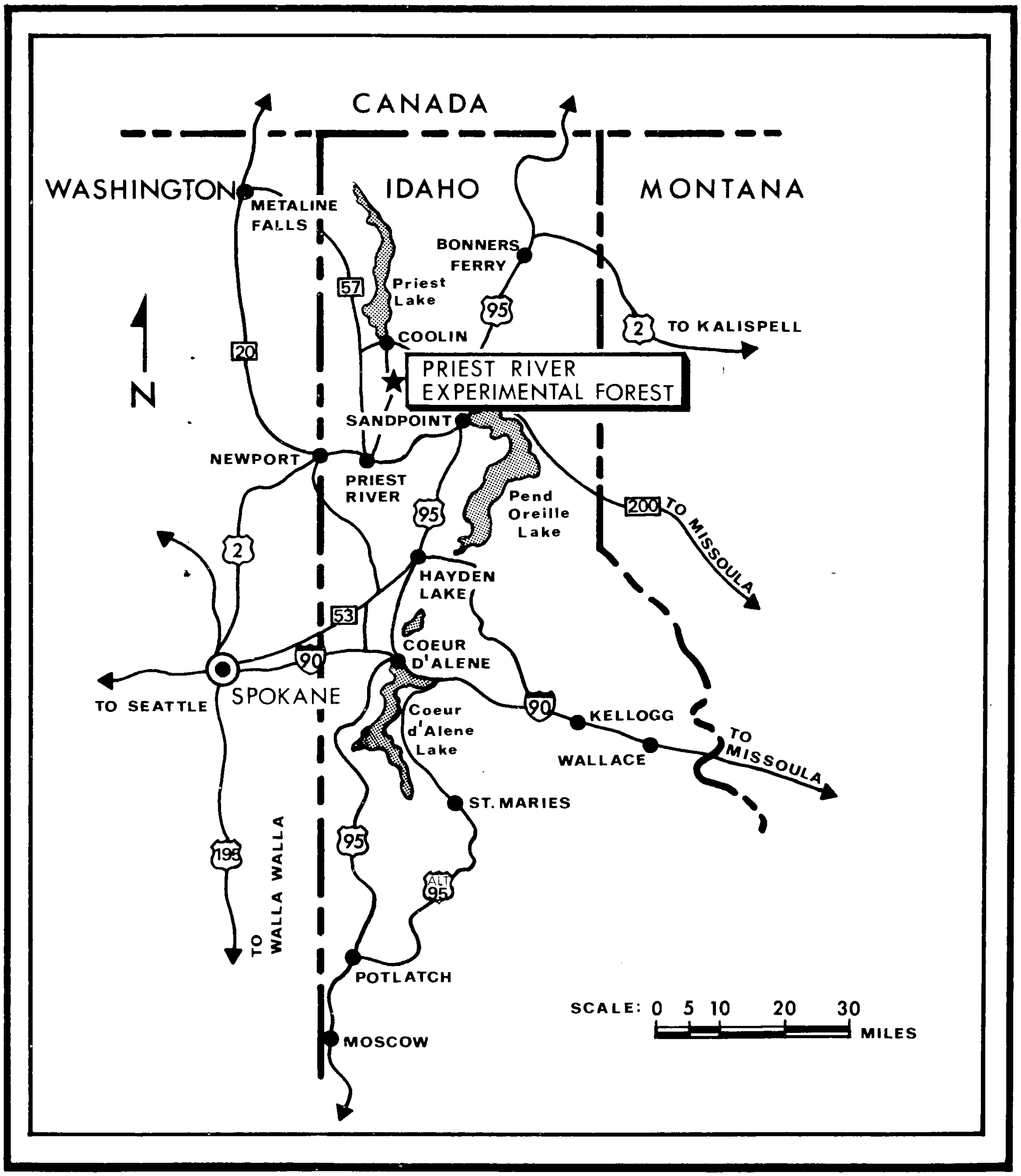
# FRONTIERS OF FORESTRY RESEARCH —

## PRIEST RIVER EXPERIMENTAL FOREST 1911-1976

CHARLES A. WELLNER

INTERMOUNTAIN FOREST AND RANGE
EXPERIMENT STATION




ACKNOWLEDGMENTS

Material for this account was obtained mainly from annual reports of Priest River Forest Experiment Station, 1911-1913; annual reports of District One Investigative Committee, 1914-1935; annual reports of Northern Rocky Mountain Forest and Range Experiment Station, 1936-1953; annual reports of Intermountain Forest and Range Experiment Station, 1954-1963; and annual reports of Priest River Experimental Forest, 1953-1974. Other unpublished sources were of great value, including a journal by D. R. Brewster, recollections by J. A. Larsen, notes and start of a history by Robert Marshall, and file memoranda and reports by F. I. Rockwell, R. H. Weidman, and many other Forest Service people. Ronald Huff, who worked at the Priest River Station from 1929-1936 and lived nearby, helped recall events and people. Many coworkers in Intermountain Station have been helpful in supplying information and in other ways.

1976

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# PREFACE

The Priest River Experiment Station was established in 1911 as the center for forest research in the productive forests of northern Idaho, western Montana, and northeastern Washington. Located out in the forest of northern Idaho, 15 miles from the nearest small town, it was to be the hub of forest research in this large forested area. Within a few years it became apparent that the range of conditions requiring study did not occur on the Priest River Experimental Forest and that the Station was too isolated to serve as the center for research. Thus, Missoula, Montana, headquarters for the National Forests of the region, became the hub of research and the Priest River Experimental Forest a site for intensive studies and experimentation, as a work center, and as a demonstration and educational facility. The Missoula Station developed into the Northern Rocky Mountain Forest and Range Experiment Station and took on wide responsibilities for research on management of forest and range lands and utilization of timber products. In 1954, it was combined with the Intermountain Forest and Range Experiment Station. The Intermountain Station with headquarters at Ogden, Utah, has many laboratories and field facilities scattered over the States of Utah, Nevada, Idaho, and Montana. The contribution of the Priest River Experimental Forest, one of these field stations, over the years has been as a field laboratory and support facility. I have tried, therefore, to present the Priest River Experimental Forest in this role and to limit this account largely to the people who used the Experimental Forest and their research programs.

Charles A. Wellner
Moscow, Idaho

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# A TENT PITCHED IN A MEADOW

The first forestry work done by the Federal Government was largely investigative. By the Act of August 15, 1876, Congress provided for a man to prosecute investigations and inquiries concerning timber consumption, forest preservation, climatic influences, and reforestation. This ambitious program was undertaken by Dr. Franklin B. Hough. For many years, until the Act of June 4, 1897, providing for the administration of the Forest Reserves, the Federal forestry activity was concentrated on research and the dissemination of its results.

In the early days research activity centered in Washington, D.C. A staff of young technically trained men were sent out to solve regional problems as they arose. But shortly after the transfer of the Forest Reserves to the Department of Agriculture in 1905, it began to be realized that a better way to obtain information for management of the National Forests was by regional experiment stations where scientists could live close to the land and its problems. The driving force in this move was Raphael Zon, in charge of the Office of Silvics. Consequently, in 1908 the first of a series of regional experiment stations was established in the Southwest for the purpose of studying the factors affecting forests in that territory. The Station was located right out in the woods in order that the men could live with their work.

The location of the now Priest River Experimental Forest was selected in August 1911 as the site for the Priest River Forest Experiment Station, fourth in the series of regional stations, and planned as the Forest Service center for forest research in the Northern Rocky Mountains. The considerations leading to this selection were recorded by F. I. Rockwell, in charge of silvics in District 1, in a statement dated March 1, 1912.

In 1911, District 1, much of which eventually became Region 1 (the Northern Region), extended from the Lake States to eastern Washington. The District was thought to comprise three forest regions: (1) "Northern Forest," found in Minnesota and Michigan; (2) "Rocky Mountain Forest," found in the Dakotas, eastern Montana, and portions of the then Missoula, Bitterroot, and Nez Perce National Forests west of the Continental Divide; and (3) "Pacific Coast Forest," covering northwestern Montana and north Idaho.

Rockwell noted that many "older forest schools" were investigating the silvics of the Northern Forest, and some, most notably the State University of Minnesota, had established experiment stations "...which will deal with problems very similar to those found in the National Forests of that region." The Rocky Mountain Forest extended into District 2 and District 3, where the Forest Service had three experiment stations at work on problems similar to those in District 1.

No experiment station had yet been established to deal with the Pacific Coast Forest in District 1, particularly the silvics of its most important species, western white pine. Investigations and experiments conducted by the District were not yielding results "commensurate with the amount of time and money spent." According to Rockwell, "All these reasons considered, there was no doubt of the advisability of placing the station in the Pacific Coast Region and in the Western white pine belt."

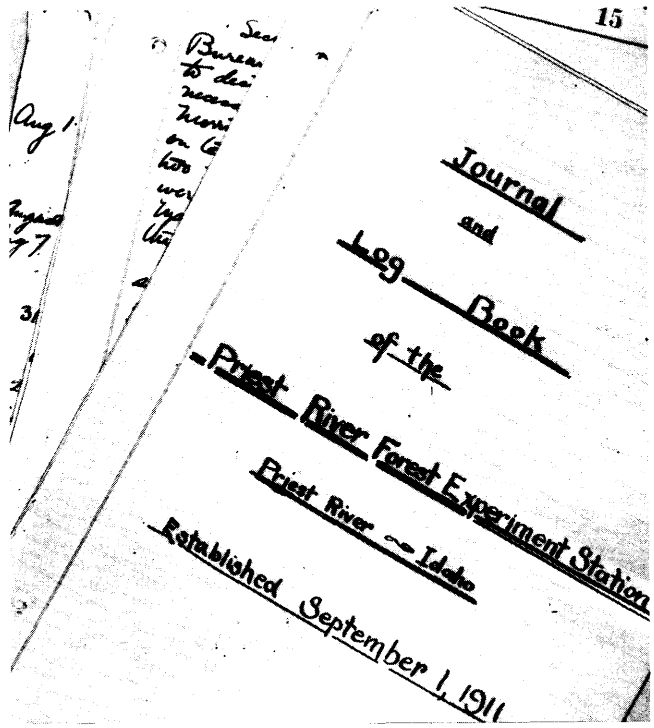
Rockwell's account of how the site was chosen reflects the kinds of investigation that had high priority within the District in those days.

> "Practically all of the available sites within reach of the main railway lines on the most promising Forests, viz. the Kootenai, Kaniksu, Coeur d'Alene, St. Joe and Lolo, were examined or considered, and the vicinity of the Benton Ranger Station on the Kaniksu National Forest was finally chosen as coming the nearest to fulfilling the desired conditions. Each of the important forest types of the region - western white pine, western larch, Douglas fir, and western yellow pine, are found on the area for the use of the Experiment Station, and in about the same relative importance as they exist in the region. In addition large flats covered with lodgepole pine in pure stands are only one and one-half miles distance, while a trail from the station along a ridge top leads up into the Alpine type on the top of Bald Mountain.
>
> "In the western white pine type about 150 acres formerly covered with mature western white pine, western larch, and western red cedar timber was cutover in 1910 and 1911 or will be cut during the present year, and offers excellent opportunities for experimentation in securing reproduction of the desirable species both by natural and artificial regeneration, and also for experiments in the introduction of exotic species. In the western yellow pine and western larch types, areas of considerable size have been bared by recurrent fires, thus providing sufficient ground for experimentation in these types and for the establishment of experimental nurseries. Thrifty even-aged stands of western white pine, western larch, Douglas fir, and western yellow pine of 40 to 50 years of age occupy a large part of Benton Creek Basin, in which the Experiment Station is situated, and will afford unrivaled opportunities for experiments in thinnings, and for the establishment of permanent sample plots for the study of yield and growth. All in all I believe the site selected is as nearly ideal as could be found."

The Priest River Station had to be carved out of a wilderness. The country in Benton and Canyon Creeks east of the county road contained not a single road, and the only trail was an old trapper's trail that wound its way up Center Ridge between Benton and Canyon Creeks out along the divide over Bald Mountain and down to Sandpoint. The only building was Benton Ranger Station near the county road. Consequently, one of the first jobs was the felling and clearing away of young timber to make openings for the construction of buildings and space for research studies.

Donald R. Brewster, first Director of the Station, kept a handwritten journal and log which vividly describes the first days of the new Station:

> "After a preliminary examination of the different north Idaho Forests with a view to establishing a Forest Experiment Station, by a party consisting of Raphael Zon, Chief of Silvics, R. Y. Stuart, Assistant District Forester in charge of Silviculture in District I, and F. I. Rockwell, in charge of Silvics in the District, the site was selected at the Benton Ranger Station on the Kaniksu Forest.
>
> "A number of considerations were involved in the selection of this site. Principal was the proximity of one of the finest stands of white pine timber on any of the National Forests in the Big Creek Basin 2 miles south of the Experiment Station site. There was also a recent cut-over area of about 100 acres close to the site which would give room for extensive planting experiments. An excellent opportunity was offered for the study of meteorological conditions on various types and sites within a short distance of each other. Large areas of young white




*A handwritten journal kept by Donald R. Brewster, first Director of the Priest River Forest Experiment Station, vividly describes the first days of the new Station.*

pine and larch were found which would be available for the location of permanent sample plots and thinning experiments. Situated in the midst of one of the most important white pine forests and close to active timber sale areas, the silvicultural aspects of western white pine could be studied to better advantage here than at any of the other proposed sites. In addition to the advantages of the site for technical study the location was good because on a main travelled stage road with rural delivery, close to a Ranger Station, with ten acres of hay land available for meadow and pasture, with excellent water and a good building site and with several ranches nearby where produce could be secured. These advantages were thought to outweigh the disadvantages of being 15 miles from town and the railroad, although this comparative isolation and lack of accessibility from the Missoula office was an important point to consider.

