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.

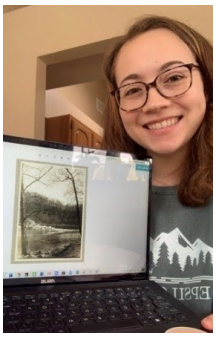
Watershed Characterization of 1st Order Tributaries along the Red Clay Creek in Delaware
Tommy Breedveld and Lily Peterson
Home Watershed: Passaic River Basin; White Clay Creek

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.

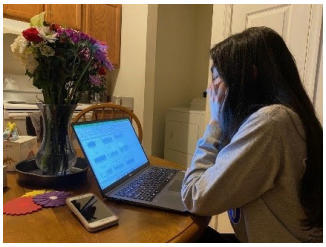
Milldam Deposits in White Clay Creek
Liz DeSonier
Home Watershed: Skippack Creek Watershed

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

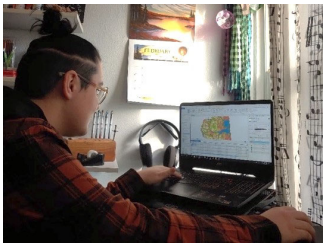
The purpose of this study is to utilize hands-on experience and a series of interviews to assess the positive impacts of forest restoration on a community in West Baltimore that has historically suffered the negative effects of stormwater. The study focuses on the 10-acre plot of land behind the West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

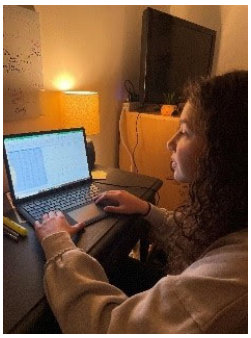


By collecting data and create updated graphs and charts, this study works to make updates to the 2016 State of the Bays Report. Based on the findings yielded from the latest available data, a decision will be made regarding which available data (collected from the National Oceanic and Atmospheric Administration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

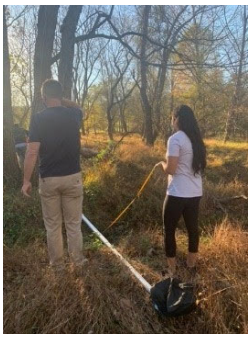
The white rot fungi (WRF) Pleurotus ostreatus grown in small bench-scale bioreactors was able to reduce the number of E. coli naturally present in aqueous dairy manure. Currently, bioreactors containing both P. chrysosporium and P. ostreatus are being evaluated for their ability to degrade E. coli and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