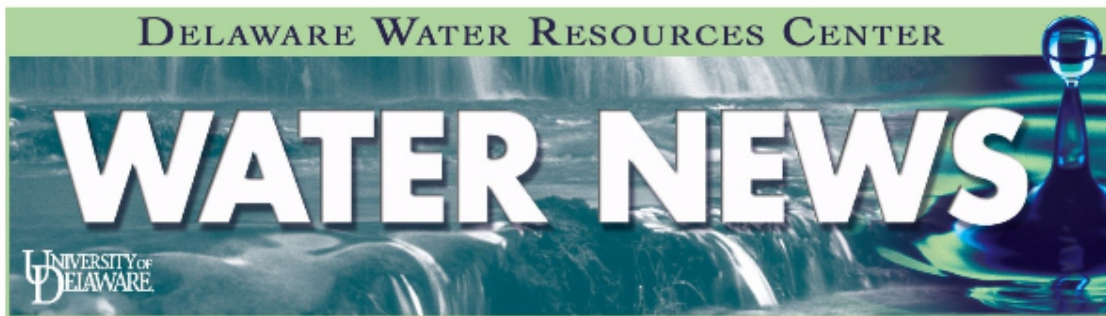


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UDWRC Director's Message

Delaware, the First State in Water

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

This has been a very good year in 2019 at the University of Delaware Water Resources Center (UDWRC) as I am pleased to report to you that the UDWRC has been recognized as "exceptional" in support of our students at Delaware universities. In accordance with the Water Resources Research Act of 1984, the U.S. Geological Survey informed the University of Delaware by letter that the UDWRC is "unique nationally" and its collaborations are "impressive," a high rating granted by the US Department of Interior. The five-year evaluation of the 54 National Institutes for Water Resources (NIWR) at land grant universities that stretch from Maine to Micronesia noted that our institute: (1) engages with universities/colleges around the state, (2) has strong leadership on the part of the Institute Director, and (3) facilitates research and information transfer closely tied to the water resources needs/issues of Delaware.

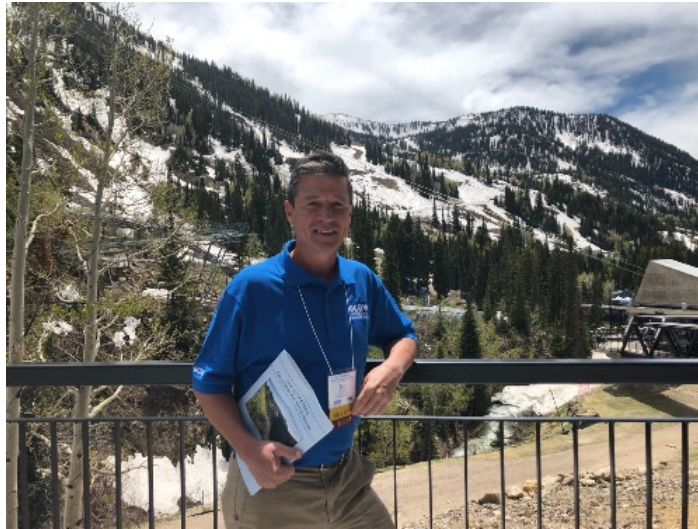
Our very good grade on the USGS report card is due to our sterling water faculty and scientists who have advised over 250 students in research and on-the-job training for careers that address the critical water issues of the day in Delaware such as coastal flooding, water pollution, and climate change. Our national prominence in water was further cemented this year with the news that the University of Delaware student section of the American Water Resources Association was voted for the 4th time as the national chapter of the year, a feat only surpassed by the University of Wisconsin and University of Florida.

I am also grateful to have been elected in June 2019 to a three-year term to the Board of Directors of the Universities Council on Water Resources (UCOWR) at the annual meeting along Little Cottonwood Creek, Utah. My fellow UCOWR board members include faculty from Oklahoma State, Mississippi State, Penn State, Purdue, Virginia Tech, Kansas State, Delaware, Hawaii, Cal Berkeley, Washington State, and Southern Illinois. What a great group of water scientists and even better people too!

