The development of a body of forest science was, along with fire control and tax reform, one of the prerequisites to private commitments to purposeful forest management in the first half of the twentieth century. This article describes the beginnings of forest research at the first forest research experiment station in the United States. Characterized by tremendous weather fluctuations and physical endurance needed to conduct experiments, the efforts at Fort Valley reflect the focused persistence demanded by Pinchot and exhibited by Gus Pearson and a host of young forest researchers. Hoping in the future to serve as an archive, interpretive facility, and environmental education center, Fort Valley should hold a special place in our memory for its role in pioneering research.

FORT VALLEY

THE BEGINNINGS OF FOREST RESEARCH

"HERE WE SHALL PLANT THE TREE OF RESEARCH" proclaimed Raphael Zon to an audience of two humans and several equines standing amidst a lovely grove of ponderosa pines of the Coconino National Forest in northern Arizona. His presence in the area was mentioned in the 7 August 1908 column "Forest Service News" in the *Coconino Sun* newspaper of Flagstaff, Arizona Territory:

> "Ralphael (sic) Zon, chief of the division of silvics of the Forest Service is in the city from Washington, accompanied by G.A. Pearson. Mr. Zon will establish temporary headquarters at Fort Valley for the purpose of making extensive investigations concerning the growth of pines, and endeavor to ascertain what causes most affect the growth of seedlings."

Zon and Pearson's mission to found the nation's first Forest Service forest research experiment station received little, if any, fanfare as the residents were not concerned over a few scientists measuring trees out in distant Fort Valley. Undeterred, forest scientist Gus Pearson moved himself into the rustic ranger's cabin, which had been originally constructed about 1906 as a temporary shelter for forest rangers, put his two mules in the barn and commenced silviculture research. These sparse beginnings blossomed into a campus of fifteen structures that housed about thirty people. Forest researchers lived and worked at the obscure spot with the goal of determining influences upon ponderosa pine regeneration. Their scope expanded to range research and covered all southwestern lands and their research findings continue to affect forest and range policy decisions. Zon's prophetic words still hold true today while the Forest Service considers the future of the Fort Valley complex.

Fort Valley's establishment was the culmination of months of planning by Forest Service Chief Gifford Pinchot, who on 11 December 1907, asked Zon to develop plans for permanent experiment stations which were solely devoted to scientific research on the national forests. Zon incorporated ideas from European foresters and his predecessors and presented his proposal on 6 May 1908 to which Pinchot made a few suggestions and encouraged Zon to proceed. About this time, northern Arizona lumbermen T.A. and M.J. Riordan asked Pinchot for help in tree regeneration. Loggers and miners clear-cut the trees leaving many areas in danger of becoming barren wastelands. Clear-cutting was the common logging practice, and in the arid southwest, presented special challenges to regeneration

BY SUSAN DEAVER OLBERDING

compared to the moister regions where trees and grasses recovered readily.

Pinchot listened to the Riordans' request as he was well familiar with the expansive northern Arizona forest from a mule-chasing escapade in 1891 while on a sojourn to the south rim of the Grand Canyon. Pinchot had hiked into the canyon and left his hobbled mules grazing on the rim. When a spring snowstorm began, the mules decided to head for home, hobbles and all, without waiting for Pinchot. He then had to track the mules through the Forest to retrieve them. Pinchot's hosts had been the Riordans, so when Coconino National Forest Supervisor Frank C.W. Pooler suggested his forest as a possible site for the nation's first research location, Pinchot passed the word on to Zon.

Zon dispatched his assistant, Samuel T. Dana, to explore areas in Arizona and New Mexico as possible locations for experiment stations. Zon also transferred young forester Gustaf A. Pearson from Oregon to Arizona to work with Dana. Then in August, Zon traveled to Flagstaff and met up with Pearson and Coconino National Forest Assistant Supervisor Willard Drake. The three rode horseback over the nine miles between Flagstaff and the Fort Valley ranger cabin. Their route through the forest skirted the southern base of the lofty San Francisco Peaks—an ancient volcano whose highest peak reaches over 12,000 feet—and their trip was delayed in a Fort Valley barn while they sat out a midsummer monsoon that produced torrents of water and created streams where there had been none before; an indication of extreme weather conditions in the area. Afterward, they rode one mile further and climbed the knoll where the Fort Valley ranger station was located, looked around, and Zon made his announcement.

