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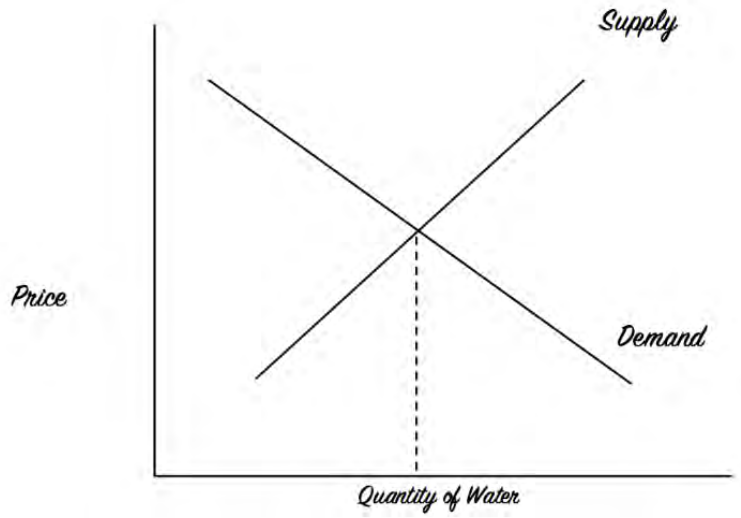
DWRC Director's Message

Why Study Water?

Gerald J. Kauffman Jr., Ph.D.

Why study water? Because it's not just good for our ecology, it's also the foundation of our economy. Established on campus in 1965 after Lyndon Baines Johnson signed the Water Resources Research Act (WRRA) during the golden era of water resources in the United States, the University of Delaware Water Resources Center (DWRC) is one of 54 National Institutes for Water Resources (NIWR) situated at land grant universities stretching across the Atlantic and Pacific from Maine to Micronesia. The 54 NIWR institutions of higher learning have graduated over 25 million alumni, many who hold jobs in the sciences, engineering, arts and humanities (STEAM) that support our national economy. We're finding that the byproducts of our NIWR universities - data and knowledge - are priced differently and worth much more now in the new economy and the old supply and demand curves just don't quite capture the true economic value of water.



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

The WRRA/NIWR research program invests in water resources that support a hundred billion dollar economy in the United States. The American Water Works Association (AWWA) calculated

the U.S. gains $220 billion in economic activity and generates 1.3 million jobs by investing in water and wastewater infrastructure. Every new water sector job adds an additional 3.7 jobs to the U.S. economy and every dollar invested in infrastructure generates $6.00 in returns. In 2005, surface waters gaged by the USGS totaled 260 billion gallons per day for irrigation, industry, thermoelectric power, and drinking water uses with an instream value estimated by the University of Delaware of $21 billion. Ecosystem services and wetland habitat in National Wildlife Refuges maintained by the U.S. Fish and Wildlife Service totaled $27 billion in 2008 dollars. The U.S. Fish and Wildlife Service estimates clean water habitat supports $157 billion in annual expenditures including $46 billion for fishing, $35 billion for hunting, and $76 billion for bird/wildlife watching.

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

DWRC Director Gerald Kauffman (right) with Associate Director David Shields (Brandywine Conservancy), President & CEO Collin O'Mara (National Wildlife Federation), and Executive Director Jim Jordan (Brandywine Red Clay Alliance) at the Bi-State Solution: Clean Water in the Brandywine-Christina Watershed conference in Mendenhall, PA on May 3, 2018.

UD Water Resources Center now part of the Biden School of Public Policy and Administration

We are proud and pleased to announce that the University of Delaware Water Resources Center is now a research unit of the Joseph R. Biden, Jr. School of Public Policy and Administration! Joe Biden is the 47th Vice President of the United States, elected at 29 to become a six-term U.S. Senator, and UD alumnus (class of '65). In 2000 Senator Biden co-sponsored legislation in Congress and signed by Bill Clinton that designated over 190 miles of the White Clay Creek and tributaries in Delaware and Pennsylvania as the first-ever national wild and scenic river system protected on a watershed-basis. With this action by the Board of Trustees, the Delaware Water Resources Center in the Biden School joins our colleagues in the National Institutes for Water Resources (NIWR) based in the Senator George Mitchell Center for Sustainability (Maine), Humphrey School of Public Affairs (Minnesota), and Strom Thurman Institute (Clemson/South Carolina).

Joe Biden and the Biden School of Public Policy and Administration, DWRC Director Gerald Kauffman, first row on left.