Established on-campus in 1965, the UDWRC is one of the 54 Congressionally-mandated National Institutes for Water Resources (NIWR) supported by the Department of Interior and US

Geological Survey at land grant universities throughout the US by the Water Resources Research Act of 1984.

Delaware was the first state to sign the Constitution in 1787 and now as we enter our 55th year on campus in 2020, we are a "First State" in water as well.



UDWRC Director Gerald Kauffman installed to the Board at the annual Universities Council on Water Resources (UCOWR) conference in Snow Bird, Utah.

UDWRC Faculty and Scientists

The UDWRC, 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. UDWRC is supported through Section 104 of the Water Resources Research Act (WRRRA) 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 UDWRC 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 UDWRC 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. The UDWRC faculty, scientists and students include:

- [Gerald J. Kauffman](#) Ph.D. (Director/Assistant Professor)
- [Martha C. Narvaez](#) (Policy Scientist)
- [Andrew R. Homsey](#) (Policy Scientist/Manager of the GIS Lab)
- [Nicole M. Minni](#) (Associate Policy Scientist GIS Lab/Lewes Campus)
- [Angela Speers](#) (Sponsored Programs Coordinator)
- [Kelly Jacobs](#) (Graduate Research Assistant M.S. Energy and Environmental Policy)
- [Matt Kirchoff](#) (Graduate Research Assistant M.S. Energy and Environmental Policy)

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](#).



Andrew Homsey, Martha Narvaez, and Gerald Kauffman pictured with graduate research assistant Jillian Young after she received the Biden School Excellence in Water Resources Award at Honor's Day in May 2019.

2019/2020 UDWRC Research Interns

With support from the U.S. Department of Interior and U.S. Geological Survey (USGS) through the WRRRA appropriated by Congress, the UDWRC supports undergraduate and graduate students studying water resources to develop research projects that reflect their unique interests. The UDWRC Research Interns for the 2019-2020 school year are:

- **Sicily Bordrick (Environmental Engineering)** *Optimization of HPLC Analysis of Ergosterol to Quantify Fungal Biomass within Bioreactors*
- **Zach Burcham (Environmental Engineering)** *Optimization of HPLC Analysis of Ergosterol to Quantify Fungal Biomass within Bioreactors*
- **Zhendong Ji (Geological Sciences)** *Discriminating Between Mill Dam and Flood Deposits Along the White Clay Creek*
- **Justin Leary (Environmental Engineering)** *Brandywine Piedmont Field Monitoring Plan*
- **Savanah Love (Environmental Science, Wesley College)** *Interactive Art Exhibit Focused on Salinification of Wetlands*
- **Aaron Nolan (Environmental Engineering)** *Wilson Run Watershed Plan in the Brandywine River*
- **Polly Ni (Environmental Engineering)** *Brandywine Piedmont Field Monitoring Plan*
- **Emily Symes (Geological Sciences)** *Sediment Fingerprint Red Clay Creek Watershed*
- **Mary Kegelman (Environmental Engineering)** *Brandywine Piedmont Field Monitoring Plan*
- **Kelly Jacobs (M.S. Energy and Environmental Policy)** *Delaware Center for Inland Bays Economic Valuation*
- **Matt Kirchoff (M.S. Energy and Environmental Policy)** *White Clay Creek Wild & Scenic River Mapping*

Meet the UDWRC Graduate Research Fellows



Kelly Jacobs

Kelly is a second-year Master's student in the Energy and Environmental Policy program. She is from Dallas, Pennsylvania and received her Bachelor's degree from Lebanon Valley College in Economics. Kelly has worked on various projects for UDWRC including the City of Wilmington's Green Jobs program, field work for White Clay Wild and Scenic, and an economic valuation report for the Nanticoke River watershed in southern Delaware. Kelly is writing her Master's thesis on Marcellus Shale fracking documentaries and how they have influenced public perception and policy in Pennsylvania.



