

# Tahoe

## UC DAVIS TAHOE ENVIRONMENTAL RESEARCH CENTER

WINTER 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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BRANDON BERRY

TERC researchers out on Lake Tahoe in incredibly poor air quality conditions during the Caldor Fire.

## RESEARCH UPDATES

### SMOKE AND ASH REPORT RELEASED

Every year across the west, large, high-intensity wildfires have become a reality of life. In recent decades, exacerbated by the effects of climate change, wildfires have grown in frequency and intensity. These new extreme fires are unprecedented, and many of their effects on the environment remain unknown and understudied.

When the Caldor fire began in 2021, a

diverse team of researchers representing five separate institutions (UC Davis, University of Nevada Reno, Desert Research Institute, US Geological Survey, and Miami University) recognized the opportunity to better understand the effects of smoke and ash on Lake Tahoe's ecosystem. There was a narrow window of opportunity to study these effects, forcing researchers to lobby for a "rapid response" study that would monitor impacts as they unfolded. In November 2022, the findings of this research were published.

## LETTER FROM THE DIRECTOR



**Geoffrey Schladow Ph.D., Director, UC Davis Tahoe Environmental Research Center**

If we learned anything in 2022, it was to expect the unexpected. After a great start to winter, January to March gave us the driest period on record for the Sierra Nevada. Summer, though not the hottest on record, was still far warmer than past summers. And just when we thought the drought would never end, the last week of 2022 and the first two weeks of 2023 saw an unprecedented number of storms impacting Tahoe and the entire western United States.

Very unexpectedly, we have seen major, new changes in the lake's biota during 2022. Nearshore algae, especially those that wash up and decompose on the lake's beaches, were present as never before. Beaches all around the lake were

impacted, fueling public outrage and concern about Lake Tahoe's future.

The most unexpected change of all to Lake Tahoe has been the disappearance of the *Mysis* shrimp, a crustacean that was introduced in the 1960s. This disappearance upended the very stable food web of Lake Tahoe. Why *Mysis* shrimp disappeared is a focus of our research, as is the chain of events that have followed. As expected, with the disappearance of *Mysis*, the zooplankton such as *Daphnia* and *Bosmina* have returned, and – in line with our scientific hypothesis – so has lake clarity. In an amazing turn of events, the clarity of Lake Tahoe in the last 6 months is at levels not seen in 40 years.

While long-term monitoring funding allows us to track the expected changes, it is not able to deal with the unexpected. Nearly all the unexpected events we have had the opportunity to discover and to study, were only possible because of the generosity of donors. They allowed researchers to spend long days and nights out on the lake. They helped provide paid summer internships for young, aspiring scientists who relish the life-altering experiences they can have at Tahoe. They allowed us to fund graduate students to test out new ideas and to develop new approaches to emerging issues.

And, as you would expect, this is all paying off in our rapidly evolving understanding of Lake Tahoe.

On behalf of all of us at TERC – our researchers, educators, students and staff – I wish to thank you for the unwavering and generous support you have given to the UC Davis Tahoe Environmental Research Center. For over 50 years UC Davis has led the research and the environmental science education education at Lake Tahoe, and provided decision makers and the general public with rigorous and unbiased science. With your help, we will continue to do that into the future.

## RESEARCH UPDATES *(Continued from Page 1)*

Researchers sought to measure how smoke and ash affect lake processes. Smoke indirectly impacts lake processes by altering the amount of sunlight that reaches the lake's surface. Ash directly influences various lake processes when it is deposited into the lake by reducing water clarity and adding nutrients.

Smoke carries fine particulate matter, which is deposited on the lake, resulting in cloudy water which increases light scattering and reduces overall clarity. TERC researchers found that measurements taken during and after the fire produced much lower clarity measurements. However, ash deposited during the fire only comprised 0.2% of the particles in the lake's surface water. As researchers studied the characteristics of ash deposited into the lake, they realized that there were significant differences in the quality of ash depending on where it was deposited. Although the south and east areas of the lake generally received more ash, the ash that was deposited in the north and west areas were higher in nutrients. Furthermore, these particles were rapidly cleared from the water through a combination of settling, consumption, or degradation.

While ash particles did not remain in Lake Tahoe for long, the increase of these particles and nutrients – along with the change in light conditions – had a significant impact on the production and composition of open-water algae. Under this wildfire-impacted light regime, the highest concentration of deep-water algae was



**Wildland firefighters working hard to control the Tamarack Fire, which burned south of Lake Tahoe at the same time as the Caldor Fire.**

found at much shallower depths in the lake. Moreover, researchers recorded the highest amount of open-water algal production on record, 20% higher than the previous highest record set in 2019. This is likely due to changing light conditions and the addition of nutrients into the lake from ash.

