

# *Biennial Director's Report*

## *Sagehen Creek Field Station 2006-2008*

### I. *Director's Narrative*

**Sagehen Creek Field Station** was established by U.C. Berkeley in 1951 through a U.S. Forest Service special use permit encompassing 450 acres within the Tahoe National Forest. The following summer, Berkeley Professor Paul Needham and his graduate students began construction of what is now the field station. Groundbreaking fisheries and wildlife studies begun under Needham and his Berkeley colleague A. Starker Leopold established a research and teaching heritage that continues today.

Two recent designations reflect this long tradition and recognize the recent expansion of research and teaching opportunities at Sagehen. In 2004, the Field Station was incorporated into the **UC Natural Reserve System**, in recognition of its long history of research by scientists throughout the University of California system. In 2006, the entire 9,000-acre Sagehen basin was designated the **Sagehen Experimental Forest** by the US Forest Service. Experimental Forest designation means that research will be the highest priority for Forest Service land management in the Sagehen Basin for the foreseeable future, and that Sagehen will be a focal point for cooperative research between university and government scientists.

Sagehen offers researchers the opportunity to study ecological processes across diverse habitats within a small, well-bounded basin. The basin is self-contained, cut off on its boundaries by deep glacial valleys to both the north and south. Sagehen Creek itself extends roughly 8 miles, from its headwaters just east of the Sierra crest, to Stampede Reservoir on the Little Truckee River.

Most of Sagehen's precipitation falls during cool wet winters, primarily as snow, while the summers are warm and dry. Because Sagehen lies on the edge of the rain shadow of the Sierra Nevada, the basin experiences a *significant precipitation gradient*. In early spring, snow may be 15 feet deep at the top of the watershed, but only a foot or two deep -- or completely absent -- at the lower end. This strong gradient creates opportunities to *study how climate, and climate change, affect forest ecology*. The field station's long weather and streamflow records are important resources for studying the hydrological consequences of climate change.

The basin contains a *broad range of habitats* within a representative example of the Sierran steppe-mixed forest-coniferous forest, including yellow pine, mixed conifer, and red fir forests, brushfields and scattered meadows. Particularly noteworthy are a series of fens, with deep peat deposits dating from the end of the last ice age. Biodiversity is high, with a total of 686 plant species. Approximately three percent of the flora is of Great Basin affinity, eight percent subalpine-alpine, and the remainder montane-boreal. The insects found in Sagehen Creek basin are broadly representative of the fauna of western North America. More than 330 families of insects, belonging to 24 orders, have been recorded at the field station, and roughly 10,000 insect species are thought to occur in the Sagehen basin.

Sagehen also serves as the hub for the **Central Sierra Field Research Stations**, a network of research areas that gives researchers access to a transect across the crest of the Sierra Nevada range. These sites include the **Central Sierra Snow Laboratory**, the **Onion Creek Experimental Watershed**, the **Chickering American River Reserve**, and the **North Fork Reserve**. The latter three research areas comprise one of the largest

remaining areas of old-growth Sierran mixed conifer forest (e.g. red fir, mountain hemlock, incense cedar, western white pine, Jeffery pine) outside the National Parks.

The Sagehen basin was extensively logged and grazed in the late 1800's and early 1900's. Beneath today's second-growth forest, one can still find traces of narrow gauge railroads, flumes, logging skids, sawmills and campsites. The nearly continuous cover of densely over-stocked second-growth forest is punctuated by wildfire scars, small timber sales, and areas of forest dieback. These forest characteristics are broadly representative of large areas of the Sierra Nevada, making the Sagehen basin an ideal place to test new strategies for managing Sierran forests. Inside the field station permit area, research and teaching have been the only activities since 1951. Outside the permit area, the public lands are attracting ever-greater recreational use in all seasons.

Over its 55-year history, Sagehen has been home to pioneering studies in aquatic and terrestrial ecology. Over 80 Ph.D. and M.S. theses and 400 publications have resulted from this work. In addition, researchers have accumulated more than 50 years of weather and stream data, and compiled inventories and teaching collections of birds, insects, plants and animals.

In the 1990's, facilities at Sagehen suffered as a result of statewide funding cuts throughout the University of California. There was even talk of closing the field station and canceling the permit with the Forest Service. Instead, in response to broad support from Berkeley faculty and local community leaders, the University renewed its commitment to the field station by investing in a series of facilities improvements, appointing a new faculty director, and hiring two energetic and enterprising resident managers.

In response to these initiatives, research and educational activities at Sagehen climbed dramatically. From an average of several hundred user-days in the 1990's, usage grew to over 6000 user-days in 2005-06, and is projected to reach 11,000 in 2008-09. User-days increased more than fourfold between 2002-03 and 2006-07. Over the same period, the number of university faculty and research scientists using the field station increased from 9 to approximately 50 and government scientists increased from 6 to roughly 100.

Today, Sagehen draws researchers from six University of California campuses, as well as from Stanford, Cornell, Oregon State University, University of Arizona, University of Wisconsin, the Smithsonian Institution, the Field Museum of Natural History, and the Museum National d'Histoire Naturelle in Paris. It also attracts representatives from government agencies, non-profit institutions, K-12 schools and the general public.

