



Vision

For the University of California, Berkeley,

Sagehen Creek Field Station,

a Biological Research and Education Station, a part of the University of

California Natural Reserve System,



Office of the Vice Chancellor for Research,



Berkeley Natural History Museums and



California Biodiversity Center.

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Introduction

This vision for the Sagehen Creek Field Station is intended to guide discussions that will lead to a long-term management plan. It describes what the field station is like today and how we will create this management plan. It identifies five long-term goals and lists ideas about what facilities, staff and programs are needed to achieve them.

Although the Field Station has operated for decades without a long-term plan, it needs one now in order to:

Protect its 50-year legacy: Wildfire poses a significant threat to the Sagehen basin. Because fuel loads have become dangerously high, the plan will include a long-range strategy for managing this risk. This has the advantage of allowing researchers to experiment with different techniques for managing fire risk and to adapt them to similar forests throughout California and Nevada.

In addition, fifty years of research and monitoring represents a substantial investment on which future researchers can build. These datasets are unique and include extensive long-term data about many species, plant succession, forest structure, water and weather. The problem is that researchers currently have difficulty accessing them because datasets are not digital, or even in standard formats. If these records were converted to digital formats, science could take advantage of them.

Cultivate new sources of support: Although historically UC Berkeley field stations were the private domain of individual professors or departments, they now serve a much wider audience throughout the UC system, the nation and even around the globe. This new orientation means that field stations and reserves need to be funded and managed in a new way. UC Berkeley is committed to supporting its use of the field station, but now it's time for other partners and collaborators to support it as well. One need is to figure out how all those who benefit from the field station's facilities, operations and resources can support it adequately and reliably.

Stimulate collaboration among researchers from many institutions: The USFS recently revitalized its relationship with the field station and designated the 8,000-acre Sagehen Creek watershed as the Sagehen Centennial Experimental Forest. This opens new opportunities for exciting collaborations between the Pacific Southwest Research Station, UC faculty and students, and researchers and scientists based elsewhere. Such collaborations could transform Sagehen into a premier research site making critical improvements in our understanding and management of Western forests. We need to figure out how such a collaborative research facility could work.

Use state-of-the-art technology to meet society's priorities for research and education: Recent technological advances make it possible to deepen and extend earlier studies conducted at Sagehen on fish and wildlife. In addition, Sagehen is particularly well suited to address a variety of new topics about which society is concerned, such as how to manage fire risk and the effects of climate change.

Coordinate among competing demands: Because these needs present us with a bewildering set of possibilities for the field station, we need to figure out how to accommodate them without creating potential conflicts.

We are interested in your feedback on a number of questions, such as Are these the right goals? What infrastructure is needed to support them? What kind of organization is required? What resources? Who is responsible and who can help? What are the priorities? What else is needed to ensure that Sagehen will be a thriving research and education center for years to come?

Once we get answers to these questions, we will develop a management plan to guide implementation over the next three to five years. In that plan, we will identify day-to-day activities needed to meet the field station's long-term goals.

Engaging a Broad Audience to Develop the Vision for the Sagehen Creek Field Station

A key step in developing this vision is to engage the people we hope the station will serve. This is because Beth Burnside, UC Berkeley's Vice Chancellor for Research, Jim Kirchner, Sagehen's Faculty Director, and Jeff Brown, Resident Manager, decided to undertake an unusual experiment of managing the field station collaboratively.

Kirchner and Brown invited a wide range of people to participate in a Program Planning Advisory Group (see table 1, or Appendix I for a complete list). They identified people who individually provided valuable perspectives, and who collectively could offer oversight and represent a range of interests.

Table 1: Program Planning Advisory Group

Universities

University of California, Berkeley
University of California, Davis
University of Nevada, Reno
Desert Research Institute

Government Agencies

California Department of Fish & Game
Nevada County Board of Supervisors,
Tahoe Truckee Unified School District
Truckee Town Council
USDA Forest Service

Non-profit organizations

Tahoe/Truckee Community Foundation
The Nature Conservancy
Truckee River Watershed Council
Mountain Climate Initiative

Members of the Planning Advisory Group generously committed to investing their time to complete the Sagehen Long-Term Management Plan. The Group first met in February 2003. The schedule to complete the plan by April 30, 2006 is:

Mid October 2005	Planning Advisory Group meets to brainstorm and begin drafting the Management Plan.
Mid January 2006.	Draft Management Plan sent to Planning Advisory Group
Late January 2006.	Planning Advisory Group's comments due on draft
February 2006	Planning Workshop with Planning Advisory Group and outside reviewers.
Early March 2006	Revised Management Plan sent to Planning Advisory Group, incorporating results of workshop
Late March 2006	Planning Advisory Group's comments due on revised Management Plan
April 2006	Final Plan completed

Setting the Context for the Vision

In this section, we describe how Sagehen Creek Field Station came to be what it is today, its habitats and facilities.

Location and Administration

Sagehen Creek Field Station lies in California, roughly 10 miles north of Truckee. The Creek itself flows east from near the Sierra crest, joins the Little Truckee River and eventually reaches Pyramid Lake. Three entities work together to manage the Sagehen Creek watershed: UC-Berkeley, the Tahoe National Forest and the U.S. Forest Service's Pacific Southwest Research Station.

Since 1951, UC-Berkeley has had a special use permit that covers about 450 acres, and includes a mile and a half of Sagehen Creek. The Field Station is administered by the Office of UC-Berkeley's Vice Chancellor for Research, the Berkeley Natural History Museums (BNHM) and the California Biodiversity Center (CBC). Professor Jim Kirchner is the Faculty Director, Jeff Brown is the Resident Station Manager and Faerthen Felix is the Resident Assistant Manager.

