THE UNIVERSITY OF ALABAMA® | Alabama Water Institute

NEWSLETTER

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AWI STRATEGIC PLAN ADDRESSES GLOBAL WATER RESEARCH AND SOLUTIONS

By Brock Parker

The Alabama Water Institute has launched its five-year strategic plan to guide its mission of carrying out cutting edge and applied research and to train the next generation of scientists to provide working, novel solutions for a more water-secure world.

The plan, which outlines the institute's path until 2026, focuses on the collaborations of water researchers at The University of Alabama and federal, state and local agencies and industries. These partnerships will help AWI provide interdisciplinary knowledge and solutions for critical water problems and issues for all humanity, as well as advance UA's commitment to be a leading education and research institution for water-related matters.

"The Alabama Water Institute has done a superb job coalescing the input of many water scientists and engineers at The University of Alabama into a strategic plan that is actionable and forward leaning, and that best represents one of the University's signature research areas," said Dr. Russell J. Mumper, vice president for research and economic development. "Given the growing water economy this plan will help our research have direct application in addressing problems that are relevant to both the state and the nation and provide many highly differentiating opportunities for our students."

The AWI was created by UA to become a world-class interdisciplinary water research institute that develops path-breaking, holistic and environmentally friendly solutions to ensure people and ecological systems in our community, state, nation and around the world are water secure with access to clean water and are resilient to extreme events.

The plan echoes UA's strategic goal of increasing productivity and innovation in research, scholarship and creative activities that impact economic and societal development. In addition, it also lays the groundwork for advancing the strategic themes of UA's Office for Research & Economic Development. Those include but are not limited to promoting cooperative water research efforts with both campus and external stakeholders, working with other UA research institutes and centers to mutually benefit endeavors from a water perspective and seeking partnerships with other research universities.

"The AWI Strategic Plan is the culmination of a great deal of work and demonstrates the depth and breadth or our research expertise in water at The University of Alabama," said Scott Rayder, AWI executive director. "It also highlights how our research needs to be as integrated as the environment we are trying to predict and understand, and the roadmap it provides should help our water enterprise here at the University."

Four primary strategic themes make up the AWI strategic plan:

- Modeling and remote sensing.
- Integrated water resource assessment.
- Management of water hazards.
- Water security and risk communication.

To accomplish the modeling and remote sensing theme, AWI will seek out research to develop the next generation of hydrological models, remote sensing of water dynamics/ecology and development of novel sensors, groundwater modeling and aquifer sustainability assessments and water quantity and quality modeling in response to changes in the physical environment.

The integrated water resource assessment theme will be met by developing basic understanding needed to inform programs and policies to reduce impact on water quantity, water quality, threatened and endangered species, health and ecosystem function. Research is critical in the areas of drinking water treatment, low cost sewage treatment, water quality and health conditions monitoring and modeling and ecosystem function management.

The third theme, management of water hazards, seeks to develop and improve predictive tools that reduce risk and increase resilience of agricul-

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AWI STRATEGIC PLAN

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tural, industrial, public water supplies and natural ecosystems to stressors. Research in areas of coastal flooding management, flood and drought forecasting, impacts of water hazards on natural environment and development of predictive tools for management of species and ecosystems will be needed.

The final theme of water security and risk communication will allow AWI to create research opportunities to communicate water, science and risk impacts on society. The research needed for this theme will be sought to effectively getting AWI's message out to the public, which includes educational outreach and the dissemination of science and risk information. It will also require research about humankind's water footprint, along with water security analysis.

AWI's strategic plan will help UA to become a global leader in state, regional, national and international water issues. AWI can guide the shift in understanding, valuing and managing water for our nation and the global community to address all water-related challenges in the future and shape our world for a better tomorrow.

NEW UA CENTER TO FILL NEED FOR UNDERSTANDING WATER SECURITY

By Adam Jones

As global demand for water increases alongside a predicted decrease in water quality and availability, The University of Alabama is taking a leadership role to ensure the nation can better manage risks to the water supply and withstand future water disruptions.

The Board of Trustees of The University of Alabama recently approved the creation of the Global Water Security Center, which will be part of the Alabama Water Institute. The center's mission is to provide decision makers with reliable information, ground-breaking research, applied scientific techniques and best practices so the impacts of the cycle of water distribution and management can be better understood, leading to appropriate action and response.

