Jasper Ridge Biological Preserve

ANNUAL REPORT 2020-2021

Our Mission and Values

JASPER RIDGE BIOLOGICAL PRESERVE

*Bent-flowered fiddlenecks (*Amsinckia lunaris*), a plant rare in California but found at Jasper Ridge. Photo: JRBP Staff*

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 longer version of the Land Acknowledgement for Stanford University authored by the Muwekma Ohlone tribe is posted inside Leslie Shao-ming Sun Field Station.

Mission

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

Contents

ANNUAL REPORT 2020-21

Cover and Back Page Photo: Robert David Siegel MD, PhD, Stanford University

Learning about ants. Photo: Merav Vonshak

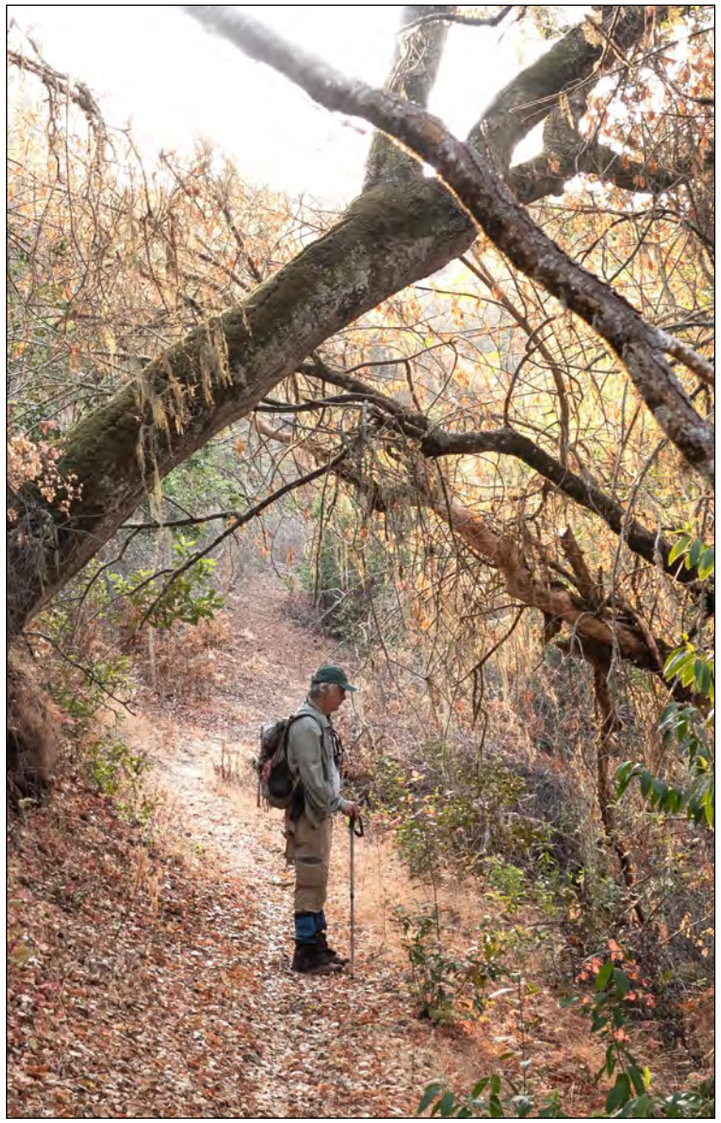
From the Directors

WINDS OF CHANGE

New Challenges, New Opportunities

Dynamic. That's the word that came to mind as we surveyed Jasper Ridge after the intense rainstorm on October 24-25 of this year refilled Searsville Reservoir overnight. Just a couple of days earlier, and for all of the past year, the word that reverberated when out and about in the preserve was a very different one: dry. Really dry. For water year 2020-2021, only 9.9 inches fell at Jasper Ridge, less than half of the 30-year average. The previous year had been dry too. You didn't need a rain gauge to see the water deficit. The trails and roads were dusty most of the year, creeks dried out way too early, much of Searsville Reservoir and Upper Lake gave way to cracked mud flats that eventually sprouted dense willow thickets in parts of the reservoir, the chaparral and oak forests took on a decided brown tinge, and parched grasses crunched underfoot. Yet, with one intense atmospheric river that in 24 hours dropped 5.5" inches of water on Jasper Ridge and some 15 inches in the uplands, the preserve transformed. Once again, the morning sky reflects blue in lapping lake waters, waterfowl splash in for a landing, new growth is turning the hills green, and the air smells sweet with moisture and damp, fertile earth. At least for now.

The lesson: what was here yesterday is not likely to be the same as what will be here tomorrow. Jasper Ridge, like all of nature, is a dynamic system buffeted by winds of change that originate both outside and within its borders. Those winds are now blowing stronger than in past years. Influences from outside include human-caused climate change, resulting in a trend towards drier, hotter conditions with less frequent but more intense storms. What will tomorrow look like in terms of species that fade away because their preferred climate is no longer here, and species that move in as conditions become more favorable for them?



Before the rain. Docent John Rawlings surveys the dry trails. Photo: Dan Quinn

WINDS OF CHANGE

Changes driven from the inside are also underway. The proposed Searsville Watershed Restoration Project (SWRP) is now at the stage of actively planning how to transform the Searsville Reservoir area back into a riparian system that will restore fish passage above Searsville Dam (see https://searsville.stanford.edu/ for more information). At the same time, Stanford University has embarked on a fire-fuels reduction plan that recommends substantial vegetation management at Jasper Ridge (see https://ehs.stanford.edu/news/stanford-university-wildfire-management-plan). As presently conceived, the watershed and fire-fuels projects will impact more than 60% of the preserve's lands over the coming years. How do we accommodate these massive yet necessary landscape alterations while still maintaining the natural ecological processes so essential to fulfilling our education, research, and ecological stewardship mandates?

After the rain. The brown trees at right are some of the Coast Live Oaks that have succumbed over the past two years, probably a combination of water stress and pathogens. Photo: JRBP Staff

These are the sorts of questions our Jasper Ridge staff and our many partners have been grappling with this year. The questions are tricky ones, but one thing is certain: Jasper Ridge nowadays is the type specimen of a dynamic system, that is, a system defined by "constant change, activity, or progress." As this dynamism continues, we look forward to engaging with you all to ensure that what makes Jasper Ridge so special—its naturally operating ecosystem, its diversity, its place in Stanford and the world as a living laboratory, and our wonderful community—remain the constants in these times of change.

Anthony Barnosky, Executive Director
Elizabeth Hadly, Faculty Director

Achieving the Vision

PROGRESS REPORT

Our 10-year strategic plan for Jasper Ridge Biological Preserve was launched in December 2018 with a roadmap for success that included enhancing communication, embarking on initiatives designed to help nature and people co-exist in our rapidly changing world, closer partnerships with other Stanford field and stewardship programs, increasing funding, ensuring adequate staffing, and updating aging infrastructure. Three years later, where do we find ourselves along that road? The short answer is, just about where we intended to be.

Enhancing Communication

We've instituted active Instagram and Twitter feeds (@stanfordjrbp), increased the frequency of news items and started up a blog series on our website; and worked with journalists to communicate goings-on at Jasper Ridge in magazines, news, and film venues. These included more than 15 articles since 2018 reported at NPR, Forbes, Punch, and Stanford Report, and two documentaries about the extinction crisis in part filmed at Jasper Ridge: a David Attenborough program reaching millions on BBC; and the movie Animal, which debuted at the Cannes Film Festival. We instituted trainings and discussion dedicated to enhancing communication about diversity, equity, and inclusion. We also update our affiliates via e-mails and of course, we have continued monthly gatherings that typically draw in people from our Jasper Ridge community and beyond.

Initiatives: Anthropocene Biodiversity & Science for Land Stewardship

Two major projects mentioned in earlier Annual Reports are now coming into the home stretch. The Anthropocene "Golden Spike" project aims to identify the type locality and beginning of what is being proposed as the Anthropocene Epoch, with Jasper Ridge being one of 12 sites being considered worldwide. Cores from Searsville Reservoir and Upper Lake are providing much new information about what defines the Anthropocene locally and globally. Results and the recommendation about which site will be the official marker of the Anthropocene transition are slated to be announced at exhibitions at Berlin's Haus der Kulteren der Welt and in scientific articles beginning in May 2022. Leading the Jasper Ridge effort is postdoctoral scholar Allison Stegner, collaborating with many researchers from Stanford and elsewhere.

