Tahoe

UC DAVIS TAHOE ENVIRONMENTAL RESEARCH CENTER

SUMMER 2023

The Tahoe Environmental Research Center (TERC) is dedicated to interdisciplinary research and education to advance the knowledge of aquatic and terrestrial ecosystems and their interactions within natural and developed Earth systems, and to communicate science-informed solutions worldwide.

TERC educates the next generation of leaders and inspires environmental stewardship in thousands of students, community members, and visitors annually through its outreach centers.

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http://tahoe.ucdavis.edu

TERC researcher Katie Senft examines a manta trawl net, used to collect microplastic samples from the surface of Lake Tahoe.

RESEARCH UPDATES

TO SINK OR SWIM: A SNAPSHOT EVALUATION OF MICROPLASTICS IN LAKE TAHOE

Carelessly discarded plastic on beaches or within the watershed of Lake Tahoe eventually breaks, down becoming microplastics. These microplastics pose a detriment to Lake Tahoe's aquatic ecosystems as well as human health. To understand and quantify the risk that these microplastics pose, researchers have been measuring the concentration of microplastics currently in the lake. Between August 2021 and August 2022, TERC conducted monthly trawls of Lake Tahoe's surface water and subsurface water to determine the concentration and makeup of microplastics in the lake. The results, published in a report released in February 2023, offer a sobering look into the state of microplastic pollution at Lake Tahoe.

Researchers identified on average a total of 8,178 plastic particles across their 12 trawls,

with the highest concentration of particles during May, June, and August. Researchers extrapolated this data to estimate that the average estimated abundance of microplastics at the lake surface was 306,044 microplastics/km². About 80% of the collected particles were either polyethylene or polypropylene. These types of plastics are commonly used in soda bottles, and other containers (and can be identified by the presence of an RIC number of 1, 2, or 5). Since no wastewater effluent discharges into Lake Tahoe, the microplastics collected by the team likely entered the lake through litter or trash.

Link to report on website: https://tahoe.ucdavis.edu/technical-reports.

CORRELATION BETWEEN FIELD SCIENTISTS

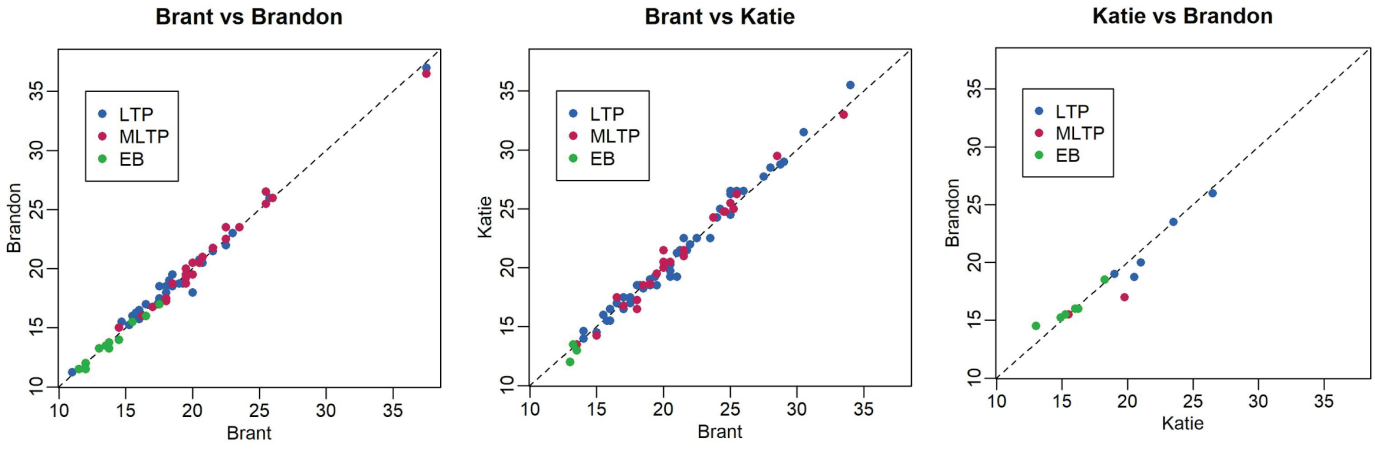
The Secchi disk and it is just one of the instruments we use to measure water clarity. Other instruments include turbidity sensors and transmissivity sensors. While the Secchi disk is a very basic instrument (no batteries and no computer required), this instrument has been used for over 50 years and is the measurement that the restoration goals for Lake Tahoe are set to.