Fort Valley, named for a stockade built in 1881, is a large, open, bowl-shaped meadow at the southwestern base of the San Francisco Peaks that sits at an elevation of about 7,000 feet. Native flora grows abundantly on the open park area and groundwater can be tapped at as little as three feet down. Ponderosa pine surrounds the valley and two year-round springs (named Big Leroux and Little Leroux) supply water. Homesteaders had tried settling the area, thinking the place perfect with its abundant resources and beauty, but most left after a short time because of the extreme temperatures.

Zon and Pearson felt the almost-untouched stand of timber (access to and from Fort Valley was difficult, cold, and expensive, so loggers had generally stayed away), the existing ranger's cabin, and the accessibility of water provided an optimal atmosphere for forest research. Also, if trees could regenerate in Fort Valley where sixty degree diurnal temperature changes are common, then they could regenerate elsewhere much easier. Pearson immediately set up experiments such as establishing a nursery, positioning weather recording instruments, surveying the surrounding forest, and posting sample plot boundaries. His research possibilities were limited only by his human endurance.

On 1 January 1909, Fort Valley's official opening as a permanent experiment station went unmentioned in the local paper until a week later. Its original name, Coconino Experiment Station, was changed in 1911 to the Fort Valley Experiment Station and has undergone subsequent name changes. Today, its moniker is the Fort Valley Experimental Forest Station (FVEFS) and that is how it is referred to in this article. Administratively, the Station was originally included with Forest Service District (now Region) 3, headquartered in Albuquerque, New Mexico, which comprised public lands in


U.S. FOREST SERVICE PHOTO

Raphael Zon developed the first plans for permanent forest experiment stations on the National Forests.

PHOTO TAKEN BY G.A. PEARSON, U.S. FOREST SERVICE PHOTO #89799

Fort Valley's Ranger Cabin in winter 1909.

Arizona, New Mexico, western Texas, and the Oklahoma panhandle. Funds for FVEFS were channeled through the Coconino National Forest until the 1915 creation of the Forest Service Branch of Research which formed the Southwestern Forest Experiment Station—a more accurate description for the scope of research that was transpiring. Eventually, Southwestern Forest Experiment Station headquarters relocated to Tucson, Arizona, expanded to include range research, and was renamed the Southwestern Forest and Range Experiment Station. This administrative umbrella continued until the 1950s when the Southwestern Research office was absorbed into Rocky Mountain Forest and Range Experiment Station, now Rocky Mountain Research Station, and managed from Fort Collins, Colorado.

LIFE AT THE STATION

Scientist Pearson, a Dr. Charles Bessey-trained University of Nebraska graduate of one year, stayed at Fort Valley as Director. He had worked on the Oregon Wallowa Forest on range revegetation during his initial year of Forest Service employment but really wanted to work with trees and was delighted to be transferred to the Silvics division and sent to Arizona to study natural regeneration of ponderosa pine. He spent the winter of 1908 in the unheated, uninsulated Fort Valley ranger cabin, which he converted into a combined office and residence. That particular winter, snow was measured in feet instead of inches and he worked as hard at survival as they did at scientific research. Pearson buried his canned food to keep it from freezing, but it froze anyway and all the labels came off, so Pearson never knew what his meal would consist of until he had opened a few cans. He began his prolific writing career and reported that his first effort, Reproduction of Western Yellow Pine in the Southwest (USDA-FSC 174), received mixed reviews and he was pleased his work wasn't ignored. He eventually wrote and published over ninety articles. His only companions were his mules Pat and Mike, and Pearson later credited much of his survival that first winter to them. They brought supplies, equipment, and men to the Station for its first decade of life. They could travel the nine miles into Flagstaff in one hour and forty minutes, when encouraged with a whip. The mules also escorted the young men into town for Saturday night entertainment and made sure they returned home safely. Scientist Emanuel Fritz, assigned to Fort Valley in 1916, described the mules as "insects" and "small, mean and self determined, but dutiful."

Additional researchers were assigned to Fort Valley for the 1909 field (or summer) season, and that first year they lived in tents, except for Pearson, who constructed himself a heated and insulated home that spring to avoid the unpleasantness of his first winter. Many foresters destined to become leaders in Forest Service Research spent time at Fort Valley since it was the first of its kind and the main field station and laboratory for forest management investigations in Region 3. Pearson trained and worked with men considered "founding fathers" of forest and range research including: Hermann Krauch, Theodore S. Woolsey, Jr., Enoch W. Nelson, Clarence F. Korstian, Edward C. Crafts, Bert Lexen, E.M. Hornibrook, Edward C. Martin, and Charles K. Cooperrider. Even Pinchot supposedly tore his pants while going through barbed wire at a Fort Valley sample plot.

