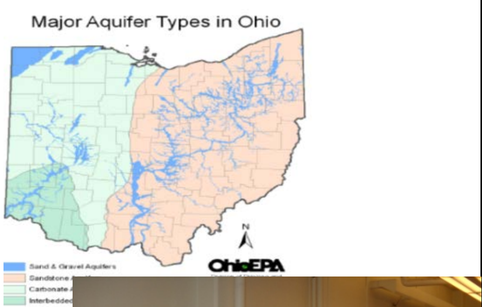
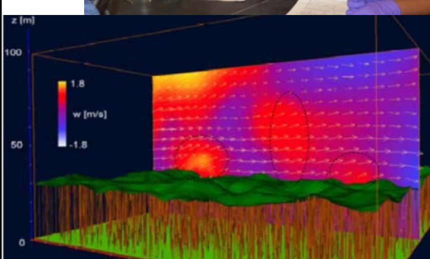
STATE of OHIO
WATER RESOURCES CENTER

MISSION
The WRC promotes innovative, water-related research in the State of Ohio through research grant competitions, coordination of interdisciplinary research proposals, and educational outreach activities.





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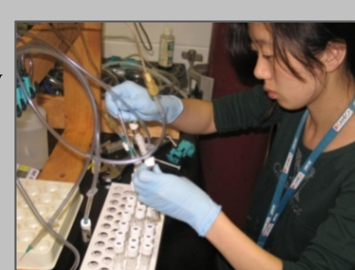
ABOUT US
Pursuant to the Water Resources Research Act of 1964, the Water Resources Center (WRC) is the federally-authorized and state-designated Water Resources Research Institute (WRRI) for the State of Ohio. The WRC was originally established in 1959 as part of the Engineering Experiment Station, College of Engineering, OSU, and conducted an extensive program of research on water and wastewater treatment processes. The Center continues to be administered through the College of Engineering and has maintained a tradition of placing special emphasis on encouraging and supporting research in the area of physical, chemical, and biological treatment processes for water and wastewater.

2010-2012 RESEARCH PROJECTS
- Development of Carbon Nanotube-based Biosensor for Monitoring Microcystin-LR in water
  - Dionysiou, D. Dionysios, University of Cincinnati
- High-performance porous polybenzimidazole membranes for water treatment using forward osmosis
  - Isabel Escobar, University of Toledo
- Generating renewable energy on Lake Erie with wave energy converters: a feasibility study
  - Ethan Kubatko, The Ohio State University
- Does alum addition affect benthic communities and metal and nutrient cycling? A case study from Grand Lake St. Marys, Ohio
  - Chad Hammerschmidt, Wright State University
- The constructed wetland dilemma: nitrogen removal at the expense of methane generation?
  - Paula Mouser, The Ohio State University
- Microbial modulation of acidic coal mine drainage chemistry: Implications for passive treatment of minewater
  - John Senko, University of Akron
- Identification of microcystin degradation bacteria in the Grand Lake St. Marys and Lake Erie western basin
  - Xiaozhen Mou, Kent State University
- Green-house-gas budget of constructed wetlands: Understanding the source to maximize benefits
  - Gil Bohrer, The Ohio State University
- Discriminating biotic and abiotic arsenic release process under highly reduced ground water conditions
  - John Lenhart, The Ohio State University
- An integrated Framework for response actions for a drinking water distribution security network
  - Dominic Boccelli, University of Cincinnati

OUTREACH
- Water Management Association of Ohio (WMAO) Luncheon Seminars for Water Professionals
- Women in Engineering GROW Summer Camp
- Part of Advisory committee of Subsurface Energy Resources Center
- Organizing committee for the Ohio River Basin Consortium for Research and Education (ORBCRE) annual meeting to take place in July, 2012



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RECENTLY FUNDED PROJECTS, JUSTIFICATION:

"A description of the level of research and the results of the activities authorized by the Water Resources Research Act"

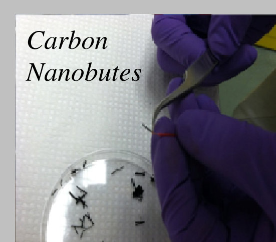
1. Does alum addition affect benthic communities and metal and nutrient cycling? A case study from Grand Lake St. Marys, Ohio

- **PI:** Chad Hammerschmidt; Wright State University
- **Justification:** Excessive nutrient loadings to water bodies can result in eutrophication, a process in which plankton grow and decompose, depleting dissolved oxygen, and, in the case of Grand Lake St. Marys (GLSM), produce toxins, degrading the ecological function of the lake and impact human. Aluminum sulfate (alum) was added to a large portion of GLSM by the Ohio EPA as a short-term treatment to decrease phosphorous levels and combat the harmful algal blooms in June 2011. However, the ecological effects of alum treatment on benthic microbial and invertebrate communities are still poorly understood. By field and laboratory studies, Dr. Hammerschmidt and his group are investigating whether alum additions to GLSM sediment have any short-term adverse effects on benthic animal communities as well as trace metal and nutrient cycles.

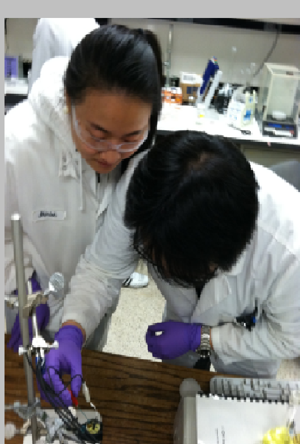
Sediment core sampling

2.The constructed wetland dilemma: nitrogen removal at the expense of methane generation?

- **PI:** Paula J. Mouser; The Ohio State University
- **Justification:** Wetlands provide a valuable ecosystem service by removing a green house gas, carbon dioxide, from the atmosphere. They also filter agriculturally-derived nitrogen that contribute to pollution and "blue baby syndrome" from water bodies. Constructed wetlands are traditionally employed as a renewable, environmentally-friendly technology for improving water quality. However, methane, another more potent green house gas can be produce from wetland and contribute to global warming. At the Ohio State University (OSU), Professors Dr. Paula Mouser and Dr. Gil Bohrer are assessing the net benefit of constructed wetlands by quantifying, at the microbial level, the removal of nitrogen relative to the production of methane by indigenous microorganisms. This research involves laboratory experiments and field measurements of gas flux for differing wetland habitats within OSU's Olentangy River Wetland Research Center. This research is important for understanding the factors that control methane production in constructed wetlands without concerns of green house gas production as it relates to nitrogen removal in Ohio's surface water bodies.



Carbon Nanobutes



3. Development of Carbon Nanotube-based Biosensor for Monitoring Microcystin-LR (MC-LR) in water

- **PI:** Dionysios Dionysiou; University of Cincinnati
- **Justification:** The formation of harmful algal blooms (HABs), especially cyanobacteria (a.k.a., blue-green algae), due to eutrophication of surface water, results in the production of natural toxins (cyanobacteria toxins) that threaten human and environmental health. Extensive research has been carried out and tremendous resources are spent on the monitoring and removal of anthropogenic pollutants from ground and drinking water, but relatively little attention has been given to rapid monitoring and quantification of cyanotoxins in surface waters experiencing algal blooms. There is an urgent need to develop innovative monitoring technologies for cyanotoxins in sources of drinking water supply. Our study provides a fundamental understanding of the development of novel sensors for the selective identification and quantification of MC-LR and other target Microcystins. Such investigations are critical for the development of cost-efficient technologies to detect water contaminated with MC-LR and other cyanotoxins.