F.P. Keen, PNW

Figure 63—Forest Service Chief Colonel Greeley (far right) with entourage at the SONC Project, 1923. (Left to right) J.F. Kimball, Hal H. Ogle, A.J. Jaenicke, S.R. Black, George Cecil, Gilbert D. Brown, W.J. Rankin, J.M. Miller, E.E. Carter, Colonel William B. Greeley.

> I feel that I am not saying much that is new to all of you. From reading your News Letters during the past summer I have been greatly impressed with the excellent manner in which you all are undertaking your various investigations. I look forward to meeting you all at the conference this fall and to a thorough discussion of our policy for the future. – F.C. Craighead.

For the remainder of 1923, Miller was headquartered in North Fork but was there only intermittently. He continued his field work on the San Joaquin Project; in May he was on a demonstration trip to the SONC project (fig. 63) near Klamath Falls with Chief of the Forest Service, Colonel Greeley, and in late July and early August he was in the Grand Canyon National Park and the Kaibab Plateau on the north side of the canyon.

An outbreak of the black hills beetle (now mountain pine beetle) north of the Grand Canyon was resulting in the death of thousands of pole-sized ponderosa pine. Miller went to examine the outbreak because the plan of reorganization also placed him in charge of the southwest region. The north rim of the Grand Canyon was very difficult to reach at that time. It meant a long trip over rough roads from Kanab, Utah, or taking the Santa Fe train to Williams, Arizona, then another train to the south rim, horseback or walking down to the Colorado River at Phantom Ranch, then up the trail to Bright Angel and the north rim. Miller chose the latter route. He walked down to the Phantom Ranch where horses awaited to ride to Bright Angel. On the return trip he reversed the mode of transport. He said it was an interesting trip, but he would not care to repeat it.

In the fall he spent time on the SONC project with Keen and Kimball helping to smooth operational problems.

Miller had been a football fan since his student days at Stanford University. The end-of-the-season game between the University of California, Berkeley, and Stanford has always been a big rivalry match called the “Big Game.” On Saturday, November 24, the day of the “Big Game,” his diary notes “went over to the game in p.m.” He had conveniently scheduled a meeting at the Forest Service office in San Francisco the day before. His diaries note attendance at quite a few Big Games.

During the half-dozen years before the reorganization, Burke had been running a one-scientist laboratory at Los Gatos and then at Stanford University as already noted. He had really become isolated from current forest entomology problems at his own choosing. He was doing some

noteworthy research on the biology and control of a number of shade tree and ornamental tree insects, but this kind of work had limited political appeal when bark beetles were killing hundreds of thousands of forest trees in the West. Shade tree entomology had a mostly urban clientele but was not considered "forest entomology" by most forestry professionals. The end of the Shade Tree Entomology Laboratory at Stanford University was on the horizon. The ending two paragraphs of his memoirs are rather sad, but on the other hand, the new organization needed his talents, as Miller well knew. Burke's last entries follow (Burke 1946):

> Several new shade tree insect pests became important and were investigated. Among these were the live oak leaf gall, *Andricus bicornis*, Bakers mealy bug and the Monterey pine sawfly which defoliated numerous trees in the native forests near Monterey. The importance of the work done by the laboratory on shade tree insects is indicated by the fact that the State Highway Department took up pest control for the trees planted along the State highways and selected W.E. Glendinning of the laboratory staff to have charge of the work. This was May 15, 1922. Another member of the staff, R.D. Hartman, was taken by the State Department of Agriculture, December 1, 1923, to head its nursery service.
>
> To carry this story further would be going beyond the first years in forest entomology. During the period that I have covered thus far in this account of my experiences, the Division of Forest Insects was concerned mainly with finding out which were the most important forest insect problems, determining the taxonomy and biologies of the insects concerned, and developing direct methods of control. In later years the trend in forest insect investigations has been to place more emphasis on ecological studies and the control of insects through forest management practices. Since 1923 I believe that the western field laboratories have been larger, better equipped and staffed with more technical men. The story of these developments belongs to another period and since I started out to give my recollections of the first years in forest entomology this seems to be a good point at which to close this autobiographical sketch.

Miller wasted no time getting Burke back into "forest entomology." In October 1923, Burke examined the Lake Arrowhead Project, which was being financed entirely by private property owners, including work on several thousand acres of Forest Service land. Miller felt it was important for Bureau entomologists to give technical aid for such a project, as private funds were being donated to control Jeffrey pine beetle on Forest Service land. Perhaps this was an appropriate first assignment for Burke, as he had first discovered the Jeffrey pine beetle as a new species in Yosemite National Park in 1906. Even though there were some research elements to the project, Burke's feelings about control projects in general were not diminished as evidenced by his November 1923 contribution to the Western Division Newsletter (Burke 1923):

> Are we not putting the cart before the horse in insect control? We are spending a lot of time and money trying to keep the insect away from the tree when we do not know why it is after it. Would it not be more sensible to spend considerable money to find out why the insect attacks the tree in the first place? If we knew just why an insect attacks it might be a simple matter to make a valuable tree non-attractive and a worthless one more attractive. Close cooperation with a good chemist should solve the problem.

This was a very prophetic statement. By the 1960s, entomologists and chemists were studying precisely what he suggested. Research on the chemistry of primary attractants of host trees and insect attractant pheromones, were hot research topics. Advances were made to the point of attracting beetles to certain "trap trees" by using aggregating attractant pheromones just as Burke had suggested almost half a century earlier.

From this point on in the story, there are few documents or memoirs left by Burke. There are some interesting contributions that he made to the Western Division Newsletter until it was discontinued in 1926. His daughters and grandsons also wrote some of their recollections about their father, and those will be used later in the story.

On December 1, Miller and Burke left on the train for Klamath Falls. Enroute, in Weed, California, they met Craighead who had been appointed chief of the Forest Insect Division in April, and Evenden, from a new field station in Coeur d'Alene, Idaho. The next 2 days they showed

J.M. Miller, PSW

Figure 64—Craighead party checking beetle control work, SONC, Bly, Oregon, December 5, 1923. (Left to right) Evenden, Craighead, Keen, Patterson, Burke, Person.

Craighead bark beetle control being carried out by crews of the SONC project near Beatty, Oregon. Unfortunately, according to Miller, they found some trees abandoned by the insects that were being treated, and the burning of western-pine-beetle-infested bark not very thorough. Luckily a big storm arrived before the chief from Washington could see any more poor work, so they high-tailed it to Klamath Falls (fig. 64).

Actually the purpose of Craighead's trip to Oregon was to meet with the Western entomologists and facilitate the new organization of the Forest Insect Division in the West. The only reason he held the meeting in Klamath Falls was that the SONC project was the highest funded project to control forest insects under the auspices of the Bureau of Entomology, so many of the entomologists were working there. And he wanted to see first-hand this important project.

Craighead gathered Miller, Burke, Patterson, Keen, Edmonston, and Evenden (fig. 65) for the next 5 days, and by December 10, the organization was drastically changed.

The changes are best described by Miller who was there (Miller and Keen, n.d.).

> THE REGIONAL FOREST INSECT LABORATORIES.
>
> Up until 1924 the locations for western field stations of the Division had been selected largely from considerations of easy access to areas where control or investigative work was undertaken, and the stations were discontinued or moved whenever it seemed expedient to do so.
>
> With the rapid development of automobile transportation after 1920, it became apparent that the projects with which forest entomologists were concerned could be handled over a wide field from permanent stations centrally located as to regions. Such centralization offered many advantages from the standpoint of research programs, such as the grouping of men near educational centers where library facilities and contacts with other research agencies were available. It also offered the opportunity for the Division to build up well equipped laboratories for its work with the assurance that the installations would be permanent.
>
> In 1923, F.C. Craighead succeeded A.D. Hopkins as Chief of the Division of Forest Insect Investigations. Craighead held conferences in 1923 and 1924 with the men engaged in western pine beetle work and took into consideration the consolidation of a number of the small western field stations that were then being administered. There were then 6 stations working on bark beetle projects located at Coeur d'Alene, Idaho; Klamath Falls and Ashland, Oregon; Stanford University, and North Fork, California; and Tucson, Arizona. At a general conference held at Klamath Falls, Oregon, in December 1923 the decision was reached that all of the stations except the one at Coeur d'Alene would be consolidated and grouped at Stanford University. This would bring together all of the work concerned with the western pine beetle in the Pacific Coast

J.E. Patterson, PSW

Figure 65—Craighead's Klamath Falls conference, December 1923. (Left to right) Burke, Evenden, Keen, Miller, Craighead, Edmonston.

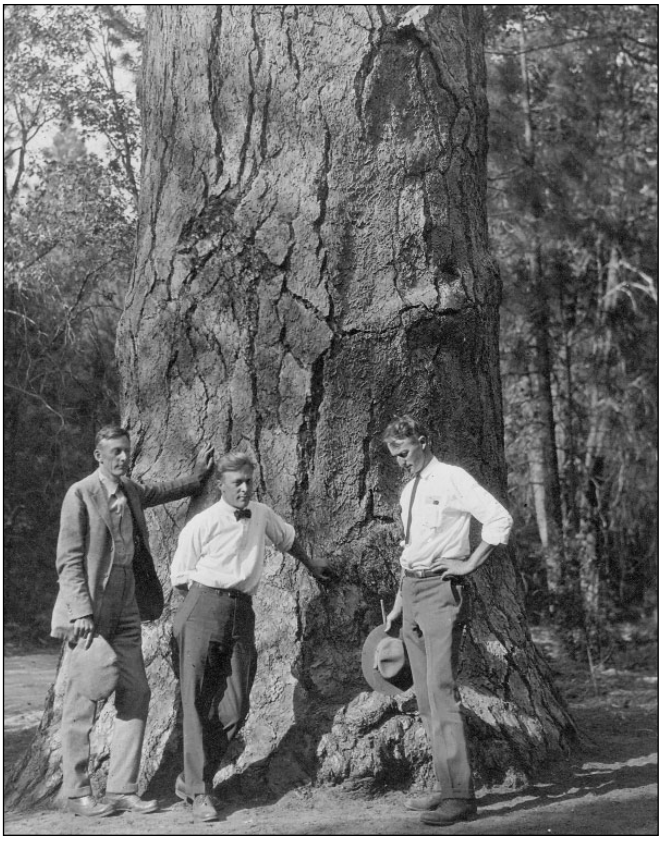
region and Southwest. The Coeur d'Alene station was to be continued and developed as the center of work for the Northern Rocky Mountain region with the mountain pine beetle as the main problem.

This move provided for 2 centers of work of the regional laboratory type for the western pine regions. For practical purposes, the California laboratory provided for the bark beetle work in the territory included by Forest Service Regions 3, 5, and 6; the Coeur d'Alene laboratory for Forest Service Regions 1 and 4. As funds permitted, it was contemplated that more adequate service would be provided by setting up additional laboratories, especially for Regions 3, 4, and 6. The title of Forest Insect Laboratory was not officially adopted by the Division until 1933.

The Forest Insect Laboratory at Stanford University went into effect in December 1924. The consolidation of personnel from the former field stations brought together a staff of approximately 12 technical men, and it was possible to concentrate man-power on the more important leads of research which will be discussed in the following sections. The program of the laboratory included a wide range of problems in forest entomology other than the western pine beetle. It's most important function was the maintenance of technical service work wherever control projects were undertaken by federal, private and state forest agencies throughout the Pacific Coast and Southwestern pine regions.

The year 1924 became a period of transition and moves. Miller was spending less time at North Fork and his family was spending more time at Bessie's family farm—"The Brose Ranch." The attraction of Yosemite continued its hold on Miller. He spent a week there discussing plans for an exhibit of forest insects in the museum, and the use of his lantern slides, and a new pine beetle movie to show summer visitors. The Bureau of Entomology was actively promoting insect control to the public now, especially since Keen found on his trip to Washington that the Assistant Secretary of Agriculture didn't know that bark beetles killed trees. Miller and the park naturalist took some time to photograph the "Giant Yellow Pine," the largest ponderosa pine in Yosemite Valley (fig. 66).

Although Burke was going to be more active on forest entomology problems, the research on shade tree entomology was continuing on a reduced scale. In January 1924, Burke, Miller, and Edmonston took Craighead to visit Monterey pine forests owned by the Del Monte Corporation that were being seriously defoliated by a sawfly. And, as if it were expected of him, Burke wrote a several-page essay on the wisdom of insect control in national parks when it was his turn to contribute the lead article for the Western Division Newsletter (Burke 1924).



J.M. Miller, PSW

Figure 66—At giant yellow pine in Yosemite Valley, California, 1927. (Left to right) H.E. Burke, F.C. Craighead, and J.M. Miller.

One paragraph tells the gist of his feelings:

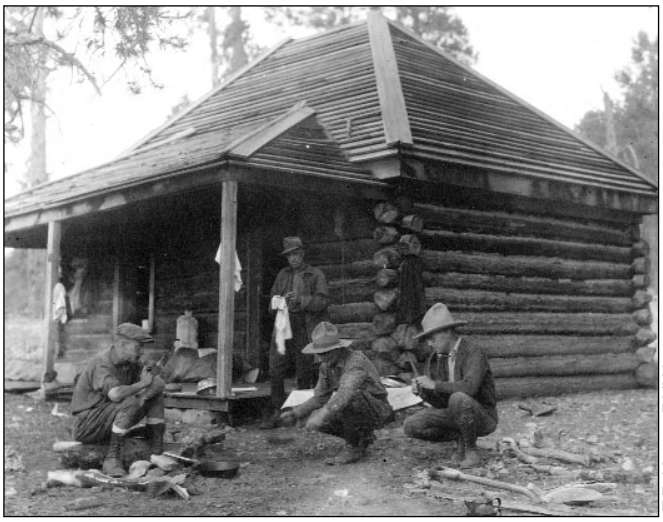
> Insect killed timber is as natural to the primeval forest as are the trees themselves. The first law of nature is ceaseless movement. All is change. Nothing stands still. Trees grow and die from many causes, destructive insects, being one of them. All of this is as nature intended and mere man should be careful how he interferes if he is going to carry out to the fullest extent the purpose for which the parks are created. *Is there any real necessity for controlling insect infestations in the parks?* [Italics added].

Of course, probably as he intended, he stirred up a hornet's nest of replies from entomologists and foresters who made their living killing insects in national forests and national parks. As a matter of fact, Crater Lake National Park had just requested funding a month before to start a control project against the mountain pine beetle, which was killing thousands of lodgepole pine (Wickman 1990).

The far-flung forest insect outbreaks that Miller now had administrative responsibility for included increasing problems in Yellowstone National Park (Furniss and Renken 2003) and a control project in the Kaibab area (fig. 67). Luckily the SONC project was winding down as the timber losses were on a downward trend, and Congress failed to provide funding until late in the year. This meant Keen's presence was not required, and this was lucky for Miller because the only other entomologist available was Patterson who was working on the Antelope Control Project with McCloud River Lumber Company, examining the bark beetle outbreak at Crater Lake, and finishing up his research on the pandora moth.

To top it off, Miller was trying to complete studies on the San Joaquin project, which had drawn him to North Fork several years earlier. This project covered a large area on the Sierra National Forest and was centered in the Chiquita Basin. The objective of the research was to see if continued summer treating of infested trees could supplement and improve the overall effectiveness of the winter/fall normal treatment periods. Summer is a difficult time to locate and treat bark-beetle-infested trees. The beetles are flying and making new attacks, and the needles are green for some months after attack. The only way to identify newly attacked trees was look for "pitch tubes" or resins mixed with the boring dust of beetle attacks exuding from the bark. It takes a very experienced eye to identify these new attacks.