### **Facility Administration**

UC Berkeley administers Sagehen Creek Field Station through the Office of the Vice Chancellor for Research. It is part of the UC Natural Reserve System, the Berkeley Natural History Museums, and the California Biodiversity Center. A station manager and assistant manager live on the site year-round. They manage all aspects of the Field Station, from program development, to maintaining the information technology and GIS facilities, to collecting basic data, to coordinating research, to outreach, to maintaining buildings and facilities. Professor James Kirchner serves as the Faculty Reserve Director. He functions as a liaison to the Berkeley campus and works with the Station Manager to develop the site management vision and research plans. Other staff members based in Berkeley provide support for human resources, technology, finance and accounting. For more information see the station's website (<http://sagehen.berkeley.edu>).

In 2005, Sagehen developed a *2005 Sagehen Field Station Vision* through a collaborative process that engaged a wide range of research and community leaders in a *Program Planning Advisory Group* (see <http://sagehen.ucnrs.org/> and click on *Planning Group* at lower left corner). The Vision identified 5 long-range goals which are to:

- Goal 1 Improve facilities for field research and education
- Goal 2 Capture, store and distribute field data
- Goal 3 Update and expand research activities
- Goal 4 Increase field education for all ages, and
- Goal 5 Provide scientific information to policy makers, resource managers and the general public.

Sagehen Creek Field Station is open year-round, and has 53 beds in winterized cabins. Most of the 22 buildings, including all sleeping cabins, are fully winterized with propane heat. Ten tent-camping spaces are also available.

Because most of the buildings date from the early days of the Field Station in the 1950's and 1960's, an extensive maintenance and renovation effort was launched in 2002. Renovation of pre-existing facilities was largely completed in summer of 2007. Sagehen is actively working on a master plan to increase year-round housing and to add more space for offices, classrooms and meetings in order to meet the goals of the *2005 Sagehen Field Station Vision*.

### Field Station Resources

Many research institutions are within easy driving distance, including the **University of Nevada** and **Desert Research Institute** (35 minutes), **Tahoe Environmental Research Center** (45 minutes), **University of California, Davis** (2 hours), **University of California, Berkeley** (3 hours), and **University of California, Merced** (3.5 hours). Researchers arriving at the **Reno Tahoe International Airport** can reach the field station in only 45 minutes. Even in winter, access to the field station is easy because the California and Nevada highway departments keep the major highways open. The station now has a large snowcat capable of keeping the 2-mile station access road open to wheeled vehicles, and a snow-packed road open into the basin for snowmobile and OHV access to remote research facility.

*Data sets.* Among Sagehen's greatest assets are its databases and collections, which now date back over half a century. Among these are:

*Meteorological data.* Daily weather data from Sagehen's on-site weather station date from 1953 to the present, and are available from the **National Climate Data Center**. Sagehen's current weather measurements include precipitation, snowfall and snow depth, relative humidity, atmospheric pressure, air temperature, soil temperature, solar radiation, and wind speed, gust and direction, daily extremes, (averages and totals) and monthly extremes (averages and totals). In addition, climate data from 1961 to the present are available from the **Western Regional Climate Center**. Precipitation chemistry has been collected through the **National Atmospheric Deposition Program** from 2001 to present.

Since 1997, weather data have been collected continuously by an automated weather station. Today the basin has five weather stations along an east-west transect, parallel to Sagehen Creek. They collect climate, snow depth and snow water equivalent data, and monitor atmospheric deposition. In addition, within a 25-km radius of Sagehen there are over a dozen weather stations, at least ten **SNOTEL** sites, and at least six active snow courses. Many of these sites have records going back for decades.

**Hydrological data.** Since 1953, Sagehen Creek has been a **Hydrological Benchmark Network Stream**. Streamflow and water chemistry data from the main gauging station are available from the U.S. Geological Survey's website. Stage and stream temperature are also monitored at ten points in the Sagehen stream network, and there are several transects of groundwater monitoring wells and tree sapflow sensors.

**Terrestrial data.** The Field Station has detailed vegetation and soil survey maps, soil series descriptions, as well as two air-borne **LIDAR** flights for the entire basin, and a number of ground-based LiDAR plots that provide a detailed digital picture of the forest canopy. The basin also has a seismic sensor.

A **Community GIS Center** at the field station provides advanced GIS support for researchers. This GIS center was established through a collaborative effort between Sagehen and the Truckee River Watershed Council, U.S. Forest Service, California Department of Fish and Game, and the Desert Research Institute.

**Biological Inventories.** Sagehen has online biological inventories of amphibians, birds, fish, insects, mammals, plants, and reptiles. It also has substantial onsite teaching collections of birds, insects, higher plants, and vertebrates.

Among fisheries scientists, the Field Station is well known for its fish observation facility, built underground next to the Sagehen Creek channel. This facility, which has served as the prototype for similar facilities on other streams, has 8 meters of underwater windows for viewing environmental conditions below the surface of the creek. Researchers can view these windows on-line through the *FishCam* (accessible from the homepage at <http://sagehen.ucnrs.org>).

## **Outreach**

Sagehen hosts a number of public education and K-12 environmental education programs, including the *Summer Speaker Series*, the *Adventure-Risk-Challenge Program*, and numerous programs with *K-12 schools*. Sagehen also has good contacts with *local and regional media*. Sagehen's popular *Summer Speaker Series* runs bi-weekly between June and August, and features top researchers presenting interesting topics to the public.

Each year, Sagehen hosts the *Adventure-Risk-Challenge* (A.R.C.) Summer Literacy and Leadership Program for at-risk teens. This six-week program, designed for motivated, high-level English Language Learners (ELL) with leadership potential, combines an intensive literacy and science focus with an outdoor, place-based, experiential curriculum (backpacking, kayaking, river rafting, etc.). The program has proven its ability to improve the students' performance on the English portion of California's High School Exit exam by two grade levels.