The organization of a center with affiliated faculty from across campus will situate researchers to interact and collaborate with senior scientists, analysts and policy decision-makers working on these issues in the international defense, meteorological, climatological, hydrological and hazard communities.

In alignment with the Alabama Water Institute's mission to carry out cutting edge and applied research and to train the next generation of scientists to provide actionable, novel solutions for a more water-secure world, students will also benefit from the center's focus through engaging in research, experiential learning and opening career opportunities. Along with student research assistants funded through external grants and contracts, the center is expected to impact hundreds of UA students in water-related undergraduate and graduate degree academic programs across campus.

"The Global Water Security Center extends academic research into the realm of operations and will enable The University of Alabama to be at the forefront of predicting how changes in water security impact the geopolitical sphere," said Scott Rayder, executive director of the Alabama Water Institute. "This ability to see water in a strategic context will provide planners in government and the private sector with a new range of tools to enhance security and help communities better serve their citizens."

Mike Gremillion, an experienced weather professional in the military and intelligence communities, will lead the Global Water Security Center while continuing as deputy director of the Alabama Water Institute. Gremillion joined UA in 2020 after more than 27 years of providing scientific leadership and expertise for national security environmental support under the U.S. Department of Defense. His last military assignment was senior meteorology and oceanography officer for National Geospatial-Intelligence Agency.

"Water is essential for all aspects of life," Gremillion said. "It is a critical component of national and foreign policy objectives and is a driver of global health, economic development and quality of life."

Despite numerous government reports and scientific studies highlighting the need to focus on the growing threats of the water-related crisis posed by a growing population coupled with environmental and physical changes, no comprehensive organization exists to provide the service UA can provide through the Global Water Security Center, he said.

"UA researchers will be at the leading-edge in providing transformative and strategic information to understand threats to water security and identifying opportunities to address the interconnected challenges to water and environmental stability," Gremillion said.

UA HIRES PREEMINENT ALUMNUS TO ADVANCE WATER RESEARCH INITIATIVES

By Alana Norris

Dr. Steve Burian

An expert water researcher and University of Alabama alumnus is joining the faculty of UA's College of Engineering.

Dr. Steven Burian will join the civil, construction and environmental engineering department as a professor June 1. In addition, he will be affiliated with the University's Alabama Water Institute.

"Steve is a nationally recognized leader in water research, and he brings a unique perspective to our efforts to drive research into operations with federal partners as well as the private sector," said Scott Rayder, AWI executive director. "He is respected by the hydrologic community around the world and brings a wealth of experience and ideas to move our expertise out of the lab into the real world."

His desire to return to Alabama had a lot to do with the direction the University is taking in its focus on water research. Burian was attracted to the growing possibilities and wanted to be part of the impact it will have on the state and beyond.

"Alabama has the vision and the trajectory to be a national leader in water. Behind the strength of the Alabama Water Institute, The University of Alabama will be known for translating water research to operations and helping the country improve the sustainability of water systems and the resilience and prosperity of communities," Burian said.

His research centers around advancing the sustainability and resilience of water infrastructure systems, including stormwater, flood control, water supply and wastewater collection.

"In particular, I will be developing and applying new data acquisition systems, computational tools, and artificial intelligence to help enhance the nation's ability to forecast water hazards and to prepare communities to respond and adapt," Burian said.

Rayder already has plans for the projects Burian will focus on with AWI including working with the National Oceanic and Atmospheric Administration, the United States Geological Survey as well as regional and state partners.

"Steve will work with faculty members to drive efforts to support our new Global Water Security Center, which is a one-of-a-kind approach to generating a new generation of water intelligence products for the public and private sectors," Rayder said.

AWI is one of four institutes in UA's Office for Research & Economic Development, and Dr. Russell Mumper, vice president of research and economic development, believes Burian will help ORED execute its mission of using innovative research to impact society.

"Dr. Burian is an internationally recognized and regarded thought leader in water and currently leads the University of Utah's Water Center as its director. In that role, he has contributed high-impact academic programs and major national and international collaborations," Mumper said. "UA is so fortunate that Dr. Burian will be joining us to take full advantage of the opportunities in front of us."

Burian was most recently a professor at the University of Utah, director of the University of Utah Water Center, project director of the U.S.-Pakistan Center for Advanced Studies in Water, and associate director for the Global Change and Sustainability Center at the University of Utah. Previously, he was a professor at the University of Arkansas, scientist at Los Alamos National Laboratory and director of a consulting firm he co-founded.