To take a measurement, the disk is lowered into the lake and the depth at which it disappears from view is recorded. As the disk descends deeper, it is more difficult to see because fine particles and algae in the water scatter the light.

Considering that the visual appearance could be subjective, our data management expert Dr. Shohei Watanabe compared the measurements of our three official Secchi disk readers (Brant Allen, Brandon Berry, and Katie Senft). He found that they were statistically within 0.2% of each other. This validates the contention that the Secchi depth reading is a highly reproducible measurement.

The annual clarity report came out in April 2023 and is available at https://tahoe.ucdavis.edu/secchi.

Recently retired TERC researcher Brant Allen prepares to take a Secchi depth measurement.



Three graphs comparing Secchi depth measurement results from Katie Senft, Brandon Barry, and Brant Allen, with each axis representing a researchers Secchi depth measurement. The blue, red, and green data points represent measurements taken at the western LTP site, the mid-lake LTP site, and the center of Emerald Bay, respectively.

TERC EXPANDS INTEGRATED NEARSHORE ALGAE MONITORING

TERC research diver surveys a patch of metaphyton algae found near a growing Asian clam population.

The nearshore of Lake Tahoe is where the public interacts with the lake and where public opinion regarding the lake's aesthetic character is primarily formed. Beyond aesthetics, the condition of the nearshore reflects the health of the lake, and the presence of both periphyton (attached algae) and metaphyton (unattached algae) are strong indicators.

TERC has been conducting nearshore algae research since 1982. Past monitoring focused on the growth of periphyton. Periphyton are algae that attach to hard surfaces (such as boulders and piers) around the shoreline. It typically starts growing in December, with a peak around April. Past research and monitoring were driven by concerns over increased development.

Based on pioneering work that TERC has undertaken in the last five years with remote sensing of the nearshore, we were selected to continue Lake Tahoe's nearshore algae monitoring program. Starting in 2023, the monitoring program has been modified to encompass a year-round strategy for an Integrated Nearshore Algal Monitoring Program. The different seasonal presence of periphyton and metaphyton requires that monitoring occur most months of the year. On account of climate change impacts, we anticipate that the seasonality of both periphyton and metaphyton may evolve over time.

The new program utilizes airborne (from helicopters and drones) remotely sensed measurements to determine the magnitude, extent, and trends in the distribution of both periphyton and metaphyton. It includes a range of field and laboratory measurements as well as the engagement of citizen science. Field and laboratory activities will include Scuba sampling, and drone and helicopter flights. TERC's laboratories will be measuring chlorophyll and Carbon-Nitrogen-Phosphorous ratios, and the speciation of the organisms found.

The public are being asked to submit their observations and photos of nearshore algae using the Citizen Science Tahoe app and the "Algae Watch" survey. These images and reports will be used by researchers to find hot spots in advance of monthly surveys and get a beach-goers view of the algae. Your observations and images are very helpful to this effort.

The goals of the program are to quantify the changing extent and intensity of nearshore algae from year to year and to assess the status and trends.

CITIZEN SCIENCE TAHOE INSTRUCTIONS

1. Download Survey123 with this link on your mobile device.

2. Download each survey on the CST Survey home page.

3. Select "Continue without signing in" in Survey123.

Want to learn more? Visit the Nearshore Algae Story Map Beautiful Beaches with a Nearshore Algae Problem for images and additional information about Lake Tahoe's nearshore algae.

TERC BEYOND TAHOE: SIERRA SMALL LAKE RESEARCH DELAYED DUE TO BIG WINTER

UC Davis Professor Steve Sadro conducts limnological research to understand how biological, physical, and chemical factors interact to regulate aquatic ecosystems. The students in his lab have research projects to better understand ecological processes in habitats ranging from coastal streams and estuaries to arctic and alpine lakes. Much of their research is conducted in the Sierra Nevada mountains, where steep landscape gradients provide a natural laboratory to test ecological questions.

