



Management Plan

For the University of California, Berkeley,
Sagehen Creek Field Station,
a Biological Research and Education Station,



Office of the Vice Chancellor for Research,



Berkeley Natural History Museums and



California Biodiversity Center.

17 July 2003
Jim Kirchner, Faculty Director
Jeff Brown, Station Manager

I. Overview and Introduction

A. Overview

The Sagehen Creek Field Station Management Plan outlines several components designed to provide for the day-to-day operation of the facility, and to promote the long-term viability of the Sagehen basin for research and educational purposes.

B. Goals of Sagehen Creek Field Station

Sagehen was established in 1951 as part of a program in teaching and research on freshwater fisheries and wildlife funded by the state of California through the University of California, Berkeley. The station's location along Sagehen Creek was chosen because of its suitability for research on trout and other research problems of interest to the Berkeley faculty. Unique research facilities were constructed, including a fish observation building with an 8m underwater window, allowing ongoing monitoring of fish behavior.

Although initially fisheries work was stressed, from the outset Sagehen was intended to serve a broad spectrum of ecological research interests. The station has particularly encouraged long-term studies and monitoring. For the first several years, the station served primarily as a research base for UC Berkeley staff and students, but since then it has been used by faculty, staff scientists and students from many universities, government agencies, non-profit institutions and K-12 schools. In recent years Sagehen has attracted researchers from New York, Colorado, and Texas in addition to California and Nevada.

The goals of Sagehen Creek Field Station are:

- a) To contribute to scientific understanding of the ecological effects of fire risk management activities in montane forest ecosystems.
- b) To test approaches to restoring and enhancing the ecological functioning of second-growth montane Western forests.
- c) To contribute to scientific understanding of the social and ecological effects of expanding residential development adjacent to Sierra Nevada wildlands, including the cumulative impacts of intensive recreational use of wildlands.
- d) To contribute to scientific understanding of the interconnections between hydrological, geochemical, and ecological processes in snowmelt-dominated watersheds.
- e) To continue to improve the ability to conduct field research and teaching in general, and to expand the range and types of studies conducted.
- f) To capture, store, and disseminate field data through the use of automated environmental sensors, computerized database systems and the World Wide Web.
- g) To enhance and expand K-12 outreach programs in field biology.
- h) To develop and implement a public outreach program, to further public education and to provide information on ongoing research at Sagehen.

C. Purposes of the Sagehen Management Plan.

Efforts are currently underway to develop a long-term comprehensive plan for the management the Field Station and the Sagehen basin. Several trends have made such a plan necessary. Increased usage is stressing the limits of the current physical plant (including renovations now underway) during the peak summer season. Increasing demand for educational use of Sagehen must be addressed. With increased usage, the need for research and educational guidelines and increased research/education support has become more important. At the same time that the need for support has increased, state-wide financial difficulties have imposed stringent budgetary constraints. A long-term plan for the Sagehen basin is also needed to preserve its natural attributes while addressing the severe, and growing, risk of catastrophic wildfire. The creation of the Central Sierra Field Research Stations, with Sagehen serving as the hub for this network, also creates opportunities and challenges. Rapidly changing technologies for field monitoring and data analysis (e.g., GIS and embedded network sensing) also provide new opportunities, but require planning and infrastructure development.

The goals of the plan are:

1. To provide for the day-to-day operation of the facility.
2. To outline management policies for research, education and outreach.
3. To acquaint the local community, the University community, other academic entities, government agencies, and other potential users with current and future research and education opportunities at Sagehen, while at the same time encouraging further suggestions for management, development and operations.
4. To anticipate and plan for future use and visitor needs.

D. Development of the Sagehen Management Plan.

Although Sagehen Creek Field Station has operated successfully for decades without a long-term plan, several recent developments have made the need for long-term planning particularly evident. First, research and teaching at Sagehen has shifted away from the emphasis on fisheries and wildlife that characterized the early decades at the Field Station. Second, Sagehen has recently emerged from a turbulent and uncertain period, and now has new on-site managers, a new Berkeley faculty director, and a new administrative home in the office of Berkeley's Vice Chancellor for Research. Third, use of Sagehen for research and teaching has increased dramatically in recent years, with user-days in 2002 totaling over three times the previous average for busy years. The intensity of current use is putting an increasing strain on the station's limited facilities. Fourth, although the Berkeley campus has made a long-term commitment to managing and supporting the station, California's well-known fiscal difficulties have highlighted the desirability of collaborative management arrangement for Sagehen, in which the station would be supported by several universities and overseen by a board of directors from the participating institutions. A long-range plan is a necessary first step in developing a

collaborative management structure for Sagehen. Fifth, rising fuel loads in the Sagehen watershed over the past several decades have led to an extreme risk of catastrophic wildfire. A long-range plan for managing this risk is urgently needed.

