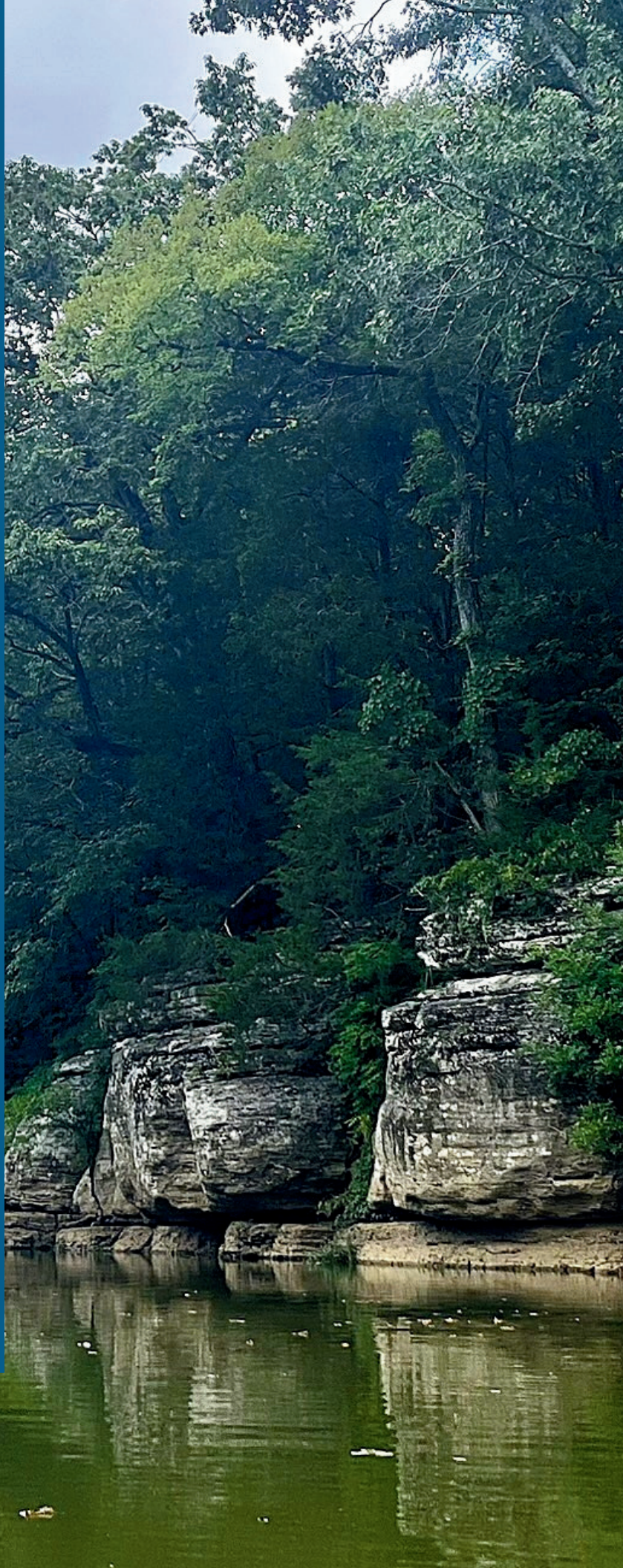
2025-2026

ANNUAL REPORT

Center for the Management, Utilization & Protection of Water Resources at Tennessee Tech University



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Letter to Stakeholders

Dear Colleagues, Partners, and Friends,

Over the past year, the Water Center has continued to address Tennessee's most pressing water resource challenges in water quality, biodiversity, and water management. Through collaborative research, technical assistance, environmental monitoring, and workforce development, we have worked to provide science-based solutions that support healthy aquatic ecosystems, sustainable communities, and informed decision-making across the state and beyond.

