

Collaborative Research Projects

One of the primary goals of the Freshwater Collaborative of Wisconsin is to encourage collaborative research among UW System students and faculty and external partners. If you would like to participate in a Collaborative Research working group, please email us at freshwater-collab@uwm.edu.

A Community Science Analysis of River Mouths Along the Western Lake Michigan Shoreline

Institution: UW-Green Bay

Principal Investigators: Erin Giese, Robert Howe, Keir Wefferling

This project leverages an existing collaboration between the Milwaukee Public Museum and the Cofrin Center for Biodiversity to engage community scientists in data collection. An undergraduate researcher was paired with mentors who specialize in ornithology and ecology and is engaging campus communities at UW-Green Bay and UW-Milwaukee in collecting rigorous scientific data that will be used to provide recommendations for best land management practices of coastal habitats, including Great Lakes beaches and river mouths.

Collaborating to Protect and Monitor Streams in an Agricultural Landscape

Institution: UW-Platteville

Principal Investigator: Kristopher Wright

Achieving a better understanding of Wisconsin's water resources is essential for their long-term sustainability. However, for an individual agency or entity, limited personnel and resources can compromise this understanding. This project is a cooperative effort among UW-Platteville faculty and undergraduate students, the Harry and Laura Nohr Chapter of Trout Unlimited and Wisconsin Department of Natural Resources to monitor and assist management of stream communities and habitats in agriculture-based watersheds of southwest Wisconsin.

Collaborative Planning for Water Research at the Mann Valley Farm

Institution: UW-River Falls

Principal Investigator: Jill Coleman-Wasik

The project is designing an outdoor, multidisciplinary teaching and research space for studying agricultural water management issues in western Wisconsin. Faculty will design research infrastructure for the UW-River Falls campus farm that is adaptable to changing needs and emerging issues. This living laboratory will offer students state-of-the-science training opportunities in agricultural water monitoring and management. It will also allow the university to host collaborative programming, research and outreach with other UW campuses, regional industries and local stakeholders.

Collaborative Research on Synthesis of Graphene Oxide from Sustainable Resources and Its Application for Removal of Per- and Polyfluoroalkyl Substances (PFAS) from Water

Institutions: UW-Stevens Point, UW-Madison

Principal Investigators: Seyed Javad Amirfakhri, UW-Stevens Point; Xuejeun Pan, UW-Madison

PFAS is a group of chemicals detected in the drinking water of millions of Americans due to their widespread applications. They have been linked to several health concerns. The main objective of this work is to synthesize graphene oxide (GO) from sustainable resources, such as walnut shells, and to investigate the performance of GO for PFAS removal from water. Several students from UW-Stevens Point and UW-Madison will be trained to perform the research. Moreover, they will participate in disseminating the results, collaborating with industrial partners, engaging our community with STEM education, and increasing public scientific literacy on PFAS contamination.

Continuation and Expansion of the Red Cedar Watershed Monitoring Project

Institutions: UW-Stout, UW-Eau Claire, UW Oshkosh, UW-River Falls

Principal Investigators: Keith Gilland, Nicole Hayes, Julia Chapman, Amanda Little (UW-Stout)

Collaborators: Sarah Vitale, UW-Eau Claire; Jill Coleman-Wasik, UW-River Falls; Greg Kleinheinz, UW Oshkosh; Chase Cummings, Dunn County Land and Water Conservation District

The Red Cedar Watershed experiences frequent blue-green algae blooms due to phosphorus pollution. Numerous projects have been implemented to reduce runoff and restore stream channels and buffer areas. This project continues to examine the effectiveness of those projects while expanding research efforts to include whole-ecosystem and watershed processes to determine the root causes of the toxic algal blooms regularly seen in lakes in the region. Students from UW-Stout, UW-River Falls, UW-Eau Claire, and UW Oshkosh will work during the summer to survey streams, riparian corridors, and wetlands while also monitoring Lakes Tainter and Menomin to help guide management decisions regarding the Red Cedar Watershed to serve as a model for other similarly impacted watersheds throughout the region.

Continuing the Work of the Data Analysis and Monitoring Crew

Institutions: UW-River Falls

Principal Investigator: Jill Coleman-Wasik

The Data Analysis and Monitoring Crew (or DAM Crew) is a two-week, hands-on, field-based training experience for UW students who are interested in river health and restoration. Participants work directly with practicing environmental professionals to attain the skills to implement a monitoring plan to assess ecological and geomorphological changes in a riverway that result from dam removal. The DAM Crew is a public-private partnership among UW-River Falls, the City of River Falls, Interfluve Inc., the Kinni Corridor Collaborative, and Trout Unlimited. Participants gain in-demand technical skills, increase their professional network, and serve the River Falls community.

