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A few words from the Director of the NRS

The UC Regents approved the addition of the Sagehen Creek Field Station to the Natural Reserve System in March 2004.

Sagehen Creek Field Station is within the Tahoe National Forest at an elevation of 6,380 feet on the eastern slope of the northern Sierra Nevada, approximately 20 miles north of Lake Tahoe. It is embedded in a mosaic of vegetation communities that includes coniferous forest dominated by Jeffrey pine, lodgepole pine and white fir, montane chaparral, sagebrush steppe, wet and dry meadows, and spring-fed fens. This high-habitat diversity is due to the topographic and hydrologic complexity of the basin, combined with a strong east-west precipitation gradient.

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UC Davis entomology student Eli Sarnat pursues his coursework in a meadow at Sagehen Creek Field Station. Photo by Alex Wild

Sagehen Creek Field Station becomes the 35th NRS reserve!

Sometimes you get an offer you can't refuse. Adding a new site to the UC reserve system in tough budgetary times is not a step to be taken lightly. But when that prospective reserve has already accumulated more than half a century of research history, when it is supporting increasingly significant teaching and public outreach efforts, and when it comes with a campus commitment of financial support, the decision becomes a lot easier.

On March 18 of this year, The Regents of the University of California designated Sagehen Creek Field Station as the 35th site in the UC Natural Reserve System. Though few people may have marked the item on the Regents' Agenda, the inclusion of this field station in the UC reserve system represented the culmination of years of effort by a wide range of interested parties, from local community activists and U.S. Forest Service representatives to UC Berkeley administrators, the Sagehen staff, and NRS personnel.

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Sagehen becomes 35th NRS reserve!

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The beginnings of facilities at Sagehen Creek Field Station, circa 1954. Photo by Paul Needham

There's no question that Sagehen is a spectacular addition to the Natural Reserve System. Located just over the crest of the Sierra Nevada in the Tahoe National Forest approximately 20 miles north of Lake Tahoe, the field station offers tremendous research and instructional opportunities. The land on which Sagehen is situated is managed by the U.S. Forest Service. The field station itself occupies some 452 acres (183 hectares) and enables access to roughly 7,900 additional acres (~3,200 hectares) of Truckee River watershed that features mountain meadows and fens, montane chaparral, and extensive stands of yellow pine, mixed conifer, and red fir forests. The area's diverse biota includes more than 500 species of vascular plants, 212 species of vertebrates, and 340 families of insects.

For decades, the site has been operated as a field station by UC Berkeley through a long-term cooperative agreement with the Forest Service, originally signed in 1951. This makes Sagehen the second oldest NRS reserve. Only Hastings Natural History Reservation, located in Carmel Valley and established in 1937, has a longer history; it too is administered through UC Berkeley.

Research at Sagehen has produced data from pioneering studies of the trout fishery and stream ecosystems, as well as long-term studies of the beaver, marten, and bird populations. The field station's online database comprises more than 50 years of weather data, as well as biological inventories for amphibians, birds, bony fishes, insects, mammals, plants, and reptiles. Teaching collections for birds, insects, plants, and mammals are also available.

Currently, Sagehen consists of 19 buildings, including a library/computer lab; two classrooms; communal kitchen, eating area, and deck; office space; and fish observation house. Up to 50 people can be housed year-round at Sagehen, making this site perfect for a wide range of field classes. Two legendary Berkeley faculty, Paul Needham and Starker Leopold, established a fisheries and wildlife field course at Sagehen in 1954, beginning a teaching tradition that continues to this day. One UC Davis course, Entomology 109, has returned to the field station every other year for more than three decades (see page 11, "Sagehen hosts two generations of 'Bug Boot Camp'").

Beth Burnside, Vice Chancellor for Research at UC Berkeley, led the effort to bring Sagehen into the NRS. "I've had a continuing interest in how field stations function and survive," she observes, citing

her long relationship with the Bermuda Biological Station for Research (<http://www.bbsr.edu>). "I was trained as a zoologist, and I like the kind of research that goes on at these sites, but I'm also aware of the kinds of challenges that such remote units have to deal with."

Even with Burnside's support, however, preparing Sagehen for admission to the NRS was a long, difficult process. Soon after she became vice chancellor in January 2001, Burnside dispatched two of her staff to look at the field station. The report they returned was dismaying. Sagehen's facilities had fallen into serious disrepair. Burnside held a few meetings on campus to gauge support for the site, but she received little encouragement. One faculty member bluntly advised her to give it back to the Forest Service.

But Burnside is not one to be easily dissuaded. She decided to go up and have a look herself. "Jeff Brown [who had just become the field station's manager] showed me around. I realized how valuable [Sagehen] was, but also what a challenge it would be. That's when we started addressing the issue of where it should go and how we could attract more faculty involvement. What are the unique things the field station could offer that would make it more competitive for resources?"

Brown turned out to be one of the bright spots in Burnside's visit. He and his wife, Faerthen Felix, were working hard to turn the place around, cleaning the buildings thoroughly and building strong contacts with the local community. "But Jeff was struggling," explains Burnside, "with no faculty

director or any real link to this campus. He was trying to bring people back, with some success, so he was starting to have needs.”

Burnside decided to support Brown's efforts. “That's when I contacted Jim Kirchner [a professor of earth and planetary science at UC Berkeley] and asked him to take on the role of faculty director. It was a challenge, but he agreed because he really cares about the station, and he was already director of Chickering [the Chickering American River Reserve, a nearby NRS site] and snow lab [the Central Sierra Snow Laboratory, administered by UC Berkeley], so it makes sense to have all of those units under the same director.”

Another reason for selecting Kirchner was that he specializes in watershed hydrology and geochemistry, an area Burnside felt might make an ideal focus for Sagehen. “Every field station needs a unique focus, and I see powerful opportunities for growth in special aspects of hydrology and pristine watershed studies. That's an area where Sagehen could really stand out.”