These changes had a cascading effect on the structure of the entire phytoplankton community. Lake Tahoe's phytoplankton community is normally dominated by diatoms, which are microscopic, silica-based algae. However, during the fire, researchers noticed cyanobacteria replaced diatoms as the dominant phytoplankton species. This could be attributed to the increase in nitrogen deposition from the ash, a finding that

was made from our research several years ago.

Although this project provides insight to the layering effects of wildfire on the lake ecosystem, it also fuels the need for further research. Implementing practices that adapt to our changing environment is not possible without solid, cutting-edge science. Data and science inform management decisions, and without the foundational knowledge provided by studies such as these, the best decisions on how to protect the health of Lake Tahoe cannot be made. Tackling these complex problems in the coming years will be challenging, but we are committed to producing the best science to help understand the world around us.

## RESEARCH UPDATES

### TRACKING THE SPREAD OF INVASIVE SPECIES AT SAND HARBOR STATE PARK

Asian clams were first observed in Lake Tahoe's aquatic ecosystem in 2002. Since then, their presence has wrought many negative consequences on the environment. After an isolated population of clams was discovered in Sand Harbor State Park in 2014, the Tahoe Regional Planning Agency, the Nevada Division of State Lands, and Marine Taxonomic Services conducted a multi-year project designed to eradicate the clams in the area using underwater rubber mats.

Following the conclusion of that effort, TERC conducted a comprehensive survey in the summer of 2021 to assess clam density throughout the

aquatic portion of Sand Harbor State Park. The survey revealed that viable clam populations had spread and were distributed throughout the entire survey area. However, densities were generally low with the exception of a few isolated areas.

One of the major concerns with Asian clams is that their metabolic byproducts (what they excrete) are known to stimulate metaphyton growth. Metaphyton are filamentous algae that grow together in large, unattached mats. If Asian clam populations continue to grow and spread, so too will metaphyton, potentially becoming nuisance algae on beaches in the area. Clam surveys will continue throughout next summer. In collaboration with the Nevada Division of State Lands, TERC will work toward a range of mitigation measures.



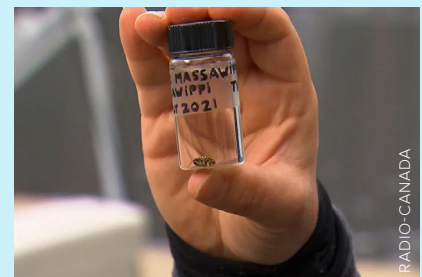
TERC researcher, Kian Bagheri, collects Asian clams during an underwater survey at Sand Harbor State Park.

### FIGHTING INVASIVE ZEBRA MUSSELS AT LAKE MASSAWIPPI, QUÉBEC, CANADA



Dr. Philippe-David Blanchette from Université de Sherbrooke in Québec, Canada.

Visiting researcher Dr. Philippe-David Blanchette, political scientist, and professor at Sherbrooke University, recently presented a public seminar at TERC on the efforts to assess and control zebra mussels in Lake Massawippi in eastern Canada. Strict surveillance protocols can help monitor the introduction of any invasive species. Early detection, scientific diving, modeling, and extraction are all ways to fight against an invasion. By learning about the efforts at other lakes around the world we can improve our success here at Lake Tahoe.



The zebra mussels collected in Lake Massawippi are still very young and small, giving scientists and conservationists hope that their spread can still be prevented.

## RESEARCH UPDATES



One of the thousands of helicopter images of the Lake Tahoe shoreline. Special thanks to Mike Bruno, helicopter pilot.

### USING AERIAL SURVEYS FOR MONITORING NEARSHORE ALGAE

This past summer, Lake Tahoe beaches were fouled by more algae than long-term researchers had ever seen in their careers. Monthly aerial surveys from a helicopter, flown by TERC Advisory Board member Mike Bruno, have allowed us to track the extent and seasonal changes of both periphyton and metaphyton. The instrumented helicopter captures thousands of images that allow researchers to locate hotspots and assess the spatial extent of algal blooms. After each flight, TERC staff and volunteers visit these locations to conduct physical surveys, collect samples, and “ground truth” what was seen from the air. This rapid

and spatially distributed approach to monitoring builds on the traditional method of monitoring where divers individually sampled a small number of locations around the shoreline of the lake.



Following aerial surveys, these ground truthing images were obtained near South Lake Tahoe (left) and Tahoe City (right).