Sagehen also hosts programs for students from both the Lake Tahoe area and inner city schools from the San Francisco Bay Area. UC Berkeley's Lawrence Hall of Science also offers a one-week, summer science camp for high school students.

Examples of Sagehen's relationship with local and regional media include several videos about Sagehen that recently ran on KGO-TV, the ABC network affiliate in the San Francisco Bay area (for more information, see <http://sagehen-video.blogspot.com>). The topics of these videos were: the new Sagehen Experimental Forest, bear research at Sagehen, and Sierra forest fire management.

## **Research and teaching at Sagehen Creek Field Station**

In the past decade, use of Sagehen's facilities has increased dramatically. Diverse programs of ecological and environmental research take place at Sagehen Creek Field Station.

Graduate research at Sagehen has provided the basis for over 80 Ph.D. and M.S. theses and 400 publications. Historically, fisheries, wildlife, range, and forestry studies have predominated. However, more recent use has expanded to include hydrology and fire-related research. Priority for space is given to UC faculty and student researchers, but Sagehen's resources and facilities are available to -- and are widely used by -- researchers and students from universities and government agencies, regardless of affiliation.

Many of the mammals found in the basin have been the subject of long-term studies, including black bear, beaver (*Castor canadensis*) (e.g. Busher et al., 1987), pine marten (*Martes americana*), (e.g. Buskirk et al., eds. 1994) coyote (e.g. Shivik et al., 1996), golden-mantled ground squirrel (Bronson 1977) and weasel (Fitzgerald, 1977).

Some of the other seminal studies conducted at Sagehen are concerned with the autecology and synecology of Sierra fens (Bartolome et al., 1990; Erman, D.C., 1973 and 1986); aquatic macroinvertebrate behavior and ecology (see many studies by Erman, N.A.), snag dynamics (Raphael and Morrison, 1987) and, of course fisheries, (e.g. Needham and Jones, 1959).

University-level classes are taught year-round at Sagehen, although the most intensive teaching activity occurs in the summer. Field courses from throughout the UC system take advantage of the Field Station's unique attributes. UC Davis, for example, alternates between offering a five-week entomology field course and a two-week botany field course each year. A number of other hydrology, wildlife, and geology field courses use the reserve on an intermittent basis.

### **A. Research unit's mission statement:**

"To serve society as a center of higher learning, providing long-term societal benefits through transmitting advanced knowledge, discovering new knowledge, and functioning as an active working repository of organized knowledge. That obligation, more specifically, includes undergraduate education, graduate and professional education, research, and other kinds of public service, which are shaped and bounded by the central pervasive mission of discovering and advancing knowledge."

Sagehen Creek Field Station achieves this mission by protecting and expanding the basin's 50+ years of research data, while working with a community of interested stakeholders to provide field research and education opportunities in a naturally functioning ecosystem.

The goals of the Sagehen Creek Field Station are:

1. To continue to improve our ability to facilitate research and teaching in general, and to expand the range and types of studies conducted
2. To secure the entire basin and relevant contiguous areas for future research and education opportunities
3. To restore the basin to an ecosystem that functions as naturally as possible

4. To develop research on social effects on the environment and methods for minimizing the negative impacts of human use of natural systems
5. To further focus the research mission for Sagehen and incorporate emerging areas of interest and need
6. To capture, store, and disseminate field data through the use of computerized database systems and the world wide web
7. To enhance and expand Sagehen's K-12 outreach program
8. To further develop and implement a public outreach program, keeping the public informed relative to the work done at the reserve and providing information and educational programs related to ongoing research
9. To create a funding mechanism to enhance Sagehen's mission and address the badly needed facility upgrades and acute staffing deficiencies
10. To integrate better with Berkeley campus systems
11. To initiate and implement a long term research effort as it relates to restoration strategies and practices. The focus for this work should help identify those that have long term positive results.

**B. Research highlights include the following projects:**

1. **Keck Hydrowatch:** the program purchased and installed 3 100-foot towers and meteorological sensing arrays for tracking the water cycle. The tall towers allow powerful future research potential, including eddy-flux instrumentation deployment above the canopy, and monitoring of bat habitat strata.
2. **SPLATs:** Nicole Vaillant submitted her Berkeley Ph.D. thesis, which includes a much-needed east-slope fire history dating to the 1600's.
3. **Hydrology:** tree sap and stream temperature and flux data are collected. Sarah Godsey (Berkeley Ph.D. student) is completing two manuscripts on the relationship between winter snowpacks and summer low flows in Sierra streams, based on insights from fieldwork at Sagehen.
4. **Slave-making ants:** Researchers Joe Sapp and Candace Torres began work on the remarkable social behavior and DNA of these insects.
5. **Highway 89 Road Ecology:** we have a GPS-collared deer herd and high school outreach program in place. The program hired an outreach coordinator and a science advisor. The first mitigation effort—a wildlife underpass—is under construction just up the road from Sagehen.
6. **Pine Martens/Wolverine:** revisiting Pine Marten research begun in the 1970's, Master's student Katie Moriarty photographs the first Wolverine documented in California since 1922.
7. **Black Bear:** camera traps confirm that CA DF&G bear cub releases in the basin are successful.
8. **Adventure Risk Challenge (ARC):** the successful, community-funded outreach program is providing a research opportunity to education students. 2007 saw the first Master's thesis evaluating the program's effectiveness.
9. **Geology:** Professor Art Sylvester and students map the surface geology of the Sagehen and Independence basins, discovering a peculiarly persistent mountain landform with significant future research potential, including a rare climate record in benthic clay deposits.