This feeling was reinforced at a stakeholders meeting that Burnside and Brown organized and held at Sagehen in the fall of 2002 to discuss the field station's future. “I was really turned on by that meeting,” Burnside recalls. “Jeff had included people from the Forest Service, the Truckee River Watershed Council, the University of Nevada, all these different people, and there were lots of water studies going on and a very lively interaction with local community groups involved in monitoring the watershed and the health of the Truckee River. It seemed to me that there were a lot of really positive possibilities there.”

Burnside also backed her commitments, guaranteeing an operating budget for at least five years (while attempting to make these funds permanent), and providing one-time funds to renovate some of Sagehen's most dilapidated structures. Even Nature contributed to the rebuilding cause that winter, when falling trees destroyed a bathhouse and a cabin. Insurance money, combined with Burnside's one-time

funds, gave Brown enough money to build some badly needed new facilities.

Through its history, Sagehen has built up a huge reservoir of support among former researchers, students, and staff. “It's an imprinting mechanism,” Burnside observes. “Once people get hooked on a field station as undergraduates or as graduate students, they'll dream up experiments or studies to try to get back there. What I'm trying to do is get enough resources into Sagehen, to build up an appropriate infrastructure so that it can attract the people who will then continually renew it.”

Having assembled secure funding, new leadership, improved infrastructure, and renewed programs, Burnside was at last ready to write to the UC Regents, officially requesting inclusion of Sagehen Creek Field Station into the UC Natural Reserve System. And once the NRS review process for such an application was complete, it was clear this was one offer the reserve system couldn't refuse. — JB



Beth Burnside, UC Berkeley Vice Chancellor for Research, who led the effort to bring Sagehen into the NRS. Photo by Alex Glazer

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Sagehen under a full load of snow in the winter of 1969. Photo by Jennie White

Sagehen brings a half century of history — and scientific data — to the UC reserve system

The newest NRS reserve is also one of its oldest. Though the Sagehen Creek Field Station officially became part of the NRS in March 2004, its history as a UC Berkeley-affiliated teaching and research facility began in the early 1950s — back when the American conservation movement was just starting to stir. As it turned out, some of the people associated with that nascent movement would play key roles in Sagehen's long history.

The story opens in 1949, when A. Starker Leopold, a young assistant professor in Berkeley's Department of Zoology, convinced the state legislature to include a line item in the University's budget for a wildlife and fisheries program. Leopold, eldest son of pioneering naturalist Aldo Leopold, was an avid fisherman and hunter. The primary goal of the new program would be to conduct research that would support healthy wildlife for sportsmen. But Leopold also believed that what was good for wildlife was good for humans as well.

The state legislature appropriated a yearly budget of \$13,000 for the program, enough back then to support research by two professors and six graduate students. Leopold and his students would handle the wildlife portion of the program. For the fisheries program, the University hired Paul Robert ("PR") Needham, who had conducted research throughout the Sierras (most notably at the Convict Creek Field Station, which is now part of the NRS's Sierra Nevada Aquatic Research Laboratory).

Leopold and Needham were both enthusiastic outdoorsmen, but they took very different approaches in setting up their research programs. Leopold and his graduate students worked at sites throughout the state on a wide range of issues — the introduction of wild turkeys, for example, or the monitoring of dwindling bighorn sheep popu-



Sagehen founder Paul Needham in the field, circa 1954. Photo courtesy of Reg Barrett

lations. Needham, on the other hand, had one overriding passion: fish, especially wild trout. He had no respect for "lily-livered, hatchery-raised fish" that were no fun to catch, and much of his research centered on proving that hatchery fish weren't necessary for maintaining a healthy trout fishery.

But to pursue his research, Needham needed a stream. And it couldn't be just

any stream. In fact, he had very exacting requirements. Then, as now, money was in short supply, so he couldn't pay for a site. The stream would have to be small enough to permit diversions and shallow enough to allow bottom sampling of microfauna. It would have to support a healthy population of endemic fish. Ideally, it should be a high-altitude site with severe winter conditions. The area should be unpolluted and unaffected by heavy grazing. And it should be adjacent to a variety of habitats to support a range of other wildlife research programs.

Naturally, the only way to find such a stream was to go fishing.

Many stories have been told of how Needham and Leopold spent the summer of 1950 fishing every trout stream in the central and northern Sierras. These stories usually conclude that the two men settled on Sagehen Creek, a little stream north of Truckee, because that's where they caught the most fish. But sportsmen tend to be colorful storytellers, so you might want to believe Needham's 1963 annual report where he gives credit for the "discovery" of Sagehen to one of his first graduate students, Edward Dwyer.

In retrospect, Needham's list of requirements looks like it was written to describe Sagehen Creek. The stream supported nine species of fish, and it could easily be channeled and diverted for the experiments Needham envisioned. Beavers had been introduced to the creek in 1945, and they prospered, creating a series of ponds that provided ideal fish habitat. The 19-square-mile

watershed was in fairly good shape, though it had been logged at least twice and bore scars from fairly recent fires. Those areas, Needham reasoned, would be ideal for forest management research. In summer, the site was grazed by 600 sheep, but no cattle, so the creek banks hadn't been trampled and eroded. And located at an elevation of 6,500 feet, the site definitely had severe winter conditions with temperatures dipping below zero. Needham was elated. All that remained was to convince the U.S. Forest Service to let the University use the land.

In the winter of 1950, then, Needham, Leopold, and regional representatives of the Tahoe National Forest gathered at a wide spot on U.S. Highway 89 outside Truckee. There they put on their cross-country skis and, following an old railroad grade left over from logging days, made their way two miles up the Sagehen Creek watershed. Near the site of the current field station, "PR" Needham outlined his vision. He must have been quite convincing. A handshake agreement was made that day, and an official Special Use Permit was signed on April 12, 1951. The stage was set.

That First Year at Sagehen

"I remember the first summer PR had the permit in hand," Glenn Flittner recalls. "He was just itching to get up there." Flittner was one of Needham's graduate students that year. "As soon as the school year ended, we piled our gear and supplies into an assortment of vehicles and headed up there. Needham drove an old pickup with a 14-foot, fiberglass skiff loaded in the back, I had a 1937 Chevrolet Sports Coupe, and Warren Freihoffer drove one of the University sedans."