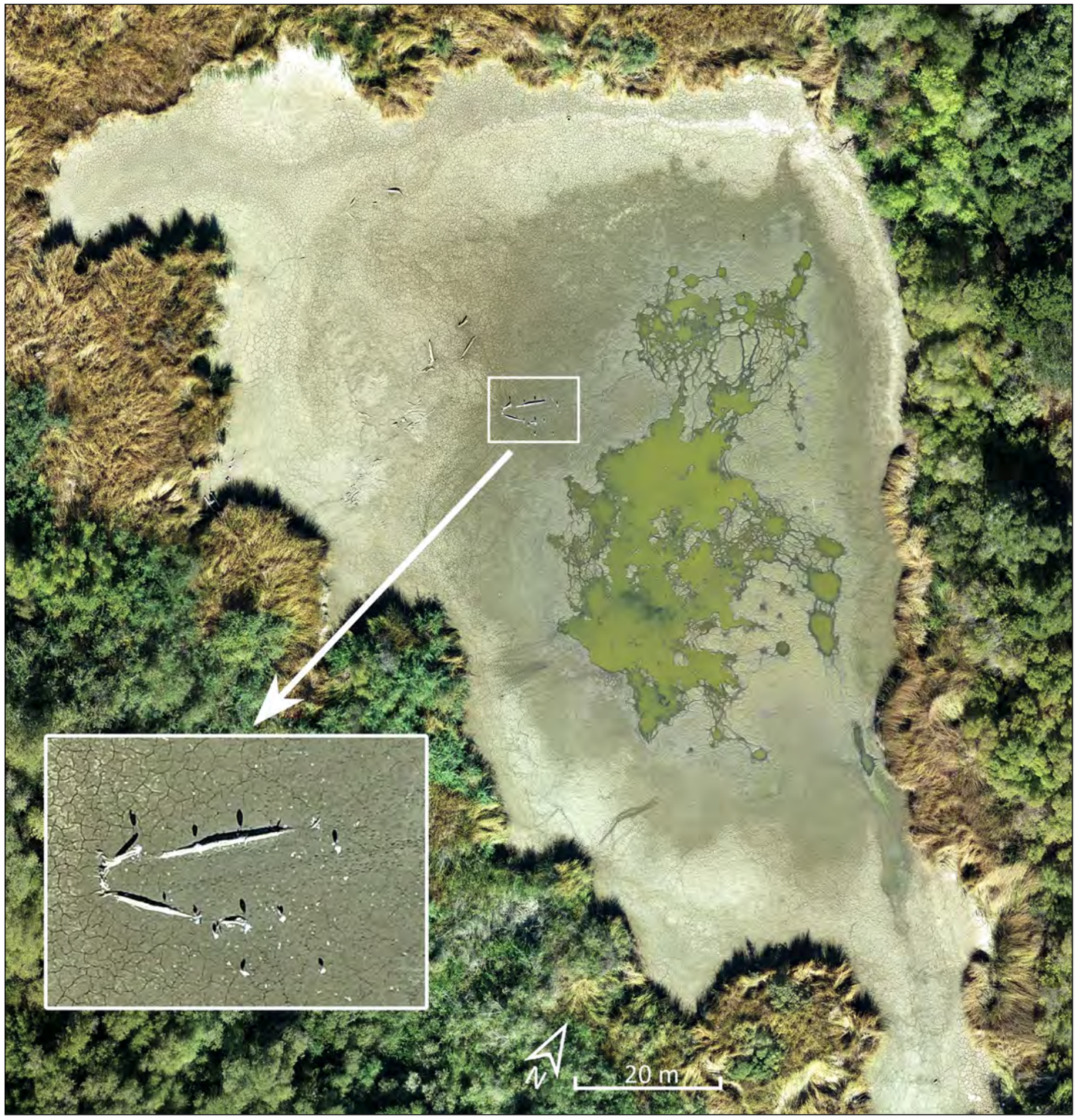
The Santa Cruz Mountains Stewardship Network's (SCMSN) Digital Atlas, a collaboration between Jasper Ridge staff and SCMSN members, has been under production by Jasper Ridge postdoctoral scholar Kelly Chauvin for the past three years and is nearing release to network members. The Atlas is a compilation of spatial data that reflects ecological, social, and stewardship conditions throughout the Santa Cruz Mountains. It is designed to enable assessment and monitoring of socioecological health now and into the future. An outward-facing version

of the information will be served through the Green Info Network. Completion of this project is scheduled for 2022. In addition, researchers at Jasper Ridge over the past three years have been innovating the uses of environmental DNA, genomic techniques, and camera-trap imagery to discover, monitor, and analyze biodiversity at levels from microbes to mountain lions.

Projects just starting up that will stretch out over the next several years include setting up monitoring that will inform us about the ecological effects of various kinds of fire-fuel reduction treatments, determining how Jasper Ridge can contribute to monarch butterfly rescue, and using the Searsville Watershed Restoration Project to inform best practices on ecological restoration under our new climatic regime.

Initiatives: Out of the Box and Into the Cloud

Projects by Jasper Ridge staff and researchers are increasingly using drone imagery to monitor and analyze vegetation, animal trails, lake levels, and other ecologically relevant information. In addition, our LoRa system was upgraded to Things Stack Community Edition V3, making it easier for students



Drone imagery shows a nearly dry Upper Lake before the October 2021 storm refilled it, and reveals usually-submerged tree skeletons (inset) that were well utilized by egrets and herons (shadows). The long-dead trees required prolonged dry land on which to grow, so they can provide valuable information about past times of drought and earthquake activity on the San Andreas Fault, which runs through the lake area. Photo: JRBP Staff

ACHIEVING THE VISION

and researchers to deploy a wide range of wireless sensors in the field and seamlessly upload the data to the cloud for archiving and analysis. LoRa is the long range, low power wireless platform that has become the de facto wireless platform of Internet of Things (IoT).

Over the past three years, Jasper Ridge staff and researchers have been exploring the new frontier of Artificial Intelligence (AI) with promising results. AI now identifies our camera trap images with greater than 94% accuracy, and has been revealing how multiple species of bats use our habitats through analyzing acoustic data.

Collaborations between Jasper Ridge researchers and staff from Biology and Computer Science developed algorithms to reliably recognize hummingbirds visiting sticky monkey flowers in video footage—even the very blurred image (right) of a hummingbird flying. Photos: Hummingbird Video AI Project

This year saw an exciting breakthrough in using AI to analyze video. Biology professor Tad Fukami and research scientist Kaoru Tsuji, Jasper Ridge's academic technology specialist Trevor Hébert, and Computer Science graduate student Daniel Kang and professors Peter Bailis, Tatsunori Hashimoto, and Matei Zaharia teamed up to use video from an array of high-resolution video cameras at Jasper Ridge to pick out occurrences of Anna's hummingbirds visiting the sticky monkey flower (*Diplacus aurantiacus*). Fukami's research and teaching has long used the sticky monkey flower system to reveal how ecosystems assemble and evolve, but a limitation has been that the interaction between the hummingbird pollinator and the flower is a relatively rare event, requiring many hours of human observation to document.

"Partnering with Jasper Ridge has been incredibly fruitful in terms of finding new problems to work on and having a direct impact on scientific applications!"
- Daniel Kang, PhD Student, Computer Science

The high-resolution video replaced human eyes, but introduced another problem: How do you find very rare events in massive datasets? Hummingbird visits were less than 0.2% of the video footage, and their flitting in and out of the field of view introduced almost infinite variations on the hummingbird image. The team developed a

novel approach that enabled recognition of the highly variable images based on the temporal relationship between the video frames of each hummingbird visit. The new approach allowed them to leverage easily classified examples (e.g., a clear, close-up image of a flying hummingbird) to find difficult examples (e.g., a blurry image of a fast-flying hummingbird in the background.)

Partnerships

Intensified need for land stewardship under Anthropocene conditions has stimulated stronger partnership with Stanford's Land, Buildings, and Real Estate (LBRE) group, with whom we are working closely to integrate academic programs with the changes to Jasper Ridge that will result from the Searsville Watershed Restoration Project (SWRP) and the Fire-fuels Reduction Project (FFRP). Combined these projects will touch more than 60% of Jasper Ridge's acreage. Also within Stanford, discussions with Hopkins Marine Station about more collaboration have been initiated. Outside Stanford we continue to work closely with the Santa Cruz Mountains Stewardship Network and the Golden Gate Biosphere Network on regional stewardship issues.

