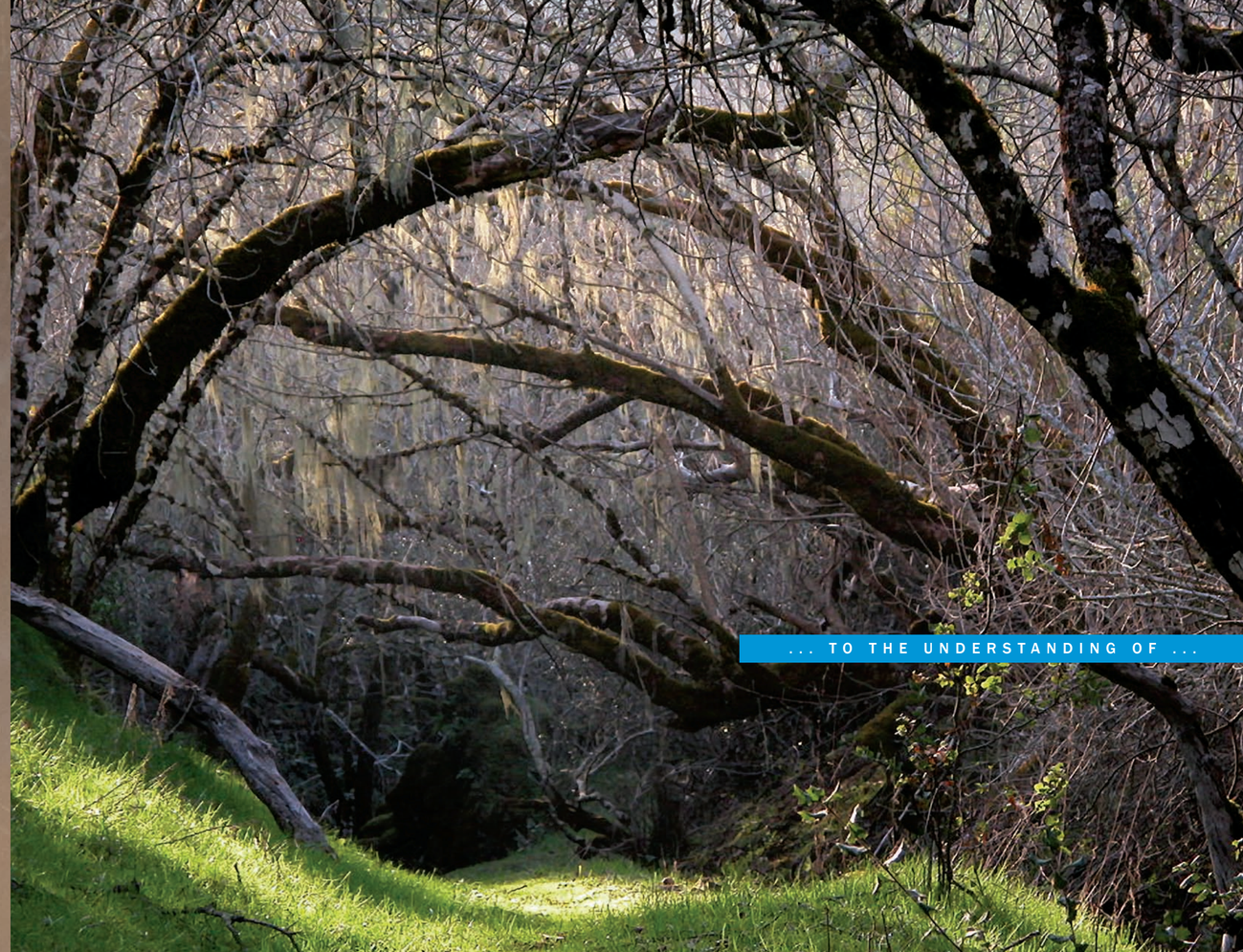

SINCE 1973...

... JASPER RIDGE BIOLOGICAL PRESERVE HAS CONTRIBUTED ...



... TO THE UNDERSTANDING OF ...


... THE EARTH'S NATURAL SYSTEMS ...


... THROUGH RESEARCH, ...

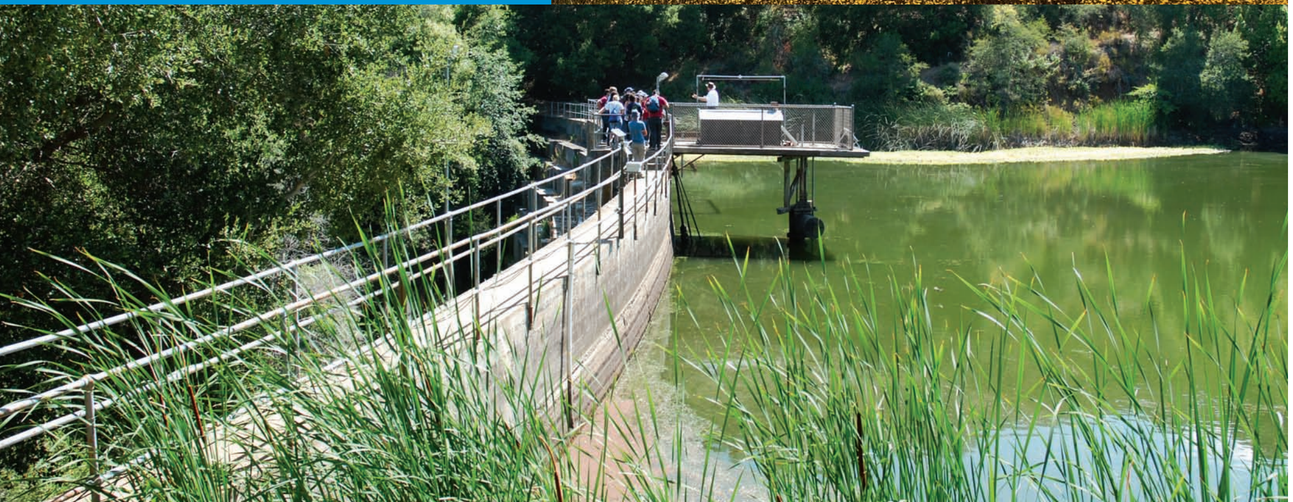
... EDUCATION, ...

... AND CONSERVATION ...

Stanford | SCHOOL OF HUMANITIES AND SCIENCES

JASPER RIDGE'S 2011-12 ANNUAL REPORT CELEBRATES THAT JOURNEY

FROM THE FACULTY DIRECTOR



As we approach the 40th anniversary of Jasper Ridge as a formal biological preserve, it is interesting to reflect on the characteristics that have made it successful. The diverse ecosystems, the great location, and a dedicated community are all important. But Jasper Ridge benefits from another key asset—Stanford's commitment to responsible stewardship.