Dr. Charles Karr, dean of the UA College of Engineering, is excited to see Burian return to the Capstone as a faculty member and believes he is an example of the type of high-quality graduate UA produces.

"Aside from being a proven commodity in research, Dr. Steve Burian is an accomplished teacher, having won numerous awards for teaching at the University of Utah," Karr said.

Burian will teach classes on water resources infrastructure and operations at UA. He said he has developed an ardent interest in enhancing higher education.

"I look forward to joining the amazing scholars and practitioners in higher education at The University of Alabama and working with them to imagine and introduce new approaches to support today's students to meet the needs of tomorrow's society," Burian said.

He received a bachelor's degree in civil engineering from the University of Notre Dame and earned both his master's and doctorate from The University of Alabama in environmental engineering and civil engineering, respectively.

ALABAMA WATER INSTITUTE NAMES FIRST FACULTY FELLOWSHIP RECIPIENTS

The Alabama Water Institute selected three faculty members from The University of Alabama as the inaugural fellows in the AWI Faculty Fellowship Program.

By Brock Parker

Dr. Lisa Davis, left, Dr. Leigh Terry, top right, and Dr. Milad R. Esfahani, bottom right.

The program recognizes UA faculty for outstanding research, extension and education programs that significantly advance UA's interdisciplinary water-related communities of science.

"These researchers are to be commended for their leadership in the water treatment technologies and hydrologic sciences and will serve as AWI ambassadors here on campus and in the larger research community with which they engage," said Scott Rayder, AWI executive director. "The University of Alabama is fortunate to have such deep expertise and talent, and we look forward to this new affiliation with AWI as they expand on their current records of accomplishment in their respective fields."

AWI established two types of fellowships. Assistant professors are eligible for the Early Career Alabama Water Institute Faculty Fellowship while associate and full professors are eligible for the Distinguished Alabama Water Institute Faculty Fellowship.

The first Early Career AWI Faculty Fellows include:

Dr. Leigh Terry, assistant professor of civil, construction and environmental engineering, College of Engineering.

Dr. Milad R. Esfahani, assistant professor of chemical and biological engineering, College of Engineering.

The first Distinguished AWI Faculty Fellow includes:

Dr. Lisa Davis, associate professor of geography, College of Arts & Sciences.

Two Early Career and one Distinguished Faculty Fellowships will be awarded each year by AWI to candidates affiliated with the institute. Each fellowship has a tenure of three academic years and is accompanied by an annual salary stipend. Selected fellows have evidenced strong interdisciplinary water-related research, education and/or extension programs. Their research, education and extension priorities align with AWI's mission to carry out cutting edge and applied research and train the next generation of scientists to provide actionable, novel solutions for a more water-secure world.

AWI Faculty Fellows serve as representatives committed to contribute to AWI's initiatives during their term and help promote the institute across UA, its partners and the public. AWI Faculty Fellows also increase the visibility and impact of the institute by participating in its H.U.B. Talk series and by submitting two interdisciplinary AWI proposals. The creation of the AWI demonstrated the commitment of UA to be a premier research and education institution around water-related issues. AWI's goal is to become a world-class interdisciplinary water research institute that develops path-breaking, holistic and environmentally friendly solutions to ensure people and ecological systems in our community, state, nation and around the world have access to clean water and are resilient to extreme events.

AWI Faculty Fellows provide a community of science to the UA campus that can respond to multiple interdisciplinary research opportunities and build a portfolio of projects and initiatives that benefit not only the University but all of society.

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UA RESEARCHERS STUDYING STORM-DRIVEN GROUNDWATER FROM BARRIER ISLANDS

By Brock Parker

Coastal areas are popular places to live and visit. Every summer, families load up their cars and head to the beach for a few days of relaxation. In Alabama, one destination is Dauphin Island, a small barrier island three miles south of Mobile Bay.

When tourists arrive, they cross their fingers for good weather. All too often, though, storms show up.

Not only can vacations be disturbed, but the waters around Dauphin Island can see an increase in groundwater and nutrients after heavy rains. Researchers from The University of Alabama recently published a paper in the journal *Frontiers in Marine Science-Coastal Ocean Processes* detailing how those storm events affect the marine ecosystem around barrier islands.

"It's interesting based on several factors," said Dr. Dini Adyasari, a postdoctoral researcher in UA's Department of Geological Sciences. "Dauphin Island is an urbanized island and a tourist destination, so there's a potentially high amount of nutrients or other pollutant concentration in the groundwater."