Funding and Staffing

Increased activity at Jasper Ridge has been facilitated by external grants that enabled hiring of postdoctoral scholars to oversee major projects (Allison Stegner and Kelly Chauvin, see Initiatives section above) and covered project costs; increasing our administrative support position from half-time to full-time and elevating our education position to the associate director level through funding provided by the School of Humanities and Sciences (H&S); and hiring on temporary staff as needed. In this coming academic year we will be adding another staff scientist position with H&S funding to concentrate on maximizing the academic opportunities of the SWRP and the FFRP. Areas where stable funding has yet to be acquired include the need to support postdoctoral researchers yearly, bring in visiting scholars, support targeted academic programs, and update infrastructure. We are actively discussing these needs with leadership and development officers in H&S.

Progress: Infrastructure

We have been working with the Capital Planning group in H&S, architects, and the LBRE team to replace the "Corporation Yard" with an Academic Support Complex (ASC). The ASC will provide fabrication facilities for research undertaken by students, faculty, and staff, and maintenance facilities essential for ensuring Jasper Ridge is safe and accessible for its users. It will be designed to fit in with the natural environment that Jasper Ridge protects, and to serve as an example to the world how humans can harmonize with nature. We will soon be looking for funding to bring this vision to life.

Education

LEARNING OUTDOORS - ONCE AGAIN UP CLOSE AND IN PERSON!

Learning about Native American history at Jasper Ridge from Laura Jones, the director of Stanford Heritage Services and University Archaeologist. Photo: JRBP Staff

This year saw a return to in-person activities as we began the climb out of pandemic isolation. Welcome back to those who already are feeling Jasper Ridge's trails under your feet! And we look forward to visits from the rest of you!

Virtual Activities

Virtual Field Trips continued to be developed for classes at Stanford and beyond. A highlight was collaborating with Stanford Earth's Ryan Petterson to build a virtual tour for the Board of Trustees, who navigated around Searsville Reservoir while sitting at their computers during their April meeting. The tour was developed to demonstrate the power of Stanford's Transforming Learning Accelerator. You can take the tour at https://jrbp.stanford.edu/about)!

Evening Lectures enriched knowledge, partnerships, and sense of belonging among our community. Tyler McFadden discussed the Menlo Atherton Ecology Research Outdoors (MERO) program. Bryan Rodriguez, Jennifer Adams, and Esmeralda Cabrera shared experiences with Latino Outdoors. Julie Cain, Paul Ehrlich, Mary Ellen Hannibal, and Jeff Schwegman gave insights into Jasper Ridge history. Kelly Chauvin, Asmeret Berhe, Sergio Redondo and undergraduate researchers Julien Ueda and Tanvi Dutta Gupta presented their Jasper Ridge research. The Oakmead Herbarium docents reported on plant communities that are establishing on the drying parts of the Searsville lakebed.

Continuing Education programs for Jasper Ridge docents included lectures on biodiversity by Rodolfo Dirzo; soils by Scott Fendorf; geology by Richard Nevle; history of native people by Laura Jones; lichens by Jesse Miller; and plant defenses by Rodolfo Dirzo and Stuart Koretz.

EDUCATION

Collaborations with Colleges and Universities included hosting 30 hours of workshops to build the San Francisco Bay Research Coordination Network for Student Opportunities in Avian Research to Enhance STEM Education (SOAR). SOAR is bringing faculty, students, and volunteers from Stanford, San Jose State University, Santa Clara University, UC Santa Cruz Doris Duke Program, Mission College, West Valley College, San Francisco Bay Bird Observatory, California Academy of Scientists, iNaturalist, and eBird to create an experiential learning and research program focused on the study of birds and their habitats. The incubator project is funded by the National Science Foundation.

We also provided learning opportunities for students and faculty from Foothill College, De Anza College, Rowan College, California State University-East Bay, California State University-Monterey Bay, University of San Francisco, Chaminade University, Brown University, UC Berkeley, and University of Colorado.

BIO / EARTHSYS 105 students suited up against poison oak, celebrating a successful afternoon collecting and quantitatively analyzing vegetation data from Jasper Ridge. Photo: JRBP Staff

K-12 partnerships continued. The Stanford SEEDS chapter, led by Sriram R. Narasimhan and Sydney Lee Schmitter, worked with Redwood High School's Redwood Environmental Academy of Leadership (REAL) teacher Chris Beetley-Hagler to develop interactive virtual lessons for high school students. The lessons focused on the Green New Deal, Climate Justice, Indigenous Fire Management, and Plant Communities of Jasper Ridge. Menlo-Atherton High School teacher Lance Powell developed a lesson plan and a virtual tour of the Searsville Reservoir watershed to teach his students about the socio-ecological implications of the planned watershed restoration project. The Menlo-Atherton

Ecology Research Outdoors (MERO) program also continued. We started new activities with Nature Based Summer Camp and Fremont High School in Sunnyvale, CA.

NGOs with which we collaborated, in addition to those noted above, included Santa Cruz Mountains Stewardship Network, Golden Gate Biosphere Network, Canopy, Grassroots Ecology, GeoCAFES, Conciencia en las America and 500 Queer Scientists.

In-Person Education and Outreach

With the Native American Cultural Center, Jasper Ridge hosted members of the ***Muwekma Ohlone Tribal Council***: Charlene Nijmeh, Chairwoman; Monica V. Arellano, Vice Chairwoman; and Gloria E. Arellano-Gomez, Councilwoman; and two Stanford students, Jade Araujo, and Ryan Duncan. Members of the Tribal Council and students recorded Stanford's land acknowledgement, which is now available on a new Stanford web page titled "Stanford's Relationships with Native Peoples." There, the land acknowledgement can be downloaded and members of the Stanford community can continue to learn more about the Muwekma Ohlone Tribe.

Collecting and identifying terrestrial invertebrates with the guidance of docent Jack Owicki. Photo: JRBP Staff

Stanford Classes came back to Jasper Ridge following appropriate safety and health guidelines. BioPOP, led by Biology professor Lauren O'Connell and Biology PhD student Stephanie Caty, involved incoming Biology graduate students in ongoing ecological monitoring efforts at

EDUCATION

Jasper Ridge. Now in its second year, BioPOP is a collaboration with Hopkins Marine Station that promotes community across the three PhD tracks of the Biology department: cellular, molecular, and organismal biology; ecology and evolution; and Hopkins marine sciences.

Rodolfo Dirzo and Jorge Ramos, with TA Vito Mendez, delivered the BIO / EARTHSYS 105 class outdoors and in-person to ten students, training them to become new Jasper Ridge docents. We are very grateful to all of the contributors to this unique class: Steve Gomez, Laura Jones, Richard Nevle, Scott Fendorf, Nona Chiariello, Katherine Preston, Stuart Koretz, Trevor Hebert and Jack Owicki!

A collaboration with Stanford Earth brought students from the SESUR and SURGE programs to Jasper Ridge.

More than 30 ***Outreach Events*** utilized Jasper Ridge. Among them were Latino Outdoors activities during

Docents Diane Renshaw, Helen Quinn, and Dan Quinn refresh their identification skills in preparation for resuming docent-led tours after more than a year of pandemic shutdown. Photo: Merav Vonshak

#LatinoConservationWeek, and hybrid in-person / virtual National Bioblitz activities of the Society for the Advancement of Chicanos/Hispanics and Native Americans in Science (SACNAS) (in collaboration with Integrated Digitized Biocollections).

Continuing our tradition of being a learning space for K-12 teachers, we hosted several teachers taking part in the Stanford Research Experience for Teachers Program of the Office of STEM Outreach. Rodolfo Dirzo worked with the teachers to build skills in developing hypotheses and experiments outdoors.

Docents returned to Jasper Ridge in July, and thereafter resumed leading tours for the general public, all in COVID-safe ways.

New Research Projects

WELCOME BACK RESEARCHERS!

Archaeologists from Stanford Land Use and Environmental Planning (LUEP) Heritage Services uncover information about historical structures at Jasper Ridge. Photo: JRBP Staff

All research at JRBP was impacted by COVID-19 restrictions, but projects in the planning stages were hit hardest. Some essential research was able to continue remotely or with JRBP staff as stand-ins, but new on-site research was temporarily suspended. By the start of September 2020, quarantines and restrictions on travel and activities began to loosen, allowing resumption of some pre-pandemic studies. Finally, on February 1, 2021, we were able to consider new research proposals, after a shutdown of more than ten months.