Stanford's commitment to Jasper Ridge is highlighted in ongoing processes on two issues with potential long-term consequences for the preserve and its mission. One concerns the future of the San Francisquito Creek watershed and Searsville dam. The other addresses the possibility of reintroducing the locally extinct Bay checkerspot butterfly. Both are issues with lots of dimensions and with features on which thoughtful people often reach different conclusions.

Both these issues are the focus of serious, long-term efforts, led by Stanford, to find good solutions; solutions that work for a wide range of stakeholders over a long time horizon. Here, I want to share some thoughts on the importance of this kind of approach, independent of the specific outcomes.

Today's world is immensely complicated. We live in an environment in which scientific knowledge interacts with technology, which interacts with diverse social, political, and economic dynamics. Simply getting a feel for all aspects of a major issue is a challenge for anybody. The hope of understanding all of the details is generally a quixotic mirage.

What is the best way to make smart decisions about issues too complex for anyone to fully grasp? I don't have a definitive answer, but I am very impressed with the approach that Stanford has been taking with the Searsville watershed and the potential for a Bay checkerspot reintroduction. From my perspective, a successful process to address issues like these depends on the following four key elements. First, there are huge opportunities in taking advantage of the knowledge and vision of smart people with diverse experiences and approaches. Building on differences of opinion and expertise can be a potent mechanism for discovering creative, unexpected possibilities. Collections of Stanford students, staff, and faculty often generate this creative potential. Second, good solutions to major issues require maintaining focus on the big-picture, long-term goals. Avoiding tangents and side issues is a key ingredient in the recipe for success. Third, everybody involved needs to recognize that the best solutions may be different from each person's initial guess. Universities tend to be wonderful places for mutual respect, but they are not always places where people can separate ideas from egos. Fourth, it is critical to appreciate that, even with the first three elements in place, few issues can be completely understood, and learning by doing provides a uniquely powerful mechanism for keeping solutions moving and on track.

The individuals who are involved make a huge difference in the prospects for success, but the institutional setting is also critical. In the ongoing processes, led by the Searsville Alternatives Study Steering Committee and, for the potential Bay checkerspot reintroduction, the Jasper Ridge Advisory Committee, Stanford has set an outstanding stage. It has gathered great people, provided them with the right mandate, and stepped back to let good solutions emerge. It is inspirational to see the confidence that the university places in its community. I'm optimistic that uniquely creative solutions will justify that confidence. ■

—Chris Field

OPPOSITE, TOP: SERPENTINE GRASSLAND, HABITAT OF LOCALLY EXTINCT BAY CHECKERSPOT BUTTERFLY.

BOTTOM: SEARSVILLE DAM WITH DAVID FREYBERG, MS '77, PhD '81, INSTRUCTING A CLASS.

THE VALLEY OAKS

In cool, crisp January, the valley oaks stand guard at the preserve stripped of their leaves, sentinels promising a greener day. It is both that promise and the trees' gnarled silhouettes that make entering Jasper Ridge a compelling experience, even during last winter's drought. I look at the trees and wonder what about their past has created such twisted and strange shapes. My attachment to these oaks has deepened over the years. They make it easy for me to reflect on the past and think about the future, all the while feeling connected to the present. They stand as vessels for the passage of time, hinting that if understood properly, I might glimpse into the currents of time. ■

MANAGEMENT

PAST, PRESENT, AND FUTURE

PHILIPPE S. COHEN

During the coming year, Jasper Ridge will celebrate the 40th anniversary of the Stanford Board of Trustees' decision to designate an initial 960 acres of land between SLAC and Portola Valley as a preserve. That action set the groundwork for reinforcing and advancing a tradition of discovery led by researchers and students.

Add the remarkable community of docents and community supporters, and the preserve has probably exceeded the expectations of almost all present for that Board's decision. Reflecting upon 1973, the preserve's establishment happened within the context of a historic year—*Roe v. Wade*, end of the Vietnam War, Watergate, Yom Kippur War, opening of the World Trade Center, establishment of liaison offices in the capitals of China and the U.S., passage of the Endangered Species Act, and Congressional authorization of the Trans-Alaska Pipeline.

For pop-culture enthusiasts among us, it was the year Secretariat won the Triple Crown, Billy Jean King defeated Bobby Riggs in the Battle of the Sexes, the designated hitter came to baseball, and George Steinbrenner bought the NY Yankees. In films, it was the year of *The Godfather* and one of my all-time favorites, *Cabaret*, while in popular music, Kiss performed its first concert and the Everly Brothers broke up.

These events will mark their 40th anniversaries in the coming year. Against such a backdrop, it may be difficult to think how the preserve's 40th will stand out. But while Jasper Ridge is but a postage stamp of land in the landscape, the discoveries made here ripple to all corners of the globe. ■

SEARSVILLE DAM The future of the preserve and Searsville Dam are intertwined, and plans for its future continue to occupy much of my attention. Dams have a peculiar symbolic dissonance as testaments to human ingenuity and progress while also standing as a physical manifestation of the human propensity to battle with natural systems.

This past year, the Searsville Steering Committee made substantial progress in developing criteria for strategic evaluations. It identified URS, Inc. as lead consultants to carry out initial technical studies that will address questions and information gaps to properly inform strategic decisions. Additionally, several meetings with groups outside the university provided perspective on needed studies and feedback that will be incorporated in assessing options. Since Searsville significantly impacts the future of the preserve, you can be sure I will keep you posted of any decisions or developments.

Initial technical studies will address: 1. The structural lifespan of the dam and the feasibility of removing or altering it. 2. How the downstream and upstream hydrology will respond to changes in sediment loads. 3. The biological consequences of changes in hydrological conditions—silting in of the reservoir, dredging, dam removal, etc. ■

FOR MORE DETAILS, PLEASE VISIT
- *http://lbre-apps.stanford.edu/searsville/*
- *http://urscorp.com*

ANN CARLSON'S *PICTURE JASPER RIDGE*

The arts emerged as an important JR partner with our first-ever visiting artist. Ann Carlson's production, *Picture Jasper Ridge*, re-staged historical moments from photographs in or near their original locations at the preserve. This production was made possible thanks to the Stanford Arts Institute and the Department of Theater and Performance Studies (formerly known as the Stanford Institute for Creativity in the Arts and Stanford Drama) and a generous gift from Anthony and Rosina Sun. There has always been an artistic undercurrent at Jasper Ridge, as shown by the paintings of Herb Dengler and Carol Hake, the line drawings of Chris Andrews, the photographs of our many docents and students (just look at this annual report), and the recent images of Rob Buelteman. In November, prior to the performance, Continuing Studies hosted an evening campus event moderated by Ann Carlson titled, "Seeing into the Life of Things," highlighting Rob Buelteman's photography, Annea Lockwood's soundscapes, and Mark Wagner's murals. In March, Ann's remarkable production of the "Picture Jasper Ridge" performance hike proved to be an inspired success, as it re-staged historical moments at the preserve. As one of the participants noted about the hike: "It was one of the most extraordinary experiences I've ever had." The performance provided a visceral dimension for how decisions and actions taken today and in the coming years are destined to become historical events whose ripples will both constrain and hopefully enhance Jasper Ridge as a flourishing landscape and as an important contributor to future knowledge. ■