The five-hour journey took the group up over Donner Summit on old U.S. Highway 40, then north on 89. The two-lane roads through the mountains were narrow and steep. Truckee was just a small logging and railroad town in those days. Once off the paved roads, Flittner recalls, they had to clear old spikes off the railroad grade because the spikes kept puncturing their tires and causing flats. "I think Needham had made an agreement with the Forest Ser-

plains with a laugh. "PR was delighted I could pick it up so quickly, so I was the big cheese when I got on the dozer."

Needham's other smart move was to hire an experienced Swedish carpenter, Gunnar Soder, to head up the construction crew. That summer, under Soder's direction, the group built a small cabin, two tent platforms, and a storage shed. "There weren't any plans," Flittner recalls. "PR would just sketch something out on a scrap of paper, and we'd go to work."

Along with the construction, Needham and the students also found time to do some preliminary scientific work surveying the creek to determine what species were present and where they were located. They did this by blocking off sections of the stream where there were alternative channels, pumping the water out of those sections, and then capturing, identifying, and weighing all the fish they found. "We would build a flashboard dam (hinged boards anchored in the stream-bed by rocks) at the upper end of the section," Flittner explains, "and put stop nets at the bottom to keep any fish from escaping. We had to pump out the deeper pools. Once we'd counted and weighed all the fish, we'd remove the dam and restore the fish."



Noted wildlife biologist A. Starker Leopold.
Photo by Norden H. (Dan) Cheatham

vice that they would clean out most of the spikes and leftover ties from the grade into the site," Flittner says, "but beyond that, everything was awfully primitive."

Fortunately, Needham had also convinced the Forest Service to leave a bulldozer at the site. There was only one problem: nobody knew how to use it. "One of my first jobs was teaching myself how to run the thing," Flittner ex-

plains. They "diverted and drained" three sections of the creek that year to establish the viability of the process and to determine what equipment they would need in future years. Needham's plan was to create a long-term program that would last at least five years.

The year 1952 established the research pattern for the next decade. While Leopold's graduate students set up

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A half century of history — and data

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wildlife studies in the basin (most notably, Joe Hall's research on the beaver population and Bob Hoffman's study of meadow voles), Needham and his students "diverted and drained" ten sections of the creek, ranging from the headwaters high on the ridges to the meandering meadows where the creek emptied into the Little Truckee River. At the same time, they conducted "creel censuses," talking with fishermen along the creek about their experiences, identifying and weighing their catch. Needham wanted the public to have access to most of the creek (except for the area immediately around the station), specifically so he could gauge the creek's efficiency as a wild-trout fishery.

The Fish Observatory

From the start, however, Needham wasn't content just to count and weigh fish. He also wanted to observe their behavior up close. To do this, he needed an underwater observatory, so he set about getting one. Just as he had done with the station's buildings, he sketched his idea on a scrap of paper and gave it to someone else to build.

Based on Needham's drawing, the builder responded with a large steel box. Unfortunately, he failed to reinforce the openings for the windows. Consequently, each time students attempted to install a plate-glass window in the curved wall of the box, the glass broke. The students struggled with the problem throughout the summer. After a number of frustrating attempts,

they finally developed a solution, using heavy plastic and sponge rubber to seal the gaps. It was early December when they finally hauled the box out to the creek and there discovered another problem: when they tried to sink the contraption, it floated.



Fish observatory in summer (above) and in winter (below). Photos by Paul Needham

After much piling on of boulders, the students were able, finally, to make the observatory at least partially functional. Needham was ecstatic. Sure, the observatory leaked a little. Sure, it was damp and freezing cold inside. Sure, they could only get it eighteen inches into the water. But it worked!

Needham wanted to put it to immediate use to see how the trout made it through the winter. He asked his stu-

dents if any of them would be willing to stay behind. Flittner and John Sabath volunteered for the task.

All went well for a few weeks. The pair made regular fish observations and did their best to prepare the small cabin and laboratory building for the bad weather ahead. PR had given them a two-way radio for communicating with the outside world, though its range was limited to a nearby Forest Service ranger station.

Then, in mid-December, the snow began falling. And falling ... and falling ... and falling. Flittner recalls: "It got so deep on the roof, that all the doors in the building jammed shut. We had to go in and out through the windows! The bulldozer even got stuck; high centering on the ice caked into the middle of the road. We finally decided to try to get out. I radioed ahead and the highway department sent a snow plow out to pick us up at the highway." The winter fish observations would have to wait. Before beginning the long snowshoe trek out to the road, the pair went into the meadow and cut a tree off at snow level. When they returned the next spring, the observation tank was still in place and still watertight — and the tree was cut off twelve feet from the ground.

In 1953, Needham obtained a \$30,000 grant from the Max C. Fleischmann Foundation and methodically began creating the station he envisioned. Each year the Swedish carpenter, Soder, and his crew added a new building or built a major addition to one of the existing structures. One year they might put up

some housing; another year it could be a classroom or a bathhouse or an expanded cookhouse. Dick Gard was involved in much of this work, as both a graduate student (Ph.D., 1958) and the station's unofficial manager from 1958 to 1962. "They wouldn't have any real plans," he recalls. "Gunnar would sit down with some scratch paper and rough out what he was going to build ... no architect or anything. This made it possible to get a lot for very little. And Gunnar liked going up there because he liked to gamble in Reno."

In addition to his "sketchpad" buildings, Soder was often challenged to create other innovations on the fly. When the station started hosting classes in 1954, Needham realized that the students would need to take showers, so Soder built a wood-fired boiler to heat the water and pitched a tent in one of the tent frames to give the bathers some privacy. Students at the station were expected to contribute labor to the construction effort, often dedicating their spare time to "rock biology," Needham's term for digging gas and sewer lines.