Deciphering and documenting change on the scale of decades to millenia

1. Bryan Black (University of Arizona): Century-scale dendrochronology of Blue Oaks (*Quercus douglasii*).
2. Julie Cain (LUEP, Stanford), Nancy Lund (JRBP): The history of Jasper Ridge Biological Preserve.
3. Francesco de Bello (University of South Bohemia, Czech Republic): LOTVS (Long-Term Vegetation Sampling)—a global, collaborative database for analyzing temporal stability in plant communities.
4. Ted Mill (JRBP), Allison Stegner (Postdoctoral Scholar, JRBP, Stanford): Water chemistry history of Searsville Reservoir.
5. Garrett Trask, Laura Jones (Archaeology and LUEP, Stanford): Archaeological and historical surveys of the Searsville Watershed Restoration Project planning areas.

Genomics and Biodiversity

6. Jack Colicchio (Postdoctoral Scholar, University of California, Berkeley): Sampling of *Mimulus guttatus* (*Erythranthe guttata*) for the California Conservation Genomics Project.
7. Bernard Kim, Marianthi Karageorgi (Postdoctoral Scholars, Stanford): A comparative population genomic approach for high-resolution inference of natural selection in fruit flies (*Drosophila*).
8. Vrinda Madabushi Suresh (Undergraduate, Biology, Stanford): Diet breadth and seasonality of bats as determined by DNA analysis of bat guano.
9. Geoffrey Morse (Professor, Biology, University of California, San Diego): Seed beetles (Coleoptera: Chrysomelidae: Bruchinae) associated with native California clovers (genus *Trifolium*).

Bernard Kim and Marianthi Karageorgi hang Drosophila *traps. Photo: JRBP Staff*

10. Olivia Partamian, Allison Stegner (Undergraduate, Postdoctoral Scholar, Stanford): Description of Searsville sediment cores.
11. Julien Ueda (Undergraduate, Biology, Stanford): Avian diversity across a gradient of urbanization re-examined after nearly 3 decades.
12. Maria Viteri (PhD candidate, Biology, Stanford): A century-timeline of ostracod diversity in sediment cores of Searsville Reservoir.
13. Kipling Will (Professor, University of California, Berkeley): Conservation genetics of Golden Bear harpaline beetles (*Dicheirus* spp. (Coleoptera: Carabidae).

Drought and wildfire risk: implications for resource management and restoration

14. Anthony Barnosky (Professor, Biology/Jasper Ridge, Stanford) and Nona Chiariello (Jasper Ridge): Distribution and abundance of nests of Dusky-footed woodrats (*Neotoma fuscipes annectens*) in high-fuel-load woodland.
15. Trevor Hébert (Academic Technology Specialist, JRBP), Kelly McManus Chauvin (Postdoctoral Fellow, JRBP): Expanding the distribution of drought-limited California milkweeds to support recovery of monarch butterflies (*Danaus plexippus*).
16. Alandra Marie Lopez (PhD candidate, ESS, Stanford): Does chromium in serpentine vegetation contribute to wildfire-generated hexavalent chromium?

*Hundreds of nests of San Francisco dusky-footed woodrats (*Neotoma fuscipes annectens*), a species of Conservation Concern, were mapped along our Westridge fence line in areas slated for fire-fuels reduction. This wood rat showed up in a back yard on Stanford lands shortly after fire-fuel reduction destroyed critical habitat around woodrat nests in nearby green space. Photo: JRBP Staff*

17. Tyler McFadden, Lucas Pavan, Rodolfo Dirzo (Lecturer, PhD candidate, Professor, Biology, Stanford), Juan Navedo (Professor, Institute of Marine Science, Universidad Austral de Chile): Do avian physiological responses to drought stress account for bird population declines within a Northern California Nature Reserve?

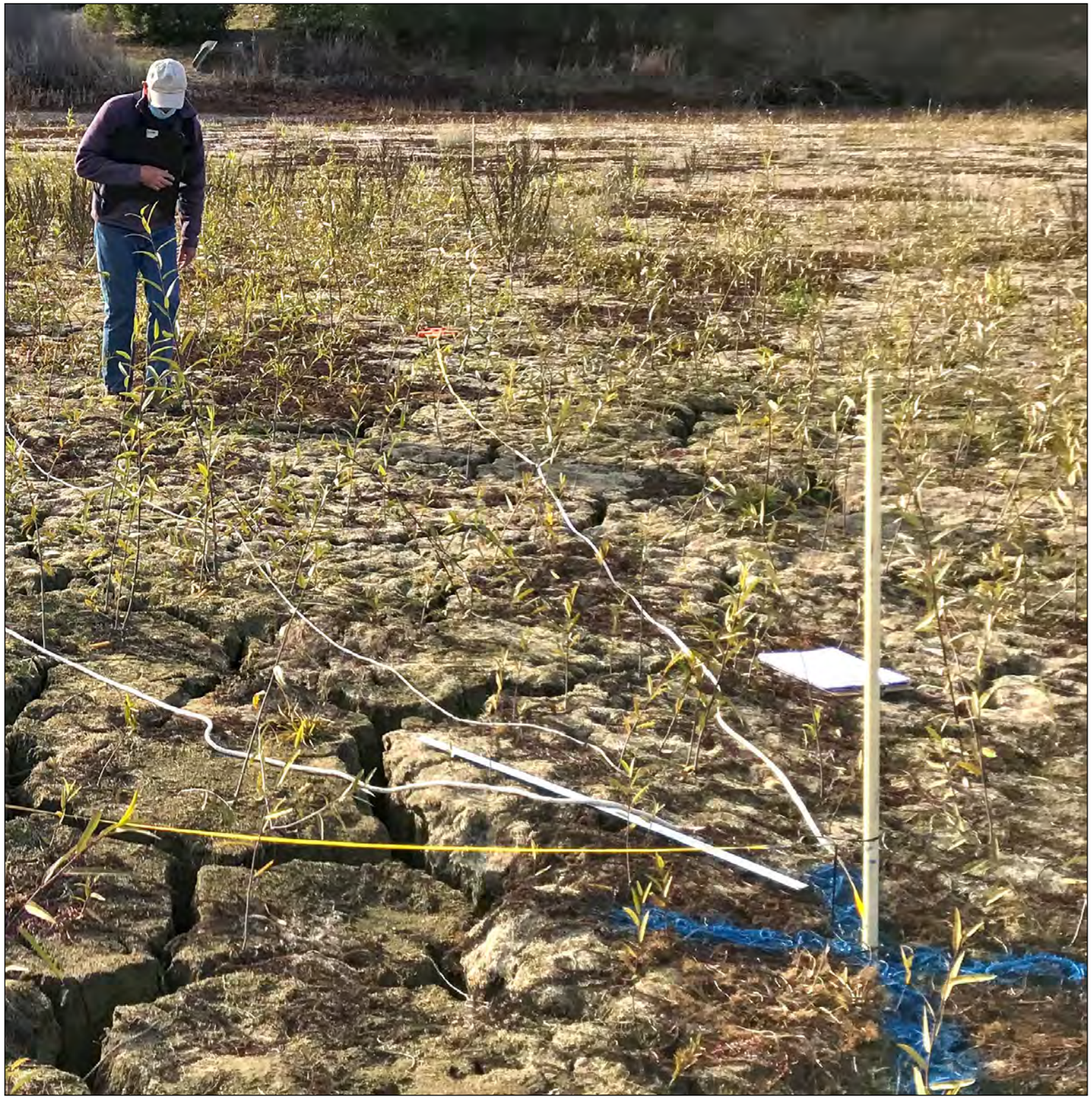
New Technology

18. Daniel Kang, Peter Bailis, Tatsunori Hashimoto, Matei Zaharia (PhD candidate, Professors, Computer

Science, Stanford), Tad Fukami, Kaoru Tsuji (Professor, Research Scientist, Biology, Stanford), Trevor Hébert (Technology Specialist, Jasper Ridge): Using Artificial Intelligence (AI) to detect hummingbirds in video recordings.

Understudied Habitats

19. Sara Keen,Travis Clow, Jane Willenbring (Postdoctoral scholar, Professor, PhD Candidate, Geological Sciences, Stanford): Sensor arrays for combined seismic and acoustic monitoring of soil structure, processes, and biological activity.
20. John Rawlings (JRBP): Distribution of four willow species and associated vegetation in Jasper Ridge riparian habitats.
21. Chih-Fu Yeh (PhD candidate, Biology, Stanford): Community assembly in water-filled tree cavities.



Docent Bill Gomez setting up a willow survey on the dry Searsville lakebed in December 2020. Photo: JRBP Staff

By the Numbers

EDUCATION

Within Stanford

1280 Stanford Student Visits

8 Stanford Classes

20 Departments or Programs

4 Stanford Schools

Overall

25 Visits for Meetings & Events

842 On-Site Visits

Overall visits increased 28% compared to last year. Because the pandemic shut us down for 10 months, virtual visits increased and on-site visits decreased.