Young silviculturist Emanuel Fritz was awestruck by the beauty of the forest with the San Francisco Peaks overshadowing all and Fritz felt blessed that he could enjoy the solitude of Fort Valley. Fritz joined the 1916 staff of the Pearson family (Pearson married in 1910), the maintenance ranger and wife, and other assistants. By this time, the Station's campus included the original ranger's cabin, a few residences, root cellar, a water system that consisted of a hand-dug well, windmill and storage tank, an office/laboratory, and a barn (for Pat and Mike and Pearson's milk cow). Pearson planned the site so that buildings were unobtrusive as though they had just dropped in amongst the trees.

Bachelor Fritz and his co-workers never figured a way to keep their quarters warm so they retired early in the evenings. During the cold weather, duties included building an all-night fire under the storage tank to keep the water system from freezing. The Station's isolation forced the workers to be self-sufficient, since the road to town was sometimes impassable and supplies were not always promptly replenished. Wintry days usually warmed up enough to set chairs outside in the sun and read or play cribbage, or to explore the forest while wearing snowshoes. Fritz also well remembered the sub-zero days and shoveling snow after a thirty-inch snowfall in April, 1917. Pearson was delighted to learn that Fritz was handy with tools because the single-wire telephone line between the FVEFS and Flagstaff always needed repair.

Pearson emphasized the housekeeping part of the job along with the scientific work since he believed that experiment stations had to be both presentable to the public and also be on the cutting edge of sound science. The Fort Valley Station triumphs as the site of the first bathroom in Region 3, built in 1918. It actually was a bathhouse, built inches away from Pearson's residence because of cost limitations on existing buildings. By this time, the Pearson's had two small children and Mrs. Pearson probably insisted upon indoor plumbing. Pearson later advised experiment stations to build structures during the first year of operations, although Fort Valley buildings were not raised right away.

PHOTO TAKEN BY G.A. PEARSON, U.S. FOREST SERVICE PHOTO #98863

Fort Valley mule team—Pat and Mike—in January 1910.

Funding was slight from the very beginning as research had low priority from administration and also lacked exposure to the general public, which in turn, meant less congressional lobbying for money. But the sparse staff, sometimes under difficult circumstances, continued to gather data necessary for making forest management decisions. Fritz was convinced that if regeneration could work in Fort Valley with its unfavorable conditions, it could be done anywhere else easier. He did not specify, however, if he was referring to Fort Valley living accommodations or forest problems.

Depression-era governmental work project funding and the expansion of research duties to include range experiments caused more construction to occur between 1930 and 1935 than the prior twenty-two years. In 1935, the original water system was replaced by a two and one-half mile underground pipeline that connected Little Leroux Springs water to the Station. Electricity replaced gaslights in 1936. This was the era of the most activity at Fort Valley, with both forest and range scientists and their families on site. Social life for the close-knit residents meant square dances, group Thanksgiving dinners, and recreational games. Townspeople, too, occasionally attended the square dances. Pearson and other scientists involved themselves in Flagstaff activities, always appearing in their official uniforms, as Pearson was a stickler about proper public behavior—never was a Forest Service vehicle parked near a movie theater. Pearson was a member of the Board of Directors for the Museum of Northern Arizona (MNA) in Flagstaff and counseled museum staff on forest and climatological issues. His contributions were so valued that MNA dedicated a building to him, known as Pearson Hall. Pearson also assisted Dr. Andrew E. Douglass, of tree-ring dating fame, by lending tree-boring equipment from FVEFS.

RANGER SCHOOL

Fort Valley served as the site for Ranger Schools to train incoming District 3 rangers as both the research scientists and National Forest personnel worked cooperatively. The first school was held in August, 1909 under tent coverings. Instructions detailing precise construction methods of these tents were sent to Pearson. Later on, regional funds were allocated to build several structures—a schoolhouse, dorm, and mess hall—upon the Station grounds that were used for the school. Students were taught silviculture, camp maintenance, law, grazing, fieldwork, horse care, and office work during the two-week sessions. Instructors included FVEFS scientists and Region personnel. A baseball game pitted the Arizona rangers against the New Mexico rangers and included rules that base runners must remove their spurs and firearms. Ranger recollections always mention the benefit of these Ranger Schools—the camaraderie that developed was as important as the skills learned. One FVEFS scientist recalled going with the 'graduates' to the airport for final good byes. Unfortunately, ranger training schools ended when World War II began and were never reinstated.