Then a new research opportunity presented itself at North Fork in July. A ranger's house caught fire and resulted in a fire of several thousand acres of ponderosa pine forests. There was much interest at the time of the interrelations of forest fires and insects. Observations by entomologists revealed that bark beetles and wood-boring insects were attracted to scorched trees and trees killed by fire, but there



F.P. Keen, PNW

Figure 67—At cabin in VT Park, Kaibab National Forest, Arizona, 1922. (Left to right) Chief of Division Dr. F.C. Craighead, W.D. Edmonston, George Hofer, F.P. Keen.

was little quantitative information on what degree of scorch resulted in bark beetle attacks, how successful brood survival was in fire-injured trees, and whether beetles emerging from fire-damaged trees would kill green trees nearby. Some work of this nature had been started by Patterson and Miller after the mistletoe burn near Ashland in 1914, but results were inconclusive. Here was a serendipitous event in the back yard of Miller's research station. Even though he was scheduled to relocate to Palo Alto in 6 months, he started a study in the burn and left his assistant Wagner stationed in North Fork to follow up (Miller and Keen 1960). Miller also started a dendrochronology study on the increment growth of various classes of pine trees in the San Joaquin project. Everyone was so busy that summer that Miller suspended the newsletter from August through November.

Burke was helping as needed, but the sawfly infestation near Monterey was so serious that he developed a gasoline-powered sprayer to attempt control measures and undertook some tests of this new approach for forest insects. To complicate matters, the new chief of the Forest Insect Division wanted to get a crash course on Western forest insect problems.

In July 1924, Craighead was back in Oregon meeting with Burke, Miller, and Patterson. Craighead was no stranger to Oregon. In 1913, as a student summer employee of the Forest Insect Division, he made a posttreatment

examination with Sergent of the northeastern Oregon project that Burke supervised (Burke and Wickman 1990).

Now, 11 years later, he was in charge of forest entomology throughout the United States for the Bureau of Entomology, Department of Agriculture. Because California and Oregon had the preponderance of forest insect problems, control appropriations, and funding, Craighead had been getting information on Western forest insect problems from politicians and Forest Service people in those states. In July he also visited the pine forests north of Klamath Falls recently defoliated by pandora moth. After viewing these forests, he went with Patterson and Miller to Crater Lake National Park to meet the Superintendent, Colonel Thompson, and apprise him of the increasing infestation of mountain pine beetle in lodgepole pine mentioned earlier. After discussing the fate of the Ashland station with Patterson (it was to be closed in 1925), Miller and Craighead headed to Yosemite National Park. They met Burke there, and Craighead was taken to areas in the high Sierra where Burke and Miller had carried out the first research and surveys of the lodgepole pine needle miner and mountain pine beetle a decade before (fig. 68).

Craighead probably spent a very pleasant 10 days in the Yosemite high Sierra.

Finally, in the fall, Miller was requested to examine tree killing in the Lake Tahoe area by Nevada State Senator Oddie. Miller found white fir, Jeffrey pine, and lodgepole pine being killed by various bark beetles. He also reported root disease, probably for the first time in that area, to Dr. Meinecke, Forest Pathologist for District 5 of the Forest Service.

Summer turned to fall, Keen's SONC office closed, Sergent resigned at Ashland and was hired by the McCloud River Lumber Company (the loss of a faithful, hard-working assistant), and the demand for insect surveys declined. Miller spent more and more time at Palo Alto. He was there consulting with Burke, the new oldtimer, on the upcoming consolidation of the entire Forest Insect Division staff at Jordan Hall on the Stanford University Campus.

A new era was opening with the New Year. Burke and Miller were working together again in the same office for the first time since 1913.

J.M. Miller, PSW

Figure 68—(Left to right) H.E. Burke, H.L. Person, F.C. Craighead at Tenaya Lake, Yosemite National Park, 1924.

CHAPTER 14: The Forest Insect Division at Stanford University, 1925-1929

The year 1925 brought some lasting changes to the Forest Insect Division Station and to the career of H.E. Burke. As he put it in the newsletter on January 1 (Burke 1925)—"After a year of peace and quiet the Palo Alto Laboratory is in the midst of great confusion and turmoil preparatory to settling down into permanent headquarters for the western work," the great confusion and turmoil was described by Miller in the December 1, 1924, Newsletter—facsimile of page 1 follows:

WESTERN DIVISION NEWS LETTER
Forest Insect Investigations, Bureau of Entomology
U.S. Department of Agriculture
(not for publication)

Palo Alto, California–December 1, 1924.

THE PALO ALTO STATION.

This issue of the News Letter is coincident with the centralizing of the activities of the Western Division of Forest Insects in one central station at Palo Alto, California. A move of this sort has been considered for several years because of the need for correlation of the work throughout the western field. This could only be accomplished by unifying four small field stations in Oregon and California at one point central to the general area to be covered. The stations involved in this move are the ones located at North Fork, California, Palo Alto, California, Ashland, Oregon and Klamath Falls, Oregon.

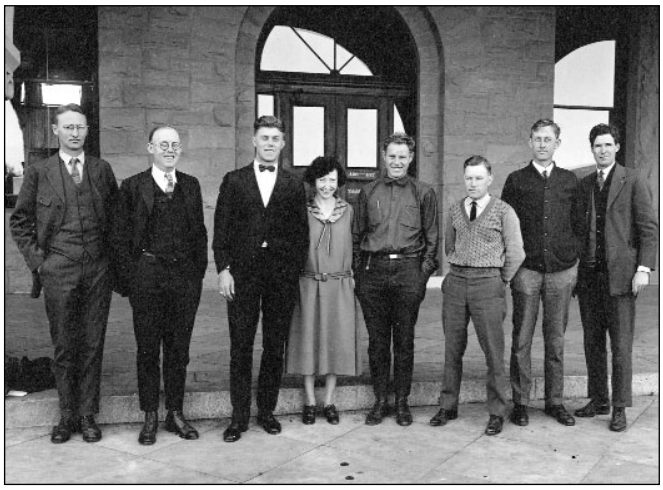
This station is the first effort on the part of the Branch to establish a permanent regional field station with an organized staff and facilities to carry out the various lines of investigation involved by the forest types of the general region. The area which this new station will attempt to serve is represented by Forest Service District 5, the southern half of District 6, District 4 and District 3. Palo Alto is central of the transportation facilities for this territory and is accessible to the District Forester's office at San Francisco. The Department of Entomology of Leland Stanford Jr. University has provided the housing necessary for laboratory and office quarters together with the use of library and other facilities.

Two of the stations affected by this consolidation will be continued as substations to facilitate the handling of special project work. These are the ones located at North Fork and Ashland in connection with the studies of the San Joaquin and Southern Oregon-Northern California project.

The personnel of the Palo Alto Station will be J.M. Miller, Dr. H.E. Burke, F.P. Keen, J.E. Patterson, O.J. Hauge, H.L. Person, Entomologists, E.A. Morrow, Assistant Scientific Aid, and R.M. Tatro, Clerk. Albert Wagner, Senior Scientific Aid, will be located at the North Fork substation during the progress of the studies on the San Joaquin project [fig. 69].

Western News Letter

Beginning with this issue we will plan to get the paper out on the first of each month from the Palo Alto Station. Due to the necessities of the field season, this is the first issue to appear since July 1, 1924. During September the question of whether it would be advisable to renew the News Letter at all was raised and a poll was taken of all the western men and others interested. There was a consensus of opinion that the paper should be kept up as it is the most available medium for this exchange of ideas and record of progress.



PSW

Figure 69—Staff of Pacific Slope Station in front of Jordan Hall, Stanford University, 1926. (Left to right) J.M. Miller, F.P. Keen, O.J. Hauge, Jean Tatro, E.A. Morrow, H.L. Person, H.E. Burke, and J.E. Patterson.

Miller went to Washington, D.C., for most of January to meet with Craighead and various people in the Bureau of Entomology, Forest Service, and Park Service. During his absence, Burke was in charge, so he bore the brunt of organizing the new station for the first month as well as his new responsibility for editing the Western Division Newsletter.

Perhaps all of this turmoil was not especially pleasing to him after spending the last 12 years as a one-man station, but for the science of forest entomology it was very important. Burke was back in the fold again with his colleagues, old and new, as a "forest entomologist." His work as a shade tree entomologist was productive and resulted in new knowledge and publications about his specialty, but the emerging science of Western forest entomology would benefit by his pioneering experiences, academic relations, and maturity, as events would demonstrate. He became the elder statesman of the newly organized station, and the fact that it was located on a university campus where he had contacts with professors and the campus administration must have helped the station get settled rapidly.

The focus of station work now started to shift from a preponderance of technical assistance for control projects with some incidental research to an increased emphasis on research. The technical assistance for control projects would continue because the Forest Service and Park Service needed such work. Their political assistance also helped with appropriations to fund the Forest Insect Division stations. But the entomologists in the station were trying to fit research into their projects to satisfy their own curiosity and to try and get a basic understanding of insect dynamics as they related to timber losses. Their new chief, Craighead, was a strong proponent of this approach.

Miller well understood this when he wrote an essay for the February 1, 1925, Western Division Newsletter titled "Investigations" (Miller 1925). In the first paragraph he wrote:

> The impetus to any research work carried on by a public agency is the result of economic pressure. To a great extent this is true of forest entomology in the United States. The demands of timber land owners for information and scientific service have largely determined the amount of funds available for the entomological work of protection. This pressure has also determined the regional problems to be first considered. The forest entomologist has had little opportunity to choose his path. Lines of research that appealed to his fancy or that in his judgment offered the most promising field for discovery, have been sidetracked for the immediate projects in hand.

He went on to explain the situation in the West.

> In the west, interest has turned largely to the protection of mature pine against bark beetle infestations. This is due to the fact that losses are often severe, that high values are at stake, and that methods of control have been developed which have yielded some measure of success. The requests of owners for information, advice and demonstration of methods has been the first obligation which we have attempted to meet.

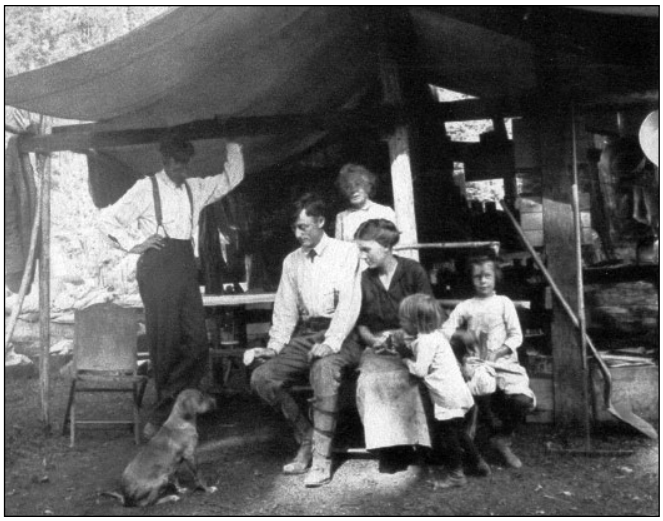
Later in the essay he explains some of the research needs as related to bark beetle problems.

> In the meantime, what about our investigative program? No one realizes better than the man in the field the need for more information and a better conception of the underlying causes of our bark beetle infestations. Such a matter as the ability to forecast the increase or decline of a bark beetle epidemic would have much to do with plans of protection. The tropisms of certain bark beetles, the distance which they fly to reinfest the areas that have been cleaned, the possibility of reducing losses through methods of forest management are some of the studies which have been considered.

This was all very well, but it was focused almost entirely on bark beetles and their depredations of pine forests. Other forest insect problems were becoming important, especially defoliating insects like the pine butterfly and Douglas-fir tussock moth in Idaho that Evenden worked on and the lodgepole pine sawfly and the spruce budworm in Yellowstone National Park (Furniss and Renkin 2003). Within a few decades, pine beetle problems were decreasing in significance in ponderosa pine stands as a spruce beetle outbreak erupted in Colorado in 1949-50. On the heels of this came Westwide spruce budworm outbreaks in fir stands in Oregon, Washington, and Idaho. The move to a University setting was fortuitous because entomology professors like Doane and others to follow became part of the research equation. Burke had already been associated with academia for over a decade, and it showed in his research and broad intellectual curiosity. Having him on the station staff and participating in forest insect research, even if such research continued to emphasize control methods, was a timely stroke of good fortune.

J.M. Miller, PSW

Figure 70—Aerial photo taken by Miller of his study area near Bass Lake, Sierra National Forest, 1925.



H.E. Burke family

Figure 71—The Burke family camp at Yellowstone National Park, 1926.

As the Stanford University years unfolded, there were changes in research emphasis by the station staff and increased participation in professional meetings and societies, but in 1925, a paradigm shift dedicated to increased basic research was still a few years away.

Miller spent most of 1925 dividing his time equally between Stanford University at Palo Alto and his research field station at North Fork where Wagner kept the fire study going. In May he became a pioneer in a new technology to rapidly assess forest insect outbreaks over a wide area. His diary entry for May 26 states, "Left Crissey Field [U.S. Army Airfield at Presidio of San Francisco] flew to North Fork in 1 hour 25 minutes. Return 4:30 p.m."

Lieutenant Taylor of the U.S. Army was the pilot on this historic flight to examine and photograph bark-beetle-killed trees and research plots near North Fork and Bass Lake. Evidently, this was the first aerial photography of insect-killed trees in the West. Several photographs were taken by Miller during the flight (fig. 70) (Miller 1926).

Miller may have been occupied with making the switch of operations from North Fork to Palo Alto, but he still found time to visit his beloved Yosemite National Park and make a hike from Booth Lake, down to Lyell Fork of Tuolumne Meadows checking for lodgepole pine needle miner and mountain pine beetle infestations.

The remainder of the station staff was very busy giving technical control advice to a new customer for their services. The National Park Service received a $25,000 appropriation in 1925 to control forest insects in the Western parks for the first time in their history. As already noted, Patterson was giving technical advice to Crater Lake National Park, which was spending its share of the appropriation combating the mountain pine beetle (Wickman 1990). And Burke, even though he was not a strong proponent of controlling insects in National Parks, was in Yellowstone National Park that summer and the following one studying control methods against a needle tier, and a sawfly defoliating lodgepole pine (Furniss and Renkin 2003). Burke was experimenting with a lead arsenate spray, delivered from trucks loaned by the Eastern Gypsy Moth Division, to kill larvae in the foliage (Burke 1932). Only 250 feet on each side of a road could be treated by this method so the result was purely cosmetic. The objective was to prevent defoliation and perhaps death of trees along scenic roads, not to reduce populations overall. Burke probably saw this as something of a wasted effort, but like a good soldier carried out the project with his usual dedication. The project did allow him to have his family with him for the summer in a beautiful setting that his wife and children enjoyed (fig. 71).

The year 1924 was the driest on record to that date in many localities in the West. This resulted in a very serious fire season. There was much interest by forest managers on the effect of bark beetles, following the fires, killing scorched trees and even nearby green trees.

TRIP TO YELLOWSTONE NATIONAL PARK 1926
by Claire Burke

The Yellowstone trip was another example of her derring-do [Mrs. Burke]. Not one of us would ever forget it or fail to place it foremost in our memories. It was not exactly a wilderness experience, but perhaps more formidable than the High Sierra was good old Highway 66. As I have often heard her say, "Even Dad looked at me as if I were crazy," when she insisted on driving all five kids and the dog in an open [it had a cloth top] Model T Ford nearly 1,000 miles from Palo Alto to West Yellowstone.