FOR MORE DETAILS AND VIDEO, PLEASE VISIT

- *http://news.stanford.edu/news/2011/october/dancer-jasper-ridge-101 011.html*
- *http://*arts.stanford.edu/gallery/2012/picture-jasper-ridge-performancehike-ann-carlson

THE LESLIE SHAO-MING SUN FIELD STATION

On June 6th, the Leslie Shao-ming Sun Field Station quietly passed its 10th anniversary as an award-winning green building. One way to measure the success of such a project is to look at how program activities at the preserve have grown and expanded. Records reveal that a large number of classes, groups, and organizations have taken advantage of this facility. A cursory review shows that at least 37 Stanford courses, seven non-Stanford courses, 36 Stanford-affiliated organizations, and 40 non-Stanford organizations were able to take advantage of the preserve that otherwise would not have if the building were not present. Adding to this remarkable success, I hope to announce in the coming year our achievement of annual net-zero carbon emissions in terms of energy consumption versus production. We have been close for quite some time and, through some changes fueled by analyzing the data collected during most of the past decade, we hope to provide evidence of our success. So stay tuned. ■

A SENSE OF PLACE An enduring and continuing theme of the preserve is the dance between our collective sense of Jasper Ridge as a place and the certainty that conditions and circumstances will change. This tension will be played out in how successfully we maintain that elusive "sense of place"—protecting the preserve's uniqueness while adapting to the changes brought by the increased presence of the human footprint. The temptation is to let nature heal itself by just erasing the footprint. But I've been around long enough to know that some injuries are cumulative and never quite fully heal. Since the founding of Stanford University, atmospheric CO_2 has increased by 30 percent and the human population has increased four-fold. Growing human presence has often led me to conclude that when it comes to managing ecosystems or landscapes, I have far more confidence in our capacity to get it wrong than in our ability to get it right. Even so, I understand that the most important contribution this biological field station can make will be to help forge new knowledge and cultivate an understanding that will help future generations pursue the long, arduous process of helping natural systems heal while conserving the life forms that are not only the basis of our existence but also a measure of life's richness. So, as I reflect upon those valley oaks as one enters the preserve, a closer look probably won't reveal any physical evidence of that landmark decision in 1973. Rather, their continued presence represents a statement about who we are and who we aspire to be. ■












190 B.C.

Earliest evidence of Native Americans on the lands that today make up the preserve.

1769

Portolá expedition arrives.

1854-1890

Town of Searsville era.

1882

Leland Stanford acquires lands.

1891

Stanford University opens its doors and first classes come to the preserve area.

Spring Valley Water Company completes construction of Searsville Dam.

1896-1897

First master's and PhD theses completed using data from JRBP lands.

1919

Stanford acquires Searville Dam and all the water rights associated with the reservoir.

Landmark research publications from each decade since 1960 that have been most cited in the scientific literature.

1922-1976

Searsville Park opens to recreational and other multi-use activities.

1961

Ehrlich's report that intrinsic dispersal barriers caused isolation of JRBP's Bay checkerspot populations lays a foundation for the concept of a "metapopulation."

1964

Sparked by studies of checkerspot butterflies, Ehrlich and Raven's formulation of the theory of coevolution initiates a new field of biology.

1967

Stanford Linear Accelerator Center (SLAC) completed.

1970

Experiments by Bartholomew on small mammal activity in the chaparral bare zone become a textbook example of vertebrate control of vegetation boundaries.

1973

January 9 the Stanford Board of Trustees formally designates 960 acres as JRBP.

1975

Docent/Education program begins.

1976

Searsville Park is closed, increasing the preserve size to the current 1,189 acres.

1983

Field's discovery of a nitrogen-photosynthesis proportionality that is conserved through leaf aging initiates tiered carbon modeling from leaves to ecosystems.

1985

Stanford and A. W. Mellon Foundation establish joint grant program to support student research at JRBP.

1986

Field and Mooney's extension of the nitrogen-photosynthesis relationship to multiple ecosystems, confirmed globally, becomes a foundation of biosphere models.

1994

First annual report is published.

1996

A first to compare organismal diversity in urban vs protected areas, Blair's report on avian losses becomes a paradigm for a syndrome of urbanization effects.

Gao's formulation of the NDWI water index, created and tested using JRBP's diverse vegetation, becomes a widely adopted vegetation index for satellite data.

1997

Showing faster carbon cycling—not storage—under elevated CO_2, results by Hungate et al lift the lid on ecosystem responses to increased CO_2.

2002

The Leslie Shao-ming Sun Field Station officially opens.

Robustly based on a model ecosystem and many global change treatments, results by Shaw et al overturn assumptions about ecosystem buffering of rising CO_2.

2005

Strategic Plan and external review of preserve completed.

First faculty director at JRBP appointed.

2010

Jasper Ridge Restoration Fellowship program established.

2011

Searsville Study Steering Committee established.

2012

Visiting artist program initiated.

RESEARCH AND MONITORING

Shared by disciplines ranging from archaeology to global change, and from plate tectonics to yeast genetics, Jasper Ridge is an irreplaceable natural laboratory. It is a place for studying how nature works, how humans have shaped a landscape, and how restoration can lead to new knowledge that has broad conservation value.

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In 2011-12, 71 studies were active at JRBP, representing nine departments at Stanford plus 16 other institutions. Three dissertations and master's theses and 28 publications were completed, bringing the publication record to 187 dissertations and theses and 520 publications.

Longterm studies are a cornerstone of the research and provide a context in which each year's observations build anticipation for the next year's. Fall of 2011 was marked by an early start to flowering in JRBP's treasured populations of Western leatherwood (*Dirca occidentalis*), which Bill Graves has studied for eight years. A dry winter followed and saw several weeks of almost nightly landings on the lake by Canada geese, including a flock of 98 recorded by Richard Jeffers ('81), Pete LaTourrette ('56, MS '57, ENG '59), Yuka Estrada and Annette Potvin during the Christmas Bird Count.

In early summer, Chris Field's global change and restoration experiment tallied more than twenty thousand native bunchgrasses, more than double the number from two years earlier, despite the dry winter, or maybe because of it. Late summer was marked by a large population of oak moths (*Phryganidia californica*), enough in some places to blur the vegetation. Rodolfo Dirzo's study of oak regeneration noted massive defoliation of some oaks, while others were barely touched. Acorn production, recorded in the 22nd annual survey by Walt Koenig, '72, was also very uneven, but this is typical and may not have been linked to oak moths.

Alongside the ongoing longterm studies are more than a dozen studies that were started or completed recently. Several of them are profiled in the following pages, beginning with a survey of historic sites and structures led by university archaeologist Laura Jones. Aspects of the heritage site survey are illustrated at left. Following Laura's overview there are highlights from a senior honors thesis, two doctoral studies, and a new study of aquatic ecology that has broad significance for wetland restoration. We close with an update on Tad Fukami's research, which expanded in 2012 to include a hundred undergraduates enrolled in the core curriculum in biology.

