

# Students in ASU lab work to improve river preserve's health

## Assistant Professor Liza Roger, Maricopa County hope to reduce pollution surrounding Hassayampa preserve

By Megan Neely, ASU News  
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Just over 60 miles from Phoenix, along U.S. Route 60, lies the [Hassayampa River Preserve](#).

The 770 acres of land surrounding the river exists within the Upper Hassayampa Basin. The over-100-mile stretch of water exists mostly underground but resurfaces just upstream of the preserve, providing a lush oasis in the middle of the desert — home to 280 bird species.

The preserve finds itself at risk due to surrounding human activities such as road and railroad traffic, mining sites and a booming rural community, leaving the potential for pollution just south of Wickenburg, Arizona, which houses just over 8,000 residents and has a rich history due to its abundance in gold, silver and copper.

That's why one professor at Arizona State University is working to study the health of the preserve.

[Liza Roger](#), an assistant professor from the [School of Molecular Sciences](#), is working in tandem with [Maricopa County](#) and the [Nature Conservancy](#) to assess the health of the preserve and to mitigate those risks and the potential for negative impacts on human health.

In 2024, Roger modified an existing course, the [Environmental Chemistry Laboratory](#), where she gathers students every spring to collect data on the preserve. With the site lacking environmental data, the course aims to provide benchmarks and time series.

She reached out to Jennifer Johnson and Chris Matthews, the regional park superintendent and the preserve's manager, respectively, and received a research permit in exchange for sharing with the county the data and solutions her class comes up with.

"I don't particularly enjoy teaching labs where you give students a handout, they go work at their bench and then when they're done, they can leave and just submit the report. I don't find that format very exciting for the instructor, nor for students," Roger said. "So I decided, since it is environmental chemistry, let's take them outside and actually experience the environment. Let's give them some field experience."

Also affiliated with the [School of Ocean Futures](#) and the [College of Global Futures](#), Roger investigates the impact of environmental change on marine invertebrates and leads the [Marine Biochem Research Lab](#), also known as the Roger Lab.

Her biggest concern for the preserve comes from the potential for chemical presence due to the old mining sites, the railroad, the passing highway and the town of Wickenburg. With this lab, she hopes to not only provide information on what is found related to pollution runoff, but also why things such as water oxygen levels are at dangerously low levels in the lake.

## **Student-driven research projects**

Students design their research project in class and examine data that they collect during onsite visits. Interests have included testing metals in soil samples, analyzing nutrients such as nitrates and phosphates in the bodies of water, and conducting growth and elemental analyses of wood from surrounding trees. One of Roger's students, Maeve Botham, looked into dendrochronology — the science of dating events and environmental change by looking at the annual growth rings found in a cross section of a tree trunk.

“My project focused on filling in gaps in the data for periods of environmental stress at the Hassayampa River Preserve,” Botham said. “It involved collecting a tree trunk cross section from the preserve, mapping the rings to determine the age of the tree and taking sawdust samples using a diamond-bit Dremel for analysis.

“I was interested in combining my areas of study for my project, including planetary health. I ended up doing a chemical analysis on the composition of tree rings to combine my technical skills in chemistry with my interests in biology.”







Maeve Botham weighs samples on an analytical balance. Photo courtesy of Sarah McGregor

Megan Leon, another student in the lab, studies environmental chemistry and joined the class due to its alignment with the work she hopes to do in the future. In the lab, Leon tested soil samples from the preserve for carcinogenic heavy metals.

“A big part of my drive for doing what I do is through the lens of environmental justice, so checking if recent wildfires caused any localized and longer-term damage to the land is right up my alley,” Leon said.

The [2024 Rose Fire](#), ultimately caused by railroad maintenance, burned 266 acres surrounding the preserve. Leon connected her research to a report she found on the potential wildfires have to produce chromium, a cancerous toxin.

“She wanted to look at the difference between the soil in the preserve that was unburnt versus the burn scar to see if there were high levels of chromium in the burnt areas. Through just wind and runoff, it could contaminate the rest of the preserve,” Roger said.

## Students trained on professional equipment

Roger wanted her students to have a chance to be physically involved in research — from design to sampling to analyzing their project data — so she reached out to [Josh Jeffs](#) and [Orenda Griffin](#) in the School of Molecular Sciences for support to accomplish this. Enter [ASU's Core Research Facilities](#), the home of 30 facilities containing state-of-the-art equipment with a mission of turning ideas into operable projects.

Students had the chance to use various instruments to run tests and analyze data from their samples. [Gwyneth Gordon](#) and [Sarah McGregor](#) from the [Metals, Environmental and Terrestrial Analytical Laboratory \(METAL\)](#) have been helping the class for the past two years with the facility's equipment. The METAL team provides guidance and hands-on training while using the facilities.

“They go to the site, get an idea of their research question and then we come to the lab and talk to them a little bit about what's possible and what's not possible with the instrumentation we have,” McGregor said. “That helps them develop what they want to analyze going forward. They come to METAL, and we help them with the sample preparation, analysis and data on various instruments.”

Instruments students used ranged from the [PE 2400](#), a conventional elemental analyzer, to the [Seal AQ2 system](#), an automated analyzer ideal for measuring dissolved nutrients and other constituents in aqueous samples, extracts and digestions.

Botham had the chance to use the [Agilent 5900 SVDV inductively coupled plasma-optical emissions spectrometry \(ICP-OES\) system](#), which allows for the quantification of a large array of elements in the parts-per-billion range.