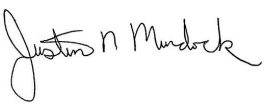
Our success is only made possible through strong partnerships with many local, state, and federal agencies; academic institutions; non-governmental organizations; industry partners; and community stakeholders. During this last year, Center faculty have worked on a diverse list of projects including developing a statewide database and dashboard for surface water nutrient concentrations; researching the distribution and habitat requirements of threatened and endangered fish and freshwater mussels, as well as invasive species such as bigheaded carp; tracking waterfowl movement across the continent, optimizing wastewater plant treatment efficiency, modeling floods hazards, and improving wetland restoration designs. These efforts reflect the Water Center's commitment to translating scientific knowledge into practical outcomes that benefit both communities and the environment. These efforts from Water Center affiliated researchers have also resulted in the largest amount of external funding awarded to the Center since it's inception in 1984, showing an increasing return on investment for state support.

A key component of our mission is preparing the next generation of water resource professionals. During the past year, the Center supported 52 graduate and 47 undergraduate students who gained valuable hands-on experience through research projects, laboratory and field investigations, and professional development opportunities. Their dedication and achievements continue to demonstrate the important role that experiential learning plays in developing future leaders in environmental science and water resources management.

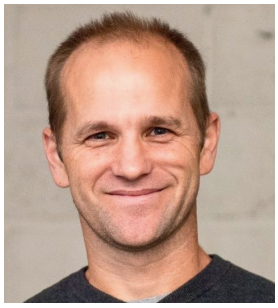
As we look ahead, we remain committed to fostering innovation, building partnerships, and addressing critical water resource needs throughout Tennessee and the southeastern United States. We will continue to support impactful research, provide technical expertise to our partners, and create opportunities for education and workforce development that advance the stewardship of our water resources.

Thank you for your continued support of the Tennessee Tech Water Center. We invite you to explore this report and learn more about the projects, people, and partnerships that made this year's accomplishments possible.
Sincerely,

Justin Murdock,



Director
Center for the Management, Utilization, and Protection of Water Resources
Professor, Department of Biology
Tennessee Tech University



- Dr. Justin Murdock
Director of the Water Center
and Professor of Biology

$4.4M
EXTERNAL GRANTS

9
OUTREACH EVENTS

$131K
COMMERCIAL LAB REVENUE

52 Graduate **47** Undergradute
STUDENTS SUPPORTED

$1.4M
STATE APPROPRIATION

Over 100
PROFESSIONAL PRESENTATIONS

$3.24
RETURN PER STATE DOLLAR

More than 40
PUBLICATIONS

Check out all of the faculty research and expertise here.

View the list of publications and presentations here.

See the list of activations here.

Center Vision & Mission

OUR MISSION

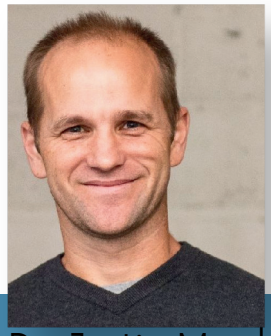
The Water Center advances water science and engineering through basic and applied research, supports faculty research and the training and mentoring of future water professionals, and serves Tennessee by partnering with state and federal agencies, communities, and industry to address water quality, biodiversity, and water security challenges.

OUR VISION

We seek to create secure water resources, healthy aquatic ecosystems, and resilient communities in Tennessee and beyond.