We lost various articles of clothing out of the open windows and went over bumps that tossed us to the ceiling as we sped along at a maximum of twenty-five miles per hour. Skimpy, the terrier mix jumped out once to chase a squirrel, but was just dazed for a few minutes and ran to catch up. Mother insists that we were never so well behaved; she kept Marion and Bud up front and Janet, Dorothy and Me in back for sociological reasons. I suppose Marion and Bud were a little too close to headquarters to get anything going between them. In hotels, we often had two double beds and the interrelationships were again carefully thought out.

Skimpy drove the whole way with hind feet on knees in the back seat and forepaws near Mother's shoulder. His face was always in the rear view mirror. He would drop exhausted whenever the car stopped, but immediately resume his post when the engine started.

The car was fantastic. Mother seemed to understand its every sound. After all, it was HER car. It bothered Harold [Claire's future husband] when we first met that the family car was always referred to as 'Mother's car', but every car we had as a family car replaced the first one which was a gift to my Mother on her birthday. Dad did eventually get a Model T long before they became fashionable to commute to work because he was never able to master the shift. Even in the Model T, he was apt to start out like a jack rabbit. But Mother and cars were made for each other.

It was not very far out of Wells, Nevada, when Mother discerned a strange sound in the engine. "Something is wrong with the timer"; so we turned back and got a new timer. I have always been

H.E. Burke family

Mrs. Burke and her birthday Model T Ford on the way to Lake Tahoe from Placerville, "my first long drive" (date unknown).

impressed with her sensitivity and understanding of cars. She and Marion could both change tires. Our horn failed but I provided a stentorious imitation of one of those musical horns on the outside of very expensive cars. It was gratifying to see the car ahead rapidly pull out of the way and the occupants stare in amazement as we hurried by. Our light weight and our ruxtle axle, something very special that Mother had put on our car, carried us through mire where many Buicks and such were hopelessly stuck. As we passed triumphantly, we would lean out and yell, "Get a Ford".

It was a happy moment when we entered the line up to go through the gate into the park. For miles we had been in a long chain of cars in two ruts in deep gravel. There was nothing to do but follow no stopping, no passing. One of the Rangers at the gate recognized us way back in the line and made the cars move a little to let us out. We were trying to hide Skimpy under a blanket as we were aware of the no-dog law in the park. We had permission to bring him because we would be at a ranger station far from the tourists, but we weren't sure that this Ranger would understand.

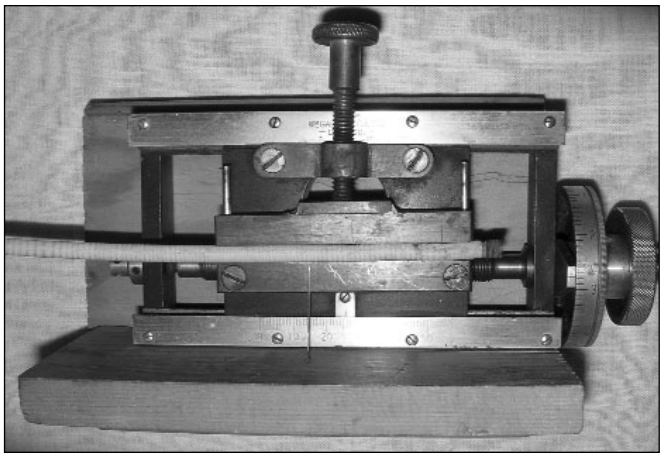
"Will your Dad be glad to see you!" he said, and waved us through the gate reserved for buses and other park vehicles. From that moment on, we owned Yellowstone." —Claire Burke (date unknown).

As mentioned earlier, a 6,000-acre blaze was started adjacent to the North Fork station when a ranger residence caught fire. This fire was in mature ponderosa pine and Miller immediately established study plots in the burned area to study the entomological relations. This research led to some important publications to be reported later.

Keen and Edmonston spent the summer of 1925 on the Kaibab Plateau continuing to help with the Black Hills beetle outbreak. They even had a local character called "Windy Jim" [Jim Henry] build a laboratory-insectory for them out of beetle-killed lumber sawn at a local mill. Professor Blackman, on leave from New York State College of Forestry, used the facilities to carry out biological studies.

Patterson, besides his work at Crater Lake, was also cruising the SONC project and finishing up his research on the pandora moth in south-central Oregon (Patterson 1929). Patterson was also using increment cores to study the effects of defoliation by pandora moth on tree growth and the relation of growth rate of ponderosa pine to susceptibility of attack by bark beetles. This was the beginning of studies that resulted in a breakthrough in the silvicultural management of western pine beetles. It was also indicative of the new dedication of at least some of the stations in aiming resources at basic research. As pointed out in the previous chapter, in the May 1925 Western Division News Letter, Burke wrote a prophetic short essay on the need of an attractant for western pine beetle. He asked, "Why do beetles attack one tree and not an identical one nearby?" This was a fundamental question that research by Hubert Person was starting to elucidate. Person was a young forester who had just joined the staff at the Stanford Laboratory. His research assignment was studying host (pine) susceptibility to bark beetle attack.

On a less enlightened note, the station hired the first female entomologist in June, 1925. Therese Beckwith, formerly a clerk at the Entomology Department of Oregon Agricultural College [Oregon State University], passed the civil examination for Junior Entomologist. But she was hired at the station as a temporary *office clerk*. Times were changing, but not that fast. She resigned a few months later, I hope to pursue a more professionally fulfilling career.



B.E. Wickman

Figure 72—Patterson's original increment core micrometer, which I still use.

The year ended at Palo Alto with Burke back at his newsletter editor duties, Miller and family in a new residence in Palo Alto, and Patterson, Keen, Person, and Walter Buckhorn (a scientific aide) filling out the staff. Hauge had resigned in November and moved back to Klamath Falls.

Measuring the radial growth of trees by using increment cores taken at breast height was in vogue. Almost all of the entomologists were making these measurements to either determine the effect of insect attacks on the trees (Patterson studying pandora moth and Burke the lodgepole needle miner), while Person, Miller, and Keen studied the relations of tree growth rate on susceptibility to beetle attack. Person alone measured over 7,000 cores in 1925 and early 1926. Measuring growth rings to about 1/100th of an inch was tedious and exacting work requiring a microscope and steady hands. Patterson devised a micrometer sliding stage that he called an "increment core comparator" (fig. 72) (Patterson 1926).

This device improved the efficiency and accuracy of measuring increment cores, and for the next decade many thousands of mature pine trees were cored and measured to determine the cryptic patterns of their growth rates.

In March 1926, the Western Division News Letter's masthead changed to "Western Forest Insect News." The subscription had swollen from only a dozen or so copies to over 100. The newsletter was increasingly calling the Palo Alto headquarters a laboratory and the other locations field stations.

In June, Miller lost his trusted field aid, Earl Morrow who transferred to the Sierra National Forest. Also, that month, the field season officially began with Burke and family going to Yellowstone National Park and Miller traveling to all of the field sites with Craighead who was making his annual field visits from Washington, D.C. He differed from Hopkins in this regard, perhaps because rail travel was improving; he visited all of the field stations at least annually and sometimes twice a year. Burke's daughter Janet, remembered one such visit to Yellowstone Park as starting with a not-too-pleased discussion of his impending visit by her parents.[1] When he arrived she distinctly remembered his wrinkled seersucker suit; he was probably disheveled from a long, hot train journey. Being a child, she did not understand this, but thought it was strange apparel for a Yellowstone Park campfire. The Burkes had quite a few VIP visitors that summer, including the Assistant Secretary of Agriculture, R.W. Dunlap.

Miller continued his annual trips to Yosemite and the Mono Lake area where extensive wind-thrown Jeffrey pine had become infested with Jeffrey pine beetle. By 1926 there was a large infestation of this insect in the area, but by 1927 it had greatly subsided. Because of the diversity of timber types and climates between the west side of the Sierra and Cascade Mountain ranges and the east side, there was never a shortage of forest insect problems to show to Craighead. Miller took full advantage of these outbreaks to propagandize the diverse problems and the station's need for more funding. Miller seemed to be a very astute leader who could discern and understand not only the research needs, but also how to publicize them and politick the right people. Under his leadership, the Forest Insect Station steadily grew in personnel and importance.

The next entomologist hired by Miller was George R. Struble, a senior entomology student at Stanford University hired to be a part-time worker at the station headquarters in Jordan Hall. Struble describes his first introduction to the station (Struble 1953):

> I was introduced to forest entomology at Stanford University in the fall of 1926, as a senior student in biology and zoology. I had taken several courses in entomology under Professors R.W. Doane, G.F. Ferris, and Isabel McCracken and decided that a career in economic entomology might be worth while. These courses were given in Jordan Hall, which housed the School of Zoology. At this location also was the Pacific Slope Laboratory of Forest Insect Investigations, U.S. Department of Agriculture, Bureau of Entomology. This laboratory was the headquarters station for forest entomological research and surveys covering the Pacific Coast States, Arizona and New Mexico.
>
> A tour of the laboratory by a group of entomology students had been arranged between Entomologist John M. Miller, in charge, and Professor Doane. The long trek by stairs led from a small headquarters office on the ground floor upward four floors into an attic section of Jordan Hall. An expanse of skylighted corridor lined by rearing cages of various designs led into a large, darkly paneled room at the north end. Some were for Dr. Isabel McCracken's studies of silkworms. Many were used in studies of forest Cerambycid larvae by Dr. H.E. Burke, a leading forest entomologist. Burke had been associated since 1901 [sic] with Dr. A.D. Hopkins, pioneer chief of forest insect investigations in America.
>
> The laboratory room was about 20 feet wide by about 40 feet long. It was lighted by a center light well and heated by a single steam radiator. Housed here were the forest insect collection, desks, files, and personnel. Two side doors led to large areas of unfinished attic space which were used mostly for storing field equipment and various tools. A section at one end was equipped and used as a photographic darkroom [something Miller always insisted on having].
>
> Our tour guides included Walter J. Buckhorn, Hubert L. Person, and John E. Patterson; others of the "bug" staff included Paul Keen and W.D. Edmundson. I was impressed by the many kinds of bark beetles in western forests and their damage. This was my first awareness of the western pine beetle.

Struble failed to mention Dr. Blackman who was writing up his biological studies of the Black Hills beetle from the Kaibab Plateau project before returning to New York.

Miller and Keen were also in a small competitive endeavor over the use of "Aeroplanes" to survey and photograph insect infestations. As noted earlier, Miller was the

[1] Correspondence from Janet Burke Eglington, 2002-2003.

first to get into the air and observe and take several photographs of bark-beetle-killed trees at Bass Lake near North Fork, California, but Keen was the first to actually experiment with aerial photography as a survey method to map an outbreak. His description of the adventure on the Modoc National Forest was written up in the Western Forest Insect News, titled, "Shooting Bugs from the Air" (Keen 1927).

> In September I had the opportunity of making such a flight over the Happy Camp District of the Modoc National Forest. The District 5 air-patrol plane, piloted by Captain M.S. Boggs, was detailed to the project through the courtesy of the Forest Service, and to the Forest Supervisor, George W. Lyons, was allotted the task of serving as weather prophet and to advise Mather Field when air and light conditions would be satisfactory for the flight.
>
> Monday, the twenty-sixth, dawned bright and clear, and Supervisor Lyons, trusting to his luck as an amateur Father Ricard, telephoned the field for the plane to come on. In the next two hours, while I negotiated forty miles of mountain road from camp to Alturas, the plane covered the two hundred miles from Sacramento to Alturas and landed on the field only a few minutes after me. Following a hasty lunch we donned helmets and goggles, strapped on the "chutes," wound up the DH-4, and in a moment Captain Boggs had it climbing skyward, like a *Chalcophora* [a wood boring beetle] scared from a bug tree, and heading toward Happy Camp Mountain.
>
> On reaching the area we circled Happy Camp lookout tower and headed toward Timber Mountain. When over the plots to be photographed I unbuckled the safety belt, knelt on the seat and hung out over the side of the fuselage in preparation to shoot at the proper moment. Captain Boggs maneuvered the plane over the plot and at a given signal shut off the motor, turned the nose up, tilted the plane to the side (a most disconcerting procedure), and as the plane settled and the vibration of the propeller ceased I clicked the camera and climbed back to safety to change plates and prepare for the next shot. After taking a dozen exposures, both vertical and oblique, we headed back to Alturas and landed safely at the field, after spending an hour and a half in the air and covering an area that would have taken a week to survey on the ground.
>
> The first day we used a "G" filter with ordinary panchromatic plates, but upon developing them found that the negatives were too weak for light conditions that prevailed on the area. You see, the Supervisor was almost as good a prophet as a Native Son, and so it started to cloud up by noon and was quite overcast by four o'clock.
>
> And the next day it rained.

Keen's exciting flight must have cooled Miller's ardor to be a pioneer in aerial photography of forests for there are no further references to this activity in his diaries, but he did take a last flight over some of his study areas just before he retired.

February 8-16, 1927, there was a meeting of all Western forest entomologists in the United States at the Palo Alto Station. J.M. Swaine, in charge of Western Forest Entomology in Canada, had suggested the year before in the Western Insect News that such a meeting be scheduled for 1927. However, no Canadian entomologists were included in the list of Burke, Evenden, Jaenicke, Miller, Blackman, Keen, Patterson, Person, and Craighead from the Washington office. Either the Canadians experienced some difficulty arranging the visit or they were not invited. For several years, Evenden and sometimes Keen had been attending the annual Western Forestry and Conservation Association meetings that were joint U.S. and Canadian. A forest entomologist from each country was invited to give an update on Western forest insect problems at every session of the association. As these "insect" sessions became more popular there was some interest in expanding the entomology portion to a full-day meeting. Swaine was most likely thinking of this when he proposed a meeting of forest entomologists only. The joint meeting never seemed to pan out, so entomologists from Canada and the United States continued to meet for brief sessions at the Western Forestry and Conservation Association annual meeting for another 20 years. In 1949, entomologists from both countries split off from the association meetings and formed their group called the Western Forest Insect Work Conference which is going strong today.

The meeting in Palo Alto was a lengthy one, 10 days, so it probably included a lot of bureaucratic chaff along with the technical wheat. In 1927, Miller's diary mentioned an ever-increasing number of trips to Berkeley without

mentioning why or precisely where. They were too numerous to involve only football and baseball games between Stanford and the University of California. Changes were on the horizon again for the Forest Insect Division, Pacific Slope Station. As recounted by Eaton (1953):

> The original proposal to locate at the University of California the forest insect investigative work of the then Bureau of Entomology's Pacific Slope Field Station at Stanford University was made by Walter Mulford, (Professor of Forestry) in a letter to J.M. Miller, dated April 15, 1927. Mulford suggested that this work be located with associated forest research being brought together on the Berkeley campus. Miller favored the proposal (letter to Craighead, April 22, 1927), and F.C. Craighead (then in charge of the Division's Washington office) fully approved (letter to Miller, May 9, 1927).

Miller must have had mixed emotions about this proposed move, because his family had their first permanent residence in Palo Alto where their son Harold (Dusty) was in high school and daughter Betty in grade school. However, Miller probably saw that the future of forest entomology lay with the newly established Forest Experiment Station and the Forestry School, both located on the University Campus at Berkeley. Before the San Francisco Bay Bridge was built, it was a shorter trip from Palo Alto to the Forest Service District 5 office in San Francisco, but the science of entomology and forestry lay in a different direction, across the Bay in Berkeley.

Miller wasted no time in establishing political ties with the Berkeley people. The December 1, 1927, Newsletter noted an important first step.

