# Jasper Ridge Biological Preserve

Annual Report 2022-23

# Mission and Values

## Land Acknowledgement

We recognize that Jasper Ridge Biological Preserve sits on the ancestral land of the Muwekma Ohlone Tribe. This land was and continues to be of great importance to the Ohlone people. Consistent with our values of community and inclusion, we have a responsibility to acknowledge, honor, and make visible the University's relationship to Native peoples.

This acknowledgment has been developed in collaboration with the Muwekma Ohlone Tribe. A full version of the Land Acknowledgement for Stanford University authored by the Muwekma Ohlone tribe is posted inside the Leslie Shao-ming Sun Field Station.

## Mission

To contribute to the understanding of the Earth's natural systems through research, education, and the protection of the preserve's resources.

## Vision

To be a leader for innovation in research, education, and communication on natural systems, through providing an interdisciplinary, cross-cultural, and place-based training ground for effective Earth stewardship by our community and the next generations of global leaders.

## Pledge

To be a safe and welcoming place for discovery, discussion, and community for people of all cultures and identities.

*Above. Cedar waxwing (Bonbycillidae). Credit: Peter and Diane Hart*

*Title page. Macro of moss (Mniaceae). Credit: Robert Siegel*

# Contents



*Bobcat (Lynx rufus). Credit: Jeff Schwegman*

# From the Directors

## Elizabeth Hadly, Outgoing Faculty Director

As a scientist who studies the impacts of global change on biodiversity in natural areas around the world, I have found the research and teaching horizons at Jasper Ridge Biological Preserve to be unparalleled. The place-based opportunities for integration of ideas across disciplines—from history to music to geochemistry to food webs to palynology, for example—have been thrilling to me and speak to what I know about our global challenges: no single discipline will solve them. The challenges facing Jasper Ridge are the same as those facing our 'wildlands' around the world: climate change, habitat degradation, pollution, invasive species and pathogens, biodiversity loss, and the increased human footprint. So, during my tenure as Faculty Director, my philosophy has been that if we can do it at Jasper Ridge, we can do it anywhere. Indeed, the diverse research that the preserve continues to support has proven that—from uncovering the first principles of ecosystem function to helping to define a whole new epoch in earth history, the Anthropocene.

It's been such a pleasure to work with our phenomenal staff, some with decades of experience and some new faces, each of whom brings a novel skillset, yet all of whom are so talented, helpful, and essential in facilitating the academic work of research and teaching, in no small part because they are quintessential natural historians. I've witnessed amazing things our staff have made happen, not only while I was director, but over my entire two decades-plus of working at JRBP. It's with deep appreciation I say, 'Thank You!' to all of them, past and present. The other superpower of JRBP is the energy and expertise—in aggregate, centuries of knowledge—so generously shared by our docents and other community members. Your curiosity, dedication, knowledge, networking, and character has made this place sing for me as a professor. The life-long learners that you are and strive to be invigorates Jasper Ridge and makes me optimistic about the future of this place and of the world. So, thanks to all of you who have taught me much about how to act as a planetary steward and how to live a life of purpose. I will miss my official roles at JRBP, but I am looking forward to continuing to cross paths with you on Jasper Ridge trails.

*Elizabeth Hadly. Credit: JRBP Staff*

*Ash-throated flycatcher (Myiarchus cinerascens). Credit: Jeff Schwegman*

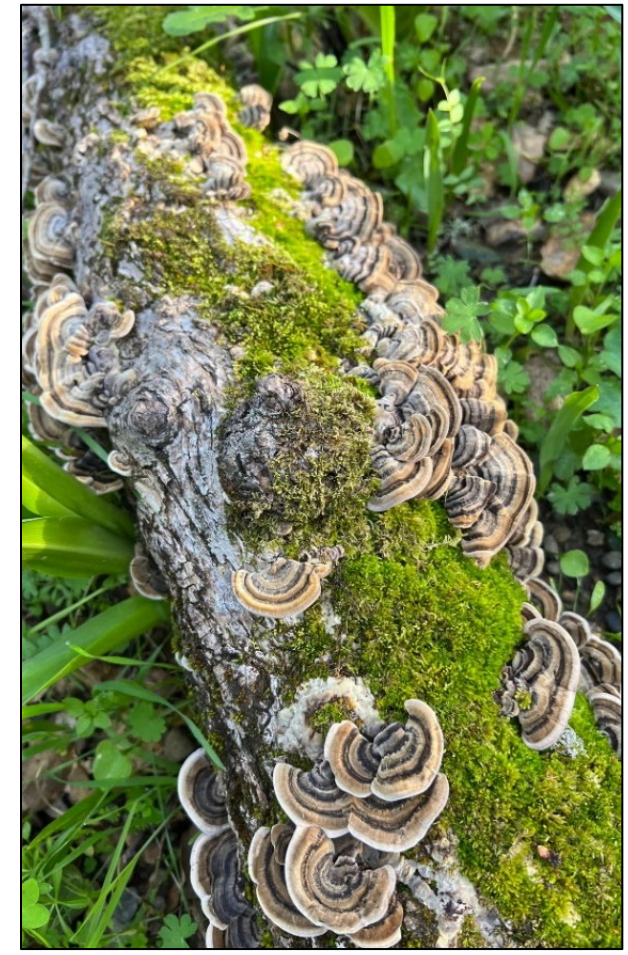
## Tadashi Fukami, Incoming Faculty Director

Since my move to Stanford in 2008, much of my research and teaching has been possible only because of Jasper Ridge Biological Preserve as well as the amazing students, postdocs, faculty, staff, and docents I got to work with there. I am grateful for the opportunity to give back to this community in my new role as Faculty Director. Elizabeth Hadly has done so much for Jasper Ridge, for which she deserves special recognition. I am excited to pick up the baton from her, and to work with everyone to make the most of Jasper Ridge, and push towards a deeper understanding of Earth's natural systems. Jasper Ridge's three mission pillars are research, education, and stewardship. I believe these goals can be more effectively achieved when approached synergistically, rather than separately. I hope to support more integrative work involving multiple pillars. Another emphasis I hope to foster is seeing Jasper Ridge not only as a place to observe nature, but also to learn how to be part of it. Current environmental issues have arisen because we have become too globally connected and forgotten that humans are an inseparable part of local nature. It is for this reason that I believe bringing the local Indigenous knowledge to the forefront of what we do at Jasper Ridge is important. Western science is a powerful tool, but it is no substitute for the intimate knowledge that Indigenous people developed about the local environment over many generations. We need both for "two-eyed seeing," viewing the world from both Indigenous and Western perspectives. I hope to encourage more research, education, and stewardship from this viewpoint. But most of all, I hope to be a good listener, particularly during this first year of my directorship, to learn from everyone, new and old, about their thoughts on this remarkable piece of land.

*Top: Photo of Tadashi Fukami. Credit: Callie Chappell*
*Left: Chrysalis of variable checkerspot butterfly (Euphydryas chalcedona) on Sticky monkeyflower (Diplacus aurantiacus). Credit: Dan Quinn*

## Jorge Ramos, Executive Director

As Jasper Ridge Biological Preserve celebrates its 50th anniversary, I am humbled by the many people that have come before and built not only the facilities but also the many long-term programs that continue to support our mission: **To contribute to the understanding of the Earth's natural systems through research, education, and stewardship of the preserve's ecosystems**. Months ago, thanks to Nona Chiariello and Dawn Neisser and the Oakmead Herbarium digitization project, I assisted in photographing a plant specimen collected in 1961 by one of the foundational naturalists of Jasper Ridge: Herb J. Dengler. Digitizing this 62-year-old plant voucher so that others worldwide can now use it for research, education and stewardship projects, represents the new chapter Jasper Ridge is about to enter. In the next decade, Jasper Ridge will undergo many large-scale disturbances resulting from our wildfire fuel-management efforts and the Searsville Watershed Restoration Project that will disrupt some of our ecosystems. And just like the digitization project, we are utilizing and learning from past efforts of our research, education, and stewardship pillars to prepare for these disturbances. For example, we are introducing the disturbances to many researchers so they can explore new questions and hypotheses; hired Dr. Katherine Glover to explore new educational experiences around these disturbances; and with Tad Fukami as our new faculty director, we will be bringing local Indigenous knowledge to the forefront of what we do at Jasper Ridge. The great work done in the past by many is the foundation to help us prepare for the future. Please join me and the rest of the staff at Jasper Ridge as we enter this new chapter. I promise it will be a very exciting time here at Jasper Ridge!