In June 2022, the majority of algae near the shoreline were periphyton. These algae are attached to rocks and gravel and can often appear as yellow-brown stalks. They have been observed at Lake Tahoe for the last 30 years. What was different in 2022, were the vast areas covered by these algae and the thickness of the growth.

Nearshore algae blooms are a growing ecological threat to the lake, as well as a detriment to people’s enjoyment of the lake and shoreline. They seriously degrade water quality and cover large areas of the beach with mats of decomposing algae, and certain types of these algae are toxic.

By actively monitoring the spatial extent, type, and intensity of nearshore algal blooms, we can better understand the underlying causes of these blooms and develop appropriate mitigation measures. Learn more about our efforts to control algae at Lake Tahoe and how you can get involved by visiting <https://tahoe.ucdavis.edu/algae>



## RESEARCH UPDATES

### CLIMATE WARMING AND ALGAE GROWTH

Algal blooms have become an unwelcome presence in some places within Lake Tahoe. Algae can be unsightly when growing near shore, and smelly when it washes up on beaches. There is a perception that algal abundance has increased in recent decades, possibly fueled by increases in nutrient availability and water temperature.

This past summer, researchers concluded a study on how periphyton growth is responding to seasonal climate warming. Graduate student Nick Framsted conducted controlled lab experiments where periphyton samples collected from rocks around the lake were placed inside chambers. The effects of changes in water temperature and nutrient concentrations could be carefully controlled and measured.

Framsted found that algal rates of production and respiration are most sensitive to climate warming during late autumn through early spring. Based on the findings from this study, it is estimated that periphyton at Lake Tahoe may have increased by 9% as a result of climate warming of water temperatures.

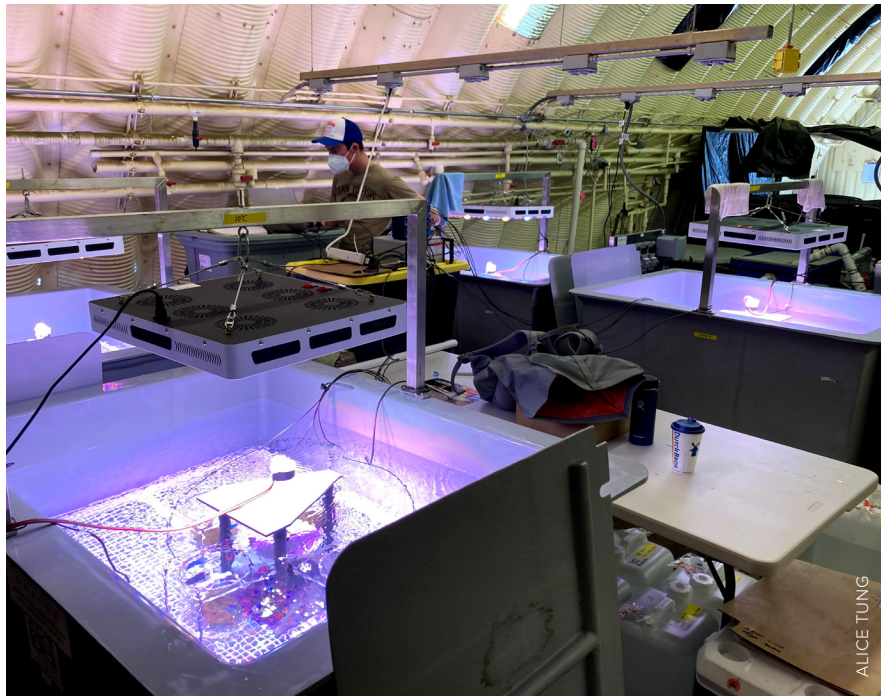
Studies such as this further our understanding of how our changing climate is impacting Lake Tahoe and other lakes in the Sierra.



Periphyton covering rocks on the shores of Lake Tahoe during a bloom in February 2022.



Scientists placed algae-covered rocks taken from the shores of Lake Tahoe into sealed plastic chambers to assess growth rates of the algae under controlled temperature and nutrient levels.



Algae samples are monitored under intense lights meant to simulate sunlight, which is necessary for plants to photosynthesize and harness the energy they need to survive.

## RESEARCH UPDATES

### TERC ON EVERY CONTINENT: COLLAPSE OF THE MILNE ICE SHELF

Climate warming is rapidly changing ecosystems across the globe. However, arctic regions are feeling the effects three to four times faster than the rest of the world. To understand and predict how the Arctic will respond to global warming, scientists across the globe are racing to study these rapidly unfolding changes.

One of these scientists is TERC researcher Dr. Alex Forrest, who spent the summer working in northern Canada, studying the effects of the collapse of the Milne Ice Shelf. The Milne Ice Shelf was one of Canada's last fully intact ice shelves until it collapsed in 2020. This past

summer marked the first time that researchers were able to return to the shelf since that collapse.