Matt Kirchoff

Matt is a second-year Master's student in the Energy and Environmental Policy program. He is from Laytonsville, Maryland and received his Bachelor's degree from the University of Delaware in Environmental Science. Since Matt is working towards his GIS certificate, most of his work for UDWRC involves mapping and data analysis. He is currently working on a solar aeration project for the City of Newark and updating a web-based, interactive map of the White Clay Creek watershed. Matt's research interests include national seashore feasibility and equity issues related to water resources.

USGS Recognizes UDWRC as "Unique Nationally" and "Impressive"

A 5-year evaluation conducted by the U.S. Geological Survey (USGS) under the provisions of Section 104 of the Water Resources Research Act of 1984 finds that among the 54 National Institutes for Water Resources at land grant universities throughout the United States, the University of Delaware Water Resources Center is "unique nationally" and its collaborations are "impressive." In the letter from the USGS to the University of Delaware, the USGS evaluation panel found that:

- The University of Delaware Water Resources Center is unique nationally in that it follows a model that is highly supportive of students. This exceptionable support of students is to be commended.
- The extensive collaboration with state and federal agencies, universities, and other entities due to the use of student internships and fellowships was impressive.

UDWRC Director Dr. Gerald J. Kauffman thanks the Administration, Congress, and the USGS for its support of the research, education, and work force training of over 250 student water resources researchers from the University of Delaware, Delaware State University, and Wesley College since 2002. We are especially grateful to our Delaware Congressional Delegation (Senator Tom Carper, Senator Chris Coons, and Congresswoman Lisa Blunt Rochester) for their support of the appropriations in the Water Resources Research Act in the Department of Interior budget. This recognition could not have happened without the leadership from the first two directors since the UDWRC was established on campus in 1965 (Dr. Robert Varrin, Professor of Civil and Environmental Engineering and Dr. Tom Sims, Deputy Dean of Agriculture and Natural Resources) and Bernard Dworsky, first director of the UD Water Resources Agency. Dr. Jerome Lewis (Director) and Lisa Allred (Policy Scientist) of the Institute for Public Administration are instrumental in hosting the UDWRC and bringing the research students on-board for their graduate assistantships and undergraduate internships.

This is good news as we enter the 55th year of the University of Delaware Water Resources Center!



UDWRC Graduate Research Students Jillian Young (MS Water Science and Policy) (left) and Kelly Jacobs (MS Energy and Environmental Policy Candidate) (right) prepare for fieldwork along the White Clay Creek National Wild and Scenic River in May 2019

The University of Delaware Water Resources Center and Delaware Sea Grant College Program, from Watershed to the Sea

Two thousand and nineteen was the year that the University of Delaware Water Resources Center (a program of the U.S. Department of Interior in USGS) and Delaware College Sea Grant Program (a program of the U.S. Department of Commerce in NOAA) integrated their research programs from freshwater in the watersheds to saltwater in the bay and the ocean. The UDWRC is one of the 54 National Institutes for Water Resources (NIWR) supported by the USGS at land grant universities throughout the US that traditionally focuses on research in the upland or freshwater regions in Delaware. Delaware Sea Grant (DSG) is one of the 33 sea grant programs along the Atlantic and Pacific and Great Lakes that focuses research on the coastal tidewater and saltwater regions of the First State. Due to our flat coastal geography and status as the lowest lying state in the nation, no area in Delaware is more than 10 miles from sea level. Therefore, it makes sense for the UDWRC and DSG to coordinate our research programs. In February 2019, the USGS Water Research Institutes and NOAA Sea Grant Programs from the Atlantic met in Washington, DC to coordinate our water research programs at Rutgers, Cornell, Penn State, Delaware, Maryland, and Virginia Tech. As part of the integration UDWRC Associate Director Martha Narvaez has been appointed to the Delaware Sea Grant Advisory Council and DSG Associate Director Christian Hauser was appointed to the Delaware Water Resources Center Advisory Panel.