DWRC Faculty and Scientists

The DWRC, established in 1965, is one of 54 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 WRRA 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 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.

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

Gerald J. Kauffman Ph.D. (Director/Assistant Professor)
Martha C. Narvaez (Policy Scientist)
Andrew R. Homsey (Policy Scientist /GIS Lab)
Nicole M. Minni (Associate Policy Scientist GIS Lab /Lewes Campus)
Angela Speers (Sponsored Programs Coordinator)
Jillian Young (Graduate Research Assistant M.S. Water Science and Policy)
Kelly Jacobs (Graduate Research Assistant M.S. Energy and Environmental Policy)

DWRC faculty, scientists and students gather with Senator Tom Carper outside the Water Resources Center.

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

2018-2019 DWRC Research Interns

With support from the U.S. Department of Interior and U.S. Geological Survey through the WRRA appropriated by Congress, the DWRC works with undergraduate and graduate students studying water resources to develop research projects that reflect their unique interests. The DWRC Research Interns for the 2018-2019 school year are:

- **Michaella Becker (Environmental Engineering)** *Impact on New Castle County Roadway Soils Amended with Biochar*
- **Nicolette Bugher (Environmental Engineering)** *Monitoring/Mitigation of Perfluoroalkyl Substances (PFAs) in Delaware Aquifers*
- **Chelsea Caplinger (Political Science)** *Policy and Governance of Interstate Watershed Management*
- **Alyssa Cortese (Environmental Science)** *Restoration of the Brandywine River in Wilmington, DE*
- **Monica Crosby (Environmental Studies)** *Water Policy and Wetland Ecology*
- **Veronica Hill (Resource Economics)** *Combat Increasing Sea Level Rise in Delaware*
- **Allison Kaltenbach (Environmental Engineering)** *Effects of Tidal Flood Inundation in Delaware*
- **Thomas McLaughlin (Business)** *Cost-Benefit of Agriculture Conservation in the Delaware Coastal Plain*
- **Rebecca Steiner (Public Policy/Environmental Studies)** *Local Plans/Ordinances and Growth Management & Water Quality Protection*
- **Mia Kane (Environmental Science)** *Regenerative Agriculture with the Delaware Nature Society*
- **Andrew Dorazio (Mechanical Engineering)** *Watershed Plan for the White Clay Creek National Wild and Scenic River*
- **Liam Warren (Energy & Environmental Policy)** *Stormwater Utility Fees in Municipalities in Delaware*
- **Natalie Zimmerman (Geology)** *Sediment Finger Printing in the White Clay Creek Watershed*
- **Kelly Jacobs (M.S. Energy & Environmental Policy)** *White Clay Creek Source Water Plan, White Clay Creek Wild & Scenic River*
- **Jillian Young (M.S. Water Science & Policy)** *GIS Stormwater Management in the White Clay Creek Watershed*

Meet the DWRC Graduate Research Fellows

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

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

The AWRA Outstanding Student Chapter Award Goes To...

For the second year in a row, the American Water Resources Association (AWRA) selected the University of Delaware (UD) Student Chapter as the AWRA Outstanding Student Chapter for 2018. This award is presented to the AWRA Student Chapter which has been most active in advancing water resources knowledge in their respective Chapter, State, and Section. The UD Student Chapter also won the award in 2015. In 36 years there have been just four, 3-time champions of the AWRA Outstanding Student Chapter Award:

Univ. of Wisconsin-Stevens Point – 1983, 1985, 1989, 1993, 1995, 1999, 2005, 2007, 2009
Pennsylvania State University – 1991, 1992, 1998
University of Florida – 2000, 2008, 2016
University of Delaware - 2015, 2017, 2018

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

The UD Student Chapter Executive Board (left to right: Maggie Capooci (President), Jillian Young (Vice President), Lauren Mosesso (Secretary), and Nathan Sienkiewicz (Treasurer)) receives the Outstanding Student Section award from AWRA President Brenda Bateman.

The UD Student Chapter's objectives are to advance water resources research, planning, development, management, and education; to establish a common meeting ground for physical, biological, and social scientists, engineers, and other persons concerned with water resources on the University of Delaware's campus; and to collect, organize, and disseminate ideas and information on the field of water resources science and technology.

In addition to the UD Student Chapter winning this award for the third time, the University of Delaware Water Resources Center's Policy Scientist, Martha Narvaez, was this year's conference chair and also served as the 51st President of AWRA in 2016.