The Cost of Cleanwater: An Efficiency Analysis of Wisconsin's Water Utilities

Institutions: UW-Whitewater

Principal Investigator: Russell Kashian

Students will conduct research through the Institute for Water Business on the efficiency of water utilities and will leverage previous research to identify how costs incurred by water districts in cleaning water leads to inefficiency and increased prices. This research seeks to identify the cost of remediation to provide

regulators the information necessary to make informed determinations regarding contaminant assessments. Results will be available in a public report and submitted for peer reviewed publication.

Data Collection and Parameter Estimation for a Dry Bean Yield Response to Irrigation Model

Institutions: UW-Stout

Principal Investigator: Keith Wojciechowski

The goal of this project is to help growers manage water resources and potentially increase yield. The research team at UW-Stout will construct automated weather stations and place them in fields containing crops. These stations will collect a variety of weather-related and plant-related data. UW-Stout's team will analyze this data to help inform the agronomy team at corporate partner, Chippewa Valley Bean, so they can better advise their growers. Students working on this project will help construct weather stations and analyze data, helping them to develop a nascent expertise in precision agriculture.

Deposition and Removal of Emerging Contaminants in the Milwaukee Estuary Area of Concern

Institutions: UW-Madison, UW-Milwaukee

Principal Investigators: Inna Popova, UW-Madison; Laodong Guo, UW-Milwaukee

The Greater Milwaukee Estuary faces pollution from emerging contaminants, such as PFAS and pharmaceuticals, posing risks to both the environment and public health. These contaminants are removed from the water through natural processes and accumulate in sediment, where they can persist for long periods, threatening organisms and humans who encounter them. The pollution history of these contaminants in the estuary remains poorly understood. This collaborative research project involves the analysis of sediment cores to study the contaminants' history and behavior. The findings will aid in managing and remediating aquatic contaminations.

Development of a Collaborative Undergraduate Research Experience to Improve Per- and Polyfluoroalkyl (PFAS) Adsorption in Nanoporous Solids

Institutions: UW-Stevens Point, UW-Milwaukee

Principal Investigators: Joseph Mondloch, UW-Stevens Point; Yin Wang, Shangping Xu, UW-Milwaukee

Per- and polyfluoroalkyl substances (aka PFAS) are emerging contaminants in Wisconsin's waterways. This project provides funding to develop a collaborative undergraduate research experience between UW-Stevens Point and UW-Milwaukee to develop new PFAS adsorption technology. Researchers will test our technology against PFAS contaminated waters including real-world samples from Wisconsin's waterways. Hands-on experience using start-of-the-art instrumentation will prepare students to enter the workforce with experience in PFAS chemistry, analysis, and treatment.

Economic Impacts of Wisconsin Fishing Supported by the Freshwater Resources of Lake Michigan and Bay of Green Bay

Institutions: UW-Green Bay, UW-Whitewater

Principal Investigator: Matthew Winden, UW-Whitewater

Student and faculty researchers seek to quantify the total economic value of the freshwater fishery resources of Lake Michigan and Bay of Green Bay to the state of Wisconsin. They will also analyze how different fishery management strategies and climate change scenarios may affect the quality, and therefore economic value, of these resources. Changes in quality and economic value in turn affect the health of regional economies and welfare of residents and visitors. Ultimately, this information helps inform resource managers about the most efficient and effective strategies available to maximize the value of this resource now and in the future.

Engaging Undergraduate Students in Cutting-Edge Research on the Use of Earth Materials for the Removal of Contaminants including Per- and Polyfluorinated Substances (PFAS)

Institutions: UW-Parkside, UW-Milwaukee

Principal Investigators: Zhaohui Li, Lori Allen, UW-Parkside; Shangping Xu, Yin Wang, UW-Milwaukee

Per- and polyfluoroalkyl substances (PFAS) are forever chemicals, indicating that they stay in water and the environment permanently. UW-Parkside and UW-Milwaukee will engage 10 undergraduate students per year to conduct cutting-edge research for PFAS and color dyes removal from water. In addition, they will conduct PFAS analyses using state-of-the-art instruments for water samples collected from local drainage and Lake Michigan. The results will help southeastern Wisconsin to develop strategies to remove emerging contaminants from water and to help protect the region from PFAS contamination.

Evaluation of Downstream Juvenile Lake Sturgeon Passage Through Two Dams on the Menominee River

Institution: UW-Green Bay

Principal Investigator: Patrick S. Forsythe

Lake Sturgeon passage has been embraced as a restoration prescription in the Great Lakes. This project will evaluate the effectiveness of downstream juvenile passage on the Menominee River and through the Park Mill and Menominee Dams. Faculty and student researchers will evaluate the movement of tagged age-0 lake sturgeon to better understand habitat use, downstream passage and survival. Data will influence future fish passage operation at the Menominee facility and others around the Great Lakes and build justification for restoring spawning habitats in upstream areas where passage is discussed.

