UNIVERSITY of CALIFORNIA
NATURAL RESERVE SYSTEM

K-12 Environmental Education in the Natural Reserve System
Serious preoccupation with environmental problems is a relatively recent phenomenon in contemporary society. While there have always been certain expressions of concern for issues relating to environment, only in the last few decades, as a result of extraordinary rapid scientific progress, as well as technological and social changes, have new problems emerged and others, which existed before, taken on entirely new dimensions. It is now recognized that many human activities, collectively, have detrimental and possibly irreversible consequences. Equally new is the realization that some problems, which arise in a variety of specific forms according to the context of individual countries where they may occur, may be affecting humanity as a whole.

—Final Report, Intergovernmental Conference on Environmental Education
Organized by UNESCO in cooperation with UNEP
Tbilisi (USSR), 14-26 October 1977
K-12 Environmental Education in the United States

In the late 1990s, the North American Association for Environmental Education and the Environmental Literacy Council commissioned a survey of kindergarten through high school (K-12) teachers concerning environmental education in the United States. The report, entitled “Environmental Studies in the K-12 Classroom: A Teacher’s View,” appeared in 2000.

From this survey, we learn that 61.2 percent of the 1,505 teachers who responded to the mailed survey included environmental topics in their curricula. Some two-thirds of the respondents (62.9 percent) taught about the environment fewer than 50 hours per year, a fifth taught 50 to 100 hours, and less than one in five respondents (17 percent) taught more than 101 hours. Overall, over 60 percent of teachers of environmental topics were trained in environmental studies and/or ecology, either before or after they became teachers. The most commonly used teaching materials were textbooks (79.1 percent), the library (75.9 percent), and newspapers (74 percent). The specific topics taught by these teachers are tabulated in Table 1.

<table>
<thead>
<tr>
<th>Environmental Topic</th>
<th># Teaching Topic (n=920)</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Recycling and waste management</td>
<td>803</td>
<td>87.3</td>
</tr>
<tr>
<td>Endangered species</td>
<td>710</td>
<td>77.2</td>
</tr>
<tr>
<td>Conservation of energy</td>
<td>688</td>
<td>74.8</td>
</tr>
<tr>
<td>Forests and wetlands</td>
<td>598</td>
<td>65.0</td>
</tr>
<tr>
<td>Air quality</td>
<td>580</td>
<td>63.5</td>
</tr>
<tr>
<td>Global warming and the ozone layer</td>
<td>348</td>
<td>37.8</td>
</tr>
<tr>
<td>Acid rain</td>
<td>310</td>
<td>33.7</td>
</tr>
<tr>
<td>Population growth</td>
<td>300</td>
<td>32.6</td>
</tr>
<tr>
<td>Other topics</td>
<td>74</td>
<td>8.0</td>
</tr>
</tbody>
</table>
The survey also explored what methods teachers used to teach about the environment. Their answers are tabulated in Table 2.

When asked to indicate the major reason they taught about the environment, 51.1 percent of teachers responding indicated that they hoped to encourage students to be active about the environment, while 22.4 percent wished to demonstrate that what students are learning in class is relevant to everyday life. These responses resonate well with the definition of environmental education developed in 1999 by the Wisconsin Environmental Education Board:

“Environmental Education is a lifelong learning process that leads to an informed and involved citizenry having the creative problem-solving skills, scientific and social literacy, ethical awareness and sensitivity for the relationship between humans and the environment, and commitment to engage in responsible individual and cooperative actions. By these actions, environmentally literate citizens will help ensure an ecologically and economically sustainable environment.”

<table>
<thead>
<tr>
<th>Method</th>
<th># of Teachers (n=920)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discuss environmental topics covered in textbooks or other reading material</td>
<td>820</td>
<td>89.1</td>
</tr>
<tr>
<td>Hands-on activities or projects</td>
<td>736</td>
<td>80.0</td>
</tr>
<tr>
<td>Problem-solving exercises</td>
<td>526</td>
<td>57.2</td>
</tr>
<tr>
<td>Field trips</td>
<td>448</td>
<td>48.7</td>
</tr>
<tr>
<td>Independent or group research projects</td>
<td>381</td>
<td>41.4</td>
</tr>
<tr>
<td>Debates on environmental issues</td>
<td>225</td>
<td>24.5</td>
</tr>
<tr>
<td>Civic action exercises, such as examining environmental legislation</td>
<td>87</td>
<td>9.5</td>
</tr>
<tr>
<td>Other</td>
<td>63</td>
<td>6.8</td>
</tr>
</tbody>
</table>
K-12 Environmental Education in the NRS

Schools are major users of the University of California’s Natural Reserve System sites. The K-12 environmental education activities supported by the NRS both enable and reinforce in distinctive ways the education offered in the schools.

Moreover, because of the very limited amount of time dedicated in the schools to environmental education, field trips to NRS sites represent a significant fraction of students’ exposure to environmental studies in a school year. Because of the dramatically effective, hands-on activities that K-12 students engage in at reserves, even a brief visit may leave deep and lasting impressions, lessons that are never forgotten and can even be life-changing.

Environmental education represents a major and valuable activity throughout the Natural Reserve System. Each year, more than 10,600 children participate in a wide variety of programs at NRS reserves, always under the guidance of University faculty and students, reserve staff, docents, and other public volunteers. For many children, their visit to an NRS reserve gives them their first insights into the functioning of the natural world. This review provides use statistics for 2003-04, the most recent year for which compiled data are available, and highlights programs with special features offered in 2004-05.