"Mr. Zon arrived August 28, 1911 with Rockwell and immediately started to assemble a crew and start a camp. The services of Louie White, a fire guard whose term of service had just expired, were secured and a trail blazed through the 1/4 mile of 50 year old timber leading from the Ranger Station and the stage road to the meadow. September 1, Mr. Austin Cary stopped on a visit to the Forest and helped locate a trail leading to what later became Meteorological Station No. 1, September 2, Forest Assistant Donald R. Brewster arrived on a temporary detail of a month from the St. Joe National Forest to help establish the Station.

"Section Director R. F. Young of the Weather Bureau at Helena arrived with Brewster to decide as to the meteorological instruments necessary. On the 4th, Forest Assistant Wm. W. Morris arrived from the Coeur d'Alene Forest also on temporary detail for a month. On the 5th two more fire guards, Fred Green and "Dad" Crosby, were added to the force and a cook, Douglas MacDonald was secured. Camp was pitched on the new site and plans of work discussed.

*The crew which established the Priest River Experiment Station in 1911. From left to right: Louie White (?), Douglas MacDonald, Howard Simson, Raphael Zon, W. W. Morris, Ed Brown (?), Donald Brewster, John Kirk (?), "Dad" Crosby, F. I. Rockwell.*

"On the 6th the technical work was begun by surveying out a 1/2 acre seed-production plot on the Jurgens brothers sale on Section 34. The next day Brewster went to Coolin to redraw the plans for the laboratory while Morris and Zon located another seed production plot on Section 26, West Branch, and Rockwell located a third on Big Creek. In the meantime, two more Guards, Ed Brown and John Kirk were hired and the work of clearing and trail cutting and road building was put under way. Ground for a nursery site was cleared and plowed on the flat north of the ranger station and additional of about two acres cleared of brush for experimental planting plots. The trail to the northeast slope blazed by Mr. Cary was cut out and at its termination a clearing of one square acre made. Trails were also cut to the sites of the proposed meteorological stations on the southwest slope and Benton Flat.

"The bid for erecting the laboratory Bld was awarded to Chas Johnson of Priest River and the site cleared on a knoll overlooking the meadow. The work of erection was well under way by the end of the month, starting the 26th.

"The road in from Benton Station was finished and graded the 14th and the first load was hauled in by the Kaniksu teamster, Howard Simpson on the 15th.

"The work of putting in a water supply was started the 14th by running a line of levels with a transit and improvised stadia rod from the building site for 2/3 of a mile up the creek at which point a good dam site was found with a fall of 50 feet to the building.

"Planting work was started on the 18th and Planting Block A laid out on Benton Flat in plots 50 feet square during the next few days. Several groups of plots were also located on Block C, the Jurgens Cut-over area.

"Oct. 1. The first half of October was busily spent in continuing the construction work, clearing, etc. and in starting the nursery, doing more planting, staking out the water ditch line. Three more laborers were hired during this period.

"October 13th the principal clearing work was considered complete and the crew was disbanded. Arrangement was made to hire the cook, Douglas MacDonald as a general assistant about the place with the position of Forest Guard.

"On October 11, Mr. Young of the Weather Bureau arrived on a second visit and supervised the installation of the various instruments at the different stations.

"It was decided to retain Brewster permanently at the Station and on the 14th he returned to St. Maries to get his family and household goods leaving Morris at the Station. Upon Brewster's return on the 18th Morris left for the Coeur d'Alene leaving only the two permanent men, Brewster and MacDonald.

"The carpenters completed the laboratory and a one room shed for MacDonald by the 31st of October and also built the frame for the greenhouse. Brewster's furniture arrived November 1st and Mrs. Brewster came down from the hotel at Coolin.

"Nov. 1. The first week in November was spent in installing the electric line to the control meteorological station on Benton Flat and in other constructive work.

"Nov. 8. The Kaniksu work horse 'Nig' arrived to help us get in the wood supply.

"Nov. 9. Twelve inches of soft snow fell with much of planting and nursery work still undone.

"Nov. 12. Twelve inches more snow making two feet deep on ground. Nursery beds set by shovelling snow away.

"Nov. 17. Electric line completed to Control Station.

"Nov. 18. Started planting with MacDonald and Moyer, one man shovelling snow (about 12" deep), one man digging and one man planting with fingers.

"Nov. 20. Finished planting work and white pine nursery work.

"Nov. 27. Started automatic weather instruments and regular daily observations. Yellow pine seed received for nursery work.

"Dec. 1. Green house work of construction started.

"Dec. 6. Yellow Pine sowing experiments completed.

"Dec. 7. Visited for Forest Supervisor Millar who stayed over night.

"Dec. 13. Installed gasoline lighting system in laboratory.

"Dec. 22. Yellow pine nursery experiments installed by building fires to melt the ground.

"Dec. 28. Went to town after glass for greenhouse."

*Donald R. Brewster behind a planted coconino source ponderosa pine in the newly established test of racial variation in ponderosa pine.*

Despite the difficulty of reaching this isolated site, the list of those who took interest in the Station is a veritable forestry "Who's Who:" Henry S. Graves, Earl H. Clapp, Raphael Zon, and S. T. Dana, all in the Washington Office. Participating District 1 foresters included W. B. Greeley, District Forester and then Assistant Chief, F. A. Silcox, R. Y. Stuart, D. T. Mason, and John Preston. Each played an important part in the establishment of the new station.

Such were the beginnings of forestry research in the Northern Rocky Mountains--from a small tent pitched in a clearing in a remote stand of white pine.

## GROWING PAINS AND WAR IN EUROPE, 1911-1920

This was a decade of development, trial, disappointment, and progress. Two major activities occupied personnel of the new Forest Experiment Station. The development of facilities was an important and time consuming job. More to the interest of the young scientists was the starting of silvicultural research along a broad front.

### *Funds*

Funding for the Station was skimpy throughout the decade. For the first full fiscal year of operation (1913), the total allotment was about $7,500, with investigations receiving considerably less money than improvements and operation. Allotments remained in the $7,000 to $9,000 level throughout the period, except for the war years when spending for the Station was cut drastically. In 1920, District 1 provided $2,500 to keep the Station open. Other investigative programs in District 1, such as products and grazing studies, were also poorly funded.

### *Personnel*

Many persons served at the Station for varying lengths of time and in different positions. Although all of them contributed to the progress that was made, only the principal investigators will be given special mention; others are listed in appendix A.

Donald R. Brewster was director of the Station from the time it was established until 1917, when he applied for an officer's commission during World War I. Brewster failed the physical exam. He worked for a time at the Forest Products Laboratory, then went into private business.

Julius V. Hoffman reported on September 1, 1912, as a technical assistant to Brewster. He left March 27, 1913, to be in charge of the newly established Wind River Forest Experiment Station in Washington.

J. A. Larsen, who held undergraduate and graduate degrees from Yale, served as Brewster's technical assistant from 1913, then became Director of the Station when Brewster left.

Ernest C. Rogers from the Minnesota Forest School came to Priest River on April 18, 1913, to take a position as field assistant for the summer. He stayed on and transferred to Savenac Nursery in 1914 to conduct nursery and planting studies. He resigned in October 1917 to begin graduate work at Johns Hopkins University and died in a Washington, D.C., hospital shortly thereafter.

W. C. Lowdermilk, an Oxford scholar, was appointed liaison officer in 1919. His major responsibility was to interpret results of research and to put results into practice by working with land managers. Although he was not actually on the staff of the Station, he cooperated with Larsen and other Station personnel for many years. He started the publication, "Applied Forestry Notes."

*Chief Forester Henry S. Graves and party at Priest River Experiment Station, 1912. From left to right: A. W. Greeley, Tanner, D. T. Mason, F. A. Silcox, J. W. Girard, M. H. Wolff, H. A. Graves, and M. N. Stickney.*

W. G. Wahlenberg was assigned to Savenac Nursery in 1920 to take charge of forestation investigations in the Office of Planting. He worked closely with J. A. Larsen.

F. I. Rockwell was in charge of silvics in District 1 at the time the Station was established and had much to do with selection of the site and development of the research program. He personally was responsible for yield studies. Although not assigned to the Station, he stayed there frequently and had a close association with Brewster and Larsen. He apparently left District 1 during World War I.

Many field assistants, mainly forestry school students or recent graduates, served for a few weeks or several months on various studies. In 1913, the District Ranger became part of the Station staff and served only the Station's needs. This practice was changed in 1918, and the District Ranger rejoined the staff of the Kaniksu Forest.

Brewster's journal and Larsen's notes mention visits by many prominent foresters and educators of the day. These included Chief Forester Henry Graves, Assistant Chief W. B. Greeley, David T. Mason, E. H. Clapp, Raphael Zon, S. T. Dana, F. A. Silcox, R. Y. Stuart, James R. Weir, James Girard, Joe Fitzwater, T. T. Munger, John F. Preston, Fred Clements, Professors H. H. Chapman and James Toumey of Yale, Clark of Williams College, and Dean Shattuck of Idaho Forest School. A typical diary entry marks Dana's visit: "Nov. 3, 1912. S.T. Dana arrived on trip of inspection remaining until the 8th and going over all the work very thoroughly with great benefit to the Station in suggestions and criticism."

## *Organization*

Over the years, innovative men at local and higher levels have seldom been satisfied with previous organizational systems and have continually attempted to improve the research organization.

At the outset the Priest River Station was under the direction of the District Forester in Missoula, with technical guidance largely from the Office of Silvics in Washington, D.C. The Director of the Station reported to the Assistant District

Forester in charge of Silviculture. Director Brewster was responsible for both the research program and the maintenance, improvement, and protection of the Station and experimental forest.

The first change came in 1914 when nursery and planting investigations were concentrated at Savenac Nursery and on the 1910 burn in Placer Creek near Wallace, Idaho, rather than at the Priest River Station. The idea was to make these investigations more relevant to practical problems. Accordingly, field technician Ernest C. Rogers was transferred to Savenac Nursery to conduct these studies. However, he at first remained a member of the Station staff and Brewster was still responsible for nursery and planting studies. However, by 1915 Rogers reported to the Chief of Planting, and planting studies, except those at Priest River, were transferred to the Office of Planting.

Meanwhile, in 1915 Chief Forester Henry Graves had established a Branch of Research in the Washington, D.C., office with Earle H. Clapp as Assistant Forester in Charge. Under him was a division of Forest Investigation headed by Raphael Zon. Both of these leaders and Chief Forester Graves were deeply concerned about the best organization for research and the lack of attention nationwide to research. Some of their concerns were the number of isolated research Stations with small staffs, burdened with administrative tasks such as construction and maintenance and protection of facilities, and the trend of the research program toward administrative problems of the moment rather than with fundamental questions. They believed that changes had to be made, including separation of research from the National Forest administrative organization.

The concerns in Washington were reflected in somewhat different ways in the District Office. By 1916, agreement had been reached in the Missoula District Office, and rather reluctantly by Brewster at Priest River and Zon in Washington, to substantial changes. A Section of Forest Investigations was established under the Assistant District Forester for Silviculture. Brewster moved to Missoula in November 1916 and was assigned responsibility for white pine and larch-fir studies and a rather nebulous overall coordinating responsibility for the Section. Rogers was responsible for forestation and nursery studies. Joseph Kittridge, already in Missoula, was in charge of Engelmann spruce and lodgepole pine studies. Lenthol Wyman, also already in Missoula, handled insect control projects. Dr. Weir and his staff in the Bureau of Plant Industry engaged in forest disease investigations were housed with the Section in Missoula. This left J. A. Larsen as the only technical man at the Priest River Station, with responsibility for the host of studies underway there. Each of these investigators (except Dr. Weir) reported directly to the Assistant District Forester. Although not clearly spelled out, Brewster still had responsibility for the research at Priest River. The organization plan for this change stated:

> "One of the important functions of the Priest River Experiment Station is to conduct local experiments to answer specific questions encountered by the different investigators in the conduct of their work, which requires intensive and detailed study which can best be carried on with the facilities of a permanent field station. Each man should be free to propose such special experiments and request that they be undertaken at the Experiment Station."

At Priest River the work was divided. Larsen had responsibility for the research program and answered to Missoula. A local ranger was given responsibility for maintenance, improvement, and protection of the Station and experimental forest and reported to the Supervisor of the Kaniksu National Forest. Operation of the Station as an effective research center depended upon close cooperation.

At the outset of the Priest River Station, the intention was to create a Station for intensive studies within an experimental forest which would be used for experimental purposes and also as a model and demonstration forest of intensive management. Brewster's diary entry of September 23, 1913 sums up the plan:

> "Mr. Raphal Zon, Chief of Forest Investigations, from Washington, D.C., arrived for the annual inspection of the Station, coming up on the auto stage in the evening. He found many changes since he left two years ago, the latter part of Sept., 1911 and seemed pleased with the progress that had been made. Mr. Zon went over all the investigative and improvement work, the files, and records in great detail. He also spent an afternoon in looking over the withdrawal up Benton Creek valley and came back a very enthusiastic convert to the plan of making the Priest River Experiment Station a miniature adminstrative unit of 4500 acres - a model Forest intensively managed along European lines. With some ten million feet of merchantable timber ready to cut and large bodies of young timber coming to maturity, the unit could be made self supporting on the basis of its annual increment and in a minimum time. The timber will be immediately accessible and saleable as soon as an inexpensive permanent road system can be installed, with a main trunk road about two miles long up the valley from the landing on Priest River and side roads up each gulch. Mr. Zon stayed until Sunday morning September 28."

The model forest idea appealed to several District people and they arranged to hold their annual ranger training school at the Station, both for the value of the Station in training and also the opportunity to use the school to build facilities and in other ways aid the development of a model forest.

The first school was held in early 1915 with Holcomb in charge. Because of the lack of facilities at the Station, it was held at the old Benton Ranger Station. The men lived in tents pitched nearby and ate their meals in the Ranger Station. The second school was held in January 1916, with Glen Smith in charge. Much of the time of this school was devoted to building permanent facilities for future ranger schools: a bunkhouse at the west end of the Station clearing and a woodshed-icehouse with a lecture room upstairs in back of cottage 1. Each training school lasted about 2 months.