The island is also located close to the Mobile Bay Estuary, where freshwater from the Mobile River mixes with salt water from the Gulf of Mexico. When you add groundwater from Dauphin Island itself, it creates a hydrologically complex environment.

Over the course of 40 days, a team of UA researchers used radon and radium isotopes as tracers to evaluate the temporal and spatial variability of fresh and recirculated submarine groundwater discharge. During this period, they experienced two significant storm events on the island. What they discovered was during and immediately after the storms, the coastal water surrounding it became a river-dominated environment.

Approximately a week later, submarine groundwater discharge was almost three times higher than a few days earlier.

"This may affect the coastal water quality because rivers bring oxidized nitrogen while groundwater brings a high concentration of reduced nitrogen, which is ammonia," said Adyasari.

An influx of these groundwater nutrients can lead to an increased chance of hypoxia, or low levels of oxygen, during this time.

"Groundwater is anoxic, so it definitely plays a role in developing hypoxia in the surface water and is associated with fish kill," said Dr. Natasha Dimova, an associate professor in the Department of Geological Sciences and environmental geochemist.

In hypoxic waters, marine life dies and sinks to the gulf floor, leading to a further decrease in oxygen. The increased groundwater nutrients can create and sustain harmful algal blooms, resulting in more problems for coastal communities.

"They cause respiratory issues for people," said Dr. Behzad Mortazavi, professor and chair of UA's Department of Biological Sciences. "They also close the beaches, and it can lead to the closure of shellfish harvest and similar situations, so that kind of impact is very real and local."

At Dauphin Island, the team discovered how variable the nitrogen levels were in two separate locations. The first area next to a pier had reduced nitrogen, which Adyasari believes is a naturally occurring event due to the native type of sediments through which groundwater flows. At the second location near a golf course, they discovered a much higher concentration of nitrate, which is potentially from the fertilizer used to maintain the field.

During dry times, surface water pools and infiltrates the ground, bringing nitrates found in substances such as fertilizer into the groundwater. As it seeps down into the subsurface, biogeochemical reactions can change the nitrate into nitrogen gas, causing it to dissipate and reduce the impact on groundwater.

However, barrier islands offer a unique challenge in filtering these contaminants because of their susceptibility to storm events.

"They are piles of sand that have been pushed around through hurricane events, so the groundwater residence time in the subsurface is very short," said Dimova. "It flushes out like a toilet, so there's not a lot of time for these chemical changes and filtration in the subsurface."

Studying these dynamics is crucial to learn how barrier islands contribute to groundwater discharge during storm events. Dimova hopes they can spend more time on these islands to easily

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BARRIER ISLANDS STUDY

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access monitoring stations and see how the waters react to storms in different seasons throughout the year.

"Seeing the huge benefit of the continuous records, our future research directions are obtaining measurements for longer periods and at multiple locations," she said. "If we can get more of those continuous interrupted records, we would understand these systems better, we can do much better predictions and we can model these systems, especially using the modern tools of artificial intelligence."

Expanding these studies and public knowledge will allow residents and visitors to become more aware of how sensitive barrier islands are to precipitation and how nutrients transported by groundwater can impact the local economy. They will create a better understanding for improving coastal water quality, groundwater quality and quantity for future freshwater resources in similar areas around the world.

Dr. Daniel Montiel, senior staff scientist at Geosyntec Consultants in Clearwater, Florida, is a co-author of the paper. Publication of the paper was funded by the Alabama Water Institute.

The project is a collaboration between the Departments of Geological and Biological Sciences in UA's College of Arts and Sciences. It was funded by multiple sources, including the Walter Benjamin Fellowship from German Research Foundation (DFG) awarded to Dr. Adyasari, the College of Arts and Sciences and the Dauphin Island Sea Lab as a faculty research fellowship awarded to Dr. Dimova and summer fellowship by the ExxonMobil Summer Fund and Geological Sciences Advisory Board (GSAB) at the Department of Geological Sciences awarded to Dr. Montiel.

WASHING AWAY NITROGEN THROUGH ROADSIDE DITCHES

By Brock Parker

Ditches are a common feature along roadways. The main purpose of these human-made conduits is to provide a path for stormwater to escape, but a University of Alabama researcher's curiosity discovered a relatively unknown benefit: the removal of nitrogen.

Dr. Corianne Tatariw's daily commute from Mobile, Alabama, to Dauphin Island was filled with miles and miles of ditches filled with vegetation. They reminded her of natural ecosystems that help lessen the load of nitrogen into coastal waters.