Whether painstakingly unearthing artifacts or deciphering the most advanced remote sensing on the planet, Jasper Ridge researchers are gaining new insights on ecosystems in a changing environment. ■

—Nona Chiariello

OPPOSITE, TOP: ARCHAEOLOGICAL EXCAVATIONS, SHADED BY TARPS, NEAR THE SITE OF THE DAMKEEPER'S HOUSE.

BOTTOM: HISTORICAL MAP WITH A WHITE RECTANGLE OUTLINING THE SURVEY AREA FOR THE DAMKEEPER'S HOUSE AND OPERATIONS.

1 MAX ROSEFIGURA, '11, EXPOSING A LARGE METAL ARTIFACT IDENTIFIED FROM HISTORICAL MAPS AS A SURVEY MONUMENT.

Heritage properties survey

LAURA JONES, MA '85, PhD '91
UNIVERSITY ARCHAEOLOGIST

Stanford archaeologists completed the first comprehensive survey of Stanford lands in 1987, recording 65 prehistoric archaeological sites. We initiated an expanded survey in 2007, including for the first time historic era sites and structures. In 2012, the second year that Jasper Ridge was part of this effort, we concentrated our work at Searsville Dam and upstream from the reservoir.

We conducted a geophysical survey to identify areas of buried metal and ground disturbance at two locations—the site of the damkeeper's house and along Family Farm Road. Archaeological excavations at the two sites yielded very different results. At Family Farm Road, more than a meter of sediment overlay small historic debris concentrations, and no *in situ* features were uncovered. Although not highly productive in terms of cultural history, this site is helping characterize hydrologic changes in the area.

At the damkeeper site, however, we discovered a number of features and hundreds of artifacts. Excavation of a large trash pit by Pedro Gonzalez, '11 (lower right), near the damkeeper's house yielded children's toys, broken plates and cups, animal bone, bullets, medicine and liquor bottles, cans, buttons, and an array of other items dating to the mid-late nineteenth century. Glassware included a honeycomb jar (upper and middle right) whose patent could be traced by Dave Daley, '05, from the number molded into the bottom.

We are integrating these archaeological finds with historic census data and maps, which are providing a picture of the rapidly changing local population at the end of the nineteenth century. Based on our results at the damkeeper site, I expect that significant subsurface archaeological deposits have survived in the upland areas around the reservoir, including features associated with the Town of Searsville and the labor camps that built the dam. Our research on census records is also yielding intriguing evidence of Native American presence in the vicinity in the late 1800s. Survey efforts will continue in 2013. ■

Are seed eaters managing the serpentine grasslands?

KELSIE POMBO, '12

Serpentine soils provide important refuge for native California grasses and forbs, because these soils are generally inhospitable to new, non-native colonizers. Unfortunately, several Eurasian grasses have successfully invaded serpentine grasslands at Jasper Ridge. For my biology honors thesis project, I examined the effect of seed-eating animals—mainly seed-harvesting ants—on the abundance and distribution of native and invasive species in the serpentine grassland. By eating and destroying seeds, ants can significantly decrease recruitment of their preferred plant species. I wanted to know if something as small as an ant carrying a grass seed could influence the entire community composition of the grasslands.

I found that while harvester ants may selectively consume certain native seeds over invasive species, effects of their foraging on plant community composition were not detectable after one year. Perhaps their impact is diffused by frequent changes in foraging areas as well as nest location. Small annual effects of seed harvesting by ants may also have been diluted by other heterogeneous factors that affect the plant community, such as temperature, rainfall, topography, and soil disturbance by gophers. Nevertheless, continuing to examine how plant-animal interactions impact the spread of invasive species is critical for preventing and managing invasions in this and other ecosystems.

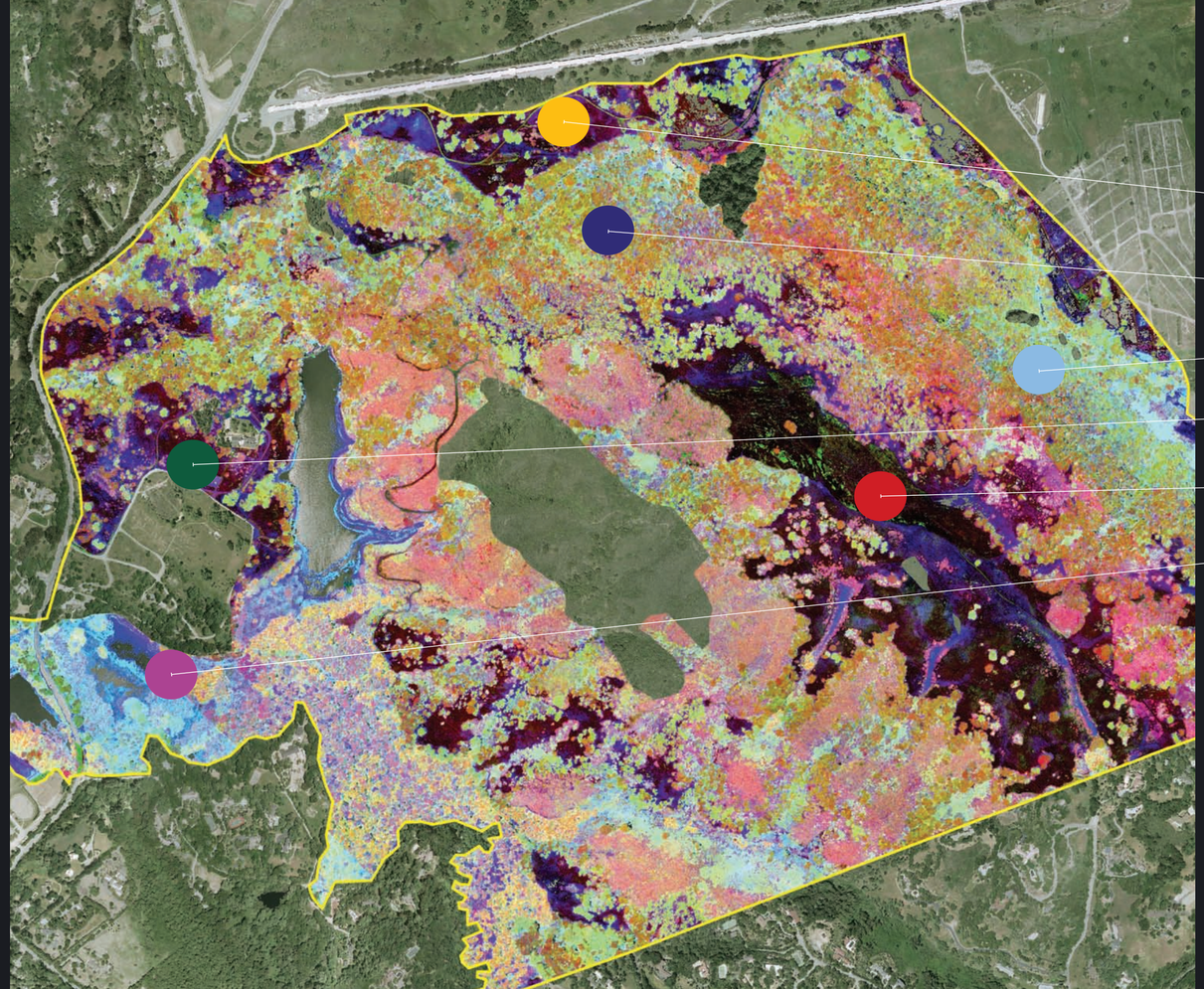
Whenever you'd like to reinvigorate your appreciation for the simple beauty and humbling detail in nature, crouch low on the grassland fire road on a spring morning and spend some time observing the harvester ants marching home with their discoveries. ■