As part of this long-range planning process, Sagehen's Faculty Director (Jim Kirchner) and Resident Manager (Jeff Brown) have assembled a Planning Advisory Group of individuals and organizations interested in the future of the station (see Table 1). It is expected that this group will meet at least twice a year, or more frequently as needed, to discuss planning issues at Sagehen. It is expected that the management plan itself will be updated every three to five years, or as required by changing circumstances.

The Planning Advisory Group includes representatives from three universities (UC-Berkeley, UC-Davis, and the University of Nevada, Reno), six government agencies (the U.S. Forest Service, the California Resources Agency, the Nevada County Board of Supervisors, the Lahontan Regional Water Quality Control Board, the Truckee Town Council, and the Truckee School District), and several non-profit organizations (including The Nature Conservancy, the Tahoe/Truckee Community Foundation, and the Truckee River Watershed Council). The diversity of constituencies represented in the Planning Advisory Group indicates the broad scope of interest in Sagehen and its future; it also makes this planning exercise an unusual experiment in participatory, collaborative planning and management. The Planning Advisory Group held its first meeting this February, and several more meetings are planned for the coming year.

Research and teaching at Sagehen have been shifting away from the emphasis on fisheries and wildlife that characterized the Station in its first decades. We have identified five new target areas in which research at Sagehen is likely to expand: (1) fire ecology and fire risk management, (2) restoration and enhancement of ecological functioning in second-growth montane Western forests, (3) social and ecological effects of development near wildlands, and (4) interconnections between hydrological, geochemical, and ecological processes in snowmelt-dominated watersheds. These five target areas are not exclusive, but instead serve to illustrate research areas for which Sagehen's setting, facilities, and infrastructure are particularly well suited.

E. Establishing Usage Limits for Sagehen

Sagehen is managed as a field research and educational facility, with the goal of encouraging as much research and educational activity as possible without damaging the resource base of the Sagehen basin. Usage limits have not been approached by use to date, except during the peak summer season between mid-June and early August. At present the primary usage constraint is the limited housing and facilities at the station. Usage impacts on the surrounding natural resources have not yet been a significant problem, owing to the size of the Sagehen basin (3200 hectares) and the scope of the surrounding network of Central Sierra Field Research Stations (CSFRS).

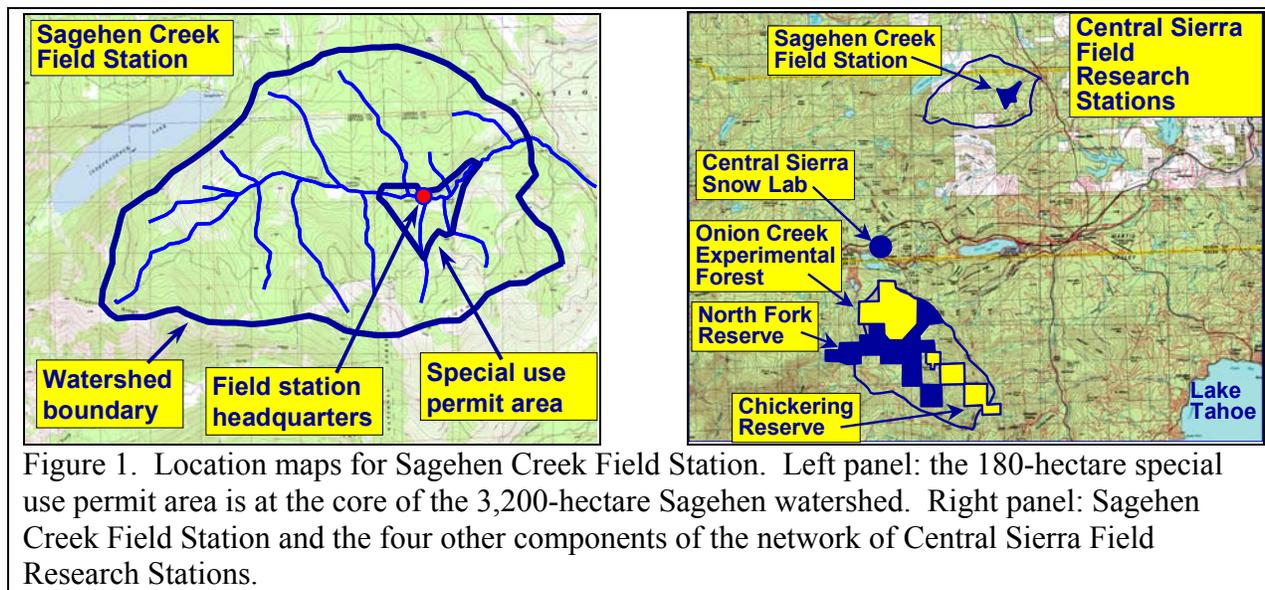
Sagehen Creek Field Station is situated just east of the crest of the Sierra Nevada mountains, roughly 13 km north of Truckee, California, at an altitude of 2,000 m. It has

