The most basic rules of the world—the ones we all live by—are ecological rules. You can't study them or even perceive them very well in a classroom or laboratory. Whether one is a botanist, a biologist, or an earth scientist, it’s imperative to go out on the mountainside, watch the rain fall over a valley, dig into the earth beneath a fallen tree, or wade a creek for cobbles with sources upstream. The best work in the natural disciplines all starts with observations in nature.

-Kenneth S. Norris, Founder of the University of California Natural Reserve System
Growth is the goal, it is a condition we associate with success, it is viewed as a desired outcome, and it is one of our cultural mantras. But not all growth is identical, desirable, or sustainable. Acknowledging limits is a hard-won lesson, and in my experience, many of our most creative accomplishments emerge from acknowledging our limits and turning them into new opportunities.

Jasper Ridge is faced with limits to growth and is susceptible to the strains and stresses associated with approaching limits. Some of the growth and the associated constraints are of our own making—the growth in research, class use, tours, and other program activities. These have raised questions about how much activity can be accommodated by the Preserve without compromising the quality of Preserve activities or the unique resources that make the Preserve so invaluable. Other pressures are external to the Preserve and come in all shapes and sizes—development and land use along our boundaries, the political and management realities of residing within an increasingly urbanized landscape, and the regional and global changes that confront us all.

There are numerous paths toward addressing these challenges, and making the right choices is a formidable task. Challenges associated with fire management, the future of Searsville Lake and Dam, and the continuing problems caused by invasive species such as West Nile Virus all demand careful attention. Staying focused on the Preserve’s mission without being overwhelmed by the crisis du jour requires considerable clarity and discipline. In an effort to assure a continued focus on the Preserve’s future, a Strategic Planning Committee was formed in November of 2002, with Chris Field (Director, Department of Global Ecology, Carnegie Institution of Washington) as its chair. Other members of the Committee include: Professors Deborah Gordon (Biological Sciences) and David Freyberg (Civil and Environmental Engineering); graduate students Will Cornwell and Lisa Moore; community members Bill Gomez, Jeanne Sedgwick, and Irene Brown; Nona Chiariello (Jasper Ridge Research Coordinator), as well as myself. The charge of the Committee is to identify policies and priorities for addressing the broad range of management issues faced by the Preserve in the coming years while prioritizing the major components of the Preserve’s mission.

From my perspective, one encouraging feature of the Strategic Planning Committee’s formation is that it precisely follows what was outlined near the end of last year’s annual report statement—the need to address the challenges of managing the Preserve within the context of an urban-wildland interface. How well we adjust to this context without compromising the mission of the Preserve is the single greatest challenge to the Preserve’s continued productivity and viability.

This past year has been marked by several events that bear out the complexities of operating within an urban-wildland interface zone.
On July 26th there was a small grassland fire at the Preserve. While this event was contained to less than two acres, the reactions that it engendered from neighbors and local officials further demonstrated the difficulties of developing and implementing a fire management plan that both protects the mission of the Preserve and reduces the risks to residents near the Preserve.

In anticipation of growing neighbor concerns, the Preserve is currently field-testing a highly sensitive infrared sensor system for monitoring fires. If successful, this will provide an early warning and response system for fires that approach or begin on the Preserve. This is one of several management efforts that the Preserve is engaged in to help ensure that our mission is not compromised while addressing some of the concerns of the surrounding communities.

A second event is the anticipated arrival of West Nile Virus. Given the close proximity of residents to the Preserve’s wetland habitat adjacent to Searsville Lake, San Mateo County has expressed concerns about managing potential risks. As a result, County officials are requiring that we proactively manage mosquitoes with a larvicide spray that uses a bacterial agent, *Bacillus sphaericus*. Hence, while being invaded by one invasive species, we must resort to bringing in another non-native species to meet County public health concerns.

This is an expensive undertaking with as yet undetermined management implications that emphasizes the permeable nature of the boundaries between the Preserve and nearby residential properties. I specifically mention these issues because it highlights what will be a continuing source of both stress and opportunity—how to reconcile the demands and expectations of a growing human presence with the ecosystem functions we are trying to understand and sustain.

While this past year has highlighted important challenges, there are also important accomplishments on several fronts. First, we celebrated our first year in our new building, the Leslie Shao-ming Sun Field Station. I’m proud to note that the Sun Field Station was the recipient of the County of San Mateo RecycleWorks Green Building Award and received a merit award from the San Diego Chapter of the American Institute of Architects. In addition, we have installed a complete energy monitoring system to document the performance of the Sun Field Station. Data from the monitoring system can be seen on our website. This system is designed not only to help educate others on the sustainable features of the new building, but also to document the degree to which we achieve one of our original goals—annual energy use resulting in net zero carbon emissions. It is one thing to announce such a goal, it is another to provide a measure of how close we’ve come to achieving it.
When I first proposed a new facility for the Preserve, my concern was the growing needs of Jasper Ridge programs. One of the “fuzzier” goals of the new facility noted in the National Science Foundation grant proposal submitted in support of the project was to “capitalize on the synergy between the research, teaching, and volunteer programs.” This first year in the Sun Field Station has proven the truth of that statement. One successful program made possible by the expanded and improved space in the Sun Field Station is monthly luncheon roundtable presentations by researchers on topics of interest to the JRBP community. This program, initiated almost entirely by docents, has featured topics ranging from yellow star thistle invasion and management to chemical communication and animal behavior. Roundtables planned for the coming year range from the future of Searsville Lake to the science of global climate change. It is precisely this kind of synergistic activity among all the diverse members of the JRBP community that we look forward to promoting in the Sun Field Station.

This past year has also been marked by the amazing productivity of researchers at Jasper Ridge. I encourage you to review the research highlights, especially the recent work of the labs of David Ackerly and Deborah Gordon. In addition, this past year is marked by major publications emerging from the Jasper Ridge Global Change Experiment. These publications (see Appendix 2) appearing in the journals *Science* and the *Proceedings of the National Academy of Sciences*, have brought into question several assumptions about how grassland ecosystems are likely to respond to global climate change. The body of work that has emerged from this past year is a tangible example of why biological field stations such as Jasper Ridge are so important.

This annual report is the ninth iteration. When I first started this tradition, it was with the intent that it would become a vehicle for communicating the importance of the Preserve to Stanford and neighboring communities, as well as a yearly reminder to supporters and the JRBP community of how their efforts fit into a larger context. As we produce this report each year, I find myself comparing the present with the past. Last year’s annual report was acknowledged with a Gold Award for superb craftsmanship in the East Bay and Diablo Craftsmen’s Club Competition, a testament to the publication skills and talents of Rebecca Young, former GIS and Data Manager. This year we hope to continue this tradition of excellence.