## Health of the land is connected to human health

Beyond collecting the data and turning it into solutions, Roger's biggest emphasis in this class and beyond is that everything is connected within planetary health. For humans to be healthy, the surrounding environment needs to be in good health. In particular, soil impacts everything from food to water to wildlife.



“You need a balanced ecosystem to have a good environment because if it is unbalanced, you might have more predators than prey, you get poor soil, and then you get plants that don't grow and foods that are poor in nutrients or loaded with bad chemical compounds,” Roger said.

“If you get plants that don't grow or are in poor health, you get less oxygen and your air isn't getting filtered and cleaned by these plants.”

She hopes that in the coming years, the class will continue building on the data that has been collected and sharing more ideas on how to further mitigate the immediate risks within and around the preserve.

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*This story originally appeared on [ASU News](#).*

<sup>1</sup> Something created or caused by human activity.

## Main image



Students in ASU Assistant Professor Liza Roger's lab collect samples at the Hassayampa River Preserve. Photo courtesy of Liza Roger

**Text image(s)**





Maeve Botham weighs samples on an analytical balance. Photo courtesy of Sarah McGregor

## Gallery



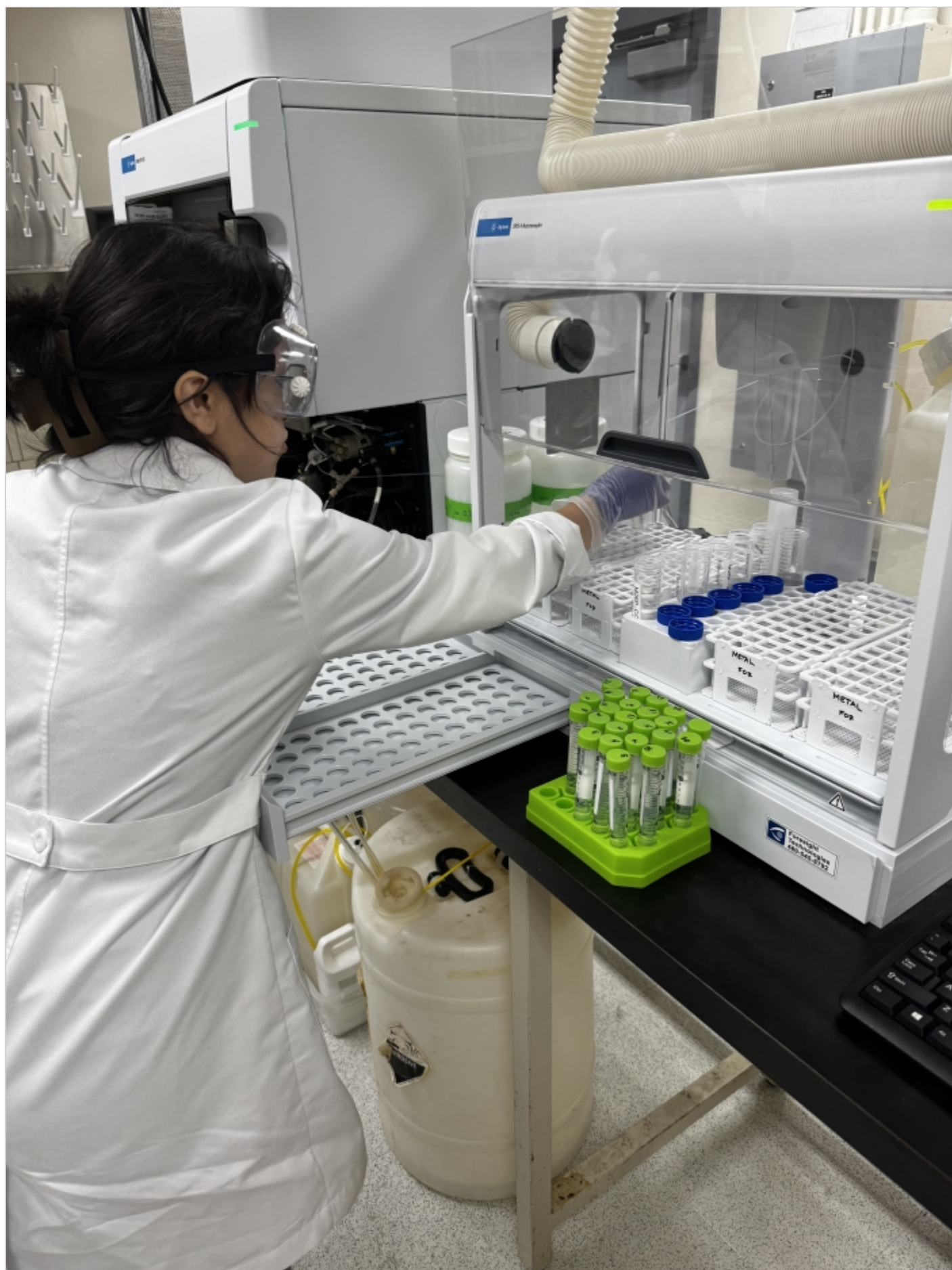
Paige Sturm and Juliana Robledo filter water samples in the field ahead of oxygen measurement (potassium permanganate demand) in the lab.





Weiyu Wu and Paige Sturm calibrate the dissolved oxygen probe at the Hassayampa River Preserve.





Juliana Robledo loads her acid-digested soil samples onto the ICP-OES autosampler for analysis.