UDWRC Director, Dr. Gerald Kauffman, presents at the Joint Atlantic Regional Meeting of the NOAA Sea Grant College Program and USGS Water Research Institutes on February 28, 2019 in Washington, D.C.

54th UDWRC Advisory Panel Meets at the Biden Institute

On May 16th, the advisory panel of the UDWRC met for the 54th annual meeting at the Biden Institute, located at 44 Kent Way. UDWRC interns had the opportunity to present their research projects and receive feedback from panel members. Project topics ranged from regenerative agriculture practices at the Coverdale Farm Preserve to addressing perfluoroalkyl chemical contamination in Delaware. UDWRC interns spend 10 hours a week from September to May working on their research projects, which often includes fieldwork and collaboration with professors from various departments.

Advisory panel members also discussed new business, including FY 2019/20 research projects, research priorities for the upcoming year, joint ventures with Delaware Sea Grant, and the UDWRC becoming part of the newly established Biden School of Public Policy and Administration.

2018/19 UDWRC Undergraduate Interns include:

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

- **Natalie Zimmerman (Geology)**, Advisor: Gerald Kauffman (Biden School), Sediment Fingerprinting in the White Clay Creek National Wild and Scenic River Watershed
- **Andrew Dorazio (Mechanical Engineering)**, Advisor: Gerald Kauffman (Biden School). Hydropower Potential along the White Clay Creek National Wild and Scenic River

2018/2019 UDWRC Graduate Students include:

- **Jillian Young (Water Science and Policy)**, Advisor: Gerald Kauffman and Andrew Homsey (Biden School). Analysis of the Watershed GIS Registry to Evaluate Stormwater Practices in the Christina River Watershed
- **Kelly Jacobs (Energy and Environmental Policy)**, Advisor: Gerald Kauffman and Martha Narvaez. GIS Mapping of Farms and Agricultural Stormwater Runoff in the White Clay Creek National Wild and Scenic River Watershed in Delaware and Pennsylvania.



UDWRC Interns and Presenters (left to right): Michaella Backer (Environmental Engineering), Alyssa Cortese (Environmental Science), Liam Warren (Engineering and Environmental Policy), Chelsea Caplinger (Political Science), Rebecca Steiner (Public Policy) and Natalie Zimmerman (Geology)



UDWRC Interns and Presenters (left to right): Veronica Hill (Resource Economics) Natalie Zimmerman (Geology), Alyssa Cortese (Environmental Science), and Mia Kane (Environmental Science)

On October 6th, the annual Coast Day event was held at the University of Delaware's Hugh R. Sharp campus in Lewes. The College of Earth, Ocean, and Environment (CEOE) and Delaware Sea Grant organized the event. This year's theme was "A Ripple Through Time" to emphasize the importance of scientists studying how our environment changes over time and how we can work to improve our future. UD faculty and various environmental groups presented their research through hands-on displays, poster presentations, and demonstrations in labs and outdoor tents. Other events included a crab cake cook-off, seafood chowder challenge, chemical magic show, watershed dance, and multiple seafood cooking demonstrations.

UDWRC staff and students attended the event and spoke to the attendees about research and policy initiatives related to water quality and water supply in the state and region. In addition to speaking about research projects, UDWRC staff and students helped children construct water-related crafts out of recycled eggs cartons, these included lobsters, flounder, and oysters. Children participating in the Coast Day scavenger hunt also stopped by the UDWRC table to collect a clue about the importance of aquatic creatures to the Maryland Coastal Bays watershed. For the full lineup of events, [click here](#).



UDWRC graduate research assistant, Matt Kirchoff, prepares materials to create water-related crafts.

The Salt Conundrum

On October 29th, the DWRC hosted The Salt Conundrum at The Outlook at the Duncan Center in Dover, Delaware. Martha Narvaez, UDWRC, and Emily Whiting, Delaware Department of Transportation (DelDOT), coordinated and hosted the event. Program sponsors included the University of Delaware Sustainable Coastal Communities Initiative (SCCI) and the Delaware Section of the American Water Resources Association (DEAWRA). The goal of the event was to bring stakeholders together to discuss various issues related to road salt application during the winter season.