*Above: Jorge Ramos. Credit: JRBP Staff.*
*Right: Turkey tail (Trametes versicolor). Credit: Larisa Fong*
*Opposite: Pacific tree frog (Pseudacris regilla). Credit: Robert Siegel*

# Education and Outreach

We've had exciting changes and accomplishments at Jasper Ridge for our education and outreach pillar. Dr. Katherine Glover officially joined the Jasper Ridge team in June as the new Associate Director of Environmental Education. Katie has 15 years' experience teaching students at many levels and types of institutions, and a background in historic ecosystems and plant communities of California. She looks forward to incorporating her knowledge of fire ecology and data science skills into her teaching and mentoring activities at Jasper Ridge. She replaces Dr. Jorge Ramos, now Executive Director. Jorge was recently recognized for his extensive contribution to the role by the Ecological Society of America. Jorge accepted the Eugene P. Odum Award for Excellence in Ecology Education at the ESA Annual Meeting in Portland, Oregon in August. Our dedicated Continuing Education group led diverse programming for our docent community. We look forward to how these changes, accomplishments, and programs will continue to shape learning experiences for visitors of all kinds here at Jasper Ridge.

*California newt (Taricha torosa). Credit: Jeff Schwegman*

Stanford classes can't get enough of Jasper Ridge! We had 31 different classes from a wide range of disciplines visit us last year, representing a record 42 Stanford-affiliated departments, programs, and student organizations. We hosted members of the Stanford community from all seven schools and SLAC for walking tours, retreats, and events. Our reach extended to Business, Education, Engineering, Humanities and Sciences, Law, Medicine, and the Doerr School of Sustainability.

Rodolfo Dirzo and Jorge Ramos, with TAs Ben Hodder and Lindsay Filgas, spearheaded the 48th docent training class during the Winter and Spring quarters of 2023! Each of the teaching days for BIO/ESYS 105 "Ecology and Natural History of Jasper Ridge" included providing theoretical background, then hands-on and experiential learning field activities at Jasper Ridge. We are very grateful to all who contributed to our multidisciplinary curriculum: Steven Gomez, Alan Launer, Sheena Sidhu, Scott Fendorf, Laura Jones, Richard Nevle, Katherine Preston, Stuart Koretz, Nona Chiariello, Katie LaBarbera, and Trevor Hébert. Thank you all for conveying your knowledge and passion for Jasper Ridge. This year's

graduating class of Jasper Ridge docents includes Natasha Batista, Kelly Benitez, Zoe Colloredo-Mansfeld, Larisa Fong, Chrysanthe Frangos, Kit Gordon, Tanvi Gupta, Bennie Hesser, Jonathan Howell, Bohdan Kamets, Weston Kirk, Mahina Kaomea, Aisling Murran, Zander Opperman, Diego Perez, Anika Quon, George Rojano, Sydney Schmitter, Thomas Schnaubelt, and Lizbeth Zambrano-Sanchez.

Evening lectures this past year enriched the knowledge of our community and showcased our three pillars of placed-based education, stewardship and research. Staff Scientist Sheena Sidhu discussed how local management and research can be applied to fuel management and restoration of the Searsville Watershed here at Jasper Ridge. Chad Wilsey, Vice President and Chief Scientist with the National Audubon Society shared several of Audubon's current initiatives and the new Bird Migration Explorer platform. Stanford Associate Professor Kabir G. Peay discussed his ongoing research program to understand how tree-fungi interactions shape the biogeography of forests. Senior Archaeologist Garrett Trask presented the preliminary findings of archeological research on the Zoology Cabin, which was built over 100 years ago on Jasper Ridge. Bill Leikam shared 10+ years of observation and study of the life cycle of the urban gray fox. Research Scientist Allison Stegner presented recent findings from a study on the Searsville Lake sediment core, linking vegetation history from pollen analysis and other geochemical markers to written history. In our last evening lecture for the academic year, Michael Wilcox gave an overview of California's Indigenous history and contemporary lifeways.

Collaborations with colleges and universities included the inaugural year of the National Science Foundation grant "San Francisco Bay Research Coordination Network for Student Opportunities in Avian Research to Enhance STEM Education (SOAR)." This five-year study aims to connect resources and grow student opportunities in fieldwork and experiential learning across a broad network of universities, colleges, and NGOs in the San Francisco Bay Area. The SOAR network includes Stanford, San Jose State University, Santa Clara University, Mission College, West Valley College, San Francisco Bay Bird Observatory, UC Santa Cruz Doris Duke Program, iNaturalist, and eBird. One of our key focuses during year 1 has been connecting students to ornithology data to build data analysis skills and field opportunities in their coursework.


*Julian Tattoni's bird-banding research. Credit: Peter Hart*

We continued to support visits and learning opportunities for Ohlone College faculty and students, including student inquiries with datasets collected from Jasper Ridge bat populations. Additionally, Jorge Ramos represented and co-organized two BioBlitzes with several partners during the SACNAS 2022 National Diversity in STEM conference in Puerto Rico. These activities exposed hundreds of first-generation students to data collection methods, natural history observation and new potential careers in the field of ecology.

Middle and high school visits included students from Menlo Atherton High School, Woodside High School, and Redwood City High School. Now in its 18th year, the REAL SEEDS program continues to connect the Stanford SEEDS chapter with Redwood High School's Redwood Environmental Academy of Leadership (REAL). Thanks to teacher Chris Beetley-Hagler, local SEEDS chapter leader Chrysanthe Nicole Frangos, and docents Esther Tok and Sriram R. Narasimhan for supporting this long-term partnership!

Our outreach continues to extend to numerous organizations and partners, with activities that encompass our education, research, and stewardship pillars. Over the past year, our programming connected with organizations like Bay Nature Magazine, Botany Buds, California Academy of Sciences, California Native Plant Society, California Department of Fish and Wildlife, Carnegie Institution for Science, Coast Ridge Ecology, Ecological Society of America, Golden Gate Biodiversity Network, Grassroots Ecology California Naturalist Class alumni, Happy Trails Hiking Group, iNaturalist, Latino Outdoors, Mid-Peninsula League, Mountain View Masters Swim Team, Save the Redwoods League, Santa Cruz Mountains Stewardship Network, Sequoia Audubon Society, Society of Children's Books Writers and Illustrators, Society for the Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS), and the UCSC Doris Duke Conservation Scholars Program.

## Continuing Education

Gary Nielsen continues to lead the Continuing Education efforts with a dedicated team of volunteers. Winter started with an update for the Searsville Watershed Restoration Project, and the spring wildflower walk continues to be a popular recurring event. The Galls of Jasper Ridge event drew interest from a group of over 20 in the spring, including another group that ventured out to explore galls at the end of summer.

*Dr. Merav Vonshak leads an exploration for galls. Credit: Alice Cummings*


*BIO/ESYS 105 GRADUATION, JUNE 2023. Credit: JRBP Staff*

# New Research

**AyoOluwateso Coker, Devaki Bhaya, Scott Fendorf** (Earth System Science, Carnegie Biosphere Sciences & Engineering) Sediment inputs and algal blooms in Searsville Reservoir

**Rodolfo Dirzo, Kathleen LaBarbera, Brody Sandel, Lynne Trulio** (Stanford, San Francisco Bay Bird Observatory, Santa Clara University, San Jose State University) San Francisco Bay Research Coordination Network for Student Opportunities in Avian Research (SOAR) to enhance STEM education and assess human impacts on avian biodiversity

**Alyssa Fong, Kirsten Verster, Elizabeth Hadly** (Biology, Earth System Science) Detection of mosquito biocides in sediment cores from Searsville Reservoir

**Chrysanthe Nicole Frangos, Rodolfo Dirzo** (Earth System Science, Biology) Long-term impacts of nurse plants on sapling growth and position in California oak savannas

**Kiara Fufunan, Sheena Sidhu, Jan Hintermeister, Vivian Neou** (Biology, JRBP) Jasper Ridge butterfly assemblage: implications for stewardship and conservation

**Lau Gherardi, Jorge Ramos** (UC Berkeley, JRBP) Disturbance and Resources Across Global Grasslands: a DRAGNet site at Jasper Ridge

**Bill Gomez, Sheena Sidhu** (JRBP) Camera trap monitoring of woodrat nest activity in fuel reduction areas

**Mel Guo, Elliott White** (Earth System Science) Remote sensing analysis of Searsville Lake wetlands

**Leo Hollberg, Alison Hoyt, Newton Nguyen, Katrina Magno, Cassandra Raen Borthwick Huff, Liam Patrick Harrison, Olivia Walsh** (Physics, Geophysics, Earth System Science, Electrical Engineering) Extended-path optical sensors for continuous cost-effective methane monitoring