This year, field research started much later than normal due to the lingering snow cover. In May 2023, there was still 16 feet of snow cover on many of the 20 lakes throughout the Sierra that are instrumented with light and temperature sensors.

Research shows that despite rapidly warming air temperatures, spring snow-pack is the biggest predictor of summer water temperatures in small Sierra Nevada lakes. Small alpine lakes are somewhat buffered from climate warming trends because they respond primarily to variation in the snow. The amount of snow controls when the lake becomes free of ice and can absorb radiation from the sun, which heats the water.

For more, visit https://caes.ucdavis.edu/news/how-climate-change-affecting-small-sierra-nevada-lakes

Professor Steven Sadro collects samples of Emerald Lake in the Sierra Nevada mountains this spring where they had to attach more extensions on the ice auger than ever before.

RAFTING TRIP ON THE GRAND CANYON

UC Davis students, including TERC graduate student Mary Jade "MJ" Farruggia, participated in an interdisciplinary learning experience on an Ecogeomorphology rafting expedition down the Grand Canyon. In the prior ten weeks, students learned in a traditional classroom setting about a diverse range of topics centered around the ecology, geology, hydrology, and policy of the Grand Canyon and the Colorado River. Students learned both from guest speakers across disciplines and from each other, as each student researched and presented on a specific research topic.

The group then spent ten days rafting through the Grand Canyon, experiencing and applying what they studied over the ten-week course. Each night on the river culminated in a science sharing circle, where students reflected on the day and linked what they saw to the things they learned. They took turns presenting a 60-second media pitch on their research topics each night at camp.

This quarter-long course was centered around the theme of science communication, where students learned and practiced communicating complex science and policy topics to a wide range of audiences, from scientists to policy makers to the general public. Students developed as scientists, outdoor enthusiasts, and community members. They learned from leaders in the field, from their peers, and from nature in this once in a lifetime experience.

TERC helped sponsor MJ's participation in this unique and valuable experience.

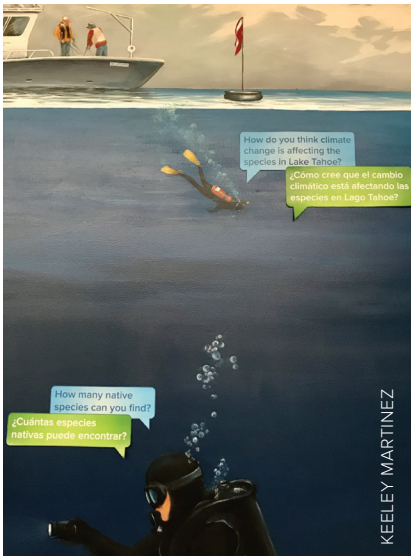
The women of the course sharing joy and camaraderie on the muddy waters of the Colorado River.

INCREASING ACCESSIBILITY IN THE SCIENCE CENTER

Following a thorough review of the Tahoe Science Center's current exhibitions, activities, and educational materials by the American Alliance of Museums, we are actively working to increase accessibility to younger children and other language speakers.

Summer intern Tess Fundter is working with Wyatt Grognet and Heather Segale from our education team, to increase accessibility, focusing specifically on increasing accommodations for Spanish-language speakers and encouraging the attendance of younger audiences beyond our current recommendation of children eight years and up. Accessibility includes anything that removes barriers that previously prevented any visitors from having equitable access to the Tahoe Science Center. Look for many of these new elements in summer 2023!

These accessibility improvements were funded by the Parasol Tahoe Community Foundation.



Discussion questions in both English and Spanish have been added around the Tahoe Science Center to spark conversations and increase engagement.

ANOTHER SUCCESSFUL SCIENCE EXPO

Science Expo was launched by TERC in 2007 as a single event in North Lake Tahoe and has since blossomed into a multi-day, bi-location event for students in North and South Lake. Each year, students in third-, fourth-, and fifth grade from the Tahoe and Truckee region come to enjoy hands-on science activities. More than 160 local high school students were trained and learned science at a deeper level in order to present activities to the younger students. The high school students enthusiastically led students through activities that included developing neurological technologies, tested students' knowledge of food chains, and furthered their understanding of the diversity of life.

The rotating themes include physical science, Earth and space science, and health and life science. This year's theme was health and life science with activities focused on organisms and ecosystems, health and nutrition, and inheritance and adaptation. TERC successfully brought 30 engaging activities to 1,216 elementary students.