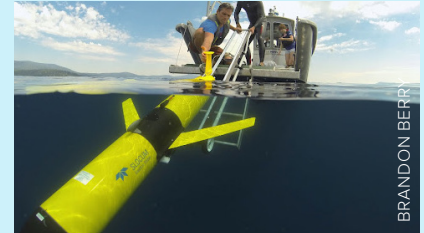
When researchers returned, they made a shocking discovery. Canada's last epishef lake, which had been supported by the ice shelf, had disappeared. Epishef lakes are a unique feature of arctic environments, formed when an ice shelf blocks the mouth of a fjord, creating a dam that traps freshwater. This freshwater accumulates and forms a lake that rests atop ocean water. The loss of this rare feature only reaffirms scientists' concerns about the effects of climate warming on arctic environments. Additional information can be found at:

<https://www.cbc.ca/news/canada/north/milne-ice-shelf-collapse-aftermath-video-1.6549807>



The last intact ice shelf in the Canadian Arctic has collapsed. The Milne Ice Shelf, which is situated in the Tuvaijuittuq marine protected area, is now adrift.

### FROM OCEANS TO LAKE – AUTONOMOUS UNDERWATER VEHICLES



TERC researchers Alex Forrest and Brant Allen release the Slocum Glider off the back of the Research Vessel Bob Richards.

Lake Tahoe provides an amazing lab to test out new equipment in an iconic location. These emerging technologies include underwater gliders as well as a range of autonomous underwater vehicles. Gliders, or buoyancy driven autonomous underwater vehicles, operate by shifting ballast from a rigid hull to an inflatable bladder. When the vehicle volume is at a minimum, it is heavier than water, it descends. When the bladder is inflated, and volume is increased, the vehicle rises through the water. By alternately increasing and decreasing the volume, a Glider can move up and down through the full depth of Lake Tahoe with almost no expenditure of energy. The direction of the vehicle's motion is controlled via tail rudder and data is transmitted via satellite datalink when the glider comes to the surface. A single battery charge is sufficient to power a glider for over 4 weeks. Instruments on-board the Glider allow for the measurement of important water quality variables such as water temperature, conductivity, turbidity, dissolved oxygen and chlorophyll.

## RESEARCH UPDATES

### TERC ON EVERY CONTINENT: HEAT TRANSFERRED BY OCEAN EDDIES ARE DESTABILIZING ANTARCTIC ICE SHELVES

Thousands of miles away from the arctic landscape of the Milne Ice shelf, the Antarctic landscape is also undergoing changes in response to our warming climate. One of the most concerning changes is the melt and retreat of Antarctica's coastal floating ice shelves. These ice shelves are situated at the end of glaciers, acting like buttresses to slow the rate of ice loss into the ocean. However, these floating ice shelves are becoming unstable in the wake of rising temperatures, raising concerns for the stability of the glaciers they support.

Drew Friedrichs, a Ph.D. candidate with UC Davis Civil & Environmental Engineering, is currently researching these changes. During the Antarctic summer of 2018/2019, Friedrichs was part of a team of researchers who traveled to Antarctica to study how heat was being transferred into the ice shelves. Heat is primarily transferred via ocean water. Ocean eddies transport warm surface water down under the ice shelves while simultaneously bringing cold water from the depths to the surface. Using data collected by autonomous underwater gliders, researchers discovered that this pattern of eddy-driven heat transport was destabilizing ice shelves by simultaneously melting

the thinnest ice and refreezing the thickest ice. This pattern of continuous melting and freezing exacerbates natural variations in ice shelf thickness, which scientists fear could result in the ice shelves breaking away from the glacier. While further research is

ongoing, the results of this study help fill in gaps in our understanding. For more information, visit:

<https://earthenvironmentcommunity.nature.com/posts/underwater-glider-observations-reveal-eddy-driven-heat-transport-near-an-antarctic-ice-shelf>



Zodiac-based operations near the Drygalski Ice Tongue in southern Terra Nova Bay.



Drew Friedrichs and Seung-Tae Yoon in Terra Nova Bay deploying the Slocum glider Stormy, equipped with a Rockland Scientific MicroRider, from the R/V Araon's zodiac.



## EDUCATION AND OUTREACH



Susie Alexander in the new Underwater Lake Tahoe Lounge at the UC Davis Tahoe Science Center.