**Daniel Kang, Timothy Dai, Trevor Hébert** (University of Illinois, Urbana-Champaign, JRBP) AI identification of birds as "bycatch" in acoustic bat recordings

**Sophie Meunier, Paul Markley, Barnabas Daru** (Biology) Collection of major plant clades in support of herbarium research on plant microbial symbionts

**Alireza Namayandeh, Scott Fendorf** (Earth System Science) Effects of soil nanoparticles on Cr(VI) formation from wildfires

**Dawn Neisser, Annabel Li, Danny Argudo, Eugene Hong, Nona Chiariello** (JRBP, Stanford Summer Fellows Program) Digital imaging of the Oakmead Herbarium for public access via the Consortium of California Herbaria

**Amaury Payelleville, Tad Fukami** (Earth System Science, Biology) Entomopathogenic nematode role in Oak pathogen life cycle

**Marta Pelaez, Rodolfo Dirzo** (Biology, Earth System Science) Oak seedling plantation in Jasper Ridge

**Sheena Sidhu, Mary Ghebreselassie, Kiara Fufunan, Lau Gherardi** (JRBP, UC Berkeley) Design and monitoring of fuel reduction in woodland and chaparral

**Chinmay Sonawane, Rodolfo Dirzo** (Earth System Science, Biology) Repeated vegetation surveys in camera-trap plots as a test for a trophic cascade

**Vrinda Madabushi Suresh, Kelly McManus Chauvin** (Biology, Earth System Science) Mapping of invasive species in Jasper Ridge

**Karrin Elise Tennant, Kabir Peay** (Earth System Science, Biology) *Populus* mycobiome

**Esther Tok, Kabir Peay** (Biology) Jasper Ridge mushroom collection

**Esther Tok, Kabir Peay** (Earth System Science, Biology) Mycobiome of two oak species on serpentine and non-serpentine substrates

**Garrett Trask** (Stanford Heritage Services) Archaeological and historical surveys including the Zoology Cabin, the Hermit's home site, the Hermit's mine

**Natalie Ward, Rodolfo Dirzo** (Biology, Earth System Science) Investigating herbarium specimens' accuracy in assessing historical herbivory

## Featured Student Research – Tanvi Gupta

*I read and reread the Jasper Ridge Biological Preserve annual report when applying to Stanford, so it is surreal to be writing this now as I approach the end of my Stanford career. Even in my wildest high school fantasies I couldn't have dreamt of what I learned here.*

*In my honors thesis, I examined mosquitos and insect control at Jasper Ridge over time and space. It built on data from San Mateo County to tell a story about the complexity of mosquito community ecology in the Anthropocene.*

*The research was hard, because Jasper Ridge showed me how expansive research could be, even when rooted in basic ecology principles. I ended up extracting DNA from soil samples, wading through the Searsville reservoir to collect water, and traveling to Houston, Texas to see if chemistry used to detect cancer could also find pesticides.*

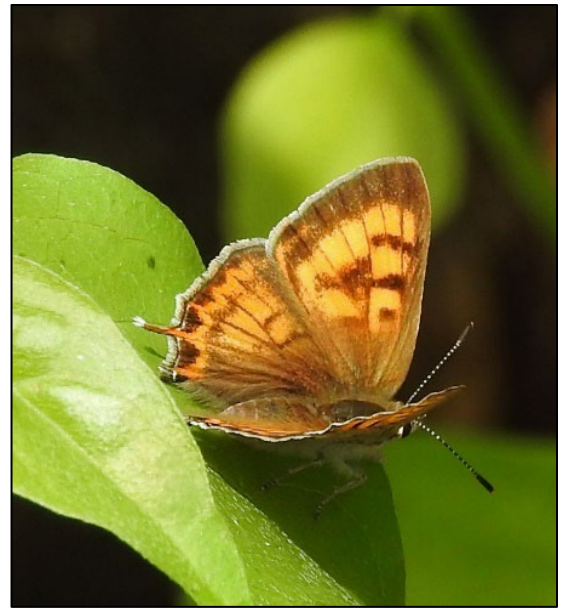
*I learned to dwell and revel in interdisciplinary, intersectional science—alongside building models and running regressions, I pitched magazines, wrote essays, and dug through archives. Thinking through Jasper Ridge's philosophies and practices of environmental stewardship illuminated how I situated my research in community ecology.*

*And I learned so many ways to situate myself in ecology communities as a researcher. I'm so grateful for all the teachers at the Ridge who taught me that lesson—the Jasper Ridge staff, my BIO/ESYS 105 community, the Hadly Lab, the Environmental Justice Working Group, blue oak trees. I learned how, with one foot grounded in the Searsville sediment, I could ask questions about the whole world.*

*Tanvi in the field. Credit: JRBP Staff*

# Stewardship

Protecting the preserve's resources is one of the foundational pillars at Jasper Ridge. We continue to meet this through ongoing stewardship as we face the challenges of mitigating wildfire and planning for the Searsville Watershed Restoration Project.



## Fire Fuel Vegetation Management

This year's fuel reduction focused on creating strategic shaded fuel breaks along Sand Hill and Westridge perimeters of the preserve. These key areas were identified through the 2021 Stanford Wildfire Management Plan (SWMP). Jasper Ridge staff, led by Stewardship Scientist Sheena Sidhu, worked closely with campus partners and consultants to follow the recommendations from our white paper *titled Recommendations for Merging Fire Fuel Mitigation with Stewardship Practices to Maintain Biodiversity and Ecosystem Function at Jasper Ridge Biological Preserve*, which we published after the 2021 Fire Fuels Ecology workshop held at the preserve. These recommendations included: communicating risk, maintaining ecological integrity, and using adaptive management for future work. This provided the framework to create treatments that avoided woodrat nests, sensitive species, and research sites while at the same time, selectively thinned and reduced vegetation to maintain some habitat complexity and diversity by keeping habitat features such as downed logs and snags. Chips were spread to help reduce invasive plants from emerging after the disturbance. This approach allowed us to accomplish the goal of reducing the risk that a low-intensity wildfire could become a high-intensity canopy fire in the case of an unintended ignition.

In addition to implementing fuel reduction, staff set up seven paired treatment and control plots within the treatment area for pre-, post-, and long-term monitoring of fuels, vegetation diversity and structure, and animal habitat. This information will be fed back into an adaptive management decision process to: 1) evaluate the effectiveness of fuel reduction, and 2) adapt to changes and long-term maintenance plans. Tentatively, we expect that after this initial fuel reduction, ongoing vegetation maintenance of the shaded fuel break could be achieved by goat gazing or other low-impact approaches.

## Searsville Watershed Restoration Project

Jasper Ridge staff continue to work closely with our Stanford Land, Buildings, and Real Estate (LBRE) partners in identifying opportunities to weave research, education and conservation in the Searsville Watershed Restoration Project. With initial construction still a few years away, we are finalizing stewardship plans for the current reservoir area which will be cleared of vegetation once the dam is modified. Staff Scientist Nona Chiariello has worked directly with consultants to develop a vegetation restoration and invasive species management plan. We have also begun connecting with researchers and are particularly excited to support developing research on the Searsvile project since this watershed is uniquely situated at a wildlife urban interface compared to most other large-scale dam projects that are in more remote areas.