**C. Unit contributions to advancing interdisciplinary research at UC Berkeley:**

Field stations provide research and educational facilities that are embedded in the natural environment. As such, they offer benefits unavailable on traditional campuses:

1. Insights into ecosystem function that on-site users serendipitously discover;
2. Environmentally-integrated research facility like hydrologic and meteorological monitoring sensors, the fish observation chamber and the student forest;
3. Innovation that occurs when people from different disciplines interact informally;
4. Expanded opportunities to gather data that may provide new understanding and create new research opportunities;
5. And especially, the research and education collaboration and partnerships that occur between the local community stakeholders.

The Sagehen basin is a designated Experimental Forest that allows scientists to ask questions on a landscape scale and over time, encompassing many aspects of ecosystem function and allowing for interdisciplinary approaches.

To preserve Sagehen's potential for research long into the future, we are actively working with local and state land trusts to acquire private parcels that encroach into the Sagehen and Independence watersheds.

Sagehen maintains environmental datasets dating as far back as the 1930's that are useful to a broad range of research questions in many overlapping disciplines. In addition, Sagehen actively works to identify and acquire new data sets that would be valuable to future research. Recent additions to Sagehen's assets include expansion of meteorological data collection, digitization of historic mammal and fish data, air-borne and ground-based laser landform and snowpack mapping. All of these new resources have now produced publications and/or are in current use by researchers at Sagehen and elsewhere.

Specific Sagehen projects that advance interdisciplinary research include:

1. **SPLATs:** Strategically Placed Land Area Treatments is an approach to forest fire fuels management that has been adopted as the preferred strategy by the US Forest Service. Sagehen researchers are testing the science behind this strategy, collecting and using massive amounts of fuels and vegetation data, airborne laser mapping and fire behavior models. This project is bringing together agency and Berkeley researchers and providing wide opportunities for ecosystem research looking at the impacts of fuel treatments that will soon be affecting the entire western US. One of the interdisciplinary projects associated with the Berkeley SPLAT study is the Pine Marten survey that turned up the unexpected Wolverine last spring, the first ever photographed in California and the first confirmed sighting since 1922. For more info, <http://sagehen.blogspot.com/2008/06/splat-related-thesis-completed.html>
2. **Keck Hydrowatch** is an interdisciplinary Berkeley research initiative aiming at closing the water cycle. This project includes earth scientists, atmospheric scientists, soils scientists, plant scientists, isotope bio-geochemists, computer scientists, electrical engineers and modelers. For more info, <http://sagehen-video.blogspot.com/2008/07/keck-hydrowatch-project.html>
3. **Highway-89 Road Ecology:** the Highway 89 Stewardship Team formed to provide research, outreach education and mitigation of animal-vehicle collisions, with the goal of developing exportable tools and techniques useful worldwide. The team includes:
  - Sierra County Fish and Wildlife Commission,
  - USDA Forest Service: Tahoe National Forest and

- Pacific Southwest Research Station,
- California Department of Fish and Game,
- California Department of Transportation (Caltrans),
- University of California Cooperative Extension,
- UC Berkeley-Sagehen Creek Field Station,
- California Deer Association,
- University of California, Davis.

For more info,

<http://sagehen.blogspot.com/2008/08/highway-89-road-ecology.html>

#### **D. Unit contributions to enhancing student research experience at UC Berkeley:**

Sagehen works hard to:

1. Identify promising areas of interdisciplinary, socially-relevant research within the watershed, then
2. Find researchers and students who are interested in doing that research.

Current and recent research has generally resulted **directly** from these aggressive outreach efforts, including US Forest Service-funded pine marten [Master's thesis] and SPLATs projects [Ph.D. thesis], Highway-89 road ecology projects, Lahontan Cutthroat Trout research [Master's thesis], ARC Program [Master's] and geologic mapping.

Professor Art Sylvester and his students mapped the surface geology of Sagehen and Independence basins in summer 2007, creating a document that was published by the US Geological Survey. The project triggered additional research by the state of Nevada into basin rock dating and has opened up several possible Master's and Ph.D. projects.

In addition, the watershed is available to anyone else wishing to arrange student research opportunities, and many organizations take advantage of this possibility, including several Earthwatch programs [egg coloration, Camas lilies], Berkeley's Lawrence Hall of Science, and various Herbarium workshops. Sagehen partners with the Truckee-Tahoe Unified School District and the Berkeley Natural History Museums for the "Exploring California Biodiversity" program that embeds Berkeley science graduate students in local schools to improve the quality of field-based science education.

This year, Sagehen saw its first graduate research in education, as Christine Hooper evaluated the efficacy of our Adventure – Risk – Challenge outreach program. This year, two more graduate students are making the program the subject of their Master's research.

The Sagehen Summer Speaker Series continues to offer student researchers the opportunity to develop research presentation and public speaking skills in front of camera[s] and a community audience. We continue to work extensively with local and state media outlets to provide visibility to research and education at Sagehen, including student research. In addition to traditional interview-based TV, print and Internet news coverage, this includes Sagehen-produced, long-form media content and stock footage.

During our 50+ Year Anniversary Celebration, Sagehen alumni founded the "Sagehen Graduate Research Fund". We continue to build this fund for future student research support grants.