Sagehen Creek Field Station also serves as the hub of the Central Sierra Field Research Stations, a network of five field stations administered by UC-Berkeley that together represent 20,000 acres of high altitude montane forests (see Figure 1).¹ These research areas together offer a unique opportunity to study a transect of natural systems that crosses the Sierra crest.

¹ Two of these field stations are in the University of California Natural Reserve System: the Chickering American River Reserve and the Sagehen Creek Field Station.

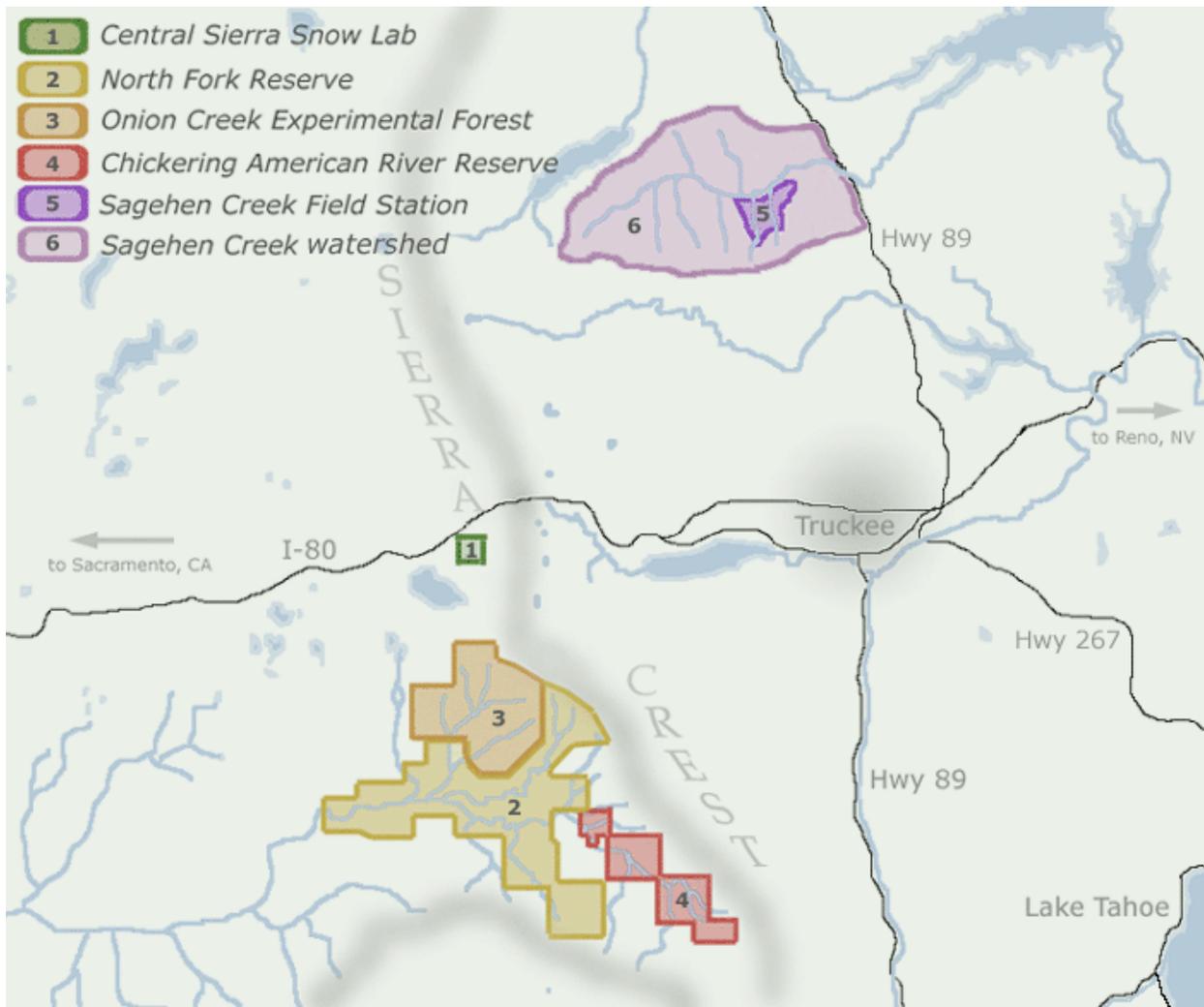


Figure 1. Location of Sagehen Creek Field Station and the four other components of the network of Central Sierra Field Research Stations.

The new Sagehen Centennial Experimental Forest encompasses the entire 8,000-acre watershed and is part of the Tahoe National Forest (see Figure 2). From a scientific viewpoint this gives it another advantage because, unlike many other research areas, it is not an ecological island. Rather it is embedded within a much larger natural area, which means that ecological processes and wildlife populations function in a relatively undisturbed manner. From an administrative view, it also means the watershed is covered by a Forest Plan that identifies its primary use as research. UC-Berkeley, the Forest Service- Pacific Southwest Research Station and the Tahoe National Forest are developing a Cooperative Management Agreement to manage the watershed and the surrounding lands.