## Stewardship Internship Summer Program

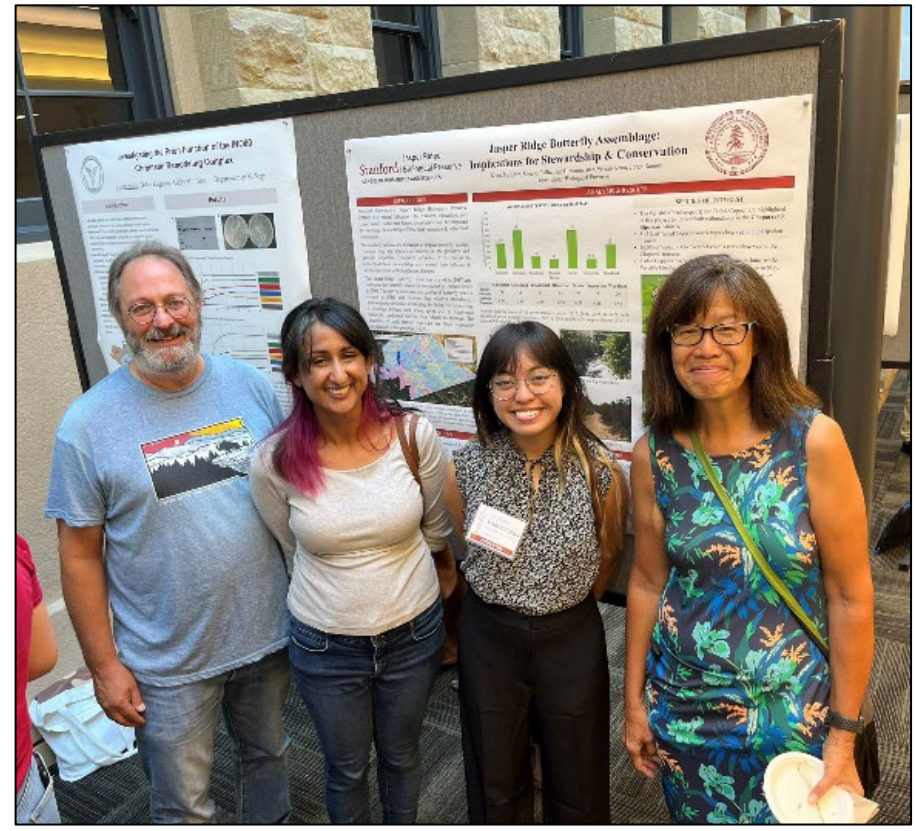
This summer, Jasper Ridge hosted two Stewardship interns in an inaugural program supported by the Maxwell/Hanrahan Foundation, Mary Ghebreselassie (senior) and Kiara Fufunan (junior). Both interns were immersed in hands-on learning in the field with Stewardship Scientist, Sheena Sidhu, and gained land management experience such as collection, on-site decision making, and stakeholder engagement, while developing skills in ecology, natural history, and science communication.

*Opposite: Tailed copper (Lycaena aorta). Credit: Jeff Schwegman*

*Below: Frost on the ridge. Credit: JRBP Staff*

## Featured Student Project – Kiara Fufunan

When summer stewardship intern, Kiara Fufunan, expressed an interest in pollinators as a potential research project to be integrated in our stewardship activity areas, it aligned not only with Sheena's entomology background but also to a docent led Jasper Ridge monitoring research project.




Kiara and Sheena reached out to two docents, Jan Hintermeister and Vivian Neou who have been leading the Jasper Ridge butterfly county research project for several years. Jan and Vivian were both very excited to share their data and knowledge, and invited Kiara into the field with them for one of their weekly butterfly counts. Kiara then organized and analyzed seven years of weekly butterfly count data that extended approximately between March and October each year in six different habitats. Kiara shared her analyses with Jan and Vivian and together they worked to interpret the results with the help of their rich ecological and rich natural history knowledge. Kiara's project was accepted to be presented in the Biology Summer Undergraduate Research Program (BSURP) symposium on campus at the end of the summer with a poster titled "Jasper Ridge Butterfly Assemblage: Implications for Stewardship & Conservation". This activity reflects the excellent collaboration among Jasper Ridge staff, students and docents, uses existing data and resources and combines research, education and stewardship, an exemplary JRBP action! We look forward to more opportunities such as this one at Jasper Ridge!

*Above: Kiara presents her poster. Credit: JRBP Staff*
*Opposite: Looking up at Searsville dam. Credit: Dan Quinn*

# Technology

## Using AI to identify birds as “bycatch” in audio recordings from the JRBP Acoustic Bat Monitoring Project

Jasper Ridge Biological Preserve’s Acoustic Bat Monitoring project has collected over 12 million audio recordings over the last 10 years. The recordings were intended to facilitate individual bat species identification, but it turns out - with minor technical tweaks to the recordings - that other organisms such as birds, insects and frogs can be found in the recordings as well, a phenomenon known as “bycatch.” A collaboration with Stanford computer science students and faculty was launched this past year to use Artificial Intelligence (AI) to find and identify birds that were recorded in those files.

Initially, BirdNET, a state-of-the-art bird call identification neural network developed by Cornell, was used to analyze the recording for birds. While BirdNET excels at recognizing isolated calls, it struggles with in-the-wild vocalizations such as those recorded at Jasper Ridge, which often present more complex acoustic backgrounds. BirdNET was able to locate most bird calls but in many cases failed to identify the correct species.

This initiative focused on listening to and labeling diverse bird calls in thousands of 5-second audio clips from the bat project. To facilitate this, Computer Science professor Daniel Kang, research assistant Timothy Dai, and JRBP technology specialist Trevor Hébert created a web-based labeling platform that enabled volunteers to log into the interface, listen to individual audio clips, and submit their species identifications. Volunteers participating in the project were JRBP birders Emily Kim, Sally Jackson, and Richard Jeffers.

So far, the volunteers have successfully labeled 2,000 recordings to be used to retrain BirdNET for greater accuracy with Jasper Ridge files. The continuing objective of this project is to leverage the Stanford computer science department’s expertise in artificial intelligence and the volunteers’ skill at species identifications to improve the capabilities of BirdNET in identifying bird vocalizations within the complex natural environments. By integrating the labels generated by the birders, BirdNET accuracy can be improved, contributing to broader ecological research. With high-accuracy data on bird vocalizations in Jasper Ridge spanning 10 years, we can extrapolate insights about the abundance and activity of Jasper Ridge’s bird populations.

## AI-Powered wildfire detection comes to Jasper Ridge

In 2020, the first ALERTWildfire (now ALERTCalifornia) wildfire monitoring camera in San Mateo County was installed at Jasper Ridge, followed by a second camera at the Stanford Dish. The cameras were provided free of charge from ALERTCalifornia and are administered and maintained by JRBP technology specialist Trevor Hébert in collaboration with ALERTCalifornia. Trevor oversaw the installation of two additional cameras at Foothills Park and Montebello Open Space Preserve, which are now operated by the City of Palo Alto. These cameras, along with over 1,000 more throughout the state, are intended to detect and confirm wildfire ignition, quickly scale fire resources, monitor fire behavior, help evacuations, and observe contained fires for flare-ups. The type of advanced pan-tilt-zoom video cameras installed at Jasper Ridge and the Dish operate continuously and are equipped with near-infrared night vision and can perform 360-degree rotations every two minutes, providing surveillance of up to 60 miles in good visibility and 120 miles on a clear night.

Until now, the cameras have depended on human viewers - either members of the public or first responders - to monitor the cameras to detect and observe wildfires. But in July 2023, ALERTCalifornia started an innovative Artificial Intelligence (AI) implementation trial to test the ability to detect fires automatically and immediately notify firefighters to improve response times and firefighting effectiveness.

By leveraging the vast amounts of video data recorded by the cameras, an advanced machine-learning model has been created to identify smoke during the daytime and the glow of fire at night. The AI system has already accurately detected local fire starts within 2 minutes. The AI system is now running on ALERTCalifornia cameras throughout all of California.

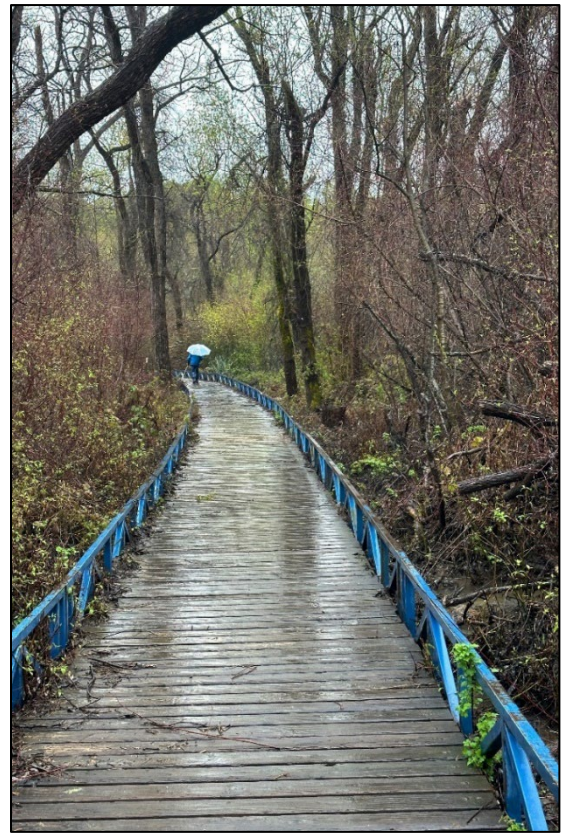
The AI wildfire detection system adds a critical layer of wildfire protection to the preserve and other Stanford University lands by enhancing firefighting effectiveness through early detection of fires, monitoring, and predicting fire behavior, and providing real-time information to firefighters. The AI system was developed by ALERTCalifornia with funding from CALFIRE, which has invested $20,277,000 in ALERTCalifornia over the last four years.