provided facilities for research and education in biology, fisheries, forestry, hydrology, entomology and wildlife since 1951, operating under a Special Use Permit from the USDA Forest Service. Research at Sagehen has resulted in over 75 Ph.D. and M.S. theses and 340 publications. Sagehen also serves as the hub for a larger field station network, the Central Sierra Field Research Stations (CSFRS). This network comprises Sagehen Creek Field Station, the Central Sierra Snow Laboratory, Onion Creek Experimental Forest, the Chickering American River Reserve, and the North Fork Reserve (see Figure 1, below). Together these field stations encompass roughly 8,000 hectares of high-altitude montane forests.

F. Sagehen Field Station Facilities and Resources

1) Location and Background

Sagehen Creek Field Station is located within the 3,200 hectare Sagehen Creek watershed in the Tahoe National Forest; the field station itself comprises approximately 180 hectares and 2.4 km of stream channel in the center of the watershed (see Figure 1, below). UC Berkeley has operated these lands under a Special Use Permit with the Tahoe National Forest since 1951. In addition, the entire Sagehen Creek watershed is managed for research purposes under the current Tahoe Forest Plan, as the primary component of multiple-use management of the basin. UC Berkeley and the Tahoe National Forest are currently developing a long-term cooperative management agreement for the Sagehen watershed and surrounding lands.



The climate at Sagehen encompasses severe contrasts. Summers are typically dry with daytime high temperatures averaging around 25 °C, but summer nighttime temperatures routinely drop below 0 °C. Winters are snowy with daytime high temperatures averaging around 5 °C; snow cover typically lasts from November to April or May, and winter access requires traveling by skis, snowshoes, or snowmobiles.

The lands surrounding the field station include several fens, wet and dry meadows, willow thickets, lodgepole pine stands, mixed forests of ponderosa pine, Jeffrey pine and white fir, and scattered stands of aspens. Strong contrasts in groundwater permeability have created sharp boundaries between habitats at Sagehen (for example, dry sagebrush meadows and permanent wet meadows coexist within 10's of meters of one another), providing valuable settings for comparative ecological research.

2) Administration

Sagehen Creek Field Station is administered by the Berkeley's Vice Chancellor for Research, the Berkeley Natural History Museums (BNHM) and the California Biodiversity Center (CBC), an organized research unit of the University of California at Berkeley. The BNHM, a consortium of campus natural history museums, is also responsible for the administration of several biological field stations controlled by the campus. The BNHM endeavors to support field research by capturing, storing, and disseminating field data via computerized database systems, and by linking research activities at Berkeley's field stations with museum-based research activities. The Resident Station Manager at Sagehen is Jeff Brown (full-time employee), the Resident Assistant Manager is Faerthen Felix (40% appointment) and the Faculty Director is Professor Jim Kirchner. Professor Kirchner also serves as director of the broader network of Central Sierra Field Research Stations.

3) Research Areas and Habitats

Sagehen is located on the east slope of the Sierra Nevada Mountains at an elevation of approximately 2000m. It part of (and is surrounded by) the Tahoe National Forest. The special use permit area includes fens, meadows that range from dry grasses and annual plants to wet, Carex-dominated areas, open areas of sagebrush, and a large area that was burned in 1960 and is currently dominated by large stands of tobacco brush and greenleaf manzanita with young lodgepole and Jeffrey pines. Along Sagehen Creek, lodgepole pines dominate. The balance of the area is mixed coniferous forest consisting primarily of lodgepole pine, Jeffrey pine, ponderosa pine and white fir.