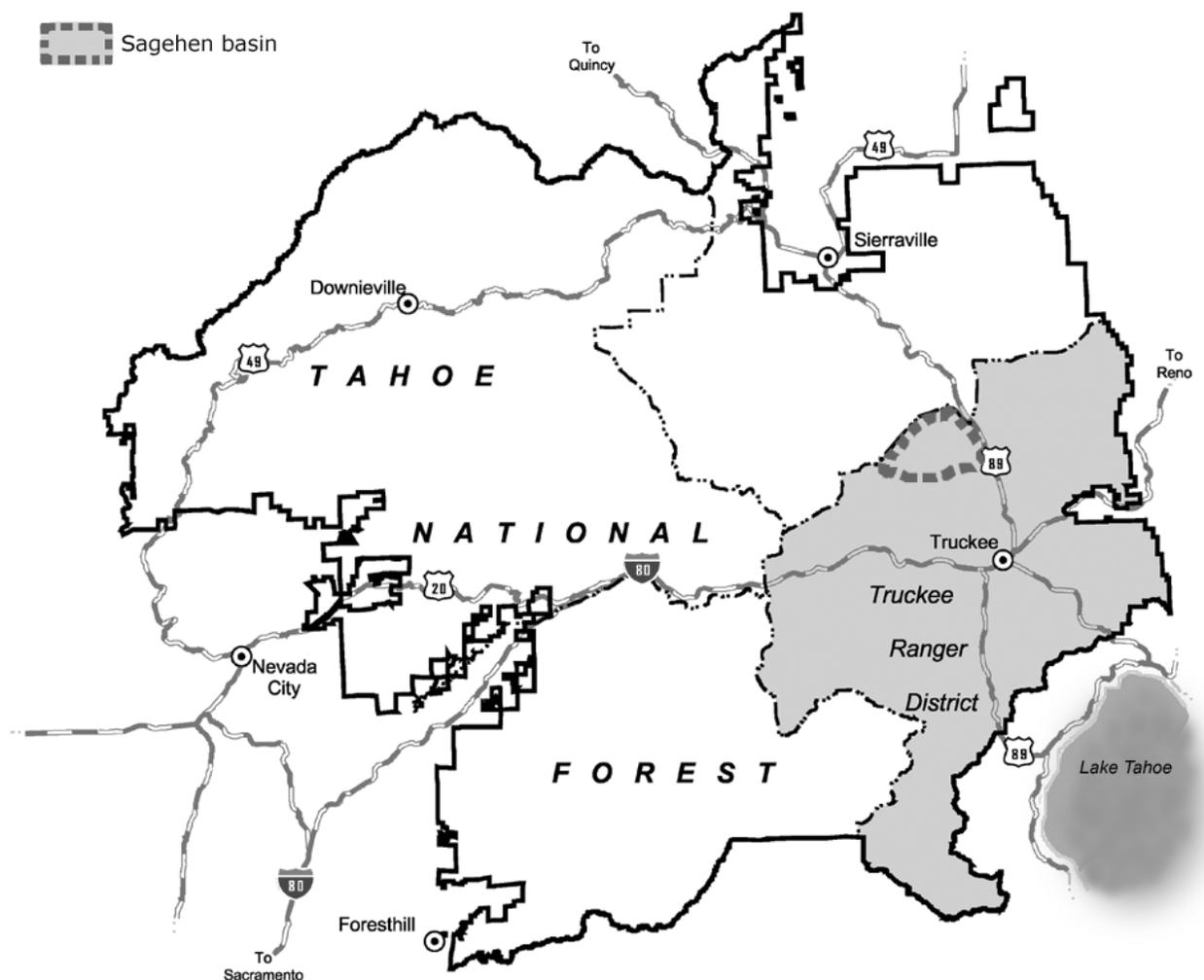


Figure 2. The location of the Sagehen Experimental Forest within the Tahoe National Forest.

Because the Forest Service has permanently protected the Sagehen watershed for research by designating the Sagehen Centennial Experimental Forest, the Pacific Southwest Research Station will be more actively participating in research in the watershed.

History

Sagehen Creek Field Station was the dream of two notable UC-Berkeley faculty members: A. Starker Leopold, a wildlife professor, and PR Needham, a fisheries professor. In the summer of 1950, they fished every trout stream in the central and northern Sierras and identified Sagehen Creek as being ideal for ecological studies. Their reasons were that it was relatively unpolluted and unaffected by cattle grazing, it was high-altitude and had severe winters, it included a wide variety of habitats, and the stream could be diverted to study its fish populations.

That winter, Leopold and Needham went cross-country skiing near the site of today's field station with representatives from the Tahoe National Forest. They so persuasively outlined a vision for research that the Forest Service granted UC-Berkeley a Special Use Permit in April 1951.

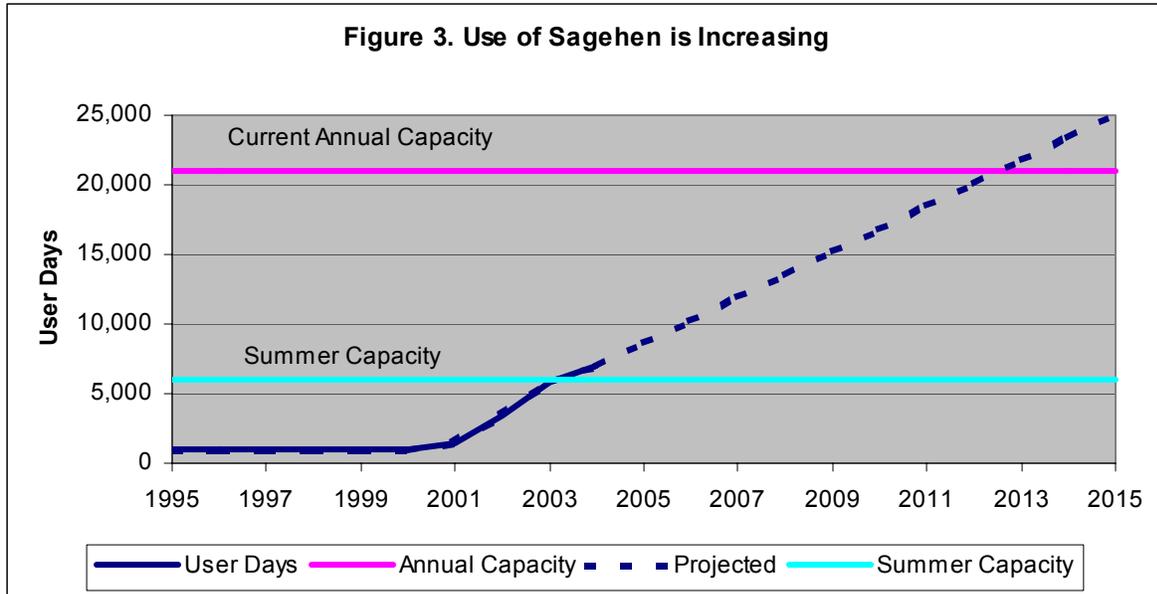
In the half century since, Sagehen has been home to pioneering studies of stream ecosystems and trout, as well as long-term studies of beaver, martens and birds. Over 75 Ph.D. and M.S. theses and 340 publications have resulted from this work. In addition, researchers have accumulated more than 50 years of weather data and compiled inventories on all manner of living things. They have also created teaching collections of birds, insects, plants and animals.