Our Team



Dr. Justin Murdock
Director



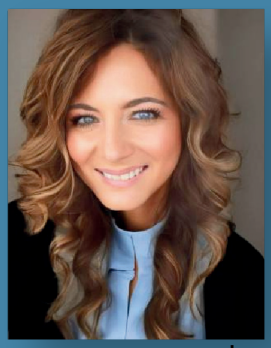
Dr. Tania Datta
Professor



Dr. Alfred Kalyanapu
Professor



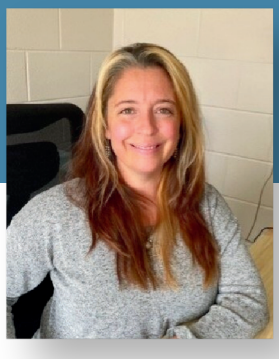
Michelle Holm
Office Manager



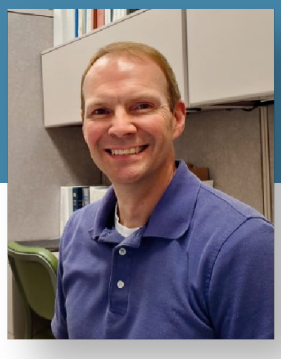
Karin Kopinski-Glibert, MPS
Specialist



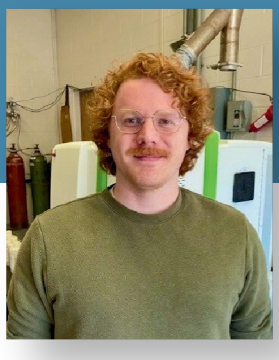
Sandy Dodson
Administrative Associate



Dr. Grace Tinker
Research Lab Manager



Phillip Burr
Commercial Lab Manager



Alex O'Neal
Analytic Chemist

Associate Researchers
- Dr. Jingjing Li
- Dr. Robert Paine

Technicians
- Vic Angros
- Elizabeth Cureton
- Andy Rosson
- Ted Sanderson

Graduate students
- Tom Miles
- Zoe Porter
- Sam Satterfield

Undergraduate Students
- Macey Warren
- Zach Hall
- Kaitlyn Landrem
- Mason Nelson

Tennessee Impact



TENNESSEE NUTRIENT SUMMIT

Tennessee's rivers, lakes, and streams face increasing pressures from excessive nutrient inputs that promote the growth of algae, cyanobacteria, and aquatic plants. These conditions can affect the appearance, odor, and ecological health of surface waters while posing risks to people, aquatic organisms, livestock, and pets. Nutrient pollution originates from multiple sources, including urban and agricultural runoff, municipal and private wastewater discharges, animal production operations, atmospheric deposition, and the loss of natural nutrient filters such as wetlands.

To advance statewide efforts to address nutrient pollution, Tennessee Tech's Water Center partnered with the Tennessee Department of Environment and Conservation and the Tennessee Nutrient Reduction Task Force to host the 2025 Tennessee Nutrient Summit on the Tennessee Tech campus. The daylong summit, themed "Weaving a Stronger Net to Protect Our Surface Waters," brought together professionals, policymakers, researchers, and community partners representing agriculture, stormwater management, wastewater treatment, conservation organizations, municipalities, universities, and state agencies. Participants shared research, management practices, and practical strategies for reducing nitrogen and phosphorus in Tennessee's waterways.

A central objective of the summit was to create opportunities for participants to learn from one another and establish connections across professional and geographic boundaries. By bringing together participants from different sectors and regions, the summit provided a broader view of how nutrient pollution affects communities and watersheds across Tennessee.

Link to web news article:
https://www.tntech.edu/news/releases/25-26/tennessee-tech-hosts-summit-to-improve-state-water-quality.php



Tennessee Impact Continued

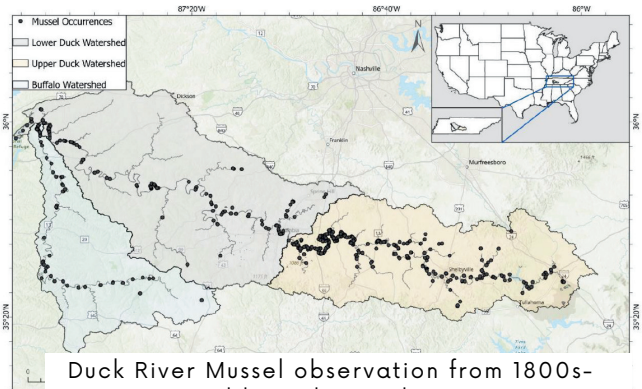


DUCK RIVER PLANNING PARTNERSHIP

Tennessee Tech University's Water Center is playing an important role in the state's latest efforts to protect one of its most important natural resources: Tennessee's Duck River, which is the most biodiverse river in North America. The River also provides drinking water to more than 250,000 people and supports agriculture, industry, recreation and fragile ecosystems across seven counties. Governor Bill Lee's executive order 108 established the Duck River Watershed Planning Partnership with 19 appointees from state agencies, utilities, local governments and conservation organizations. Tennessee Tech became the sole university on the board, with Water Center Director Justin Murdock serving as its academic member. With more and more people moving to central Tennessee, an increased amount of water is being pulled from the Duck River, leading to lower water levels. Pollution is also increasing, including sediment, pesticides, chemicals and runoff from landfills, creating both water quality and quantity issues.

