshop information is found here.

Welcome new subscribers! Contributions, comments and questions are always appreciated. Water News serves citizens interested in topics on Delaware water resources and is published by the Delaware Water Resources Center, University of Delaware.

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Future University of Delaware Water Resources Center Building

Questions?


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