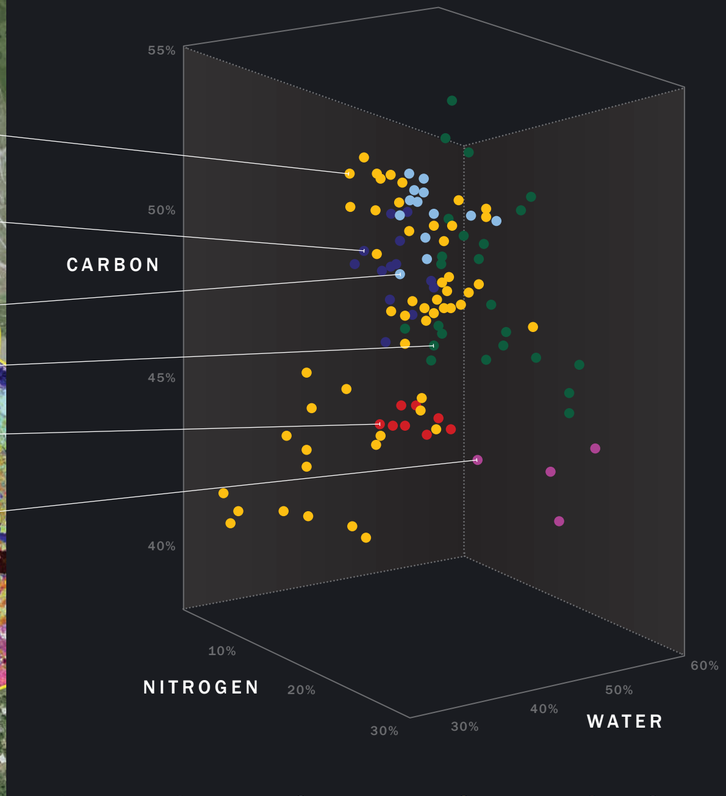
Measuring plant chemical traits from the sky

KYLA DAHLIN, PhD '12

Carbon, nitrogen, and water are essential components for all life, and how the amounts of these chemicals vary from organism to organism can tell us many things about how ecosystems function. For my dissertation research, I used a new sensor called the Carnegie Airborne Observatory Airborne Taxonomic Mapping System, combined with field data, to create maps of carbon, nitrogen, and water of canopy leaves across Jasper Ridge. In the composite image to the right we see carbon shown as red, nitrogen as green, and water as blue.

For two decades Jasper Ridge has served as a test area for airborne remote sensing. For such a small site it is incredibly diverse, with vegetation ranging from serpentine grasslands to coast redwoods, making it a fantastic place to test both new sensors and ecological theories. In my dissertation I showed that while environmental gradients, like topography and geology, are important drivers of changes in plant chemical traits, changes in species composition are far more important. This result highlights the fact that many ecosystem processes, including past land use and dispersal limitation, need to be considered when we think about how plants respond to their environment today and in the future. ■





THE CARNEGIE AIRBORNE OBSERVATORY IS MADE POSSIBLE BY THE GORDON AND BETTY MOORE FOUNDATION, THE GRANTHAM FOUNDATION FOR THE PROTECTION OF THE ENVIRONMENT, THE W. M. KECK FOUNDATION, THE MARGARET A. CARGILL FOUNDATION, MARY ANNE NYBURG BAKER AND G. LEONARD BAKER JR., AND WILLIAM R. HEARST III.

A century of change measured in dragonflies

JOAN BALL, UC BERKELEY
DOCTORAL CANDIDATE

Clarence H. Kennedy, AM 1915, was an entomologist and specialist in Odonata—dragonflies and damselflies—which he collected throughout central California in 1914. His goal was to document the diversity of dragonflies and their habitats throughout the state. At that time he was working on a master's degree at Stanford and collected extensively around Palo Alto, Portola Valley, and Jasper Ridge.

Almost a century later, during the summers of 2011 and 2012, I re-surveyed Kennedy's sites, including Jasper Ridge, and specifically Searsville Reservoir, the pool at the base of Searsville dam, San Francisquito Creek, and Corte Madera Creek. I am documenting how Odonata communities have changed over time as a result of climate change and land use. So far, I have found that while site-level species richness has not changed significantly across sites on average, communities across the state are becoming more similar as their habitats become homogenized.

Jasper Ridge provides important dragonfly habitat, particularly for certain stream species such as *Cordulegaster dorsalis*, more commonly known as the Spiketail. In 1914 Kennedy found this species along streams throughout Palo Alto and Portola Valley, but within this area, Jasper Ridge is the only site where I have found it still abundant. ■

Functional recovery of wetland ecosystems

DAVID MORENO MATEOS,
RESTORATION FELLOW

Since construction of Searsville dam 125 years ago, the reservoir and wetlands have developed an array of ecosystem functions, such as the accumulation of carbon in soils and the exchange of resources with surrounding terrestrial ecosystems. My goal is to understand how these functions develop over time, and how humans can accelerate or facilitate the functional recovery or development of ecosystems.

My student assistants (Minh Chau Ho, '13, lower left, Eddie Hill, and Mark Valentine, '15) and I are studying the rate at which carbon accumulates in wetland soils and the controlling mechanisms. After collecting sediment cores throughout the wetlands and parts of the lake bed, we are using radiocarbon dating to determine when carbon was captured from the atmosphere by wetland plants and microbial communities. Once the carbon is captured it can remain in wetland soils for a very long time helping to reduce the amount of CO_2 in the atmosphere.