RESEARCH AT THE STATION

Long-time objectives of FVEFS ponderosa pine research include natural and artificial regeneration, stand improvement methods,

and mensurational (measuring) studies. Early research was primarily conducted in the Coconino National Forest within walking or riding distance of the Station because of few roads or vehicles. Hundreds of forested acres were available to the scientists. Pearson and his staff established sample plots throughout cutover and virgin forest lands varying in size from twelve to four hundred acres. Most of the trees in each plot were assigned and tagged with a number, so scientists could measure and observe the tree's growth over time. Usually a tree was measured every five years, sometimes more often, and checked for disease infestation, rodent damage, or other factors that affected its life. As transportation improved, other sample plots were established in southwest forests.

In January 1909, Pearson initiated a project to determine the effect of weather on ponderosa pine seed regeneration. He established six meteorological observation stations in a chain across the open park of Fort Valley, of which, three stations were checked daily, and the others weekly. The stations monitored temperature, precipitation, relative humidity, and wind movement within the park area. This assignment was to determine weather's role in reseeding and it accompanied other experiments such as the creation of plots for a seed-tree method of regeneration.

Pearson's subsequent climate-related project involved meteorological stations set at different elevations up the Peaks. This work also expanded on biologist C. Hart Merriam's work of 1889 when he developed the lifezones theory which established that distribution of distinct biotic communities is based on factors that include altitude, temperature, and humidity. Between 1916 and 1920, this study of forest types to find out physical conditions prevailing in specific forests was funded for help in fire fighting. If foresters understood which type of forest dries out before another type, then fire fighters could better prepare. Instruments placed at various locations and altitudes recorded air, soil, precipitation, and wind. Nurseries with different trees species were planted to see what grew or didn't grow at specific altitudes. Fritz was involved in this project as he and his partner placed weather stations at 8,500 feet and 10,500 feet altitudes on the Peaks. The higher station was installed in mid-November when the ground was already frozen solid and they chipped out the earth to bury support poles. They then gathered data weekly from the stations, no matter what the weather. It was an all-day event and they left the station at 5 a.m. with snowshoes strapped on and lunches packed. They'd break trail for each other during the arduous climb up through freshly fallen snow and then they'd run down the mountain once their tasks were completed.

PHOTO BY A.G. VALERA, U.S. FOREST SERVICE PHOTO #90923

Forest Ranger School on the Coconino National Forest in October 1909.

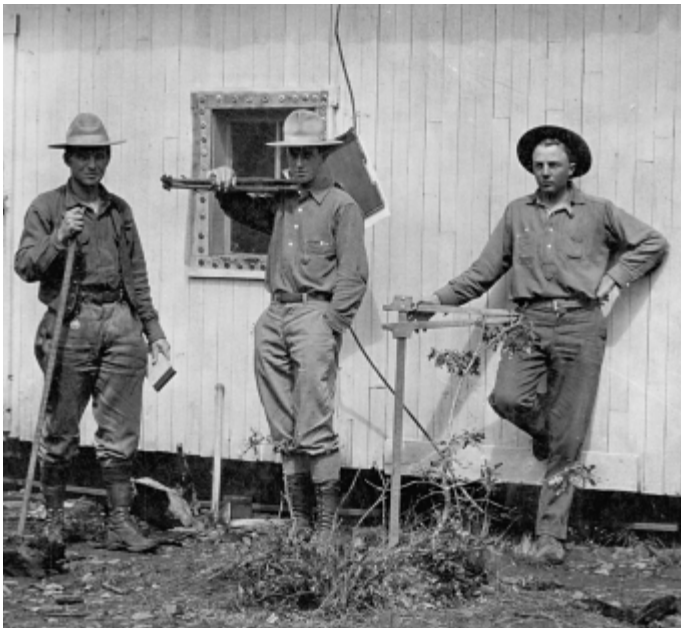
Observant Pearson noted how research plots were affected by disturbances by wildlife and livestock grazing so he, naturally, began a study geared toward trees and grasses that were subject to grazing or browsing. His 1910 recommendation was that logged lands should be protected from sheep and cattle grazing until the seedlings were well established. Further examination over the next several years on sample plots specifically established for the study of grazing habits corroborated these findings. This put Pearson in poor standing with the Arizona Cattlemen's and Sheepgrowers Association, who in 1921 passed a resolution recommending that FVEFS be de-funded. The resolution was rescinded when cattlemen admitted to wearily voting 'aye' without giving the issue much thought. Regarding wildlife grazing, Pearson wryly noted that deer were the number one browser of tender pine seedlings and he felt that foresters had more trouble with wildlife than domestic stock.