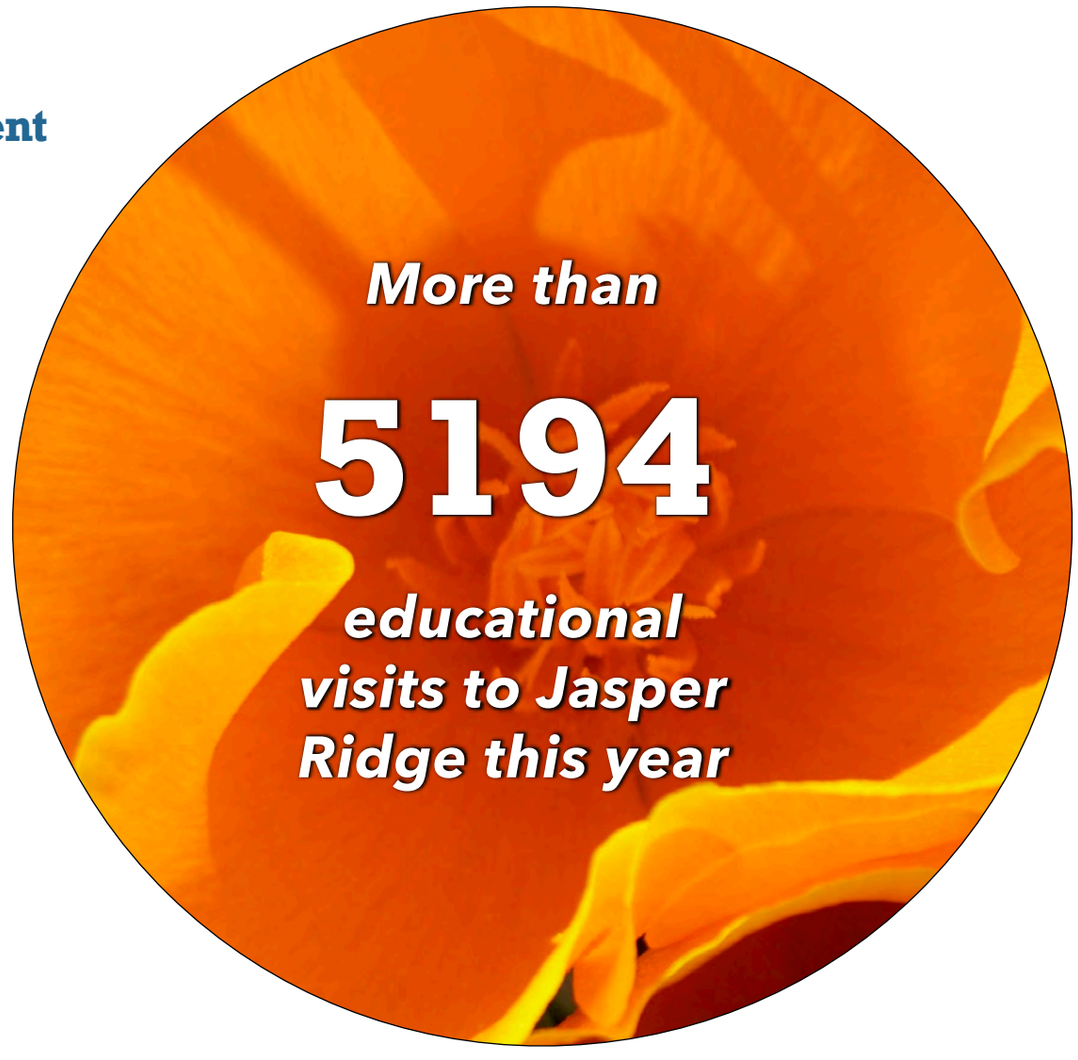


Photo: JRBP Staff

Outside Stanford

2119 Visits by Learners Outside Stanford

1117 Non-Stanford College Student Visits

678 K-12 Visits

15 Non-Stanford Colleges & Universities

5 High Schools & Middle Schools

16 Partner Organizations

By the Numbers

RESEARCH

Within Stanford

3 Stanford Schools

7 Academic Departments

19 Stanford Faculty

9 Postdocs and Visiting Scholars

17 Graduate Students

8 Undergraduates

28 Other Stanford (LBRE, Various Staff, etc.)

24 Jasper Ridge Docents

105 Stanford Researchers

61 Total Projects

Photo: Dan Quinn

Outside Stanford

~27 Researchers (includes single sampling visits and data provided to other PIs by Jasper Ridge staff; does not include all collaborators)

6 Countries outside the USA

Overall

The number of researchers using Jasper Ridge this year increased by 28% compared to last year due to an increased number of investigators collaborating on projects.

32 Research publications

Stewardship

TRANSITIONS UNDERWAY

Red willows (middle distance) and Epazote (foreground) became densely established on the newly-exposed lake bed. For scale, the gray dot just left of the middle of the photo is a standing person's head. We use the Spanish common name, Epazote, for Dysphania ambrosioides *rather than the English common name Mexican Tea, because 'Mexican Tea' is also often used for species other than* D. ambrosioides. *'Epazote' derives from the Aztec language Nahuatl. Translated it means 'skunk sweat', probably in reference to its strong odor. The plant has a rich history of medicinal and cooking uses in pre-colonial Aztec and Maya cultures and in present-day Mexico. Photo: JRBP Staff*

Ecosystem shifts

Two years of severe drought and diseases such as Sudden Oak Death have impacted Jasper Ridge in ways that may have long-lasting consequences. The signs were everywhere when we re-opened this summer after the COVID closure. Stressed, dead, and downed trees were evident throughout the woodlands, many shrubs produced little or no fruit, and Searsville Reservoir was at its lowest level in most people's memory. Impacts such as these can initiate major ecosystem shifts through vegetation dieback, increased fire risk, or ecological succession. They are also opportunities for research, teaching, and restoration.

Searsville Reservoir: Ecological succession that will inform restoration

One ecosystem shift already in full swing is formation of a riparian woodland in the upstream third of Searsville Reservoir. Over the past two years, this part of the lake has been dry for several months, whereas previously it held standing water year-round. The transition underway is a textbook example of ecological succession in a freshwater lake, and has broad significance for planning the Searsville Watershed Restoration Project (SWRP). Formation of the new woodland began when drawdown of the reservoir occurred early enough to coincide with dispersal of willow seeds, which occurred in late spring and early summer 2020, as revealed by drone imagery. The next five months provided good conditions for willow establishment, even as the drying lakebed became fractured with meter-deep fissures. The lakebed stayed dry through December 2020, making it possible to

combine ground surveys with drone imagery to assess the extent, abundance, and size of willows after the growing season ended. By then, the colony spanned about one acre and contained more than 9,000 willow saplings, of which about 200 were at least a meter tall.

As the reservoir began filling again in midwinter, the young willows became nature's version of a pond filter, trapping debris, filamentous algae, and sediment. Then the 2021 drawdown of the reservoir combined with the drought once again dried out the lake bed. Willows and other plants rapidly and densely covered the newly exposed ground, and many of the first year's willow saplings shot up to more than 2m in height.

Almost all the willows in the new colony are Red Willows (*Salix laevigata*), long considered JRBP's least common willow species with only a few individuals present. A search for the possible "mother tree(s)" of the willow colony turned up mature Red Willows upstream of the reservoir and on its margin, interspersed among JRBP's three other willow species.

Egrets and herons took advantage of the low lake levels, which concentrated their meals in shallow waters. Photo: Robert David Siegel, MD, PhD, Stanford University

Surrounding the willows, a non-native herbaceous species, Epazote (*Dysphania ambrosioides*), formed a stand nearly as large, dense and tall as the willows.

These surveys dovetailed with quarterly botanical surveys by SWRP planners to produce a more complete picture of habitat long recognized primarily for its remarkable avian richness. The studies also documented several plant species not previously reported at Jasper Ridge.

Woodrat nests—more than just ladder fuels

With devastating wildfires becoming the norm in California, there is a growing conservation crisis about how to reduce wildfire risks to people and property while still protecting biodiversity. This makes for complex decision-making, especially at Jasper Ridge, where protection of the preserve's natural resources is paramount.