Freshwater@UW: An Immersive Undergraduate Summer Research Opportunities Program for the University of Wisconsin System

Institutions: UW-Madison

Principal Investigator: Alison Mikulyuk

The Freshwater@UW Summer Research Opportunities Program provides immersive, hands-on mentored research experiences to 27 promising undergraduates within the 13 member institutions of the Freshwater Collaborative. The program's central aim is to support the growth of our freshwater research enterprise and freshwater workforce through collaborative, cross-system programming designed to train,



recruit, retain and diversify the next generation of freshwater professionals. The program strives to create new, high-impact opportunities for talented students to build their skill and cultivate relationships within the UW System to that will help them seek further training in freshwater science.

Lead, facilitate, and support policy research for the UW Water Policy Network

Institutions: UW-Milwaukee

Principal Investigator: Melissa Scanlan

The Center for Water Policy leads, facilitates and supports the UW Water Policy Network, which serves as a hub for government agencies, private sector, NGOs, media and other stakeholders to identify water policy collaborators and experts. This project fosters collaboration on water policy research and curriculum across UW System by strengthening relationships among multidisciplinary faculty, researchers and students working on freshwater policy. The center convenes the UW Water Policy Network for presentations and discussions around key policy issues identified in the Freshwater Collaborative of Wisconsin's 10 Grand Water Challenges.

Micro- and Nanoplastics as Vectors for the Transport of Organic Contaminants in Freshwater Environments: Influence of Natural Organic Matter and Plastic Weathering

Institutions: UW-Madison, UW-Milwaukee

Principal Investigators: Joel Pedersen, UW-Madison; Laodong Guo, UW-Milwaukee

Microplastics have been widely documented in fish, air and natural waters, and have been found in drinking water, sewage, soil and sediment. Nanoplastics have been shown to be even more toxic to organisms and could serve as vectors for transporting emerging contaminants and other organic pollutants into freshwater ecosystems. Researchers examined the interactions between these toxic plastics and selected organic contaminants to determine how natural organic matter affects how they break down in freshwater environments. This project has produced baseline data for a grant from the National Science Foundation.

Microplastics – A Multidisciplinary Approach to Understanding Sources, Transport, Adsorption of POPs, and Fate in St. Louis River Estuary and Western Lake Superior

Institutions: UW-Eau Claire, UW-Madison, UW-Superior

Principal Investigators: Todd Wellnitz, Dustin Haines, UW-Eau Claire; Nimish Pujara, UW-Madison; Lorena Rios Mendoza, UW-Superior

Microplastic are an emerging aquatic pollutant. Faculty and students examined microplastics in the environment and in digestive tracks of aquatic organisms living in western Lake Superior and the St. Louis River Estuary to gain a clearer picture of the potential harm these particles can cause to the local water quality, food webs and human populations. Undergraduates from UW-Eau Claire will also collaborate with area high school teachers to develop a lesson plan about microplastics, and undergraduates from all three institutions will collaborate with staff from Duluth's Great Lakes Aquarium to create an interactive exhibit to teach the public about microplastics in the St. Louis River Estuary and Lake Superior.

Microplastics in the Lake Winnebago and Upper Mississippi River Systems and the Implications for Food Webs and Water Treatment Infrastructure

Institutions: UW-La Crosse, UW Oshkosh

Principal Investigators: Eric Strauss, UW-La Crosse; Robert Stelzer, Greg Kleinheinz, UW Oshkosh

Microplastic contamination poses a water-quality safety issue and is an emerging contaminant of importance for many stakeholders in Wisconsin. Researchers are collaborating with the Wisconsin Department of Natural Resources and the Upper Mississippi River Restoration Long Term Resource Monitoring Group to determine the quantity and types of microplastics in the Lake Winnebago System and the Upper Mississippi River. Results will inform advanced research that will help identify how environmentally realistic concentrations of microplastics impact freshwater food webs, human health, and water treatment infrastructure.

Mitigating Eutrophication Events: Understanding Controls on Phosphorus Contamination in Surface Water and Groundwater in Western Wisconsin

Institutions: UW-Eau Claire, UW-River Falls

Principal Investigators: Sarah Vitale, UW-Eau Claire; Holly Dolliver, UW-River Falls

Phosphorus loading in Wisconsin is responsible for significant lake eutrophication, causing a loss of recreational tourism, reducing commercial fisheries, and decreasing biodiversity. UW faculty and undergraduate students are collaborating with the USGS Upper Midwest Water Science Center to investigate phosphorus migration in the hydrologic system and the potential impact of nutrient-loading through groundwater discharge on lake eutrophication. Findings may better inform sustainable management of lakes. Interested stakeholders include regulatory agencies, scientific organizations, environmental groups, the agricultural and silica sand mining industries, and communities across the state of Wisconsin and the upper Midwest impacted by phosphorus-driven eutrophication.