Science Expo returned to South Lake Tahoe during the week of April 17–21 in partnership with Alissa Zertuche and Michelle McLean of the Lake Tahoe Unified School District who are part of the South Tahoe Environmental Education Coalition.

The North Lake Science Expo took place on May 18 and 19 at Incline Village High School through the support of Peter Fairley, an Incline High School science teacher. At North Lake, TERC reached 476 students with this science education event. The 2024 Science Expo theme will be physical science. Thank you to the teachers, high school students, and volunteers who supported this event in 2023. We look forward to working with you again in 2024!

A high school volunteer from Incline High School checks a students pupillary light reflex at a health science station.

WATERSHED AND CLIMATE-FRIENDLY GARDENING PRACTICES FOR LOCAL FOOD PRODUCTION

TERC hosted the first Grow Your Own Community Festival on June 2, 2023, at the UC Davis Tahoe City Field Station (TCFS) in collaboration with the UCCE Lake Tahoe Master Gardeners and Slow Food Lake Tahoe (SFLT).

More than 140 attendees had the opportunity to learn about TERC research, tour the Field Station, visit the Demonstration Garden, conduct water quality monitoring, and pick up pre-ordered plants. The Grow Your Own plants are part of a citizen science phenology project that examines plants varietals that are more likely to thrive considering our high elevation, unpredictable weather, and short growing season.

Garden experts from TERC, the Master Gardeners, SFLT, and Full Circle Compost were available to educate participants about watershed-friendly gardening practices and provide tips and tricks for Tahoe gardening success. Participants followed the TCFS Demonstration Garden pathway to visit with participating non-profit organizations including Sierra Nevada Alliance, GreenUP!, The Greenhouse Project, and Pet Network Humane Society. Food and beer were provided by MOGROG Food Truck and Tahoe National Brewery.

TERC began the Green Thumb Gardening program with docent and Master Gardener Dave Long in 2008. This program allowed residents of the Tahoe Basin to explore gardening at high elevation. The focus of these classes included lake-friendly gardening practices including the thoughtful application of fertilizers, irrigation, best management practices (BMPs), and composting. In 2020 through 2022, the gardening demonstrations moved to a virtual platform with over 500 attendees and an additional 2,858 views on YouTube. Now, the Grow Your Own program has expanded to include events in Tahoe City, South Lake Tahoe, and Truckee, educating a 590 participants at all three Grow Your Own events.

TERC docent Maggie Schumacher leads a water quailty and benthic macroinvertibate moniotring activity. This station was just one of many kid-friendly activities at the event.

TERC Education Program Manager and Master Gardener Alison Toy explains the best methods for growing leafy greens in the Tahoe-Truckee environment.

TERC AmeriCorps member Keeley Martinez and Tahoe Tessie take a break from office work for a quick yoga session. Using AR technology, users can creatively place Tahoe Tessie anywhere in their environment for a cool photo.

SNAP A PHOTO WITH TAHOE TESSIE THIS SUMMER!

Have you ever wanted to take a photo with Lake Tahoe's mythic monster, Tahoe Tessie? With UC Davis TERC's new app, Find Tahoe Tessie™, you can snap a photo with one of the many discoverable Tahoe Tessie animations at the beach, in the woods, or anywhere you like! If you submit your photo to UC Davis TERC, you could win prizes such as a trip out on the TERC research vessel or a Tahoe Tessie t-shirt.

The Find Tahoe Tessie™ app is TERC's latest endeavor to increase science learning and accessibility. Through a fun, interactive game, anyone can learn how climate change is affecting Lake Tahoe's aquatic ecosystem. As players progress through the app, they discover multiple animated Tahoe Tessies, which can be placed in the surrounding environment using novel Augmented Reality (AR) technology. Players can then snap a photo of Tahoe Tessie, as she does yoga, munches on aquatic plants, or plays with a beach ball. The photo contest is a fun way to promote the app, which aims to teach elementary students about how climate change is affecting Lake Tahoe's aquatic ecosystem.

Willie makes a friend while visiting the lake shore.