### NEW UNDERWATER LAKE TAHOE LOUNGE AT THE UC DAVIS TAHOE SCIENCE CENTER

Stepping into the new “Underwater Lake Tahoe” exhibit at our Tahoe Science Center is enough to take your breath away or make you want to hold your breath as you immerse yourself in the underwater art by muralist Susie Alexander (@susiealexanderart). Alexander recently completed an artistic rendering of Lake Tahoe’s underwater habitat and the aquatic organisms that can be found there. The TERC education team created an accompanying scavenger hunt that will guide visitors through the many species hidden in the mural while also telling the unique stories of each organism.

The mural project is part of a larger Institute of Museum and Library Services grant-funded project to teach about climate change and aquatic ecosystems. Additional

FUNDING FOR THIS PROJECT GENEROUSLY PROVIDED BY:



elements including videos, activities, and augmented reality features will be added in the coming months, with funding from the Parosol Tahoe Community Foundation.



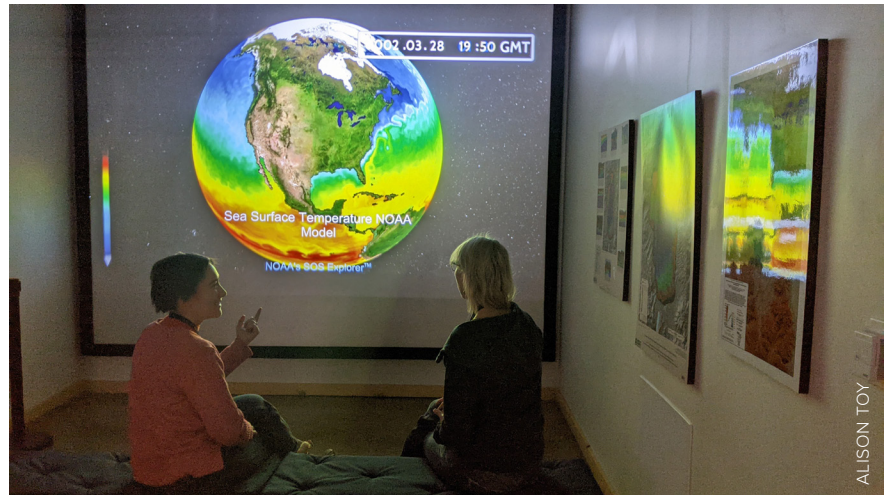
TERC is developing Augmented Reality models of the Lake Tahoe aquatic species for the future Augmented Reality “Underwater Lake Tahoe” exhibit in the Lounge.

## EDUCATION AND OUTREACH

### NEW EXHIBIT: SCIENCE ON A SPHERE EXPLORER

There's a new, exciting exhibit at the science center! Through funding from the Teichert Foundation and Gellert Family Foundation, TERC recently purchased NOAA's Science on a Sphere Explorer (SOSx) software.

The Science on a Sphere Explorer exhibit allows TERC to display animated images such as earthquakes, atmospheric storms, and climate change data to display environmental processes in an intuitive and captivating way. TERC has already begun using the Science on a Sphere Explorer content in our school field trips and students were engaged with the visualizations and data presentation of earthquakes and changing Earth temperatures. The exhibit is also available as part of our regular public tours. If you haven't visited for a while, a lot has changed. Stop by for a visit!



Keeley Martinez and Heather Segale checking out the new Science on a Sphere Explorer exhibits in the 3-D Theater.



Keeley Martinez and Heather Segale checking out the new Science on a Sphere Explorer exhibits on the large monitor in the Tahoe Science Center.

### EXHIBIT SUPPORTED BY FUNDING FROM:



## EDUCATION AND OUTREACH



Tahoe Tessie isn't real, but climate change is! Using augmented reality (AR) technology, players can place Tahoe Tessie almost anywhere in the world.

### TAHOE TESSIE IS HERE TO TEACH ABOUT THE EFFECTS OF CLIMATE CHANGE

After over a year of planning and development, TERC's new "Find Tahoe Tessie" app is ready to make its debut! Find Tahoe Tessie is an Augmented Reality (AR) gaming app which places the mythical Tahoe Tessie in and around Lake Tahoe. While using the app, players become scientists and throughout the game find scientific tools that can be used for lake experiments, explore Tahoe through local excursions, and apply scientific knowledge that will help find Tahoe Tessie. There are many scientific