During the 1930s, experimental research was conducted on ponderosa pine, pinon tree nut production, nursery observation, range monitoring, fence post durability, and logging and timber sale monitoring. Beginning in 1936, thirty Civilian Conservation Corps (CCC) laborers worked at Fort Valley during the summer for several years on reservoirs, erosion control, forest planting and seeding, forest stand improvement, range restoration, eradication of poisonous plants and weeds, and experimental plots. Ten miles of utilization roads were also built during the Corps' tenure, as well as several extant Station structures.

Fort Valley staff that were not called into World War II military service gave radio interviews on forest topics that promoted the value of research on national resources during wartime. Pearson encouraged more use of forest trees to support national defense. The Edward C. Martin family were the lone ones living at Fort Valley during the War to keep research projects alive. Ed and his wife, Florence Cary, had met at Fort Valley when he was a CCC Supervisor and she a clerk for Pearson. They married in 1938 and their daughter was born in 1940. Florence planted a Victory garden in the original nursery site before being told such activities were not allowed on federal property.

In 1942, after a five-year analysis, a study of current Forest Service timber harvesting methods was thought to be misdirected, and Station scientists recommended that a new approach called "improvement selection" be initiated. This technique sought to cut the less desirable trees first to allow the higher quality trees more room to grow. Early logging practices had always cut the straight trees first and left the crooked ones. The Coconino National Forest began using the improvement selection method primarily because Pearson recommended it.

Studies on post-forest fire management began when a 1948 man-caused fire burned 1,800 acres near Fort Valley, and in 1950, another 1,500 acres burned. With the proximity of the Station



U.S. FOREST SERVICE PHOTO #16929

Fort valley scientists leaving tool shack for work in 1913. From Left: Hermann Krauch, M.W. Talbot, and Forbes.

to the fires, researchers were provided an opportunity for an experimental effort in replanting. The methods proved successful as they allowed the burned area to recover more efficiently and these techniques have since been employed across the nation.

Research emphasis changed in the latter half of the twentieth century from regeneration to forest management procedures. New studies began on aspen fuel cutting (in conjunction with the Coconino National Forest), wheatgrass, tests of herbicides on perennial grasses, Little Leroux Springs water flow variations, and experiments of Arizona fescue and mountain muhly plant growth. Scientific focus changed again in the 1980s to stress physiology and a greenhouse was specially constructed on FVEFS to study seedling growth in a monitored atmosphere and an entomology lab was built near Pat and Mike's barn to examine the effect of stress on trees from insect attacks. During the 1990s, research continued in the greenhouses and entomology lab, and also on goshawk and spotted owl habitats, with the main emphasis on thinning for wildfire control, which has become a major discussion point in the west.

FORT VALLEY EXPERIMENTAL FOREST

Before 1931, research areas were not designated study forests except through agreements between the Coconino National Forest and FVEFS that withdrew certain forest lands from entry. In 1931, a Forester's Order officially established the Fort Valley Experimental Forest on Coconino National Forest lands. This protected study plots from logging, hunting, fuelwood cutting, homesteading, and other uses. The original order listed 2,420 acres near the Station as Experimental Forest and all research analyses of the forest were to be conducted at the Fort Valley Experiment Station. In 1935, amendments added 1,600 acres, including Little Leroux Springs and some Kaibab National Forest lands. Another amendment in 1941 added more forest lands, making a total of 4,950 acres on the Experimental Forest. Other Experimental Forests were established in the southwest as forest and range research extended their work to the varied microclimates found in the unique southwest topography.