We are also measuring the flux of various groups of insects between aquatic and terrestrial ecosystems. To do this we use malaise traps (lower left picture) that we set up in groups at the edge of wetland habitats (San Francisquito creek, Searsville lake, Middle marsh, and Skipper's pond). The traps funnel insects into different compartments depending on whether the insects are moving toward the wetland or away. We sort the insects into taxonomic groups and then dry and weigh the groups to determine the net movement of biomass to or from the wetland. So far, we have found a five-fold higher mass of insects moving toward vegetated wetlands, such as the marsh, than moving away from them, whereas the same insect groups showed nearly balanced movement to and from the open water of the reservoir. Results from these studies will help us understand how ecosystems work and how we can improve restoration success. ■

The *Mimulus* microcosm

TADASHI FUKAMI,
ASSISTANT PROFESSOR

Jasper Ridge's population of *Mimulus aurantiacus* (sticky monkey-flower) is a major focus of my research and teaching. My lab and instructional team focus on the interactions among three groups of organisms: microorganisms that live in *Mimulus* floral nectar; pollinators that consume nectar and ferry microbes between flowers; and the plants themselves. In 2011-12, our studies achieved several milestones.

Building on two pilot years, we completed the phase-in of a new introductory biology majors' course (Biology 44Y) in which students learn how to do research using *Mimulus* as a model system. In spring 2012, all 134 students in the course integrated weekly field observations and microbial genomic studies; contributed to a large, collective dataset; formulated and tested hypotheses; and communicated their results orally and in writing. Assessments by a team of education researchers, and by the students themselves, indicate that the course fosters an understanding of scientific research, which is our goal.

Many of the techniques and hypotheses in Biology 44Y have counterparts in studies of other microorganisms, including the human microbiome. These parallels add to the relevance of the course because many students will pursue careers in medicine. At the same time, students gain an appreciation of the ecological complexity of natural environments. At Jasper Ridge, *Mimulus* occupies habitats ranging from shaded woodland to exposed chaparral. Photographs of the plant canopy above a *Mimulus* individual, taken as a circular "fisheye" image, can be analyzed to estimate the amount of light received by a plant during a day, month, or season, which turns out to be a strong predictor of floral biology.

Biology 44Y has been a springboard for other projects, including honors thesis research by Ashley Good, '12, and Rachel Powell, '13, and outreach to high-school and community college teachers by instructional team members Matt Knope, PhD '12, and Pat Seawell, '70.

In August 2011, postdoctoral fellow Rachel Vannette joined my lab and has worked on nectar microbes, nectar chemistry, and pollination with research assistant Marie-Pierre Gauthier and me. In studies where we inoculated flowers with a bacterium, a yeast, or nothing at all, we found that hummingbirds were less effective at pollinating flowers whose inoculum had been the bacterium, as compared with the yeast or no inoculum, possibly because of differences in nectar chemistry. The first postdoctoral fellow on my *Mimulus* research, Kabir Peay, accepted a new faculty position in 2012—at Stanford!—and it was great to welcome him back as a faculty colleague. ■

1 ELSA PARRA, '12, SURVEYING MIMULUS FLOWERS DURING BIOLOGY 44Y

EDUCATION

In addition to the ever increasing number of Stanford faculty, students, and classes that make up the core of the Jasper Ridge education program, the preserve's education efforts, both formal and informal, continue to contribute more each year to the public understanding of science and highlight the potential of citizen science.

To illustrate, I have asked Jasper Ridge collaborating teacher Halo Shapiro Smart of the REAL program, Stanford undergraduate Kimberly Gibson, longtime birder Rigdon Currie, and ant surveyor Matthew Bahls to write about their work both at the preserve and beyond.

—Cynthia Wilber

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REAL
by Halo Shapiro Smart

Jasper Ridge has been a vital part of my work as the teacher and coordinator of the Redwood Environmental Academy of Leadership (REAL) program. REAL began as a science learning-by-doing program supported by the Stanford K12 Initiative and is now a full fledged environmentally based service learning program designed to support and engage at-risk learners at Redwood High School. I found at Jasper Ridge a community of scientists, students, and volunteers willing to help my students learn about ecology and build their science skills.

Coming to the REAL program, I had over ten years of experience as a social studies teacher and ample experience developing and leading programs, but very little experience teaching science. During the very steep science learning curve, Jasper Ridge was a tremendous resource for me. Field trips to Jasper Ridge provoked scientific inquiry and motivated my students to care deeply about the environment and to challenge themselves academically. Additionally, Rodolfo Dirzo, Cindy Wilber, and their students brought lab equipment, resident experts, and volunteers to Redwood High School to teach hands-on ecology. REAL students caught and identified three spine stickleback and other fish in the Cordilleras Creek with Alan Launer, MS, BS '81, and learned from Bill Gomez, MBA '67, about the intertidal species at Fitzgerald Marine Reserve. The students learned about urban farming practices from Kimberly Gibson, Stanford undergraduate and president of the Stanford SEEDS chapter, and got up close and personal with flowers to marvel at the reproductive strategies of plants with Rodolfo Dirzo. These were applied, hands-on field experiences that engaged and inspired the students to enjoy and embrace science.

One of my goals for REAL was to close the nature deficit which is pronounced among the urban and suburban youth at Redwood High School. Jasper Ridge was again there to support my students with days of trail based learning across seasons at Jasper Ridge. One rainy winter day REAL students geared up in rain boots and ponchos to pull fish traps and study aquatic invertebrates in San Francisquito creek and came away loving Jasper Ridge, and respecting and feeling at home in nature.

Jasper Ridge, the land, the trails, the people and the research has been instrumental in the development and continued success of the REAL program. It has also ignited in me a love of ecology that informs my teaching on a daily basis. ■

1 *REAL* TEACHER AND JRBP DOCENT, HALO SHAPIRO SMART EXPLAINING GALLS AND THE LIFE CYCLE OF THE WILLOW LEAF SAWFLY *PONTANIA PACIFICA* TO STUDENT DIANA TATAKAMOTONGA.

Outreach—Local and Global
by Kimberly Gibson, '13

Since taking Bio 96 (now Bio 105) as a freshman, Jasper Ridge has been an integral part of my interdisciplinary career at Stanford. As an urban studies major, I sometimes catch people by surprise when I come rushing into class with a large sun hat and a picture of poison oak on my t-shirt. Quite contrary to what my classmates might think, I have found my work at Jasper Ridge to be directly applicable to what I study in the classroom. By volunteering through JR outreach with the REAL program, spending spring quarters with the brilliant Eastside students, and leading the occasional tour for iphone wielding teenagers, I have had the opportunity to see first hand the effects of urbanization on people, nature, and the relationship between the two.

Of all the opportunities to be involved in ecology and environmental education at Jasper Ridge, volunteering with the Eastside Field Studies Program has been the most engaging and rewarding. Despite my social science background, spending eight weeks teaching ecology to a small group of sixth graders seemed like an easy enough task, when I volunteered to join the program as a sophomore. Eight weeks later, my knowledge had been expertly dissected to extract every iota of information and pushed into new levels of understanding by the insatiable curiosity of my students.