Educational programs take many forms at NRS reserves. Inner city students in Los Angeles might take a daylong field trip to the Stunt Ranch Santa Monica Mountains Reserve to explore a chaparral ecosystem. Latino students from north of Santa Barbara might be given the opportunity to visit the Sedgwick Reserve throughout the school year to restore an eroded creek bed. For students from Mammoth Lakes, a weekend might be spent planting a native landscape at the local junior college under the guidance of a reserve educator. For high school students near Lake Tahoe, an intensive, six-week summer course at the Sagehen Creek Field Station fosters their leadership skills and mastery of English.

What is the role of the NRS?

The role of the NRS in environmental education is integral to the University’s mission of teaching, research, and public service. In many cases, NRS reserves are the only UC presence in large areas of the state. This is obviously true on the eastern side of the Sierra Nevada Mountains, in the remote reaches of the Mojave Desert, and on the isolated Big Sur Coast. But it can also be true in areas nearer to a campus, for the reserves have a special ability to reach out to specific student populations — English language learners, Native Americans, and other underrepresented populations — to capture their interest with the beauty of nature and the fascination of science, and to open up their worldviews to the possibilities of attending the University.
Twenty-one of the 35 NRS reserves have active K-12 education programs. The following charts represent such use for fiscal year 2003-04, the most recent year for which complete data are available. The first chart includes eight reserves that support more than 600 user days per year.

**K-12 Outreach Use 2003-04 • Sites with >600 User Days**

The thirteen reserves whose use is documented below have smaller (less than 600 user days per year), but still significant, K-12 education programs. Many are located in remote parts of the state, far from large population centers, or lack adequate facilities to handle large numbers of students. The remaining fourteen NRS sites that do not support K-12 use are closed to the public due to ownership concerns, environmental sensitivities, or absence of facilities and onsite staff.

**K-12 Outreach Use 2003-04 • Sites with <600 User Days**
Reserves with the highest level of use tend to be those located close to urban areas with large numbers of schools. For example, students from 28 different schools widely distributed in the greater Los Angeles area visited the Stunt Ranch Santa Monica Mountains Reserve (see map on facing page). The Sierra Nevada Aquatic Research Laboratory (SNARL) and Valentine Camp are distant from major urban centers, but serve as indispensable sites for environmental education for students from six different schools in Inyo and Mono counties.

As noted in the introduction, field trips represent a significant component of K-12 environmental education in the schools. Four reserves — Stunt Ranch, San Joaquin Freshwater Marsh, SNARL, and Sedgwick — are the major destinations for K-12 students and account for 74.5 percent of all such use of NRS sites.
Stunt Ranch Reserve attracts many visits

NRS reserves located near large urban areas can attract large numbers of K-12 students. Each year schools from throughout the Los Angeles metropolitan area visit the Stunt Ranch Santa Monica Mountains Reserve to participate in its environmental education program.

1. Oak Park Independent School
2. Lupin Hill Elementary
3. Round Meadow Elementary
4. Bay Laurel Elementary
5. Lockhurst Elementary
6. Our Lady of the Valley
7. Reseda Elementary
8. Woodland Hills Private School
9. Liggett Elementary
10. Monlux Math/Science Elementary
11. Curtis School Fairburn Avenue Elementary
12. Fairburn Avenue Elementary
13. Lycee Francais
14. Stoner Avenue Elementary
15. Loyola Village Elementary
16. Turning Point School
17. Windsor Hill Elementary
18. Hyde Park Elementary
19. Normont Elementary
20. Dr. Martin Luther King Elementary
21. Russell Avenue Elementary
22. Main Street Elementary
23. Normandy Avenue Elementary
24. Euclid Avenue Elementary
25. Robert F. Kennedy Elementary
26. Mt. Washington Elementary
27. Los Feliz Elementary
28. Toluca Lake Elementary
SANTA CRUZ ISLAND RESERVE IS PROTECTED, OWNED, AND MANAGED BY THE NATURE CONSERVANCY (TNC). ANGELO COAST RANGE, JENNY PYGMY FOREST, JEPSON PRAIRIE, AND EMERSON OAKS RESERVES ARE PROTECTED BY TNC, AS IS OASIS DE LOS OSOS, A SATELLITE SITE OF JAMES SAN JACINTO MOUNTAINS RESERVE. TNC IS INVOLVED IN THE PROTECTION OF LANDELS-HILL BIG CREEK RESERVE. AÑO NUEVO ISLAND RESERVE IS A 25-ACRE PORTION OF THE 4,000-ACRE AÑO NUEVO STATE RESERVE, ALL OF WHICH IS OWNED AND OPERATED BY CALIFORNIA STATE PARKS.
The nine K-12 environmental education programs highlighted in this section represent a sample of the range of programs going on at NRS reserves. Often these exist because of the sheer determination and creativity of NRS staff members who saw the need for such valuable environmental education programs and made them possible. These programs offer a glimpse of the sometimes-untapped potential of the NRS’s living laboratories.
Based at the Sagehen Creek Field Station, this intensive six-week summer program combines outdoor adventure and leadership activities with English and science instruction. Serving at-risk tenth- and eleventh-grade English Language Learners (ELL) whose first language is Spanish, ARC has dramatically improved its graduates’ performance on the English portion of the California High School Exit Exam.

The program aligns closely with California State Standards, and all key ARC instructors are credentialed teachers. Program director Katie Fesus holds an M.A. in Education from Stanford University and a California teaching credential from Mills College in Oakland.