The fish observatory was in regular use. Two of Needham's students, Albert Jones and Elbert Brock, spent the winter of 1953-54 in it. "We never saw any fish out the windows during the daytime," Jones recalls, "so we had to go down there before sunrise in the morning or at night. We would put on our heaviest jackets and lie on the bottom of the tank. There was a wooden grate floor on the bottom, so it wasn't totally unbearable. But we never saw an awful lot." Nevertheless, Jones and Needham did publish a couple of papers based on work carried out in the observatory. And they were recognized in the popular press when a writer from *Outdoor Life* visited and wrote an article on the professor's crazy "fishbowl."



Stream observations at Sagehen in the 1950s. Photo by Paul Needham

After a few years, Needham decided that he needed a larger, more permanent observation tank. He approached the Fleischmann Foundation with his concept in 1961. They liked the idea, and construction of the current fishhouse was completed in 1962.

Compared to the earlier tank, the new tank was a Taj Mahal, measuring 30 feet, with three, large, plate-glass windows, each one eight feet long. Needham even had the building wired with coaxial cables, imagining that future researchers would use television cameras to monitor the fish from the warmth and comfort of their laboratory. This dream was finally realized in 2004, when a Web-based "fish cam" was tied into the field station's network.

During the fifties and into the early sixties, as Sagehen's facilities grew, more and more researchers and teachers were attracted to the station. By the end of the 1950s, work conducted at Sagehen provided the basis for dozens of papers, as well as 12 master's and doctoral theses, with many more in progress. Topics went well beyond the trout

fishery, focusing on local fauna that ranged from beavers to nesting goshawks to the watershed's small mammal populations.

The completion of a teaching laboratory, funded by the National Science Foundation and large enough to house two classes of 10 students each, was a major development. All summer long, a steady stream of field classes would take up residence at the station. Beginning in 1954 and continuing well into the 1970s, Leopold, Needham, and their successors brought up their summer *Field Course in Wildlife and Fisheries*. They were soon joined by other classes in botany and entomology.

When PR Needham died unexpectedly in 1964, he left behind an amazing legacy. The once-primitive station had evolved to include 11 buildings and six tent frames. The station's central headquarters featured a kitchen, dining room, recreation room, and well-equipped laboratories. Three of the living quarters were even insulated and suitable for year-round occupancy. And PR had never given up on conducting those winter stream observations.

— JB



Paul Needham recording data at Sagehen. Photo courtesy of Reg Barrett

The Leopold years (1965-1978) and beyond — Sagehen hits its stride after Starker takes charge

After Paul Needham's death, Starker Leopold took over as faculty manager of Sagehen.

Where Needham's interest had been largely in the fishery, Leopold focused on wildlife studies. Drawing on his wide range of agency contacts, he was able to secure funding for an amazing array of studies, most having to do with establishing an animal's natural history or assessing how various fauna adapt to human-induced changes.

The science career of Vernon Hawthorne is a perfect example of how Leopold operated. In 1961, Hawthorne came to Sagehen straight from the wildlife program at California State University at Humboldt, and he stayed on as station manager for 20 years. He says: "Starker thought everybody should have a project of some kind, so he asked me what I wanted to study. I mentioned the coyotes, and naturally he had a connection at Fish and Game, so we started a coyote project."



Former Sagehen manager Vernon Hawthorne in the 1960s, with local coyote ready for tagging. Photo courtesy of Vernon Hawthorne

This was the era before animals could be radio-tagged and tracked remotely. Hawthorne's main tools were live traps, binoculars, and a field notebook. "We didn't have a lot of computers and fancy gadgets," Hawthorne recalls. "You made do with what you had. My coyote study was mainly based on trapping and tagging them throughout the year. At the very end, we started to get into a little bit of telemetry. That was as high tech as we ever got around here. It was very primitive." Halfway through his project, Hawthorne realized he had collected enough data for a thesis, and he obtained his master's degree in 1970. Decades later, Hawthorne's thesis is still available in the field station's library, along with more than 70 other Sagehen-based theses.

Leopold was also determined to get Needham's fisheries studies into print. In 1969, he called Dick Gard, who had worked alongside Needham for almost the entire 10-year study. Gard had left Sagehen and was spending a year sailing around the South Pacific. He received Leopold's call when he docked in Hawaii in December 1969. "I was probably the best person to write it up," Gard admits, "since I'd been involved longer than anybody. So when Starker offered me the job, I was delighted to accept."

Leopold's choice was a good one. Gard and co-author Don Seegrist brought the data from Needham's 10-year study of Sagehen Creek into print in July 1972 with the publication of two articles in the *Transactions of the American Fisheries Society*. Gard also collaborated with Glenn Flittner, Needham's former graduate student from the study's earliest days. The paper they co-authored appeared in the *Journal of Wildlife Management* in 1974. Looking back at the data, Flittner observes: "We dis-

covered, after sampling three to four years in a row, that our sampling methods were actually changing the population structures in those sections of the stream because the fine fry, the incubating eggs, and many of the aquatic organisms were decimated during the process. That was one of the chief findings to come out of that study."

During this period, Needham's dream of documenting fish behavior also finally came to fruition. Before he died, he had obtained a grant to purchase camera equipment and supplies. Bob Butler, one of his fisheries graduate students, took on the project and kept it going for many years. Even after moving on to a professorship at Pennsylvania State University, Butler would still travel across country to Sagehen each summer to document different aspects of fish behavior.

Winter filming fell to Hawthorne, and not only was he able to document how trout behave beneath the ice, but he also captured never-before-seen images of ice formation in the stream. His most notable discovery was the formation of anchor ice, which can transform the entire stream into frozen slush. "It was 29° below outside," Hawthorne recalls. "That was the coldest winter we'd ever recorded, and I was out in the fish house all night doing time-lapse shots. You had to be there. You couldn't just sit up at the house or it wouldn't get done. It was a 16mm film camera, so it wasn't like video where you could check to see how it was coming out."

Like most Sagehen projects, the success of this filming depended more on researcher determination and ingenuity than on available resources. "It was all done on a shoestring," Hawthorne says. "Bob Butler would have a little

bit of money left over from one thing or another, and he'd send out to buy some film or get some footage."