Activity at Sagehen reached an all-time low in the 1990s when its facilities became so run-down that few faculty or researchers wanted to use it. Although theoretically it could accommodate 21,000 user days per year, it had fewer than 1,000. Berkeley faculty even began to talk about closing the field station and canceling the permit with the Forest Service.

Sagehen's rebirth began when a new team of people took over its operation. Beth Burnside, who has a long-standing interest in field stations and their survival, became UC-Berkeley's Vice Chancellor for Research. At about the same time, Jeff Brown and Faerthen Felix became Sagehen's resident managers. They immediately threw themselves into turning the place around, fixing up buildings and developing strong contacts in the local community. When Burnside saw what progress Brown and Felix were making, she asked Jim Kirchner, a Berkeley professor of earth and planetary science, to become Sagehen's faculty director.

Together, this team has rekindled people's interest in conducting research and education at Sagehen. Today, Sagehen draws researchers not just from California, but also from Colorado, Texas, Nevada, Illinois and New York. It attracts not only university scientists, but also representatives from government agencies, non-profit institutions, K-12 schools and the general public. Each year, user days climb steadily, reaching 7,000 in 2005 (see Figure 3).

The new team has almost been too successful. Because summer is when the ecosystem is most dynamic, that is when faculty and researchers find the field station most attractive. Because most use takes place in June, July and early August, already in summer the demand exceeds Sagehen's capacity. The result is that Sagehen is losing groups to other places that can offer them better facilities, especially offices, classrooms, storage space – and decent housing. This is a problem because it limits the innovation that occurs when people from all disciplines interact; we lose the long-term understanding of the ecosystem that long-term users have, and we lose opportunities to gather data that may provide new insights. You can see how growth in user days has fallen off in the past two years.



Yet, at current activity levels, Sagehen Creek Field Station is not financially sustainable, nor can it fulfill its potential to support adaptive management and train future policy makers. It must find ways to improve its facilities, attract new research, and increase use during the school year. This is one of the reasons we need to develop this long-term management plan.

Habitats

Sagehen is great natural laboratory because it is full of extremes. Summers are dry, with daytime highs around 80 °F, but nighttime temperatures can drop below freezing. In the winter, temperatures reach only 40 °F and the ground is often snow-covered between November and May.

Climate also varies greatly within the watershed, which gives rise to a wide variety of habitats. A strong east-west gradient in precipitation results because it lies east of the Sierra Nevada crest. In addition, differences in groundwater permeability create such sharp habitat boundaries that dry sagebrush flats are found within 50 feet of permanently wet meadows.

The 450-acre permit area contains fens, sagebrush and meadows that vary from dry grasses with annual plants to wet areas with sedges. Lodgepole pines dominate along Sagehen Creek. A large area was burned in 1960 and now is covered by extensive stands of tobacco brush, greenleaf manzanita and young lodgepole and Jeffrey pines. The balance of the area grows a mixture of white fir and lodgepole, Jeffrey and ponderosa pines.

Outside the permit area in the watershed, researchers can find stands of aspen and white fir. Stands of red fir also exist, some of which have been logged. Nearly pure patches of woolly mule's ear show where sheep grazing was heavy in the past. Mountain hemlock grows on Carpenter Ridge, at the headwaters of Sagehen Creek, and a small lake and vernal pool lie just below the ridgeline.

Outside the Experimental Forest and the Central Sierra Field Research Stations, researchers also have access to the Tahoe National Forest, where they can collaborate with land managers to learn about fire ecology and long-term forest management. Lessons derived from such research can apply to similar forests throughout California and Nevada. Lake Tahoe, Pyramid Lake and many small lakes are also within easy driving distance.

Facilities

Sagehen Creek Field Station is a year-round facility that accommodates researchers and field classes for either day use or overnight stays. It also provides data to researchers who never actually come to the field station. The 22 buildings are located primarily in the Upper Camp or the Lower Camp Headquarters Complex (Figure 4). Outlying buildings include the Leopold K-12 area and the highway garage.

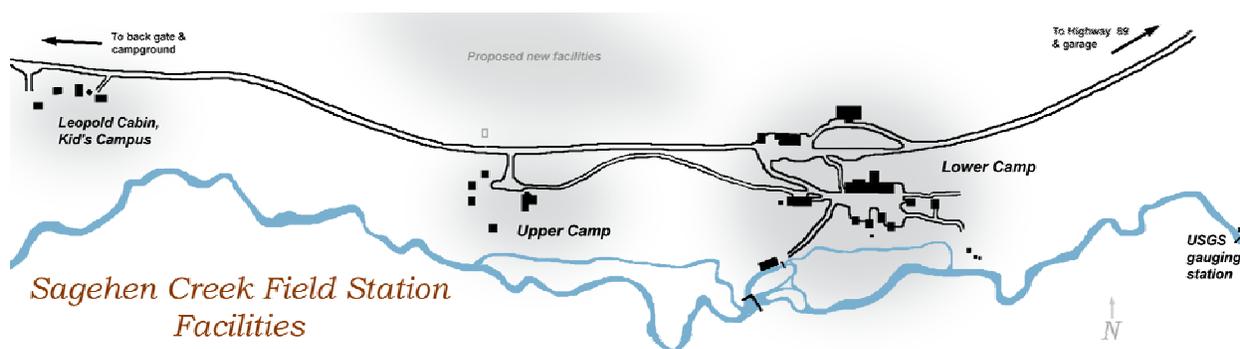


Figure 4. Facilities location map for Sagehen Creek Field Station's Upper Camp, Lower Camp/headquarters and Wireless Network Coverage areas.