*Opposite: Anna's hummingbird (Calypte anna). Credit: Dan Quinn*
*Right: ALERTCalifornia wildfire detection and monitoring camera. Credit: JRBP Staff*

# Operations

## Rain and Wind Damage

Due to several particularly strong atmospheric rivers that brought unprecedented levels of rain to the watershed, the preserve endured severe flooding and erosion. This past rainy season there were four historic streamflow events in San Francisquito Creek with December 31, 2022, coming in at second largest with 6340 cubic feet per second (CFS). March 21, 2023, also fell into the top 10 historical flows with 4080 CFS, while two other peak flows in January and March made it into the top 20 all-time peak flows. Flooding at the box culvert crossing at San Francisquito Creek on Road C caused multiple obstructions from log jams and a large tree trunk, and an atmospheric river on March 10, 2023, deposited large cobble that completely blocked the north culvert and partially blocked the two other culverts.



Between December 29th and New Year's Eve, Jasper Ridge received 5.58 inches of rain which caused the maintenance yard to experience extraordinary flooding with some areas under 3 feet of water. The flooding caused damage to structures and equipment and floated large piles of lumber off racks. The same storm caused severe erosion problems on most of the preserve's roads with significant grades. As the amount of water overwhelmed drainage ditches and culverts, it cut deep trenches into many roads, particularly roads D and E, which necessitated trucking in new cover along with grading and compaction. The storm on March 10, 2023, caused a moderate landslide on Road E that is still partially obstructing the road until a plan can be devised for stabilizing the bank.

Many of this season's storms were accompanied by exceptionally high winds which brought down 35 trees or major limbs across our roads and trails. Many more trees fell in other areas of the preserve. Two major wind events happened in quick succession on March 14 and 22. These two windstorms produced unusually high sustained winds, with peak gusts up to 64mph. The high number of downed trees was exacerbated by previous years of drought combined with diseases such as Sudden Oak Death.

*Wet day on the causeway. Credit: Alice Cummings*

## Major Projects

Working together with Humanities & Sciences Capital Planning along with Land Buildings and Real Estate (LBRE), we initiated a major cleanup of our corporation yard. The cleanup first focused on removing a large inventory of legacy chemicals, paints, and other hazardous materials that were no longer needed. We reduced the overall inventory of the yard by up to 90% through a wood and metal recycling program and removed several of the old, dilapidated trailers that had been used to store materials. Long term plans call for construction of a new maintenance yard with garage, shop, and storage space.

Working with LBRE, we identified two crucial building renewal projects needed to keep the Leslie Shao-ming Sun Field Station in good operating condition for years to come. Foremost was the need to replace the redwood siding on the building's exterior. UV exposure on the south side had caused severe cupping and cracking of the wood siding, while on the north side, acorn woodpeckers were finding new places to open holes for their acorns. Over the course of 2022-2023, we worked with LBRE and the campus architect's office to identify an exterior siding material that both fire-hardens the building and is resistant to acorn woodpeckers while producing an appropriate aesthetic that honors the original architectural intent. The installation of this new siding will start in the Spring of 2024.

The second project was to replace both our 20-year-old roof along with the glycol collectors which provide solar heating for the building. The new glycol collectors will be 40% more efficient which will further help reduce the amount of propane needed to heat the building during the winter months.

*Flooding in Corp Yard. Credit: JRBP Staff*

# BY THE NUMBERS
# EDUCATION

**WITHIN STANFORD**

2366 STUDENT VISITS
13 CLASSES
42 DEPARTMENTS AND PROGRAMS
8 SCHOOLS AND SLAC
794 VISITS FOR MEETINGS AND EVENTS

**OUTSIDE STANFORD**

149 COLLEGE STUDENT VISITS
227 K-12 VISITS
7 COLLEGES AND UNIVERSITIES
3 HIGH SCHOOLS AND MIDDLE SCHOOLS
29 PARTNER ORGANIZATIONS

# TOTALS

WITHIN STANFORD: 4080 VISITS
OUTSIDE STANFORD: 1946 VISITS
OVERALL: 6026 VISITS

*Serpentine grassland near Escobar gate. Credit: JRBP Staff*

*Cedar waxwing (Bonbycillidae). Credit: Peter and Diane Hart*

# BY THE NUMBERS
# RESEARCH

3 STANFORD SCHOOLS
9 ACADEMIC DEPARTMENTS AND UNITS
84 ACADEMIC RESEARCHERS

22 STANFORD FACULTY (2 by courtesy)
13 POSTDOCS AND VISITING SCHOLARS
19 GRADUATE STUDENTS
12 UNDERGRADUATES
18 UNIVERSITY STAFF

## TOTALS

INCLUDING NON-STANFORD ACADEMIC INVESTIGATORS

111 RESEARCHERS
70 PROJECTS
38 PUBLICATIONS
3 COUNTRIES

# Congratulations

## Jasper Ridge Biological Preserve Stewardship Intern Program

**Kiara Fufunan** and **Mary Ghebreselassie** were the inaugural participants of the Jasper Ridge Biological Preserve Stewardship Intern Program and were mentored by Dr. Sheena Sidhu. Supported by the Maxwell/Hanrahan Foundation, the internship is a new and prestigious initiative that empowers aspiring students interested in conservation. This immersive program was created for undergraduate students seeking hands-on, real-world experience with active environmental stewardship while developing skills in ecology, natural history, and field work. This year, both Mary and Kiara focused on projects related to fire management. Mary chose to design a website for the preserve about the traditional fire management techniques that Indigenous peoples have practiced on lands near Jasper Ridge for centuries. Meanwhile, Kiara monitored butterflies to see if their populations changed as stewardship activities potentially impact.

## Stanford Summer Fellows Program interns:

The Stanford Summer Fellows Program is designed for Stanford students to gain exposure to research for the first time via exploratory research projects under the guidance of a mentor.

**Danny Argudo** and **Eugene Hong** mentored by Dr. Nona Chiariello and Dawn Neisser. Both Danny and Eugene focused their internship working to digitize more than 6000 plant specimens of the Oakmead Herbarium at Jasper Ridge Biological Preserve.

*Raindrops on shooting stars (Primula clevelandii var. patula). Credit: Dan Quinn*

## Stanford/A.W. Mellon grant for student research at Jasper Ridge.

In 1986, the A.W. Mellon Foundation provided endowment funding to Professor Harold A. Mooney to establish a grant program for independent research at Jasper Ridge by Stanford graduate students and undergraduates.

**AyoOluwateso Coker**: A study in Searsville: an analysis of sediment on summer algal blooms

## 2023 Stanford Doer School of Sustainability Awards

Dean's Award for Undergraduate Academic Achievement:

Jasper Ridge Biological Preserve docents: **Lizzie Avila, Alan Cuevas, Xavier Gomez and Sydney Schmitter**

Earth Systems Program:

Miller-Marsden Prize for Innovative Research on the Environment: **Sydney Schmitter**

Earth Systems Justice, Equity, Diversity & Inclusion Scholars Award: **Xavier Gomez, Tanvi Gupta**

Outstanding Service to the Earth Systems Program: **George Rojano, Sydney Schmitter**

Earth Systems Program, Julie Kennedy Public Service Scholars:

The Julie Kennedy Public Service Scholar Award recognizes students who have engaged in meaningful public service activities, either on their own or through established organizations, related to their Earth Systems studies.