The surrounding Sagehen watershed encompasses tracts of uncut red and white fir, areas of logged red fir and small groves of aspen. On Carpenter Ridge (the headwaters of Sagehen Creek at the Sierra crest) are stands of mountain hemlock; beneath the cirque of the ridge is a small lake and vernal pool. Some areas within the basin have been heavily grazed by sheep, where large stands of woolly mule's ear (*Wyethia mollis*) occur in near-monoculture. Many small lakes and several large water bodies (including Lake Tahoe and Pyramid Lake) are within driving distance of Sagehen.

Fish populations in Sagehen Creek have been studied extensively. The most important species in the creek are brown, rainbow and brook trout, Tahoe sucker and Piute sculpin. The underwater viewing window at Sagehen's fish house has allowed extensive observation of fish behavior.

Perhaps the most important attribute of the Sagehen basin is its 50-year record of research and monitoring. Long-term data from Sagehen cover nearly all species of vertebrates, many aquatic invertebrates, fire succession and vegetation, stream flow, water quality and weather records. Much of this information is available on Sagehen's website (<http://sagehen.berkeley.edu>).

4) Physical Facilities

Sagehen administers 180 ha and 2.4 km of Sagehen Creek within the Tahoe National Forest under a Special Use Permit. The site has 22 buildings (Figure 2). Negotiations are now underway with the USDA Forest Service for the expansion of the research area to include the entire 3,200-hectare Sagehen basin. A plan for research management for the Sagehen basin will be formalized through a long-range Cooperative Management Agreement.

Sagehen's facilities are divided into two main groups: *the Lower camp/headquarters complex* and *Upper Camp* of researcher cabins, with several outlying buildings including the *Leopold cabin* and the highway garage. Most of Sagehen's facilities are 40-50 years old, and are in need of renovation or replacement. The renovation process began in 2003 with contracting for replacement of the Lower Bathhouse, complete renovation of the community kitchen, roof repair on the East Cabin and the Tool Shed and removal of three damaged tent cabins.

Sagehen can house a maximum of 53 people in heated, winterized cabins (most are heated with wood stoves). One large, unheated laboratory/classroom building with two separate spaces is available for teaching or research in the summer months and a small, heated wet lab is available year round. There are three kitchen spaces and one dining hall where researchers and visitors may prepare their meals. A small library/conference room has good selection of local and regional field guides, Sagehen-based theses and reprints of scientific publications. The University of Nevada, Reno library is only 70km away, and provides extensive access to journals and books (as well as inter-library loan services from Stanford and Berkeley).

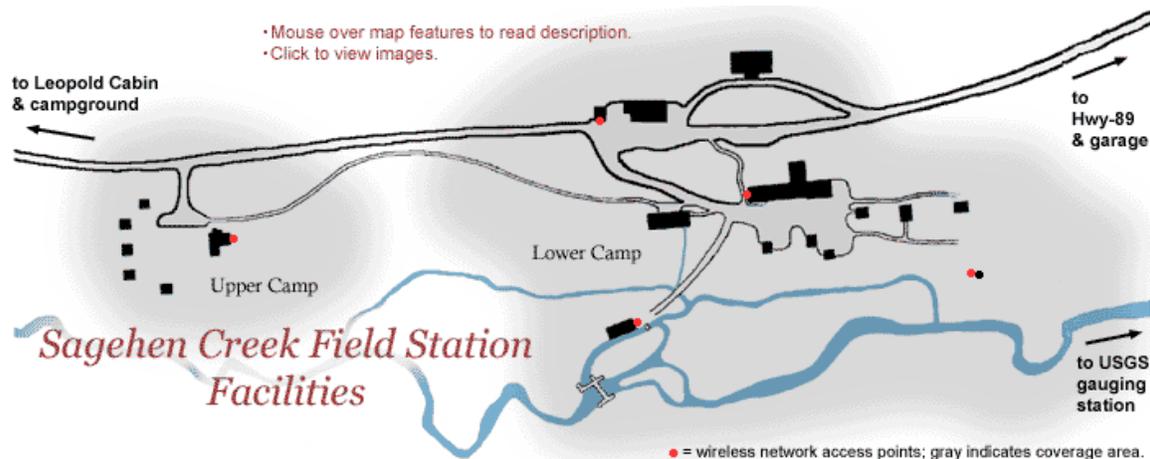


Figure 2. Facilities location map for Sagehen Creek Field Station's Upper Camp, Lower Camp/headquarters and Wireless Network Coverage areas.