New construction at the field station pretty much came to a halt by the mid-sixties. One of the last major improvements during this period came in 1966 when a facilities grant from the National Science Foundation financed a power line into the station. After five years of relying on a generator for power a few hours each evening, Vernon Hawthorne's wife, Nancy Hawthorne, was ecstatic: "Before they brought the power in, there were generator rules. If you wanted to wash or iron or vacuum, you didn't do it during the day. You did it at night."

The Eighties

Don and Nancy Erman first came to Sagehen in 1971. Don had just been hired as an assistant professor in UC Berkeley's School of Forestry and Conservation, and Nancy was a research scientist. One of Don's first assignments was co-teaching the wildlife fisheries field course at Sagehen with Marshall White, a researcher who'd worked at Sagehen for years. On their first day, White took the Ermans on a tour of the site.

"One thing he took us out to see was the so-called Mason's Bog or the Hanging Bog," Erman recalls. "It's just across the creek south of the main field station. He took us over there because he figured we were aquatic people and thought we might be interested in looking at it. I was fresh from my Ph.D. studies in classical limnology and knew that bogs form traditionally as the end successions from lake filling. So I was confident I could talk at great length



Nancy and Vernon Hawthorne visiting Sagehen in 2004, more than 20 years after the conclusion of their tenure at the field station. Photo by Jeff Brown

about how this thing was formed and about the sphagnum mosses that thrived in the acidic soils."

Erman's first surprise upon reaching the site was that the "bog" was on a slope, so it obviously hadn't formed in an old lake basin. And when he checked the ground, he found no sphagnum mosses. Erman was intrigued, realizing he had discovered someplace very special. He later learned that the site wasn't a bog at all, but a fen — a hanging fen, to be precise.

"I was somewhat stunned that nothing I had learned about peat lands seemed to correspond with what I was seeing," Erman recalls. "It just sort of piqued my intellectual curiosity about what this thing was, and why it didn't seem to fit anything I had read in my studies."

The mystery of Mason's Bog — or, rather, Mason's Fen — was just the first of many surprises that drew the Ermans back to Sagehen year after year. Don served as faculty director at the field station from 1978 to 1985; Nancy completed a number of ground-breaking aquatic insect studies there. Over time, they found that the area's remarkable environment, combined with a constantly changing group of trained

researchers, was always turning up new mysteries to explore.

A perfect example came one spring in the mid-seventies when Leopold and White returned to the station after a fishing trip. The fishing had been poor in Sagehen Creek because the snowmelt had made the stream high and silty. So the pair gradually worked their way upstream until they reached Kiln Meadow, just above the station. From there,

they followed a small stream up the north side of the valley where they immediately started catching rainbow trout. It struck them that all the trout were male and about the same size.

Their story sparked Don Erman's curiosity, and he began to investigate. After several years of catch-and-release studies, he came to the conclusion that the intermittent stream, though it dried up each year by August, was actually the main spawning tributary for the local rainbow trout. Leopold and White had stumbled upon the young males, who, with the first signs of spring, move up to the spawning grounds. This discovery would have a number of ramifications for forestry management practices throughout the West.

"At the time, it wasn't well established or even known in the literature that intermittent streams had this very important function," Erman explains. "The Forest Service usually only protects the main stream where the fish are. No one worried about or protected a side stream — in particular, one considered intermittent. Such streams were thought to be of no importance. But it turns out they're extremely important."

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The Leopold years

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The industry, naturally, wasn't too excited about providing protective measures because intermittent streams are so common."

For Erman, such discoveries illustrate the importance of having a permanent field station. "When you're in an area where the organisms and systems are at your doorstep 24 hours a day over a long period of time, you can observe the unexpected. For most field studies now, you go in, do your work, and leave. There's no opportunity for seeing things you hadn't planned on. That's the serendipity of science. Whenever you're at some place and able to observe it all the time and go out at weird times, you observe things, you think about things, you see stuff you hadn't thought about. That will always be the advantage of having a place where people can stay and live and work."

The science and teaching that Sagehen hosted hummed along nicely through the seventies and eighties. The facility itself, however, was starved for funds and slowly deteriorating. Mike Williams, currently resident director of the NRS's Sedgwick Reserve in Santa Barbara County, was hired in the spring of 1981 as Sagehen's station manager. Although his background was in botany, he suspects his other skills got him the job. "I'd worked for a plumbing company in the Lake Tahoe area, putting in sewer systems," he notes with a laugh. "Sagehen had a crumbling water system and no sewer system at all, so that was my selling point."

And not only were the student-dug sewer lines failing in the harsh mountain environment of Sagehen. "Gas lines were crumbling, too," Williams explains. "We actually had propane gas bubbling up in our front yard during



The 15-square-mile Sagehen basin in winter. Photo by Jerry Booth

the spring melt, and I couldn't figure out why. Well, all the old propane lines in the yard were leaking, and that can be hazardous! We did have one explosion there about a month after I arrived. It blew up the room I was in — blew me out the door right in front of two UC vans pulling up with a classload of students. I was on fire and had to roll around to put it out. Then I had to try to figure out how to get the fire in the apartment out. Managing the station was trying at first, the place had been neglected for years, and everything was broken."

Despite this dismal start, the science at Sagehen kept Williams around. "I got a lot of research done there," he recalls. "Forty percent of my time was dedicated to research, which is a very healthy thing to do if you're going to hire people with degrees to manage these places. So I started a study on mules ear (*Wyethia mollis*) that I took with me to the University of Washington and did my dissertation on."

Williams is still amazed by the number of studies that were being conducted at the field station when he ar-

rived. "It was really active. Reg Barrett had his pine marten work going on, so they had two grad students living on site all year round, tracking pine martens with radiotelemetry. Then they had a big project by Marty Raphael, which was in essence a detailed inventory of wildlife use of that 15-square-mile basin."