I encourage you to page through this document and read it closely. You will see a remarkable pool of talent and commitment from volunteers, researchers, faculty, students, and committee members. This year, I want to close by acknowledging the staff at Jasper Ridge. Their continued good sprits, commitment, and professionalism are vital to protecting and supporting so much that we celebrate at JRBP.
Research at JRBP this year continued its growing focus on environmental and biotic change. Whereas much of the Preserve’s research in the past focused on mechanisms and processes underlying adaptations to the Jasper Ridge environment, a common thread of much current research is how ecosystems function in a changing world. Longtime observers of the Preserve will detect in this annual report a sharpening contrast with the Preserve’s history.

Recent discoveries suggest the extent and magnitude of change facing JRBP. Professor Deborah Gordon’s research group discovered that Argentine ants invading JRBP not only displace some native species but also disrupt interactions among those that remain. Studies within the multi-investigator Global Change Experiment found that levels of atmospheric CO2, nitrogen deposition, temperature, and precipitation expected in the next century can alter both plant communities and microbial communities in the soil. And Professor Paul Ehrlich’s long-term studies of Bay checkerspot butterflies have linked the butterfly’s extinction at JRBP to weather variation associated with climate change. These findings, together with many of the year’s publications, point to major changes in the biotic communities of Jasper Ridge. That such a coherent theme emerges from diverse and independent research programs is perhaps the strongest message of all.

The importance of change at JRBP—both realized and anticipated—underscores the value of long-term studies. For example, because of the long duration of the Gordon lab’s studies of invasion by Argentine ants, researchers have been able to compare many individual survey points pre- and post-invasion, in addition to using the short-term approach of snapshot comparisons between invaded and uninvaded points. A study organized by former Stanford Ph.D. student Nathan Sanders used both types of comparisons to analyze the spatial distribution of native ant species that withstand invasion. The team found that before invasion, native ant species tend to have more organized communities (with reduced spatial overlap among species), but they change to more random communities (with greater overlap) soon after invasion, a process the researchers term “community disassembly.” Had the team used only short-term comparisons of invaded and uninvaded sites, they wouldn’t have been able to rule out the possibility that the pattern was due to intrinsic differences between sites that were invaded and those that were not.

The Global Change Experiment, now in its sixth year of studying the response of natural grassland to anticipated environmental changes, experienced change of another sort. In July, a wildfire spread into the experiment and burned a quarter of the study plots. As researchers grappled with the impact, Professor Chris Field proposed a way of moving forward: continuing the main experiment with six replicates of each treatment, and repairing the burned plots so the effects of the fire could be studied with a modified experimental design. After two months of replacing devices that monitor or apply treatments in the

**Research Highlights**

Sixty-six studies were active this year, nearly half of them associated with long-term studies led by investigators from Stanford and the Carnegie Institution. Among researchers from the Stanford campus, three Schools and nine departments or programs were represented. A dozen new studies, including five by visiting investigators, were started in geology, ecology, and phylogeography (topics at the interface of phylogenetics and geography). Principal investigators included 30 faculty and senior scientists, 10 postdoctoral fellows, 12 graduate students, and three undergraduates who produced 38 publications, dissertations, and theses. See Appendices 1 and 2 for details.
burned plots, the experiment was ready for the current growing season and the opportunity to study the interaction between fire and other environmental changes. Because the fire occurred within a long-term experiment, its effects will be interpreted in relation to six years of pre-burn measurements, as well as to ongoing studies of unburned plots.

Of the many aspects of ecosystem change investigated at Jasper Ridge, none is more challenging than freshwater dynamics. With a dam nearing the end of its ‘useful’ lifespan, a watershed fundamentally altered by the dam, and expected changes in the rainfall regime, the Preserve faces challenges in understanding and managing water resources that affect a large landscape. The remainder of this overview of research examines a diverse set of studies that bear on many water-related issues. UNESCO’s designation of 2003 as the International Year of Freshwater Resources is a reminder that such challenges are globally important.

Dynamics of Water Resources

A common theme across diverse studies at JRBP is the importance of annual variation in precipitation. For example, several recent studies have found lasting signatures of extreme rainfall years. One such year was “water year 1998,” the twelve month period beginning in October, 1997 and ending in September, 1998, which coincided with the setup of the Global Change Experiment. Researchers made pre-treatment measurements on experimental plots during 1998 so they could later make pre- and post-treatment comparisons, in addition to comparisons across treatments. While the record-setting rainfall of 1998 did not produce the pre-treatment baseline the researchers expected, it allowed them to capture processes that may be equally important. For example, postdoctoral fellow Jeff Dukes found that aboveground plant growth in 1998 was greater than control plots have produced in any year since. Even more importantly, the record rainfall facilitated widespread establishment of perennial grasses and forbs. These perennials were dwarfed by faster-growing annuals in 1998, but their foothold was secured. Dukes found that by 2002, well-established perennials were co-dominant with annuals in a fifth of all study plots, independent of the experimental treatments. Production data for 2003 are the first to suggest a reversal in the expansion of perennials.

Research at Stanford’s Center for Conservation Biology now attributes the Bay checkerspot butterfly extinction at JRBP to changes in the frequency of extreme water years. In two papers authored by former CCB researchers John McLaughlin and Jessica Hellmann, CCB Director Carol Boggs, and Professor Paul Ehrlich, a nearly 40-year record of the butterfly’s population size is analyzed alongside an even longer record of total precipitation during each growing season. By statistically comparing 20-year intervals along the rainfall record, they found that precipitation totals were more variable after 1971 than before. Mathematical relationships between annual rainfall and butterfly population size suggest that population crashes were very likely after 1971, as indeed occurred, leading to extinction of two independent sub-populations of the Bay checkerspot in 1991 and 1998. The model predicts that if rainfall variability had continued at pre-1971 levels, the butterfly would have persisted at JRBP for centuries longer. Previous studies by Professor Ehrlich’s group have shown that drought years threaten the butterfly by prematurely drying up food-plants consumed by larvae, while very wet years tend to be too cold for larvae to grow adequately. Thus, either kind of extreme in local climate conditions can threaten the butterfly.