Regenerative Agriculture at the Delaware Nature Society's Coverdale Farm Preserve

In early 2018 the Delaware Nature Society (DNS) began a regenerative agricultural program in the Coverdale Farm Preserve. Regenerative agriculture is a system of farming principles which aims to capture carbon in soil and aboveground biomass. The goals of regenerative agriculture are to increase biodiversity, enrich soil, improve watersheds, and enhance ecosystem services in farming culture.

There are four main principles to ensure these goals are met:

- Include progressively improving whole agroecosystems.
- Create context-specific designs and holistic decisions that express the essence of each specific farm.
- Ensure just and reciprocal relationship amongst all stakeholders.
- Continuously grow and evolve individuals, farms, and communities to express their innate potential.

Many practices are put in place to ensure and enhance the first principle such as low till/no till farming and animal control of the land; in preference to chemicals and pesticides.

The Coverdale Farm Preserve is protected by conservation easements which are voluntary legal agreements between a landowner and a land trust or government agency that permanently limits uses of the land in order to protect its conservation values. With a total of 377 acres in total and 200 acres reserved for their nature preserve, the Coverdale Farm Preserve has 177 acres of working farmland for which regenerative agriculture can take place.

While focusing on investments to establish a regenerative agriculture system into their preserve, the DNS has been utilizing guidelines from the Rodale Institute, the leading institute in regenerative agriculture. The overall goal of the Rodale Institute's regenerative agricultural research is to increase soil organic matter over time, improve animal welfare, provide economic stability and fairness for farmers, ranchers, and workers, and create resilient regional ecosystems and communities. The Rodale Institute has performed independent agricultural research on regenerative agriculture as well as creating organic practices and establishing research projects to further develop this system.

DNS's Watershed Stewardship Team Leader, Kristen Travers, is working closely with DWRC intern, Mia Kane, on this research project. Mia is a sophomore Environmental Science major. DWRC interns, such as Mia, address water resources issues of critical importance to Delaware and the Mid-Atlantic region. Interns working with DWRC conduct projects consistent with these priorities with the support of a faculty/scientist advisor. Martha Narvaez, Policy Scientist at DWRC, will serve as project advisor (October 2018-April 2019) with funding provided by the U.S. Geological Survey through Section 104 of the WRRA.

As part of her research project, Mia will be working with DNS to collect field data as well as collect and document data and content from prior reports on the water chemistry and quality to assess the feasibility of implementing regenerative agriculture at the Coverdale Preserve Farm. One important question to address while conducting this research is whether regenerative agriculture can take place on the farm without past chemicals or pesticides affecting the quality of the outcome.

Wheels for Water

On October 14th, a brisk fall Sunday afternoon, approximately 20 water-minded cyclists could be spotted cruising Wilmington's city streets. Community members gathered at the Urban Bike Project for a water-themed bike tour through the City of Wilmington. The tour, which showcased water features and projects throughout the City, was a cooperative event between cycling experts, water experts, and the Clean Water Alliance. Along the route, cyclists stopped at the Brandywine Treatment Plant, Brandywine Raceway, a combined sewer overflow (CSO) site, Rockford Tower, Cool Springs Reservoir, DuPont Environmental Education Center, and the South Wilmington Wetland Project. The organizers and leaders of this collaborative event included:

- Leah Kacanda, Project Manager, City of Wilmington Office of Economic Development
- Laura Miller, Outreach Coordinator, Delaware Nature Society
- Martha Narvaez, Policy Scientist, University of Delaware, Water Resources Center
- Sally O'Byrne, Lifelong Delawarean, Community Member
- Laura Wilburn, Executive Director, Urban Bike Project

The City of Wilmington's Bryan Lennon also joined the group at multiple locations to provide his water expertise and the City's perspective. At each location, ride leaders explained the importance of water in context of the site and answered questions from the participants.

The Urban Bike Project, which cosponsored the event, supports the Wilmington community by providing access to bicycling as a healthy, affordable, and practical means of transportation and recreation. The DWRC is a steering committee member of the Clean Water Alliance, an initiative to educate people about the importance of clean water and a coalition of organizations and stakeholders working together across the state to secure funding for clean water.

Following the three-hour tour, attendees gathered at a happy hour at Stitchhouse Brewing Company, one of Wilmington's newest microbreweries in the heart of downtown Wilmington, to continue the discussion on clean water and the role of the Clean Water Alliance.