Mitigating PFAS Contamination of Groundwater: Biochar Sequestration of PFAS in Biosolid Leachate at the Field Scale

Institutions: UW-Green Bay, UW-Milwaukee

Principal Investigators: Kpoti Gunn, Michael Holly, UW-Green Bay; Yin Wang, UW-Milwaukee

Sewage sludge or biosolids generated in Wisconsin are largely applied to agricultural lands. Through this practice, biosolids may be the most diffuse source PFAS contamination of groundwater resources. This project aims to evaluate onsite the PFAS immobilization performance of activated biochar incorporated in soils receiving biosolids, and to develop methods for PFAS analysis of soil and groundwater leachate. Students involved in the project will contribute to experimental setup, soil and water sampling; laboratory and data analysis; and results publication.

Pilot Project: Development of an In Vivo Method to Assess the Innate Immune Response in Fathead minnow Larvae

Institutions: UW-La Crosse, UW-Madison

Principal Investigators: Tisha King-Heiden, UW-La Crosse; Gavin Dehnert, UW-Madison

Students will work with faculty from UW-La Crosse and UW-Madison to develop a new bioassay to study the immune response of wild fish. As part of their training, they will job shadow at the Wisconsin State Lab of Hygiene to gain a deeper understanding of how bioassays are used in the field of environmental toxicology. They will meet with experts from the Wisconsin Department of Health to see how data from

these bioassays can be used to inform water quality standards. Finally, they will network at science conferences to learn about job opportunities in the field of environmental toxicology.

Quantifying the Impact of Spatial and Temporal Variation in Hyporheic Zone Fluxes on Phosphorus Transport and Release in Wisconsin Streams and Rivers

Institutions: UW-Green Bay, UW-Madison

Principal Investigators: Erin Berns-Herrboldt, UW-Green Bay; Christopher Zahasky, UW-Madison

Riverbed sediments can be an important source of phosphorus to Wisconsin waterways, driving eutrophication and negatively impacting aquatic health, human health, and local economies. There is limited understanding of how groundwater–surface water exchange impacts river sediment phosphorus storage. Students will characterize phosphorus and subsurface hydrology in stream sediments at two sites in central Wisconsin and conduct batch and column experiments on sediment samples to evaluate which biogeochemical conditions promote storage and release of phosphorus. Project findings are anticipated to inform land, nutrient, and water management decisions.

UW Oshkosh Comprehensive Freshwater Collaborative of Wisconsin Training, Community Engagement, Business Enterprise, Research, and Recruitment Program

Institutions: UW Oshkosh, UW-Eau Claire, UW-Stout

Principal Investigator: Greg Kleinheinz, UW Oshkosh

UW Oshkosh offers student training opportunities at the Environmental Research and Innovation Center (ERIC), a state-certified laboratory for many water testing parameters as well as a contract R&D laboratory for various community and industry projects. The partnership with the Freshwater Collaborative allows students from any UW campus opportunities to work at ERIC field research sites or take a field course each summer, which embeds students in communities to study surface, well and groundwater. It also provides resources for faculty-student research and student-industry projects. UW Oshkosh offers access to a research and teaching boat on the Lake Winnebago system at no charge to Freshwater Collaborative partners.

Water, Health, and Habitat Interactions: Building Capacity for Water Careers and Education

Institutions: UW-Milwaukee, UW-Green Bay, UW-La Crosse, UW-Parkside, UW-River Falls, UW-Whitewater

Principal Investigator: Tracy Boyer, UW-Milwaukee

Collaborators: Chris Houghton, UW-Green Bay; Tisha King-Heiden, UW-La Crosse; Julie Kinzleman, UW-Parkside; Kevin Thaisen, UW-River Falls; Elisabeth Harrahy, UW-Whitewater

UW-Milwaukee is leading a collaboration with five UW campuses to implement three intensive hands-on courses that were developed specifically for the Freshwater Collaborative. These summer courses will provide undergraduate students throughout UW System with an affordable opportunity to conduct research and field work on Lake Michigan. These courses also create a nucleus of classes for future planned freshwater certificate offerings. This project will also expand a UWM field course, based on feedback from industry partners, to make it more accessible to students on other campuses or those working full time. Faculty will also build an intensive series of specialized aquaculture courses that complement workforce development efforts. In addition, UWM will host a daylong field work experience aboard the R/V Neeskey for undergraduates participating in the Freshwater@UW Summer Scholars Program.