FUNDING FOR THIS APP GENEROUSLY PROVIDED BY:

INSTITUTE of Museum and Library SERVICES

HOW TO ENTER TO FIND TAHOE TESSIE PHOTO CONTEST

1. Take cool photo with of the many unlockable Tahoe Tessies in the Find Tahoe Tessie game. The more creative the better!

2. Email your submission to cmchenry@ucdavis.edu and include the photo/video, your name, Instagram handle (if applicable), permission to post on social media, and one or more facts you learned while playing the Find Tahoe app.

Visit our website https://tahoe.ucdavis.edu/findtahoetessie for more information

SCAN ME

Scan this QR code with a smartphone camera to download the Find Tahoe Tessie (TM) app!

STAFF UPDATES

TWO NEW AMERICORPS MEMBERS JOIN EDUCATION AND OUTREACH TEAM

If you've visited the Science Center or attended a TERC event in recent months, you've probably met Wyatt Grognet or Claire McHenry. Wyatt and Claire are the two newest additions to TERC's education and outreach team.

WYATT GROGNET

Wyatt Grognet is excited to be joining the education team here at TERC. He grew up in Tuolumne County and went to college at Cal Poly Humboldt, where he earned a bachelor's degree in Environmental Education. He has particular expertise in creating engaging, accessible interpretive signs for exhibits and displays. While at Humboldt, he participated in logging sports and joined the Marching Lumberjacks. After graduating, he spent a lot of time traveling across the western US and backpacking in the Sierras. He has called the Sierras home his whole life and is excited to have an opportunity to share his love for the mountains with others.

CLAIRE MCHENRY

Claire spent most of her childhood in Seattle, WA where she participated in multiple sports programs and art-based activities. In 2018 she moved to St. Paul, MN to attend Macalester College. At school, Claire played on the Macalester softball team and spent many hours sketching in her journal, crocheting clothing, and taking multiple camping trips throughout the state. She enjoyed learning about the impacts humans have made on the environment and especially studying hydrology and geomorphology. She majored in geology and minored in GIS. After college, she worked as a contractor at the USGS Wetland and Aquatic Research Center in Lafayette, LA. There, Claire studied the impact of sea level rise on saline and brackish marsh migration inland in the Gulf and Atlantic coasts. Claire is very excited to be back on the west coast and is involved in many of TERC's community-based education programs.

Wyatt Grognet is learning many new skills in his role at TERC, and aspires to secure a position as an interpretive ranger at a state park after completing his AmeriCorps term.

Claire McHenry is enjoying the experience of living in the Tahoe basin, and hopes to continue living and working in the area after her AmeriCorps term ends in September.

STAFF UPDATES

BRANT ALLEN RETIRES AFTER 35 YEARS OF SERVICE

After 35 years Brant Allen, boat captain, fisheries biologist and scientific diver, retired from TERC at the end of June. In his three decades of work at Lake Tahoe, Brant has studied and witnessed firsthand how lake clarity, productivity, and the food web have changed.

Brant has also seen how TERC has grown and evolved, including the transition from the Tahoe Research Group to TERC, and the construction of the Tahoe Center for Environmental Sciences and the renovation of TERC's Field Station (the historic fish hatchery). To recognize Brant's service to UC Davis, he was selected as the recipient of the 2023 Lifetime Achievement Stewardship award which celebrates his achievements and their significant and lasting impact on UC Davis.

Four days before his retirement, Brant gave a presentation at Granlibakken about his lifetime of science at Lake Tahoe, where he candidly reflected on what he's learned during his. His presentation included three distinct stories titled "A ménage a trois under Tahoe moonlight," "proof that size really does matter," and "how a little sewage can ruin a date night." Each story eloquently and hilariously demonstrated the value of scientific observations in understanding data. It is through the collection of data from a range of sources that a deep, scientific understanding of an ecosystem occurs.

While the entire TERC staff is sad to see Brant retire, we are equally excited for his next chapter. Brant and his wife are moving to Bend, Oregon where they look forward to enjoying all that central Oregon has to offer.

Thank you Brant for 35 years of service with UC Davis.

TERC researchers Scott Hackley and Brant Allen back in the early days of the Tahoe Research Group, circa 1990.