These facilities can accommodate a total of 53 people in heated, winterized cabins. Researchers and visitors can prepare their own meals in three kitchen spaces (one large commercial style), and eat in the dining hall or outside at picnic tables or on a shaded deck.

Reservations for lodging, research and education space can be made by going to <http://sagehen.ucnrs.org> and clicking on **Reservations**. Priority is currently given to faculty and students from Berkeley, followed by people from other University of California campuses, then other California colleges and agencies, and lastly everybody else. With the new collaborative approach, we may need to devise a new way to allocate use among all partners.

For education and research, the field station has one large, heated building with two separate spaces. It also has a small wet lab. One of the field station's unique features is a 25-foot long underwater window through which researchers can study fish behavior. You can see this by going to <http://sagehen.ucnrs.org> and clicking on **Fish-cam!**

In the Lower Camp, one room triples as a library, conference room and computer lab. The computers and peripherals are networked with a local wired and wireless LAN. Satellite Internet access is available in the Lower and Upper camps and the upper parts of the Sagehen basin (see Figure 4).

Data and Research

In over fifty years of research, Sagehen has accumulated massive amounts of data, which contributes to its value for research. Much of this data is digital and available by going to the station's website (<http://sagehen.ucnrs.org>), clicking on **Resources** and then **data**.

Six automated weather stations record a host of meteorological variables along a transect from the Lower Camp to the upper ridgeline, documenting how the basin's weather varies with altitude (see Figure 5). At the Lower Camp weather station, daily weather records date back to 1953 (see Table 2), which you can buy from the National Climate Data Center (<http://www.ncdc.noaa.gov>). Snow telemetry (SNOTEL) records dating from 19? are available from an automated remote sensing site on Carpenter Ridge operated by the National Water and Climate Center. Since 2001, we have monitored the chemistry of precipitation and dry deposition as part of US EPA's nationwide National Atmospheric Deposition Program. In 2005, we installed 2 more snowmelt pans to measure how much precipitation falls as snow above the Lower Camp.

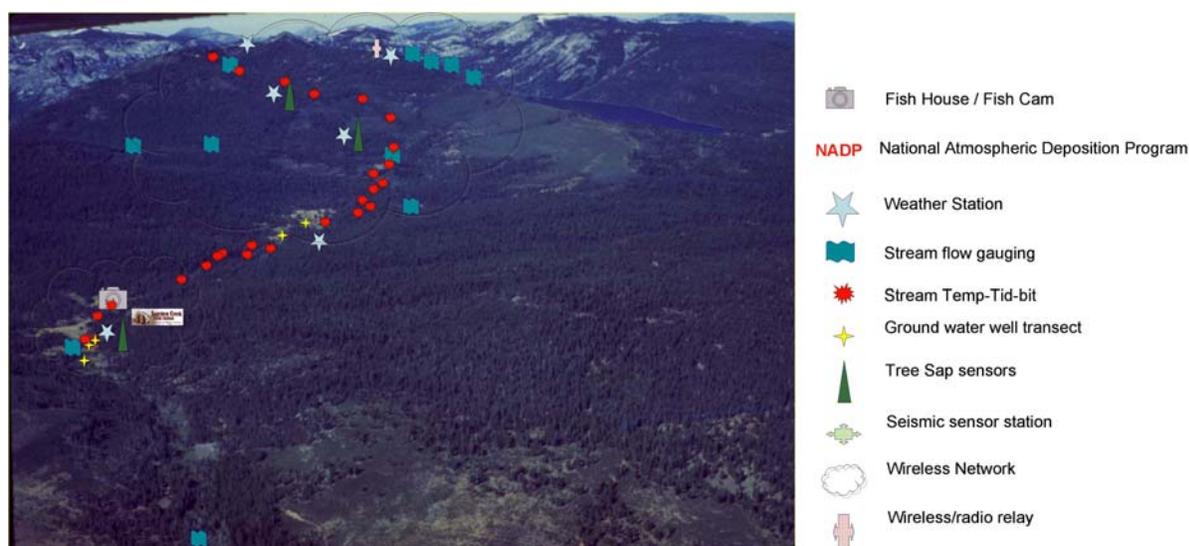


Figure 5. Location of automated environmental sensors, computerized database systems and wireless Internet in the Sagehen Creek Basin

Because Sagehen Creek is part of the Hydrology Benchmark Network, USGS has measured stream flow since October 1953 and water quality since 1968. In 2003, USGS installed a satellite uplink so these data are now available in real time. Water temperature is measured in several

sites along Sagehen Creek and its tributaries. Groundwater depth and temperature are also measured in a few places. Other routinely collected data include daily satellite imagery, seismic activity, and three transects of tree sap flow data.

More data are posted on our website. With the Fish Cam, you can watch the fish in our underwater window in real time. You can download lists of species found in the basin -- amphibians, birds, bony fishes, insects, mammals, plants and reptiles. You can search the bibliography of research conducted at Sagehen, including articles published in the popular press.