The Duck River Watershed Planning Partnership has been tasked with preparing a report to outline recommendations for the river's future. It is home to many threatened or endangered species, some of which cannot be found anywhere else on the planet.

One of these endangered groups is freshwater mussels, a specialty of Amanda Rosenberg, assistant unit leader of the TN Cooperative Fishery Research Unit and Water Center associated faculty. Dr. Rosenberger has joined the Partnership's Conservation and Recreation working group, led by Dr. Murdock, to provide needed expertise in mussel ecology and conservation. The two-year Planning Partnership will end in December 2026 culminating in a report outlining a framework to preserve the watershed's biological, economic, and cultural heritage.



Duck River Mussel observation from 1800s-2022. Womble and Rosenberger 2025.

Research Focus Areas

The Water Center strives to address all aspects of water resource needs of Tennessee, but strives to excel in distinct areas where we have strong expertise and experience.

1

ECOLOGY AND BIODIVERSITY

This focus area advances the understanding, conservation, and management of aquatic species, their habitats, and ecosystem services. Specific research areas includes sportfish and nongame species management, threatened and endangered species, invasive species, aquatic food webs, ecosystem function, and the effects of environmental change on aquatic communities.

2

WATER SUSTAINABILITY AND SECURITY

This focus area develops knowledge and practical solutions to protect water quality, maintain reliable water resources, and support water sustainable use. Research encompasses surface water and groundwater quality, drinking water and wastewater treatment, nutrient pollution, stormwater runoff, watershed health, harmful algal blooms, microplastics, emerging contaminants, and ecotoxicology.

3

MODELING AND SIMULATION

This focus area develops and applies models to understand how water, pollutants, and other materials move through watersheds, rivers, reservoirs, wetlands, and built environments. Research includes watershed and computational hydrology, flood-risk assessment and forecasting, water-quality modeling, reservoir analysis, and the integration of water quantity and quality information.

4

TECHNOLOGY DEVELOPMENT

This focus area creates, evaluates, and applies innovative tools for water research, environmental monitoring, data analysis, and resource management. Areas of emphasis include low-cost environmental sensors, monitoring and control systems, geospatial mapping, remote sensing, web-based geographic information systems, large-data analytics, and advanced visualization.

Highlight - Ecology & Biodiversity

Molecular biology has become heavily integrated into wildlife and fisheries conservation and management. Water Center associated researchers have been involved in developing cutting edge molecular techniques for detecting rare species in streams using environmental DNA, identifying invasive species movement and hybridization, and building more efficient monitoring of toxin producing algae at the gene level.

The Water Center's Dr. Robert Paine and masters student Hannah Swain-Menzel have been using **environmental DNA (eDNA) surveillance** methods to monitor for the Duskytail Darter (Etheostoma percnurum), a federally endangered fish endemic to Copper Creek, Virginia. The distribution of this species has shrunk throughout its native habitat to only a few river kilometers near the confluence with the Clinch River. Environmental DNA surveillance combined with Species Distribution Modeling (i.e., MaxEnt) helped guide intensive eDNA surveillance and identified an under-surveyed population, expanding the contemporary distribution. Our efforts will help Virginia wildlife agencies and other conservation identify core survey area and assist with repopulation efforts. Funded by the Virginia Department of Wildlife Resources.



Tom Miles, a PhD candidate with the USGS Cooperative Fisheries Unit has been researching **Alabama Bass introgression** into native Smallmouth Bass in Tennessee's rivers and reservoirs. Using single nucleotide polymorphism (SNP) genotyping, this project will help fisheries managers battle the spread and impact of Alabama Bass in Tennessee and across the Southeastern United States. Tom's work has provided the foundation for the Water Center to provide black bass genotyping as a commercial service to partners throughout the Southeast. Funding provided by the Tennessee Wildlife.