Most ARC students are drawn from the local Tahoe-Truckee Unified School District, where 25 percent of the district’s students are designated as ELL. Ninety percent of these ELL students are achieving below grade level, and 60 percent drop out before graduation. Each year Fesus works with school faculty and staff to identify eight to ten ELL students who have both leadership and academic potential, but who are struggling with English. She then meets with the students and their families to determine their interest in participating in the program.

The ARC curriculum consists of a series of outdoor expeditions interspersed with academic time spent at Sagehen. Each program component has been designed to gradually build the students’ confidence and self-sufficiency until, by the end of the six weeks, they are comfortable with spending twenty-four hours on their own in the wilderness, teaching younger students basic science concepts, and reading their poetry in public.

The program’s tone is set on the first day when the students head into the Desolation Wilderness for an eight-day backpacking trip. Because most of the participants have no camping experience, ARC instructors carefully guide this trip, ensuring student safety while teaching backcountry survival skills. During this trip, participants begin to establish their group culture as they take responsibility for essential day-to-day chores.
Following the backpacking trip, the group comes to Sagehen to focus on language arts, science, and leadership/physical fitness.

The language arts curriculum includes reading groups, vocabulary and grammar exercises, writing projects, peer sharing, and public speaking. By the end of the program, each student drafts, edits, and publishes three major writing assignments.

The science curriculum is organized around the local school district’s “Teaching Tahoe” standards, introducing the students to the natural world and environmental concepts. Students research a natural history topic and create a bilingual interpretive trail on their topic. They then lead tours for young students from the local Boys and Girls Club.

The leadership and physical fitness curriculum challenges each student to take on groupwide leadership and support roles as they prepare meals, clean their campsite, facilitate daily group meetings, and maintain a camp log. This curriculum also teaches wilderness medicine, healthy nutrition, and building physical strength through running and other exercise.

Time at Sagehen is interspersed with new expeditions: sea kayaking on Lake Tahoe, river rafting, rock climbing, ROPES courses, an environmental service day, and additional backpacking trips. Each successive adventure demands a higher level of self-sufficiency from the students until, by the final trip, they are completely in charge of planning and carrying out a wilderness trip that includes a twenty-four-hour solo and an off-trail peak ascent.

In the first year of the program (2004), all of the students improved dramatically on post-program English examinations. Four of five students eligible to take the High School Exit Exam passed on their first try. Equally important has been the dramatic improvement in the students’ self-confidence and willingness to explore new opportunities. As 2005 participant Israel Carillo wrote:

Climbing these mountains
Is teaching me
That every difficult obstacle
Can be overcome if I believe
In myself

Environmental education has to come out of the universities and academic institutions, down to a grassroots level establishing a direct contact with its target groups.

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ENVIRONMENTAL EDUCATION: GLOBAL TRENDS AND LOCAL REALITY

Ulf Carlsson and Strike Mkandla.
United Nations Environment Programme
Online Colloquium, October 19-30, 1998

This resource provides an informal review of the lessons learned from the first twenty-five years of efforts in the field of environmental education by the United Nations Environment Program and other internal organizations. It includes a list of ten suggestions to direct environmental educators to focus on some important aspects of environmental education through improving its relevance and efficiency.
Camp Kalawashaq’
Santa Ynez Band of Chumash Mission Indians
Kids Summer Camp Program 2005

Participating Reserve: SEDGWICK RESERVE

Funded by: SANTA YNEZ BAND OF CHUMASH INDIANS

Participating Institutions: Camp Kalawashaq’ is a joint effort supported by the Santa Ynez tribal Elders and Education Committees, the Sedgwick Reserve, the UCSB Office of Campus Outreach Initiatives, and the UCSB Bren School of Environmental Science and Management.

Additional Information: <http://santaynezchumash.org/education.html>

In 2003, the Santa Ynez Band of Chumash Indians Education Committee partnered with UC Santa Barbara (UCSB) to establish a summer camp to build their children’s awareness of tribal culture and the natural environment, and to spark an interest in attending college. To achieve these goals, the Chumash education staff worked with the outreach team at UCSB’s Sedgwick Reserve to design an annual six-week program that balanced learning and fun. Serving students from six to sixteen years of age, the program has grown steadily in its first three years of operation, from eight to ten children the first year, to more than forty in 2005.

Camp activities incorporate tribal culture and history, with hands-on science activities at UCSB, Sedgwick Reserve, and such other locations as regional parks, a local natural history museum, and the tribal hall. Tribal culture activities range from building and maintaining a traditional Chumash ap (house) at Sedgwick, to learning the Chumash language, which until recently was on the verge of disappearing. A number of experts come to the camp to share their knowledge:

- Joe Dabill, a talented survival specialist, visited Sedgwick to present a workshop on Chumash Lifeways, including flint-knapping, fire-making, cordage-making, use of hand drills, atlatl-throwing, archery, use of native plants, and hands-on crafts. Dabill has taught classes for the Santa Cruz Mountains Natural History Association, the Santa Barbara Museum of Natural History, and the California Academy of Sciences.

- Mark Mendez came to the reserve to lead activities in Chumash music and games, teaching the children to make clappersticks, deer-hoof rattles, and other regalia. Mendez has presented workshops at numerous schools, pow-wows, and museums, including the Sherman Indian School Museum, the Huntington Library, and the Santa Barbara Museum of Natural History.