#### FUNDING FOR THIS APP GENEROUSLY PROVIDED BY:

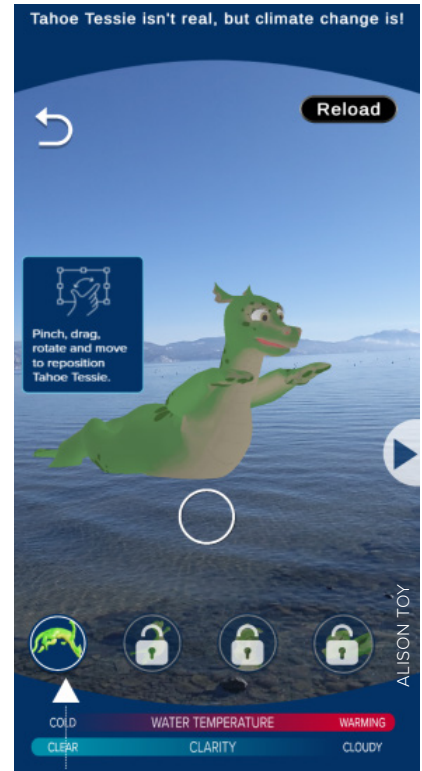


discoveries to be made throughout this app and while this fun is for the entire family, our learning objectives target students in the third to fifth-grade range.

Use your phone to capture (a photo) of Tahoe Tessie thriving in Lake Tahoe, share content on social media, and learn about the impacts of climate change on the lake, on Tahoe Tessie, and on other aquatic organisms.



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



"Swimming Tahoe Tessie" is one of the many different types of Tessies that players can unlock while playing the game.



## EDUCATION AND OUTREACH

### UPDATED VIDEO EXHIBITS AVAILABLE AT THE TAHOE SCIENCE CENTER

UC Davis installed seven new video exhibits in the permanent exhibits of the Tahoe Science Center. The original videos were produced in 2006, so there was a pressing need to include all the new scientific understanding that has been accrued since that time.

You can learn what makes Lake Tahoe unique, embark on the UC Davis Research Vessel, and see the changes in our watershed at the Virtual Research Vessel. In the Virtual Lab you can find out who lives in Lake Tahoe, discover the impacts of invasive species, get the big story behind the tiniest particles, and help decide the future of Tahoe forests.

Funding for the video exhibit equipment and updated videos was provided by generous support from private donors, the Parasol Tahoe Community Foundation, and the Tahoe Truckee Community Foundation.



Three new updated videos on the “Virtual Research Vessel” exhibit at the UC Davis Tahoe Science Center.



Four new updated videos on the “Virtual Laboratory” exhibit at the UC Davis Tahoe Science Center.

FUNDING FOR THIS EXHIBIT GENEROUSLY PROVIDED BY:



## EDUCATION AND OUTREACH

### LEARNING THE ART OF INTERPRETATION

In November and December, the TERC education and outreach staff alongside many volunteer docents had the opportunity to participate in a four-day Certified Interpretive Guide training through the National Association of Interpretation. According to the official NAI website, “Interpreters connect visitors to important natural, cultural, and historical resources at parks, nature centers, historical sites, aquariums, zoos, and anywhere that people come to learn about places.” Interpretive guides are found across many different professional fields, including teachers, park rangers, and volunteers.

During the course, participants were introduced to the basic principles of interpretation and taught how to apply these principles. Since many of the workshop participants are involved with the Tahoe Science Center, we

hope that the skills learned during this workshop will improve current and future education programs by helping visitors connect to Lake Tahoe on a deeper level. Special thanks to Stephanie Ambrosia for leading an incredible workshop!



**This workshop is part of the National Association for Interpretation (NAI) certification programs. At the end of the workshop, many participants officially became certified interpretive guides.**



**Workshop participants of the third day of instruction. Each person learned something valuable from the course.**

### TILDEN'S PRINCIPLES OF INTERPRETATION

Freeman Tilden is considered one of the most influential figures of modern interpretation. In 1957, he published “Interpreting Our Heritage,” which included six principles that he regarded as essential for effective interpretation.

1. Any interpretation that does not somehow relate what is being displayed or described to something within the personality or experience of the visitor will be sterile.
2. Information, as such, is not Interpretation. Interpretation is revelation based upon information. But they are entirely different things. However all interpretation includes information.
3. Interpretation is an art, which combines many arts, whether the materials presented are scientific, historical or architectural. Any art is in some degree teachable.
4. The chief aim of Interpretation is not instruction, but provocation.
5. Interpretation should aim to present a whole rather than a part, and must address itself to the whole [person] rather than any phase.
6. Interpretation addressed to children (say up to the age of twelve) should not be a dilution of the presentation to adults, but should follow a fundamentally different approach. To be at its best it will require a separate program.

## EDUCATION AND OUTREACH

### TERC CIRC 2

To celebrate the summer beauty of Lake Tahoe and raise awareness of threats to the lake, TERC sponsored the second annual Circumnavigation of Lake Tahoe for Science, a seven-day kayaking journey affectionately referred to as TERC CIRC.