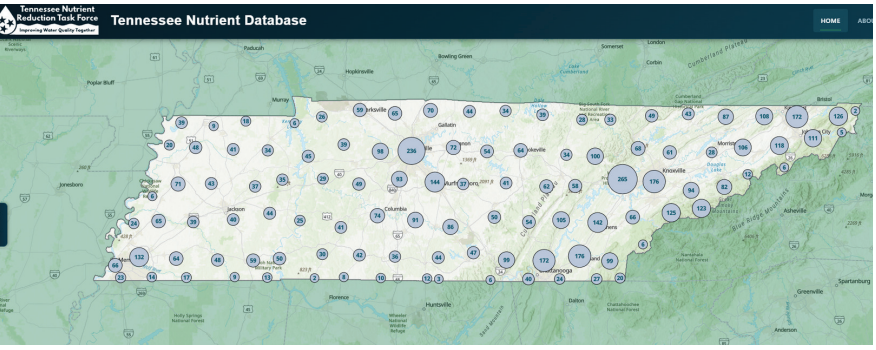
Dr. Jingjing Li, a postdoctoral research scientist at the Water Center has developed a molecular protocol for monitoring harmful algal blooms through the optimization of an **algal toxin gene detection** protocol for Tennessee waters. This method quantifies the four main freshwater cyanobacteria toxin genes simultaneously, for a robust, fast, and cost efficient method towards a better method for detecting toxin risks in surface waters. Funded by the Tennessee Department of Environment and Conservation.

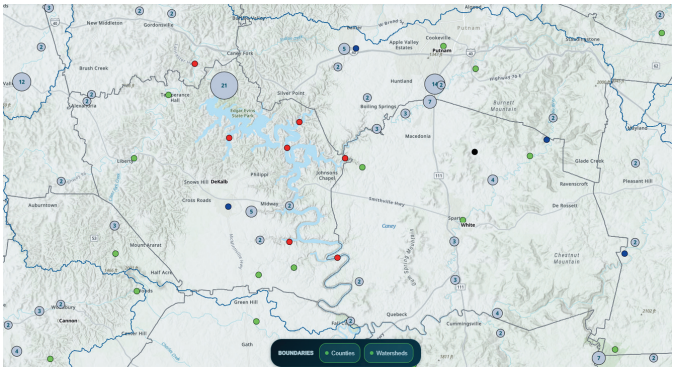
Highlight - Water Sustainability

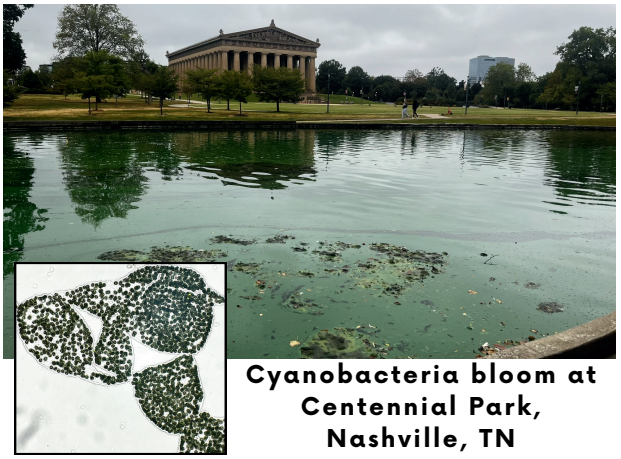
Nutrient pollution in surface waters is a growing issue in Tennessee that can have detrimental effects on water quality, including decreased oxygen for wildlife and harmful algal blooms. Water Center faculty Drs. Tania Datta and Grace Tinker, along with TN Tech alum Paul Tinker, partnered with TDEC to create a centralized database of all available nutrient measurements in Tennessee surface waters dating back to 1946. This past year, the website has been updated to improve the user experience by enhancing graphics and visuals, providing a our option for first-time users, and allowing data to be downloaded either in real time or via email.