II. *Publications arising from Sagehen research, 2006-2008:*

Regrettably, researchers are lax about announcing their research publications to Sagehen, despite their promises to do so as part of our research application process. The following list includes the few published papers reported, along with the results of a Google Scholar search.

This search indicates that numerous researchers around the world are beginning to use published Sagehen historic data sets in the development of mathematical models of hydrology, engineering, climate, etc. [current examples indicated by \*]. In addition to the listed publications, there were numerous citations of historic Sagehen published research.

For links to publications and/or abstracts: <http://sagehen.ucnrs.org/publications2.htm>

*Theses:*

Year	Author	Degree	School	Title	Ref.
2008	Nicole M. Vaillant	Ph.D.	UCB	Sagehen Experimental Forest Past, Present, and Future: An Evaluation of the Fireshed Assessment Process. 172 pp.	#84
2008	Christine Hooper	Masters	Sierra-Nevada College	Bridging the gap: the union of personal and academic growth.  ARC: Delivering literacy and personal growth for English Language Learners through outdoor education. 59 pp.	#83
2007	Elise D. Ferree	Ph.D.	UCSC	Tail White and the Influence of Male Attractiveness on Maternal Investment in Dark-Eyed Juncos. 104 pp.	#82
2007	Jonathan E. Stead	Masters	UCD	Exploring Reintroduction of Lahontan Cutthroat Trout in a Headwater Stream. 86 pp.	#81
2006	Carie L. Sears	Masters	UCD	Assessing distribution, habitat suitability, and site occupancy of Great Gray Owls ( <i>Strix nebulosa</i> ) in California.	#80

*Research Publications:*

Author	Year	Title	Journal	Ref.
Shiojiri, K., and R. Karban	2008.	Seasonality of herbivory and communication between individuals of sagebrush	Arthropod-Plant Interactions	2(2):87-92
Shiojiri, K., and R. Karban	2008.	Vascular Systemic Induced Resistance For <i>Artemisia cana</i> and Volatile Communication for <i>Artemisia douglasiana</i>	Am. Midland Naturalist	159(2):468-477
Sylvester, A. G.	2008.	NEW GEOLOGIC MAP OF THE SAGEHEN CREEK AND INDEPENDENCE LAKE	Geological Society of America Abstracts	40(1) p. 54

		HYDROLOGIC BASINS, NORTHEASTERN SIERRA NEVADA, CALIFORNIA	with Programs	
Pravosudov, V. V.	2008.	Mountain chickadees discriminate between potential cache pilferers and non-pilferers	Proc. of the Royal Society B: Biological Sciences	
*Peterson, D. H., I. Stewart, F. Murphy	2008.	Principal Hydrologic Responses to Climatic and Geologic Variability in the Sierra Nevada, California	San Francisco Estuary and Watershed Science	6(1):article 3
Adler, C., K. Clark- Snustad, and S. R. Kephart	2007.	Prezygotic Barriers to Hybridization in <i>Camassia</i> : An Analysis of Habitat Disparities		
*Bathurst, J. C.	2007.	Effect of Coarse Surface Layer on Bed-Load Transport	J. Hydr. Engrg.	133(11):1192- 1205
Ferree, E. D.	2007.	White tail plumage and brood sex ration in dark-eyed juncos ( <i>Junco hyemalis thurberi</i> ).	Behav. Ecol. Sociobiol.	62:109-117.
Hatfield, R. G. and G. LeBuhn	2007.	Patch and landscape factors shape community assemblage of bumble bees, <i>Bombus</i> spp. (Hymenoptera: ...	Biol. Conservation	
Karban, R., K.	2007.	Associational resistance for mule's ears with sagebrush neighbors	Plant Ecology	83(2), 2007 pp. 295-303
Karban, R., K.	2007.	Experimental clipping of sagebrush inhibits seed germination of neighbours	Ecology Letters	10(9):791-797
Karban, R., K.	2007.	Damage to sagebrush attracts predators but this does not reduce herbivory.	Entomologia Experimentalis et Applicata	125(1):71-80
*McCafferty, W. P. and M. D. Meyer.	2007.	Insecta, Ephemeroptera: Transcontinental range extensions in western North America.	Check List 2007	3(1) ISSN: 1809-127X
Melody, A. D	2007.	ACTIVE FAULTING AND QUATERNARY PALEOHYDROLOGY IN THE TRUCKEE FAULT ZONE, NORTHWESTERN WALKER LANE, CALIFORNIA	GSA Cordilleran Section - 103rd Annual Meeting (4-6 May 2007)	Paper No. 4-2
*Pagano, T. C.	2007.	Influence of NRCS snowcourse measurement date on data accuracy and climatic trends	Eos Trans. AGU	88(52), Fall Meet. Suppl., Abstract GC41A-0101
Solomon, M., K. Cuffey, and C. T. Hunsaker	2007.	Stream Water Temperature and Climate Variability along Two Elevational Gradients in the Sierra Nevada Mountains, California, U.S.A.	Eos Trans. AGU	88(52), Fall Meet. Suppl., Abstract GC41A-0106