The model forest concept appears repeatedly in reports over the years with sustained enthusiasm. The experimental forest was even given the name of "The Selkirk Model Forest." But the model forest remained a concept that never developed. Funding was never adequate to carry on the research program, let alone build the necessary roads and trails and thin the young stands needed for development of the model forest. Markets for timber at the time were geared to white pine sawlogs and cedar poles and not to the complete utilization of all species and young as well as old timber that the model forest concept required. But the model forest plan never died; it was only postponed in the planning and thinking.

A significant organizational change was made in 1918 when research in the field was separated from the National Forest administrative organization and put directly under the Branch of Research in Washington. Larsen remained at Priest River, became Director of the Priest River Experiment Station, and reported to the Branch of Research.

World War I brought budget and manpower problems. Brewster's departure for the Army in 1917 had left Larsen as the only investigator concerned with studies at Priest River. The Priest River Station, in fact forest research nationwide, suffered its lowest level in 1920 when Congress drastically cut research appropriations. Larsen was transferred, temporarily, to District 1 to work with W. C. Lowdermilk on slash studies. The District managed to budget a minimum amount for maintenance and protection of the Priest River Station and experimental forest, but research at the Station was practically at a standstill from July 1920 until June 1921.

Guiding research activities throughout these years was an investigative committee. Shortly after the Priest River Station was established, Forester Graves in Service Order 41, January 2, 1912, directed that an Investigative Committee be created in each District. One representative of each major line of investigation conducted in the District, Silviculture, Grazing, and Products, and one Supervisor were to make up the Committee. District 1 in Missoula promptly established a District Investigative Committee and on January 20, 1912, Brewster went to Missoula to complete reports and meet with the new committee.

The District Investigative Committee served an important function for all investigative work in the District. It reviewed, advised, and recommended to the District Forester. It met once each year except in 1917 and 1918. Its makeup was substantially as directed by Service Order 41, but varied at times. In 1914 its membership consisted of D. R. Brewster as chairman, Forest Supervisor Elers Koch, P. R. Hicks from Products, and C. E. Fleming from Grazing. But the Committee meeting that year was also attended by the District Forester, the Assistant District Foresters for Silviculture, Operation, Grazing, and Lands, and the Chief of the Section of Planting. Dr. Weir, Forest Pathologist with the Bureau of Plant Industry, was also invited to attend at times. Possibly one of the greatest benefits of the Committee was that it forced all investigators to summarize their studies, think through and justify their programs, and prepare reports each year for review.

Certain cooperators were very important to the Station and District. The Office of Forest Pathology in the Bureau of Plant Industry has already been mentioned. That Office had been established in Missoula in 1913. It was moved to Spokane in 1919 and discontinued in 1921.

Another office, the Northern Rocky Mountain Field Station of the Bureau of Entomology, was established in Coeur d'Alene, Idaho, during the summer of 1919. J. C. Evenden was soon put in charge of this Station, beginning a long period of close cooperation between the Coeur d'Alene Station and the Forest Service.

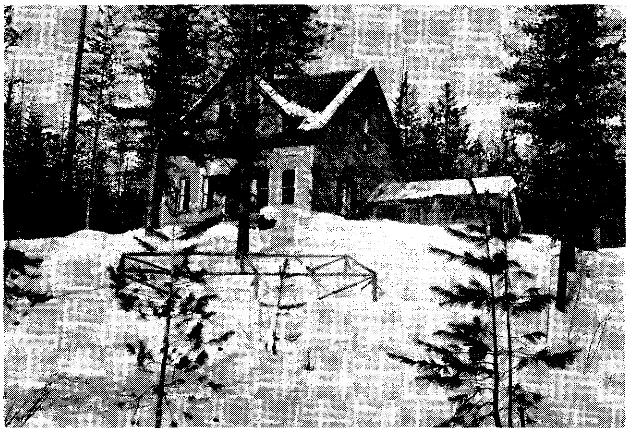
### *Research Facilities*

During the decade, many improvements were made to the Station. An office-laboratory and three cottages were constructed; a workshop, bunkhouse, lecture hall-woodshed, and various outbuildings were provided. Road right-of-way was cleared 3-1/4 miles up Benton Creek; the trail network was expanded. In 1917 a new lookout was built on Experimental Point.

A construction limitation of $650 per building was a serious constraint. Several of the buildings were completed by contributed time. The limitation proved insufficient for the very first building, the office-laboratory; the solution was completion with personal funds and contributed time. The only recognition was a bronze strip on windowsills which read "This window purchased by Donald R. Brewster"!

There were other important improvements. A water supply dam was built up Benton Creek and a gravity water system was completed in 1912. A telephone line was constructed to the lookout in 1914. It was reported that cottage 1 had the distinction of being the first Forest Service building constructed with a bath tub! Sewage systems, fences to provide pastures for dairy cows and horses yet keep them away from the dwellings - these and upkeep and maintenance of the new facilities were a drain on precious time.

During the winter of 1913-1914 Joseph Kittredge, Jr., and S. V. Fullaway mapped and made a cruise of the experimental forest. This included 4,250 acres in the Benton and Canyon Creek drainages that had been reserved in 1913 to be used for experimental and demonstration purposes. An unusually deep snow that winter made the work very difficult. The job was completed the following winter by Claude Sutton and F. R. Paine.



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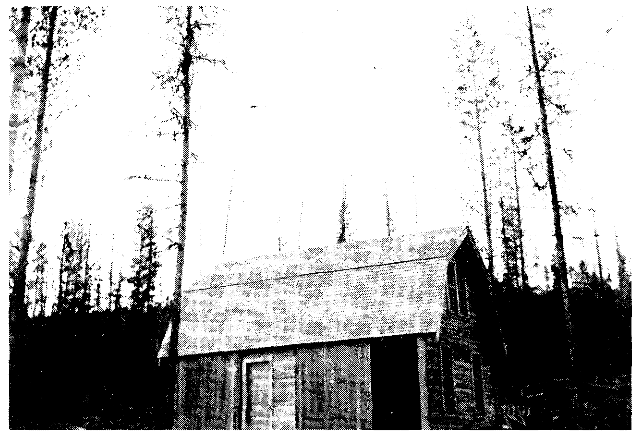

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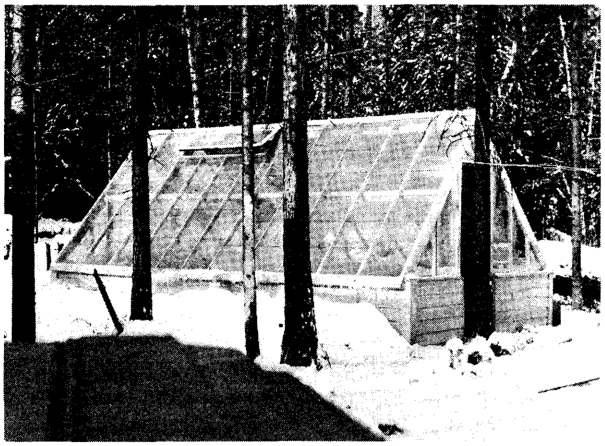
*Early buildings at Priest River Experiment Station: A. Office-laboratory; B. Cottages 1 and 2; C. Barn; D. Wagon and storage shed; E. Bunkhouse for rangers; F. Lecture room and woodshed.*



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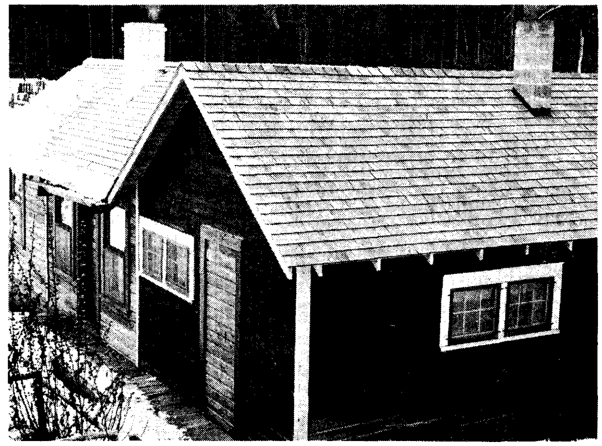

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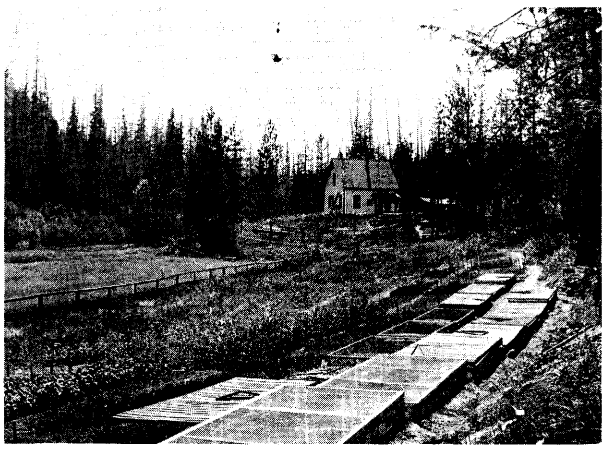

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D

*A. Greenhouse, 1912; B. Cottage 3, 1915; C. Nursery in the meadow, 1914; D. Ponderosa pine racial varieties planting after fourth season, 1915.*

Despite primitive living conditions, severe weather, bad roads, and building limitations work proceeded on schedule with time out for social events. For example, a diary entry of February 20, 1912, reads, "The ranchers of the countryside gave a house warming in the laboratory building which ended at 6 AM and was attended by about 50 people. Every one voted it the most successful affair of the season."

### *Investigative Program*

At the outset, Raphael Zon played a major role in charting direction of the research program of the Priest River Station. Later, the program showed increasing influence of District 1 people.

The site for the Station had barely been selected when Zon was off into the nearby forest observing cone production on western white pine trees which resulted in a publication. Brewster gave major emphasis during the first two years to nursery and planting studies and to natural regeneration investigations working with Hoffman.

These latter studies with Hoffman gave rise to a theory that adequate seeds for regeneration were stored in the duff. Hoffman took this idea with him to the Douglas-fir region. It required 25 years of painstaking research in both the western white pine and Douglas-fir regions to place the "stored seed" theory into perspective. Brewster also established three climatological stations in October 1911 to gain information about the climatic factors controlling distribution of forest trees and types. Larsen on his arrival promptly became involved in the seed, nursery, planting, and climatological studies while Brewster gave more of his attention to management studies of the effects of methods of cutting on natural regeneration. In the planting studies a surprising amount of attention was focused on suitability of nonindigenous species for planting in northern Idaho.

Pressing problems in the District's planting program and at Savenac Nursery resulted in a decision in 1914 to concentrate nursery and planting research at Savenac and in Placer Creek in country burned over in 1910 near Wallace, Idaho. Research on seed testing and certain fundamental nursery and planting studies begun at Priest River were continued by Larsen.

The District Investigative Committee at their meeting in January 1916 discussed a suggestion by the Office of Operations that studies of detection and control of forest fires be started. The Committee decided to begin a project on "the rate of spread of fire and its relation to different weather conditions, site conditions, and variations in cover." Larsen began a study at Priest River of "the relation of meteorological conditions to fire hazard." This consisted of weekly determinations of moisture in the duff, litter, and surface soil at three representative locations where climatic readings were taken. He continued these measurements in 1917 and branched out to a more comprehensive study of the relation of fires to weather conditions by using records from a number of weather stations. Another study concerned with fire hazard, an investigation of slash disposal on a number of cuttings, was conducted by Larsen and Lowdermilk in 1920. These various studies by Larsen marked the start of fire research at the Priest River Station.

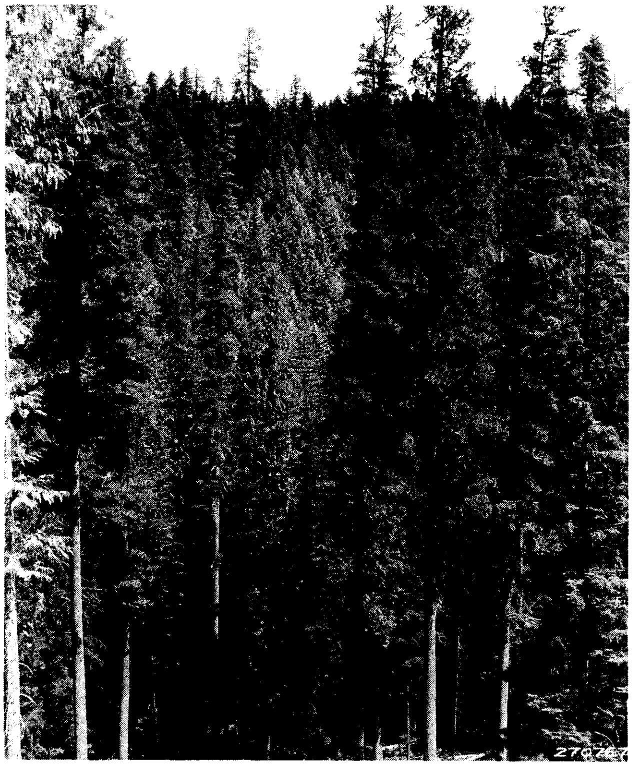
*Packing lumber to build a lookout cabin on Experiment Station Lookout, 1917.*

*The new lookout cabin with C. H. Finley, the lookout, in 1917.*

Other problems also received some attention. Brewster in 1914 established a thinning experiment in the 55-year-old stand near the Station, and Larsen established a similar experiment up Benton Creek in 1919. Brewster spent some time in studies of the larch-Douglas-fir type in western Montana. As Rockwell was working on growth and yield, little was done by the people at Priest River on mensurational studies except to give some assistance to Rockwell and establish a few permanent yield plots on the experimental forest. During this period, Rockwell prepared a comprehensive manuscript on western white pine and its management. Although he revised it several times, it was never published.

Most of the research program during this period was carried out at Priest River and Savenac. Some of the studies, however, went beyond the experimental forest in order to cover the needed range of conditions.