The program agenda highlighted state and regional transportation practices and environmental research and concerns related to salt. Representatives from Delaware, Maryland, Pennsylvania, and Virginia's departments of transportation (DOT) spoke about their specific practices related to road salt application. Each DOT has a plan in place to reduce the amount of salt used for deicing purposes, which includes properly training employees to apply salt correctly. Scientists from Stroud Water Research Center, USGS, Delaware Geological Survey, and the University of Delaware also discussed the environmental impacts of road salt, specifically related to water quality. When road salt migrates into surface water, chloride levels become elevated, causing damage to aquatic ecosystems. Road salt also penetrates the groundwater supply used for drinking water purposes, often making tap water taste salty. Due to the negative ecological and human effects, reducing chloride pollution in surface water and groundwater has become an

important environmental goal for the region.

Following the event, attendees were invited to a happy hour at Fordham & Dominion Brewing Company to continue the discussion. For the full agenda and access to the conference presentations, [click here](#).



UD AWRA Student Chapter, Four-Time Winner!

On Wednesday, November 6th, the American Water Resources Association (AWRA) presented the University of Delaware Student Chapter (UDAWRA) with the AWRA Outstanding Student Chapter for 2019. This award is presented to the AWRA Student Chapter that has been most active in advancing water resources knowledge and carrying out the association's mission. This is the third consecutive year UDAWRA won the award and the fourth overall win. UDAWRA also won in 2015, 2017, and 2018. UDAWRA is officially the second winningest school in AWRA history; the only other Student Chapter with more wins than UDAWRA is the University of Wisconsin-Stevens Point.

Jillian Young, the former UDAWRA Student Chapter Vice President and DWRC graduate fellow, accepted the award during the awards luncheon on the final day of the conference in Salt Lake City, Utah. Members of the Executive Board for the 2018-19 school year included Maggie Capoooci (President), Jillian Young (Vice President), Lauren Mosesso (Secretary), and Nate Sienkiewicz (Treasurer).

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. For more information about the UD Student Chapter, [click here](#).



Jillian Young (left) and Martha Narvaez, UD Student Chapter advisor (right), pose after the awards luncheon in Salt Lake City, Utah.

Brandywine Shad 2020

Shad, the silver-bellied, tasty, fighting fish that fed colonial America, are ready to return from the Atlantic to their ancient homes up the Brandywine River. Following the recent removal of the 112-year-old West Street Dam in Wilmington, Delaware and through funding from the National Fish and Wildlife Foundation (NFWF), Brandywine Shad 2020 partners are embarking on restoring fish migration to the Brandywine River.

With the recently awarded NFWF funding, the UDWRC, in partnership with Brandywine Shad 2020, will collaborate with the City of Wilmington to conduct a feasibility study, prepare conceptual engineering drawings, and initiate permitting and regulatory approvals to restore fish passage, specifically American shad, hickory shad, river herring, striped bass and other anadromous species, to the Brandywine Creek through the City of Wilmington, Delaware. The long-term conservation outcome of this project is to restore fish passage and habitat to the 320 sq. mi. Brandywine Creek watershed by removing on-stream dams and/or installing fish ladders, fish notches, rock ramps or bypass channels. Currently there are 11 low head (2 ft to 10 ft high) dams along 5.2 miles of the Delaware portion of the Brandywine Creek that stretch from tidewater upstream.

Brandywine Shad 2020 has awarded a contract to the Kleinschmidt Group of Strasburg, PA to analyze five of the eleven dams along 2.5 miles of the Brandywine River. Kleinschmidt has a breadth of experience and has designed more than 125 fish passage facilities in the United States and Canada and more than 30 dam removal projects in nine states. Kleinschmidt will conduct a feasibility assessment to determine the best solution at each dam ranging from dam removal to building a fish passage structure, building on the progress made during the summer to remove the West Street Dam. Kleinschmidt will also work closely with students at UDWRC throughout the project, reducing the costs while providing students with real world hands-on experience as they start new careers and jobs after graduation.