Habitat Comparisons

Other studies are asking how site-to-site differences in water availability affect the variation in physiological characteristics within plant communities. Such studies may help researchers predict how biotic communities will shift in response to climate change. Will Cornwell, a Ph.D. student working with Stanford Professor David Ackerly, is studying woody species along gradients in water re-
sources, such as from ridgelines to ravines, and from south- to north-facing slopes. He has found that towards the dry end of the gradients, there are opposite patterns in two important indicators of adaptive physiology. The density of wood in stems is more uniform in dry sites than would be expected from a random assemblage of species, while the size of leaves is more variable than expected. These findings suggest that high levels of water stress impose tight constraints on wood density but allow alternative leaf adaptations, such as deciduousness or reduced physiological activity.

Katherine Preston, a researcher and lecturer from the Ackerly lab, has been studying extremes of water availability from an evolutionary perspective. She is comparing leaf and stem properties across pairs of related species from contrasting climates, and has found parallel evolutionary divergence across multiple pairs. Species of dry habitats have properties that mitigate the risk of losing water through their leaves faster than it can be moved through their stems. For example, such species have a reduced total surface area of leaves for stems of a given thickness. These and other traits reduce the likelihood that the threadlike columns of water in the stem will rupture, leaving plants facing a pump-priming dilemma.

In his recently completed Ph.D. dissertation, Nishanta Rajakaruna (University of British Columbia) took an approach that combines elements of both Cornwell’s and Preston’s work. Rajakaruna asked whether similar patterns of evolutionary divergence occur along gradients of water availability both within sites and across regions. Rajakaruna studied goldfields, *Lasthenia californica*, and found that plants in well-drained ridgetop areas of JRBP were genetically distinct from plants in the soggy swales. The details of their adaptations reflect the complex role of water in ecosystems. Although plants from ridgetops are better adapted to drought, swale plants are better adapted to salt stress, a condition typical of swales, where ions collect after leaching from the slope. These ridge and swale habitats are so common in serpentine grasslands that Rajakaruna considers JRBP a microcosm of conditions and responses across the species’ range.

Soil chemistry has another important dimension in serpentine grasslands because of the presence of potentially toxic elements, such as chromium. Chris Oze studied these soils for his Ph.D. dissertation as a model for what to expect in soils contaminated by chromium-laden industrial waste. Oze found that hexavalent chromium—the toxic form—was undetectable in rocks, soils, and clays, but when he turned to the soil solution, he found the opposite—a majority was the toxic form. Experimenting with soil samples in the lab, Oze discovered that the chemical conversion between toxic and benign forms of chromium depends on how long the soil stays wet and how much organic matter and other minerals are present. In the field, groundwater samples from the bedrock serpentine contained concentrations that exceed limits set by the U.S. Environmental Protection Agency, a result with important implications for managing waste sites.

**Global Change Experiment**

Many of the complex physiological and evolutionary patterns that will affect responses to future environmental change are being studied in the Jasper Ridge Global Change Experiment, directed by Professor Chris Field (Carnegie Inst.) together with Professors Brendan Bohannan, Harold Mooney, and Peter Vitousek (Stanford), Shauna Somerville (Carnegie Inst.) and James Tiedje (Michigan State Univ.). Added precipitation, applied via sprinkler irrigation after each major rainfall and twice after the season’s final rainfall, is included in eight of the experiment’s sixteen different treatment combinations, making it possible to study how future increases in precipitation may interact with other environmental changes.

One hypothesis that researchers are testing in the Global Change Experiment is that ecosystem responses to global changes, including increased precipitation, are likely to be shaped by changes in the availability of soil nu-
1. Using a Sunfleck Ceptometer, Kris Hulvey measures light levels in a grassland microcosm. She and Dr. Erika Zavaleta will use the data to determine the effect of species diversity change on grassland susceptibility to yellow starthistle invasion.

2. Jean Knops of the University of Nebraska and Walt Koenig of U.C. Berkeley count acorns in September, 2003 as part of their statewide survey of acorn production by California oaks.

3. Ph.D. student Nicole Heller finds and marks an Argentine ant nest as part of a three-year study measuring the survival and growth of individual ant nests.

4. Undergraduate Kenny Dixon measures leaf area as part of a study relating plant functional traits and ecological distribution, led by graduate student Will Cornwell and postdoctoral researcher Katherine Preston.

5. Grace Hsu, a senior at Saratoga High School, positions a meter-long rod of light sensors at various heights above the ground to study the penetration of light through standing litter to germinating seedlings.


7. Postdoctoral researcher Katherine Preston prepares shoots for a study comparing biomass of leaves and stems in 55 species across light and moisture gradients.

8. Ph.D. student Lisa Moore positions a chamber for measuring the rate of soil respiration in a grassland plot.

9. Graduate student Virginia Matzek preserves oak leaves in liquid nitrogen for a physiological study of fast and slow growth in plants.

10. Duncan Menge, Stanford Class of 2003, takes a soil core from the Jasper Ridge Global Change Experiment for his undergraduate honors thesis work on phosphorus limitation under global change manipulations.

11. Center for Conservation Biology research staff Paulo Oliveira collects seedbank samples at a Jasper Ridge reference site for the Stanford Foothills grassland restoration project.
trients that are essential to plants. Duncan Menge, a Stanford undergraduate, designed his Honors thesis project to find out whether global change factors that relieve limits to plant growth by one nutrient lead to limitation by another. He was particularly interested in relative limitation by nitrogen and phosphorus, two of the most common nutrient limitations to plant growth. He found that added water reduces the amount of an enzyme that frees phosphate ions from organic compounds in the soil, a key step in making those ions available for uptake by plants. From this and other results from his thesis, Menge concluded that added water reduces phosphorus availability but reduces nitrogen availability even more. Studies by postdoctoral fellows Peter Horz and Adrian Barbroof, working with Professor Brendan Bohannan, identify one mechanism behind the altered nitrogen availability. They have found that with added precipitation, there is a decrease in the abundance of bacteria that oxidize ammonium to nitrite, a key step regulating the amount of nitrate available to plants.

Although plants might be expected to compensate for reduced nutrient availability by growing more or deeper roots, Ph.D. student Lisa Moore has found that plots with added water have shallower root systems instead. Moore considers this a potentially short-sighted response by the plants because it allows greater growth of shoots early in the season but leaves plants shortchanged later on when drying soils demand more extensive root systems. This trade-off may help explain an important response of annual primary production discovered by postdoctoral fellow Jeff Dukes: increases in the length of the growing season (determined by the dates of the first and last significant rains) tend to produce increases in primary production, whereas augmenting water within a naturally triggered growing season does not. Added moisture does, however, shift the seasonal impact of natural herbivory by snails and slugs. Ph.D. students Halton Peters and Elsa Cleland, together with high school senior Grace Hsu, found that in the treatments with added water, herbivory was diminished in fall and increased in spring, a shift that appears to have significant effects on the composition of the plant community. All of these findings underscore the need for more detailed predictions of the timing of precipitation in regional models of future climate change.