Jasper Ridge Biological Preserve docents: **Aiyana Washington, Chrysanthe Frangos, Sydney Schmitter and George Rojano**

*California buckeye (Aesculus californica) with lace lichen (Ramalina menziesii).*

*Credit: Alice Cummings*

# Publications

Álvarez-Pérez S, De Vega C, Vanoirbeek K, Tsuji K, Jacquemyn H, Fukami T, Michiels C, Lievens B (2023) Phylogenomic analysis of the genus *Rosenbergiella* and description of *Rosenbergiella gaditana* sp. *nov.*, *Rosenbergiella metrosideri* sp. *nov.*, *Rosenbergiella epipactidis* subsp. *epipactidis subsp. nov.*, *Rosenbergiella epipactidis* subsp. *californiensis* subsp. *nov.*, *Rosenbergiella epipactidis* subsp. *japonicus* subsp. *nov.*, *Rosenbergiella nectarea* subsp. *nectarea* subsp. *nov.* and *Rosenbergiella nectarea* subsp. *apis* subsp. *nov.*, isolated from floral nectar and insects. International Journal of Systematic and Evolutionary Microbiology 73(3):005777. https://doi.org/10.1099/ijsem.0.005777

Anderson RS, Stegner MA, La Selle S, Sherrod B, Barnosky AD, Hadly EA (2023) Witnessing history: comparison of a century of sedimentary and written records in a California protected area. Regional Environmental Change 23(2):1-8. https://doi-org.stanford.idm.oclc.org/10.1007/s10113-023-02056-9

Chappell CR, Dhami MK, Bitter MC, Czech L, Paredes SH, Barrie FB, Calderón Y, Eritano K, Golden LA, Hekmat-Scafe D, Hsu V, Kieschnick C, Malladi S, Rush N, Fukami T (2022) Wide-ranging consequences of priority effects governed by an overarching factor. eLife 11:e79647. https://doi.org/10.7554/eLife.79647

Couper LI, Farner JE, Lyberger KP, Lee AS, Mordecai EA (2023) Evidence of thermal adaptation in a widely distributed mosquito species. bioRxiv. https://doi.org/10.1101/2023.03.02.530886

Decker LE, San Juan PA, Warren ML, Duckworth CE, Gao C, Fukami T (2022) Higher variability in fungi compared to bacteria in the foraging honey bee gut. Microbial Ecology. https://doi.org/10.1007/s00248-021-01922-5

Dittmar EL, Schemske D (2023) Temporal variation in selection influences microgeographic local adaptation. The American Naturalist (in press) https://doi.org/10.1086/725865

Gupta TD (2022) What pesticides showed me about protecting our future. Voices for Biodiversity: Aug 28, 2022. https://voicesforbiodiversity.org/

Head MJ, Steffen W, Fagerlind D, Waters CN, Poirier C, Syvitski J, Zalasiewicz JA, Barnosky AD, Cearreta A, Jeandel C, Leinfelder R (2022) The Great Acceleration is real and provides a quantitative basis for the proposed Anthropocene Series/Epoch. Episodes Journal of International Geoscience 45(4):359-76. https://doi.org/10.18814/epiiugs/2021/021031

Heller NE, McManus Chauvin K, Skybrook D, Barnosky AD (2023) Including stewardship in ecosystem health assessment. Nature Sustainability 6:1-1.

Huot F, Biondi BL, Clapp RG (2022) Detecting local earthquakes via fiber-optic cables in telecommunication conduits under Stanford University campus using deep learning. arXiv preprint https://doi.org/10.48550/arXiv.2203.05932

Koenig WD, Knops JM (2022) Drivers of winter population cycles in the Varied Thrush *(Ixoreus naevius)*. Canadian Journal of Zoology. https://doi.org/10.1139/cjz-2022-0028

Lagerstrom KM, Hadly EA (2023) Under-appreciated phylogroup diversity of *Escherichia coli* within and between animals at the urban-wildland Interface. Applied and Environmental Microbiology: e00142-23. https://doi.org/10.1128/aem.00142-23

Lyberger K, Farner J, Couper L, Mordecai EA (2023) A mosquito parasite is locally adapted to its host but not temperature. bioRxiv. 2023:2023-04. https://www.biorxiv.org/content/10.1101/2023.04.21.537840v1.abstract

Ma X, Wang T, Shi Z, Chiariello NR, Docherty K, Field CB, Gutknecht J, Gao Q, Gu Y, Guo X, Hungate BA (2022) Long-term nitrogen deposition enhances microbial capacities in soil carbon stabilization but reduces network complexity. *Microbiome* 10, 112 https://doi.org/10.1186/s40168-022-01309-9

Mathur Y, Awosiji V, Mukerji T, Scheirer AH, Peters KE (2023) Soil geochemistry of hydrogen and other gases along the San Andreas Fault. https://eartharxiv.org/repository/view/5721/

Pan Y, Jackson RB, Hollinger DY, Phillips OL, Nowak RS, Norby RJ, Oren R, Reich PB, Lüscher A, Mueller KE, Owensby C, Birdsey R, Jom J, Luo Y (2022) Contrasting responses of woody and grassland ecosystems to increased CO2 as water supply varies. Nature Ecology & Evolution 6(3):315-23. https://doi-org.stanford.idm.oclc.org/10.1038/s41559-021-01642-6

Parmesan C, Singer MC (2022) Mosaics of climatic stress across species' ranges: tradeoffs cause adaptive evolution to limits of climatic tolerance. Philosophical Transactions of the Royal Society B *377*(1848), p.20210003. https://doi.org/10.1098/rstb.2021.0003

Parmesan C, Singer MC, Wee B, Mikheyev S (2023) The case for prioritizing ecology/behavior and hybridization over genomics/taxonomy and species' integrity in conservation under climate change. Biological Conservation 281:109967. https://doi.org/10.1016/j.biocon.2023.109967

Patterson AE, Williams TM, Ramos J, Pierre S (2023) Building authentic connections to science through mentorship, activism, and community, in teaching and practice. In: *Transforming Education for Sustainability: Discourses on Justice, Inclusion, and Authenticity* pp. 47-73. Cham: Springer International Publishing. https://link.springer.com/chapter/10.1007/978-3-031-13536-1_4

Rao K, Ulloa YJ, Bienert N, Chiariello NR, Holtzman NM, Quetin GR, Peters ST, Winstein K, Castelletti D, Schroeder DM, Konings AG (2022) Side-facing UHF-band radar system to monitor tree water status. Proceedings of the 2022 IEEE International Geoscience and Remote Sensing Symposium, pp. 5559-5562, https://doi.org/10.1109/IGARSS46834.2022.9883620

Shoemaker LG, Hallett LM, Zhao L, Reuman DC, Wang S, Cottingham KL, Hobbs RJ, Castorani MC, Downing AL, Dudney JC, Fey SB (2022) The long and the short of it: mechanisms of synchronous and compensatory dynamics across temporal scales. Ecology 103(4):e3650. https://doi.org/10.1002/ecy.3650

Stegner MA, Hadly EA, Barnosky AD, La Selle SP, Sherrod B, Anderson RS, Redondo SA, Viteri MC, Weaver KL, Cundy AB, Gaca P, Rose NL, Yang H, Roberts SL, Hajdas I, Black BA, Spanbauer TL (2023) The Searsville Lake Site (California, USA) as a candidate Global Boundary Stratotype Section and Point for the Anthropocene Series. The Anthropocene Review https://doi.org/10.1177/20530196221144098

Viteri MC, Hadly EA (2022) Spatiotemporal impacts of the Anthropocene on small mammal communities, and the role of small biological preserves in maintaining biodiversity. Frontiers in Ecology and Evolution 10:916239. https://doi.org/10.3389/fevo.2022.916239

Viteri MC, Stegner MA, Hadly EA (2023) Bothersome burrowers: tracking the impact of Botta's pocket gopher *(Thomomys bottae)* bioturbation on a late-Holocene site. Journal of Archaeological Science: Reports 48:103848. https://doi.org/10.1016/j.jasrep.2023.103848

Wang C, Christman LE, Klemperer SL, Glen JM, McPhee DK, Chen B (2022) Assessment of a claimed ultra-low frequency electromagnetic (ULFEM) earthquake precursor. Geophysical Journal International 229(3):2081-95. https://doi.org/10.1093/gji/ggab530

Wang M, Sun X, Cao B, Chiariello NR, Docherty KM, Field CB, Gao Q, Gutknecht JL, Guo X, He G, Hungate BA, Lei J, Niboyet A, LeRoux X, Shi Z, Shu W, Yuan M, Zhou J, Yang Y (2023) Long-term elevated precipitation induces grassland soil carbon loss via microbe-plant-soil interplay. Global Change Biology. https://doi.org/10.1111/gcb.16811

***Water over the dam. Credit: Dan Quinn***

# DISSERTATIONS

This year's seven dissertations spring from four academic disciplines—biology, computer science, geophysics, and horticulture. Their breadth is striking, even for a field station known as a cross-section of the field sciences and highlights the expanding application of new technologies to the rich data sources of Jasper Ridge. Below are a few of their findings.