It seemed that nothing in the Sagehen watershed escaped study. "Mike Morrison was doing a snag inventory," Williams recounts, "to see if the Forest Service was adhering to its management goal of leaving one snag per acre." Snags — standing dead trees — play a surprisingly important role in the forest ecosystem by providing nesting areas for animals. Pine martens, for example, live in hollowed-out snags, as do a variety of birds and insects. Unfortunately, people often cut snags for firewood in national forests. So when Morrison's ground-truthing revealed that the actual density of snags was much lower than predicted, the implications of that discovery were significant. When it came to snag density, at least, established forest management techniques weren't working.

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Future entomologists labor long into the night.
Photo by Alex Wild

Sagehen hosts two generations of “Bug Boot Camp”

Every other year for the past 42 years, the UC Davis “Bug Boot Camp” has come to Sagehen Creek Field Station to put its location and facilities to good use. This intensive, five-week-long course — which challenges students to collect, identify, and curate 200 families of insects, while also carrying out a significant field observation or experiment — is a mainstay of the UCD entomology program.

Philip Ward has been teaching the class since 1982. “It’s very intense,” he says. “Students work at their projects six days a week, usually from 7 or 8 in the morning to 11 at night: collecting, keying, preserving, mounting, and labeling their collection.” And, he admits, “in practice, at the end of the course, they even spend Sundays working.”

Ward limits class size to 10 and nearly always has to turn away prospective students. Deanna Jackson, currently a graduate student at Davis, took the course in 2002 as the culmination of her undergraduate experience. She says: “When you work at a place like Sagehen, with such a diversity of habitats, you get experience keying and handling a wide range of insects, from tiny wasps to huge moths. The variety is really valuable if you plan to make entomology your career.”

Ward’s predecessor, Richard Bohart, first started bringing entomology classes to Sagehen in 1954. Beyond the pull of historic precedent, Ward lists three reasons for returning again and again to this particular field station.

The first reason is location. Not only does the watershed provide a wealth of habitats, but the surrounding area is likewise diverse. “Within two hours of Sagehen,” Ward happily explains, “we can access almost anything from alpine meadows to Great Basin desert, with a whole slew of habitats in between — montane chaparral, sagebrush, mixed conifer forest, meadows, swamps, fens, or alpine ridges.”

The second reason is the facilities. “Sure, we’d appreciate upgrades,” Ward admits, commenting on Sagehen’s aging physical plant. “But this is one of the few places that can host a class of eight to ten for five weeks. There’s enough housing, a decent communal kitchen area, library, and conference room, and enough lab space. That’s crucial for entomology, because the students have boxes and boxes of insects and equipment, and they need bench space where they can work.”

The final factor is familiarity. “We have a tremendous database of knowledge built up about the station,” explains Ward. “Decades of entomological research and teaching have created a comprehensive picture of the insect diversity there. I can present my students with reliable lists of the families they’re likely to encounter. I can point to particular microhabitats and say, Here’s a place where you might find this kind of insect. For teaching purposes, that’s great. It adds that little bit of predictability that allows me to expose students to particular kinds of insects because we know the fauna so well.” — JB

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Dusk at the bug lab. Photo by Alex Wild

The Leopold years

Continued from page 10

Williams found himself drawn into a number of studies. “All the stream work was fascinating,” he recalls. “Don Erman and Edmund Andrews drafted me for their streambed load transport studies. We were looking at how much bedload is rock and how often that rock moved. Luna Leopold [former chief hydrologist of the U.S. Geological Survey, professor emeritus of geology at UC Berkeley, and younger brother to Starker] created these models to look at how stable streams are. Don Erman was looking at rock movement and caddis fly populations, determining which reaches of the stream were more active with caddis fly larvae. Don also had a large network of caddis fly traps around the basin, which we checked weekly, even in winter. We also did a lot of fish trapping to monitor fish passage during the spring migration and then back out again in the fall. It was exhilarating and exhausting!” — JB



Mike Williams, now resident director at the NRS's Sedgwick Reserve near Santa Barbara, was Sagehen's station manager from 1981 to 1985. Photo by Reg Barrett



Little was left of Sagehen's lower bathhouse after it took a direct hit in 2001, following the long, hard decade of the 1990s. Photo by Jeff Brown

The Fall — How Sagehen very nearly didn't survive the 1990s

Reg Barrett never wanted to be faculty director of Sagehen, though he'd been peripherally involved with the field station for years.

Three of his students had conducted research on martens there, and one student, Ellen Woodward, was continuing the long-term beaver research that Starker Leopold's students — notably, Joe Hall and Dave Taylor — had started in the 1950s. But like Leopold, Barrett and his students could pursue their wildlife studies almost anywhere in the state. Though Barrett appreciated the great work that had been done at Sagehen, the burden of keeping the place going was a distraction.

The field station itself was not in good shape. A series of lean budget years at the University had severely cut into the funds available for maintaining existing facilities, much less making any improvements. “Every year we'd ask for a 10 percent budget increase, and ev-

ery year we'd get hit with a 10 percent cut,” Barrett recalls. “After awhile, there's just not enough to do what you need to do to keep the place going.” Attempts by both Barrett (as Sagehen's then-current faculty director) and Don Erman (as a former faculty director) to raise private funds for new buildings were unsuccessful. Finally, exasperated, Barrett gave up. And so did the University: in 1993, it announced plans to withdraw from Sagehen Creek Field Station.

Shorty Boucher, who nowadays is the staff manager of those NRS reserves administered by UC Davis, and her husband, Mark Reynolds, had come to Sagehen in 1989 to serve as on-site managers. They were still there in 1993 when they received word of the field station's imminent closure and consequent loss of their jobs. “Mark and I didn't want to see the place go down,” she explains. “We actually found new positions elsewhere, but before we left



Sagehen, we drafted a letter and basically sent it to anyone connected with the reserve or the area.”

Their letter struck a nerve, especially in the local community. Truckee had changed dramatically since the mid-1950s. It was no longer a small lumber and railroad town. The opening of Interstate 80 for the 1960 Winter Olympics, along with the dramatic growth of ski resorts and vacation home developments, had attracted a swarm of outsiders, mostly from the San Francisco Bay Area. Environmental concerns were now a major issue in the region.