**Watershed Studies**

Both the timing and amount of precipitation affect the movement of water through ecosystems. Surface runoff and groundwater transport from roughly half the Preserve feed into Searsville Lake, which also drains another 14 square miles of forested slopes on highly erodible geologic formations in the Coast Range. Runoff from the watershed washes soil, rocks, and plant debris into Searsville Lake, which traps roughly ninety percent of the sediment. A century of deposition in the lake has drastically reduced both its area and depth. This year, Stanford Professor David Freyberg began studying how the groundwater in vegetated alluvial areas interacts with the active waterways. His studies have already shown that the summer drawdown of the lake triggers a parallel but delayed decline in groundwater energy. These studies will be important for predicting what will happen to biotically sensitive wetlands in the future.

Groundwater dynamics also affect the extent to which Searsville Lake is storing carbon that would otherwise contribute to increases in atmospheric carbon dioxide, a greenhouse gas. Ph.D. student Asmeret Asefaw Berhe (U.C. Berkeley) is working with a team of scientists from the U.S. Geological Survey who have been studying 40-foot cores of sediment they removed from the lake. Berhe joined them to analyze the fate of carbon that had been carried down from the watershed as plant litter and organic matter in soil. They have found that buried sediments in the deepest area of the lake contain organic carbon that has been largely preserved and will remain so for a thousand years or more if left in place. By contrast, sediment in periodically drained alluvium near the lake’s main tributary may be subject to more
rapid decomposition and/or less effective burial. The lake is preserving less and less additional carbon, however, because of its decreasing capacity to store sediment.

The dam not only withholds sediment from its outflow creek, San Francisquito, but also alters the seasonal flow characteristics of that creek. At various times since 1996, Jonathan Owens, Chris White, and Barry Hecht of Balance Hydrologics have studied how these changes in outflow might affect native strains of steelhead trout and other stream dwellers. Currently they are measuring flow over the dam and are setting up a station for monitoring water quality in Bear Creek, a major tributary of San Francisquito. Their studies are sponsored by Stanford Utilities and are part of the cooperative Long-Term Monitoring and Assessment Program (LTMAP) for San Francisquito Creek.

Researchers Gordon Holtgrieve and Scott Loarie and Stanford Conservation Biologist Alan Launer have continued their monitoring of San Francisquito Creek for sensitive species such as steelhead and California red-legged frogs, both federally protected species. This year they completed an analysis that suggested that the distribution of red-legged frogs may be constrained to the middle reaches of the creek by both urban development and non-native crustaceans in downstream areas and by invasive species in the upper reaches, especially predatory bullfrogs and bass carried by Searsville Lake’s outflow. The team also discovered marked fluctuations in one of the Creek’s potentially most disruptive invaders, mitten crabs, which migrate upstream from San Francisco Bay. In 1999 and 2000, the team observed hundreds of crabs as far as two kilometers into JRBP, but in 2002, they saw none. Because crab migration requires moderate streamflow, the researchers suspect that population declines may be caused by either very dry years or wet years with very high streamflow.

Hydrologic changes occurring at JRBP are critical to the local watershed and representative of broader—sometimes global—challenges. Although research programs at Jasper Ridge are diverse and independent, often they intersect along common themes. For example, several recent studies at JRBP underscore the importance of the hydrologic regime in the evolution of the flora and the composition of communities, while other studies consider processes by which predicted changes in rainfall may alter species and ecosystems in the future. Results from the Global Change Experiment emphasize that the consequences of these changes will depend on other environmental changes and their effects on soil nutrients. In coming years, Searsville Dam and Lake will be an important focal point in local freshwater resources. The dam truncated a steelhead spawning run that once extended from the Bay into the upper reaches of the watershed, and also interrupted the natural flux of sediment from the Coast Range to the Bay. Studies of these impacts, together with monitoring and experimental studies of biotic communities, groundwater, dissolved nutrients, surface flow, and water quality, all provide a growing source of scientific input for managing freshwater resources and contributing to the health of this and other watersheds.
In academic year 2002-03, the new Jean Lane Environmental Education classrooms of the Leslie Shao-Ming Sun Field Station housed a stimulating and diverse range of classes, lectures, workshops, and discussions. Stanford University classes included Core Experimental Laboratory for Ecology (Biology 44Y), Field Studies in Earth Systems (Earth Systems 189), Botany (Biology 120), Jasper Ridge Docent Training (Biology 96), as well as the Quest Scholars Program. Additionally, workshop classes were held quarterly in collaboration with the Stanford Teacher Education Program (STEP) and the Stanford Ecology and Environmental Sciences retreat filled the building with students and faculty in March. During spring quarter, the Eastside College Preparatory School’s (ECP) Field Studies class collected and studied their ecosystem data with the help of Stanford undergraduates, and in June, Jasper Ridge hosted a weeklong field trip for Ecological Society of America (ESA) students representing colleges and universities from throughout the United States. For a complete list of instructional use, see Appendix 3.

Biology 44Y brought 250 students to the Preserve for ecology labs during spring quarter. The students collected and analyzed samples of aquatic systems in Corte Madera and San Franciscoito Creeks to explore relationships between abiotic factors and macroinvertebrate diversity and abundance. A series of Hester-Dendy sampling plates were placed at various sites in the creeks. These devices, composed of multiple masonite plates divided by nylon spacers, provided artificial substrates for macroinvertebrates and were disassembled by students for specimen examination. The students measured the effects of five abiotic factors: dissolved oxygen, temperature, pH, velocity, and conductivity, on the populations of macroinvertebrates that settled on the plates.

Earth Systems 189 students heard classroom lectures by Stanford faculty members and participated in field studies in the rapidly changing delta region where Corte Madera Creek enters Searsville Lake, a site that is marked by gradients of soil saturation and a pronounced pattern of vegetation succession. Students learned and applied field and laboratory methods in geology, soils, biogeochemistry, and plant ecology as they studied the fundamental workings of this ecosystem. The course emphasized questions and study methods relating to the landforms and rock types resulting from California tectonics, processes involved in soil formation, and nitrogen cycling. Structure, distribution, and the functional properties of the successional plant communities were also investigated by the class.

Spring 2003 marked the fifth year of the Eastside College Preparatory School JRBP Field Studies class. For ten weeks, 15 ECP sixth graders collected data in their ecosystem sites for three hours each Wednesday morning as they worked alongside Stanford undergraduates Laura McClendon, Simha Reddy, and
1. Docent and Eastside College Preparatory School mentor Britt Sandler explains the finer details of Jasper Ridge geology in a hands-on class.