The station has a network of computers and peripheral devices, connected via a local wired and wireless LAN with satellite internet access that services the Lower and Upper camp areas. Sagehen has also been selected as a test location for distributed environmental sensing, as part of the NSF-funded Center for Embedded Network Sensing (CENS). Sagehen's role in CENS is still in the design process.

The station has a website (<http://socrates.berkeley.edu/~sagehen>) with an online application/reservation system, online data source links, an online bibliography, and species lists for amphibians, mammals, birds, bony fishes, plants and reptiles. There is also extensive station information available on the website. There is one computer dedicated to GIS applications and data storage. Further enhancements to the station's GIS/data capabilities are in process.

Sagehen has a fully automated weather station that records temperature, humidity, atmospheric pressure, wind speed, wind direction, solar radiation and ground soil moisture. This information is collected and archived at the Western Region Climate Center and is available online. Working in conjunction with the Desert Research Institute (DRI), three additional weather stations are being installed progressively up the basin towards the upper ridgeline. There is also a SNOTEL site on the ridgeline, further adding to Sagehen's archive of weather data. Sagehen is also a US EPA National Atmospheric Deposition Program monitoring site. This nationwide program samples and analyzes the chemistry of precipitation and dry deposition.

Sagehen Creek is a benchmark stream within the USGS benchmark hydrologic network. Stream water samples are collected on a regular basis and analyzed by the USGS. These analyses are archived and available online. A USGS stream gauging station has been in operation at Sagehen since the early 1950's. Real-time satellite transmission will begin this spring with the installation of satellite uplink equipment.

G. Challenges

Expanding research activity at Sagehen and in the surrounding network of Central Sierra Field Research Stations has meant that staff and facilities are stretched thin. Over the past 5-10 years, Sagehen has averaged roughly 950 user days per year, but calendar year 2001 recorded over 1500 user days, and calendar year 2002 recorded over 3,400 user days. The long-range plan will need to evaluate the impact of rising use on Sagehen's facilities and infrastructure. Ongoing fiscal challenges within the California State budget will make it difficult for the state government, including the University of California, to provide substantial facilities improvement funds for the foreseeable future.

The risk of catastrophic forest fires within the Sagehen watershed is high, and rising year by year. Very high fuel loads have resulted from a combination of decades of fire suppression, regrowth of crowded even-aged stands following logging in the early 1900's, and bark beetle infestations that have left extensive dead and downed lodgepole pine. The development of a Forest Health Management Plan for the Sagehen Basin will be a critical component of the long-term strategic plan for Sagehen. The draft plan that is currently under development envisions an adaptive management approach, in which the ecological effects of different management strategies, such as thinning and prescribed burning, will be intensively monitored. We expect

that fire management activities at Sagehen will generate many research opportunities relating to fire ecology, management and post-fire restoration.

II. Research/Educational/Outreach Use Management Policy

A. Goals of Research/Educational/Outreach Use Management

1. To provide research, educational and outreach support and facilities for researchers and others active at Sagehen.
2. To provide access to natural ecosystems for researchers and educators working in the central Sierra Nevada.
3. To provide for the orderly management of research projects, educational and outreach programs such that unintended lasting effects on the habitats are minimized and conflicts among projects and activities are avoided.

B. General Research and Educational/Outreach Guidelines

A very broad range of research projects and Educational/Outreach programs are considered potentially appropriate for Sagehen, under the following general constraints.

1. Approval: Researchers, educators and others, including resident researchers, must obtain written approval from the Station Manager and Faculty Director before initiating any project. This is accomplished through an online reservation/application system.

2. Basis of evaluation: Proposals for research, educational and outreach activities at Sagehen are to be evaluated by the Station Manager, the Faculty Director, and in some instances the USDA Forest Service, primarily according to the impact of the proposed work on the natural resources in research/study areas.

Early contact in the planning stages and regular meetings between researchers, educators and others are encouraged to discuss present and planned activity with the Station Manager. Sagehen staff, visiting scientists, post doctoral students, educators, undergraduates and independent research associates are all requested to present research/educational and outreach plans to the Station Manager, spelling out the research areas needed, special conditions, expected conflicts, duration, potential environmental impacts of the project, and housing needs.

3. Informing users of the on-site research regulations: Potential users of Sagehen are provided a list of regulations online.