Local community leaders and politicians, many of whom had never before been aware of Sagehen Creek Field Station, were suddenly concerned to learn it was closing. One person who received Boucher’s letter was Kathleen Eagen, Truckee’s first mayor. “We always kind of knew Sagehen was out there,” she says, “but it wasn’t at the top of my mind until we heard it was going to be shut. Then we started learning a lot about Sagehen.”

Mayor Eagen, County Supervisor Sam Dardick, and other local activists quickly launched an effort to reverse UC’s decision. “There was a tremendous amount of activity at multiple levels,” she recalls. “Citizens, the town council, the Nevada County Board of Supervisors, the Forest Service — we were all determined not to let go of a legacy developed over time, or all that wealth of information.”

The community decided they needed the expertise that Sagehen represented. “We all need to be informed about how our watershed works,” Eagen explains, “to make sure that, as we tinker with it, advertently or inadvertently, we don’t screw it up. So it was fundamental that we wanted to make sure something with such an incredibly rich history of

work and data didn’t go away for all the wrong reasons.”

Today most people who remember the effort to save Sagehen will swear that Eagen led the charge against the University’s decision to close the field station by calling California’s governor (at that time, Pete Wilson), who then called the University’s president, who then called UC Berkeley’s chancellor, who then called UC Berkeley’s vice chancellor for research, with this succinct message: “Are you crazy?” Eagen denies having made such an initial call, but does modestly admit to having spoken with a few friends of hers, who happened to be UC Regents. “We had tremendous support locally. I don’t think of myself as the prime mover so much as I think of everybody coming together and doing what needed to be done to have it happen.”

The “Save Sagehen” movement actually marked a milestone in the development of the Truckee area’s environmental consciousness. Many of the movement’s leaders went on to found the Truckee River Watershed Council. Eagen observes: “Ten years ago, I probably couldn’t have told you why the community came together over this, but now I realize that people who live here *choose* to be here. They don’t come for incredible job opportunities or anything. They come here for the environment, and they figure out how to make a living afterwards.”

And so the University didn’t close Sagehen. But neither did it really support the field station. In effect, the site was placed on life support. A caretaker took up residence; fieldwork and classes continued at a low level. As the facilities continued to deteriorate, some classes moved to other sites. Public access was not encouraged.

One long-time local resident who recalls this period is Sarah Trebilcock,

who owns a nursery in Truckee. A Truckee resident since 1975, she had become a leader in the effort to save Sagehen. She knew the site well from the time when she was enrolled as a graduate student in botany at UC Davis, and she remembers taking field trips there with two legendary UC Davis professors, Ledyard Stebbins and Jack Major. But she also remembers that her attempts to visit the field station in the mid-nineties were usually rebuffed. “The custodian out there didn’t really want people to visit,” she says. “I’d call to say I’d like to come out there, and he’d say no, there’s danger from mountain lions this week, or some other feeble excuse. Eventually, none of us wanted to go near the place.”

Fortunately, Trebilcock is a dedicated community organizer who values Sagehen’s resources. “I’d used the station’s herbarium to do some plant identification work, and I regularly took groups out there in the eighties and early nineties. I realized we were going to lose the place unless we got professional managers out there.”

From her student days at Davis, Trebilcock was also familiar with the UC Natural Reserve System. Back then, she had visited a number of NRS sites, talking to reserve staff, especially about their outreach programs with local schools and communities. Now, together with other activists, she began to imagine a program where local schools could take kids out to Sagehen to study aquatic ecology, or carnivorous plants, or winter ecology. The key, she realized, would be to find a manager who could develop a good relationship with the community.

Meanwhile, at UC Berkeley, Vice Chancellor for Research Beth Burnside was having similar thoughts. — JB

Recovery and Renaissance — How Sagehen was saved (largely through first-rate management and administration) and so lived on to join the reserve system

Jeff Brown isn't your typical field station manager. He doesn't have a Ph.D. He hasn't spent his career in research. But Sagehen Creek Field Station didn't need a typical manager. It needed someone who could literally rebuild every aspect of its program, from its crumbling facilities to its user base and its community support.

When UC Berkeley contacted Brown, he was in Utah, leading river trips during the summer and conducting avalanche patrols during the winter. His wife, Faerthen Felix, who serves as the assistant manager at Sagehen, has an equally adventurous résumé. The two had made careers out of convincing people they can do "impossible" things on the rivers and mountains of the West.

Brown is frank about what he found at Sagehen when he arrived in 2001: "This place had fallen apart. It needed someone to come in and put it back together. I like doing that. But we had no budget, no faculty director, no contacts on campus. So we just plugged away, rented a big dumpster, and slowly began to get the place cleaned up. And then we just started talking to people, encourag-

ing them to come. Over time, that's paid off."

The numbers reflect Brown's success. From an annual base of perhaps 900 user days in the eighties and nineties, the statistics have grown steadily each year to 2,100 user days in 2001, 3,400 in 2002, and 4,500 user days in 2003. These increases are across-the-board, in every category of reserve user. Graduate students are returning to work on their theses. Faculty and agency scientists are setting up new research projects. Children in classes from local schools are coming out for daylong visits and overnight programs. From colleges and universities, undergraduates are slowly coming back. In addition to the "Bug Boot Camp," another UC Davis class — this one a botany course

— has signed on for the next five years at Sagehen, while UC Berkeley's Forestry Field Camp is coming for a day visit. Brown is working hard to lure back classes from UC Berkeley's Jepson Herbarium that once visited the field station regularly.

To support this growth, Brown is leading a mini-construction boom: renovating the main kitchen, building two replacement cabins and a new bathhouse. "We've seen it go from one extreme to another," Brown notes happily. "This is probably the best physical shape that the station has been since the fifties and sixties."