The field station's library has copies of the theses and scientific articles based on research conducted here, as well as a good selection of local field guides. (A more extensive collection of journals and books is available just 50 miles away at The University of Nevada, Reno library, which also provides inter-library loans from Stanford and UC-Berkeley.) Hard copies of original data are also available, and may be the only way for researchers to get access to data from the older research.

Table 2: Sagehen Weather Data

Air temperature
Atmospheric pressure
Precipitation
Relative humidity
Solar radiation
Soil moisture
Soil temperature
Snow depth
Wind direction
Wind gust
Wind speed

Planning to Meet Long-Range Goals

With a picture of what the field station is today, we can begin to create our vision for its future. As mentioned in the introduction, the field station has five goals that reflect the broad range of activities it supports. They are to:

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

Each of these goals is described in more detail below, including what is being done to achieve them. Each goal also has a list of what we need to do to meet it.

Goal 1: Improve facilities for field research and education.

Physical plant is the main limit to activity at the field station – housing, laboratories, classrooms, storage, meeting space and year-round access. Although Sagehen is most interesting to researcher in summer, it could support more research and education during the rest of the year. The main obstacle is that you can't reach it by car when snow is on the ground. In winter, the only access is by skis, snowshoes, snowcat or snowmobiles. This makes it difficult to evacuate in

an emergency and poses a safety hazard. Because auto access is hard to predict, field trips and research are hard to plan. Year-round auto access is essential if activity at the field station is to increase.

Another difficulty is that most of the facilities are 40 to 50 years old and need to be renovated or replaced, which we are doing as time and resources allow. For example, in 2004 we replaced the Lower Bathhouse, completely renovated the community kitchen, repaired the roofs of the East Cabin, Johnson Cabin and Tool Shed, and replaced three damaged tent cabins with two new cabins. Using the wall of a new cabin, we created an outdoor meeting space for 150 people with a screen, white board, audio-visual and sound system.

In 2005, we improved the classroom by replacing windows and doors and installing lab style cabinetry. We remodeled the botany lab by installing dry lab bench space for 15 people. We dedicated the area near the Leopold Cabin to K-12 use, where we built outdoor shaded classrooms and living space for 10 students and 2 instructors.

But renovations and year-round access are not enough. In summer, capacity is already exceeded and Sagehen is losing groups to other places. Our plan is to accommodate a level of research and education activity that will not damage the Sagehen ecosystem. Faculty and researchers say they need better facilities than the field station can currently offer. Specifically, they need more classrooms, offices, meeting space and storage space. Most importantly, they need more decent housing. The field station must expand and upgrade its facilities if it is to participate in nationally recognized and cutting-edge science. Specifically, it needs to

1. Get equipment to be accessible year-round

- A vehicle mounted snowblower to keep the road open
- Snowcats for access to the watershed and emergency evacuation during severe weather conditions
- Snowmobiles for access to the watershed
- A tractor to maintain the road

2. Support research and education

- Comprehensive wet lab
- Dry laboratory space for 30 people
- Classroom for 30
- Office space for 15-20 researchers
- Indoor meeting space for 150 people
- 8 faculty cabins
- Expanded computer lab
- Updated biological collections
- Onsite GIS and data collection
- Additional indoor storage space

3. Hire staff

- Maintenance person (steward)

- Resident biologist

4. Create an endowment

- Gain approval for having fundraising for Sagehen become a component of the overall fundraising for the Berkeley campus
- Devise a new way to allocate funding and use among all partners

Goal 2: Capture, store and distribute field data

We are continually updating and expanding the station's ability to record, store and manage data, but much more could be done using automated environmental sensors, computerized databases and the web. For example, Sagehen Creek Field Station has been selected to be part of an NSF-funded test of new technology called “Embedded Network Sensing” (CENS). These are networks of wireless sensors, robots, cameras and computers at the frontier of environmental monitoring. They measure the full panel of meteorological variables, detect a passing animal, and even record bird songs.² These sensors are highly energy efficient because they are asleep except when recording and transmitting data. If some nodes of the network fail, others automatically locate neighbors and remap the network.

To achieve this goal, we need to add staff, expand data collection, convert old data sets to digital format and add programs. Specifically, we need to:

1. Hire staff

- Hire a full time manager of the information system, whose job would be to:

2. Develop the information system

- Update the website
- Maintain the network
- Develop and implement a digital system for collecting data from researchers
- Train researchers how to collect digital data in standard formats
- Develop a system to capture, store and make data available to a broader audience
- Implement embedded networked sensing technology

3. Collect data

- Install precipitation gauges at all weather stations
- Expand the network of dataloggers recording stream height and temperature on mainstem and tributaries
- Expand the sampling and processing of stream and spring water quality
- Increase the number of dataloggers that record groundwater depth and temperature
- LIDAR³ the other areas of the Central Sierra Field Station

² Broad, William J. 2005. “A Web of Sensors, Taking Earth’s Pulse,” *New York Times*, May 10, 2005. Downloaded from the web on July 3, 2005.

³ LIDAR, which stands for Light Detecting And Ranging, is a new technology that measures elevation extremely accurately and is considered a standard requirement for some ecosystem studies. It measures the distance to an

- Install more web cams throughout the basin
- Install and maintain network of eddy correlation sensors, which measure carbon flux and make it possible to estimate net ecological productivity
- Expand the network of tree sap flow measurements
- Support and maintain the field station network

Goal 3: Update and expand research.

Sagehen Centennial Experimental Forest is open to all kinds of research as long as it does not conflict with ongoing research or its other goals. Sagehen and the CSFRS (Central Sierra Field Research Stations) are poised to participate in several very exciting and prestigious research efforts, such as the National Ecological Observatory Network (NEON) and the Sierra Nevada Hydrologic Observatory (SNHO). Of the many scientific questions facing our society, Sagehen is a particularly well suited to conduct research in seven areas.