**Kate Lagerstrom**'s ground-breaking dissertation examines the distribution and diversity of the common gut bacterium *Escherichia coli* in the scat of 17 wild animal species at Jasper Ridge. *E. coli* is a very well-studied bacterium, except in wild animals, and Lagerstrom used the enormous literature on the biology of *E. coli* and its pathogenicity in humans as the reference for comparison with wild animals. Her results on *E. coli* at Jasper Ridge recast the wildland–urban interface as a wildlife–human interface. As one example, she identified 89 unique strains (sequence types) in just 145 isolates of *E. coli*, illustrating the substantial diversity of *E. coli* in wildlife, many strains of which can be found in humans, can cause disease in humans, and are drug-resistant. Her findings have implications for disease transmission between humans and wild animals, and set standards for surveillance methods to capture the microbiome diversity in wild animal populations.

Many diseases of humans and wildlife will change in the future due to climate change, especially as climate warming allows disease vectors such as mosquitoes to expand their range. **Lisa Couper**'s dissertation takes a global-to-local assessment of mosquito-vectored disease by mathematically modeling the potential response of many mosquito species to climate warming, and then using one focal species for experimental studies of thermal tolerance and adaptation. Her focal species is *Aedes sierrensis,* the western treehole mosquito, which ranges from Southern California to British Columbia. It is the primary vector of Dog Heartworm Disease in the coastal and foothill areas of California, but is not considered a risk to human health. Couper collected *Ae. sierrensis* from across its range, and raised populations under a span of temperatures in the laboratory. Among her findings is that adaptation to rising temperatures is evident but may not be sufficient—*Ae. sierrensis* populations are experiencing temperatures that exceed the thermal tolerance they exhibited in the lab. Couper's research helps establish *Ae. sierrensis* as a model system for studying thermal adaptation in mosquitoes, and underpins current mosquito experiments at Jasper Ridge.

A very expansive dissertation by **Callie Chappell** on the nature of communities begins with the nectar microbiome of *Diplacus (Mimulus) aurantiacus* flowers, and ultimately concludes with the structure of the scientific community. Chappell examines ecological dynamics such as the competition between bacteria and yeast in floral nectar, and dissects how the outcome may be entrained early if bacteria acidify the nectar enough to drive out the dominant yeast and drive down nectar consumption by hummingbirds. Alongside this analysis is a personal reflection on Chappell's life in terms of pathways, outcomes, and contingencies, including a trajectory from artist to scientist to artist-scientist. Woven together, these perspectives convey how a diversity of human pathways enriches the scientific community. The graphics and illustrations in Chappell's dissertation are a testament to this synthesis.

Nectar microbiomes are scientifically tractable in part because flowers are small, discrete and numerous (often likened to "islands"), and they are ephemeral. In contrast, the microbiome of the soil is an "ocean"—an unbounded medium that is large, interconnected, and persistent—and, therefore, most tractable via highly controlled experiments. **Suzanne Ou**'s dissertation achieved this with a two-phase greenhouse study designed to unravel plant-microbial interactions of serpentine grassland. Ou grew monocultures in pots to create soil microbiomes that were "conditioned" by individual species, and later used the conditioned soil to test growth of the same species or another. Throughout, she tracked soil bacteria and fungi. The power of Ou's approach is illustrated by her findings, which include: soil microbiomes are highly dynamic, undergoing changes even within the lifespan of short-lived plant species such as serpentine annuals; they continue to change during a fallow period (akin to summer); and, unconditioned field soil may support greater next-generation plant growth than soil pre-conditioned by the same species.

***View of the Dish. Credit: Larisa Fong***

*Banana slug (Ariolimax). Credit: Alice Cummings*

A hummingbird visiting a *Diplacus* flower is fascinating to watch, but it might grow old if you were making enough observations to analyze visitation behavior. That's when computer science steps in, as illustrated by **Daniel Kang**'s dissertation applying machine learning techniques to some seemingly different contexts such as video of *Diplacus* shrubs at Jasper Ridge and street video from major cities. Kang's challenge was to detect the "traffic" of hummingbirds or vehicles, and translate that traffic to useful numerical data. As with many such problems, the enormous quantity of video can make processing too expensive. But often the goal is to understand the traffic pattern, rather than exact events, so Kang designed algorithms to yield data that are approximate but have defined reliability. Kang concludes that this combination of approximate and reliable can transform a prohibitively expensive machine-learning problem into a feasible one and produce statistically useful numerical data from exponentially growing streams of video, audio, and text.

Machine learning techniques feature also in **Fantine Huot's** dissertation on detecting seismic events. The Jasper Ridge seismic station ("JRSC") is one of two seismic stations on Stanford lands that Huot used as a reference for validating earthquake detection from fiber-optic networks in telecommunications conduits under Stanford campus. Huot explains that fiber-optic networks offer a ready, low-cost infrastructure to monitor earthquakes in urban areas, but this process requires an efficient machine-learning system designed for low signal-to-noise ratios and anomalies characteristic of telecom installations and urban environments. From three years of continuous fiber optic data, Huot concludes that her approach successfully complements the high signal-to-noise data typical of JRSC and other sparsely distributed seismometers outside urban areas. JRSC is located in a cavity in bedrock on the west shore of Searsville Reservoir and has operated for three decades.

**Austin Gimondo**'s dissertation answers a question asked by many Jasper Ridge visitors who discover the beauty of *Dirca occidentalis* (western leatherwood)—what would it take for this botanical treasure to be a part of residential neighborhoods? Merging approaches from horticulture and ecology, Gimondo addresses the promise and pitfalls of bringing *Dirca's* three species into the horticultural trade. For our native western leatherwood, the question is especially difficult because it is found only in the San Francisco Bay area, and Jasper Ridge is one of the few places where it is locally abundant. Gimondo concludes that if limits to seed production by *Dirca* are solved, there is horticultural potential. Each *Dirca* flower produces a single seed within a tiny avocado-like fruit, and the best chances of that happening locally are years when autumn is dry and pollinators are present during flowering. The horticultural promise of *Dirca* resonates with recent research showing that gardens can play a significant role in biodiversity conservation.

***Serpentine grasslands in bloom. Credit: Dan Quinn***

Chappell, Callie Rodgers (2023) Coloring outside the lines: community assembly in the life sciences. PhD Dissertation, Biology, Stanford University. https://www.proquest.com/dissertations-theses/coloring-outside-lines-community-assembly-life/docview/2827706916/se-2?accountid=14026

Couper, Lisa (2023) Mosquitoes in a warming world: climate adaptation and its consequences for disease transmission. PhD dissertation, Biology, Stanford University. https://searchworks.stanford.edu/view/14782649

Gimondo, J. Austin (2022) Biotic and abiotic risks to *Dirca* spp. in managed landscapes. PhD Dissertation, Horticulture, Iowa State University. https://www.proquest.com/dissertations-theses/biotic-abiotic-risks-em-dirca-spp-managed/docview/2716982854/se-2?accountid=14026

Huot, Fantine (2022) Machine learning for seismic event detection: a story in three parts: Earthquakes, microseismic events, and tectonic tremors. PhD Dissertation, Geophysics, Stanford University. https://www.proquest.com/dissertations-theses/machine-learning-seismic-event-detection-story/docview/2689296962/se-2?accountid=14026

Kang, Daniel (2022) Efficient and accurate systems for querying unstructured data. PhD Dissertation, Computer Science, Stanford University. https://www.proquest.com/dissertations-theses/efficient-accurate-systems-querying-unstructured/docview/2787194552/se-2?accountid=14026

Lagerstrom, Katherine Marie (2023) The wild side of *E. coli*: investigating the ecology and diversity of *Escherichia coli* in wild animals. PhD Dissertation, Biology, Stanford University. https://searchworks.stanford.edu/view/14640530

Ou, Suzanne Xianran (2023) Spatiotemporal dynamics of plant-soil-microbe interactions. PhD Dissertation, Biology, Stanford University. https://searchworks.stanford.edu/view/in00000001631

*Western fence lizard (Sceloporus occidentalis. Credit: Jeff Schwegman*

# Financials

## Expenditures - $1,425,073.31

| | |
|---|---|
| Administration | $29,055.66 |
| Operations | $242,453.33 |
| Land Management | $18,233.63 |
| Education/Outreach | $24,244.17 |
| Research | $11,552.94 |
| Salary | $1,089,533.58 |

## Revenues - $ 1,554,432.37

| | |
|---|---|
| General Income | $34,574.06 |
| University H&S | $303,579.00 |
| Gifts | $94,788.42 |
| Grants | $125,973.00* |
| Endowment Income | $995,517.89 |