> FOREST ENTOMOLOGIST ASSIGNED TO CALIFORNIA EXPERIMENT STATION
>
> Assistant Entomologist H.L. Person took up quarters with the California Experiment Station at Berkeley [now Pacific Southwest Research Station] on November 1. Mr. Person's assignment will provide for an important phase of coordination of work between the Bureau of Entomology Station at Palo Alto and the California Experiment Station of the Forest Service. The greater part of Person's time will be given to entomological studies in which the Experiment Station is immediately interested. The Experiment Station has provided funds for a temporary assistant to work with Person in the compilation of the results of the western pine beetle tree selection studies. George R. Struble, who worked with Person last season, has been appointed to take up the assistant work in January.

What Person felt about this move is unknown. He had just recently married and according to Struble, his assistant, the couple was a popular part of the station (Struble 1953). Several months after the transfer, Person had an essay in the Western Forest Insect News that seemed critical of the research of his erstwhile colleagues at the station (Person 1928) (fig. 73).

> The selection of an 80-acre sample plot in 1926 and the addition of two 40-acre plots in 1927 may be taken as one mark of the change in the nature of forest insect investigations that has taken place within a short space of time. Much of the cream of discovery has been skimmed off the field of forest entomology, and the day of short-time studies on a great variety of insects, and of promiscuous wanderings through the forests for the taking of notes on life histories and habits of miscellaneous insects, has largely passed for the scientific investigator. There is still much to be gained by this type of study, but by most of us it will have to be followed as side line or as a form of recreation. The more evident habits and points in the life histories of our most injurious forest insects are known. What is most needed now is a knowledge of the fundamental relationships that result in increases or decreases in the loss from insects.

He presented a summary of his research to date, which was unique and proving valuable, and made a case for the use of permanent plots for this type of research. However, he seemed to forget that Miller, Patterson, and Keen had been using long-term permanent plots since 1914 and that his Cascadel plot was actually one of Miller's long-term study plots that was graciously offered for Person's use.

Miller and the others must have been at least mildly stung by this young scientist's assessment of forest insect research. Miller took exactly 30 days to reply, but he did it in his usual thoughtful way, without getting personal. The reply explains the need to remember the insect in the developing science of forest entomology in this era so well that it is worth including the entire essay (Miller 1928).

PSW

Figure 73—Field party at Mt. Hamilton, California, 1928. (Left to right) H.L. Person, W.J. Buckhorn, F.P. Keen, J.C. Evenden, J.M. Miller, H.E. Burke.

An Informal Letter of
U.S. DEPARTMENT OF AGRICULTURE
BUREAU OF ENTOMOLOGY
FOREST INSECT INVESTIGATIONS
(not for publication)

423 Jordan Hall, Stanford University, California,
March 1, 1928

FOREST ENTOMOLOGY STILL ENTOMOLOGY
By J.M. Miller

In Person's article in the February issue of this paper he very appropriately introduces the change in emphasis that has come about in our line of attack upon certain problems in Forest Entomology. Instead of devoting our entire attention to finding out what the insects are, how they live and what they do, we are concerned as well with the way in which they fit into the scheme of things in the forest. Through the large sample plot and with various types of surveys we are trying to determine the type of forest and other environmental conditions that are favorable or unfavorable to the beetles. The tree rather than the insect becomes the basis of our attack on the problem.

The shift of perspective, in which entomology becomes primarily a phase of forestry, now offers the most promising developments in the solution of our more important bark beetle's problems. But there is an obvious danger in carrying this line of approach to an extreme. First of all we are still entomologists, and a sound knowledge of the insects, their life histories, distribution and ecology is the first consideration in this science. It is in the application of this information that the title of "forest" entomologist becomes significant.

The purpose of these comments is not to start a discussion of "Why is a Forest Entomologist?" but to emphasize to the field man the necessity of keeping up the systematic collections and note records that figured so prominently in the early work of the Division of Forest Insects. I know that on control projects, and even on our sample plot and brood study work, we are prone to let this activity go by the board. This is largely due to the pressure of recording an immense amount of survey data, and to the fact that the need for insect collections and notes is not obvious at the time. The real advantages of gathering this material usually come later, when we want to check up on some particular point in the study and refer to the note or the original material if necessary.

The 'Hopk. U.S.' numbered note system, planned by Dr. Hopkins in the early days of the Division, has stood the test of considerable neglect, abuse and flagrant liberties on the part of the field men. It is still possible by this system, even though the notes have been poorly kept, to obtain any worth while information regarding any particular insect in any locality that has been recorded in the system. All the information so kept can be adequately indexed, summarized and made available to any other worker in the group. Such references are really indispensable to the field station files.

The most glaring violations of this system are where field men do not collect at all, or else take a large series of the insects connected with some particular study but fail to enter these or the appropriate data in the numbered note series. The information so recorded is available only to the collector himself, and in time will probably be lost even to him.

Although on some projects it seems best to work with the tools and methods of the forester, it is still part of our job to maintain an orderly accumulation of information about the insects that concern our problems. In doing so let's stick to the system we now have until a better one has been devised and adopted.[2]

[2] The Hopkins U.S. numbered note system for collected forest insects was recently computerized by the Forest Service Washington office led by retired entomologists Mel McKnight and Torolf Torgersen, thus vindicating Miller's faith in the importance of the system. The system can be found at http://www.fs.fed.us/pnw/bmnri/hussi1.html.

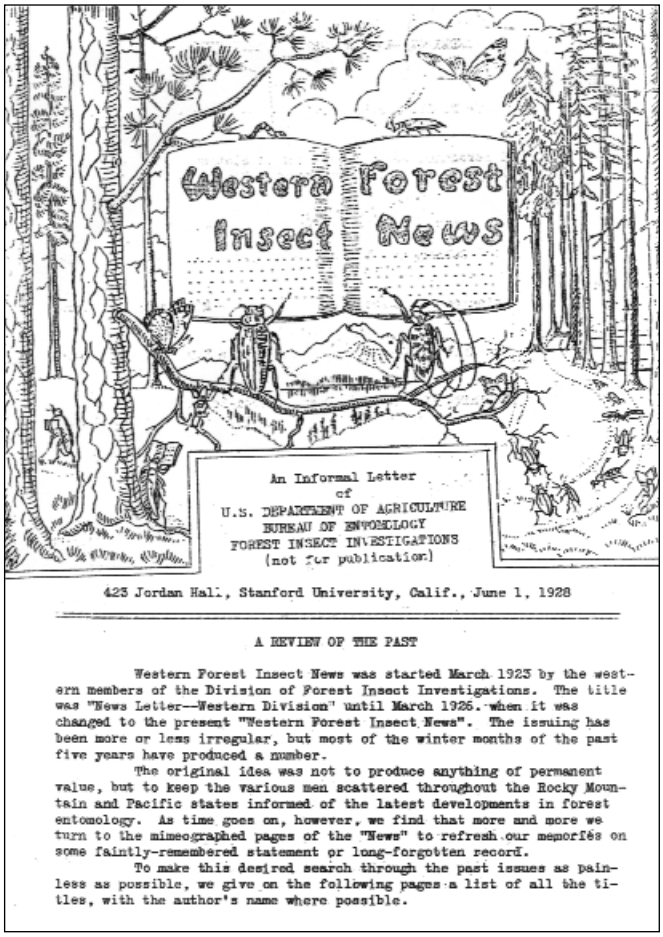


Figure 74—Cover of the Western Forest Insect News showing Mrs. Bushey's artwork.

The June 1, 1928, issue of the Western Forest Insect News was its last. It contained an index of all previous issues and a list of subscribers. There were 132 people and organizations receiving copies at no charge. There was no reason given for its demise, but Burke, the editor, must have been sorely pressed to assemble the monthly news and get it mailed out on time even though he had some good clerical assistance in Mrs. Bushey, who even did the artwork (fig. 74).

Burke was very involved in preparing reports on his control work in Yellowstone and Glacier National Parks for a conference held in Berkeley in 1928. There were apparently no volunteer editors forthcoming, so a valuable historical newsletter ceased publication.

The plans for moving to Berkeley were progressing in 1929 even as the station staff went about their duties in the field (Eaton 1953).

> In a letter to Mulford dated April 9, 1929, Miller described the amount and kind of space that would be needed for forest insect investigations if the Palo Alto station were to move to Berkeley. In reply (April 17, 1929) Mulford stated that the University was committed to the plan of having all or nearly all of the forest insect group housed in Giannini Hall at Berkeley; that C.B. Hutchison (then Dean, College of Agriculture) approved of arrangements planned; and (in effect) that most of the needs of the forest insect group could be met.

The Pacific Slope Station was about to take the most significant leap to date by moving to Berkeley. Continual change seemed to be part of the Station's role since its inception. Organizations are always changing in different ways, but the changes occurring in forest insect research seemed to be extraordinary in such a short period from 1910 to 1930.

CHAPTER 15: The 1930s–A Momentous Decade for the Forest Insect Division

The decade beginning in 1930 was an extraordinary period for the Division of Forest Insect Investigations on the Pacific slope. Some of the more significant changes that affected Burke and Miller included the relocation of the Palo Alto lab from Stanford to the University of California at Berkeley; creation of a new Forest Insect Laboratory at Portland, Oregon; establishment of the first permanent Forest Insect Field Stations in California; many personnel changes; an extreme drought in the West that greatly exacerbated bark beetle problems; the first aerial control operation against a defoliator; and, one of the most notorious forest fires in the Pacific Northwest, with attendant insect problems.

In this chapter, the professional careers and personal lives of both Burke and Miller are tied directly or indirectly to the unfolding events of the period.

The relocation of the Palo Alto lab to the University of California School of Forestry influenced many of the coming changes. Miller described the move in a very sparse paragraph (Miller and Keen, n.d.):

> In September 1930 the California laboratory was moved from Stanford to the University of California campus at Berkeley into laboratory and office quarters provided by the School of Forestry. This move established close contact of the research work with the Forest Experiment Station of the Forest Service, the School of Forestry and Entomology Division of the College of Agriculture.

Luckily Eaton prepared a summary of the move that provided a little more detail, as first noted in the previous chapter (Eaton 1953).

> Formal invitation for the Forest Insect Laboratory to move to Berkeley was made by R.G. Sproul (President of the University) in a letter to F.C. Craighead dated July 2, No commitments were made regarding what the University would provide; simply that the University would be glad to have the Forest Insect Laboratory establish permanent office and laboratory headquarters with the University of California at Berkeley. This invitation seems to have been acknowledged at the Division and Bureau levels in Washington (no copies in the Berkeley file). Craighead wrote Mulford on October 10, 1930, thanking him for his efforts in behalf of the laboratory. The decision was to accept the invitation, and the move to Berkeley was made during the last week of September, 1930. Recommendations on assignment of rooms in Giannini Hall for forest insect work were made by Mulford to Hutchinson in a letter dated October 14, 1930.

It appears that no formal agreement was drawn up specifying the conditions under which the Forest Insect Laboratory would occupy space at Berkeley. Allusions to the need for an agreement were made in correspondence between Craighead and Miller in the spring of 1930, but apparently no definite action was taken. In a letter to Craighead dated April 4, 1930, Miller makes the following comment: "Apparently a formal agreement would have to be renewed from year to year, and for that reason would not have any great advantage over an informal understanding."

The logic of this relocation had been developing for several years and was evidenced by Person's and Struble's detail to the Forest Service Experiment Station in 1928. During summer and fall of 1930, various Forest Insect Division staff members made the move to six rooms on the top floor of Giannini Hall on the University of California Campus. And as related by Struble, the attic area was used for storage, and by the mid-1930s three additional offices were acquired, one of them outfitted as a photographic darkroom (Struble 1953).

This move was affected by some personal hardships for Miller, whose family did not move their home to Berkeley. Palo Alto was the only permanent home the Miller family had experienced. There were probably some serious family conferences about this, but Bess stood firm. There was reluctance on the part of Miller to give up this residence. Consequently, Miller found bachelor quarters in Berkeley and commuted to his home across the bay on weekends. As Miller had no small children at home and he traveled a great deal anyway, he probably viewed the situation as a temporary inconvenience.

Burke's case was somewhat different. In February 1930, shade tree investigations were made a special project, and Burke was assigned to work in a laboratory at Palo Alto. Then in 1932, his shade tree lab was transferred to

the division of Fruit and Shade Tree Investigations. Burke describes the new assignment as follows (Burke, n.d.):

> January 1, 1932 Shade Tree insects investigations was transferred from the division of Forest Insects to the division of Fruit and Shade Tree Insects. The work continued as before. Special attention was given to the bark beetles infesting the Monterey cypress and the Monterey pine. A number of experiments with various materials were conducted to determine the best methods of preventing attacks by cypress bark beetles on the twigs of living trees. It was found that sprays of lime sulfur and arsenate of lead give the best results.

How this new assignment was arranged through Miller and Craighead is not known, but to the great loss of forest entomology, Burke left the Division of Forest Insect Investigations for good this time. By this time, Burke had such strong ties to the Palo Alto area that it is doubtful he would have sold his home and moved his family to Berkeley or even commuted on weekends like Miller.

The forest insect problems in Oregon were becoming increasingly acute. Ever since the SONC project near Klamath Falls, Keen had been spending the majority of his time in Oregon. For several years Kimball, head of the Klamath Forest Protection Association, along with other private forest interests, the Forest Service, and State Forester Elliot, had been lobbying to have a permanent Forest Insect Division Laboratory in Oregon. Through the influence of Oregon's Senator McNary, a $15,000 appropriation was secured to establish such a lab in Portland, Oregon (Maunder 1974). In 1930, Thornton T. Munger, the first director of the Forest Service Pacific Northwest Experiment Station, helped Keen obtain quarters with his organization in the Lewis building in Portland. Keen was appointed head of the lab by Craighead, and moved there from Palo Alto with his scientific aid, Buckhorn.

This new lab relieved Miller of much responsibility, but it also deprived the new Berkeley lab of the entomologist most knowledgeable concerning bark beetles. In addition, Patterson decided to resign from the Bureau of Entomology and go into a family business building and operating a resort hotel at Pinehurst, Oregon (Wickman 1987). This also dashed any hope Keen may have had for Patterson to be assigned to his Portland lab. (Patterson was still commuting between Ashland, Oregon, and Palo Alto on weekends and was still in charge of the Crater Lake National Park Mountain Pine Beetle project during the summer.) Miller's description of the Portland laboratory follows (Miller and Keen, n.d.):

> The need for a separate laboratory to conduct control surveys and investigations in Region 6 had been realized for some years prior to 1930.
>
> The Western Forestry and Conservation Association, representing both the owners of Douglas-fir and pine timber throughout the west was active in enlisting support for such a project. The entire eastside pine belt of Oregon and Washington had been sustaining high losses of timber resources from beetle infestations and both private and federal owners were vitally interested in seeing an adequate survey and research program undertaken. As a result of this support, a substantial increase in the appropriation for the Division was secured for the fiscal year 1931 and the decision was reached to apply this to a new laboratory to be established at Portland, Oregon, to serve the territory of Oregon and Washington. F.P. Keen was selected to take charge of this new laboratory.
>
> The most important phase of the program of the Portland laboratory was the western pine beetle survey and research for the eastside pine type extending from southern Oregon to northern Washington. This was carried on with the cooperation and financial support of the Forest Service, Indian Service and private owners. Problems of defoliation and fire injury in the Douglas-fir region developed, however, soon after the laboratory was established and have absorbed a considerable part of the attention of this laboratory.

In the 1930s, there were two historic phenomena taking place: the "Great Depression," which was human-caused, the other, the greatest Western drought ever recorded to that point. The Depression brought drastic decreases in appropriations and personnel levels in government agencies. The drought affected tree health, and bark beetle problems were rapidly increasing.