A poster child for prioritizing stewardship actions could be the San Francisco dusky-footed woodrat (*Neotoma fuscipes annectens*), a species of Conservation Concern. They construct houses by piling up twigs and branches, essentially contributing to ladder fuels. Yet, as a keystone species, these woodrats influence the abundance of many other animals, including some that use the woodrat houses. In the 36 acres of Jasper Ridge woodland that have been ranked as high priority for reducing fire risk, 343 woodrat houses were mapped this summer. We know little about many other species potentially at risk.

Experimental use of a remote-controlled masticator operated by Dan Dempsey, fuel mitigation specialist for Woodside Fire Protection District, to clear underbrush and ladder fuels near Mapache Gate. Photo: JRBP Staff

How then, to accomplish fuel reduction in the context of the Jasper Ridge mission? Ecologically promising approaches include using browsing and grazing animals to thin understory, and, where conditions allow, prescribed burning. Goats and sheep have been effectively used in the Jasper Ridge Boething area for the past few years, and past prescribed burns have proceeded safely here. Other options under discussion include the potentially more ecologically destructive use of masticators and/or hand crews to cut, chip, and remove

vegetation. With the Woodside Fire Protection District, we experimented with using a remote-controlled masticator to clear surface and ladder fuels from approximately one acre near Mapache Gate; we will be monitoring that area to better understand the long-term effects.

A key concern with mechanical fuel-reduction is colonization of disturbed areas by invasive species, which we witnessed after eliminating fire fuels near our Main Gate in 2018. Yellow star-thistle (*Centaurea solstitialis)* spread rapidly. In response, we are mowing and bagging at strategic times through the year to reduce seed production. So far, results of this treatment look promising.

Milkweed and Monarch Rescue

As fuel loads are reduced, habitats will become more open. This will create new opportunities for restoration of grassland species that are in serious peril. California milkweeds (genus *Asclepias*) are a prime candidate because they are irreplaceable as a food source for iconic monarch butterflies (*Danaus plexippus)*, whose populations have recently plummeted. This year, 1,100 narrow-leaf milkweed (*A. fascicularis*) seeds were collected from the preserve's largest patch, with the aim of propagating them to better understand how to increase monarch habitat, and if Jasper Ridge is the right place to do that. We also hosted many sessions on how we might contribute to the groundswell of concern, passion, and the search for solutions to monarch decline, statewide and beyond.

We do not know if milkweeds were ever common at Jasper Ridge, although monarchs using this patch on Trail 10 have been caught on camera traps. Thinking broadly about how to use and enhance our habitats may help us identify novel approaches to advancing important conservation goals. Photo: JRBP Staff

Pandemic Wanderings

EXPLORING NEARBY NATURE

A. Photo: Dawn Neisser

Like the rest of Stanford and much of the world, Jasper Ridge was closed to general use for most of this pandemic year. Ever resourceful, many of our affiliates found other places to get their nature fix by visiting nearby areas. To commemorate this unusual year, we asked our affiliates to submit photos of the places they substituted for Jasper Ridge, as well as those that documented their return here when we re-opened in mid-summer. Self-quiz to test your Jasper Ridge knowledge: which of the photos on these pages are *not* of Jasper Ridge? Answers on pg. 34. Thanks to all of you who sent in photos! And welcome back everyone!

B. Photo: Jeff Schwegman

EXPLORING NEARBY NATURE

C. Photo: Peter Hart

D. Photo: Susan Walz

E. Photo: Scott Gould

Congratulations

ORGANIZATION OF BIOLOGICAL FIELD STATION AWARDS

The plaque honoring Jasper Ridge for its programs in Human Diversity now hangs at Sun Field Station. Photo: JRBP Staff

Jasper Ridge staff and affiliates received three awards from the Organization of Biological Field Stations this year. The OBFS includes about 200 field stations from around the world, and has the mission of helping member stations "increase their effectiveness in supporting critical research, education, and outreach programs."

Human Diversity Award

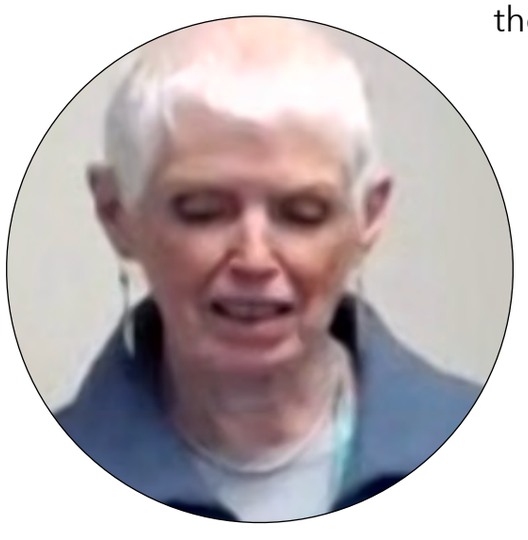
Kudos to Jorge Ramos and the rest of the Jasper Ridge community for programs put in place over the years that were recognized with the 2021 Human Diversity Award from the Organization of Biological Field Stations (OBFS). The Human Diversity Award is given annually to a member field station in recognition of "unique activities, programs, or approaches that increase the involvement, engagement and sustainability of underrepresented groups in field science."

Among the activities for which Jasper Ridge was recognized are partnerships with the Menlo-Atherton High School Ecology Research Outdoors Program (MERO), Redwood High School Environmental Academy Leadership Program (REAL), STEAM Program for Latina Girls, Latino Outdoors, Society for Advancing Chicanos, Hispanics, and Native Americans in Science (SACNAS), and the Ecological Society of America SEEDS program. Each year these programs reach hundreds of students and other learners that range in age from middle-school, to high-school, to college and university students.

OBFS Mary Hufty Local Hero Award

John Working and Lysbeth Anderson were honored as "individuals who exemplify the ideals of OBFS and support research, education, and outreach through personal and professional actions" They were honored for their contributions to both Jasper Ridge and Flathead Lake Biological Station. John has served as docent at Jasper Ridge for 40 years,

John Working



Lysbeth Anderson

where his tours have the reputation of being "legendary." He helped establish the Jasper Ridge bird transects, an effort that has produced a nearly continuous 40-year data set that continues to this day.

Lysbeth has been an active member of the Flathead Lake Biological Station Advisory Board for half a decade, and has been unwavering in her support and providing critical guidance for both Jasper Ridge and Flathead Lake.

OBFS Meeting Support Award

Jasper Ridge docent and student Julien Ueda was awarded an OBFS Meeting Support Award. He is studying the long-term bird population trends at Jasper Ridge—using the data that John Working started collecting four decades ago! Julien is an undergraduate in the Dirzo Lab in Biology.

Julien Ueda

Jasper Ridge Environmental Scholar Award

Sydney Lee Schmitter and Sriram R. Narasimhan were the inaugural recipients of the Environmental Scholar Award. The award recognizes commitment to education, outreach, and inclusivity to build and sustain a dynamic community for learning at Jasper Ridge and beyond. Their outreach efforts with the Redwood Environmental Academy of Leadership (REAL) program and the Stanford SEEDS student chapter provided educational opportunities to broad audiences including groups historically under-represented in STEM.

Sydney Lee Schmitter

Sriram R. Narasimhan

Tanvi Dutta Gupta

Stanford Existential Risk Initiative Fellowship

Junior Tanvi Dutta Gupta received a Stanford Existential Risk Initiative fellowship to analyze mosquito population dynamics at Jasper Ridge and the impact of biocides on insect numbers. She was also awarded a Chappell Lougee scholarship to research the history of biocide use at Jasper Ridge and biocide development at Stanford. Tanvi is a member of the Hadly Lab in Biology.

Biology Summer Undergraduate Research Program (B-SURP)

Olivia Partamian received a B-SURP award to participate in a study of ostracods from Searsville Reservoir sediment cores. Her work included helping to extract ostracods from the sediment, and preparing smear slides. Olivia is a member of the Hadly Lab in Biology.

Olivia Partamian

Philippe Cohen Graduate Fellowship Award

The recipients for 2021-22 are Biology PhD students Lisa Couper (Mordecai Lab) and Magdalena Warren (Fukami Lab).

Lisa studies patterns of thermal tolerance in vector populations and the effects of vector adaptation on disease transmission under climate change. Lisa's past research focused on the microbial ecology of Lyme disease and the effects of climate change on tick-borne disease incidence.

Lisa Couper

Magdalena Warren

Magdalena studies microbial community ecology. Her work aims to understand the effects that microbial communities have on their hosts, and the influences of gradients such as temperature and pH on the microbial communities. Magdalena's past research examined the connections between temperature, location, and the intricate microbe-plant-pollinator relationships that influence the nectar microbiome of *Asclepias curassavica*, a non-native tropical milkweed.