*Purple owl's clover (Castilleja exserta). Credit: Alice Cummings*

*Expenditures and revenues only include funds controlled by JRBP, the majority of which are for maintaining the preserve for users. Most users fund their work from non-JRBP sources. *Year 1 of National Science Foundation Research Coordination Network SOAR Grant to Professor Rodolfo Dirzo.*

*The Oakmead Herbarium crew in the field. Credit: Alice Cummings*

# Advisory Groups

## 2022-2023 Jasper Ridge Faculty Advisory Committee

ELIZABETH HADLY - JRBP Faculty Director, Biology

NICOLE M. ARDOIN - Graduate School of Education

CRAIG CRIDDLE - Civil and Environmental Engineering

RODOLFO DIRZO - Biology

STEPHEN A. FELT - Comparative Medicine

SCOTT FENDORF - Earth System Science

ZEPHYR FRANK - History

DAVID L. FREYBERG - Civil and Environmental Engineering

TADASHI FUKAMI - Biology

KABIR GABRIEL PEAY - Biology

MANU PRAKASH - Bioengineering

DEBORAH SIVAS - Law

FIORENZA MICHELI - Hopkins Marine Station

JEREMY GOLDBOGEN - Hopkins Marine Station

WILLIAM BARNETT - Graduate School of Business

JORGE RAMOS - JRBP Executive Director (ex-officio)

NONA CHIARIELLO - JRBP Staff Scientist (ex-officio)

ERIN GILMOUR MORDECAI - Biology

CHINMAY SONAWANE - Graduate Student Representative, Biology

BEN MORAN - Graduate Student Representative, Biology

*California scrub jay (Aphelocoma californica). Credit: Dan Quinn*

## 2022-2023 Jasper Ridge Coordinating Council

RYAN ADESNIK – Vice President for Government Affairs

JESSICA SHORS APPEL - San Francisco Water Department

SHWETA BHATNAGAR - Office of Government Affairs

RICK DEBENEDETTI - Woodside Trail Club

DENNIS DEBROECK - Peninsula Open Space Trust, Board Chair; PIE Ranch, Board member, Retired Senior Corporate Partner, Fenwick & West LLP

DON BULLARD - Woodside Fire Protection District

MARY ELLEN HANNIBAL - Citizen science, nature writer

JERRY HEARN - Grassroots Ecology and Jasper Ridge docent

LAURA JONES - Stanford LBRE Archaeology

KELLY KLINE - Associate Vice President, Local Government Affairs

JACKIE MAGNO - Stanford University, DCI Program & Jasper Ridge neighbor

BETSY MORGENTHALER - Jasper Ridge docent

TRISH MULVEY - Palo Alto Community Volunteer

HELEN NUCKOLLS - SLAC National Accelerator Laboratory

DIANE RENSHAW - Jasper Ridge docent

HEYWARD ROBINSON - Vice President, Oakbio Products, former mayor of Menlo Park and former Chairman, San Francisquito Creek Joint Powers Authority

JEANNE SEDGWICK - Neighbor and Jasper Ridge docent

ANNE SHULOCK - Assistant Vice President for the Arts, Stanford University

DAVID SMERNOFF - Grassroots Ecology

LYNN STEGNER - Stanford Continuing Studies Program, author, editor, and literary consultant

KARINE TOKATLIAN - Midpeninsula Regional Open Space District

SUSAN WITEBSKY - SLAC National Accelerator Laboratory

ERIC WRIGHT - Senior University Counsel, Stanford University

JONATHAN YOUNG - Presidio Trust

TOM ZIGTERMAN - Stanford University Water Resources & Civil Infrastructure

JORGE RAMOS - JRBP Executive Director (ex-officio)

NONA CHIARIELLO - JRBP Staff Scientist (ex-officio)

ELIZABETH HADLY - JRBP Faculty Director (ex-officio)

# 2022-23 Staff

From left to right

**Sheena Sidhu**
Staff Scientist

**Trevor Hébert**
Academic Technology Specialist

**Jorge Ramos**
Executive Director

**Steven Gomez**
Operations Manager

**Nona Chiariello**
Staff Scientist

**Katherine Glover**
Assoc. Director for Environmental Education

**Elizabeth Hadly**
Outgoing Faculty Director

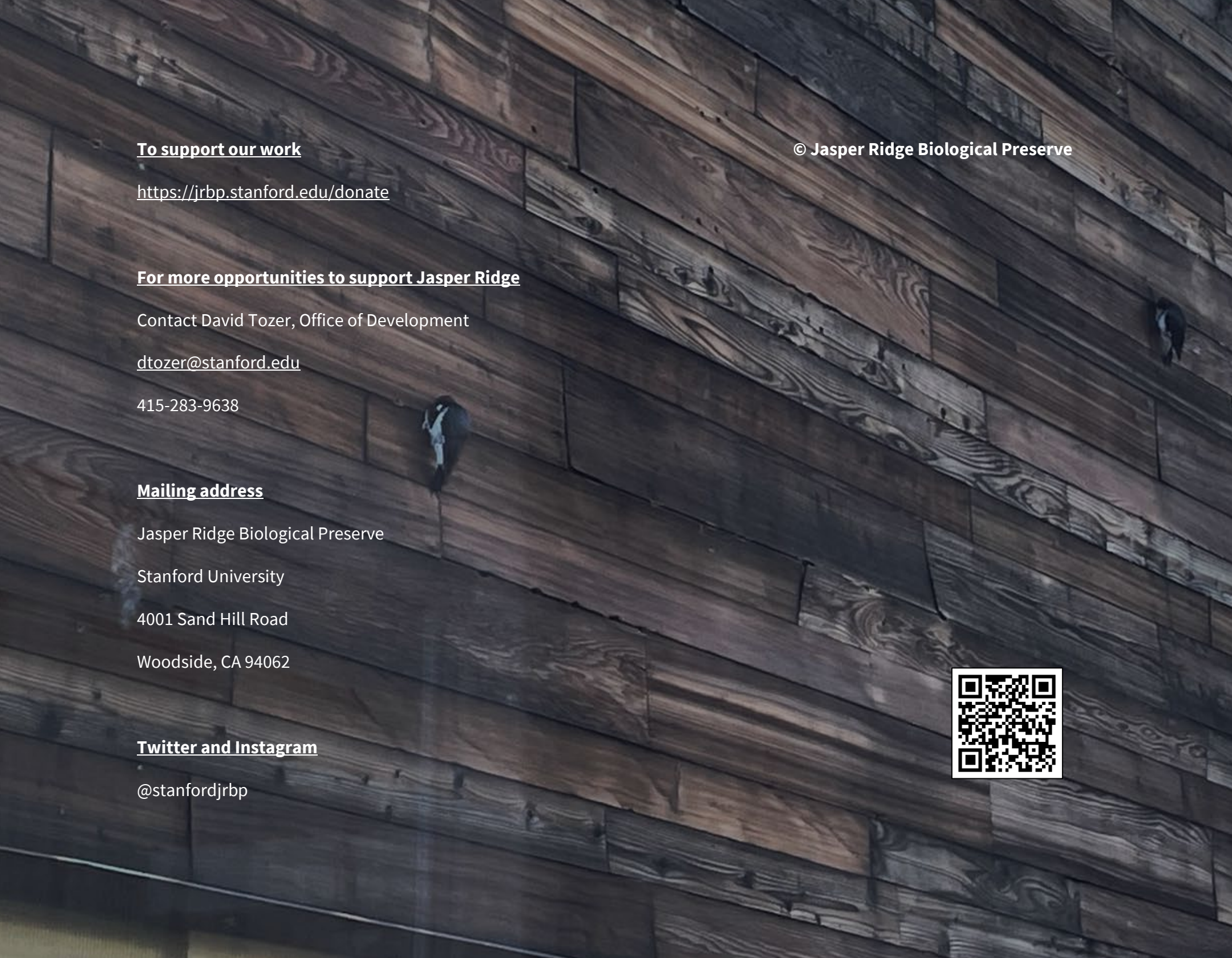
**Tadashi Fukami**
Incoming Faculty Director

**Brooke Fabricant**
Resident Ranger

**Seth Tanen**
Administrative Program Manager

**Catalina McNiel**
Operations Assistant

*Landscape through tree. Credit: Larisa Fong*



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https://jrbp.stanford.edu/donate

**For more opportunities to support Jasper Ridge**

Contact David Tozer, Office of Development

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