*Clearing away debris on Jurgens Flat for experimental plots, 1912.*



*Mature white pine timber on Benton Creek, 1932.*

To determine research priorities during this period, I estimated the proportion of the total research effort devoted to each line of study from annual reports and other reports of the time. The following tabulation shows the great emphasis on planting and methods of cutting to get regeneration--two subjects of utmost importance to a region that on the one hand needed to plant large acreages of recent burns and on the other hand needed to know how to cut stands in the increasing timber business. The disastrous fires before and during the period were reflected in increasing attention to fire research.

| Line of study | Responsibility | Percent of total effort |
|---|---|---|
| Planting (including seed, nursery, and sowing and planting) | Brewster, Larsen, Kitchen, Wahlenberg, Delavan, Rogers | 45 |
| Methods of cutting (and natural regeneration) | Brewster, Larsen, Rogers, Hoffman | 30 |
| Thinning | Brewster, Larsen | 2 |
| Meteorological studies (and climatic controls of forest types) | Larsen | 8 |
| Volume, growth, and yield | Brewster, Larsen | 3 |
| Tree studies | Brewster | 2 |
| Fire studies (and studies of slash disposal) | Larsen, Lowdermilk, Delavan | 10 |
| | | 100 |

## RECOVERY FROM THE WAR AND REORGANIZATION, 1921-1930

The 1921-1930 period was one of recovery after the lean years of World War I, of change in the diversity and direction of programs, and of a relatively constant allotment base, but decreasing manpower for Station research despite an increasing interest in research and need for research results, and a generally accelerating program of research in the northern Rocky Mountains by the entrance of universities and other agencies into forest research. The role of the Priest River Branch Station as a field facility and work center in the western white pine type for conducting certain kinds of research, for testing hypotheses, and for educational and demonstration purposes became better understood. Its limitations, because it did not represent the range of conditions requiring study, were also recognized more fully.

### *Funds*

After the loss of research funds during fiscal year 1921, allotments were partially restored in fiscal year 1922. Estimates of fiscal year 1922 funds for activities connected with the Priest River Station were:

| Unit of investigation | Allotments from appropriated funds for-- | | | | | |
|---|---|---|---|---|---|---|
| | Silvical investigations | Planting research | Statutory | General expense | Improvements | Total |
| | Dollars | | | | | |
| Liaison (Lowdermilk) | 2,680 | | | | | 2,680 |
| Planting (Wahlenberg) | | 2,160 | | | | 2,160 |
| Priest River Station (Larsen and Kempff) | 4,070 | | 1,220 | 1,125 | 1,020 | 7,435 |
| Total | 6,750 | 2,160 | 1,220 | 1,125 | 1,020 | 12,275 |

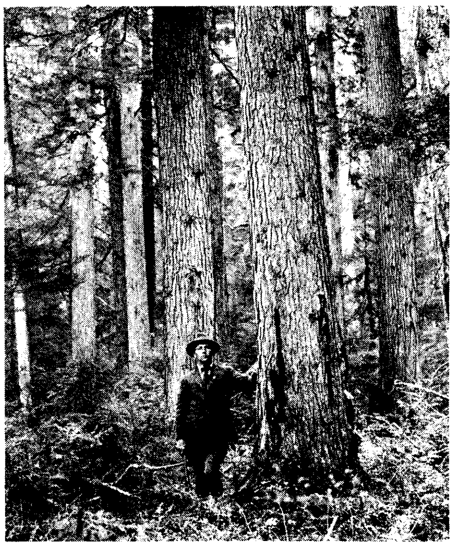
Some increase in funding occurred the following fiscal year when provision was made for a director and an investigator on fire studies. The increase, however, amounted to only $6,645, bringing the total allotment to $18,920 and providing for six permanent research positions, including Ranger Kempff at the Priest River forest.

During the decade allotments remained at about the same level; in fiscal year 1931 the total was $22,254. But both the liaison and planting positions had been discontinued leaving only four research positions, including Ranger Thompson at the Priest River Branch Station.

It is interesting that allotments for Forest Service research in the northern Rocky Mountains were so low during a period when the need for forest research was widely recognized and forest research by other Federal agencies and universities in the main was expanding. For example, the "Annual Investigative Report, District One, For The Year 1929," shows a total expenditure in the northern Rockies of $136,022 by all agencies on all lines of study. Of this total the Forest Service expenditure was $45,100 which included funds spent by both the Station and the Region. In contrast the Office of Blister Rust Control spent $54,000 on studies of white pine blister rust alone.

## *Personnel*

Personnel of the Priest River Experiment Station changed completely during the 1921-1930 period. At the beginning of the decade, the staff consisted of J. A. Larsen, Director; G. Kempff, Ranger at the Priest River Experimental Forest; W. C. Lowdermilk, Liaison Officer; and W. C. Wahlenberg, Forest Examiner on nursery and planting investigations at Savenac Nursery. Actually, neither Lowdermilk nor Wahlenberg were part of the staff of the Priest River Station, but they were both engaged in investigative work closely allied with the Station. By the end of the decade both of these latter positions had been discontinued, Larsen and Kempff had left, and the staff of the renamed Northern Rocky Mountain Forest Experiment Station consisted of R. H. Weidman, Director; H. T. Gisborne on fire research; I. T. Haig on silvicultural and mensurational studies; J. B. Thompson, Superintendent of the Priest River Experimental Forest; and Anna J. Bramseth, Clerk.



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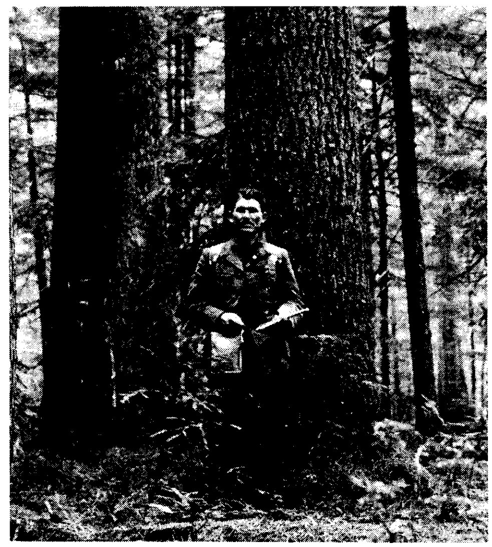

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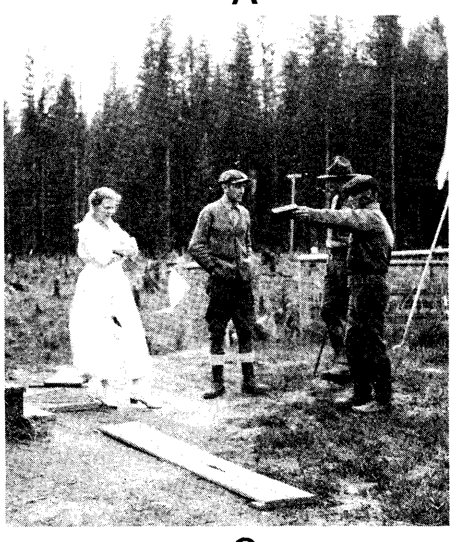

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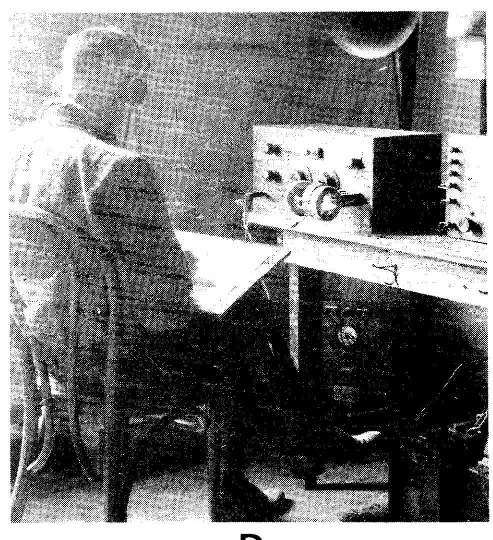


D

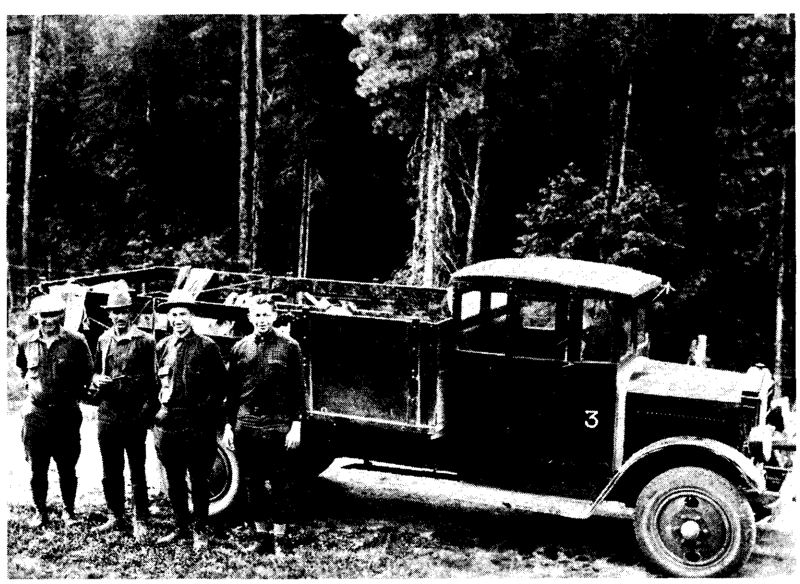
*A. J. A. Larsen in climax stand of western hemlock, Upper Priest River Valley; B. W. C. Lowdermilk in an overmature stand of western white pine and associates, Upper Priest River Valley, 1920; C. Mrs. J. A. Larsen, McCarthy, W. C. Lowdermilk, and G. Kempff between cottages 1 and 2, Priest River Station, 1920; D. H. T. Gisborne beside fire weather radio receiving station, about 1924.*

*A. Robert Marshall observing new seedlings on a milacre quadrat established to study natural reproduction on the 1926 Granite Creek burn, plot 133, Kaniksu National Forest, 1927; B. R. Marshall, R. H. Weidman, G. Kempff, and Deàn F. G. Miller on Big Creek south of Priest River Station, 1928; C. G. Kempff, H. T. Gisborne, R. H. Weidman, and R. Marshall beside Forest Service truck at Priest River Station, 1928.*

A

B

C



Some of the more noteworthy staff changes were as follows:

Robert H. Weidman, who had been a Forest Examiner on silvicultural investigations of ponderosa pine in eastern Oregon, was appointed Director of the Priest River Experiment Station and moved to Missoula in November 1921. He remained as Director to the end of the period.

Harry T. Gisborne reported for duty in Missoula in March 1922 as the first professional forester on fire research full time. He came from the staff of the Whitman National Forest where he had worked on timber sales.

I. T. Haig accepted a Junior Forester position on growth and yield and silvicultural investigations in the summer of 1923 after graduation from Pennsylvania State Forest School. He took educational leave during the school year of 1927-1928 to do graduate work at Yale University.

Robert Marshall came to the Station as a Junior Forester on silvicultural investigations in summer of 1925. From September 1927 to June 1928 he took G. Kempff's place at the Priest River Branch Station while Kempff was on educational leave to Harvard University. Marshall went on educational leave in September 1928 to do graduate work at Johns Hopkins University and later was active in establishing the wilderness system.

G. Kempff went on educational leave to Harvard University during the school year of 1927-1928 and left the Station in the fall of 1928 to accept a research position on the staff of the Forest School in the University of Idaho, Moscow.

J. B. Thompson replaced Kempff in 1928 as Ranger of the Priest River Branch Station.

Several staff members left the Station during this period. W. C. Lowdermilk left in July 1922, J. A. Larsen accepted a teaching position at Iowa State University in the fall of 1924, W. G. Wahlenberg transferred to the Southern Forest Experiment Station in March 1927.

With headquarters of the Station in Missoula, the experimental forest served as a summer work center for the staff of professionals and their temporary assistants. During winter months, however, the branch station settled down frequently to only the Ranger and his family and a handyman, at times.

## *Organization*

The major organizational change of the 1921-1930 period was made at the start of the period. On July 1, 1921, funds were provided for two new positions. R. H. Weidman was appointed Director and moved to Missoula in November. The second position, a fire research investigator, was filled by H. T. Gisborne's move to Missoula in March 1922. Headquarters of the Priest River Experiment Station were moved to Missoula. J. A. Larsen moved from Priest River to Missoula. Responsibility for planting research at the Savenac Nursery, by W. C. Wahlenberg, was transferred back to the Station from the Office of Planting of District 1. However, the Liaison Officer, W. C. Lowdermilk, although paid from investigative funds, remained on the staff of District 1. An immediate request for a change in name to Northern Rocky Mountain Forest Experiment Station was made to the Washington Office to more properly reflect the wider responsibilities of the Station and to remove the anomaly of Priest River Experiment Station, Missoula, Montana. But approval for a change in name did not come until June 1925 although requested year after year!

This delay in changing the name of the Missoula office only added to the confusion of what to call the Station at Priest River. During the period it was variously called:

The Priest River Experiment Station
Priest River Branch Station
Priest River Station
Forest Experiment Station, Priest River, Idaho
Priest River Experimental Forest

The latter title seemed to be generally accepted by 1930.

A loss to the Station in cooperative relations was experienced when the Office of Forest Pathology, Bureau of Plant Industry, in Spokane was closed on July 1, 1921. However, Dr. Ernest E. Hubert, who had been assistant to Dr. J. E. Weir before the office was closed, accepted in September 1925 a teaching and research position with the Forest School at the University of Idaho. He gave the Station and District a great amount of help on forest disease problems and cooperated in research programs.

Organizational arrangements of other cooperators also affected the Station. The Office of Blister Rust Control of the Bureau of Entomology and Plant Quarantine established an office in Moscow in 1922 with C. R. Stillinger there and in 1923 moved their office from Seattle to Spokane. The Bureau of Entomology also continued to maintain the Northern Rocky Mountain Field Station in Coeur d'Alene with J. C. Evenden in charge.