Tyler McFadden

Biology Department Norman K. Wessells Teaching Award

PhD student Tyler McFadden was honored by the Biology Department for his exceptional effectiveness as a teaching assistant, in part for his ornithology course (co-taught with PhD student Lucas Pavan), which includes a field component they teach at Jasper Ridge. Tyler has also mentored undergraduates who work on ornithology projects at Jasper Ridge, and co-founded the MERO program, one of the outreach programs for which Jasper Ridge received the OBFS Human Diversity Award (pg. 25). He has also been an important contributor to the SOAR project, which is building a STEM education program around ornithology (pg. 10). Tyler is a member of the Dirzo Lab in Biology.

Publications

Leaf and stem galls are abnormal plant growths caused by insects, mites, nematodes, fungi, bacteria, and viruses. Docent Paul Heiple points to "oak apple" galls on this Valley Oak, which are induced by a wasp that is aptly named Andricus quercuscalifornicus*. Ramón Perea and coauthors (publication 23) identified more than 20 different kinds of galls on three species of Jasper Ridge oaks, with the highest gall diversity on Coast Live Oaks. Valley Oaks have lower gall diversity but often have large quantities. Photo: Merav Vonshak*

1. Alvarez-Perez S, Baker LJ, Morris MM, Tsuji K, Sanchez VA, et al. 2021. *Acinetobacter pollinis* sp. nov., *Acinetobacter baretiae* sp. nov. and *Acinetobacter rathckeae* sp. nov., isolated from floral nectar and honey bees. International Journal of Systematic and Evolutionary Microbiology 71: 004783. https://doi.org/10.1099/ijsem.0.004783.
2. Cooper KM, Auerbach AJJ, Bader JD, Beadles-Bohling AS, Brashears JA, et al. 2020. Fourteen recommendations to create a more inclusive environment for LGBTQ+ individuals in academic biology. CBE—Life Sciences Education 19: es6. https://doi.org/10.1187/cbe.20-04-0062.
3. Couper LI, Sanders NJ, Heller NE, Gordon DM. 2021. Multiyear drought exacerbates long-term effects of climate on an invasive ant species. Ecology: e03476. https://doi.org/10.1002/ecy.3476.
4. Croll D, Crous P, Pereira D, Mordecai E, McDonald B, Brunner P. 2021. Genome-scale phylogenies reveal relationships among *Parastagonospora* species infecting domesticated and wild grasses. Persoonia-Molecular Phylogeny and Evolution of Fungi 46: 116-128. https://doi.org/10.3767/persoonia.2021.46.04.
5. Cushman JH, Saunders LE, Refsland TK. 2020. Long-term and interactive effects of different mammalian consumers on growth, survival, and recruitment of dominant tree species. Ecology and Evolution 10: 8801-14. https://doi-org.stanford.idm.oclc.org/10.1002/ece3.6578.
6. Decker LE, San Juan PA, Warren ML, Duckworth CE, Gao C, Fukami T. 2020. Higher variability in fungi compared to bacteria in the foraging Honey Bee gut. https://www.biorxiv.org/content/biorxiv/early/2020/10/21/2020.10.20.348128.full.pdf.
7. Fang G, Li YE, Zhao Y, Martin ER. 2020. Urban near-surface seismic monitoring using distributed acoustic sensing. Geophysical Research Letters 47: e2019GL086115. https://doi-org.stanford.idm.oclc.org/10.1029/2019GL086115.
8. Farner JE, Spear ER, Mordecai EA. 2020. Habitat type and interannual variation shape unique fungal pathogen communities on a California native bunchgrass. Fungal Ecology 48: 100983. https://doi.org/10.1016/j.funeco.2020.100983.
9. Flegal AR, Odigie KO. 2020. Distinguishing between natural and industrial lead in consumer products and other environmental matrices. Journal of Agricultural and Food

PUBLICATIONS

Chemistry 68: 12810-12819. https://doi-org.stanford.idm.oclc.org/10.1021/acs.jafc.9b07848.

10. Gao Y, Ding J, Yuan M, Chiariello N, Docherty K, et al. 2021. Long-term warming in a Mediterranean-type grassland affects soil bacterial functional potential but not bacterial taxonomic composition. npj Biofilms and Microbiomes 7: 17. https://www.ncbi.nlm.nih.gov/pubmed/33558544.
11. Gray DA, Weissman DB, Cole JA, Lemmon EM. 2020. Multilocus phylogeny of *Gryllus* field crickets (Orthoptera: Gryllidae: Gryllinae) utilizing anchored hybrid enrichment. Zootaxa 4750.3. 2. https://www.ncbi.nlm.nih.gov/pubmed/32230457.
12. Kang D, Gan E, Bailis P, Hashimoto T, Zaharia M. 2020. Approximate selection with guarantees using proxies. arXiv preprint arXiv:2004.00827.
13. Kendig AE, Spear ER, Daws SC, Flory SL, Mordecai EA. 2021. Native perennial and non-native annual grasses shape pathogen community composition and disease severity in a California grassland. Journal of Ecology 109: 900-12. https://www.ncbi.nlm.nih.gov/pubmed/34158675.
14. Koenig WD, Knops J, Carmen W. 2020. Intraspecific variation in the relationship between weather and masting behavior in the California valley oak *Quercus lobata*. Canadian Journal of Forest Research. https://doi.org/10.1139/cjfr-2020-0098.
15. Koweek DA, García-Sánchez C, Brodrick PG, Gassett P, Caldeira K. 2020. Evaluating hypoxia alleviation through induced downwelling. Science of the Total Environment 719: 137334. https://www.ncbi.nlm.nih.gov/pubmed/32135325.
16. Lagerstrom KM, Hadly EA. 2021. The under-investigated wild side of *Escherichia coli*: genetic diversity, pathogenicity and antimicrobial resistance in wild animals. Proceedings of the Royal Society B 288: 20210399. https://www.ncbi.nlm.nih.gov/pubmed/33849316.
17. Leempoel K, Hébert T, Hadly EA. 2020. A comparison of eDNA to camera trapping for assessment of terrestrial mammal diversity. Proceedings of the Royal Society B 287: 20192353. https://www.ncbi.nlm.nih.gov/pubmed/31937227.

*A harvester ant (*Veromessor andrei*) removing a dead carpenter ant (*Camponotus *sp.) from its nest. Both are native species at Jasper Ridge. Lisa Couper and coauthors (publication 3) used information from the 28-year Jasper Ridge ant survey to determine that native species are faring a little better than invasive Argentine ants under conditions of climate change. Photo: Merav Vonshak*