2. Kim Carlson and Alvin Chin, 2003 docent trainees, test the water potential of a variety of plants using a pressure chamber.

3. Biology 44Y students Stephanie Hu, Amrit Rao, Camille Palma, and Lisa Yoshimi pose in their waders with teaching assistant Berry Brosi (holding flow meter) after returning from taking measurements of dissolved oxygen, temperature, pH, velocity, and conductivity in San Francisquito Creek.

4. Students from the Ecological Society of America SEEDS (Strategies for Ecology Education, Development, and Sustainability) fieldtrip collect fish traps in the San Francisquito creek with Dr. Alan Launer.

5. Local high school science teachers participate in one of a series of workshops sponsored by the Stanford Teacher Education Program (STEP) and JRBP.

6. Resident Ranger and local mycologist Brooke Fabricant teaches docents Carol Hake and Betsy Clebsch how to key a specimen.

7. Abby Hall and David Martinez inventory what they have caught as part of their Biology 96 terrestrial invertebrate class.

8. As part of a field exercise in Earth Systems 189, Alicia Aponte and John Juarez access the upper canopy of a willow stand from the bucket of a lift truck in order to monitor light levels and sample leaves.

9. Two Eastside College Preparatory School students carefully examine a field specimen with a hand lens before recording their data.

10. Mike Greene, postdoctoral fellow in Dr. Deborah Gordon’s lab, explains harvester ant Pogonomyrmmex barbatus behavior to Jasper Ridge docents during the 2002 Docent Field Trip to the American Museum of Natural History’s Southwest Research Station in the Chiricahua Mountains of southeastern Arizona.
Britt Sandler. In addition to collecting data on air and soil temperatures, relative humidity, and plant growth, the students explored special topics including adaptations (plant and animal), insects, botany, geology, and tracking. Students presented their work to peers and ECP faculty at the end of the quarter.

The ESA Strategies for Ecology Education, Development, and Sustainability (SEEDS) Program began in 1996 as a collaborative effort to work towards increasing the number of minorities in the field of ecology. Student field trips are an important component of the program and aim to foster greater student identification with ecology through direct field experience. In June of 2003, JRBP hosted the SEEDS field trip to Northern California which included two days of field work at Jasper Ridge, a visit to Hopkins Marine Station in Monterey, and other sites in the Bay Area. Attendees included 17 students from ten schools, three SEEDS faculty, three staff members from the Ecological Society of America, and one participant from the All Nations Louis Stokes Alliance for Minority Participation (ANLSAMP). More information about the SEEDS program is available at http://esa.org/seeds/.

In academic year 2002-2003, JRBP collaborated with faculty and staff of the Stanford Teacher Education Program (STEP) and held
quarterly teacher training workshops for local middle and high school teachers. Participants gained experience working with new technology for data collection and curriculum design. Utilizing soil temperature probes and specialized software from Vernier, workshop teachers will collaborate during academic year 2003-2004 in a multi-school soil temperature experiment. Students at collaborating schools will have the opportunity to do hands-on field science at their own campus and will develop valuable skills in quantitative analysis as they compare the results of the various locations. These data, which will represent several microclimates in the Bay Area, including soil temperature data from the Jasper Ridge Global Change Experiment (JRGCE), will be entered into a web-based data set and accessible by all participants. The JRB/STEP/local schools environmental education model provides an opportunity for thousands of students to engage in meaningful scientific activity each year without excessively increasing human use of the Preserve.

The 2003 docent class (Biology 96) was the first to use the new Jean Lane Environmental classroom for lectures and indoor work. Stanford faculty, JRB staff, docents, and local experts taught classes on subjects such as valuing ecosystem services, geology, soils, hydrology, botany, tracking, terrestrial invertebrates, and global climate
change. The class also spent many wet Thursday afternoons in the field, learning first-hand the intricacies of natural history, ecology, and environmental science at the Preserve. In June, these 19 new docents were officially graduated into the JRBP docent community.

Bio 96 and the Jasper Ridge community exemplify the efforts of instructors and students to provide opportunities for inquiry-based education in ecology and provide a bridge between education (both formal and informal) and the volunteer base of the Preserve.

Looking to the future and the consistent increase in demand for meaningful environmental education, new collaborations at the Preserve are aimed at teacher education and intensive field classes for selected schools. Docent participation is key to the success of these new models. The JRBP/STEP liaison reflects the efforts and expertise of docents Margaret Krebs, Rosa Navarro, Monya Baker, Misty Sato and Bill Gomez. Eastside College Preparatory School’s field classes involve a quarter-long mentoring commitment by Stanford docents each year, and docents contribute to the success of Biology 44Y and other classes annually.

Educational opportunities for the JRBP community also continue to increase—many the direct result of docent efforts. Two notable examples of docent-generated education in 2002-03 were the monthly lunch time round-

Malaise insect traps were used to collect insects nightly at the JRBP permanent bat station at Searsville Lake between June and September 2003.

and Bill Gomez and have been supported enthusiastically by the community.

Increasingly, docents have provided valuable contributions to the JRBP research community. In 2002-03 docents contributed to research in many areas including global climate change, ant research, bat research, water quality testing, bird censuses and more. Over a quarter of the docent community participated in these efforts.

The work of docent Tom Mudd was particularly impressive this year. Tom observed enormous and unaccountable variation in bat activity from night to night at the permanent bat station at Searsville Lake and consulted with emeriti professors of statistics, Lincoln Moses (docent) and Bill Brown (JRBP birder). Analysis of the bat data began with the assistance of Stanford graduate student Sam Hui. After consulting with entomologist Paul Arnaud of the California Academy of Sciences and JRBP researcher, Irene Brown, insect abundance was added as a variable.
With the help of docents Patrick Hsieh, Bill Gomez, Dexter Hake, and John Working, high school senior Tim Sun, and Preserve staff, insects were collected nightly using Malaise traps at the bat station between June and September 2003 to investigate the relationship between insect abundance and bat activity. The results of this study, entitled *The Relationship Between Bat Activity, Insect Abundance, and Weather Conditions* were presented at the North American Symposium on Bat Research in October 2003 in Lincoln, Nebraska.

Visitors to the new Sun Field Station are often awed by the energy-saving attributes of this "green" facility and leave having learned substantial lessons about energy conservation and sustainability. Much less obvious, but just as central to the operations of the Preserve, is the energy contributed by the Preserve’s phenomenal docent community.