- Marcos Lopez, a founder of the Chumash Maritime Association, showed the students how to build a tomol (wooden plank boat), explained how the tribe used the boats to travel out to the Channel Islands, and gave the children an opportunity to paddle a tomol. Lopez has participated in the building of four tomols and has twice paddled in channel crossings from the mainland to Santa Cruz Island.

- On an overnight trip to Santa Cruz Island (site of original Chumash villages), noted Chumash storyteller Julie Tumamait-Stenslie introduced the students to traditional tribal lore. Tumamait-Stenslie is descended from a long line of culture bearers, people dedicated to preserving traditional Chumash stories, songs, dances, and medicine.
The science curriculum includes interactive lessons in environmental science, marine life, geology, botany, and biology. Activities include:

- A trip to UC Santa Barbara, where the students tour the Marine Science Laboratory, the Bren School, and the marine touch tanks, followed by a floating-laboratory excursion aboard the marine research vessel Condor Express.

- Interpretive hikes at Sedgwick led by volunteer docents who introduce students to the area’s native animals and plants. Other reserve activities popular with the students include building fish tanks, designing aquatic robots, and participating in an environmental restoration project where they remove invasive flora and replace them with native plants.

- The camp ends with a closing ceremony at the reserve, where parents and tribal elders gather to celebrate the students’ accomplishments and to watch them perform Chumash dances and songs. For many students, this is their first public opportunity to use the tribal regalia and gear (clappersticks, deer-hoof rattles, and shell rattles) they created earlier in the program.

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Formal and traditional environmental education must be strengthened, but it must also be complemented by nonformal and non-traditional approaches to reach out to important groups in society.

—Carlsson and Mkandla

ENVIRONMENTAL EDUCATION
Exploring California Biodiversity

Participating Reserves: ANGELO COAST RANGE RESERVE, HASTINGS NATURAL HISTORY RESERVATION, SAGEHEN CREEK FIELD STATION

Funded by: NATIONAL SCIENCE FOUNDATION

Additional Information: <http://gk12calbio.berkeley.edu/>

The primary goal of the Exploring California Biodiversity program is to inspire in urban children an appreciation for the rich diversity of life and a recognition that biodiversity is not confined to rainforests in exotic places, but extends to their own schoolyards. Perhaps the most inspiring experience for any child is direct observation of life, and from this experience comes comprehension of life’s diversity, along with an appreciation of variation, adaptation, and the potential for biological evolution.

This National Science Foundation-funded program develops a learning community among graduate student fellows, classroom teachers, and their students that focuses on understanding the natural environment. Eight graduate fellows associated with the UC Berkeley Natural History Museums (BNHM), along with eight undergraduate associates, work with middle and high schools in the San Francisco Bay Area, using the facilities and resources of the BNHM and UC Berkeley-administered NRS reserves. The program involves field trips, the building and studying of natural history collections in the K-12 schools, additional study of BNHM collections, and the use of interpretive tools.

Students in the program come from high schools and middle schools located in minority-dominated urban areas. Each year these students visit three NRS reserves — Angelo Coast Range Reserve, Hastings Natural History Reservation, and Sagehen Creek Field Station — to learn about the diversity of organisms that live in California and techniques for studying this diversity. Among other activities, the students learn how to capture (and release) and identify animals, collect and preserve plants, observe animals in the wild, navigate using a compass and GPS unit, and maintain accurate field notes.
One key to the program’s success is hiring graduate students who can capture the interest and imagination of young students. The program seeks out students who are advanced in their research, have a strong desire to work with a younger audience, and who show creative thinking about how to approach non-university audiences. The selected fellows undergo training and develop the curriculum in July and August before the school year begins; they are evaluated and mentored as the year progresses.

In addition to reaching underserved students, the program has opened doors for the University in three primary areas. First, it provides opportunities for UC Berkeley graduate students to develop their ability to teach and communicate their specialized knowledge to younger students from diverse backgrounds. Graduate students involved in the program are based at one of the UC Berkeley Natural History Museums or the California Biodiversity Center (CBC). Second, the program provides a means through which the University can connect with the local K-12 community, particularly minority-dominated institutions. Finally, the program serves to highlight a sampling of UC Berkeley’s finest assets, its museums and natural reserves.

Schools involved in the program are located in some of the most depressed urban school districts in California (Pittsburg, Richmond, El Cerrito, Berkeley, Oakland). However, recognizing that remote rural communities often have limited access to University-level resources and enrichment, the program is now being expanded to include schools near the UC Berkeley natural reserves in Mendocino, Monterey, and Nevada counties. This expansion enhances access to science education and increases the University’s interaction with diverse communities that have widely varied values, issues, and concerns.

**Teacher Comments about Exploring California Biodiversity**

I like being involved in this project because I am deeply concerned about the loss of habitat and biodiversity in California and because I will learn techniques and information that I can share with my students. Our students are always excited at the prospect of being involved in projects that have meaning in the real world. They are aware of the loss of biodiversity in California, but have never been offered an opportunity to have more than a minute impact on reversing this loss. Through involvement in this project the students will learn to look closely at the natural world around them and provide baseline data that could effect change!

—Peg Dabel
Adams Middle School
Richmond, CA

I have found that hands-on experience is the most effective way to awaken students’ enthusiasm for science. When they experience science as a process, they see and relate to it in a very positive way. This can work in their future, whether as a career path or simply as a heightened and informed appreciation of science.