Paddlers had the option to choose up to seven separate day trip segments of 6-13 miles of spectacular shoreline paddling through the blue waters of the lake. The event ran from June 20 to June 26, 2022 and offered a unique opportunity to connect with the lake, learn from TERC scientists discussing

the latest research, collect science measurements on the journey, and feel the spirit of camaraderie with like-minded paddlers. According to Geoffrey Schladow, TERC's director, "The best way to truly understand the fragile beauty of Lake Tahoe is to be on the water in a kayak and slowly progress around the shore. Every part of the lake is unique, and they all have different challenges."

TERC is eagerly in the process of plans for TERC CIRC 3, scheduled for June 19-25, 2023. Visit the <https://tahoe.ucdavis.edu/events> for more information.



Participants ready their kayaks for a day of adventure and learning during TERC CIRC 2.

### LIFE AND HEALTH SCIENCE FOCUS OF 2023 SCIENCE EXPO

Science Expo includes hands-on science activities for upper-elementary school students from the greater Lake Tahoe and Truckee Region. This annual event is designed to increase student excitement and interest in science through interactive, hands-on activities, games, and demonstrations. In 2022, after a 2-year hiatus, local students were welcomed to Incline High School for a return to an in-person Science Expo.

The TERC education team is once again extending Science Expo to include dates for South Tahoe students on April 17-21, 2023, at South Tahoe High School. The South Tahoe program will be sponsored by the South Tahoe High School Career

Technical Education. North Tahoe and Truckee students are invited to return to Incline High School the week of May 15-19, 2023.

The 2023 event will include 30 Life and Health Science activities covering

topics from the themes of Organisms and Ecosystems, Inheritance and Adaptation, Health and Nutrition. Interested teachers and volunteers should contact Keeley Martinez at [kcmart@ucdavis.edu](mailto:kcmart@ucdavis.edu).



Elementary students visit Incline High School in 2022 for Science Expo with a focus on Earth and Space Science.

## TERC TEAM UPDATES

### ERIC YOUNG

Erik Young is a recent addition to TERC's scientific team. Erik works as a staff research associate providing field support for a range of projects with a long-term focus on sensor development and environmental robotics. He is currently leading the bathymetric survey of Clear Lake, believed to be the oldest lake in North America. Erik has a background in hydrology (BSc) and environmental geochemistry (MSc).

"I'm still working on my first project, which is collecting bathymetric and sidescan sonar data in Clear Lake, CA, to improve the accuracy of our numerical models and to provide insight into lakebed characteristics. I am looking forward to working with our AUVs and gliders, and I would like to work some numerical modeling into my position in the future as well."



Eric Young braves the cold of Lake Tahoe to gather data for one of TERC's many ongoing reserach projects.

### HELEN FILLMORE

Helen Fillmore is one of TERC's newest staff members and a part of our chemistry team. She analyzes water samples for nutrients and has been working on the primary productivity study, a decades-long project. Primary productivity, or the rate at which algae grow, has increased by 500% since the 1960s, and Helen has been instrumental in finally unravelling the reasons why this has occurred. "This is a really challenging project and we've really had to put our heads together to navigate some significant transitional hurdles and work to maintain the 60+ year dataset," said Helen Fillmore.

A member of the Washoe nation, Helen is working hard to ensure that the work TERC does has impact and relevance for all members of the community. "I want people to know that there are paths for Indigenous kids to become scientists and to work in their homelands, but it takes a community that offers help and opportunities along the way. I'm really grateful for all the people who helped me get to this chapter of my career. This year with TERC has been a dream come true in unexpected ways."



Helen Fillmore aboard the UC Davis Research Vessel collecting samples for Primary Productivity analysis of Lake Tahoe.

### KEELEY MARTINEZ

Keeley Martinez is TERC's newest AmeriCorps member. While Keeley is new to living in the Tahoe basin, she harbors a lifelong love of the Sierras. Raised in Nevada City surrounded by forests and wilderness, she developed a love and appreciation for the natural environment at an early age. She pursued her passion for environmental conservation in college and graduated from Cal Poly, San Luis Obispo, where she majored in Environmental Management and Protection. During her time at Cal Poly, she worked as a lab assistant in a soil lab where she assisted two separate research projects. After graduation, she worked as a soil technician for the US Forest Service in Montana before moving back to California.

At TERC, she is in charge of the science center's social media and marketing strategies. She is also the special events coordinator and in charge of exhibit maintenance. As the point person on the education team for writing and editing, she also helped organize this newsletter.



Keeley Martinez is thrilled to spend the next 10 months living and working at Lake Tahoe.