Brandywine Shad 2020 is a coalition of 12 local, regional and national conservation minded organizations working to reopen the river so that native fish can reach the Brandywine Valley into Pennsylvania. Brandywine Shad 2020 nonprofit founding partners and supporting organizations include founding partners (Brandywine Conservancy, Hagley Museum and Library, University of Delaware Water Resources Center) and supporting organizations (American Rivers, Brandywine Red Clay Alliance, Delaware Nature Society, Partnership for the Delaware Estuary, Stroud Water Research Center, The Conservation Fund, The Nature Conservancy).



Polly Ni (left), Justin Leary (center) and Mary Kegelmann (right) UDWRRC Research Interns working on the Brandywine Shad 2020 project.

Delaware GIS Day 2019

On Monday, November 18th at the Air Command Mobility Museum in Dover the GIS Day Committee held its 12th Annual GIS Day field trip. GIS day is an International Event which falls during Geography Awareness Week. The GIS Day Committee, a subcommittee of the Delaware Geographic Data Committee, is made up of nine GIS professionals ranging from the federal, state, and county government; higher education; and utility industries.



2019 DE GIS Committee. Photo by: Scott Figurski

Approximately 285 fifth grade students attended this year's event, which represented three schools; John R. Downes Elementary, Nellie Hughes Stokes and Frederick Douglass Elementary. There were 16 stations, each providing the students with a unique experience learning how geospatial technologies are used across many industries. There were 60 volunteers guiding the students on their tour. Examples of the stations include:

- The Delaware Emergency Management Agency demonstrated how drones are used in emergency situations through simulations and real life examples.

- Delaware Technical Community College shared an interactive watershed model to create, test, and visualize how various factors within a watershed impact runoff and flooding. The students learned how civil and environmental engineers use GIS to model watersheds and develop approaches for flood management.
- Students practiced their GIS skills using ARCGIS Online to discover data in Delaware and all over the world.
- Students went on a Water Resource Scavenger Hunt, which was an exploration of Delaware that highlights the science, history, and policy of the State's valued water resources.
- The United States Air Force explained how they use GIS to support their mission at Dover Air Force Base and how they collect data with their survey equipment.
- The University of Delaware, College of Earth, Ocean and Environment, provided a hands-on experience using an augmented reality sandbox using an Xbox Kinect, projector, and open source software. The Kinect "sees" the topography of the sand in the box and the software projects the topographical map onto the sand in real time.
- The volunteers at the museum provided a tour which included: entering a C5 aircraft, exploring a control tower and using a flight simulator.

A highlight of the field trip was a special visit from Delaware Chief Information Officer, James Collins and DelDOT Secretary Jennifer Cohan. GIS Day provided the students with an inspirational opportunity by exposing them to geospatial technologies and real-world applications that are making a difference in the world, thus opening a door for them to learn about this growing industry. Find out more about the event and future activities [here](#).

Rain Garden Story Map

Winter is upon us and with that comes snow and rain! That snow and rain causes pollutants from our yards and roads to enter our streams. There's a green solution to managing stormwater where we live, it is called a rain garden. Rain gardens are easy to construct, low cost and beautiful. The soils and plants in rain gardens absorb the water and filter pollutants before they enter the waterways. A rain garden provides beauty and habitat for songbirds and butterflies. Rain gardens also conserve precious water supplies and downstream drinking water sources, protecting the water quality necessary to support our economy, recreation, tourism, agriculture and industry. Through a partnership with DNREC, Division of Watershed Stewardship, UDWRC's Nicole Minni has brought the state's rain garden photo gallery and website to life through the use of ArcGIS Story map. Showcased on the [Delaware Watersheds website](#), you can visit the gallery and learn all about the benefits of rain gardens. Visit the [Rain Garden Story Map](#) to learn more about rain gardens and take part in caring for OUR waterways by building a rain garden today.

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](#).

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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