1

This past summer I used what I learned at Jasper Ridge to conduct my honors thesis research on the impact of urbanization on peri-urban agriculture in Hyderabad, India. My focus is on the increased participation of women in agriculture and one of my objectives was to study their decision-making power and receptivity towards organic practices. For the most part my data has been collected through surveys and interviews with the lady farmers, but as a side project, I collaborated with a local researcher to conduct an experiment in which yield and growth rates of rice were compared in fields treated with conventional chemical fertilizers and fields fertilized with compost. ■

A Perspective on Birding
by Rigdon Currie

The volunteer bird census at Jasper Ridge began in 1979 with Bill, BS '40 MD' 44, and Jean Clark leading the effort and has collected invaluable data for thirty-three years. My census group, which also included Bob Buell, John Working, '49, Lysbeth Working, '54, Will Wilson, and Ted Chandik did a "walk-around" (our term) or "transect" (proper term) census of Area A for about 18 years. This area starts at the Sun Field Station and includes the territory out to the visitor parking lot over to Sand Hill Road and down the creek to trail 5, up the hill and back to the dam and Sun Center.

As long as our hearing held up we did a quite thorough job and knew generally where to find which species. Even though our goal was to count every bird we could see or hear in our area, including those that flew over, we always tried for a high species count so set up our route accordingly. We got to know where and when to find which species. Our data sheets were then turned in to Zoe Chandik who faithfully maintained all the records for years.

2

Our group changed a bit over the years. Bob Buell "retired" and sadly Ted died in 2011, both big losses. Will joined us several years ago and more recently Dave Crockett, MSEE '64, ace photographer, and Roberta Maxwell. We are in a transition situation again because my ears as well as Will's have lost their youthful sensitivity, but we are most fortunate that Rob Furrow, a grad student at Stanford with keen eyes and ears, joined us and now has taken over. I have enjoyed this birding walk-around immensely—so much so that I have commuted to the preserve from coastal Marin since 1994! Jasper Ridge is indeed a special place! ■

1 STANFORD SENIOR KIMBERLY GIBSON HARVESTING EGGPLANTS NEAR HYDERABAD, INDIA AS PART OF HER URBAN STUDIES HONORS THESIS RESEARCH.

2 AREA A BIRDERS, THE LATE TED CHANDIK, RIGDON CURRIE, LYSBETH WORKING, AND JOHN WORKING.

Citizen Science at Jasper Ridge

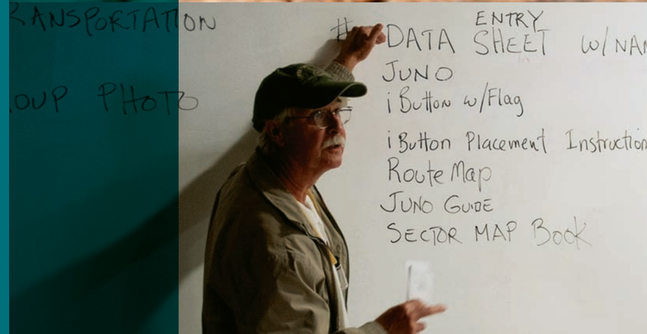
MATTHEW BAHLS

In 1993, Stanford graduate student Katy Human and Professor Deborah Gordon began a biannual survey to track the invasion of Jasper Ridge by *Linepithema humile*, the Argentine ant. Based on the speed with which the Argentine ants moved into the preserve, they initially believed the survey would chronicle the complete inundation of native ant habitat by this very successful invader.

However, the Argentine and native ant populations have established relatively consistent borders over the last two decades although these borders do change. Some sites always had Argentine ants and some never, while some sites fluctuate between the two according to weather conditions. Since 1993, several graduate students and researchers have carried the mantle of chief surveyor, including Nathan J. Sanders, PhD '01, Nicole Heller, PhD '05, Jessica Shors, PhD '09, Katherine Fitzgerald, PhD '11, and Merav Vonshak.

In 2010, Nicole Heller helped the ant survey become a predominantly volunteer effort. This change allowed Jasper Ridge docents and community members to participate in the effort, and their help has been crucial to the long-term manageability of this labor intensive study. In the early years, the 250+ survey points within Jasper Ridge would take a single graduate student a month to survey, but the same points are now surveyed by a team of about 20 volunteers in a single day. Participants are trained to identify not only the Argentine ants, but also the twelve most common genera in the preserve, and have learned to navigate and input their data via the latest GPS devices. Under the current direction of Stanford postdoc Merav Vonshak, the volunteers have also expanded their data collection to include temperature and humidity, factors highly correlated to ant activity.

The Jasper Ridge ant survey represents a wonderful example of how citizen scientists, in partnership with academic researchers and Jasper Ridge staff, can play a collaborative role in ongoing research. On behalf of the volunteer leadership, we are all incredibly proud to be involved. Special thanks to my fellow volunteer leaders: Paul Heiple, Gary Smith, and Marguerite Stevens. ■



PHOTOGRAPHY: TOP: POST-DOCTORAL SCHOLAR MERAV VONSHAK USING AN ASPIRATOR TO COLLECT ANTS FOR THE 2011-12 SURVEY. MIDDLE: HARVESTER ANTS, *MESSOR ANDREI*, IN COMBAT. BOTTOM: JRBP DOCENT GARY SMITH LEADING A TRAINING CLASS FOR ANT SURVEY PARTICIPANTS.

TECHNOLOGY

PhenoCam In Spring 2012, I installed a high-resolution digital video camera provided by the PhenoCam network at the Jasper Ridge Eddy Flux station. The PhenoCam network is a collaborative effort among researchers and land managers from academic institutions and government agencies across the country. The new camera at Jasper Ridge is one of over 50 at core PhenoCam sites in North America. There are more than 75 other cameras located at affiliated sites around the world.

The PhenoCam network enables researchers to continuously monitor vegetation phenology in real time over a range of diverse climate regions and ecosystems. Every half hour an image from the high-resolution digital camera is uploaded via the JRBP outdoor wireless network to the PhenoCam servers, where they are available to researchers for download. At Jasper Ridge, the proximity of the PhenoCam camera to the Eddy Flux station allows researchers to compare phenological observations from the camera images with eddy covariance data showing the exchange of carbon and water between annual grassland and the atmosphere.

Vegetation phenology is concerned with life cycle events such as leaf emergence, flowering, leaf coloring and senescence, and how these events are influenced by seasonal and yearly variations in climate as well as by structural factors such as elevation. The PhenoCam data can help improve understanding of plant and ecosystem function and the relationship between environmental factors and phenology in diverse habitats. The data may also be important to the understanding of phenological responses to climate change and global warming. Former Stanford engineering student Stephen Klosterman, MS '11, initiated the establishment of the Jasper Ridge PhenoCam station while working on his Master's in Engineering project at Stanford and the preserve. For the project he was interested in linking phenology with ecosystem exchanges of water and CO_2 at Jasper Ridge but realized that the available phenological data were too infrequent to enable meaningful linkages. Klosterman is currently pursuing a PhD in the Department of Organismic and Evolutionary Biology at Harvard University. He is continuing to work with the Jasper Ridge PhenoCam and eddy flux data as part of his doctoral research. ■

—Trevor Hebert

PUBLICATIONS

Adams RI. 2011. Ecological and evolutionary connections between genetic and species diversity. PhD dissertation, Department of Biology, Stanford University.