PEARSON'S RETIREMENT

In September 1944, Pearson received tribute for his thirty years of distinguished scientific work on ponderosa pine management. His impending retirement in December led to a seminar held at Fort Valley where twenty-five representatives of timber management and research from five western regions met for three days of discussions and fieldwork on ponderosa pine research. Pearson and his staff had measured and nurtured over 40,000 trees in the Fort Valley Experimental Forest and countless others across the southwest. Pearson's pioneering work in tree regeneration helped his successors ponder all influential factors before deciding upon the best approach to resolve a given situation. For his retirement project, Pearson wrote a monograph on ponderosa pine management that eventually became *the* handbook. Pearson died in 1949 as he was finishing his monograph and his colleagues saw the manuscript to production. Pearson is considered by some as influential as Pinchot in the early years of the Forest Service, yet he is little known outside of the southwest. Pearson became deaf as he aged and this, along with being questioned about his methods by up-and-coming researchers, caused Pearson to become defensive and embittered. His last decade of work was emotionally difficult for all those near him.

When he left, the flame he and Zon had lighted at Fort Valley grew faint as scientific presence diminished. Arizona State Teachers College (now Northern Arizona University) in Flagstaff began a School of Forestry during the 1950s and Forest Service personnel assisted professors by lecturing and offering laboratory opportunities to students. The Rocky Mountain Forest and Range Experiment Station built an on-campus Forestry Sciences Laboratory next to the School of Forestry and commencement of these two new programs coincided with the fiftieth anniversary of the FVEFS. Celebrations emphasized the newer facilities that would henceforth perform much of the work that had been accomplished at Fort Valley. And but for an on-site caretaker, the Station was generally vacated.

During the mid-1970s, FVEFS buildings were listed as surplus property and three were sold and moved off-site before other agencies said they wanted to rent facilities in situ. The Forest Service entered into a memorandum of understanding with the U.S. Geological Survey who rented several Fort Valley buildings for plate tectonics studies because the quietness meant their sensitive monitoring equipment would get more accurate recordings. Other groups to lease Fort Valley buildings for research purposes included departments of Northern Arizona University and the University of Arizona. Had these agencies not requested use of the Fort Valley structures, chances are the historic site would have been dismantled.

THE FUTURE

Fort Valley is nearing its centennial and efforts to plan for its future are underway and attempts to nominate the site to the

U.S. FOREST SERVICE PHOTO #90949

Gus Pearson reading a sling psychrometer at a Fort Valley meteorological station in 1910.

National Register of Historic Places are in process. With tight budget funds in Forest Service Research, building rehabilitation monies must come from outside sources. The Fort Valley Experimental Forest Station is a unique place because of its rank as the nations' original forest experiment station and its role in pioneering forest research. Today the campus is intact and the buildings are in fair condition. There is a comprehensive archive that contain maps, reports, photos, and most of the material compiled by Pearson and the early scientists as they discerned ponderosa pine silviculture. Guidelines on, for example, where to put a tree tag were written and rewritten several times as fieldwork altered methods. Measurements and notes of a given tree, still tagged today, over decades of monitoring offer an incredible resource to today's scientist. Photos dating to 1900 show southwest landscapes before man's alteration. This irreplaceable data is extant primarily because it was tucked away and forgotten in the Fort Valley office vault for several decades. It is now being officially archived.

Realization of Fort Valley's potential as a dynamic interpretive facility is also increasing. Recently, an environmental education day camp used Fort Valley to instruct middle school students on current thought in forest health and the Station's history. An explanation of the forest types project caused them to pause and consider just what the earlier scientists had accomplished. These students had learned the different forest types by reading a textbook, and not from actual field work. They were amazed that the information had to be initially gathered and analyzed. They became excited about locating the original plots by utilizing original maps, photographs, and records and to retrace steps to sites where the forest types study occurred. Gleeful shouts announced when a tagged tree or old nursery fencepost was spotted. One student said he wanted to return in winter via snowshoes as the original researchers did!

Fort Valley is a mere ⅛-mile from a major highway yet its secluded setting atop a small knoll shields it from contemporaneous intrusions. The historic structures sit appealingly amidst the pines, spruce, and fir and provide a sense of quiet for the visitor. Walking through Fort Valley today easily invokes visions of scientists measuring trees, planting seedlings, monitoring wildlife and livestock damage to trees, recording temperatures and precipitation, or a myriad of other activities. Fort Valley's role has evolved over time, but its heritage value and potential to help convey the lessons of history to public and professional audiences remains barely tapped. Additional investment will be necessary for Fort Valley to reach this new potential.

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