Alas, Burke's Division of Fruit and Shade Tree Investigations was also affected by budget reductions. Even though part of his assignment included forest insect problems in

recreation areas such as national parks and he was still doing some consulting in Yosemite National Park in 1932, shade tree entomology was on the chopping block. As Burke put it (Burke, n.d.):

> Due to lack of appropriations for shade tree insect investigations, the laboratory at Palo Alto was closed June 30, 1934 and Burke retired from Government Service. His youthful ambition was still realized, however, since every month he received a government check for $100.00 minus $3.50 for retirement.

After retirement, Burke was for some time a consulting entomologist for Freeman-Meyers Co., arborists of Santa Barbara. He was also a member of FAX Service, a consulting company on termites, fungi, and other pests of timber products and buildings.

Southern California and city life, however, did not appeal to Burke, and as soon as he could, he moved to a small acreage near Los Gatos to enjoy the simple life.

Family lore has it that Burke was not really keen on retiring, in fact, he was somewhat depressed for a while, worrying his wife.[1] He was still active in entomology giving talks to garden clubs and other organizations. In 1936, the American Forestry textbook series published *Forest Insects* by Doane and several authors, including Burke (Doane et al. 1936). He was the only experienced forest entomologist of the four authors, although Miller and Keen both made large contributions to the book and were originally to be coauthors. A misunderstanding about federal regulations and private book publishing caused Miller and Keen to drop their share of the authorship (Maunder 1974).

One can't help but wonder what additional contributions Burke would have made to the science of forest entomology if he had moved with the others to Berkeley. On the other hand, although he never shirked his responsibilities and willingly shared his knowledge, he sometimes seemed to be a reluctant part of the Forest Insect Laboratory. Some of that can possibly be attributed to Hopkins' iron-fisted control of his field entomologists during the northeastern Oregon and Craggy Mountain control projects in 1910-13. It was not until late 1913 that Hopkins loosened his control of field operations enough that entomologists like Miller could run their own projects.

The economic impact of the Depression had a severe effect on Patterson. He had resigned to run the new family hotel enterprise just as the economic downturn began. The Pinehurst Inn suffered the fate of many resorts during the Great Depression. It was closed in 1933 before all the upstairs guestrooms were completed, and the main building burned to the ground a few years later.

Patterson returned to the Pacific Slope Forest Insect Laboratory at Berkeley in early 1934 and was put in charge of a Works Progress Administration (WPA) project to document, with photographs and drawings, research and control activities on the western pine beetle. He also provided technical leadership on bark beetle control projects carried out by one of the first Civilian Conservation Corps (CCC) camps in the Sierra Nevada of California (Wickman 1987).

The reason he did not go to the new Portland laboratory was probably related to the level of funding the new lab had at that time because Patterson still maintained his permanent residence in Ashland, Oregon. He became a weekend commuter with Miller and, in fact, the two shared various bachelor quarters for many years. When I first met him in August 1948, he was using a cot in his office in Giannini Hall as his sometimes quarters. Patterson was welcomed back by Miller; several, new young entomologists were beginning their careers in the Berkeley lab, so Miller and Patterson were now the only "old hands."

With the departure of Keen to head the Portland lab, Craighead hired Ken Salman, a recent Ph.D. from Massachusetts A&M, to replace Keen at the Berkeley lab. According to Keen, this appointment was made without Miller's input or knowledge and related to Craighead's desire to move more Eastern entomologists to the West (Maunder 1974). Salman's assignment was to be in charge of the newly developed regional program of insect surveys and control in California. His research project was a continuation of the tree susceptibility classification that Keen had started. This was to cause some competitive relations with Keen, as two different tree classifications were ultimately researched, tested, and published by Keen and Salman

[1] Personal communication from Janet Burke Eglington (daughter), 2002.

(Keen 1936, 1943; Salman and Bongberg 1942). Keen's research on tree classification continued in Oregon and was called the "Keen Ponderosa Pine Tree Classification." The Salman-Bongberg approach was called the "California Pine Risk-Rating System." Both systems evolved from research on tree susceptibility to bark beetle attack that had been conducted in the 1920s by Miller, Keen, Patterson, Person, and Struble. Tree growth rates were a particularly important area of the studies, with Miller and Person proposing that slower growing mature ponderosa pine were more susceptible to attack by the western pine beetle than younger more vigorous trees (Smith et al. 1981).

The rating systems resulted in a silvicultural approach to managing the western pine beetle instead of the direct control method of felling infested trees, then peeling and burning the bark. This was a breakthrough for forest managers that allowed them to capture the economic value of susceptible trees before they were killed by bark beetles, and at the same time resulted in decreased beetle populations or at least seemed to prevent outbreaks. The Salman-Bongberg California risk-rating system identified susceptible trees by assigning penalty points to crown and stem characteristics of a tree. This was followed up by a logging practice called sanitation salvage (Smith et al. 1981). The Keen system, involved four classes based on age and four vigor classes within each age class. It was oriented more toward identifying the susceptibility of individual trees to insect attack. Keen also assigned penalty points in his system. It was slightly more complex to use and was not directly tied to the sanitation salvage concept, but a certain level of logging of susceptible trees was generally followed. Keen's classification was more widely used in ponderosa pine stands of eastern Oregon, and the California system was used for both ponderosa pine and Jeffrey pine stands in eastern California.

One important result of sanitation-salvage logging was the longevity of its effectiveness in reducing high losses in stands to bark beetles. In a study at Blacks Mountain Experimental Forest, the removal of as little as 10 to 15 percent of the stand volume in high-risk trees reduced subsequent losses by an average of 82 percent for more than

PSW

Figure 75—Ponderosa pine killed by western pine beetle during the 1930s outbreak, Modoc National Forest.

20 years (Wickman and Eaton 1962). As study results were published in the 1940s, McCloud River Lumber Company, Collins Pine, and the Forest Service quickly adopted sanitation salvage as a silvicultural practice in east-side California pine forests (Smith et al. 1981).

Miller should be recognized as probably the first entomologist to study how tree growth rate (as an indicator of stress) was related to susceptibility to bark beetle attack. He measured tree growth on thousands of increment cores as part of his studies on the Sierra National Forest in the 1920s. Further, his encouragement to younger scientists like Person to follow his lead to fruition of their own ideas, demonstrated unselfish leadership on his part.

The drought-related stress to trees on million of acres of ponderosa pine forests in the inland West caused dramatic levels of tree mortality that could not be ignored by politicians (fig. 75). Miller, Keen, and Patterson also played a clever propaganda game to procure appropriations to increase the research efforts on the western pine beetle. During the depression, government agencies provided some level of support for artists, cartographers, and draftsmen as a "make work" program. These artisans were eagerly employed by Miller at bargain prices to produce hand-colored photo albums showing the extent of the tree mortality caused by bark beetles, what was being done, and what was needed in the form of research programs to curb this wasteful tree loss (fig. 76) (Struble 1953). Miller got the

$200,000,000 Tree Beetle!

The Forest Menace

Give Science a Chance

BATTLE THE BEETLE

GOVERNMENT ASKED TO GIVE AID IN BATTLE AGAINST THE DESTRUCTIVE PINE BARK BEETLE

California has every reason to hope that the modest request that Congress appropriate $50,000 to combat the pine bark beetle in this State will be granted.

cooperating with Congressman Clarence F. Lea, who has introduced the resolution. If the money is forthcoming, the United States Bureau of Entomology and Plant Quarantine

PSW

Figure 76—Beetle propaganda for the making of lantern slides, 1937.

Joan Salman Rhodes

Figure 77—Hackamore Field Station living quarters and Salman's daughter, Joan, 1933.

message across by supplying these albums to trade associations, chambers of commerce, politicians, and universities. The appropriations increased during a period when many agencies and laboratories like Burke's were shut down. The increased funding helped get the tree selection research of Keen and Salman operational within a decade, a short turnaround time for such research. It also resulted in an increase of scientific research at the Berkeley Laboratory. Struble, who started in 1928, was made a permanent employee in 1930. Other entomologists and foresters hired included Phil Johnson (1931), Jack Bongberg (1934), Jack Whiteside (1935), Stu Yuill (1935), A.S. West, Jr. (1937), Ralph Hall (1938), Howard McKenzie (1938), and J.W. Johnson (1940). Other entomologists who spent some time at the Berkeley lab during this period and then transferred elsewhere included R.L. Furniss, C.B. Eaton, N.D. Wygant, W.D. Bedard, and D. DeLeon (Furniss and Wickman 1998).

The appropriation increases triggered by the bark beetle outbreaks also resulted in forest insect research reverting to a mode of operation used before the move to Stanford University. That is, field stations, strategically located out in the forests, were once again being considered to house entomologists and provide laboratories closer to their research sites. And the wherewithal to build such stations was available through depression-era programs like the WPA and CCC. A rather crude station was built at Hackamore in the Modoc National Forest. It consisted of small cabins and a small lab and rearing building for study of the western pine beetle. Some early forest entomologists like Robert Furniss, A.S. West, Jr., Jack Whiteside, and Jack Bongberg, worked there under Salman. The buildings at this site were the temporary type, probably because it was not at a convenient location (fig. 77).[2]

The next two field stations established were more elaborate, however, both in size and quality of construction. Struble described the establishment of these two field stations (Struble 1953).

> Extensive bark beetle infestations and losses in California by 1937 offered convincing proof of the need for research data season by season in the field. Centers having common features of climate, topography, soil and stand were believed important. Differences in infestations between trees in eastside and westside (Sierra) forests were recognized, and insect control would of necessity depend on an applicable information base.
>
> Public support for establishing permanent field centers of research (California State Chamber of Commerce) had reached a climax of interest by the fall, 1937. Funds totaling $7,000 were allocated by the USDA's Bureau of Entomology & Plant Quarantine to the U.S. Forest Service. Representing eastside conditions, a laboratory was located near Hat Creek Ranger Station, Shasta County on the Lassen National Forest. A second laboratory, typifying westside forest conditions was located near Miami Ranger Station, Mariposa County on the Sierra National Forest. Both facilities were erected by CCC crews under Forest Service supervision and in operation by summer of 1938. Each consisted of

[2] Personal communication from Joan Salman Rhodes, who also provided photos, 2004.

PSW

Figure 78—Civilian Conservation Corps crew injecting girdled tree with chemicals, 1930s.

J.E. Patterson, PSW

Figure 79—Staff building bunkhouse with treated logs as an experiment, Hat Creek. On wall, R.C. Hall, P.C. Johnson; on logs, J.E. Patterson, G.R. Struble, 1943.

> office, laboratory, rearing facilities, shop, garage, and camp living facilities.
>
> The Hat Creek Laboratory served initially as a study base for developing improved methods to control the western pine beetle. The identity and use of visual tree difference indicators of risk against attacks were being tested and refined at Black's Mountain [Experimental Forest] nearby under the direction of Salman and Bongberg. The flathead [flatheaded woodborer] and survey improvement studies at Hackamore were transferred to the Hat Creek base.

Robert Z. Callaham, who was a graduate school student assistant for Miller, described the unique log dormitory built by the entomologists in 1943 at Hat Creek.[3]

> Ralph Hall told me that logs used to build the Hat Creek Lab were cut from trees that had been subjected, before felling, to injection of preservative chemicals. Using techniques pioneered by H.L. Person and Nick Mirov (1928-1930), workers had girdled each tree with an axe creating a frill just above the stump height. Just below the frill, a reservoir made from an inner tube from a truck or auto tire was sealed with nails around the trunk. The rubber reservoir was rounded upward resembling a doughnut and chemicals were placed inside to flood the frilled area [fig. 78]. The tree's conduction system moved the toxicants upward in the exposed outer annual rings. The result was that logs subsequently cut from injected trees, when placed vertically to form walls, were never successfully attacked by insects or fungi [fig. 79]. The bark clung tight rather than peeling off as it would have if wood-boring insects had been able to penetrate. For all I know, those log walls may still be standing with bark intact.[4]

By 1938, Forest Insect Investigations had come full circle from field stations in 1910-23, to laboratories at Stanford and then California Universities back to having the best of both types of facilities. Permanent laboratories located on major university campuses provided access to libraries, laboratory equipment, and interaction with other scientists. It also provided for stable residences in cities amenable to family life. The permanent field stations were usually used only spring, summer, and fall and allowed the entomologists convenience to their field studies with some laboratory facilities. It also allowed many families of entomologists to

[3] Personal correspondence from Dr. R.Z. Callaham, 2004.

[4] I reexamined the logs periodically for bark retention and rot when I was in charge of Hat Creek 1956-67 and found the logs sound and bark tight. An examination by a historical archaeology consultant in 2004 reported similar conditions.

R.L. Furniss, PNW

Figure 80—Felling dead trees after the Tillamook burn, 1930s.

R.L. Furniss, PNW

Figure 81—R.L. Furniss pointing out larval galleries of wood-boring insects in fire-damaged Douglas-fir, Tillamook Burn.

spend very memorable summers at the Hat Creek and Miami Field Bases.

Further north in Oregon, Keen was also fighting his battles against forest insects, only with fewer resources available to him than in California. A young entomologist, Robert L. Furniss, was assigned to him from the California laboratory in 1934. The disastrous Tillamook Fire burned its first quarter million acres in 1933. Subsequent fires and reburns occurred over the next decade. Attempts to salvage huge amounts of fire-damaged timber were complicated by woodborer attacks that were causing degradation of lumber sawn from the fire salvage logs. Furniss' first assignment in 1934 was to study the species of woodborers attacking the dead trees. He also made a fine photographic record of the insect damage and salvage operations (fig. 80) (Wickman et al. 2002).

Some other Berkeley personnel moved to Portland, Oregon, to help Keen, including Jack Whiteside and William Bedard, Sr. Whiteside and Bedard assisted Keen with surveys and studies of the western pine beetle outbreaks. Furniss mostly studied insects associated with Douglas-fir (fig. 81).

Miller's diaries for this period indicated a change in his field work. In 1930, because of the move from Palo Alto to Berkeley, he spent most of the year traveling back and forth between the two stations. As one would expect, he had much equipment to move, new offices and laboratories to outfit, and the need to establish working relations between the Forest Insect Laboratory and the University of California Forestry School, and California Forest Experiment Station (now the Pacific Southwest Research Station). The terms, "Forest Insect Investigations" and "Forest Insect Laboratories" seemed to be used commonly from this time on.

By 1931, Miller was able to make about half a dozen field trips to Grant Grove National Park, Pinehurst, and an entomology camp at Harvey Valley and the Pickering Mill in Alturas. There was no mention of a trip to Yosemite, and this was unusual because until 1930 he was there several times a year.

However, Miller was not deskbound long at the new lab in Berkeley. From 1932 to the end of the decade, he traveled constantly from March to November, from the San Bernardino Mountains in southern California to the temporary Hackamore Forest Insect Field Station in the Modoc National Forest near the Oregon border. He also went to Portland several times to confer with Keen at his new lab, but there is no mention of Keen reciprocating.

He made up for missing 2 years of visits to Yosemite National Park by going there as many as eight times in some years and usually at least half a dozen times a year.

Diary entries are sparse on the purpose of various trips, but reports and publications indicate he was doing research on bark beetles at Eight-Mile (Yosemite National Park), Bass Lake, Harvey Valley, Hackamore, and other localities

as well as supervising a growing group of young entomologists. The supervisory duties alone must have been daunting. His entry for November 5, 1935: "Paid Bongberg's Doctors bill—$2.50." Bongberg, being one of the new entomologists, may have been a little short before payday. Miller also went farther afield to Yellowstone and Grand Canyon National Parks, Prescott, Arizona (McKenzie was there studying the Prescott scale on ponderosa pine) and Fort Collins and Estes Park, Colorado. He even left on Christmas Eve, 1936, on a trip to Washington, D.C., to see Craighead. That seemed a little beyond the normal call of duty.