4. Reporting: Researchers are requested to file a brief project report before they leave Sagehen, to acknowledge Sagehen assistance in their publications, and to send Sagehen two copies of all publications based on work at Sagehen and associated reserves. We recognize that much of the long-term value of work at Sagehen is the long-term accumulation of data, not all of which is published, but which can be made available to future researchers. Sagehen therefore may request a copy of all field notes be archived at Sagehen in the format established and maintained since the 1950's. Further, Sagehen may request fully documented data sets. Originals

of archived data sets may not be removed from Sagehen, but Sagehen may provide copies or duplication facilities to those requesting archived data.

a) Upon written request by the investigator, Sagehen will safeguard data from release to persons not specifically authorized by the investigator for a period of 10 years after the data are deposited. The data will be made generally available in the absence of such a written request.

b) In the event of an investigator's death while data are protected, data will be made generally available in the absence of contrary instructions.

c) In the case of projects already underway at the time this policy is implemented, it is especially critical that the investigators appreciate the importance of archiving existing data, to enhance the value of data that will be archived in the future.

5. Permits: Researchers, educators and others must obtain any necessary permits from the State of California and Federal Government before collecting, importing, or exporting animal or plant materials. Bird banding will be done under current U. S. Fish and Wildlife Service Guidelines and regulations. Animal Care and Use Protocols, as required by the National Science Foundation and UC Berkeley Animal Protocol Office, are to be acquired by visiting researchers through their sponsoring academic units. All of this needs to be accomplished prior to the start of any work at Sagehen.

6. Contracts: Researchers, educators and others will be individually responsible for following University of California contracting and insurance policy for any work done under contract for materials or goods to be delivered on Sagehen. Sagehen takes no responsibility for oversight or care of materials delivered by freight or by other delivery vendors under contract with researchers.

7. Indemnification: All researchers, assistants, visitors and anyone present at Sagehen to work on approved projects must sign a copy of the Liability Release Form, available online from the Sagehen website, <http://sagehen.berkeley.edu>

8. Resolution of conflicts: From time to time, conflicts may arise between resident staff researchers, visiting researchers and the teaching community at Sagehen. Normally, such problems can be resolved amicably by the parties involved or through the informal mediation by the Sagehen Resident Manager. In the event that mediation efforts by the Resident Manager or the Faculty Director are unsuccessful, the UCB Field Station Committee may agree to hear a case and recommend a resolution.

Attachments:

Table 1: Sagehen Reserve Program Planning Advisory Group list

Appendix I: Sagehen Planning Proposal, pdf doc available online on "Planning Group Page"

Appendix II: Sagehen Emergency Response Plan, available online on the "Info Page"

Table 1. Sagehen Program Planning Advisory Group: Membership as of February 2003

University of California, Berkeley	
Beth Burnside	Vice Chancellor for Research (ex officio)
Jim Kirchner	Professor and Director, Sagehen Creek Field Station
Jeff Brown	Station Manager, Sagehen Creek Field Station
Mary Power	Professor and Director, California Biodiversity Center
John Battles	Professor of Forest Ecology
Laurie Goldman	Director of Planning and Analysis, Office of VC-Research
University of California, Davis	
Susan Harrison	Professor and Director, UC-Davis Natural Reserve System
University of Nevada, Reno	
Scott Tyler	Professor and Director, Hydrology Graduate Program
Dale Johnson	Professor
Doug Boyle	Associate Research Professor, Desert Research Institute
US Forest Service	
Steve Eubanks	Forest Supervisor, Tahoe National Forest
Joanne Roubique	District Ranger, Truckee Ranger District
Peter Stine	Program Manager, Pacific Southwest Research Station
California Resources Agency	
Greg Greenwood	Deputy Asst. Secretary/Science Advisor
Nevada County Board of Supervisors	
Barbara Green	County Supervisor
Lahontan Regional Water Quality Control Board	
Cadie Olsen	Hydrologist
Truckee Town Council	
Don McCormack	Former Town Councilman
Truckee School District	
Pat Gemma	Superintendent
The Nature Conservancy	
Jim Gaither	Sierra Nevada Program Director
Tahoe/Truckee Community Foundation	
Lisa Dobey	Executive Director
Truckee River Watershed Council	
Lisa Wallace	Executive Director
Jim Plehn	Member
Sarah Trebilcock	Member
Integrated Environmental Restoration, Inc.	
Michael Hogan	Principal
Soderquist Consulting	
Charles Soderquist	Principal
Jones & Stokes	
Edward Beedy	Science Coordinator