When Weidman became Director, the idea persisted that Priest River Experimental Forest should become a model forest to demonstrate intensive timber management and sustained yield. Weidman's skepticism was reflected in a letter to Kempff dated February 22, 1922:

> "Two of the original objects of the Experiment Station were the development of its experimental forest on a basis of sustained yield, and the location on this forest of the permanent experiments in cutting, thinning, yield, etc., needed to solve the silvicultural problems of the District. Experience has shown that the time is not ripe for this. In the one case, the silvicultural needs of an increasing timber sale business are for immediate information which cannot await the establishment of the necessary conditions on the experimental forest. The urgent need of District I is primarily for field study of reproduction, yield, methods of cutting, and the fire problem. As such studies must be conducted, wherever the conditions exist throughout the District, the headquarters of the work will very likely continue to be located at some central point like Missoula, to which it was moved last fall. In the other case, the development of the experimental forest on a basis of sustained yield--to the high degree of silvicultural management desired--makes it necessary that there be a constant market which will take material of all species and sizes. At present there is no such market and it is very likely there will not be, until a railroad is built up Priest River, or until such time as motor trucking becomes feasible in this locality. Although the experimental forest contains a million feet of mature timber at the head of Benton Creek and about two million feet on Fox Creek, which could be logged at the present time, it does not seem that it would be good business to do this--if the original plan is ever realized of managing this forest on sustained yield.
>
> "As there is little likelihood of an opportunity for intensive silvicultural management of the experimental forest for some years to come; there does not seem to be any justification for the development of further

improvements with such forest management in view. This applies to road construction within the experimental forest, and as the Experiment Station will very likely be used mostly as a summer Research headquarters, it applies also to such development work as stumping, grading, and other improvement of the grounds around the Experiment Station buildings."

Apparently, Weidman soon caught the Model Forest thinking for as Secretary of the District Investigative Committee he wrote in the report of the January 12, 1923, meeting:

> "One of the efforts of the year, which it is felt will mark a forward step for Research in District I, was to start definitely the plan of permanent management of the experimental forest at Priest River on the basis of sustained yield. The object is to make of this 4030-acre tract an organized forest property, in which the various stages of growth will be properly represented, the silvicultural processes will be scientifically directed, and a regular yield of lumber will be cut annually without depleting the growing stock. It is believed this will prove a valuable demonstration forest for the western white pine type--a forest which in the future will furnish the results and lessons of intensive management when this information will be needed for general application. It is doubtful whether any activity of the Experiment Station can be more far-reaching and important to the District than this."

This resulted in a drive to complete the Benton Creek road to provide access for timber sales. The 1922 fire, resulting in the need to harvest the fire-killed timber, diverted timber sales to the burned area for a few years. The fire also emphasized the importance of plans, manpower, and improvements that would protect the experimental forest from fire. Kempff roughed out a fire plan and also a management plan which provided for an annual cut of 400,000 board feet on the 4,000 acre reserved area.

The 1925 annual report of the Investigative Committee contained a rather discouraging picture of opportunities for intensive management on the experimental forest:

> "Although the Benton Creek road was finished in 1924, there have not yet been favorable conditions for making sales in the body of virgin timber at the end of the road. Sales are desirable, and especially small ones, in order to establish methods-of-cutting plots on the experimental forest. One of the difficulties in making small sales here is that there is not enough white pine in the stand to move the mixed species except under the most favorable conditions of the lumber market."

By 1927 the role of the experimental forest as a field work center for research activities and as a training and demonstration area was well recognized. Little mention was made thereafter about making the experimental forest a model of forest management.

The Priest River Experimental Forest continued to be used for demonstration and training. Ranger schools and guard schools were held there at times. The University of Idaho Forest School began, in the spring of 1926, to hold a field school there. The students were given training by Station people in forest investigations and by Kaniksu personnel in timber-sale practices. The students helped establish a number of permanent sample plots on the experimental forest as a part of their training.

The District 1 (changed to Region 1 in 1930) Investigative Committee continued as an effective and important coordinating group during this period. The District Forester served as chairman of the group and the secretary position was rotated among investigative officers during the first years of the period but in later years the Director of the Station consistently filled the position. The committee continued and extended the practice of inviting other agencies concerned with forest research to their meetings. All agencies conducting investigations reported at the annual January meetings which usually lasted two or three days. The annual report became a valuable document as it included these reports and recommendations as expressions of the whole group.

By 1928 the annual meeting was attended by 34 people including representation from not only the Forest Service, but also from the Forest Insect Laboratory in Coeur d'Alene, the Office of Blister Rust Control in Spokane, the Weather Bureau in Spokane, the State Foresters of Montana and Idaho, and the Forestry Schools of the Universities of Montana and Idaho.

In 1929, it was decided that the main purposes of the annual meeting were to inform and coordinate, that the name should be changed to Investigative Council, and that voting membership should be extended to various agencies outside the Forest Service.

In 1929 and again in 1930 when the Council met in Spokane, it was well attended by representatives from the Forest Service, both District and Station, and from other Federal and State agencies, universities, private companies, and British Columbia Province.

### *Research Facilities*

After the major construction activity at the Priest River Station during the early years of the 1911 to 1920 decade, the period 1921-1930 was quiet indeed as no new buildings were constructed. In fact funds for maintenance of buildings were never adequate. However, some improvements were made on the experimental forest. The Benton Creek road was completed and an intensive trail system built. Management and fire control plans were roughed out. A number of timber sales on the experimental forest occupied much of Ranger Kempff's time in sales administration and scaling of logs. Following is a chronological account of improvements and other developments during the period:

1922

- Highlanding Fire of August 1-4 burned over 850 acres in and adjoining the south side of the experimental forest; about 400 acres were within the experimental forest. The fire started from an abandoned campfire along the county road in the southwest corner of the experimental forest.
- An intensive fire protection plan was developed for the experimental forest based on values, risks, and causes of fires.
- Fire weather station established on Jurgens Flat clearcut area.

1923

- One mile of fire break constructed along the South Ridge. This was a clearing 1 chain wide with everything but large trees removed and burned and a trail at middle of burn cleared to mineral soil.
- Station grounds given further cleaning: stumps pulled and burned, logs burned, brush cut, trees planted, road system within grounds developed. Greenhouse was dismantled.
- Office of Blister Rust Control conducted a test of *Ribes* eradication for control of white pine blister rust. A crew of 15 men tested complete eradication of *Ribes* on 1,700 acres in Benton Creek drainage. A total of 53,555 bushes were pulled (31 per acre) at a cost of $1.91 per acre.

- Several timber sales underway. One sale of 300,000 board feet was completed. Another for 1,300,000 board feet was made to remove timber killed by the 1922 fire. Still another was for 500 cedar poles and 100,000 board feet of sawlogs. Another sale, for 50 cords of firewood, was to remove larch snags along the county road to develop a fire break.

- A working plan was prepared for the 4,030 reserved acres within the forest. It provided for an annual cut of 400,000 board feet.

1924
- Model plantation on Jurgens Flat partially established.

- A drop in temperature on 12/14/24 of 50 degrees in 12 hours damaged white pine, ponderosa pine, and lodgepole pine, and killed ceanothus back to root collars. Certain races in ponderosa pine racial varieties test severely damaged.

1925
- Bureau of Soils made a soil survey of the experimental forest.

- Six sample plots established.

- Model plantation of 12 acres completed.

1926
- Ten sample plots established on experimental forest bringing total number of plots on experimental forest to 47.

- Some 57 acres on Fox Creek were planted.

1927
- Fifteen miles of trails, mainly in the Canyon Creek drainage, were constructed.

- Eleven new plots established in or not far from the experimental forest on areas burned in 1926 or areas recently cutover.

- A 15-acre timber sale was made a mile up Benton Creek to demonstrate various cutting methods.

1928
- Additional trails built.

1929
- Trail system completed bringing total to about 50 miles and making any point on experimental forest within a 15- to 20-minute walking distance from a road or trail.

- Arboretum site selected and mapped.

1930
- Three flammability stations, a clearcut, half-cut, and full timber, were established to determine the effects of forest canopy on weather and fuel relationships.

*Investigative Program*

Although headquarters of the Priest River Experiment Station were moved to Missoula in 1921, the research program of the Station during the 1921-1930 decade was concerned primarily with rather fundamental fire studies and management of western white pine forests. Consequently, the Priest River Experimental Forest served very well as a work center for conducting much of the field work there and on the Kaniksu and Coeur d'Alene National Forests.

The major change in the research program from the previous decade was the emphasis on fire research and growth and yield of white pine forests.

The two main lines of study in the fire research program were: (1) Determining and predicting fire conditions (fire danger) and (2) relation of forest fires to lightning. These occupied Gisborne's attention during the entire period. About midway during the decade he added a third effort, cooperative work with the Weather Bureau in producing and disseminating weather forecasts of maximum value in forest fire control. Finally, in 1930 he began work on a fourth line of inquiry: statistical analysis of Region One fire records to determine speed and strength of attack needed to attain successful fire control in each important timber and fuel type in the Region.

The problem of growth and yield was of high concern to forest managers throughout the period. Yield information was badly needed to set cutting levels. The question of whether to determine yield of fully stocked stands--normal yields--or yields of forests as they actually grow over larger areas was a hotly discussed issue. The Station opted for a normal yield study with plans for an application study of normal yields to actual yields. Haig developed excellent normal yield tables, but the application study was never made.

Nursery and planting studies were continued at Savenac Nursery by Wahlenberg until 1927 when they were discontinued. However, Dave Olson, Chief of Planting, conducted administrative nursery and planting studies throughout the period. Wahlenberg did an outstanding job of reporting on the Savenac studies and Larsen on the earlier Priest River investigations. Olson, too, published a bulletin on nursery and planting practices.

Natural regeneration after cutting and wildfire continued to be an area of interest and concern. Major attention was given to this problem by studies on older burns, by determining what had happened on old cutting areas, and by intensive studies on recent burns and cutovers using permanent plots.

Very little attention was given to thinning except to remeasure the Brewster and Larsen plots on the experimental forest and to establish a few more plots there. One thinning on the experimental forest, a commercial thinning from above, may have been the first commercial logging job actually done by the Forest Service.

Larsen continued working up data from his earlier forest type studies before and after he left for Iowa State University. One interesting outcome was the first generalized forest type map of the region.

Weidman had been engaged in silvicultural studies of ponderosa pine in eastern Oregon before he transferred to the Station in 1921. As a result he had been assigned responsibility for a public requirements study and report for ponderosa pine in the northern region. This assignment, continuing the studies in eastern Oregon for several years, and writing a timber growing and logging practices bulletin on ponderosa pine occupied much of his research time during the decade. He did assist, however, with the studies of natural regeneration in the white pine type.

The following tabulation gives a rough estimate of distribution of research effort during the decade:

| Line of study | Responsibility | Percent of total effort |
|---|---|---|
| Planting | Wahlenberg, Larsen | 19 |
| Natural regeneration | Larsen, Haig, Marshall, Weidman | 25 |
| Thinning | Kempff | 1 |
| Growth and yield | Larsen, Haig | 16 |
| Forest type studies | Larsen | 2 |
| Fire | Gisborne | 29 |
| Ponderosa pine silvicultural studies | Weidman | 8 |
| | | 100 |

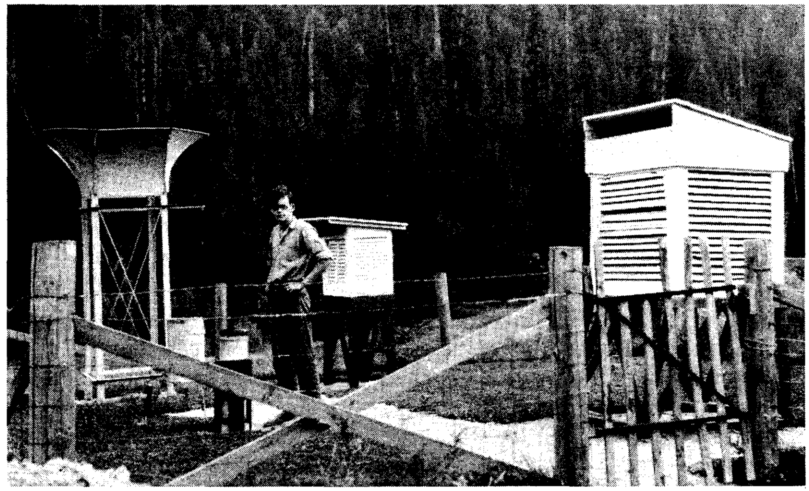
A

B

C

*Thinning studies on the Priest River Experimental Forest, 1926: A. Dean Francis Garner Miller in 65-year-old western white pine stand with western redcedar understory, before thinning, plot 110; B. Cordwood cut from a similar heavily thinned stand, plot 109; C. Deck of logs removed from a similar stand thinned from above, plot 111.*

*A. George Jemison at control weather station, 1930; B. George Fisher in "Chevrolet 6" used by field crews. Those not able to sit in front usually sat on boxes in the back, enclosed with a grating that gave the appearance of prisoners in a cage! Priest River Experimental Forest, 1930.*



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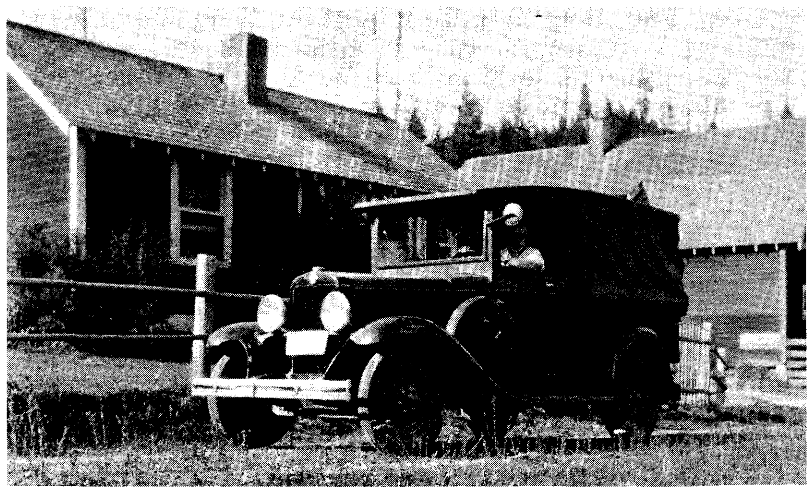


B

# THE GREAT DEPRESSION AND WORLD WAR II, 1931-1944

This period started with strength, expansions, and enthusiasm, and ended with the drastic cutbacks and discouragement of World War II. Increases in regular research appropriations in Fiscal Year 1931 permitted expanded programs to some extent, but larger expansions resulted from funds for emergency programs to relieve the economic depression. These emergency programs also resulted in a complete rebuilding of the Priest River Station and much improvement work on the experimental forest. Yet regular funds diminished during the period and emergency funds dried up.