Additionally, the database continues to expand with the addition of new data and water quality characteristics that were identified over the past year. This database provides a foundational dataset for assessing long-term trends in nutrient pollution changes and is available for all researchers and state and federal management agencies. https://tdec.tn.gov/nutrient/home

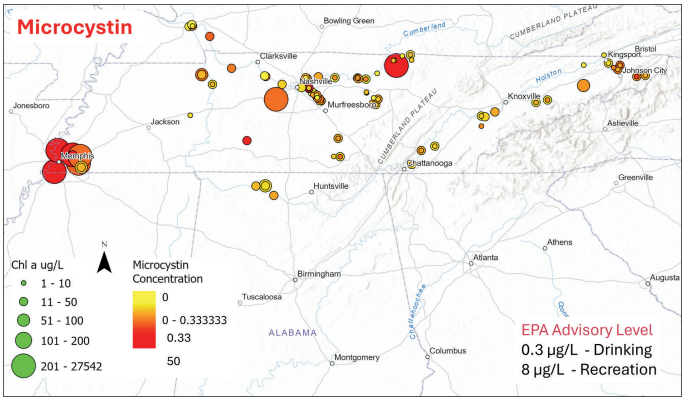
Harmful algal blooms are an emerging concern in all surfaces in Tennessee and are increasing due to nutrient pollution and warming waters. Blooms consisting of cyanobacteria can produce several types of toxins that effect the nervous system and liver function of people, livestock and pets that ingest them. The Water Center has established several partnerships with state and federal agencies to monitor, detect, and predict blooms. The Water Center laboratory is currently provides the analytical services in toxin measurements and algal identification for TDEC's HAB response program, including a bloom in Nashville's Centennial Park, (pictured below). Additionally, Dr. Murdock is currently working on several research projects including mapping the distribution of algal toxins in state surface waters, and better understand what water conditions trigger blooms and toxin production. He also works with the Us Army Corps of Engineers and other universities on projects to predict algal blooms in large, managed rivers including the Ohio, Cumberland, and Illinois rivers.





