Delaware Water Resources | Water News

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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!

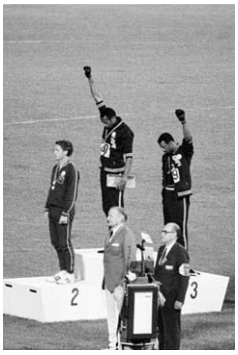
With regard to our racial awakening and indeed my own personal reckoning, I have thought about this every day and looked into the mirror and we need to do better--much, much better. The scales are off my eyes now and at long last the stage is set for true racial equality where indeed all of humanity 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.

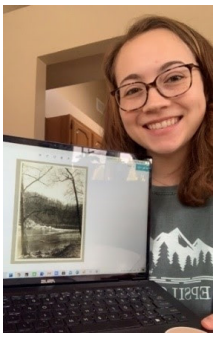
Watershed Characterization of 1st Order Tributaries along the Red Clay Creek in Delaware
Tommy Breedveld and Lily Peterson
Home Watershed: Passaic River Basin; White Clay Creek

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.

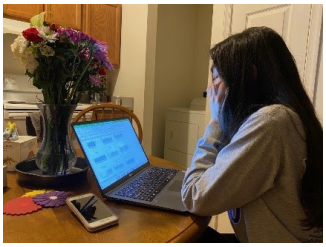
Milldam Deposits in White Clay Creek
Liz DeSonier
Home Watershed: Skippack Creek Watershed

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

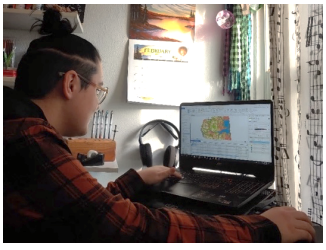
The purpose of this study is to utilize hands-on experience and a series of interviews to assess the positive impacts of forest restoration on a community in West Baltimore that has historically suffered the negative effects of stormwater. The study focuses on the 10-acre plot of land behind the West 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

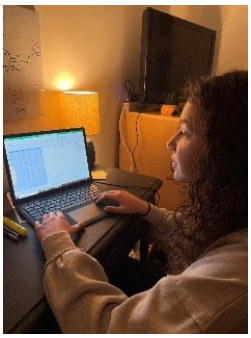


By collecting data and create updated graphs and charts, this study works to make updates to the 2016 State of the Bays Report. Based on the findings yielded from the latest available data, a decision will be made regarding which available data (collected from the National Oceanic and Atmospheric Administration (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

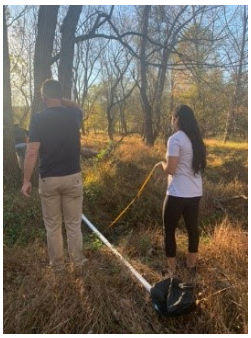
The white rot fungi (WRF) Pleurotus ostreatus grown in small bench-scale bioreactors was able to reduce the number of E. coli naturally present in aqueous dairy manure. Currently, bioreactors containing both P. chrysosporium and P. ostreatus are being evaluated for their ability to degrade E. coli and 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

UDWRC Advisory Panel

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Steve Williams/Jennifer Walls
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Dover, DE 19901

Christian Hauser
Associate Director
Delaware Sea Grant College Program
Newark, DE 19711

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, llike 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.

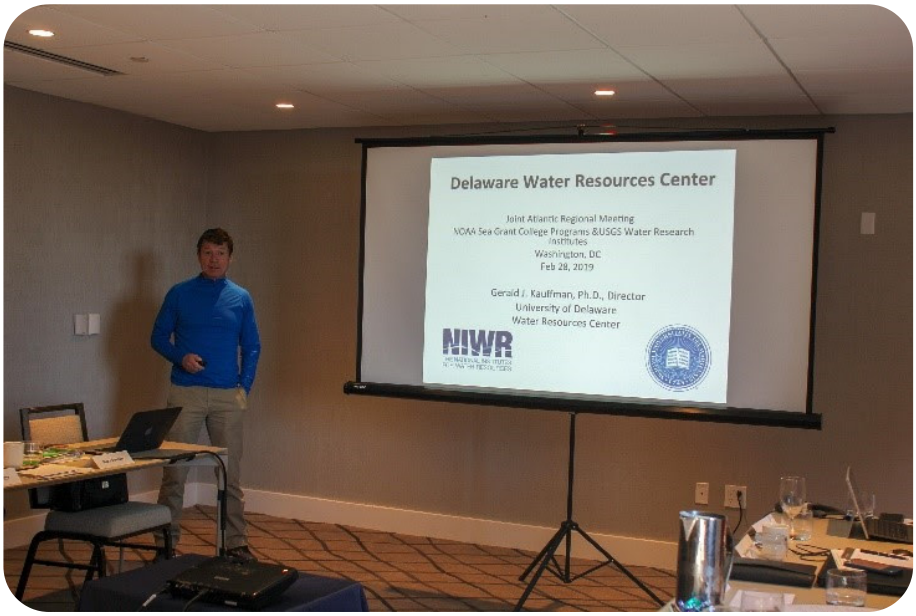
Part of the problem with the marsh is not merely its total extent, but (perhaps more importantly) its condition. If the marsh platform (the "ground" layer of a wetland) cannot keep up with sea level rise and subsidence, the interior portions can begin to exhibit "pooling" as interior open water areas 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.

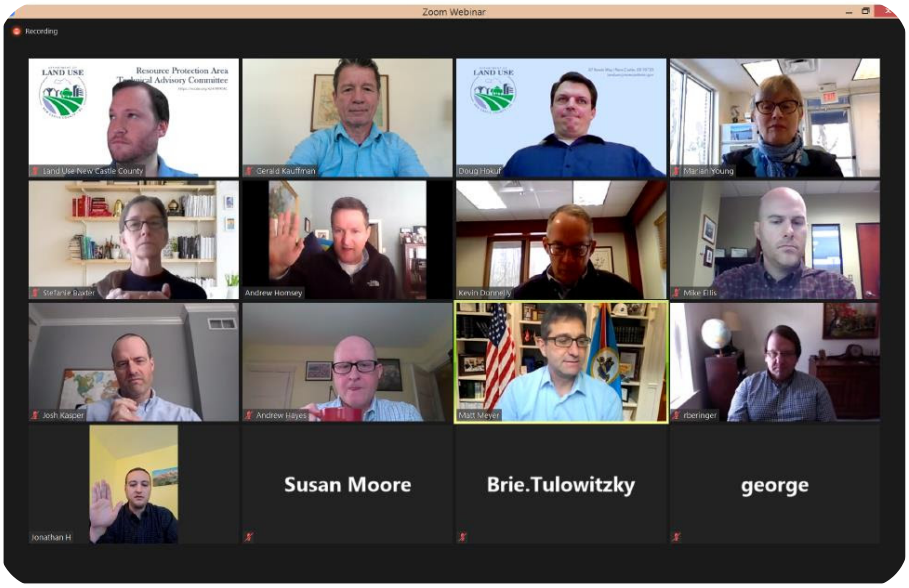
Kat Warner

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) to represent the mid-Atlantic Region, joining water institute directors from the U. of Illinois, U. of California, Kansas State U., U. of the Virgin Islands, Oklahoma State U., U. of Connecticut, Oregon State U., Texas A&M U., U. of Nebraska, U. of Minnesota, and U. of Alaska.



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.

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