At the start of the period, the Station was expanding and taking on new responsibilities. A host of young professionals were recruited and trained in research. Under the inspiring leadership of Director Lyle F. Watts, a Station organization was developed and Station people learned how to work effectively as a research team.

A formal order written by R. H. Weidman establishing the Priest River Experimental Forest at its present size was signed by Chief of the Forest Service, R. Y. Stuart, on April 8, 1931.

## *Funds*

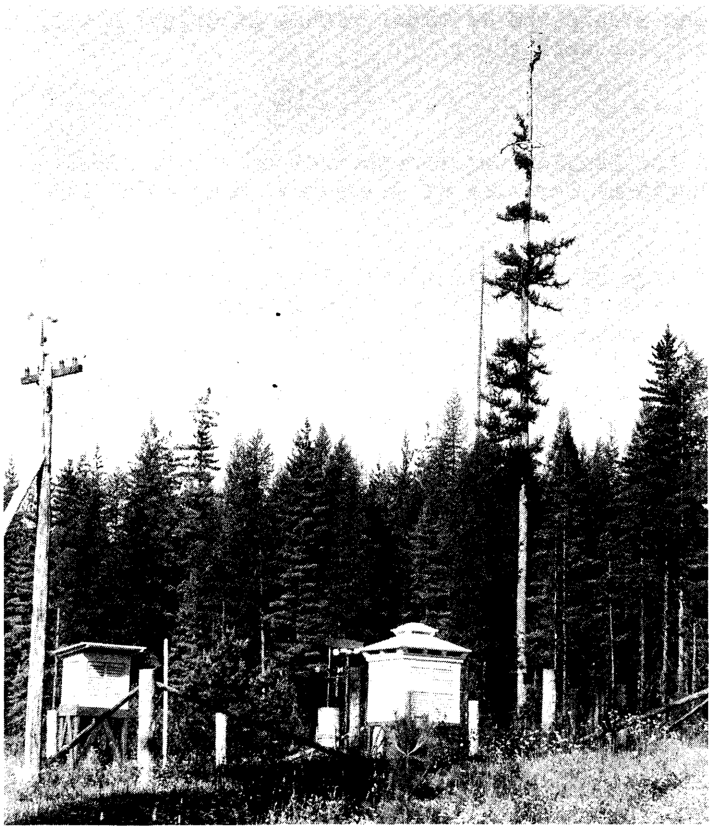
The Station was reorganized and expanded on July 1, 1931. The Office of Forest Products was transferred from Region 1 to the Station, which brought $14,900 into the Station. The Station also received an increase in allotments of $43,500 to be used to expand fire research, to begin range research, and to finance a forest survey program. The Station's financial base increased from $21,000 in Fiscal Year 1931 to $74,500 in Fiscal Year 1932. In addition, Region 1 contributed about $10,000 to the Station to finance certain fire studies.

However, attrition in regular research allotments began immediately. Research allotments for forest management research programs (silviculture and fire), whose field activities were centered to a great extent at the Priest River Experimental Forest, were $33,900 in Fiscal Year 1932. Two years later they had declined to $25,290.

| | Allotments by fiscal years | | | |
|---|---|---|---|---|
| | 1932 | | 1934 | |
| Research Division | Research | Region 1 | Research | Region 1 |
| Silviculture | $15,000 | $ 1,074 | $10,117 | |
| Fire | 18,900 | 9,347 | 14,837 | $ 6,411 |
| Totals | 33,900 | 10,471 | 25,290 | 6,411 |

Regular research allotments for programs continued to decline. By Fiscal Year 1941 they were down about one third from Fiscal Year 1932 levels, and by Fiscal Year 1944 during World War II they were less than half the Fiscal Year 1932 level.

However, regular research allotments were only one face of the coin. The other, and sometimes brighter, face was funds, beginning in 1931, for emergency programs to



*The control weather station and G. M. Jemison atop the 150-foot tree where weather instruments were maintained. Priest River Experimental Forest, 1932.*

pull the Nation out of the economic depression. Of various amounts, kinds, flexibility, duration, and variability in how funds and manpower could be used, the intent of all was to put people to work. They bolstered the research program and provided funding and manpower for major improvements on the Priest River Experimental Forest.

Because of the uncertainty of emergency funds from year to year and the way they could be used, they were not efficient funds for research. Some programs provided manpower only. Some provided funds that could be used for supplies, materials, and equipment in addition to manpower. Some were restricted to kinds of people and kinds of work. They all required the time of regular personnel for planning and supervision. Often the projects were of such short duration that they had doubtful research value. Emergency programs were both a curse and a boon.

Of the legion of alphabet emergency programs--RESNIRA, IMPNIRA, CWA, ECW, CCC, FERA, NYA--The Civilian Conservation Corps (CCC) program probably was the best insofar as research and the Priest River Experimental Forest were concerned. It was the most stable and provided good manpower.

Yet as the Nation recovered from economic depression, emergency funds tapered off, including the CCC program. By Fiscal Year 1942 they all had ceased. The Station had to make do with a less than bare bones regular budget.

## *Personnel*

With reorganization and expansion of the Station in 1931, only two Station divisions, Fire and Silvics, were concerned with the Priest River Experimental Forest. Much of the field work of these two divisions was conducted on the experimental forest or on nearby areas using the experimental forest as a field center. Consequently, the following lists of personnel include only those people who at times worked at Priest River, or in some instances were responsible for the work there.

Director's Office

Lyle F. Watts became Director when the Station was reorganized on July 1, 1931. He left the Station in 1936 to become Regional Forester at Milwaukee, Wisconsin, and later Chief of the Forest Service.

Stephen Wyckoff, who had been in charge of the Office of Blister Rust Control in Spokane for several years, succeeded Watts in 1936 and left the Station in 1938 to become Director of the Pacific Northwest Station.

Melvin Bradner had come into the Station in 1931 as head of the Office of Forest Products. He was in charge of both Forest Products and Forest Survey. Beginning in 1935 he served as Assistant Director and remained in charge of Forest Survey. He succeeded Wyckoff as Director in 1938 and served in that capacity for the rest of this period.

Mary Jo Pershina transferred into the Station in 1931 and served as Station Administrative Assistant throughout the period. Outstanding in her position, she had much to do with the Priest River Experimental Forest and the program there.

Division Chiefs

Harry T. Gisborne served as Chief of the Division of Fire Research throughout the period. He also was responsible for silvicultural research from 1942 to 1945.

Robert H. Weidman stepped down as Director and became Chief of the Silvics Division in 1931. In 1935 he relinquished that position to spend full time on forestation research. He transferred from the Station in 1937 to become Superintendent of the Institute of Forest Genetics at Placerville, California.

Lloyd Hornby was supervisor of the Flathead Forest before he transferred to the Station in 1931 to head up a cooperative research, development, and application program in fire control planning. He succeeded Weidman as Chief of the Division of Silvics in 1935 but was so occupied with completing a major manuscript on fire control planning that he was unable to give much time to the Division Chief job. He died August 27, 1937, of a heart attack on the Toboggan Creek forest fire in the Clearwater National Forest.

I. V. Anderson came into the Station with the Office of Forest Products in 1931. He became Division Chief in 1935. In that year he planned a road system for the Priest River Experimental Forest.

Kenneth P. Davis, who had been a Ranger on the Gallatin Forest, first worked for the Station on a silviculture field crew at Priest River during the summer of 1932 between two years of graduate study at the University of Michigan. He returned to Priest River on a regular appointment in 1933 but soon was sent by Director Watts to the newly established Deception Creek Experimental Forest in the Coeur d'Alene National Forest to plan development and to begin a research program there. He served as first Superintendent of the Deception Creek Forest and in 1935 was assigned responsibility for white pine silvicultural studies. He became Chief of the Division in 1937 and remained in that capacity until he transferred to Washington, D.C., in 1940 as assistant to I. T. Haig who was in charge of the Silvics Division there. In the late 1930's he took educational leave to work on a Ph.D. at the University of Michigan. Davis later became Dean of the Forestry School at the University of Montana, then a professor of forestry first at the University of Michigan and later at Yale University.

Other Professionals

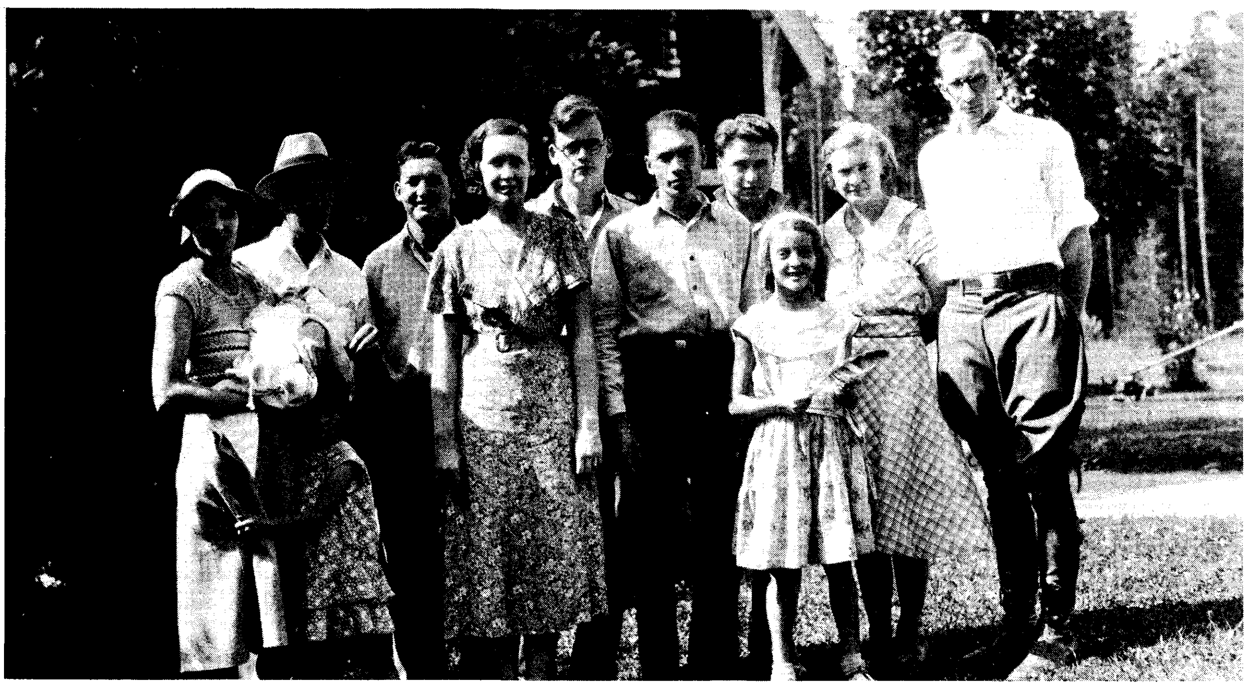
Irvine T. Haig continued in silvicultural research with periods of educational leave to work on his Ph.D. at Yale University. He transferred in 1935 to Washington, D.C., the Division of Silvics.

George M. Jemison in 1930 worked as a summer assistant to Gisborne in fire research at Priest River. Upon graduation from the University of Idaho in 1931 he received a permanent appointment with the Station and served in the Division of Fire Research spending summers at the Priest River Station until he transferred to the Southeastern Station in 1937 to head up fire research there.

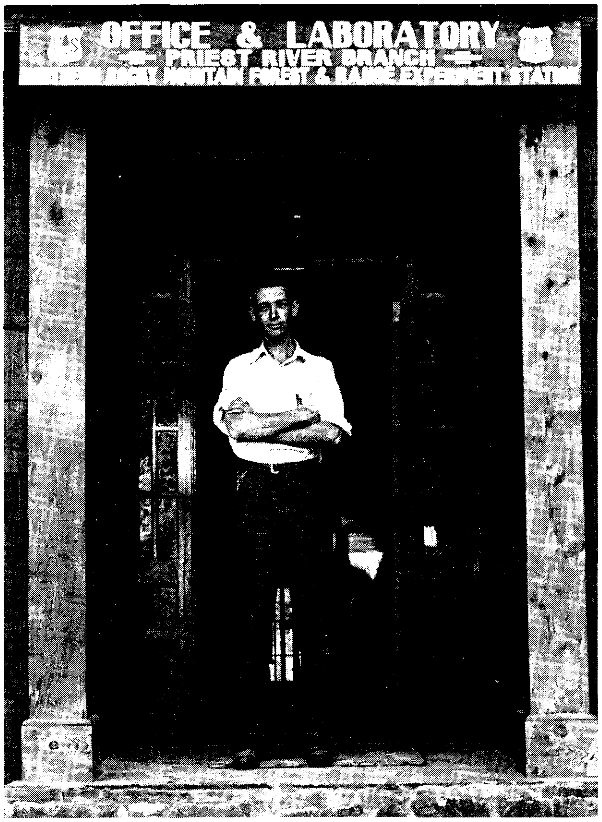
George M. Fisher also had worked as a field assistant at Priest River during the summer of 1930. He returned to the Station in 1933 in the emergency work program and was given responsibility for making timber surveys on the Station's three experimental forests. His crew completed a new survey of the Priest River Forest during the winter of 1933-34. He transferred from the Station in 1935.