Westmoreland, D. and R. A. Kiltie	2007.	Egg coloration and selection for crypsis in open-nesting blackbirds	J. of Avian Biol.	38(6):682-689
Westmoreland, D., M. Schmitz, and K. E. Burns	2007.	Egg color as an adaptation for thermoregulation	J. of Field Ornith.	78(2):176-183
Hughes, S. S.	2006.	UC's Sagehen Creek Field Station at Fifty," an oral history conducted in 2004.	Regional Oral History Office, Bancroft Library, UC Berkeley	PDF - 150 pp.
Karban, R., K. Shiojiri, M. Huntzinger and A. C. McCall	2006.	Damage-induced resistance in Sagebrush: volatiles are key to intra- and interplant communication.	Ecology	87(4), 2006 pp. 922-930
Shiojiri, K., and R. Karban	2006.	Plant age, communication, and resistance to herbivores: young sagebrush plants are better emitters and receivers	Oecologia	149(2):214-220
Gerke, D. M. and S. A. Stewart	2006.	Strategic Placement of Treatments (SPOTS): Maximizing the Effectiveness of Fuel and Vegetation Treatments on Problem Fire Behavior and Effects	US Forest Service	
Evans, A. V. and J. N. Hogue	2006.	Field Guide to Beetles of California	University of California Press	ISBN 0520246578, 9780520246577
Elder, B. D.	2006.	Comparing the direct and community-mediated effects of disturbance on plant population dynamics: flooding, herbivory and <i>Mimulus guttatus</i>	J. of Ecol.	94 (3): 656-669 MAY 2006
Elder, B. D.	2006.	Disturbance-mediated trophic interactions and plant performance	Oecologia	147(2):261-271 Mar 2006

*Popular Press:*

Author	Year	Title	Journal	Ref.
Countis, S.	2006.	Youth camp receives \$65K grant	Sierra Sun	July 28, 2006.
Olney, J.	2006.	California forests primed for disaster: story and video	KGOTV 7-ABC San Francisco	July 31, 2006.
Sanders, R.	2006.	Grant helps expand UC Natural Reserve outreach	UC Berkeley News	Aug. 2, 2006.
Leachman, S.	2006.	Leadership program for teens expanding into Sedgwick Reserve.	Santa Barbara News-Press	Aug. 5, 2006.

Staff	2006.	How to learn more in 40 days than in an entire school career.	Moonshine Ink	Vintage 4, Nip 9 (Aug, 2006): p. 8
Olney, J.	2006.	California's new Experimental Forest. story and video	KGOTV 7-ABC San Francisco	Aug. 14, 2006
Olney, J.	2006.	Scientists study California bears. story and video	KGOTV 7-ABC San Francisco	Aug. 15, 2006
Staff	2007.	Volunteer Corner: Suzie Cordero. Adventure Risk Challenge Summer Literacy and Leadership Program	Sierra Sun	March 6, 2007
Countis, S.	2007.	Volunteers sought for stream adoption in Truckee	Sierra Sun	April 13, 2007
McCartney, P.	2007.	Training for stream monitoring to begin	Sierra Sun	April 20, 2007
Staff	2007.	Stream training set for Sagehen	Sierra Sun	April 26, 2007
Richards, G.	2007.	The life and times of the Sierra Nevada Wood and Lumber Company: echoes from the past-Part I	Sierra Sun	May 22, 2007
Richards, G.	2007.	Building the new town of Hobart Mills: echoes from the past-Part III	Sierra Sun	June 19, 2007
Quesnel, E.	2007.	Connecting with our backyard: 5th Graders visit Sagehen Creek Field Station	Moonshine Ink	Vintage 5, Nip 7 (June 14 -July 11, 2007): pp. 13
Staff	2007.	Sagehen Summer Speaker Series	Moonshine Ink	Vintage 5, Nip 6 (July 12-Aug. 8, 2007): pp. 18
Sylvester, T.	2007.	Spot treatment for full protection. SPLATs: The Technique That Could Save Our Forests.	Moonshine Ink	Vintage 5, Nip 6 (July 12-Aug. 8, 2007): pp. 18
Wallace, N. K.	2007.	Bridge to self-reliance - high school students participate in leadership and literacy summer program.	Santa Barbara News-Press	July 20, 2007 3:04 PM
Cristancho, A.	2007.	KidZone takes August break	Sierra Sun	July 29, 2007
Booth, J.	2007.	Sagehen Creek Field Station Brochure. Designed for prospective reserve users, these brochures describe the natural resources of the sites and contain information on access, facilities, and use.	UC Natural Reserve System	August, 2007.
Poole, R. M.	2007.	Fish Story: Native trout are returning to America's rivers and streams, thanks to new thinking by scientists and conservationists. [includes interview of Sagehen alum Bob Behnke]	Smithsonian Magazine	August, 2007: pp.86-99