"I thought maybe these can act like wetlands or rivers, which have a reasonably high capacity for nitrogen removal," said Tatariw, a postdoctoral researcher in UA's Department of Biological Sciences.

Too much nitrogen can act as a pollutant that can create or sustain harmful algal blooms and dead zones in coastal waters. Those can reduce oxygen levels which kill marine life and cause irritation in human respiratory systems.

The impact of nitrogen can be mitigated when microbes separate it from water, turning it into a gas that dissipates into the atmosphere.

Tatariw's study, recently published in *American Geophysical Union's Journal of Geophysical Research: Biogeosciences*, compared the nitrogen removal ability by microbes in ditches from three distinct landscapes surrounding Mobile.

"You have this shift as you move around the bay from less developed forested land to a highly urbanized area around Mobile itself," Tatariw said. "On the east side of the bay, you have a lot of agricultural land use."

Tatariw and her team spent four weeks gathering samples from 96 different ditches along paved two-lane roads in each of those three areas. What they discovered was these ditches were as effective at removing nitrogen as natural ecosystems, such as wetlands and streams.

Dr. Corianne Tatariw

"It seems that when the ditches are constructed, they're pretty homogenized, and because they're managed to a certain extent, it seems like any effects of land use might actually be kind of muted," Tatariw said. "These drainage networks might actually be a little more resilient to land use change or land use effects."

To identify and determine the effectiveness of microbial communities in ditches near the forested, urban and agricultural areas, Tatariw's team looked at plant biomass, inorganic nitrogen content in water and soil characteristics. They identified the different microbes in each sample by using 16S rRNA gene sequencing.

The amount of nitrate removal from each sample was determined by creating a slurry from the soil samples and water. A stable isotope of nitrogen, 15-nitrate, was then added to the slurries to see by how much the microbes reduced it. The result was a potential removal of 89% on average.

"It was really important to connect the microbes and the landscapes," said Dr. Behzad Mortazavi, professor and chair of UA's Department of Biological Sciences. "We wanted to learn about their function across the landscapes and the magnitude of their impact."

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WASHING AWAY NITROGEN

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Roadside ditches can remove nitrogen before it gets to waterways. Photo credit: Corianne Tatariw

Now knowing that these ditches can serve as bonus filters from excess nutrients, Tatariw said information like this can help in future development choices.

"We can possibly design our roadways in a manner that helps reduce nitrogen runoff," she said. "One choice that could be made is building vegetated ditches as opposed to putting in concrete culverts."

Tatariw said their data points to plant biomass being an important driver of both nitrogen removal and shaping the microbial communities. Even though there have been some land use effects in rivers and wetlands close to the ditches, it didn't seem to matter in ditches given their effectiveness at removing nitrogen in all land use types.

"People really haven't done a lot of work on how roadside ditches might reduce nutrient loads or how much will they remove nitrogen," she said. "By doing this study, we've now provided a baseline and opened a Pandora's box of questions to ask."

Information from an article in AGU Eos was used in this report.

UA DEVELOPING LEADING-EDGE RADAR SYSTEM FOR CRITICAL WATER INFORMATION

Scientists are always in search of more data to help in understanding the world, and that need drives innovation to gather and analyze the information critical in navigating tomorrow's challenges.

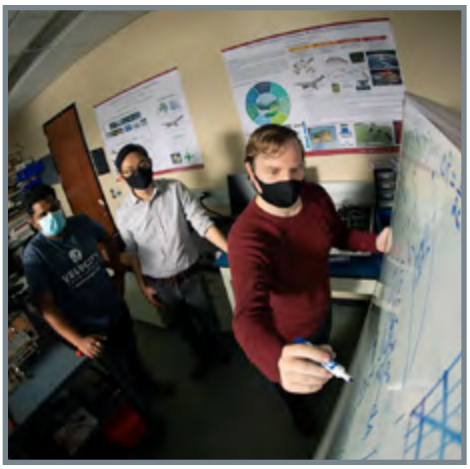
By Adam Jones

To grasp the amount of water Mother Nature has poured into a region, scientists have created elaborate models that can show the available water resources and spit out predictions of what's to come so governments and businesses can plan and position to take advantage. But those models rely on a foundation of data, and the more precise the data, the better people can prepare for, say, a scarcity of water because of dry soil or an abundance of water coming from a thick snow pack in the mountains.