He was almost constantly on the go for an 8-year period. His daughter, Betty, noted that she did not see much of him at times.[5]

As described earlier, the building of two new field stations at Hat Creek on the Lassen National Forest and at Miami on the Sierra National Forest in 1938 took up an inordinate amount of his time and travel. And all of this as the most damaging bark beetle outbreaks on record were occurring throughout California. Miller's leadership and entomological and political acumen resulted in increased support for the Forest Insect Investigations Laboratory at Berkeley and some breakthrough research being carried out by relatively inexperienced, young entomologists. Miller sums up the decade as follows (Miller and Keen, n.d.):

> The setting up of the Portland Laboratory in 1931 was the most recent step of the Division in establishing new centers of work for western pine beetle investigations. For the next decade a great amount of research was centered around the laboratories at Berkeley and Portland and their outlying field locations [fig. 82]. It is the accumulation of the results of these and proceeding studies which calls for the summarization of this review. [The published book: Biology and Control of the Western Pine Beetle, with Keen].
>
> It was during this recent period that a very active interest in the problem was developed by certain public agencies such as the Western Pine Association and the California State Chamber of Commerce which includes many large owners of pine timber in its membership. This interest can be attributed to a period of very heavy beetle-caused losses in commercial pine areas beginning in 1927 and continuing until 1938. The groups concerned brought considerable pressure for an expanded program of research and surveys by the Division and in 1937 increased appropriations were secured.
>
> These new funds were applied mainly on a forest insect hazard survey of the eastside pine region in Northern California. Additional personnel were added to the Berkeley laboratory until in 1939 it had a staff of 15 permanent employees in addition to summer field crews of about 20 foresters and entomologists.

PNW

Figure 82—Portland, Oregon, conference, 1936. Front row (left to right) R.L. Furniss, J. Beal, J. Evenden. Back row (left to right) F.P. Keen, J.M. Miller, A.J. Jaenicke, F.C. Craighead, and W. Buckhorn.

But changes of a different kind were on the horizon. The challenge of keeping forest entomology research on track through World War II would test Miller again.

[5] Correspondence from Mrs. Betty Miller Moore, 2002.

CHAPTER 16: Miller Closes His Bureau of Entomology Career

By 1940, Miller was at the apex of his career. He had the largest forest insect laboratory in the West, working on some of the most important forest insect problems in the United States; consequently, he probably had the largest budget. Bark beetle problems were being researched by 10 professional foresters and entomologists at Berkeley. They were developing improved survey methods and determining pine forests and individual trees most susceptible to outbreaks. However, the Congressional appropriation for fiscal year 1941 cut $27,000 from the Berkeley Lab's budget. This caused considerable strain on the program of work including cutting back on the hazard survey.[1]

Continually working long hours, Miller still must have found the weekend commutes from Berkeley to his home in Palo Alto irksome. On New Year's Eve, 1939, the family rented out the Palo Alto house and moved to a rental in Berkeley. It lasted only 1 year, partly because Bess missed her garden and familiar surroundings.

In 1940 and 1941, Miller made many field trips to the crude Hackamore Field Station located at a Pickering Lumber Company Camp to check Salman's stand hazard survey conducted by Phil Johnson. This was an ambitious attempt to map 2 million acres of pine stands in northern California at risk to western beetles. At the new Hat Creek Field Station and Blacks Mountain Experimental Forest, Bongberg, Patterson, and Hall were studying the western pine beetle and pine engraver beetle. At the new Miami Field Station, Struble was busy with mountain pine beetle and other insects attacking sugar pine. It is interesting that Miller only recorded one meeting with Keen at the new Portland Forest Insect Lab during these 2 years. Keen was hard pressed with many insect problems in the Pacific Northwest and a much smaller budget that initially supported only two entomologists.

Miller's diary entry for Sunday, December 7, 1941, read: " . . . at 12:15 P.M. just heard the report of the attack on Pearl Harbor." On that day the lives of everyone in the United States changed in some manner. And only those Government bureaus demonstrating a contribution to the war effort survived, but most did so with reduced budgets and personnel. The Bureau of Entomology was no exception. Miller's diary for 1942 indicates meetings in Washington, D.C., February 18-21, and Portland, Oregon, in March. In May, Mr. Whitney of the Budget Bureau made a visit to the Berkeley lab and was given a tour of several field projects by Miller. The Berkeley lab survived, no doubt because of its ties to the Forest Service and the importance of forest protection and lumber production needed for the war effort, but research programs were affected as Miller noted (Miller and Keen, n.d.):

> In the spring of 1942 the impact of World War II began to have its effect upon the plans and personnel for the western pine beetle program. Although there were substantial cuts in the appropriations for the fiscal years of 1942 and 1943, the need for funds soon became less important as the call for men at both laboratories for military duty reduced the staff and replacements were no longer available. Priorities of the war program eliminated a number of projects and the restrictions placed upon travel made it difficult to continue the essential jobs on an adequate scale.

Bongberg and Yuill joined the U.S. Navy as officers in medical entomology, and Bedard was transferred to Berkeley from Coeur d'Alene to help fill the vacancies. On the personal side, Miller's son Dusty (Harold), a naval officer, left for duty at Pearl Harbor on June 15. Miller did a lot of travel to Hat Creek and Miami during the 1942 field season no doubt helping Patterson, Hall, and Struble who were still on duty, but very short handed.

And matters came to a head in Salman's resignation in 1942, which involved Craighead in the Washington office. Although Salman and Keen had some competitive studies relating to different tree classification systems, both systems were scientifically valid. As mentioned earlier, their use by forest managers was related to geography, and Salman and Keen did not seem to take the situation personally. However, at this time Craighead thought that chemicals could be injected into high-risk trees, perhaps preventing beetle attacks and thus preserving them until they could be logged. Salman evidently objected to this idea heatedly, and

[1] Correspondence to Miller from Craighead, Chief of the Forest Insect Investigations, Washington, D.C., in my possession.

a controversy developed to the point that Salman resigned from the Bureau of Entomology in 1942.[2]

Miller describes an important reorganization of the Berkeley and Portland labs as follows (Miller and Keen, n.d.):

> In order to better mobilize what resources were available in men and facilities for continuing the essential phases of the western pine beetle program, a reorganization plan was decided upon by the Division to take effect in August 1942. The Berkeley and Portland laboratories were combined under a joint administration in order to effectively integrate the program in both regions. Each laboratory was continued at its established location to continue the assignments and local contacts of the over-all program, but the Portland laboratory was brought under general direction from Berkeley. The more important personnel changes brought about by the reorganization were the assignment of F.P. Keen as coordinator of the 2 laboratories with headquarters at Berkeley, J.M. Miller being relieved of administrative work in order that he could give full time to a summarization of western pine beetle studies prior to his retirement, R.L. Furniss assigned as Administrator for the Portland Laboratory, and J.E. Patterson for the Berkeley laboratory.

Miller had some inkling of the impending change because Mr. Annuad, acting chief of the Bureau of Entomology in the Washington office, had just visited with Miller in Berkeley. Miller's handwritten note to Keen in Portland is included verbatim.[3]

> Berkeley, Cal.
> Aug. 3, 1942
> Dear Paul Keen,
>
> I have just perused two memoranda which came in the mail this afternoon and they look like memorable documents for both of us. At last Annuad has settled something, and the tone of these notifications seems to indicate that it is final. You are going to take over here.
>
> I imagine that you are trying to guess what my reactions are to the change mainly because I am trying to guess yours. I might as well relieve any misgivings you may have by telling you that this was just what I wanted. In fact it looks too good to be true as to last very long.
>
> Both documents say a lot with unusual clarity and brevity. It pleases me beyond measure that along with change you are to have "full responsibility to make all personnel assignments under the combined program." It is my feeling that the change is going to be welcomed by most of the personnel here.
>
> It looks as though you are going to have an expensive luxury on your hands in the form of a high priced "technical advisor." Well, I am not going to take the title too seriously. I only want to smooth the way for you to come in here as well as I can, and to cause you as little embarrassment as possible. I will fit in anywhere you think I can be of the most usefulness, and if I can't be of some help to you it is my intention to go ahead with plans for early retirement soon after I become eligible.
>
> Apparently you will need to come down here soon to get the lay of the land. We are in the process of a clerical turn-over since LeBallister [the office clerk] is due to be called by the Navy within 15 days. There are a lot of other loose ends since about half of our force has left or is leaving. I have several field trips projected within the next three weeks, but will hold these up pending your plans. Please let me hear from you as soon as you recover from the shock.
>
> Anyway it is a long lane that has no turning– and this seems to be it.
> Sincerely,
> John M. Miller

In Keen's oral history he stated (Maunder 1974):

> I arrived in Berkeley on November 10 [from Portland, Oregon]. The Berkeley station consisted of a well run organization with the following men: J.M. Miller, in charge and ready to retire; John Patterson, Ralph Hall, Jack Bongberg, Phil Johnson, George Struble, Stu Yuill, Charles Eaton, Don DeLeon, and Howard McKenzie; plus the

[2] Both the Author and Malcolm Furniss have searched official files for information on this controversy. Furniss found one memo April 20, 1942, from Craighead to Miller regarding personnel changes, e.g., Salman on leave until May 11 and Craighead waiting for Salman to decide what action he will take. Both Furniss and the author have heard various hearsay stories from entomologists in Berkeley on this situation. Suffice to say Salman felt strongly enough to resign in 1942 and take up farming in the central valley of California. Salman's daughter Joan, believes it was an accumulation of actions by management over some period of time that caused him to resign because he had moved his family to his farm the year before he resigned. Personal letter, Joan Salman Rhodes to me August 22, 2004.

[3] A handwritten letter from Miller to Keen on August 3, 1942, in possession of Malcolm Furniss.

Figure 83—Work conference in Berkeley, 1941 or 1942. Front L to R, Gibson, DeLeon, Lois Weaver, Eaton. Second row, Evenden, Keen, Struble, Wygant, Yuill. Third row Miller, P. Johnson, Johnson, Hall, Patterson. Fourth row, LeBalister, Salman, Hagle, Bongberg, McKenzie.

administrative staff of the chief clerk, M.L. LeBallister and secretary, Lois Weaver[4] [fig. 83].

There were hints of Miller's possible retirement in 1943, and Keen even thought he retired in 1943 (Maunder 1974). But Miller actually remained as part of the Berkeley staff as an independent scientist or "technical advisor" for 9 more years.

Unfortunately, Miller developed some health problems in 1943, so perhaps the administrative change was timely. These problems continued for the next 3 years. Notes at the back of his 1944 diary state: "spots, I can recognize pressure, some days better than others, ultimate use of drug." Consultations with half a dozen physicians and eye specialists continued until he had an apparently successful eye operation on December 14, 1946, in Palo Alto.

There were many weeks and days of sick leave taken during this period, but though he must have been uncomfortable during many of his field trips, he continued to help the personnel at the Berkeley lab during the manpower shortage at the height of World War II. He also did not neglect trips to Yosemite National Park (fig. 84). Most of his office work consisted of working on a manuscript of the grand summary of 30 years of research on the *Biology and Control of the Western Pine Beetle*. Another task he took on was encouraging Burke to write his memoirs, then spending months editing the manuscript drafts. Miller's diary for Sunday, March 15, 1944, states "Keen and Patterson [with Miller] made a trip to Los Gatos and spent part of the day with the Burkes." This was the first diary entry mentioning Burke for years, and I highly suspect that his three old comrades made a semiofficial visit to the Burke farm to talk him into writing up his recollections.

This was an important visit for the history of forest entomology in the Western United States. Miller's diaries for the next several years described working on the "Burke Summary" as he termed it. On June 28, 1946,

[4] Keen's memory was a little off. Miller had not decided to retire, LeBallister was in the Navy, and Bongberg and Yuill were about to enlist as Naval officers.

P.C. Johnson, PSW

Figure 84—Entomology staff, Berkeley, California, 1946. Front (left to right) Paul Keen, Edith Edmonston, John Miller; back (left to right) George Struble, Ralph Hall, John Patterson, and Philip Johnson. Bongberg was probably still in the Navy.

My Recollections of the First Years in Forest Entomology by H.E. Burke was issued in small numbers as an unpublished report by the Berkeley Forest Insect Laboratory. It was printed by using an old mimeograph process with gelatin plates producing blue print that got fainter with each succeeding copy. Needless to say, after about 100 copies the print was pretty light. Photographs, mostly from the Berkeley photograph file, were reproduced and glued in the report. Only about half of the copies were assembled in final form for distribution and they disappeared rapidly.

In the winter of 1948-49, I was working part time as a student aid at the Berkeley laboratory while attending the university. My first job was to assemble the remaining loose pages, hot-iron photos in place, and staple on covers. This was my introduction to forest entomology history in the West and resulted in my only introduction to Burke, who came by to pick up a few copies. He was a kindly and distinguished-looking gentleman who thanked me and left. I have had regrets ever since that I did not have him sign the copy I was allowed to keep. Burke's personal history, *My Recollections . . .* ended in 1923, but it set the stage for all that followed relating to forest entomology on the Pacific slope.

In 1946, Miller became involved in research on breeding pines resistant to forest insects. Dr. Palmer Stockwell, Director of the Institute of Forest Genetics (IFG), a field station of California Forest Experiment Station (now Pacific Southwest Research Station), asked Keen for assistance of an entomologist to investigate resistance of IFG's pine hybrids. Keen negotiated with Miller, who had just completed his part in production of the "Burke Summary," and Miller agreed to take on this assignment. Located near Placerville, in the foothills of the Sierra Nevada, IFG was moving toward mass production of interspecific pine hybrids for outplanting on national forests in California. Miller's task was to determine whether some of these new hybrids might be resistant to troublesome insects.

Miller, until he retired 6 years later, became for all practical purposes, the resident entomologist at IFG. He had his own office, spacious laboratories, and opportunities for insect rearing in the progeny test plantings. One of IFG's scientists happened to be Dr. N.T. "Nick" Mirov, a plant physiologist with a colorful past. Nick, a university-trained forester in Czarist Russia, had served as a naval cadet in the White Russian navy. After Russia's Revolution, Nick escaped through Siberia and China and made his way to San Francisco and Berkeley. Miller probably came to know Mirov in 1928 and 1929 when Mirov was hired to assist Hubert L. Person's studies on the Modoc and Lassen National Forests on host selection by bark beetles.[5]

Miller was researching the susceptibility of certain crossbred ponderosa pines to the pine reproduction weevil. This weevil had been described by C.B. Eaton and named for him (Eaton 1942). Before WWII, it was causing extensive problems in ponderosa and Jeffrey pine plantations. It was killing many trees before they could outgrow old, established manzanita brush fields.

There were thousands of acres of manzanita brush fields in northern California resulting from fires in the 19th century. Most of these areas were completely devoid of trees because trees were not able to become established. The Forest Service, in an attempt to reclaim these brush fields to valuable timber lands, planted thousands of acres especially around Mount Shasta. Unfortunately, the tiny weevil

[5] Personal communication from R.Z. Callaham.

attacked most of the trees several years after planting. Some brush fields were planted several times. The new insecticide, DDT, sprayed from helicopters was the very latest technology used to try to control the weevil. Because the weevil spends much of its life cycle under the bark or in the wood of attacked trees, aerial spraying resulted in inconsistent control. In tests at IFG, Miller found by forcing attacks on young trees that Jeffrey pine-Coulter pine hybrids were resistant to weevil attack. Several students including Robert Z. Callaham, were introduced to the intricacies of genetic experimental designs as a result of Miller's mentoring at the Institute. Callaham was assigned by Keen to assist Miller while taking graduate studies in botany and genetics.