Cyclists at Rockford Tower

Coast Day 2018

On October 7th, 2018 the DWRC participated in Coast Day. The event took place at the University of Delaware's Hugh R. Sharp campus in Lewes and was sponsored by the College of Earth, Ocean, and Environment (CEOE) and the Delaware Sea Grant College Program. The theme for this year's event was "Science Serving Coastal Communities." Coast Day attendees had the opportunity to participate in a crab cake cook-off, seafood chowder taste test, and several cooking tutorials. Local food and artisan vendors as well as environmental organizations, such as The Partnership for the Delaware Estuary, The Nature Conservancy, Delaware, and DNREC, were present. Additionally, University of Delaware professors presented their research about coastal communities and marine life. For the full lineup of events, click here.

The DWRC staff and students spent the day interacting with the public about the DWRC's mission and projects as well as assisting children with a water-related craft and scavenger hunt. For the craft, children could choose to make a crab using a red plate and construction paper or color a flounder fish with googly eyes. Children participating in the Coast Day treasure hunt stopped by the DWRC table to collect a fact about the Maryland Coastal Bays Watershed. The DWRC staff and students explained that fish species, blue crabs, and wetlands are all important to the Maryland Coastal Bays Watershed for various reasons. Nicole Minni, Associate Policy Scientist and GIS/Graphic Specialist at the Lewes campus, coordinated the event.

Nicole Minni assists children with water-related crafts at Coast Day 2018.

Allie Cortese, environmental science major and DWRC research intern, shows off her craft-making abilities.

Clean Water: A Bi-State Solution

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

The conference was organized and hosted by the Brandywine-Christina Cluster Partners:

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

Andrew Johnson, Program Director at The William Penn Foundation, kicked off the conference and spoke about the DRWI. Over the past seven years the William Penn Foundation has distributed over $100 million dollars for clean water in the Brandywine-Christina watershed. Andrew said, despite these efforts, "it's still not enough." More funds are needed to help the water's health.

Brandywine-Christina Cluster Partners gather with DNREC Secretary Shawn Garvin and PADEP Secretary Patrick McDonnell near the PA/DE state line in Mendenhall, PA on May 3, 2018.

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

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

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

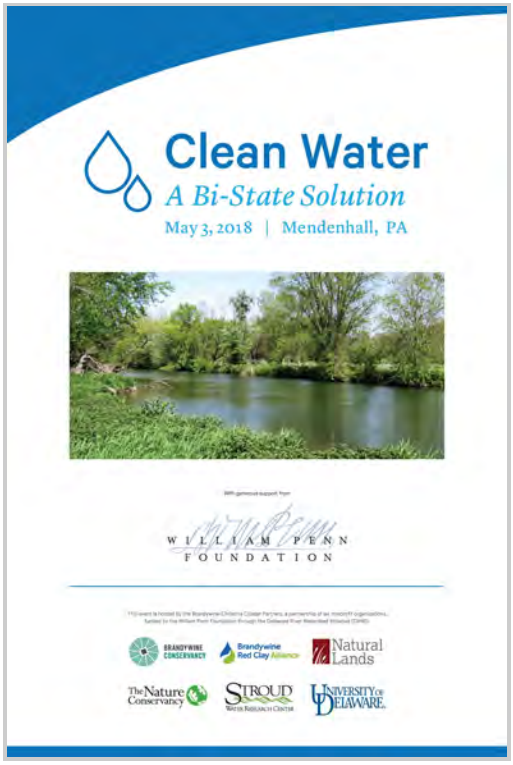
The second panel session provided an overview of projects from the federal and local government perspective. The panel included Shane Morgan, the Watershed Coordinator for the White Clay Creek Wild and Scenic River Program, who talked about how joint projects on land protection, outreach, education,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

The keynote speaker was Collin O'Mara, President and CEO of the National Wildlife Federation (NWF). O'Mara expressed how impressed he is with the work being done in the watershed. He mentioned that as he travels around the country, he sees the Brandywine-Christina watershed as a model for others to follow and he noted, "we need to succeed to be a model for other areas."

After lunch, conference attendees participated in a field tour. The tour included a restored stream, best management practices on a farm in Pennsylvania and the City of Wilmington's Hoopes Reservoir on the Red Clay Creek in Delaware. At the reservoir, which has been closed to the public since the early 1970s, conference attendees were invited to hike to the overlook to view the City's backup water supply and a critical component of the City's Source Water Protection Program.

Overall, the conference was a huge success and a valuable exchange of information. Conference attendees also took home the recently-released 2018 State of the Watershed Report, which exhibits the status and trends within the Brandywine-Christina watershed.

The report and conference presentations can be found here.



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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