Docent efforts are the hidden energy source that fuels considerable and significant work often without acknowledgment. In 2002-03, this inexhaustible energy source generously supported the Preserve in efforts that ranged from teaching and tours to data collection, physical labor, and a multitude of other tasks.

We thank you.
<table>
<thead>
<tr>
<th>Project</th>
<th>Principal Investigator(s)</th>
<th>Department or Division</th>
<th>Institution</th>
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<tbody>
<tr>
<td>Comparative ecology and life history of chaparral shrub species</td>
<td>Ackerly, David</td>
<td>Biological Sciences</td>
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<td>Functional diversity of California woody plant communities</td>
<td>Cornwall, Will</td>
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<td>Stem-allometry and hydraulic conductivity in chaparral plants</td>
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<td>Community assembly on serpentine chaparral</td>
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<td>Reference surveys for Stanford Foothills Restoration Project</td>
<td>Anderson, Sean; Oliveira, Paulo</td>
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<td>Annual grassland responses to litter manipulation</td>
<td>Amatangelo, Kathryn</td>
<td>Biological Sciences &amp; Global Ecology</td>
<td>Stanford Univ. &amp; Carnegie Inst.</td>
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<td>Biosystematics of <em>Hilara</em>, <em>Medetera</em>, and parasitoids of Tachinidae</td>
<td>Arnaud, Paul</td>
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<td>Cal. Academy of Sciences</td>
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<td>Carbon burial and preservation in Searsville and other lake environments</td>
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<td>Variation in heavy metal tolerance in <em>Lathyrus californicus</em></td>
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<td>Population biology of the butterfly <em>Euphydryas chalcogona</em></td>
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<td>San Francisco watershed mapping</td>
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<td>Magnesium cycles in California serpentine areas: Edgewood Park and JRPB</td>
<td>Coleman, Robert; Oze, Christopher;</td>
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<td>Skinner, Catherine</td>
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<td>Mammalian herbivores as mediators of community structure and soil fertility</td>
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<td>Functional trait comparison among different grass floras</td>
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<td>Instituto Multidisciplinario de</td>
<td>Universidad Nacional de Cordoba, Argentina</td>
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<td>Long-term studies of <em>Euphydryas editha bayensis</em></td>
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<td>Effects of global change on methane oxidation</td>
<td>Blankinship, Joey</td>
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<td>Spectral measurement of aboveground vegetation dynamics</td>
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<td>Stanford University</td>
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<td>Population and species effects on biogeochemistry</td>
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<td>Plant organic compounds and microbial functional diversity</td>
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<td>Response of soil bacterial communities to elevated CO₂</td>
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<td>Effects of global change on soil nitrogen cycling</td>
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<td>Phosphorus limitation under global change manipulations</td>
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<td>Belowground effects of multiple global changes</td>
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<td>Belowground dynamics of carbon, nitrogen, and biomass</td>
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<td>Global Ecology</td>
<td>Carnegie Instit. of Washington</td>
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<td>Changes in gene expression in <em>Geranium dissectum</em> and <em>Avena barbata</em></td>
<td>Thayer, Sue</td>
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<td>Carnegie Instit. of Washington</td>
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<td>Isotopic analysis of respiratory carbon dynamics</td>
<td>Torn, Margaret</td>
<td>Center for Isotope Geochemistry</td>
<td>Lawrence Berkeley Nat’l. Lab.</td>
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<td>Videorecording of seasonal changes for remote sensing course development</td>
<td>Fleishman, Erica</td>
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<td>Seto, Karen</td>
<td>Ctr. for Environ. Science &amp; Policy</td>
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<td>Ground water flow in Searsville Lake sediments and lake-ground water exchange</td>
<td>Freyberg, David; Kim, Dongkyun</td>
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<td>Department or Division</td>
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<td>Climate-vegetation relationships in Mediterranean ecosystems</td>
<td>Garcia, Monica</td>
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<td>Calochortus phylogeography</td>
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<td>Argentine ant (<em>Linepithema humile</em>) invasion and the response of native ants</td>
<td>Gordon, Deborah</td>
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<td>Effects of tending by Argentine ants on Homoptera abundance</td>
<td>Fleming-Davies, Arietta</td>
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<td>Chemical ecology of the Argentine ant</td>
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<td>Monitoring of water flow and quality</td>
<td>Hecht, Barry; Owens, Jonathan</td>
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<td>Simulation of hydrologic response and sediment transport after dam removal</td>
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<td>Effects of rainfall variability and gopher removal on serpentine grassland</td>
<td>Hobbs, Richard</td>
<td>Environmental Science</td>
<td>Murdoch University, Australia</td>
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<td>GPS mapping for the San Francisquito Archaeological Research Project GIS</td>
<td>Jones, Laura</td>
<td>Campus Archaeology</td>
<td>Stanford University</td>
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<td>Earthquake prediction from precursory electromagnetic anomalies</td>
<td>McPhee, Darcy; Klemperer, Simon</td>
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<td>Stanford University</td>
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<td>Natural barriers to Argentine ant invasion: the role of transitional environments</td>
<td>Kark, Salit; Heller, Nicole; Young, Rebecca</td>
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<td>Regional surveys of annual acorn production</td>
<td>Koening, Walter</td>
<td>Hastings Natural History Reserv.</td>
<td>Univ. of California, Berkeley</td>
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<td>Carbon cycling in shrub and grassland landscapes invaded by exotics</td>
<td>Koteen, Laurie</td>
<td>Energy and Resources Group</td>
<td>Univ. of California, Berkeley</td>
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<td>Broad band seismic monitoring</td>
<td>Kovach, Robert</td>
<td>Geophysics</td>
<td>Stanford University</td>
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<td>Survey of San Francisquito Creek and removal of exotics</td>
<td>Launer, Alan</td>
<td>Center for Conservation Biology</td>
<td>Stanford University</td>
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<td>Terrestrial plant stoichiometry</td>
<td>Matteck, Virginia</td>
<td>Biological Sciences</td>
<td>Stanford University</td>
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<td>Long-term monitoring of ecosystem processes by eddy flux</td>
<td>Merchant, George; Field, Christopher; Kaduk, Joerg</td>
<td>Global Ecology</td>
<td>Carnegie Inst. of Washington University of Leicester</td>
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<td>Photochemical changes in natural organs in Searsville Lake water</td>
<td>Mill, Theodore</td>
<td>Atmos. Chem. &amp; Space Physics</td>
<td>SRI International</td>
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<td>Stability of chromium(III) in the soil environment</td>
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<td>Geological &amp; Environmental Sciences</td>
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<td>Mapping of invasive plants along Santa Clara County creeks</td>
<td>Peritz, Jennifer</td>
<td>Geological &amp; Environmental Sciences</td>
<td>Santa Clara Valley Audubon Soc.</td>
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<td>Evolutionary dynamics of flower color polymorphism in <em>Linanthus parviflorus</em></td>
<td>Schemske, Douglas</td>
<td>Plant Biology</td>
<td>Michigan State University</td>
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<td>Assessment of <em>Brachypodium distachyon</em> for studies of cereal genomics</td>
<td>Somerville, Christopher</td>
<td>Plant Biology</td>
<td>Carnegie Inst. of Washington</td>
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<td>Fire history of JRBP and the region</td>
<td>Stephens, Scott</td>
<td>Envr. Science, Policy, &amp; Mgmt.</td>
<td>Univ. of California, Berkeley</td>
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<td>Passive cumulative monitoring of nitrogenous atmospheric pollutants and ozone</td>
<td>Weiss, Stuart; Luft, David</td>
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<td>Long-term acoustical monitoring of bat activity</td>
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<td>JRBP</td>
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<td>Biodiversity and grassland invasions</td>
<td>Zavaleta, Erika; Hulvey, Kris</td>
<td>Integrative Biology</td>
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Appendix 2: Publications