That's where engineering researchers at The University of Alabama come in. A team of researchers at UA develop, test and deploy radars that can scan and image snow and soil to see the amount of water stored below the visible surface.

The team at the UA Remote Sensing Center, part of the Alabama Water Institute, have taken radar technology, that used to be mounted on huge planes or trucks and operated by several people, and shrunk them to fit into aerial drones operated from the ground. Leaders in radar imaging, UA researchers are using cutting-edge technology developed at UA to inform decisions on the use of water resources.

"To get fine-scale measurements, we need to get closer to the ground to get a zoomed-in view that satellites and air planes can't provide, and, in order to do that, we have to fit it on a drone," said Christopher Simpson, a doctorate student in aerospace engineering who is helping lead the project. "We are miniaturizing the drones, but we can still cover a good bit of land with this system."



Dr. Stephen Yan, center, with graduate students Shriniwas Kolpuke, left, and Christopher Simpson, right, discuss a remote sensing project in a lab at The University of Alabama.

The information collected and analyzed by the UA researchers will feed into hydrological models such as the National Water Model maintained by the National Oceanic and Atmospheric Administration through the National Water Center, located in Tuscaloosa, Alabama.

"The application is water management," said Dr. Stephen Yan, who specializes in radar and antenna systems research. "What can be done with the data depends on the user, but in uploading this data on snow volume and soil moisture to the broader community, we help develop and validate models that can be used to see if there might be a flood or drought to help planning with drinking water or water for crops."

While satellite imaging covers huge areas of land and on-site measurements of geophysical data provide detailed information at specific locations, neither provide the fine imaging resolution over a large enough area for the accuracy desired in

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LEADING-EDGE RADAR SYSTEM

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hydrological models.

"With any model, the finer the resolutions you can capture, the more accurate you can be," Simpson said. "The fine-scale measurements give you more fidelity in certain situations."

Satellite imaging and radar mounted on airplanes scan the Earth with resolutions on the kilometer scale, meaning those images can only provide an accuracy of what's under the surface within 30 kilometers, for instance. That's great information for models, but a clearer picture can be captured using UA-developed radars mounted on drones that can provide a resolution close to 10-meter scales.

The ultra-wideband radar operating at microwave frequencies is able to see below the surface at low altitudes. The drone-based soil moisture radar also has sufficient sensitivity and resolution to see through trees and vegetation, isolating their effects from soil moisture measurements – a capability that was not possible from existing drone-based radars. Four drones with integrated radar, a set up weighing about 55 pounds, working together in an automated pattern can do a broad sweep of an area in a short period of time.

Dr. Jordan Larson, who researches unmanned aerial vehicles, and his students are helping the team by developing drones on campus tailor-

Graduate students prepare for a test of measuring soil moisture.

made for this imaging project. The goal is to move to a swarm operation to minimize downtime in charging drones between flights by covering even more land.

"If you want to be efficient, you want to cover as much space as you can with as many drones as you can that fly for longer periods of time capable of a fine resolution," Larson said. "There is no other leader in this area, so it's easier to design this ourselves."

The team also uses in-situ measurements to help give the drones a baseline that helps validate radar estimates of soil moisture during processing. Sama Memari, a graduate student in civil and environmental engineering, uses probes that stick 5 centimeters in the ground to measure soil moisture and inputs vegetation coverage of the area.

"We need to have some ground truth to calibrate and verify the data," Yan said.

All of this data will help in modeling the future state of water in a region.

"Hydrologists can use this information to determine the state of the soil in different seasons, and our goal is to provide more accurate data for those water management needs," Yan said.

This work is supported through NOAA by a $5.5M grant through the Cooperative Institute for Satellite and Earth System Studies at the University of Maryland. Dr. Yan is an assistant professor of electrical and computer engineering and deputy director of the Remote Sensing Center.

Dr. Larson is an assistant professor of aerospace engineering and mechanics. The Remote Sensing Center is led by Dr. Prasad Gogineni, the Cudworth Professor of Engineering.

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If you have expertise that could contribute to addressing complex water issues, please register yourself on our website. All registered members are considered affiliated with AWI and have access to all AWI resources.

To register, visit the AWI website: ***awi.ua.edu***

Eligibility Criteria:

- A faculty/staff/student appointment at The University of Alabama.
- Research expertise in a water-related field.
- Completion of registration form.

Questions?
Please contact Stefanie O'Neill at: soneill2@ua.edu or 205-348-9128.

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