COMBINING SCIENCE, ART, AND ACCESSIBILITY IN FULL STEAM AHEAD

The Full STEAM (Science, Technology, Engineering, Art, and Math) Ahead event is a free, bilingual (Spanish + English) community, family-friendly event at Tahoe Backyard, Kings Beach. The event is scheduled for Friday, August 18, from 2:00 to 5:00 P.M.. This event will merge science and art with interactive stations designed to inspire creativity and critical thinking in participants of all ages and bring attention to the beauty of science. For those aged 21+, join Bear Belly Brewing for some beer pong and learn about the physics of the game with us!

This event features live music and is hosted by TERC, Chickadee Art Collective, Bear Belly Brewing, Tahoe Backyard, and many more. All activity stations will have instruction and signs in both English and Spanish. A Spanish interpreter will be present at most tables.

Full STEAM Ahead hopes to engaging students in science education and learning through various art activies.

SCIENCE SPEAKS LECTURE SERIES AT GRANLIBAKKEN!

After years of hosting TERC's monthly science lectures at the Tahoe Science Center in Incline Village, our Science Speaks Lecture series has a new venue. All our upcoming monthly science lectures will be held at Granlibakken in Tahoe City, making access easier for those living on the north and west shores. There are many exciting lectures planned for this summer, including the 2023 State of the Lake of Report, scheduled for July 20.

On August 10, Brother Guy Consolmagno, Director of the Vatican Observatory, is presenting "Deep Waters to Deep Space: Father Angelo Secchi's Amazing 19th Century Science". He will discuss the legacy of Father Angelo Secchi, founding director of the Vatican Observatory and inventor of the Secchi disk.

On August 31, renowned science fiction author Kim Stanley Robinson is presenting his newest book, "The High Sierra: A Love Story," which weaves the geologic history of the Sierra Nevada with Robinson's personal and intimate relationship to them.

Join us at Granlibakken for any or all of these lectures, and check out our upcoming events page for more information. https://tahoe.ucdavis.edu/events.

Father Angelo Secchi, founder of the Vatican Observatory, is also the inventor of the Secchi disk, an instrument used to measure clarity at Lake Tahoe since the 1960s.

UC DAVIS TERC BY THE NUMBERS

ONE **LAKE TAHOE**

6 DECADES
of monitoring lake health

2 SCIENCE CENTERS
Eriksson Education Center in Tahoe City, CA and Tahoe Science Center in Incline Village, NV

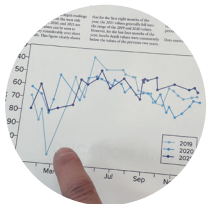
84
monitored forest plots

174,000+
people reached with educational programs

150+
graduate students

60+
annual field trips, serving **4,000+** students

600+
scientific publications



20 MILLION
data points collected annually

GIVING TO THE TAHOE ENVIRONMENTAL RESEARCH CENTER

Private Support is critical to continuing the Tahoe Environmental Research Center's legacy of groundbreaking work in restoring and sustaining Lake Tahoe. Gifts at every level support research, education and outreach, and give the flexibility to address emerging needs and opportunities. Every gift makes a difference and there are many ways to give. Thank you!

- o **YES**, I wish to support the Tahoe Environmental Research Center with the gift amount shown below.
- o Please contact me about how I can make a deferred or estate gift to UC Davis.
- o I wish this gift to remain anonymous.

Mail to: UC Davis Gift Administration
Attention: Office of Research (TERC)
202 Cousteau Place, Suite 185
Davis, CA 95618

All gifts are tax deductible. UC Davis is committed to providing excellent donor stewardship. To learn more about the University's gift policies, please visit http://giving.ucdavis.edu/ways-to-give/disclosures.

Science Sustainer

There are two easy options for giving:

1) Make a secure online gift at https://give.ucdavis.edu/TERC

2) Fill out the information below and mail with a check payable to UC Regents

Enclosed is my tax-deductible contribution.

Please make checks payable to UC Regents.

Name: _____

Spouse/Partner: _____

Address: _____

City, State, Zip: _____

Phone: _____

Gift Amount: _____

MAKE A GIFT TAX-FREE WITH AN IRA

- ☑ Do you want to support TERC's science at Lake Tahoe?
- ☑ Are you over 70 ½?
- ☑ Do you need all of your required minimum distribution from retirement assets?

» **Consider a gift via an IRA.** Visit http://plannedgiving.ucdavis.edu/ira-charitable-rollover for more details.