Richards, G.	2007.	Life in Hobart Mills: echoes from the past-Part IV	Sierra Sun	Aug. 3, 2007
Cristancho, A.	2007.	Groups seek to restore local watershed: erosion from dirt roads targeted.	Sierra Sun	Aug. 8, 2007
Olney, J.	2007.	Sierra's Experimental Forest Is A Scientist's Dream	KGOTV 7-ABC San Francisco	Aug. 15, 2007
Olney, J.	2007.	ARC Program helps teenagers thrive.	KGOTV 7-ABC San Francisco	Sept. 3, 2007
Cristancho, A.	2007.	Students learn science at Sagehen field station.	Sierra Sun	Sept. 26, 2007
Staff	2007.	The Sierra Nevada Now and Then: Revisiting the Grinnell Survey	Sierra Sun	Sept. 27, 2007
Booth, J.	2007.	Written in Stone: Students Sign on for Geology Field Camp to Get a Hard Introduction to Rocky Realities.	UC NRS Transect	25.2: 7-10
Booth, J.	2007.	Outreach Program Expands to Second NRS Reserve.	UC NRS Transect	25.2: 11
Magin, K.	2007.	Wildfire run-off impacts Lake Tahoe clarity	Sierra Sun	Oct.31 , 2007
Howard, G.	2007.	Supervisor Leaving Tahoe Forest.	Sierra Sun	Dec. 17, 2007
Sacramento (AP)	2008.	Orphaned Bear Cub To Get Hibernation Help	CBS 13/CW31, Sacramento	Jan. 2, 2008
Garrard, E.	2008.	Into the wild: Orphaned bear released.	Sierra Sun	Jan. 2, 2008
Chandler, K.	2008.	Rescued bear cub released into hibernation den near Truckee.	KOLO8-TV, Reno	Jan. 2, 2008
Kobeley, J.	2008.	Rescued bear cub released into hibernation den near Truckee.	News 10, Sacramento	Jan. 2, 2008
Truckee (AP)	2008.	Rescued bear cub released into hibernation den near Truckee	San Diego Union-Tribune	Jan. 2, 2008
Ishimaru, H.	2008.	Orphaned cub placed in hibernation.	KGOTV 7-ABC San Francisco	Jan. 2, 2008
Sanders, R.	2008.	Orphaned bear cub snuggles into new home at Sagehen reserve.	UC Berkeley News	Jan. 3, 2008
Sharp, R.	2008.	Baby bear back in wild.	CNN.com	Jan. 3, 2008
Leve, C. & T. Sylvester	2008.	(Back) Into the Wild: Releasing a cub brings a bit of hope after a deadly summer for bears.	Moonshine Ink	Vintage 6, Nip 2 (Jan. 17- Feb. 13, 2008): pp. 8
Bioregion Boy	2008.	Oh Deer, Where Can We Go?: For the deer, sharing the lower Truckee Rive watershed has meant a big change of behavior. [background info related to the Sagehen Hwy 89 road ecology project].	Moonshine Ink	Vintage 6, Nip 2 (Jan. 17- Feb. 13, 2008): pp. 15
Garrard, E.	2008.	Queens hold court	Sierra Sun	Feb. 13, 2008
Staff	2008.	OSU Researcher Documents Rare Wolverine in California	Oregon State U. News	March 5, 2008
Knudsen, T.	2008.	Elusive wolverine makes its first	Sac-Bee	March 5, 2008

Sierra appearance in years.				
(AP)	2008.	Research camera spots rare wolverine near Truckee	Sierra Sun	March 5, 2008
Brown, J.	2008.	Caught on Camera	Sierra Sun	March 5, 2008
Staff	2008.	Scientists Believe Photograph Depicts Wolverine in California	Press release: US Forest Service and photos	March 6, 2008
(UPI)	2008.	Wolverine photographed in Sierra Nevada	UPI	March 6, 2008
Darling, D.	2008.	Image of wolverine starts search for more in state	Redding Record Searchlight	March 7, 2008
Gray, K.	2008.	Wolverine Spring in California's Central Sierra Trumps Punxsutawney Phil	California Progress Report	March 7, 2008
Brown, J.	2008.	Rare wolverine caught on film near Truckee	North Lake Tahoe Bonanza	March 7, 2008
Fimrite, P.	2008.	Photo has outdoors experts thinking wolverine	San Francisco Chronicle	March 7, 2008
Sacramento (AP)	2008.	Student's camera snaps wolverine in California	CNN.com	March 10, 2008
Brown, M.	2008.	Feds: Wolverine numbers low, but not endangered	Sierra Sun	March 12, 2008
Staff	2008.	Wolverines in California [includes photos]	CADF&G	March 16, 2008
Staff	2008.	Additional Evidence of Wolverine Found in the Tahoe National Forest.	Press Release: CADF&G, US Forest Service and photos	March 21, 2008
Sacramento (AP)	2008.	Gotcha! More Photos Snapped of Elusive Sierra Wolverine	News10	March 22, 2008
Sacramento (AP)	2008.	Research camera snaps additional wolverine photos	Sierra Sun	March 24, 2008
Fimrite, P.	2008.	It's true: wolverine is thriving near Tahoe	San Francisco Chronicle	March 25, 2008
Howard, G.	2008.	Researchers await wolverine DNA results	Sierra Sun	April 1, 2008
Fimrite, P.	2008.	Scientists: Tahoe wolverine not from state	San Francisco Chronicle	April 3, 2008
Knudsen, T.	2008.	Wolverine photographed in Sierra Nevada likely not a California native	Sac-Bee	April 3, 2008
Howard, G.	2008.	Wolverine: It's a boy. And he's not from around here.	Sierra Sun	April 4, 2008
Bate, J.	2008.	Skeptics don't gnaw at Wally Wolverine.	Sierra Sun	April 6, 2008
AP	2008.	Preliminary DNA analysis completed on California Wolverine.	Innovations Report - Germany	April 7, 2008
Darling, D.	2008.	Scientist: Wolverine seen in Sierra Nevada came from Rockies.	Redding Record Searchlight	April 13, 2008