Callaham related his research with Miller at the IFG in a letter to Malcolm Furniss in 1993 (copy in my possession).

> After reporting on my work in the Lagunas, Keen assigned me during the winter of 1950-1951 to assist John Miller at the Institute of Forest Genetics (IFG) at Placerville. In 1946 Dr. Palmer Stockwell, who was in charge at IFG, had requested the Berkeley Forest Insect Lab to study resistance of pine species and species hybrids to forest insects. Miller was assigned to work at IFG. What follows is taken from a paper that I presented in 1953.[6]
>
> Miller soon discovered by forcing attacks on these trees that each pine species varied in its inherent resistance to the pine reproduction weevil [Miller 1950]. This resistance ranged from complete resistance on the part of coulter pine through intermediate resistance on the part of Jeffrey and ponderosa pines to a very high degree of susceptibility on the part of Apache pine and Rocky Mountain ponderosa pine. F_1 and natural hybrids between resistant and susceptible species usually exhibited a degree of susceptibility intermediate between that of the two parent species. Miller expended considerable time in studying the entire problem; however, up to the present time, we have not been able to determine the cause of resistance or to determine why resistance varies from season to season in trees of certain species and between races of the same species . . .
>
> The pine reproduction weevil had decimated the Jeffrey pine plantations on the west flank of Mt. Shasta, close to Mt. Shasta City. Some of my earliest recollections of work with JM in the field were of going to that location where trees had been planted about 12 years before in strips punched through the brush by bulldozers. We collected infested stems, hauled them to IFG in his "sedan delivery," and spread them throughout the rows of two- to four-foot-tall pine progenies. These had previously been enclosed within large zippered screen cages. The weevils emerging in the spring went about their business. By summer trees were fading and John suddenly retired. That left me alone during the winter of 1951-1952 to tally the resulting mortality and produce a report on our work [Callaham and Miller 1952].
>
> That report also included results of our first attempts, during the summer of 1951, to determine resistance of larger, 20-years or older pines to *Dendroctonus* species. John and I planned and conducted the first forced attacks of *D. brevicomis* (D.b.), *D. Jeffreyi* (D.j.), and *D. monticolae* (D.m.) on various pine species and species hybrids. John had wanted for many years to force Db to attack Jeffrey pine and its hybrids and to force Dj to attack ponderosa pine and its hybrids. He and I planned the work, but I carried it out alone when he suddenly retired in 1951.[7]

Miller was truly a versatile and inquisitive scientist who very late in his career pioneered searching for inherent resistance to pine-infesting insects.

To demonstrate his practical side, Miller spent October 25 and 26, 1950, on some aerial survey flights in the Armstrong Lookout area on the Stanislaus National Forest. His eyesight and vertigo problems must have improved because spotting bark-beetle-killed trees from the air requires good vision and a settled stomach.

Miller's last diary was for the year 1950. The last entries for that year were; November 5–"air flight over Stanislaus and Eldorado Country," and November 18–"Stanford-Army game." He didn't say who won, but Miller was still a dedicated football fan. He went to high school games when living in Ashland, and he rarely missed a "Big Game" between Stanford and California. In addition to

[6] Callaham, R.Z. 1953. Studies of the resistance of pines to beetles. Presentation to the Entomological Society of America, Pacific Coast Section, South Lake Tahoe, 9 p.

[7] I remember assisting Callaham with some of these studies when I was a student aide at the Forest Insect Lab.

playing and watching football, as a young man he enjoyed trout fishing and deer hunting. He progressed from traveling by horseback, stage coach, and shank's mare to being one of the first forest entomologists to own and use an automobile for field trips. In the process, he became an auto repairman of note, developing the ability to fix brakes, flywheels, radiators, water pumps, oil pan punctures, and innumerable flat tires, and to pound out dents caused by errant pine trees. He was the first forest entomologist in the West to take photographs of bark-beetle-killed trees from an Army Air Service biplane. His personal science was exemplary. He was a father figure and mentor to many young entomologists and foresters. He was a soft-spoken politician who knew how to get funding for his lab. There are no documented remarks disparaging him in any way—he was considered a gentleman, a scholar, and a leader by his contemporaries.

Keen sent letters to "Friends of John Miller" announcing John's retirement on November 1, 1951, after 44 years of government service.[8] In his usual modest way, Miller did not want a "fuss" made, but if a party was to be given by the Forest Insect Lab "please keep it simple." An informal goodwill luncheon on October 30 at the El Dumpo restaurant in Berkeley ended his official career. Farewell letters from colleagues and friends filled a little booklet presented to him. One typical letter stated "I can honestly say you treated me more like a friend than underling. You were one swell boss!"[9]

Ironically, the Bureau of Entomology Forest Insect Division, converted to the Forest Service, California Forest and Range Experiment Station just 3 years after Miller retired. He almost went full circle back to the U.S. Forest Service.

At nearly 70, Miller had no intention of just fading away. He was actively seeking an assignment with the Food and Agriculture Organization as a consultant to the Mexican government helping with their bark beetle problems. If that did not materialize, he planned to continue his research at IFG on genetics of bark beetles in a volunteer status. John Miller just could not stop being an entomologist.

[8] Letter in possession of Malcolm Furniss.

[9] Retirement letters, bound, in my possession.

Epilogue

Harry Eugene Burke 1878-1963

Burke retired ahead of his time in 1934 at age 57 (fig. 85). After several years of consulting on shade and ornamental tree entomology, giving talks to garden clubs, and helping write a textbook on forest entomology with professor Doane at Stanford University, he realized his professional career had ended. This was unfortunate because, of all of the forest entomologists of his era, he was perhaps the one most sensitive to the natural long-term role of insects in forests. This ecological bent sometimes put him at odds with other professionals who believed that most forest insect pests were to be destroyed or at least reduced to population levels as low as possible. Growing trees, not insects, was the order of the day. Burke saw insects as just another disturbance agent in the forests–neither good nor bad, but playing a long-term role in a forests' life history. Even though he sprayed trees with chemicals in Yellowstone National Park and other places to kill tree-damaging insects, he became increasingly critical of insect control projects, especially in national parks where trees were not managed for their economic value as saw logs. He was a good 50 years ahead of his time in this philosophy. If he had worked another decade or so there is no telling what influence he would have had on insect control policies, especially in national parks where today insect outbreaks are not treated.

Burke authored 63 publications during a period from 1905 to 1940. This was a noteworthy publishing record for a field entomologist during that era. He was also president of the Pacific branch of the Entomological Society of America in 1935, several years after he retired.

With his creative instincts thwarted, Burke directed his energy toward agricultural pursuits. David Pratt, his grandson, remembers his retirement as follows:

> My grandfather's primary hobbies after he retired were gardening and reading. In late 1938, my grandparents and parents moved into a large two story home in Los Gatos (where I spent the first 13+ years of my life). The home was situated on a two acre lot which had approximately one acre of fruit trees (apricots, prunes, almonds and who knows what else). There were three chicken coops, occupied by ducks, geese, chickens and rabbits. There was a large vegetable garden, lots of berrys and loads of other stuff. The place was ringed by a four foot hog wire fence and every post had a grape growing up it. This kept him very busy until about a year before he died.[1]

Figure 85—Harry Eugene Burke 1878-1963.

Burke greatly enjoyed all of his grandchildren and no doubt taught them much about the natural world. His daughters remember hikes with their father in Yosemite National Park, where he continued to camp after he retired. They took off on these adventures not for distance or speed, but learning all kinds of things about flowers, trees, bugs, and nature in general.

Family members say his mind was sharp and memory excellent in old age. When he died at age 84 on March 26, 1963, in Los Gatos, California, C.B. Eaton, a newcomer when Burke retired, and F.P. Keen, the first entomologist Burke hired, wrote the following about him in his obituary published in *The Journal of Economic Entomology* (Eaton and Keen 1964):

> Dr. Burke was gifted with a friendly, affable personality. He was a good conversationalist and an interesting storyteller. He enjoyed a broad

[1] Correspondence from David Pratt in 2002.

> acquaintance with men in his field and always spoke well of them. He was held in esteem as an entomologist for the intimate details of knowledge concerning large numbers of insect species. His leadership was recognized and respected in applied forest insect control.

It is interesting to note that they memorialized his insect control activities. But I maintain that he was also one of our profession's earliest forest ecologists. Regardless of either viewpoint, Burke was liked and respected as an entomologist and a person. Burke was cremated and his ashes found a fitting resting place. His daughter deposited them in the Sierra Nevada Mountains near Lake Tahoe.[2]

John Martin Miller, 1882-1952

To sum up John Miller's career in a few sentences is difficult (fig. 86). He was the second university-trained forest entomologist on the scene in California and Oregon after Burke. Luckily for our profession, Burke and Miller became friends and coleaders of the fledgling science of forest entomology in the second decade of the 20th century. Miller's coworkers, subordinates, and professional colleagues remarked on his work ethic, his care for people's well-being, his quiet demeanor, and his firm convictions. He had the ability to analyze problems and pursue a course of action, but not at the expense of animosity, even when the problems were controversial. His relationship with A.D. Hopkins before he joined the Bureau of Entomology is a good example.

Having started his career as a ranger in the U.S. Forest Service, he had great empathy for the field manager. His personal and unit's research projects were oriented first and foremost toward assisting forest managers with their insect problems. However, this did not prevent him from encouraging basic research or from following his own curiosity like using airplanes in forest insect surveys or studying the role of tree genetics in managing forest pests.

He produced many important technical reports on a timely basis, and this sometimes precluded more formal

Figure 86—John Martin Miller, 1882-1952.

publications. However, his book with F.P. Keen, *Biology and Control of the Western Pine Beetle*, summarized over 50 years of research (Miller and Keen 1960). It is a classic and still the basic reference for entomologists studying bark beetles. He was also an excellent photographer who continuously improved his equipment and techniques. He usually had a darkroom in both his home and at work.

Miller was at his best when in the field. He was noted for his walking ability, and many young workers struggled to keep up with him. In his later years, he became a little forgetful when afield. He usually carried quite a bit of photographic equipment, and it became normal to assign someone in the field party to follow Miller and pick up his glasses, notebook, or camera filters he may have left on a log or a rock. This, of course, was done most discreetly.[3]

When Miller retired, he had already applied for a job consulting with the Mexican government helping with their bark beetle problems. This assignment was under the auspices of the Food and Agriculture Organization of the United Nations.

Just before retirement he made an exploratory trip to Mexico to examine the prospects. Of course he always

[2] Grandson, Paul Pratt, remembers that his mother, Marion Burke Pratt, took her father's ashes up the KT-22 ski lift at Squaw Valley and then walked around the south side of the peak looking out toward the Rubicon River to scatter them. E-mail to me July 20, 2004.

[3] I know, because I had one such assignment.

carried a camera, and the Mexican police accused him of taking photographs in a prohibited area. Miller was briefly detained (some say in the local jail) until the matter was resolved in Miller's favor. Of course when he returned to the lab at Berkeley and the story was leaked he was in for much good-natured ribbing by his colleagues.

Since the Mexican assignment was international, Miller was in competition with an Italian entomologist for the job. When he took his physical examination, the doctor said he had some heart problems. Miller found another doctor who gave him a passing physical. He also had glaucoma and feared this would end his Mexican job if exposed. He was accepted for the assignment and in 1952 went to Mexico accompanied by his wife Bess.

The next news received about Miller's Mexican assignment saddened everyone who knew him. F.P. Keen sent word on April 1, 1952, to all forest insect laboratories "…that John Miller had passed away in Mexico City. Details were lacking, but John had returned from Yucatan and had come down with a chill. Mrs. Miller had been with him but had returned recently to the bay area."[4]

In addition to family, many of Miller's old colleagues and current coworkers attended the funeral. His brother, a long-time pastor, presided over the service.

Miller was such a dedicated and hard worker and enjoyed his profession so much, it is not hard to think of him passing away as he lived, curious and active to the end.

Mrs. Burke and Mrs. Miller

This story cannot end without a tribute to two remarkable women. Mrs. Burke and Mrs. Miller were integral parts of their husbands' successful careers. Both of them spent their honeymoons on official trips with their husbands studying insects in the wilderness. Most of their children were born in small mountain towns, usually while their husbands were in the field working. It is understandable that when they acquired their first permanent residences near Stanford University they never moved again. The offspring of both families were highly educated and very successful; both

H.E. Burke family

Figure 87—Marion Armstrong Burke, 1887-1984.

women raised their children well with sometimes minimal help from often-absent husbands.

Marion Armstrong Burke's biography was not included in Burke's memories in the early chapters, so I will add it here. H.E. Burke met his future wife in Washington, D.C., in 1906 (fig. 87). The following excerpts were from a short biography written by one of the Burkes' daughters.[5]

> Marion Armstrong was the oldest child of Luther Kelly Armstrong and Marion Rebecca Brown. She was born March 15, 1887, in Culpeper, Virginia. Both her parents were natives of that state with ancestry that, in the case of her mother, went back to 1617 in the Jamestown colony and in the 1650s in Maryland.
>
> Marion and Gene [H.E. Burke] were married April 8, 1907, in Washington, D.C., and their honeymoon was definitely an eye opener for her. He had a field project scheduled that summer in the wilds of Utah, Kamas and Panquitch Lake. Marion had little experience cooking, let alone over a campfire. Like most white southerners, she was used to black servants doing the menial work. That first wilderness camp experience was a near disaster. Gene was no more experienced with cooking than she. It was a great relief months later as the

[4] Correspondence in possession of Malcolm Furniss. He remembers bringing pine boughs from the Sierra Nevadas to put on Miller's casket. Robert Callaham remembers bringing pine cones from IFG to place on his casket.

[5] Author and date unknown. Probably written by the Burkes' oldest daughter, Marion. Copy provided to me by daughter Janet Burke Eglington.

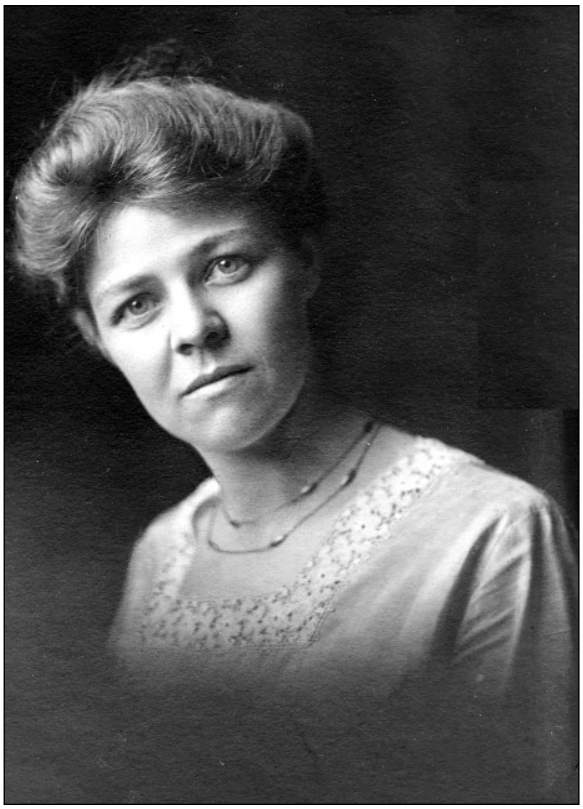
> weather turned real cold, that the Mormon farmer who had brought them to their campsite decided he should check on them as they had seemed greenhorns to him to begin with. Thus he rescued them, as they were by now almost out of supplies.
>
> This experience did not discourage Marion, however. She remained ready and willing to live in whatever western lumbertown or field camp Gene's work took them [to], whether she was pregnant or not, or with the five children they eventually had.