PUBLICATIONS

18. Lesage JC. 2020. Long-term effects of management and climate on California's grassland flora and rare plant species. PhD Dissertation, Environmental Studies, University of California, Santa Cruz.
19. López-Sánchez A, Johnson I, Dirzo R, Perea R. 2021. Matching species traits and microsites improves regeneration in mixed oak woodlands. Applied Vegetation Science 24:e12536. https://doi-org.stanford.idm.oclc.org/10.1111/avsc.12536.
20. Meyer JM, Leempoel K, Losapio G, Hadly EA. 2020. Molecular Ecological Network Analyses: An effective conservation tool for the assessment of biodiversity, trophic interactions, and community structure. Frontiers in Ecology and Evolution 8: 360. https://www.frontiersin.org/article/10.3389/fevo.2020.588430.
21. Moon M. 2020. Observing and modeling climate controls and feedbacks on vegetation phenology at local-to-continental scales. PhD Dissertation, Earth and Environment, Boston University.
22. Nelson RA, Francis EJ, Berry JA, Cornwell WK, Anderegg LDL. 2020. The role of climate niche, geofloristic history, habitat preference, and allometry on wood density within a California plant community. Forests 11: 105. https://www.mdpi.com/1999-4907/11/1/105.
23. Perea R, Dirzo R, Bieler S, Wilson Fernandes G. 2021. Incidence of galls on sympatric California oaks: ecological and physiological perspectives. Diversity 13: 20. https://www.mdpi.com/1424-2818/13/1/20.
24. Shackleton RT, Foxcroft LC, Pyšek P, Wood LE, Richardson DM. 2020. Assessing biological invasions in protected areas after 30 years: Revisiting nature reserves targeted by the 1980s SCOPE programme. Biological Conservation 243: 108424. https://doi.org/10.1016/j.biocon.2020.108424.
25. Song C, Uricchio LH, Mordecai EA, Saavedra S. 2021. Understanding the emergence of contingent and deterministic exclusion in multispecies communities. Ecology Letters 24: 2155-68. https://www.ncbi.nlm.nih.gov/pubmed/34288350.
26. Torres-Martínez L, Porter SS, Wendlandt C, Purcell J, Ortiz-Barbosa G, et al. 2021. Evolution of specialization in a plant-microbial mutualism is explained by the oscillation theory of speciation. Evolution 75: 1070-86. https://www.ncbi.nlm.nih.gov/pubmed/33782951.
27. Walter JA, Hallett LM, Sheppard LW, Anderson TL, Zhao L, et al. 2020. Micro-scale geography of synchrony in a serpentine plant community. Journal of Ecology 109: 750-762. https://doi.org/10.1111/1365-2745.13503.
28. Walter JA, Shoemaker LG, Lany NK, Castorani MCN, Fey SB, et al. 2021. The spatial synchrony of species richness and its relationship to ecosystem stability. Ecology: e03486. https://esajournals.onlinelibrary.wiley.com/doi/abs/10.1002/ecy.3486.
29. Wang C, Christman LE, Klemperer SL, Glen J, McPhee DK, Chen B. 2021. Assessment of a claimed ultra-low frequency electromagnetic (ULFEM) earthquake precursor. EarthArXiv. https://doi.org/10.31223/X5CG8P.
30. Yang J, Zhang Y, Du L, Liu X, Shi S, Chen B. 2021. Improving the selection of vegetation index characteristic wavelengths by using the PROSPECT model for leaf water content estimation. Remote Sensing 13: 821. https://www.mdpi.com/2072-4292/13/4/821.
31. Yang S, Zheng Q, Yang Y, Yuan M, Ma X, et al. 2020. Fire affects the taxonomic and functional composition of soil microbial communities, with cascading effects on grassland ecosystem functioning. Global Change Biology 26: 431-42. https://www.ncbi.nlm.nih.gov/pubmed/31562826.
32. Zalasiewicz J, Waters CN, Ellis EC, Head MJ, Vidas D, et al. 2021. The Anthropocene: Comparing its meaning in geology (Chronostratigraphy) with conceptual approaches arising in other disciplines. Earth's Future 9: e2020EF001896. https://doi.org/10.1029/2020EF001896.

Financials

PANDEMIC REDUCTIONS

Expenditures	**$1,396,409**
Administration	$22,671
Operations	$100,641
Land Management	$5,719
Education	$10,225
*Research	$161,896
Staff Salary & Fringe	$1,041,164
**Encumbered	$54,093

Revenues	**$1,396,409**
General Income	$11,577
University H&S	$263,953
Gifts	$44,171
Grants	$181,679
***Endowment Income	$895,029

Revenues and expenditures fell this year due to the financial impacts of the COVID-19 shutdown. Also reduced was water availability, with so little rain. These Lesser Goldfinches, like many of Jasper Ridge's wildlife species, coped by utilizing a spring which luckily did not completely dry up. Photo: Peter Hart

Expenditures and revenues only include funds controlled by JRBP, the vast majority of which are for direct support of maintaining the preserve for users. Most users fund their work from non-JRBP sources.

* Includes $148,355 post-doctoral and research assistant salaries and fringe.

** The majority of encumbered funds are committed towards the purchase of a much-needed new tractor and attachments (total cost ~$150,000) ordered in FY21, but which will not be delivered and payed for until FY22.

*** Includes $80,000 from an endowment administered by the Biology Department but restricted for use by JRBP. Revenues and expenditures do not include student support provided by the Philippe Cohen Graduate Student Fellowship, which is administered out of Biology.

Advisory Groups & Staff

Community Coordinating Council

Advisors from Stanford and non-Stanford groups representing the broad range of organizations with which the preserve interacts. Provides advice and guidance to the directors on significant management challenges.

JESSICA SHORS APPEL - San Francisco Water Department; RICK DEBENEDETTI - Woodside Trail Club; DON BULLARD - Woodside Fire Protection District; DENNIS DEBROECK - Peninsula Open Space Trust, Board Chair, PIE Ranch, Board Member, Retired Senior Corporate Partner, Fenwick & West LLP; MARY ELLEN HANNIBAL - Citizen science, nature writer; JERRY HEARN - Grass Roots Ecology Board Chair and Jasper Ridge docent; LAURA JONES – Stanford LBRE Archaeology; JACKIE MAGNO - Stanford University, DCI Program & Jasper Ridge neighbor; JEAN MCCOWN - Stanford University Government/ Community Relations; 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 JPA; JEANNE SEDGWICK - Neighbor and Jasper Ridge docent; ANNE SCHULOCK – Assistant Vice President for the Arts, Stanford University; DAVID SMERNOFF - Grassroots Ecology; LYNN STEGNER - Stanford Continuing Studies Program, author, editor, and literary consultant; MATTHEW TIEWS - Associate Vice President for Campus Engagement, Stanford University; 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; ANTHONY BARNOSKY - JRBP Executive Director (ex-officio); NONA CHIARIELLO - JRBP Staff Scientist (ex-officio); ELIZABETH HADLY - JRBP Faculty Director (ex-officio)

Staff

ELIZABETH HADLY - Faculty Director; ANTHONY BARNOSKY - Executive Director; NONA CHIARIELLO - Staff Scientist; BROOKE FABRICANT - Resident Ranger; DORIAN GOLAN - Administrative Program Manager; STEVEN GOMEZ - Operations Manager; TREVOR HÉBERT - Academic Technology Specialist; JORGE RAMOS - Associate Director for Environmental Education; KELLY MCMANUS CHAUVIN, ALLISON STEGNER - Postdoctoral Scholars; CAROLINE GLAZER - GIS Assistant; KEI TOMOZAWA - Research Assistant

Faculty Advisory Committee

Composed of Stanford faculty and graduate students to provide high-level guidance on strategy and policy.

1,NICOLE M. ARDOIN - Graduate School of Education; 2,WILLIAM BARNETT - School of Business; 3,ALEXANDRIA BOEHM - Civil and Environmental Engineering; 4,CRAIG CRIDDLE - Civil and Environmental Engineering; 5,RODOLFO DIRZO - Biology; 6,STEPHEN A. FELT - Comparative Medicine; 7,SCOTT FENDORF - Earth System Science; 8,ZEPHYR FRANK - History; 9,DAVID L. FREYBERG - Civil and Environmental Engineering; 10,TADASHI FUKAMI - Biology;

ADVISORY GROUPS

11,JEREMY GOLDBOGEN - Hopkins Marine Station; 12,ALEXANDRA KONINGS - Earth System Science; 13,FIORENZA MICHELI - Hopkins Marine Station; 14,ERIN GILMOUR MORDECAI - Biology; 15,KABIR GABRIEL PEAY - Biology; 16,MANU PRAKASH - Bioengineering; 17,DEBORAH SIVAS - Law / Director of the Stanford Environmental Law Clinic; 18,KATHERINE LAGERSTROM - Graduate Student Representative, Biology; 19,BEN MORAN - Graduate Student Representative, Biology; 20,ELIZABETH HADLY - JRBP Faculty Director, Biology; ANTHONY BARNOSKY - JRBP Executive Director (ex-officio); NONA CHIARIELLO - JRBP Staff Scientist (ex-officio)

Rotated off the FAC this year: A hearty thank you to these faculty and students for valuable guidance over the years! MARK DENNY - Hopkins Marine Station; DMITRI PETROV - Biology; BARTON H. THOMPSON JR. - Law; GAIL WIGHT - Art; GLADE ARTHUR DLOTT - Graduate Student Representative, Biology; SERGIO ADAN REDONDO - Graduate Student Representative, Biology

Jasper Ridge Faculty Advisory Committee members. The Committee has a representative from each of Stanford's Schools. Numbers are keyed to names in the text to the left.

Answers to Pandemic Wanderings Quiz *on pgs. 23-24: A-Methusela Tree on California Water Service Company Land, viewed from El Corte Madera Creek Open Space Preserve. B-Scorpion at Edgewood Park. C-Peregrine Falcon at Año Nuevo State Park. D-Overgrown sign by Searsville Reservoir. E-Lupines at Jasper Ridge.*

Thank You!

To support our work: https://jrbp.stanford.edu/donate

For more information about opportunities to support Jasper Ridge,
contact: Lisa Rying, Office of Development, 650-723-9537, lrying@stanford.edu

Mailing address:
Jasper Ridge Biological Preserve
Stanford University,
4001 Sand Hill Road
Woodside, CA 94062

Twitter and Instagram: @stanfordjrbp