Building on Previous Research Any number of good research projects could build on and update past research conducted in the Sagehen Creek watershed. Two new projects do just that. One is investigating how to reintroduce the threatened Lahontan cutthroat trout. The other is learning about bear hibernation. Digitizing historic data would make it easier for researchers to build on past research.

Researching Management of Fire Risk Two UC-Berkeley professors are now conducting a three-year study that adapts to Sagehen a fire behavior model that was developed in the Northern Rocky Mountains. They are using it to evaluate alternative designs for a management strategy called “Strategically Placed Land Area Treatments” (SPLAT). UC will provide information and new tools to the Tahoe National Forest.

A Forest Service Interdisciplinary Team will use UC Berkeley’s information to develop the SPLAT design and draft a Forest Health Management Plan. This will apply different management treatments, such as thinning and prescribed burning. The next phase will be to implement the treatments, test how they affect fire behavior, and monitor the results. Lessons will be incorporated into adaptive management.

Because this research will significantly change ecological patterns and functions throughout the watershed, it is critical to collect extensive baseline data to measure the impact of SPLAT. Ideally, over the next 2 to 4 years research will be conducted on all ecosystem components -- animals, birds, insects, vegetation, hydrology, and atmospheric dynamics.

Restoring Second-Growth Western Montane Forests Perhaps the ultimate test of ecological science is not whether you can describe ecological systems, or even conserve them, but whether you can restore them once they’ve been significantly altered. This is multi-disciplinary work in which theory meets practice. Some treatments to reduce fire risk may be a type of restoration.

object by timing how long it takes for a laser beam to be reflected back to the transmitter. The resulting image looks exactly like the terrain, including trees, buildings, roadways and streams.

Sagehen is also a good place to explore other types of restoration, such as how to recover from heavy sheep grazing. Being relatively unaltered, it can also suggest how other, more disturbed watersheds could be restored.

Understanding the Impact of Residential Development on Sierra Nevada Wildlands A researcher from UC-Berkeley is currently studying how land use and climate change affect vegetation and animals. Other similar studies could be conducted, such as: how do changes in land use and climate change affect hydrological and ecosystem processes? Or what impacts do changes in these processes have on forestry, water quality, water supply, and recreation?

Studying Ecological Interconnections in Watersheds Dominated by Snowmelt Ecological interconnections in watersheds dominated by snowmelt are important because the Sierra snowpack provides much of California's and northwestern Nevada's water supply. Collecting data about snowpack that show changes in its timing, duration and magnitude, will improve our understanding of global climate change. This research would use data from the automated sensors described in Goal 2.

Studying Animal Behavior Using Microtechnology This is another area in which work has started at Sagehen, but more could be done. For example, we have installed a web cam in the fish house to monitor fish behavior. We are funded to develop a wireless data collar for bears. We are installing two transects of sensors to monitor bat activity. And we are actively expanding the networks for wireless and automated data collection that could be used to study animal behavior. If the CENS technology described in Goal 2 is installed at Sagehen, this kind of research could expand considerably.

Understanding Long-Term and Broad Scale Ecological Processes We are eager to incorporate Sagehen into new and existing national networks for ecological research. For example, Sagehen is an ideal candidate for the Long-Term Ecological Research (LTER) network. This network currently includes 26 field sites distributed at both poles, and from the Sonoran Desert in Arizona, to tropical rainforests in Puerto Rico, and to northern hardwood forests in New Hampshire.⁴ At present, the closest LTER site is an hour east of Eugene, Oregon, in the much wetter Cascade Mountains. Very little information exists about biogeochemical cycling in Sierra Nevada forests, which is incredible given their importance. By becoming an LTER site, Sagehen can clearly help fill that gap.

If Sagehen becomes a test site for CENS, it would also be a prime candidate for the National Ecological Observatory Network (NEON). This project, which is just getting underway, is designed to study major environmental challenges such as invasive species that cost agriculture more than \$100 billion each year, or planning for climate change.⁵ Because these are large-scale challenges, NEON sites will be distributed coast-to-coast and include urban and suburban areas as well as agriculture and wildlands. A large group of faculty from the University of California, the Desert Research Institute and California State University are already interested in this project.⁶

⁴ Information retrieved from www.lternet.edu on July 5, 2005.

⁵ From www.neoninc.org/, downloaded July 3, 2005. Also Broad, "A Web of Sensors," op. cit.

⁶ Downloaded from <http://ibrcs.aibs.org> on July 5, 2005.

Achieving this goal involves using existing data to discover new ecosystem patterns and process, extending research already underway, attracting more scientists, and joining networks that support basic and applied ecological science. Specifically, we need to:

- 1. Digitize existing data:**
 - Mark-recapture data that describe the size, distribution and characteristics of wildlife populations
 - Creel census – data collected from people fishing along Sagehen Creek
 - Divert and Drain data – 10 years of measuring all the aquatic species found within 10 sections of Sagehen Creek
- 2. Use cutting-edge technologies to study animal behavior and watersheds dominated by snowmelt**
- 3. Extend research already underway**
 - Follow-up on Phase I of SPLATS
- 4. Encourage more scientists to conduct research at Sagehen**
- 5. Join networks that conduct ecological science, such as**
 - National Ecological Observatory Network (NEON)
 - Long-term Ecological Research (LTER)

Goal 4: Increase field education for all ages

For years Sagehen Creek Field Station has been a field camp for undergraduate and graduate students from UC-Berkeley, UC-Davis, University of Nevada-Reno (UNR), San Francisco State University, and Sierra Nevada College. Subjects studied range from hydrology and stream ecology, to insects and plants, to birds and bears. Not all courses are about science – one field trip from UNR is a course in leadership development.