## UPCOMING AND PAST EVENTS

### TAHOE FILM FEST (DEC. 1 – 4, 2022)

And that's a wrap! The Tahoe Film Fest finished its eighth year on December 4, 2022, after a weekend of fun, thought-provoking films from around the world. VIPs including Amy Redford, director of "What Comes Around," and Prudence Brando, director of "Head," were in attendance presenting their films, watching films, and attending

the parties held each evening at the Crystal Bay Club alongside Tahoe locals. If you haven't attended the Tahoe Film Fest before, you should put it on your calendar for the first weekend of December 2023. Or if you are looking for some great films, check out <https://tahoefilmfest.com/>. Several of the films hosted at this year's Tahoe Film Fest were recently nominated for awards.



"Pretty Problems," one of the films from the Tahoe Film Fest was shown at Northstar Cinema.



Tahoe Film Fest was held at Incline Cinema, Northstar Cinema, and Crystal Bay Club (shown).

## UPCOMING EVENTS

**Feb 9, 2023:** Why is a third of food wasted worldwide?, with Dr. Ned Spang, UC Davis Food Science and Technology

**Mar 23, 2023:** Attraction and Relationships, with Dr. Paul Eastwick, UC Davis Attraction and Relationships Research Lab

**April 17 – 21, 2023:** Science Expo at South Lake Tahoe High School

**April 27, 2023:** Managing water during California's wild changes in climate, with Dr. Jeffrey Mount, UC Davis Center for Watershed Sciences

**May 15 – 19, 2023:** Science Expo at Incline High School

**May 18, 2023:** The Last Ice Area with Dr. Warwick Vincent, Université Laval in Québec, Canada

**Jun 1, 2023:** Psychedelics May Offer New Treatments for Depression, Related Disorders, with Dr. David Olson, UC Davis Chemistry and Biochemistry and Molecular Medicine

**June 13:** A Lifetime of Science at Lake Tahoe, with Brant Allen, UC Davis TERC

**Jun 19 – 25, 2023:** TERC CIRC(umnavigation) of Lake Tahoe

**June dates TBD:** Become a Tahoe Expert Workshops

**July 20, 2023:** State of the Lake, with Dr. Geoff Schladow, director of UC Davis TERC

**August 31, 2023:** The High Sierra: A Love Story, with American science fiction writer Kim Stanley Robinson

**For more information:** <https://taho.ucdavis.edu/events/>



UC DAVIS TERC BY THE NUMBERS

**6** DECADES OF MONITORING LAKE HEALTH



OVER ONE-HUNDRED FIFTY



GRADUATE STUDENTS

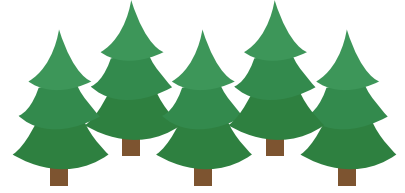
OVER

**600**

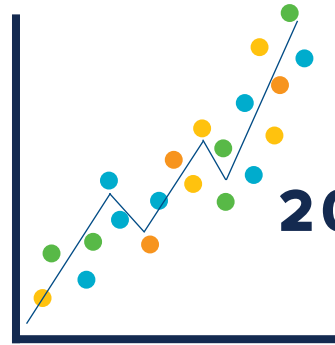


SCIENTIFIC PUBLICATIONS

**84**



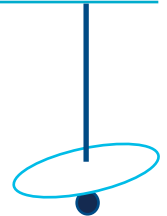
MONITORED FOREST PLOTS ARE HELPING US UNDERSTAND FOREST RESILIENCE



ADVANCED TECHNOLOGIES COLLECTING **20 MILLION** DATA POINTS ANNUALLY

**THOUSANDS**

OF CLARITY AND WATER QUALITY SAMPLES MEASURED

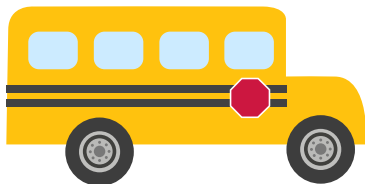


**EIGHTY**

SCHOOL FIELD TRIPS

**TWO THOUSAND**

STUDENTS REACHED ANNUALLY



**172,000**



PEOPLE REACHED BY EDUCATIONAL PROGRAMS

2 SCIENCE CENTERS AROUND



Tahoe City, CA



Incline Village, NV

**LAKE TAHOE**

## 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!

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

Mail to: UC Davis Tahoe Environmental Research Center  
Watershed Sciences Building  
One Shields Avenue  
Davis, CA 95616-8527

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### 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: \_\_\_\_\_

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## 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.