Charles A. Wellner, the author of this history, first worked for the Station on the silvicultural field crew at Priest River in 1932. Subsequent years were spent in silvicultural research with summers at Priest River except 1936 when he was Superintendent of the Deception Creek Forest. During the late 1930's he served as Acting Division Chief of Silvics while Davis was at the University of Michigan. When Davis left in 1940, he served as Acting Division Chief until leaving in December 1942 for duty in the Navy.

Corland James accepted a position in 1934 with the Station in silvicultural research, mainly on ponderosa pine yield studies. He became Superintendent of the Deception Creek Experimental Forest during 1935 and transferred from the Station in early 1936.



*"Residents" at the Priest River Station during the summer of 1932. From left to right: Mrs. J. B. Thompson, J. B. (Tommie) Thompson, Helen Mac Thompson (in front of Thompson), Morris Huberman, Beatrice Jemison, George Jemison, Ted Haig, Charles Wellner, Louise Thompson (in front of Wellner), Mary Davis, and Kenneth Davis.*

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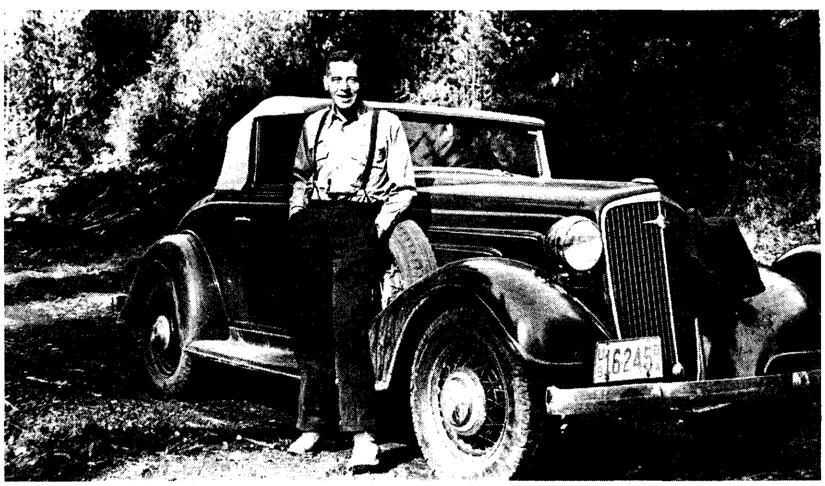

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*A. Lloyd Hayes, 1937; B. Carl Ostrom, 1935; C. Melvin Bradner, 1935.*

G. Lloyd Hayes began work in 1934 as an assistant in the silvicultural field crew at Priest River then at Deception Creek. That fall he began work under Gisborne in fire research, spending his summers at Priest River. He also served during 1937-1938 as Superintendent at Priest River after Thompson transferred and before McKeever reported. He transferred in 1942 to the Southeastern Station in fire research.

Theodore Kachin began working for the Station in fire research in 1935. His summers were spent at Priest River. He left the Station in 1938.

Stewart E. Brown first worked for the Station on the silviculture field crew at Priest River in the summer of 1934. He returned to the Station in silvicultural research in 1935 and transferred in 1939.

Lester Harris worked at Priest River under Thompson's direction during 1935.

John B. Thompson, who ably served as Superintendent of the Priest River Experimental Forest during its greatest period of rebuilding and development, transferred to the Kaniksu Forest in early 1937.

Clifford S. Schopmeyer, with a Ph.D. in plant physiology from Duke University, came to the Station in 1937 and worked mainly on forestation studies. He transferred to Intermountain Station in 1941.

Donald G. McKeever came to Priest River as Superintendent in 1938. He took over forestation studies in 1941 when Schopmeyer transferred but resigned from the Station in 1942 to accept a position with Weyerhaeuser Timber Company.

Chalmer K. Lyman worked in fire research in 1939 and again in 1944.

Paul W. Stickel transferred from the Northeastern Station to the Northern Rocky Mountain Station in 1940 to work under Gisborne in fire research. He resigned from the Station in 1943.

Austin E. Helmers started with the Station in 1942 in silvicultural research. He maintained the Deception Creek Forest and remeasured the large number of permanent silvicultural sample plots during the trying financial and manpower times of World War II.

## Station Superintendents

Included in the foregoing and following lists are those who served as Superintendent of the Priest River Experimental Forest during this period. These were:

| Came | Left | Superintendent |
|---|---|---|
| 1928 | 1937 | John B. Thompson |
| 1937 | 1938 | G. Lloyd Hayes |
| 1938 | 1941 | Donald G. McKeever |
| 1941 (winter) | 1942 | Elton E. Bentley |
| 1942 | 1944 | John D. Crowe |
| 1944 | 1945 | L. H. Whetsler |

## Permanent Assistants

Emergency funds during this period permitted hiring of most of those in professional positions listed above and also a large number of people in professional assistant positions. Some of those in the latter status who gave important service, much at the Priest River Forest, are the following:

| Assistant | Research Division | Period |
|---|---|---|
| Hans Roffler | Timber Survey of Exp. Forest | 1933-1935 |
| Carl Ostrom | Silviculture | 1934-1936 |
| Jasper Buck | Fire | 1936-1938 |
| Max Howell | Silviculture | 1937-1938 |
| Elton E. Bentley | Superintendent, Deception Creek Experimental Forest | 1937-1942 |
| John D. Crowe | Silviculture | 1937-1939 |
| | Superintendent, P.R.E.F. | 1942-1944 |
| Vern L. Cline | Fire | 1937-1941 |
| Bert L. Naiman | Fire | 1937-1941 |
| George Fahnestock | Silviculture | 1938-1939 |
| William B. Peterson | Silviculture | 1938-1940 |
| George Weyerman | Fire | 1939-1940 |

In addition to the foregoing, a large number of people in emergency programs, especially the CCC and NYA, served as valuable research assistants. During World War II a number of conscientous objectors, Civilian Public Service, gave dedicated service without payment for salary. Four of these, D. P. Flaccus, B. Hammarstrom, K. B. Spangler, and R. Phibbs, assisted at times on the Priest River Forest. Former Director Larsen served as Lookingglass lookout in 1944.

During this period the Station employed several college professors during the summer to carry out specialized research. Those who served in this capacity at the Priest River Station were the following:

1934-1935. Drs. Schallenberg and Little, physicists at the University of Montana, were at Priest River studying visibility of fires and the development of visibility meters.

1937-1938. Dr. Leon Richards, a chemist with the University of Montana, studied the chemical content of green vegetation as related to flammability.

Other university people stayed at the Priest River Forest while engaged in cooperative or their own research. Three who frequently worked there were John Ehrlich, Albert W. Slipp, and Rexford Daubenmire of the University of Idaho.

### *Organization*

The major organizational change during the 1931-1944 period was the reorganization of July 1, 1931, that changed the name to Northern Rocky Mountain Forest and Range Experiment Station and set up the following research divisions within the Station: Silvics, Fire, Products, Range, and Forest Survey. In the annual report of the Region 1 Investigative Council for 1931 the urgent need was expressed to bring these fields of research up to the full funding authorized by the McNary-McSweeney Act and to start research in Erosion and Streamflow, Biological Research, and Forest Economics, all also authorized in that Act. As funds for the latter activities never materialized during this period, the basic Station organization of five research divisions, each headed by a division Chief, was maintained throughout the period.

Director Watts supervised the Superintendent of the Priest River Experimental Forest with the advice of the two divisions concerned, Fire and Silviculture. When Watts left, responsibility for the Priest River Station fell largely to the Division of Fire Research and that for Deception Creek to the Division of Silvics. However, the Division of Silvics was largely responsible for activities on the Priest River Experimental Forest itself, such as roads, timber sales, and stand improvement.

Because of these assigned or assumed responsibilities, Priest River became the center for fire research and Deception Creek for silvicultural studies. Considerable rivalry between the two divisions ensued. Growth in fire research activities required nearly full use of Priest River facilities for that activity. There really wasn't room there at the time for a strong silvicultural research program.

The Regional Investigative Council of the Northern Rocky Mountain Region continued strongly enough, but was discontinued in 1936. Programs had so grown in size and complexity that the Council meeting was large--so large that studied review was difficult. The Council may have gone under from sheer weight. Yet the keen interest expressed at the last meeting showed a need for some means to review and coordinate research efforts of all agencies.

In 1931 Employment Relief Funds in the amount of $5,900 were used at Priest River for much needed maintenance and improvements. (This was still during President Hoover's administration!) The year 1933 marked the real beginning of emergency relief funds.

In that year both manpower and funds were received for improvements at the Priest River Station and on the experimental forest under the National Industrial Recovery Act, the Civil Works Administration, and the Civilian Conservation Corps programs.

A full 200-man CCC camp, F-127, was established in the summer of 1933 in the extreme southwest corner of the experimental forest between the county road and the river near the mouth of Big Creek. Following is a tenure record of this camp:

| Year | Occupancy |
|---|---|
| 1933 | Summer |
| 1934 | Summer |
| 1935-1942 | The camp was occupied on 5/1/35 by Company 1235. Thereafter until the CCC program was discontinued in 1942, Camp F-127 was a year-round camp occupied by Company 1235. |

The first Camp Superintendent was Tiny Paige. Louis H. Whetsler served as Superintendent for many years. Forestry Foremen who supervised much of the work on the experimental forest included John Cluzon, Leo Black, Peter Hirst, Kirt Kimball, and Clem Wallace.

This camp performed a tremendous amount of work on the experimental forest including road and building construction, maintenance of buildings and grounds, stand improvement, fire hazard reduction, blister rust control, tree planting, research plot establishment, and research assistance.

Most of the emergency programs disappeared long before World War II. As each program was dropped, it became necessary to reduce those Station personnel supported by emergency funds. One by one people were transferred, mainly to positions in the National Forest organization. The last emergency program to go was the CCC. Its loss was traumatic to the Station, especially at places such as the Priest River Experimental Forest. Here relief programs had built and maintained a sizable physical plant, but the manpower and funds for maintenance were suddenly gone. Regular allotments were at a low level, too, and even these shrank as Station people entered the Armed Services, for when people left, funds for their positions frequently were withdrawn. Manpower was so reduced in the Divisions of Silvics and Fire that when the author left for the Navy in December 1942, Director Bradner combined the two divisions during the War period. The situation is best told in a statement by H. T. Gisborne in the Station Annual Report for 1944:

> "With the exception of one new and short-time study of fuel reduction, the major effort of both silvicultural and fire research has been to maintain the continuity and standards of the most essential long-time research projects which were under way when the war started. Gisborne, Lyman, and Helmers constituted the total technical staff, with Miss Johnson continuing to serve as compilation clerk and stenographer for the division. A high school boy served at Deception Creek Experimental Forest and a college professor at Priest River Experimental Forest as temporary assistants during most of June, July, and August. Three Civilian Public Service men from the R-1 smokejumper squad helped on the silvicultural fall plot work from September 15 to November 25. One of these men is being used throughout the winter at Missoula on compilation of plot data, while two others are serving as caretakers at Deception Creek. These men receive

no salary and cost us only $5 per month plus their actual travel and subsistence. The Priest River superintendent resigned in December, having purchased a fruit ranch. A replacement was obtained in time to receive 10 days' coaching by the departing superintendent, but this new man will have to return to his forest construction job on April 1. That will require another replacement, another overlap of salaries, and considerable training effort."

### *Research Facilities*

Because of emergency programs, especially the CCC, improvements and developments on the Priest River Experimental Forest were tremendous during the 1931-1944 period. The following lists of improvements include only major items.

The original buildings were all removed or refurbished during the period. The office-laboratory was sold and removed in 1937 and is now used as a ranch home immediately north of the Station. Cottages 1,2,3 and the woodshed lecture room were demolished in winter of 1935-1936 to make room for the new office-laboratory, as well as most outbuildings and Benton Ranger Station.

New headquarters facilities constructed during the period included the following:

| Improvement | Year completed | By |
|---|---|---|
| Gasoline house | 1931 | Employment Relief Funds |
| Water supply and sewer system improvement | 1931 | Employment Relief Funds |
| Five-stall garage | 1931 | Employment Relief Funds |
| Cookhouse bunkhouse (on site of barn) | 1932 | Employment Relief Funds |
| Present Cottage 2 | 1934 | NIRA |
| Power line from Priest River to Station, 13-1/2 miles | 1934 | NIRA and CWA |
| Fire weather tower, 150 feet | 1934 | NIRA and CCC |
| Improvement of station grounds | 1934 | CCC |
| Gasoline house near garage | 1935 | CCC |
| Shop improved | 1935 | CCC |
| Underground telephone and power system | 1935 | CCC |
| New sewage system | 1935 | CCC |
| New woodshed and powersaw in Priscilla Gulch | 1935 | CCC |
| Cottage 1 (lodge) | 1936 | CCC |
| Cottage 3 | 1936 | CCC |
| Laboratory-Office | 1936 | CCC |
| Cottage 4 | 1939 | CCC |

About 20 miles of road were constructed during the first years of the CCC program (Appendix C). This was partly because major protection roads over the experimental forest were completed by 1935, and partly due to the fact that financing use of heavy road equipment became increasingly difficult. Labor was available, but not funds for equipment. The author scheduled clearing right of ways of utilization roads in the early 1940's and about 1.5 miles of road D were cleared by CCC crews before this activity was stopped because of a policy not to clear unless funds were in hand to complete each road.