After Harry Burke retired, Marion Burke continued her automobile trips, taking the family to Yosemite or the mountains every summer and doing the driving because Harry still did not like automobiles. She was active in the community of Los Gatos and lived in a large house, helping raise two grandsons for 13 years in the 1940s and 1950s. She was active to the end and lived alone until a week before her death on July 26, 1984, at the age of 97.[6]

Bessie Miller remained at her residence in Palo Alto after John Miller's death (fig. 88). She had long before lost her ardor for camping in the mountains (her daughter Betty remembers often accompanying the Burkes on their annual camping trips because her own mother was through with camping), and she definitely did not like driving an auto. Mrs. Miller became a flower gardener of note, a hobby John Miller was not too fond of because he couldn't do it in a photographic dark room.

Raising and educating their son and daughter became Mrs. Miller's priority. Her daughter remembers her mother's life and wrote the following (Moore 2003):

> Bess lived on after John's death, until 1987. She died at the age of 100 years and 8 months. All but the last 6 years of her widowhood were spent in Palo Alto at the only "permanent" home they ever owned. Bess likewise had hobbies to fill lonely hours. She learned sewing when she was very young, and made clothes for her brothers and sisters and herself as a part of her family duties. She continued to sew for her own family. She had learned the piano when a traveling salesman came to the farm in Missouri and traded his piano for one of her father's horses. Music was something she shared with John. One of the first items bought for the Palo Alto home was a new Steinway piano, and I remember as a child that after dinner, they often played music together—he on the instrument he called a "peck horn" and she on the piano. Bess came from a large family and it was close knit. She enjoyed visiting her relatives and did so whenever she could. She was of a "social" nature and enjoyed social functions in the community, mostly church groups and the "Women's Club." However in later life she became involved with the group of Palo Alto artists and took up lessons in watercolor painting.



J.M. Miller family

Figure 88—Bessie Brose Miller, 1886-1987.

Burke and Miller were extremely lucky men to have had such devoted wives. It couldn't help but have played an important role in their successful professional lives. Behind these two good men were two good women.

[6] Undated letters to me from David Pratt and Janet Eglington.

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Other Sources

In addition to the references cited, which were mostly processed reports, published reports, and books, there were other important sources of background material on Burke and Miller. A list of the important sources that are not readily available in archives follows.

Interviews—I had two personal interviews with Burke's grandson, David Pratt, in 2003 and 2004. I spent a very rewarding several hours with Betty Miller Moore, John Miller's daughter, in May 2004. The interviews did not provide specific historical details, but rather gave me a flavor of family life of the two men beyond what I could obtain from written records. In addition, David Pratt organized an index of Burke's photographs, which he shared with me, and which was helpful for choosing illustrations.

Correspondence—I had a spate of letter writing (for 3 years) with the following people once they were aware of my biography project: Janet Burke Eglington and Dorothy Burke Walker (H.E. Burke's daughters), Betty Miller Moore (Miller's daughter), David Pratt, and Paul Pratt (H.E. Burke's grandsons) who lived with the H.E. Burkes for 13 years, and Joan Salman Rhodes, Ken Salman's daughter, who provided photographs and family history.

Dr. Robert Z. Callaham, retired Deputy Chief for Research, USDA Forest Service, who was the last person to work with J.M. Miller on research projects at the Institute of Forest Genetics, Placerville, California.

Except in the case of Dr. Callaham, the letters mostly related to family affairs, like how the families lived at isolated field locations during the summer and anecdotes and family legend. This type of information may not be historically precise, but does add color to the everyday lives of the two entomologists.

Unpublished family documents—Both the Burke and Miller families have saved documents, correspondence, drafts of memoirs, photographs, several privately published Miller family histories, and a compliation of letters from Miller to his future wife. I was allowed to use portions of these letters, and they are included in several chapters covering Miller's Forest Service career before he joined the Bureau of Entomology.

Official government correspondence—Unfortunately, official correspondence often gets purged from government files every several decades. Correspondence dating back to the period of these biographies is rare and, if archived, difficult to locate. I used official correspondence from several sources: Pacific Southwest Region/Pacific Southwest Research Station library, now located at the Rocky Mountain Research Station in Ogden, Utah. The correspondence of Robert L. Furniss (deceased), who was leader of the Portland Forest Insect laboratory. Malcom M. Furniss, retired forest entomologist, Moscow, Idaho, inherited his brother's correspondence file and provided me with valuable letters. The historical forest entomology files at the La Grande Forestry and Range Sciences Laboratory, Pacific Northwest Research Station. And perhaps, most important, historical correspondence I have been collecting since the early 1950s. Particularly important to this story is official correspondence of A.D. Hopkins to H.E. Burke and others from 1910 to 1914. These letters were somehow found and saved by Robert Dolph (deceased) and Charles Sartwell, retired Forest Service forest entomologists, and given to me over 25 years ago.

Western Forest Insect News—this newsletter was suggested at the 1923 Berkeley conference on forest entomology. It was approved by Hopkins and the Chief of the Bureau of Entomology in March 1923. The first issue was dated April 16, 1923, and was called "News Letter—Western Division." A year later, the title was changed to "Western Division Newsletter." On March 1, 1926, the name was changed again to "Western Forest Insect News."

Initially, this informal newsletter had a limited distribution of several dozen copies sent to Western forest entomology workers. The distribution list in the last issue, June 1, 1928, included over 120 people, libraries, universities, and government agencies. The demand for the newsletter became so great that Miller and Burke (the editor) could no longer devote the necessary time and money to its production and distribution.

I know of only three complete sets: mine, Malcolm Furniss', and a set at the Federal Records Center, Seattle, Washington. There may be individual issues scattered in private collections or university libraries. There is a wealth of information over a 5-year period on personnel, research and control projects, and philosophical discourse on forest entomology in the newsletters.

Personal experience—Historians may wince at the mention of a writer using his personal memories as a source for a biography, but I used all information available. To my knowledge, there are only three scientists still alive who worked with and for J.M. Miller. They are Dr. Robert Z. Callaham, Malcolm M. Furniss, and me. Both Callaham and Furniss provided valuable memories of their association with Miller. In my case, during a period from summer of 1948 until Miller's retirement, I did field and office work for Miller, Patterson, Keen, Hall, Bongberg, and Struble. After my professional appointment in 1956, I worked for Hall and C.B. Eaton. All of these pioneer forest entomologists were storytellers. Long automobile rides and campfires tend to loosen tongues. I hope I captured some of the rich flavor of their reminiscences.

Oral histories—The oral histories of Keen and Hall are referenced in the text and available at the Forest Historical Society in North Carolina. However, I want to insert a caveat here concerning the accuracy of oral histories. Age may play tricks with one's memory, and sometimes long-forgotten slights or criticisms seem to resurface. As one example, in Keen's interview, he claimed Miller retired in 1943 when he took over as leader of the Berkeley Insect Laboratory. In fact, Miller worked for almost 9 more years as an independent scientist (or technical advisor) for the Bureau of Entomology in Berkeley. These were some of Miller's most productive research and publishing years. He even took over as lab leader in the occasional absences of Keen, as I recounted in the preface. Another point is that the contributions of others is sometimes forgotten. From 1943 until his retirement, John Patterson was the administrator of the Berkeley lab, and Robert L. Furniss of the Portland lab with Keen in overall charge. That this arrangement functioned so well was mainly due to the excellent leadership of Patterson and Furniss. There is not much in the oral histories on this aspect. I used the oral histories with caution, cross checking statements with other sources whenever possible.

Miller's diaries—Miller developed a daily dairy habit as soon as he joined the U.S. Forest Service. A daily dairy was required of forest officers, so his dairies started with his Forest Service appointment in 1909 and continued until his retirement. He actually kept two diaries for many of the years between 1910 and 1920. One diary tracked travel and expenses, and the second contained biological notes wherever he was working at the time. The early diaries contain more detail of his travel, mode of travel, and kind of work he was doing. As the years went by, the entries became very brief; for example, the Tuesday, May 23, 1950, entry is "Berkeley." For Saturday, November 18, 1950, the entry is "Stanford-Army game."

Unfortunately, the diaries do not go into administrative or personnel details, but from 1910 to 1940, they do faithfully record his travels, who he met with, and why. This information was valuable for relating Miller's work habits, his prodigious amount of travel, and the primitive transportation and living conditions in the field. The information also was used to crossdate reports on various projects.

There was one serious problem with his diaries. Many were small, 4- by 6-inch USDA field diaries, or even smaller stationery store diaries. Miller's handwriting was small and tight to begin with, and often he wrote even smaller to get all of his entry into the designated diary space for the day. Consequently, I had to read most of them by using a magnifying glass. Then to top it off, he wrote most entries in light pencil. But my complaints are trivial compared to the value of having 40 years of a person's daily journal when preparing his biography.

We can thank Miller's wife for keeping his letters and diaries and his son, Harold Miller, a career Forest Service forester, for recognizing their value, saving them after his mother died, and then entrusting them to his daughter, Susan Lowenkron when he died. Susan, in turn, entrusted the diaries to me in 2003.

Burke also kept a daily journal his entire life, according to grandson David Pratt. Unfortunately, Mrs. Burke thought her husband's diaries and correspondence should be kept private, so she destroyed them after he died.

Appendix

UNITED STATES DEPARTMENT OF AGRICULTURE, BUREAU OF ENTOMOLOGY, BRANCH OF FOREST INSECT INVESTIGATIONS, WASHINGTON, D. C.

TO OWNERS AND OTHERS INTERESTED IN THE PROTECTION OF THE PINE TIMBER OF NORTHEASTERN OREGON FROM DEPREDATIONS BY BARK BEETLES.

Extensive investigations carried on by experts of the Bureau of Entomology, assisted by officers of the Forest Service and interested owners of timber, have revealed the fact that a large percentage of the pine timber in northeastern Oregon has been killed during the past five years by an insect known as the mountain-pine beetle.

While heretofore this beetle has confined its principal depredations to the lodgepole pine, it is now gradually adapting itself to the yellow pine, thus threatening the best trees and stands of this timber on and adjacent to the Wallowa and Whitman national forests.

According to the conclusions and recommendations of the expert of the Bureau of Entomology in charge of forest insect investigations, based on the reports of the representatives of the Bureau, of the Forest Service, and of private owners, who have conducted special investigations to ascertain the facts relating to the technical and practical features of the problem, it is evident that unless the proper steps are taken to control the depredations, many millions of dollars' worth of the best yellow-pine timber of the area will be killed within the next few years.

It appears that it is not practicable to undertake at this time to control the depredations in the lodgepole-pine areas, but it does appear to be entirely practicable to control them in the principal yellow-pine areas in and adjacent to the eastern part of the Whitman and southwestern part of the Wallowa national forest at a cost of from $30,000 to $100,000, and thus prevent, within the next five or ten years, the further death of timber, which, judging from the history of similar depredations by this beetle in other sections of the Rocky Mountain region, is certain to be worth, in stumpage values, several millions of dollars.

The depredations in and adjacent to the yellow-pine areas are so extensive and the number of infested trees is so large that control work, if attempted with any prospect of success, with the limited funds that might be available from all sources and the limited number of laborers who could be secured for the work, must be by the methods of cutting and barking, and cutting and burning, the required number of infested trees at direct expense. It is also certain that unless there is a very general cooperation, by all of the principal owners and interests involved, in an energetic effort to carry on the work according to a plan of procedure definitely agreed upon and based on established principles and requirements, nothing of importance can be accomplished.

Extensive experiments with methods of controlling this class of beetles have been conducted, according to the requirements and instructions of the experts of the Bureau of Entomology, by private owners and by the Forest Service direct, or in cooperation with other interests, in five different areas in Colorado and two in Montana. All of these have been successful in controlling the depredations, and all have demonstrated conclusively that such work will pay, in the timber protected, an enormous profit on the money expended.

These demonstrations and experiments have also shown that if from 35 to 75 per cent of the infested timber in the principal centers of infestation within the radius of one or more townships is felled and barked or otherwise disposed of within the required period to kill the broods of insects in the bark, the remaining living timber will be protected from depredations for many years after.

The direct expense of cutting and barking and cutting and burning the infested trees has ranged from 15 cents to $1 per tree, or an average of about 50 cents per tree. Whenever the beetle-infested timber has been utilized within the required period, the desired control has been affected without ultimate cost. When the timber is felled and barked at direct expense, the merchantable timber thus treated is usually available for utilization for two or more years after it is cut, and the amount that can usually be sold and converted into lumber will yield enough revenue to cover a large percentage, and in some cases all, of the original cost.

The Bureau of Entomology has no funds that can be devoted to direct control work, but it will devote all

available funds and men toward locating the infested timber, directing the operation of marking the same for cutting, and giving technical advice and instructions on the essential features of the control work, provided it has sufficient assurance from the owners and others directly concerned that its recommendations will be adopted and carried out, so far as it is practicable to do so.

The Forest Service has given assurance that during the months of October and November it will devote all available funds, amounting to at least $5,000, to direct control work in an important center of infestation located by the experts of the Bureau of Entomology in the yellow pine on one of the national forests; also, that it will endeavor to secure a special emergency appropriation to continue the work next spring in the same or other centers, provided the principal private owners of affected or threatened timber in or adjacent to these centers will give similar assurance that they will cooperate in an attempt to dispose of the required proportion of the infestation on their property.

Therefore, if you are interested in the protection of the timber from further depredations by the beetle, are you willing to join the Forest Service in an organized cooperative effort to adopt and carry out the recommendations of the Bureau of Entomology for the treatment of the required percentage of infested trees and to take the necessary action relating to the infested timber which may be located and marked on the property in which your are directly or indirectly interested?

If the timber on the lands in which you are interested is found to be healthy, are you willing to contribute to a general fund to assist in the disposal of the important centers of infestation, which are found to be a menace to it?

Will you make an effort to attend, or have a representative of your interests attend, a meeting to be held at Baker City, Oregon, on September 1, 1910, to discuss and adopt a definite policy of procedure toward the protection of the timber of northeastern Oregon from insect depredations?

An early reply is important, in order that the Bureau of Entomology may judge whether or not it can proceed with its efforts to bring about the required action, or whether it will be necessary to abandon the project and turn its attention to other sections of the country in which similar depredations demand attention.

Correspondence relating to organization for cooperative control work and the general methods of procedure in such work should be addressed to the District Forester, Portland, Oregon.

Correspondence relating to the insect and methods and recommendations for control work should be addressed to Mr. H. E. Burke, Agent and Expert, Bureau of Entomology, Sumpter, Oregon.

A. D. HOPKINS,
In Charge Forest Insect Investigations.

Approved:
L. O. HOWARD
Chief, Bureau of Entomology.
AUGUST 5, 1910.

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Pacific Northwest Research Station

Web site	http://www.fs.fed.us/pnw
Telephone	(503) 808-2592
Publication requests	(503) 808-2138
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E-mail	pnw_pnwpubs@fs.fed.us
Mailing address	Publications Distribution Pacific Northwest Research Station P.O. Box 3890 Portland, OR 97208-3890

U.S. Department of Agriculture
Pacific Northwest Research Station
333 SW First Avenue
P.O. Box 3890
Portland, OR 97208-3890

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