### Stanford University Classes (2,622)

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<td>Anth Sci 3</td>
<td>Introduction to Prehistoric Archaeological Sites (Rick)</td>
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<td>Anth Sci 149</td>
<td>Archaeological Field Methods (Bandy)</td>
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<td>Arch 19</td>
<td>Historical Archaeological Field Methods, Continuing Studies (Jones, Bandy)</td>
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<td>Art Hist 150A</td>
<td>American Architecture and Urbanism (Littman)</td>
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<tr>
<td>Bio 13</td>
<td>Wildflower Families of the Bay Area, Continuing Studies (Corelli)</td>
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<td>Bio 35</td>
<td>Trees and Shrubs of the San Francisco Bay Region, Continuing Studies (Corelli)</td>
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<td>Bio 44Y</td>
<td>Core Experimental Lab (Malladi, Yelton)</td>
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<td>Bio 96A/B</td>
<td>JRBP Docent Training Program (Vitousek)</td>
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<td>Bio 117</td>
<td>Biology and Global Change (Matson, Vitousek, Monney)</td>
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<td>BIO 120</td>
<td>General Botany (Preston)</td>
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<td>Bio 223</td>
<td>Plant Taxonomy (Preston, Cornell, Ray)</td>
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<td>CEE 31Q</td>
<td>Accessing Architecture Through Drawing (Walters)</td>
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<td>CEE 61Q</td>
<td>Big Dams, City Hall, and the Sierra Club (Kitanidis)</td>
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<td>CEE 166D</td>
<td>Water Resources (Freyberg)</td>
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<td>CEE 176A</td>
<td>Energy Efficient Buildings (Masters)</td>
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<td>CTL 60</td>
<td>Investigating Stanford’s Treasures (Moser)</td>
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<td>Esys 10</td>
<td>Introduction to Earth Systems (Ernst)</td>
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<td>Esys 189</td>
<td>Field Studies in Earth Systems (Chiariello, Fendorf, Ackery, Matson, Miller)</td>
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<td>GES 175</td>
<td>Science of Soils (Fendorf)</td>
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<td>Phi 133</td>
<td>Major Figures in 20th-Century Philosophy (Follesdal)</td>
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<td>Urb 172</td>
<td>Green Architecture (Jacobson)</td>
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<td>Urb 181</td>
<td>Environmentally Sustainable Cities (Cushing)</td>
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<td>Quest Scholars Program (Ackerly)</td>
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<td>History of Stanford Architecture (Kwan)</td>
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### Non-Stanford University Classes (148)

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<td>Bio 103</td>
<td>Cañada College, Native Plants and Wildflowers (Steiner)</td>
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<td>CE 140</td>
<td>Santa Clara Univ., Water Resources Engineering (Perry)</td>
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<td>720958X</td>
<td>De Anza College, Natural History of the Bay Area (West-Bourke)</td>
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<td>ES 79</td>
<td>De Anza College, Renewable and Alternative Energy Systems (Gould)</td>
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<td>-</td>
<td>Ecological Society of America, Strategies for Ecology Education, Development, and Sustainability</td>
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### Stanford Organizations (1,299)

- Association of Chinese Students and Scholars at Stanford
- Bechtel International Center
- Beehive Group
- Center for Comparative Studies in Race and Ethnicity
- Center for Advanced Study in the Behavioral Sciences
- Cantor Center for Visual Arts
- Department of Biological Sciences
- Department of Civil and Environmental Engineering
- Department of Physics
- Digital Vision Fellowship Program
- Escondido Village
- Faculty Women’s Club
- Graduate School of Business
- Hopkins Marine Station
- Information Technology Systems and Services
- Master of Liberal Arts Alumni
- Medical School Alums
- Office of Technology Licensing
- Quilen Dorm
- Robinson Dorm
- School of Engineering
- School of Medicine
- Stanford Alumni Club of Los Gatos / Saratoga
- Stanford Environmental Law Society
- Stanford Libraries Staff Association
- Stanford Management Company
- Stanford Teacher Education Program
- Stanford University Board of Trustees
- Stanford University Emeriti Board of Trustees
- Synergy House
- Toyon Dorm
- Undergraduate Advising Center

### Other Organizations (2,848)

- The American Society of Landscape Architects
- Ano Nuevo State Reserve
- Anshen + Allen
- California Garden and Landscape History Society
- California Native Plant Society
- Canopy
- Carnegie Institution of Washington
- Chartwell School
- Crystal Springs School
- Eastside College Preparatory School
- Edgewood County Park and Natural Preserve
- Environmental Defense
- Environmental Volunteers
- Filoli Docents & Horticulturists
- Fitzgerald Marine Reserve
- The Forum
- Foundation for Global Community
- Gamble Garden
- Golden Gate Biosphere Reserve
- Gunn High School
- Hillsdale High School
- Menlo School
- Menopausal Men’s Marching Group
- Muwekma Tribe
- Palo Alto Fire Department
- The Peninsula School
- Portola Valley Ranch
- Rob Wellington Quigley Architectural Firm
- Rocky Mountain Biological Laboratory
- San Mateo County Parks and Recreation
- San Mateo County RecycleWorks
- Santa Clara Valley Audubon Society
- Sequoia Audubon
- Sierra Club New York
- Swedish Women’s Educational Association
- Town of Portola Valley
- Union of Concerned Scientists
- University Corporation for Atmospheric Research
- US Green Building Council
- Wild Bird Center of San Carlos
- Woodside-Atherton Garden Club
- Woodside High School
- Young Presidents’ Organization
Appendix 4: Financial Summary: 2002-03 Fiscal Year