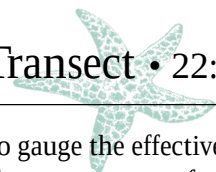
The local community has responded well to Sagehen's renaissance — and Brown's hospitality. Cadie Olsen, a hydrologist for the Lahontan Regional Water Quality Control Board, recalls: "I had a researcher doing a watershed-wide study on creek invertebrates. He really wanted to use Sagehen Creek, but access had always been tough. But when I called Jeff, his response floored me: 'Sure, come on in!' He really threw the doors open wide."

In return, Olsen, a lifelong resident of the area, has helped Brown make connections



Jeff Brown (left) signed on as station manager at Sagehen in 2001 and has never since had a free moment. Faerthen Felix (right), Sagehen's assistant manager, has a reputation for being able to handle almost anything. Photos by Jerry Booth





with people throughout the community. Brown points to a diagram on the wall of his office and explains: “Cadie sketched out a chart of all the people I should know in the community, and she was right. They’ve all been incredibly supportive.” One example of this support is the community GIS Center taking shape in the field station library. By pooling resources, individuals in the community and researchers have put together a state-of-the-art system that will benefit everyone.

Brown has also nurtured the research relationship between the University of California and various government agencies. UC Berkeley researcher John Battles is just beginning a three-year fire

study to gauge the effectiveness of different forest treatments for preventing fires. His work is funded by the U.S. Forest Service. Meanwhile, Peter Moyle and Shorty Boucher of UC Davis are starting an investigation of why it is so difficult to reintroduce native Lahontan cutthroat trout to local watersheds. Their project is supported by the U.S. Fish and Wildlife Service.

With so much activity going on at Sagehen, the field station will soon reach the limits of what it can support, so Brown is already mapping out plans for new facilities that could offer space for large meetings, faculty housing that will encourage more field research, and a new lab with modern equipment and

facilities. Brown contemplates such changes with enthusiasm: “The needs of our users have changed. They need resources, phones, computers, online access. And that takes space. We have a Band-Aid on it now, but we need to do more.”

And so Sagehen Creek Field Station continues to evolve to reflect society’s needs and concerns. Where once the research goal was promoting a healthy sports fishery, today the focus has matured to protecting a watershed that faces greatly increased human pressure, reintroducing listed species to the area, reducing fire danger, *and* restoring the forest’s ecological balance. — JB

“Portfolio of reserves” available to Sagehen-based scientists

The Sagehen Creek Field Station offers scientists opportunities that extend far beyond its 452 acres or even the surrounding 7,900-acre watershed. Jim Kirchner, faculty director for this new NRS reserve, is also faculty director for four other protected areas in the Truckee-Donner Pass area: the Central Sierra Snow Laboratory (<http://research.chance.berkeley.edu/ccsl>), the Onion Creek Experimental Watershed, the NRS’s Chickering American River Reserve (<http://nrs.ucop.edu/publications/specs/chickering.pdf>), and nearby North Fork Association Lands.

Kirchner refers to this “portfolio of reserves” as the Central Sierra Field Research Stations (<http://socrates.berkeley.edu/~sagehen/CSFRC%20site/CSFRS.htm>) and emphasizes the diverse opportunities they offer: “Sagehen is a great site if a researcher wants to work with a landscape that has a history of human manipulation, but if you’re looking for pristine wilderness, you should go to Chickering, North Fork, or Onion Creek. They all offer protected near-pristine old-growth that is difficult to find anywhere else in the Sierras.”

From a hydrologic perspective — Kirchner’s specialty — each of the four sites is distinct from the others. Sagehen is located on the eastern side of the Sierras; the other areas are on the western side. And while Sagehen lies at the headwaters of the Truckee River system,

Chickering and the North Fork Association Lands are located at the headwaters of the American River system, and the snow lab is at the headwaters of the south fork of the Yuba River. Kirchner says: “Each watershed offers different snow melt regimes, different plant communities, and different phenologies.”*

Sagehen also offers easy access to other areas within the 1.2 million-acre Tahoe National Forest, which that forest’s supervisor is willing to make available for “mutually beneficial research.”

Wherever in the Tahoe-Donner Pass area a researcher does decide to work, Sagehen can provide a perfect base of operations, offering housing, classrooms, lab space, and a computer network. Researchers interested in working at any of the CSFRS sites should contact:

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Website: <http://sagehen.berkeley.edu>

*Phenology is the scientific study of the life-cycle response of plants and animals to seasonality and climatic change.

A few words

Continued from page 1

Until Sagehen joined the reserve system, no NRS site had offered this particular constellation of habitats, and few exhibit such sharp habitat gradients. Inventories of the diverse biota found in the nearly 8,000 acres surrounding Sagehen include over 500 species of vascular plants, 212 species of vertebrates, and 340 families of insects.

We devote this issue of *Transect* to tracing the fascinating 53-year history of this field station. The dedication and ingenuity of the managers and researchers who maintained and utilized this station for so many years, through severe winters in inadequate facilities, are inspiring.

Sagehen operates under a long-term cooperative agreement, signed in 1951, between the University and the U.S. Forest Service. The Forest Service has strongly supported recent efforts to improve facilities at Sagehen and to

expand and enhance the research at this field station. Here is the perspective on Sagehen offered by Steve Eubanks, Forest Supervisor of Tahoe National Forest:

Sagehen is one of a small number of sites within the national forests that offers the

opportunity for a synergistic collaboration between researchers and managers. I worked on the Blue River Ranger District in Oregon, which includes the H. J. Andrews Experimental Forest. My experience there showed me how a

research/management partnership can dramatically increase the quality of land and resource management. Sagehen has the same potential for several reasons. First, it has a long history of research and the data that goes along with that research. Second, it has an incredible group of "alumni" who remain interested in the station and who have conducted research throughout the West. And third, there's currently a resurgence of interest in Sagehen from the academic research community. It's become a renewed "mag-



Field class at Sagehen. Photo courtesy of Reg Barrett

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net" for various kinds of forest research. I hope researchers will consider Sagehen a jumping-off point, a base of operations, for doing work throughout the Tahoe National Forest. Conditions here apply to large sections of California when you're looking at issues like fire ecology and sustainable long-term forest management.

— Alexander N. Glazer
 Director, Natural Reserve System

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