Andonian K, Hierro J. 2011. Species interactions contribute to the success of a global plant invader. Biological Invasions 13: 2957-2965.

Belisle M, Peay KG, Fukami T. 2012. Flowers as islands: spatial distribution of nectar-inhabiting microfungi among plants of *Mimulus aurantiacus*, a hummingbird-pollinated shrub. Microbial Ecology 63: 711-718.

Bickel DJ, Arnaud PH Jr. 2011. *Medetera johnthomasi* (Diptera: Dolichopodidae), a new species from California with notes on the *aberrans* species group. Pan-Pacific Entomologist 87: 124-129.

Bonebrake TC, Navratil RT, Boggs CL, Fendorf S, Field CB, Ehrlich PR. 2011. Native and non-native community assembly through edaphic manipulation: Implications for habitat creation and restoration. Restoration Ecology 19: 709-716.

Brown JR, Blankinship JC, Niboyet A, Van Groenigen KJ, Dijkstra P, Le Roux X, Leadley PW, Hungate BA. 2012. Effects of multiple global change treatments on soil N_2O fluxes. Biogeochemistry 109: 85-100.

Brownell SE, Kloser MJ, Fukami T, Shavelson R. 2012. Undergraduate biology lab courses: comparing the impact of traditionally based "cookbook" and authentic research-based courses on student lab experiences. Journal of College Science Teaching 41: 36-45.

Cleland EE, Clark CM, Collins SL, Fargione JE, Gough L, Gross KL, Pennings SC, Suding KN. 2011. Patterns of trait convergence and divergence among native and exotic species in herbaceous plant communities are not modified by nitrogen enrichment. Journal of Ecology 99:1327-1338.

Dahlin KM. 2012. Ecosystem assembly in California: Linking pattern to process at the landscape scale. PhD dissertation, Department of Biology, Stanford University.

Dahlin KM, Asner GP, Field CB. 2012. Environmental filtering and land-use history drive patterns in biomass accumulation in a mediterranean-type landscape. Ecological Applications 22: 104-118.

Docherty KM, Balser TC, Bohannan BJM, Gutknecht JLM. 2012. Soil microbial responses to fire and interacting global change factors in a California annual grassland. Biogeochemistry 109: 63-83.

Dukes J, Chiariello N, Loarie S, Field C. 2011. Strong response of an invasive plant species (*Centaurea solstitialis* L.) to global environmental changes. Ecological Applications 21(6):1887-1894.

Fitzgerald K, Gordon DM. 2012. Effects of vegetation cover, presence of native ant species, and human disturbance on colonization by Argentine ants. Conservation Biology 26: 525-538.

Gutknecht JLM, Field CB, Balser TC. 2012. Microbial communities and their responses to simulated global change fluctuate greatly over multiple years. Global Change Biology 18: 2256-2269.

Hulvey KB, Zavaleta ES. 2012. Abundance declines of a native forb have nonlinear impacts on grassland invasion resistance. Ecology 92: 378-388.

Kloser M, Brownell S, Chiariello NR, Fukami T. 2011. Integrating teaching and research in undergraduate biology laboratory education. PLoS Biology 9(11): e1001174. doi:10.1371/journal.pbio.1001174.

Luke C, Frenzel P. 2011. Potential of pmoA amplicon pyrosequencing for methanotroph diversity studies. Applied and Environmental Microbiology 77: 6305-6309.

Mendoza E, Martineau P, Brenner E, Dirzo R. 2011. A novel method to improve individual animal identification based on camera-trapping data. Journal of Wildlife Management 75(4):973-979.

Moles AT, Wallis IR, Foley WJ, Warton DI, Stegen JC, And Others. 2011. Putting plant resistance traits on the map: a test of the idea that plants are better defended at lower latitudes. New Phytologist 191(3):777-788.

Niboyet A, Brown JR, Dijkstra P, Blankinship JC, Leadley PW, Le Roux X, Barthes L, Barnard RL, Field CB, Hungate BA. 2011. Global change could amplify fire effects on soil greenhouse gas emissions. PLoS ONE 6(6):e20105.

Niboyet A, Le Roux X, Dijkstra P, Hungate BA, Barthes L, Blankinship JC, Brown JR, Field CB, Leadley PW. 2011. Testing interactive effects of global environmental changes on soil nitrogen cycling. Ecosphere 2(5):art56.

Owens J, White C, Baggett T, Brown S, Hecht B. 2011. Water quality and streamflow monitoring of San Francisquito and Los Trancos Creeks at Piers Lane, and Bear Creek at Sand Hill Road, water year 2010. Long-term Monitoring and Assessment Program, San Mateo and Santa Clara Counties, California.

Pasari JR. 2011. Grassland invasion, management, and multifunctionality. PhD dissertation, Department of Environmental Studies, University of California at Santa Cruz.

Peay KG, Belisle M, Fukami T. 2011. Phylogenetic relatedness predicts priority effects in nectar yeast communities. Proceedings of the Royal Society B: Biological Sciences doi: 10.1098/rspb.2011.1230.

Pinter-Wollman N, Gordon DM, Holmes S. 2012. Nest site and weather affect the personality of harvester ant colonies. Behavioral Ecology 23: 1022-1029.

Porter SS. 2011. Evolutionary responses to environmental context in the legume-rhizobium mutualism. PhD dissertation, University of California at Davis.

Porter SS, Rice KJ. 2012. Tradeoffs, spatial heterogeneity, and the maintenance of microbial diversity. Evolution (in press).

Sanders NJ, Suarez AV. 2011. Elton's insights into the ecology of ant invasions: lessons learned and lessons still to be learned. In: Richardson DM, editor. Fifty Years of Invasion Ecology: Wiley-Blackwell. p 237-251.

Saunders LE. 2011. Individual and interactive effects of large and small mammalian herbivores on oak performance and the woody understory community. Master's thesis, Department of Biology, Sonoma State University.

Trinh DH, Chui TFM. 2012. An empirical method for approximating canopy throughfall. Hydrological Processes (in press).

Wu Z, Dijkstra P, Koch G, Peñuelas J, Hungate B. 2011. Responses of terrestrial ecosystems to temperature and precipitation change: a meta-analysis of experimental manipulation. Global Change Biology 17:927-942.

Yost JM, Barry T, Kay KM, Rajakaruna N. 2012. Edaphic adaptation maintains the coexistence of two cryptic species on serpentine soils. American Journal of Botany 99: 890-897.

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Financial Summary and Projection
Summary of Research Activity
Educational Use
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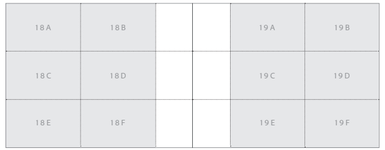

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DESIGN

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Printed on 100% recycled paper using soy-based inks.

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