—Phil Wharton
El Cerrito High School

I believe this project will be of inestimable value to my students. Emphasizing the scientific process, field techniques, museum-building, and a genuine appreciation for the biodiversity of the “island” of California, my students will learn what it is to be a scientist, rather than to just study science.

—Mardi Mertens
Berkeley High School
Each year the Orange County Department of Education (OCDE) brings 2,000 to 4,000 second- and third-grade students to the San Joaquin Freshwater Marsh Reserve as part of its “Inside the Outdoors” environmental education program. These students come from more than fifty schools across Orange County for workshops that look at the role of animals and plants in the marsh, the impact of pollution, and wetlands ecology.

The students take advantage of a marsh section recently restored under a grant from the California Coastal Conservancy. Reserve staff prepared special wildlife viewing and teaching sites by clearing zones through dense cattail stands, pumping water to create convenient, flooded aquatic habitat, and mowing the adjacent upland buffer zone. Upon arriving at the marsh, students engage in a variety of hands-on activities: bird watching, studying the impacts of pollution through a food chain game, creating a model of the marsh, and touching a live marsh animal.

Each half-day workshop is taught by “Inside the Outdoors” staff members, who have carefully designed the program to conform to the California Science Content Standards and the Science Framework for California Public Schools. The overall goal of the program is to empower students, teachers, parents, and the community to explore natural areas and to expand their environmental understanding.

Note: This program has been suspended for the 2005-06 school year due to concerns about West Nile Virus. Discussions are now underway to bring the program back to the reserve for the 2006-07 school year.
About “Inside the Outdoors”

The Orange County Department of Education supports all of the “Inside the Outdoors” programs, including thirteen field sites, sixteen Traveling Scientist programs, and five Orange County Outdoor Science School sites. The program serves approximately 120,000 students per year. As Program Manager Dave Raetz notes:

*We bring science to life. The kids get exposure to science in a fun, hands-on, interactive way that meets the tradition of a school field trip, while also filling the needs of the teachers to teach the standards-based curriculum.*

Participant Feedback

The whole day was wonderful! The students came back so excited after the field trip. I’m thrilled at the information they shared with our class and parents. The program was very informative and educational!

—Joanne Wilhelm
Holy Family School

... ...

It was wonderful. The students really grew in appreciation of the wildlife. I loved the food chain game, and the snake was very interesting.

—Lori Mandir
Chapman Hills
Kids in Nature

Participating Reserve: SEDGWICK RESERVE

Funded by: UCSB FACULTY OUTREACH GRANTS, BELLA VISTA FOUNDATION, SANTA YNEZ BAND OF CHUMASH INDIANS, UCSB WOMEN’S FACULTY CLUB, DENNIS GOODCHILD KIDS IN NATURE MEMORIAL FUND, AND PRIVATE DONORS

Participating Institutions: UCSB Cheadle Center for Biodiversity and Ecological Restoration, and Sedgwick Reserve


Kids in Nature (KIN) is a year-long program that introduces underserved fourth- to sixth-grade students in northern Santa Barbara County to science and the environment. Now entering its fifth year, the program brings the students on regular trips to the Sedgwick Reserve and the UC Santa Barbara (UCSB) campus for activities that interweave science, the arts, and technology. Depending upon funding, anywhere from 135 to 240 students participate each year.

KIN targets elementary schools that feed into low-performing high schools. These schools tend to score low on standardized tests and serve higher percentages of underserved and underrepresented students. All KIN schools are in the federal Title I program for economically disadvantaged schools. The program’s goals are to excite these students about science, teach them to care about the environment, and encourage them to consider attending college. All KIN activities are designed to help students meet grade-level California Science and Visual Arts Standards.

The program features six field trips spread throughout the school year: five three-hour sessions at the Sedgwick Reserve and one three-hour session at UCSB. An additional general campus awareness visit to UCSB is also offered, when funding is available. During their visits to the reserve, the students work in groups of four to six under the guidance of a specially trained KIN docent. This docent remains with the group throughout the year, providing students with a strong mentor.

Each group is challenged to restore a 25-square-meter plot of land along Figueroa Creek, using native plants grown in the reserve’s onsite nursery. During their first visit, the students tour the nursery to learn about the different plants.

They then work together to design their restoration, prepare the site, and put in the plants. Part of each subsequent visit is spent tending the plots and recording plant growth, using digital cameras and other tools. During each visit, the students also take hikes to explore other aspects of the reserve’s ecology or geology. On each hike, the docents provide binoculars to encourage the students to make observations and broaden their understanding of the interrelatedness of all aspects of nature.
One major key to the success of the Sedgwick Reserve’s environmental education programs is the dedication and creativity of more than 100 docent volunteers. The docent program was established in 2001 to help the reserve director expand educational opportunities. The docents’ primary function is to interpret the landscape, ecology, and research activities for both K-12 students and public visitors. Through the years, they have introduced more than 10,000 visitors to University-level research, as well as the area’s natural history. Docents involved in the Kids in Nature program work with the same group of students for an entire school year, forming a close intergenerational bond that facilitates learning.

Each fall the reserve presents a training course of seventeen sessions for new docents. These sessions cover a wide range of topics, from geology and oak biology to environmental dance and movement. The instructors include field research scientists, local experts in specific fields, and faculty from UCSB, the Santa Barbara Museum of Natural History, and the Santa Barbara Botanic Garden. Current docents also take regular refresher courses on a monthly basis.