Sagehen also hosts environmental education for elementary and high school students. Although historically it mostly served students from Truckee and Lake Tahoe, recently it has attracted students from Foresthill and Berkeley, as well.

In 2004 and 2005, Sagehen became the base camp for Adventure Risk Challenge, a six-week summer program designed to help teens who are learning English as a second language and have low literacy skills. The goal is to improve their chance of graduating from high school and going to college. Each summer, nine or ten teenagers study a curriculum that focuses on language, environmental science and leadership skills.

We'd like to create the Sagehen Place-Based Learning Institute to house field education for all ages. To do so, we'd need to:

- Hire a coordinator for the Sagehen Placed-Based Learning Institute
- Establish demonstration projects in the Basin
- Build an interpretive trail and program
- Encourage more undergraduate and graduate field courses

- Work with K-12 schools to develop service-learning programs and standards based curricula.
- Expand K-12 plots and data collection.
- Create a Docent Program to train guides for public tours
- Train K-12 teachers and docents to use Sagehen for place-based education
- Develop permanent funding base for the Adventure, Risk Challenge (ARC) program and expand the program to other locations in the US.

Goal 5: Provide scientific information to policy makers, resource managers and general public

Scientific information is frequently presented in formats that are difficult for non-scientists to access, yet the information could help them create better policies and programs. To be sure, science provides only some of the information people use to make decisions -- they also consider risk, practicality, values and must interpolate when science has no information to offer. By increasing people's scientific understanding of resource issues, neutral and objective information can help people move beyond policy deadlock and agree on solutions. Academic and Forest Service researchers have accumulated knowledge that can help non-scientists form opinions about, set policies for, and manage natural resources. Subject areas range from air quality to ecosystem processes, fire science to insects and diseases, recreation to vegetation management, watersheds to fish and wildlife. The challenge is to get that information out so that non-scientists can use it.

Sagehen Creek Field Station is already reaching out to non-scientific audiences. In 2005, we are hosting a public science symposium on climate change, and holding a speaker series in which researchers tell the public about their work. Much more can be done, however. What Sagehen really needs is staff and a well-orchestrated program. Specifically, this means

- Hire a coordinator to share scientific knowledge outside the research and academic community
- Identify the audience for scientific information, for example, federal land managers, county supervisors, water suppliers, and land trusts
- Interview key representatives of the target audience to determine what information they need.
- Design and implement a structured education program for the general public
- Identify and create a range of educational forums and media
- Make presentations to key audiences
- Create opportunities for scientists and non-technical audiences to understand each other
- Build a Web based education and outreach program that includes video broadcasting of public events

Conclusion

These goals and activities are an ambitious agenda for the Sagehen Creek Field Station, yet they represent only some of the possibilities that lie ahead. We are interested to hear what you think about these ideas and whether you can suggest how to implement them. We will use your feedback to develop an implementation plan that will guide day-to-day activities at the station for the next three to five years. In this way, we hope Sagehen will meet your needs and thrive for years to come.

Appendix I: Sagehen Reserve Program Planning Advisory Group⁷

John Battles	Professor of Forest Ecology, University of California, Berkeley
Edward Beedy	Science Coordinator, Jones & Stokes
Doug Boyle	Associate Research Professor, Desert Research Institute, University of Nevada, Reno
Jeff Brown	Station Manager, Sagehen Creek Field Station, University of California, Berkeley
Beth Burnside	Vice Chancellor for Research (ex officio), University of California, Berkeley
Ray Butler	Interested Citizen
Carol DeMuth	Assistant Director, Pacific Southwest Research Station, UCDA Forest Service
Lisa Dobey	Executive Director, Tahoe/Truckee Community Foundation
Steve Eubanks	Forest Supervisor, US Forest Service, Tahoe National Forest
Jim Gaither	The Nature Conservancy, Sierra Nevada Program Director
Alexander Glazer	Director, UC Natural Reserve System
Laurie Goldman	Director of Planning and Analysis, Office of VC-Research, University of California, Berkeley
Barbara Green	Truckee Town Council
Greg Greenwood	Executive Director, Swiss Mountain Climate Institute
Susan Harrison	Professor and Director, UC-Davis Natural Reserve System, University of California, Davis
Lisa Heki	Lahontan Cutthroat Trout Project Manager, US Fish and Wildlife Service
Michael Hogan	Principle, Integrated Environmental Restoration, Inc.
Dale Johnson	Professor, University of Nevada, Reno
Jim Kirchner	Professor and Director, Sagehen Creek Field Station and Central Sierra Field Research Stations, University of California, Berkeley
Don McCormack	Former Truckee Town Councilman
Sandra Morey	Regional Manager, Region 2, California Department of Fish & Game
Cadie Olsen	Hydrologist, Trinity Consulting
Ted Owens	Nevada County Board of Supervisors
Jim Plehn	Member, Truckee River Watershed Council

⁷ Membership as of February 2005.

Mary Power	Professor and Director, California Biodiversity Center, University of California, Berkeley
Vladimir Pravosudov	Assistant Professor, University of Nevada Reno
Ted Robertson	Lawrence Hall of Science, University of California, Berkeley
Joanne Roubique	District Ranger, US Forest Service Truckee Ranger District
Jim Sedell	Director, US Forest Service, Pacific Southwest Research Station
Peter Stine	Program Manager, US Forest Service, Pacific Southwest Research Station
Sarah Trebilcock	Member, Truckee River Watershed Council
Scott Tyler	Professor and Director, Hydrology Graduate Program, University of Nevada, Reno
Lisa Wallace	Executive Director, Truckee River Watershed Council
Dennis Williams	Superintendent, Tahoe Truckee Unified School District