

**RHODE ISLAND
WATER RESOURCE
CENTER
2021-2022**

RIWRC supported **four** research projects, **three** outreach and professional development activities.



**TOTAL RESEARCH
EXPENDITURES**

2021-2022

\$250,000

Six

Graduate students
SUPPORTED

**OVERALL RESEARCH
EXPENDITURES**

2012-2022

\$2.1M

The RIWRC supports water resources technology, management, education, and communications innovation in Rhode Island.

Projects Supported by the Rhode Island Water Resource Center 2021-2022

A Geospatial Risk Model for Assessing Threats to Rhode Island Water Resources

Dr. Ali Shafqat Akanda, Graduate Student Farah Nusrat Civil and Environmental Engineering

The water quantity and quality information available to environmental stakeholders throughout Rhode Island is minimal and based on only a few point measurements across the state. There is a critical need for a high-resolution understanding of the state's water resources threats and their larger scale hydroclimatic and anthropogenic determinants. In this study, we are developing a high-resolution geospatial model to assess the state's water resources threats from climatic changes and extremes. Our goal is to achieve a quantitative understanding of these relationships and a detailed mapping of the state's water resources and associated risks at high resolutions.

Systematic Assessment of Plastic Waste in the Freshwater Systems of Rhode Island

Dr. Andrew Davies, Dr. Coleen Suckling, Graduate Student Sarah Davis.

This summer, our project goal is to establish a baseline assessment of the levels of plastic debris within nine of the major freshwater resources in Rhode Island, including studies along the Blackstone River and storm-water ponds in Roger Williams Park. Additionally, we have developed a novel gridded slide system for imaging and characterizing extremely small particles on filter papers after processing, creating a coordinate-based approach to record the locations of particles on the slide as they are imaged, measured, and tested for polymer type using Raman spectroscopy. In addition to finalizing field and laboratory methods, we are preparing to engage volunteers from the URI Watershed Watch program in our sampling efforts. The Watershed Watch program, led by Program Director Elizabeth Herron, promotes active community participation in water quality protection and educates the public about issues.



Ph.D. student Sarah Davis, who studies Biological and Environmental Sciences with a focus on microplastics in the environment. In this photo you can also see the pump-filter system in-use, testing microplastic particle recovery methods.

Seasonal and Surface Dynamics of PFAS In Westerly, Rhode Island

Dr. Rainer Lohmann, Graduate Student Matt Dunn, Graduate School of Oceanography.



PhD Candidate Matt Dunn deploys passive samplers using a cinder block at the Bradford Boat Launch in Westerly, RI

This research aims to use a novel detection tool for per- and polyfluorinated alkyl substances (PFAS) to monitor seasonal and surface dynamics in an urban river and estuary. 11 months of field sampling has been completed along the Pawcatuck River. Nine field sites stretch from the river's head at Worden's Pond to the saline and tidal portion of the river just before Watch Hill, Westerly. A novel passive sampler has been used in sequential month-long deployments to provide time-weighted average concentrations of PFAS across seasonal and tidal trends in this urban river and estuary. Additionally, two waste lagoons associated with historical textile mills along the river have been sampled to quantify their point source contamination to downstream sites. All samples are in the process of being extracted and analyzed. In addition to analyzing all collected samples, the suspect screening will

be done to better characterize the PFAS contamination's scope along the river. Currently, it is expected that legacy PFAS compounds associated with textile processes are the dominant compounds of concern.

Water Use and Availability on Block Island, RI

Dr. Thomas Boving, Graduate Student Jeeban Panthi, Graduate Student Isabella Giacomo, Geosciences.

This research project focuses on forecasting the water demand on Block Island (BI) by considering projected demographic and societal changes that may affect the island's water use in the foreseeable future. It consisted of a compilation of historical monthly withdrawals by the BI Water Company (BIWC) and other public water supply systems reporting. Further, we estimate wastewater collection and return flows and assess unaccounted water use/losses based on BIWC data. We are measuring water table elevations at BIWC wells and private wells in the vicinity of the water plant. Additionally, we have conducted the first of two geoelectric field surveys in the northern part of BI. The geophysical data from these surveys will inform us about the extent and possible seasonal variations of the freshwater/saltwater interface in this part of the island. Finally, we have obtained drill logs and other hydrogeologic information that will aid in estimating the island's water budget and projecting water availability under future development scenarios.



Graduate students Mrs. Isabella Giacomo and Mr. Jeeban Panthi are discussing water level data with BI resident and project volunteer Mrs. Valerie Preler

Outreach Project

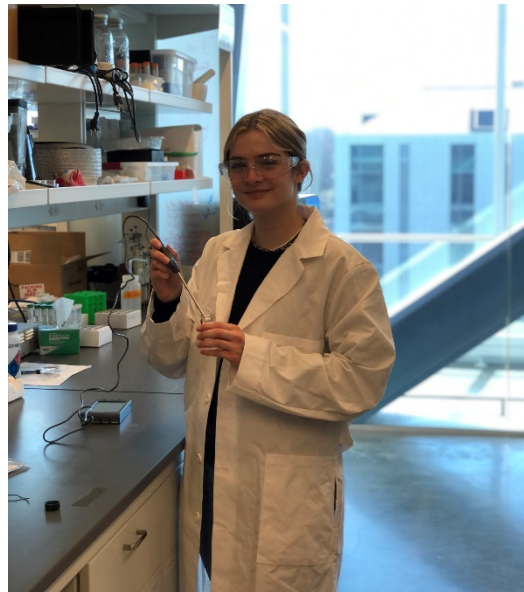
Dr Vinka Oyanedel Craver, Undergraduate Student Eva Davet. Civil and Environmental Engineering.