Sedgwick Reserve Docent Program

On their visit to UCSB’s Cheadle Center for Biodiversity and Ecological Restoration, students investigate plant structure and function and participate in hands-on laboratory activities that teach them how to use microscopes and other laboratory equipment. They also visit the herbarium, restored natural areas on campus, and the bird and live reptile collections to learn more about native plants, animals, and habitats. Lessons the students learn on these field trips are reinforced by classroom activities back at their schools. Each KIN class receives microscopes, prepared slides, software, and other materials to study plant structure. Each student gets his or her own KIN journal to record field and laboratory observations throughout the year.

The KIN experience culminates on Celebration Day, when students from all the schools come together to display their reports, writings, artwork, and multimedia productions to parents and the public. As well as presenting their own work, the children are also treated to a wildlife presentation and a barbeque lunch.
In the fall of 1990, Paso Robles High School science teachers Mark DiMaggio and Ken Ward brought a group of their biology students to the Santa Cruz Island Reserve to learn about the island’s unique environment and to experience field research firsthand. That year’s program was so successful that they returned the following year with another class. Then, in 1993, as demand increased, they added a summer field biology course. Both weeklong programs continue to this day.

The primary goals of both courses are to give students an opportunity to carry out practical, hands-on, biology fieldwork, to interact with reserve scientists, to contribute to the island’s restoration, and, at the same time, to get out of the classroom for a great adventure. While on the island, students undertake a resource management/conservation project under the guidance of a Nature Conservancy scientist, a National Park Service scientist, or the NRS reserve manager. As they work, the students learn important field biology techniques, including such practical information as plant identification, the use of compasses and transect tapes, and the importance of recording field data in a neat and organized way. After a week, the students have a good insight into what a career doing fieldwork might be like.

Each program includes twelve to fifteen students, varying in age from fourteen to eighteen. The students have widely varied backgrounds, though the summer program typically attracts more college-bound students, because participation is selective. In addition to their field project, the students handle much of the program logistics: planning menus, buying supplies, preparing meals, and cleaning up afterwards. For many, even these experiences become a major step in their development.

Over the years, the program has brought more than 425 students to Santa Cruz Island. For almost all of the students, it has been a fun week full of hard work, new friends, and a new appreciation for nature. Most alumni recall it as “the best thing I did while in high school.” For a few, the experience has literally been a life-changing event, altering their college plans and sparking an interest in pursuing a career in field research.
Program Results

Lead teacher Mark DiMaggio gauges the success of his program by the impact it has had on individual students. Here are six student stories:

- Michael Glinski pursued a career in wildlife art after experiencing the outdoors at Santa Cruz Island (SCI).
- Keith Miller is currently studying environmental science as a result of his experience on SCI.
- Joey Reti is studying anthropology and archaeology at UCLA and has been to Africa twice, since being introduced to outdoor fieldwork on SCI.
- Sophie Pierzalowski is planning a career in conservation biology, after a summer week on the island.
- Rashell Ralston spent an entire summer as an intern on the island and went on to pursue a degree in biology at UCSB.
- Mark Lawler pursued a degree and a career with the National Park Service after being enchanted by SCI.

Why use NRS sites?

NRS sites are ideal for this type of experience for high school field biology classes, because:

- They are widely distributed throughout the state and are within reasonable distance from most any school in California.
- NRS sites are a natural laboratory where ecological processes can be observed and studied.
- NRS sites offer the likelihood that university scientists or grad students will be on hand, conducting their research, and will either need assistance or can share their expertise with the students.
- NRS sites often need volunteer help on a wide variety of projects. This gives students the opportunity to become involved in real science.
- The staff at NRS sites have always been very helpful and eager to help high school students and to assist in arranging visits to the reserve.

Santa Cruz Island Reserve offers all these benefits, plus the additional HUGE advantage of being an island. This opens up the chance for students to learn about the unique biology of islands and brings in the wonderful sense of adventure that being on an island includes.

—Mark DiMaggio
Earth Sciences and Biology Teacher
Paso Robles High School
Stunt Ranch Reserve Public Education

Participating Reserve:
STUNT RANCH SANTA MONICA MOUNTAINS RESERVE

Funded by: PRIVATE DONATIONS

Participating Institutions: UCLA, Mountains Restoration Trust

Online Information: <http://nrs.ucop.edu/Stunt-Ranch-Santa-Monica.htm>
Transect 20.3 (Winter 2002): “Educational Programs Thrive at Stunt Ranch Reserve — Even with Sky for Roof and Earth for Floor” (pages 8-11). A PDF of this article can be accessed at: <http://nrs.ucop.edu/Transect-Stunt.htm>.

Each year more than 3,000 students from dozens of elementary and high schools throughout the greater Los Angeles area visit the Stunt Ranch Santa Monica Mountains Reserve for programs in the natural history of chaparral and oak woodlands, local geology, and the history of the Chumash people. The program, coordinated by the Cold Creek Docents, has been running continuously on the site since 1977.

The three-hour school programs are often customized to meet the needs of individual teachers. In most cases, classes of sixty to seventy students arrive by bus and are divided into groups of ten to twelve. Each group then takes a 1.5-mile hike through several plant/animal communities to experience those communities firsthand, while a docent explains relevant ecological concepts. The latter part of the program is held in the reserve’s educational zone where students take part in a rotation of activities that includes discussing Chumash village life, examining preserved animal specimens, grinding acorns, experimenting with “cave wall” painting, playing Native American games, and watching tool-making demonstrations.