Expense Summary - $730,350

- Salaries & Benefits: 414,325
- Operations & Maintenance: 177,601
- Administration: 59,383
- Docent / Education Support: 52,739
- Research Support: 14,017
- Land Management: 6,412
- Fund Raising & Public Relations: 5,873

Revenue Summary - $708,361

- Endowment Income: 435,654
- University General Funds Support: 194,000
- Unrestricted Donations: 64,909
- Income (tours, sales, etc.): 13,798

Expenses exceeded revenue due to several one-time costs associated with the move into the Leslie Shao-ming Sun Field Station: These expenses totaled $76,580 and included installation of a cistern, additional casework and countertops, classroom furnishings and projectors, shelving, and lockers. The base operating budget without one-time expenses associated with the move into the Sun Field Station came to $677,183. This is about $4,000 less than the last fiscal year.

Unrestricted donations included pledges of $10,000 associated with the capital campaign for the Leslie Shao-ming Sun Field Station. The shortfall between expenses and revenue is partly a result of a reduction in endowment payout and was covered by unrestricted donor accounts.
Appendix 5: Donors

Unrestricted Gifts, September 1, 2002 – August 31, 2003

Amber Foundation
Anonymous
Paul H. & Madeline L. Arnaud, Jr.
Richard K. Arnold
Leonie Barkin
Nancy & Dr. Clayton Bavor
Kathleen Bennett & Thomas J. Malloy
Monika Björkman
Irene Brown
Robert R. Buell
James Caldwell
Dudley B. & Curtis R. Carlson
Jack Chin
William H. Clark
Mary H. & Robert Dodge
Carol A. & Luis E. Ebner
Karin A. Ecklemeier
Nancy H. & David W. Ferguson
Edward M. Fryer
Sara A. Fultz
Stephen J. Galli, M.D.
Lindy G. Gardner
Margaret E. Green
Evelyn D. & Walter Haas, Jr. Fund
Carol & Dexter Hake
Karen D. Hamilton
Dr. Benjamin C. and Ruth Hammett
Mary C. Henry & Rajpal Sandhu Foundation
Pauline E. Heyneker
Leo M. & Florence A. Holub
Mary Hufty & Daniel S. Alegria
Margery Janes
Johnson & Johnson
Dirk & Charlene Kabcenell
Anthony J. & Judith H. Kramer
Kerstin Fraser & Alan G. Magary
Martin Family Foundation
Robert J. Masi, M.D.
Arthur Matula
Ethel B. Meece
Lincoln E. Moses
Mary Ann & James Alan Nahmens
John R. Page
Ruth S. & David Y. Porter
Earl F. & Patricia Cashel Schmidt, Jr.
Albert & Joel Wells Schreck
Shack Riders
Rolf G. Spamer, DDS
Peter D. Stent
Anthony Sun
The Rev. Marylou McClure Taylor
Ruth & Eugene W. Troetschler
Anne E. Warren
Richard J. & Louise Wiesner
Eleanor J. Wood
Woodside-Atherton Garden Club
John Working
Sunia I. Yang
Richard I. Yankwich & M. Megan McCaslin
William H. & Annette J. Young
Appendix 6: The JRBP Community

David Ackerly
Molly Aecck
Karen Amatangelo
Sean Anderson
Chris Andrews
Michael Anthony
Paul Arnaud
Ron Arps
Greg Asner
Naomi Austen
Monya Baker
Matthew Bandy
Marisha Banister
Mary Baron
Nancy Bavor
Kathleen Bennett
Asmeret Asefaw Berhe
Joseph Berry
Radika Bhaskar
Monika Björkman
Kindel Blau-Luerner
Carole Boggs
Brendan Bohannan
Sharon Brauman
Russell Brzyski
Bill Brown
Irene Brown
Bob Buell
Gene Bulf
Ruth Buneman
Al Butner
Fleming Byrom
Nicholas Casey
Sally Casey
Ted Chandik
Zoe Chandik
Andrew Chang
Audrey Chang
Aleksandr Chebanov
Carl Cheney
Nona Chiariello
Alvin Chin
Jack Chin
Jean Clark
William Clark
Brandon Cochran
Elsa Cleland
Brian Cohen
Philippe Cohen
Robert Coleman
Heather Cooley

Toni Corelli
Will Cornwell
Stuart Cousins
Jenny Creelman
Rig Currie
Hall Cushman
Gretchen Daily
Yvonne Daley
Marge De Staebler
Fran DeRose
Kenneth Dixon
Bob Dodge
Janet Doell
Ted Dolton
Kim Dongkyun
Jeff Dukes
Michael Eckert
Janice Ezgerly-Rooks
Edwin Ehmke
Paul Ehrlich
Lisa Ehrlich
Linda Elkind
Claire Elliot
Gary Erns
Irene Estelle
Michelle Evelyn
Deana Fabbro-
Johnston
Brooke Fabrictant
Natasha Fabricant
Ron Fark
John Fark
Scott Fendorf
Christopher Field
Susan Finlayson
Forrest Fleischman
Erica Fleshman
Anietra Fleming-
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Illustrations
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Jim Caldwell, front cover, back cover
Eliza Jewett, inside front cover
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Layout by Justin Holl and Rebecca Young

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In Memoriam

Konrad B. Krauskopf, a pioneer in the field of geochemistry, a member of the Stanford University faculty since 1939 and a Jasper Ridge geology instructor, died at his campus home on May 4, 2003 at age 92. Krauskopf was one of very few scientists in the late 1930s who helped define the emerging field of geochemistry, which combined the concepts of physical chemistry with those of geology. Krauskopf “provided scientists with the original defining texts in geochemistry and physical geology,” according to Gary Ernst, Jasper Ridge instructor and Stanford Professor of Earth Sciences. In a career spanning more than six decades, Krauskopf led numerous geological and mapping expeditions to such places as the Pacific Northwest, the Sierra Nevada and White Inyo Ranges, the Transmexican Volcanic Belt, and coastal Norway. His pioneering research and academic achievements earned him numerous honors, including the Legendary Geoscientist Award from the American Geological Institute in 2000 and the Distinguished Public Service Medal from the Mineralogical Society of America in 1994. He was a member of the National Academy of Sciences and the American Philosophical Society.