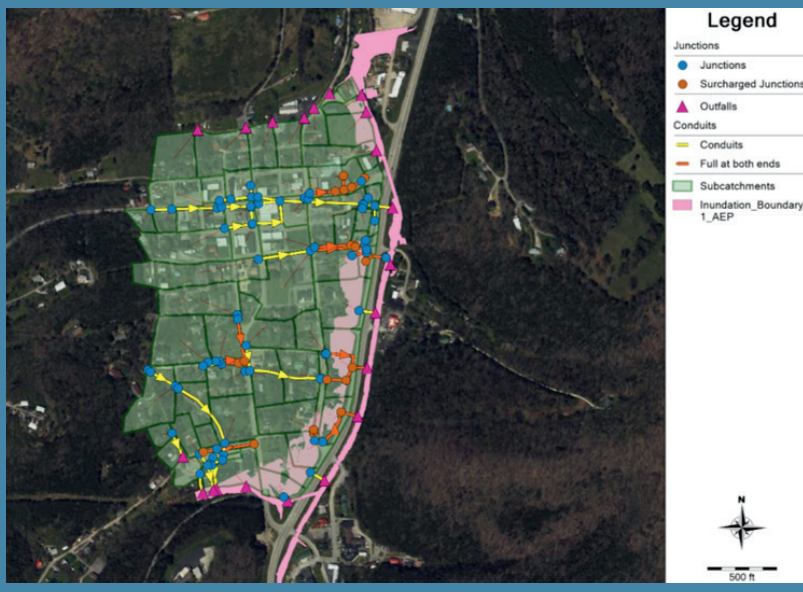


Cyanobacteria bloom at Centennial Park, Nashville, TN

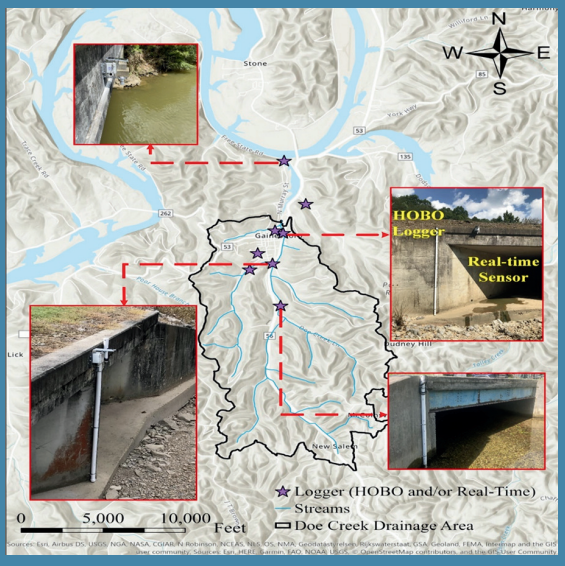


Highlight - Modeling & Simulation

Flood and stormwater management are crucial for mitigating flood risks but underserved rural communities often lack the necessary infrastructure to address flood risks. The town of Gainesboro in Jackson County, Tennessee has historically faced stormwater management and flooding challenges. For example, in March 2021, flooding resulted in S3,9M of damage within Jackson County. Limited data on watershed characteristics, stormwater assets, water quantity and quality before 2019 made infrastructure improvement planning a challenging task. Tennessee Tech's Water Center faculty partnered with the Town of Gainesboro to improve stormwater management and initiated long-term monitoring, modeling, and data-driven planning to address flood and stormwater vulnerabilities. this work estimated daily streamflow discharge from 5 climate datasets (1980–2099) across 7 global climate models, and extracted annual peak flows from over 3,300 HEC-RAS model simulations to estimate flood hydrographs and create land inundation maps across rainfall scenarios. By integrating modeling, field data, and future flow projections, this research lays a foundation for data-driven decision-making, infrastructure prioritization, and flood-resilient planning in all Tennessee communities.



Simulation of observed "high magnitude" storm along with 100 yr flood inundation results from HECRAS modeling.



Equipment Locations and Installation in the Doe Creek Watershed, TN



Analytical Laboratory

The Water Center's state-certified water quality laboratory has provided trusted analytical services to homeowners, businesses, government agencies, and the research community throughout Tennessee, particularly the Upper Cumberland region, for more than four decades. Combining certified laboratory testing with faculty expertise, the lab supports regulatory compliance, environmental research, and water resource management.

Our expertise includes drinking water, wastewater, and stormwater sampling; water characterization and treatability studies; flow and water-quality assessment of streams and watersheds; and genetic-based investigations. Additionally, we offer specialized services such as chlorophyll and algal toxin analysis, microbial source tracking and eDNA metabarcoding, microplastics characterization and quantification, and geospatial analysis. By combining advanced analytical capabilities, environmental monitoring, and technical expertise, the Water Center delivers reliable data and practical solutions that help communities, industries, researchers, and government partners make informed decisions to protect and improve water resources.





Analytical capabilities include:

- Trace/heavy metals
- Anions
- Solids
- BOD, COD, TOC
- Bacteria (E. coli and total coliform)
- Dissolved oxygen, conductivity, and pH
- Cyanide
- Oil and grease
- Nutrients
- Chlorophyll
- Microbial source tracking
- eDNA Surveillance
- Algal Toxins

Water Center Outreach

The Water Center remained committed to community engagement and environmental education by participating in a variety of outreach events, conferences, and educational programs throughout the fiscal year. These opportunities allowed Center staff to engage with students, educators, water professionals, and community members while increasing awareness of water quality, nutrient pollution, and stormwater runoff. The Center also showcased its analytical laboratory capabilities and research expertise through exhibitor booths and networking opportunities at regional conferences across Tennessee and Kentucky, strengthening partnerships and expanding its reach within the water resources community.







During this fiscal year, the Water Center participated in the following events:

- Kentucky/Tennessee Water Professionals Conference 2025 – Exhibitor Booth
- Kentucky/Tennessee Water Professionals Conference 2025 - Water For Life - School-aged Educational Event
- Tennessee Tech Sustainability Day 2025 – Outreach Event
- Tennessee Nutrient Summit 2025 - Meeting
- Tennessee Tech STEM Center FAB Friday 2025 - School-aged Educational Event
- Field Work for Stroud Research 2025 , "Understanding How Salt Creates Stress in Riparian-Strem Ecosystems" - Community Science Event
- Tennessee Tech Earth Day 2026 - Outreach Event
- Joined a Community Science Group for Tennessee that focuses on water and watershed health and education - Outreach Development
- Cumberland River Compact Water Fest 2026 - School-aged Educational Event









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watercenterlab@tntech.edu