Located in a relatively undisturbed watershed of the Santa Monica Mountains and surrounded by 1,500 acres of protected open space, the Stunt Ranch Santa Monica Mountains Reserve provides a perfect place to introduce local students to the environment.
The diversity of animal and plant life along the stream and the proximity of a number of different natural communities offer a rich environment for exploration.

Most of the students who visit the reserve are from the inner city. They have grown up in an urban environment, and this is often their first experience with a natural area. Some are uncomfortable with the mountains and chaparral. Many worry about rattlesnakes and mountain lions. But under the careful guidance of the docents, the students gradually become familiar with the outdoor environment. They leave the program with a sense of accomplishment, as well as an understanding of the importance of resource conservation.

This program is a collaboration between UCLA, the reserve’s administering campus, and the Cold Creek Docents, the educational component of the nonprofit Mountains Restoration Trust, an organization dedicated to preserving, protecting, and enhancing the Santa Monica Mountains.

**The Cold Creek Docents**

For over a quarter century, the Cold Creek Docents have persevered through wildfires, earthquakes, torrential rains, and landslides to provide an award-winning environmental education program to schools throughout the greater Los Angeles area.

Each year new and continuing docents spend two months in weekly training courses conducted by experts in such areas as wildlife behavior, ecological principles and communities, geology, aquatic resources, and Chumash/Tongva culture. In 1993, the group was recognized with the Governor’s Historic Preservation Award for their unique archaeology education program. In 1995, they received a *Take Pride in California* award from the California Department of State Parks.
The Outdoor Science Education Program (OSEP) at the Valentine Eastern Sierra Reserve (VESR) in Mammoth Lakes is designed to provide the elementary and middle schools in Inyo and Mono counties with meaningful, hands-on science education and enrichment. Schools in this isolated, sparsely populated portion of the state travel up to 90 miles to participate in these workshops.

OSEP programs take place at both VESR sites — the Sierra Nevada Aquatic Research Laboratory and Valentine Camp — as well as in the local schools with two primary components. The field trip component is the largest part of the program, hosting approximately 2,000 students per year from twelve schools in six different school districts. Field trips feature a two- to three-hour, hands-on, age-appropriate lesson that has been carefully aligned with regional school curricula. Some typical lessons present ant ecology with ant tracking and food-preference experiments; aquatic invertebrate identification and classification; introduction to forest mammals (with skulls and furs); and conifer identification and forest fire ecology.
Many lessons include simulation games with graphing and data analysis. The primary instructors for the program are VESR Education Coordinator Leslie Dawson, a former park ranger who holds three teaching credentials and a master’s degree in Education, and Sherry Taylor, who has ten years of environmental education experience with Dawson. The schools provide transportation to and from the reserve, supervising teachers, and chaperones. This part of the program is offered through the generous support of Mammoth Mountain Ski Area.

VESR also offers a summer school program — one- and two-week summer classes for up to 120 students (ten students per class) in grades one through nine. Younger students study habitats, insects, bats, or trees, while the older students may study life skills of early man, natural history, forest ecology, or art in nature. The program employs up to nine teachers with a wide variety of specialties and is fully subscribed each year. The instructors in this program range include classroom teachers, graduate students, and biologists with government agencies. A trained volunteer docent assists each teacher. Many students have taken every class offered and are now serving as teaching assistants in the program. Several alumni of the program are now enrolled in universities as biology majors; two alumni have received teaching credentials and returned as instructors in the program. This part of the program is self-supporting through fees charged to the students.

Reserve instructors also bring the OSEP program to the classroom through pre- and post-field trip lessons, Earth Week activities, and through the Native Plant Project. The Native Plant Project, co-sponsored by the California Native Plant Society, is an in-class unit designed to teach Mammoth Elementary fourth-grade students about life history, propagation, and restoration using native plants.
Established in 1986, the Los Angeles Conservation Corps (LACC) is a community-based nonprofit dedicated to providing at-risk young adults and school-aged youth with opportunities for success. “Corps members” learn new job skills, explore educational opportunities, gain work experiences that focus on conservation and service, and discover the diversity of southern California’s natural resources. In the course of the program, they experience personal growth, while making important contributions to the greater Los Angeles area.

Launched in the spring of 2005, the UCSB-LACC Natural Reserve Science Education Program brings inner city youth to the Sedgwick Reserve for weekend programs that integrate restoration fieldwork, environmental science education, and college preparedness training.

The weekends are followed by a two-week summer internship in July for selected students on the UC Santa Barbara campus. Program goals are to:

- Introduce participants to a range of natural sciences in contextual settings
- Educate participants on environmental science careers and college opportunities
- Encourage interactive learning and intellectual curiosity
- Encourage excitement about the environmental sciences
- Develop an understanding of applied science in a natural reserve setting
- Identify students best suited for University of California summer internships
- Assist students to develop skills that will enhance their opportunities for college.

While at Sedgwick Reserve, students are guided by volunteer docents who have received extensive training in the area’s natural history. They then conduct a project at the native plant nursery, investigate propagation techniques for native plants, collect seeds for future restoration projects, meet with scientists conducting research at the reserve, take cross-country hikes to learn about the area’s natural history, enjoy a star-viewing session with astronomy experts, and hear a presentation from the UCSB Campus Admissions staff on preparing for college.