Staff	2008.	Wolverine may not be Cal native.	Reno Gazette Journal	April 17, 2008
Driscoll, J.	2008.	On the wolverine's trail.	Times-Standard	April 21, 2008
Lawrence, S.	2008.	Camera Spots Wolverine in Sierra Nevada	Huffington Post	April 21, 2008
Galante, J.	2008.	Wolverines Return to California, Scaring Bears, Mountain Lions	Bloomberg.com	May 14, 2008
Lightcap, S.	2008.	Students study at Sagehen Station	Sierra Sun	June 5, 2008
Becker, J.	2008.	Trekking for wildflower treasures	Sierra Sun	June 13, 2008
Howard, G.	2008.	Studying bears, hands on: College students try to trap bears for science north of Truckee	Sierra Sun	June 14, 2008
Howard, G.	2008.	Future Foresters [Nagano]	Sierra Sun	June 24, 2008
Howard, G.	2008.	Truckee wolverine results still pending	Sierra Sun	June 25, 2008
Howard, G.	2008.	Animal X-ing	Sierra Sun	June 28, 2008
Brown, M.	2008.	SPLAT research project completed	Joint Fire Science website	

*Multi-media:*

<b>Author</b>	<b>Date</b>	<b>Title</b>	<b>Outlet</b>	<b>Run time</b>
Felix, F.	7-4-06	Help, I'm lost!: video tour of the Sagehen website.	Sagehen TV	
Felix, F.	7-28-06	Bear research revs up in the Sagehen Experimental Forest.	Channel 6: Truckee-Tahoe Community Television	30:00
Olney, J.	7-31-06	Sierra forests primed for disaster. video	KGOTV 7-ABC San Francisco	03:24
Felix, F.	8-10-06	Sagehen Experimental Forest Dedication Ceremony, June 24, 2006.	Channel 6: Truckee-Tahoe Community Television	52:40
Olney, J.	8-15-06	California's new Experimental Forest. video	KGOTV 7-ABC San Francisco	03:33
Olney, J.	8-15-06	Scientists study California bears. video	KGOTV 7-ABC San Francisco	03:26
Felix, F.	8-17-06	Summer Speaker Series #10: "Plant Communication" with Prof. Rick Karban.	Channel 6: Truckee-Tahoe Community Television	49:40
Felix, F.	8-27-06	Pirates of Sagehen Basin: Slave-Raiding Ants	Channel 6: Truckee-Tahoe Community Television	08:57
A.R.C. Program	2006.	Sagehen Forest Interpretive Signs	Sagehen Creek Field Station	5 large format pp.
Felix, F.	9-29-06	Conservation and Research Agreement signed for the North Fork of the American River: sneak peak at the terrain.	Sagehen TV	00:17

Carpenter, C.	10-7-06	ARC program slideshow	Sagehen TV	
Felix, F.	3-1-07	A Winter Visit to Sagehen	Sagehen TV	11:56
Felix, F.	6-9-07	Why are there so many butterflies all of a sudden?	Sagehen TV/YouTube	04:30
Felix, F.	7-31-07	Black Bear Research in Sagehen Basin	Amazon.com/CreateSpace	33:38
Olney, J.	8-15-07	Sierra's Experimental Forest Is A Scientist's Dream	KGOTV 7-ABC San Francisco	03:54
Olney, J.	9-3-07	ARC Program helps teenagers thrive.	KGOTV 7-ABC San Francisco	04:26
Sacramento (AP)	1-2-08	Orphaned Bear Cub To Get Hibernation Help	CBS 13/CW31, Sacramento	
Garrard, E.	1-2-08	Into the wild: Orphaned bear released.	Sierra Sun	
Chandler, K.	1-2-08	Rescued bear cub released into hibernation den near Truckee.	KOLO8-TV, Reno	
Kobeley, J.	1-2-08	Rescued bear cub released into hibernation den near Truckee.	News 10, Sacramento	
Ishimaru, H.	1-2-08	Orphaned cub placed in hibernation.	KGOTV 7-ABC San Francisco	
Sharp, R.	1-3-08	Baby bear back in wild.	CNN.com	01:34
Cabrera, T.	2007.	Youth Voices Radio Project segment: The ARC Program.	KVMR-FM - Nevada City, CA	
Vermont Public Television	4-11-08	Remote Sensing of Environmental Conditions	Vermont Public Television	
Felix, F.	5-17-08	Spawning native Catostomus Tahoeensis.	Sagehen TV	01:33
Felix, F.	5-17-08	Ant ranchers.	Sagehen TV	00:19
Felix, F.	6-08-08	Predator reaction to animal coloration.	Sagehen TV	08:51
Felix, F.	6-08-08	Sagehen Outreach.	Sagehen TV	01:00

### III. Funding

*Provide a list of current and pending awards of extramural funding for research linked to your unit in the period 2006–2008...*

Researchers obtain their own grants, and Sagehen does not collect information concerning the research awards of researchers working here. Major grants that we do know about include:

A. KECK Hydrowatch Project	\$ 1.6 million
B. SPLAT	\$ 0.5 million
C. Highway 89 animal undercrossing	\$ 1.5 million

In addition, prior work at Sagehen was instrumental in securing a \$4.25 million grant from the National Science Foundation for the Sierra Nevada Critical Zone Observatory at Kings River Experimental Watershed (with two Berkeley PI's out of a total of seven PI's from UC campuses).

Sagehen does not receive funding from its researchers' grants, other than our standard overnight user fees and contributions to some of our environmental sensing infrastructure. Sagehen pursues grants for in-house outreach and education programs (such as our Community GIS Center and our Adventure-Risk-Challenge Summer Literacy and Leadership Program for at-risk teens). Sagehen also has sought facility upgrade funding from the NSF Field Stations and Marine Laboratories program.