In collaboration with the GEMS-Net, the Rhode Island water Resource Center developed an outreach project for middle and high school teachers from all over Rhode Island. RIWRC participated in a breakout session with seven high school teachers and taught them how to use several handheld water sensors, such as pH and salinity sensors. The objective of this activity was to introduce the teachers to available capabilities to have a fun lab activity in their respective classrooms. The teachers were also able to learn about the research work at the Water for The World Laboratory at URI. At the end of the session, the teachers tour the Engineering Analytical Facility and the Engineering Imaging Facility. Below are some of the comments given by the teachers at the end of the activity:

"Vinka and the students were informative and able to pose things in a way that made us have to think, work and reflect upon our results."

"We needed more time! The presenters were perfect."

"I liked seeing the science equipment in the breakout session about water."



In this photo BS Civil Engineering student Eva Davet test one of the water sensors in the Water for the World laboratory.

RI Water Resource Virtual Forum 2021

Dr Vinka Oyanedel Craver, Civil and Environmental Engineering

The virtual forum happened on September 13th, 2021. This meeting aimed to allow the academic community in Rhode Island to meet with people from the RI governmental agencies to discuss and understand what type of water research and focus the state of Rhode Island needs. Representatives from USGS New England Water Science Center, Rhode Island Water Resource Board, Rhode Island Department of Administration Division of Statewide Planning, Rhode Island Department of Environmental, and the Center for Drinking Water Quality Rhode Island Department of Health discussed challenges and research opportunities related with water resources in Rhode Island. The forum was recorded and is available on the Rhode Island Water Resource Center website.

URI Engineering Analytical Core

*Dr Vinka Oyanedel Craver, Civil and Environmental Engineering. Graduate Student
Tania Oliveira, Chemical Engineering*

The RIWRC also supports a graduate student to work half time for the RIWRC and half time for the Engineering Analytical Core. The student helped coordinate activities in the facility and planning training sessions for new and advanced users, ordered supplies, booked calendar and hours management, and did instrument troubleshooting. Please find below a comment given by Tania Oliveira regarding the Engineering Analytical Core role:

“I was exposed to several analytical techniques, and I was able to learn a little about each one of them. It has been a challenging and gratifying learning period.”

Products

- Akanda, A. S., Wagner, F., Siemon, L., Nusrat, F., & Thiem, L. Leveraging Earth Observations to Monitor and Understand Linkages between Urbanization, Climate Extremes, Heat Islands and Air Quality Indices in Emerging Megacities. In *AGU Fall Meeting Abstracts* (Vol. 2019, pp. GH21B-1209).
- Wagner, F., Nusrat, F., Thiem, L. and Akanda, A.S., An Earth Observations based nexus approach to evaluate the water-energy interactions and human vulnerability in urban regions. *ASCE Journal of Water Resources Planning Management*, In Progress.
- S. Daer, J.E. Goodwill, K. Ikuma. “Effect of ferrate and monochloramine disinfection on the physiological and transcriptomic response of *Escherichia coli* at late stationary phase” *Water Research*, Volume 189, 2021
- Franco, P., Spellman, C., Addison, E., and Goodwill, J., “Measuring and Managing Trihalomethanes with Novel Gas Chromatography and Aeration Approaches” 2021 UCOWR/NIWR Annual Water Resources Conference.
- E. L. Addison, K. T. Gerlach, C. D. Spellman, G. Santilli, A. R. Fairbrother, Z. Shepard, J. D. Dudley, J. E. Goodwill, Physicochemical implications of cyanobacteria oxidation with Fe(VI), *Chemosphere*, Volume 266, 2021.
- Young, K.S.R.; Pradhanang, S.M. “Small Unmanned Aircraft (sUAS)-Deployed Thermal Infrared (TIR) Imaging for Environmental Surveys with Implications in Submarine Groundwater Discharge (SGD): Methods, Challenges, and Novel Opportunities”. *Remote Sens.* 2021, 13, 1331.
- Thompson, E., Cretella, K., Shepard, Z., Oyanedel-Craver, V., “Isolation of Manganese Oxide Nanoparticle Producing Bacteria from Drinking Water”, American Chemical Society: Division of Environmental Chemistry, April 2021. (Poster, delivered virtually)
- Cretella, K., Thompson, E., Shepard, Z., Oyanedel-Craver, V., “Analysis of Metals in Southern Rhode Island Drinking Water Distribution System”, American Chemical Society: Division of Environmental Chemistry, April 2021. (Poster, delivered virtually)