Program participants are high school freshmen and sophomores selected from the LACC’s “Clean and Green” Program. Fully 94 percent of the participants are nonwhite and 31 percent live below the poverty line. Three to four LACC team leaders accompany each group to assist with the program. Piloted in 2005 for 60 students, the program will be expanded to include 100 students in 2006.
Additional Programs

This brochure highlights nine of the many unique K-12 and public education programs going on throughout the UC Natural Reserve System. Other programs include:

“Drawing from Nature,” a monthly children’s feature that appears in the Los Angeles Times and is written by Carol Felixson, the Director of Education and Community Outreach at UCLA’s Stunt Ranch Santa Monica Mountains Reserve and the Mildred E. Mathias Botanical Garden. Each article features an animal or a plant found at the reserve or in the garden. The articles are illustrated with artwork created by children and include instructions to readers for how to do the art at home. Transect 23:1 (Spring 2005) features this program in “Young Readers Explore the Art of Nature” (pages 6-7) and can be downloaded at: <http://nrs.ucop.edu/Transect-Stunt.htm>.

A number of reserves host public lecture programs that give the public in remote parts of the state an opportunity to hear from the University’s top field scientists. These include the McLaughlin Natural Reserve (<http://nrs.ucdavis.edu/mclaughlin.html>) near Clear Lake, the Sagehen Creek Field Station (<http://sagehen.ucnrs.org/index.html>) north of Truckee, the Sierra Nevada Aquatic Research Laboratory (<http://vesr.ucnrs.org/index.html>) south of Mammoth, and the Hastings Natural History Reservation (<http://hastingsresrve.org>) in Carmel Valley.

The development of the Internet has also opened up a number of new science education opportunities for NRS reserves. Each day 3,000 to 4,000 people log on to the James San Jacinto Mountains Reserve’s Web-based environmental observatory (<http://www.jamesreserve.edu/weather.php>) to follow the development of chicks in nest boxes or observe bird-feeding behavior. Likewise, the public can watch trout moving upstream via Sagehen Creek’s underwater “fish cam” (<http://sagehen.ucnrs.org/fish-cam.htm>) or watch developments in an owl nesting box at the Hastings Natural History Reservation site (<http://www.hastingsreserve.org/Webcams/WebcanIntro.html>). While all of these Internet-accessible projects are primarily designed to aid ongoing scientific research on site, they are also inspiring a new generation of prospective scientists and engineers.

In addition to conducting its own programs, the NRS lends support to the science education efforts of other University programs:

The UC Berkeley Lawrence Hall of Science Research Camp for High School Students program (<http://www.lawrencehallofscience.org/classes/campsres.html#coastal>) uses both the Sagehen Creek Field Station and the Bodega Marine Reserve.

School trips to the Birch Aquarium at Scripps Institution of Oceanography regularly visit the nearby Scripps Coastal Reserve, while visitors to the Seymour Center at UC Santa Cruz’s Long Marine Laboratory often include a visit to the overlook at Younger Lagoon Reserve.

Faculty in the California State Summer School for Mathematics & Science Program (COSMOS) (<http://www.ucop.edu/cosmos/>) bring high school students to the San Joaquin Freshwater Marsh near UC Irvine and the Younger Lagoon Reserve near UC Santa Cruz to conduct field investigations.

Learning is not compulsory... neither is survival.
—W. Edwards Deming (1900-1993)
connecting young students with science & the environment

UC Natural Reserve System
Environmental Education
Online Resources

- **History of Environmental Education: Four Fundamental Documents**

  Download the following four United Nations documents on the landmarks in the evolution of environmental education at the international level:

  2. Intergovernmental Conference on Environmental Education (1977)

- **The North American Association for Environmental Education (NAAEE)**

  “The North American Association for Environmental Education (NAAEE) is a network of professionals, students, and volunteers working in the field of environmental education throughout North America and in over 55 countries around the world. Since 1971, the Association has promoted environmental education and supported the work of environmental educators. There are many environmental interest groups, and many organizations dedicated to improving education. NAAEE uniquely combines and integrates both of these perspectives, and takes a cooperative, nonconfrontational, scientifically balanced approach to promoting education about environmental issues.”

  [http://naaee.org/pages/aboutnaaee/index.html#history](http://naaee.org/pages/aboutnaaee/index.html#history)

  Environmental Studies in the K-12 Classroom: A Teacher’s View.  
  Prepared by Survey Research Center, University of Maryland College Park, December 2000.  

- **The Environmental Literacy Council**

  “An independent, nonprofit organization, the Council gives teachers the tools to help students develop environmental literacy: a fundamental understanding of the systems of the world, both living and nonliving, along with the analytical skills needed to weigh scientific evidence and policy choices.”


- **Millennium Ecosystem Assessment**

  “The Millennium Ecosystem Assessment (MA) is designed to meet the needs of decision-makers and the public for scientific information concerning the consequences of ecosystem change for human well-being, and options for responding to those changes. The MA focuses on ecosystem services (the benefits people obtain from ecosystems, like food, water, and climate regulation), how changes in these services have affected human well-being and how such changes may affect people in the future. It also focuses on the responses that might be adopted at local, national, or global scales to improve ecosystem management and contribute to human well-being and alleviate poverty. The MA was launched by U.N. Secretary-General Kofi Annan in June 2001 and was completed in March 2005.”


- **U.S. Environmental Protection Agency Teaching Center**

  Information for teachers on many environmental issues:  
  [http://www.epa.gov/teachers/bkg-index.htm](http://www.epa.gov/teachers/bkg-index.htm)

- **Links to Discipline-Specific Glossaries on Environmental Subjects**