*Priest River Experimental Forest, 1932: A. Office-laboratory; B. Cottages 1, 2, 3, and woodshed-lecture hall; C. Shop and new garage; D. Southeast corner of Forest where CCC camp and arboretum were later located.*

A

B

C

D

## Other Improvements

Following are other improvements on the experimental forest:

| Year | Improvement | By |
|---|---|---|
| 1931 | Fire break on South Ridge, 1-1/2 miles | Employment Relief Funds |
| 1931 | Fences, 2-1/2 miles | Employment Relief Funds |
| 1933 | Lookout on Lookingglass Mt. (Gisborne Mt.) | CCC Funds |
| 1933-1942 | Grounds landscaping, improvement, and upkeep, building upkeep and maintenance, snow removal, wood procurement, telephone line construction and maintenance, power line maintenance, thinning, pruning, snag removal, hazard reduction, defective tree disposal, rodent control, tree planting, arboretum planting and maintenance, white pine blister rust control, roadside cleanup, etc., etc. | CCC |
| 1933-1934 | New survey of experimental forest by George Fisher, Alfred E. Spaulding, William L. Davis, Hans C. Roffler, George H. Gibb, Milland Evenson, Jerome Dahl, and Robert Holgren. Comprehensive report by Fisher and Roffler in 1935. | CCC Funds |
| 1937 | Snow courses at Benton Spring and Benton Meadow started | |
| 1938 | Benton Creek streamflow dam and gaging station | CCC |
| 1940 | Transect cleared | CCC |

The Priest River Experimental Forest was used increasingly for demonstration, education, and training. It became a popular place for in-Service training sessions, conferences, student training, and meetings of various groups.

## *Investigative Program*

The 1931-1944 period was not one for orderly growth and development of a research program. A major depression leading into emergency work programs and ending with a world war was hardly the climate for careful development. Yet despite the uncertainties, the continual funding crises, the near daily problems in personnel management, this was an outstanding period in fire research and marked major contributions in timber management research. And research at the Priest River Experimental Forest played a major part in these successes.

### Fire Research

The story in fire research is especially interesting. The northern Rocky Mountain region had experienced a series of catastrophic fire years. Beginning in 1910, and

*A. H. T. Gisborne explaining fire research studies to Montana Forest School seniors at the clearcut flammability station; B. Montana Forest School seniors and the bus in which they traveled at Priest River Experimental Forest, 1940.*

A

B

picking only those years when acreage burned on National Forests was over 100,000 acres, the record through 1931 was as follows:

| Year | National Forest area burned |
|---|---|
| | Acres |
| 1910 | 2,573,172 |
| 1917 | 135,148 |
| 1919 | 1,329,276 |
| 1926 | 340,791 |
| 1929 | 241,516 |
| 1931 | 129,460 |

The general concern of the time is expressed in a statement in the report of the District Investigative Council for 1928:

"Mr. Flint pointed out that all forest areas in this region are burning five times faster than the rate which is acceptable for adequate control, and that timber-sale areas are being burned so rapidly that a large volume of our expensive silvicultural work is being completely lost. The need is not for more projects, but for more work on the existant studies, which are recognized as the most promising."

The 1929 report summed up the critical problem as follows:

"The outstanding fact in reviewing the experience of 1926 and 1929 is that protection organizations are still unable during such bad seasons to get fires while they are small. The urgent problem, therefore, to which increased research funds should be devoted at the start is to ascertain the facts that will help protection agencies get on top of the very practical problem of detecting and getting men to fires more quickly. Summed up, this means reducing hour control to the shortest time possible. The project will involve all aspects of elapsed time including the determination of relatively safe hour control for the different forester inflammability types. Following that the human failures involved in suppression will call for research help."

Control of forest fires was the most critical problem facing Region 1 in 1931. Another disastrous fire season that year only emphasized the problem. In fact, the Freeman Lake Fire of 1931 had seriously threatened the Priest River Experimental Forest. During his first 10 years with the Station, Gisborne had demonstrated an ability to select critical aspects of the fire problem and to work in close cooperation with administrative people toward their solution. Fire research, then, was set to take advantage of the increased funding that came in Fiscal Year 1931 including the contribution from Region 1. The research program included work on two major problems: (1) fire attack, and (2) fire behavior.

Fire attack included two investigations: (1) analyses (Gisborne and Hornby) of Region 1 fire records to determine speed and strength of attack needed to control fire in each important timber and fuel type; and (2) the planning (Hornby) of facilities and manpower.

Fire behavior was the line of research to which Gisborne had devoted most of his attention during the first 10 years. It included three phases: (a) the measurement of weather conditions at numerous stations throughout the Region in cooperation with the U.S. Weather Bureau for improvement of daily fire weather forecasts; (b) the recording of observations of lightning storms to obtain better information concerning lightning, the most important cause of forest fires in Region 1; (c) fundamental studies of fire behavior, fuel flammability, and instrumental methods of measuring current effects of fuel moisture. Both Gisborne and Jemison worked on fire behavior and conducted most of their field work at the Priest River Experiment Station.

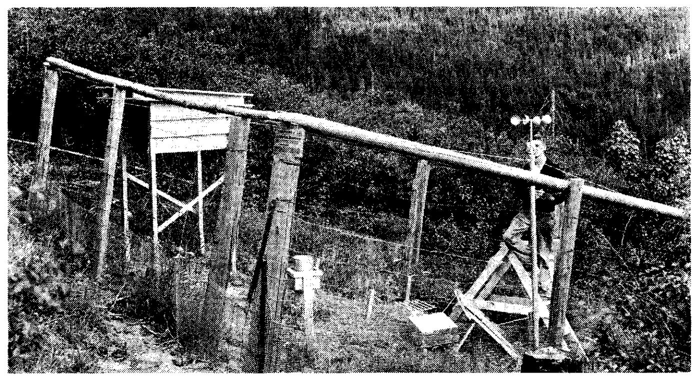
A major milestone in fire research was reached during the winter of 1931 and 1932 when Gisborne put together his first trial fire danger meter, described in the 1932 Investigative Council report:

"In order to insure consideration of all the important variable factors of fire danger, a device called a Fire Danger Meter was evolved during the winter of 1931-32. This device rates the effect of each of six factors in fire danger including (1) season of the year, (2) activity of lightning and people, (3) visibility, or the distance at which small smokes can be discovered, (4) wind velocity, (5) exceptionally low relative humidity, and (6) fuel moisture and inflammability. By the integration of the effects of these six factors the Danger Meter produces a rating of fire danger both in terms of rate of spread of fire and in terms of administrative action needed to cope successfully with prevailing or probable danger."

*A. Tommie Thompson computing fire danger, 1935; B. George M. Jemison at full timbered "inflammability" station, 1935; C. G. Lloyd Hayes recording wind movement at the 2,700-foot altitude and aspect station, 1935; D. H. T. Gisborne taking notes on moisture content of large logs.*

A


B



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D

So was born a fire danger rating system that within 25 years was adopted throughout the United States and Canada, and by many forest fire control organizations throughout the world.

The three aspects of fire behavior outlined above were tackled on many fronts by Gisborne, Jemison, and Hayes at the Priest River Experimental Forest. Major studies included:

| | Studies | Responsibility |
|---|---|---|
| A. | Factors affecting fire behavior | |
| | Under forest canopies - conducted at the clearcut, half-cut, and full timber flammability stations on Jurgens Flats. | Jemison |
| | At various altitudes and aspects - conducted at paired north and south slope stations at three locations on South Ridge. | Hayes |
| | Up through the forest canopy - conducted on the 150-foot fire weather tower. Only the wind factor was reported. | Gisborne |
| | Green vegetation - collections were made from a plot in section 34 just off the experimental forest. | Jemison, Gisborne |
| | Moisture content of large logs - conducted at CC-HC-UC flammability stations on Jurgens Flat. | Hayes |
| | Across a transect of a mountain valley - the transect for this study was cleared in 1940 but the study was never conducted. | Gisborne |
| | Different fuel types - a start was made on the Fox Creek flat south of the forest. Later Stickel made studies on larger fires. | Jemison, Lyman, Stickel |
| B. | Instruments and devices for measuring factors affecting fire behavior | |
| | The attempt was made to develop cheap yet reliable instruments to equip many fire danger stations:<br>Duff hygrometers<br>Fuel moisture sticks<br>Rain gages<br>Wind scales and gages<br>Visibility meters<br>Devices to record a multiple of factors over time | Gisborne, Jemison, Hayes |

During 1944 Lyman studied factors affecting fuel reduction programs. None of this study was conducted on the experimental forest.

## Timber Management Research

Major Station emphasis in timber management research to 1931 had been directed to investigations of natural and artificial regeneration and growth in the western white pine type. The 1931 annual report of the Investigative Council struck the following somber note:

"The White Pine Situation

"White pine is at present by far the most valuable tree in the region with the possible exception of western red cedar, at present a much less extensively distributed species. White pine produces a high quality lumber which commands a premium in many markets because of certain special uses for which it is deemed especially fit. As a result, it brings much higher stumpage prices than most of the other species with which it is associated and, in addition, its annual growth and final yields are large. Along with these excellent qualities go several serious drawbacks:

"(1) It forms an inflammable type, difficult to protect from fire.

"(2) It is a natural host of *Dendroctonus monticolae* and therefore subject to epidemic insect attacks at recurring intervals.

"(3) It is now rather fully exposed to the scourge of white pine blister rust through 61 known infection centers in North Idaho.

"Under this combination of excessive fire control costs, susceptibility to recurring attacks of *Dendroctonus monticolae*, and the necessity of Ribes eradication to prevent blister rust losses, it is an open question as to whether the perpetuation of the white pine type by expensive protection and silvicultural measures can be justified.

"The problem is, therefore, essentially an economic one and though extremely complex from many standpoints, can be logically resolved into the question of whether or not it will pay to grow white pine in the face of these greatly increasing costs. As much of our research is predicated on the desirability of maintaining or increasing the amount of western white pine in its native region, some members of the council felt that this issue should be squarely faced by all interested agencies. The best answer to the problem is probably a compromise somewhere between the abandonment of western white pine as a major commercial species and its complete protection from all enemies throughout its range. Back of our request for increases for silvicultural research is the immediate need for more study of the growth and yield responsibilities of the species commonly associated in the western white pine type."

The hard question of whether it was economically feasible to grow western white pine was deferred rather than answered at the time because emergency relief programs provided the funds and manpower to attempt control of fire, white pine blister rust, and the mountain pine beetle. The question really was answered by default.

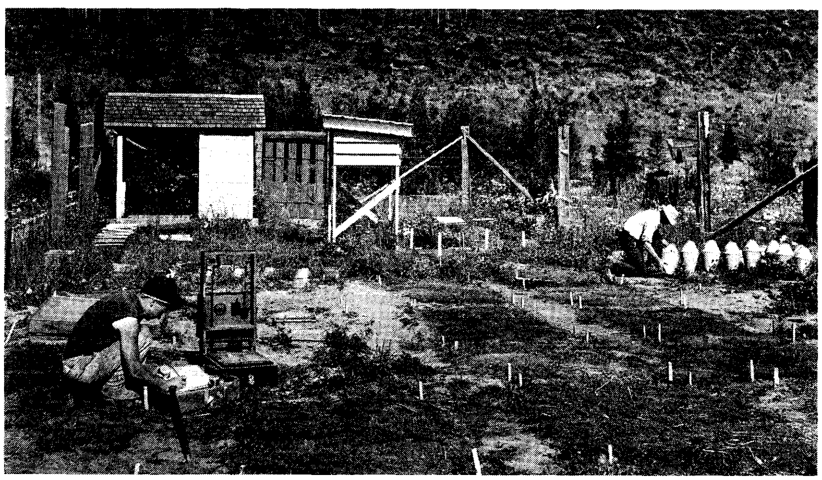
As a result, timber management research in the Station continued emphasis on western white pine forests with greater attention to species associated with white pine. Field work for this research was centered at the Priest River Experimental Forest and to an increasing extent the Deception Creek Experimental Forest after its establishment in 1933.

Some attention was given to problems in other forest types. The Station made major contributions to the ponderosa pine interregional normal yield study. Field work and analysis were completed on a study of growth in partially cut western larch-Douglas-fir stands. Experimental forests were selected and established for timber management research in ponderosa pine, larch-fir, and lodgepole pine types. But funding for research in these types never came.

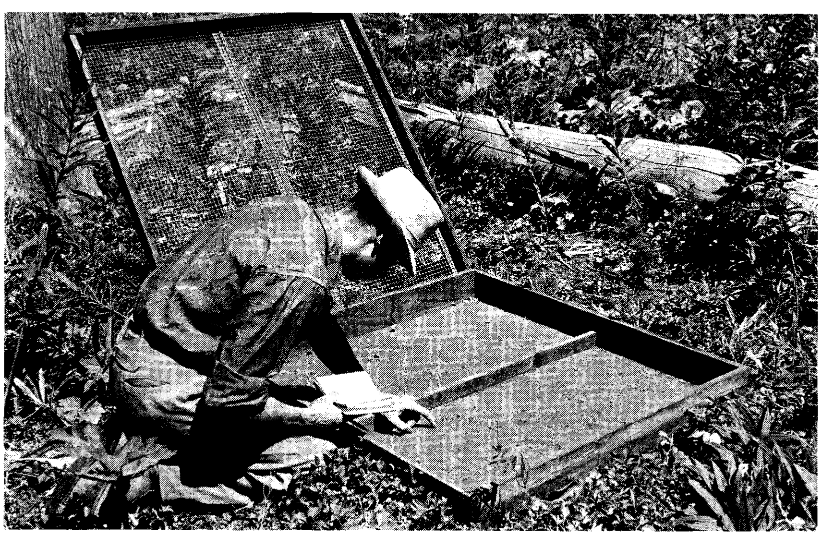
Timber management research during this period included studies of natural regeneration in all of its aspects, early stand development, growth and yield, stand improvement, artificial forestation, insects and diseases (cooperative), and the economics of timber growing.

Studies of natural regeneration started by Marshall, Weidman, and Haig during the 1920's were continued and completed. Haig made a very comprehensive study at Priest River of the factors affecting early survival of seedlings. This study was carried out from 1931 to 1934 at the clearcut, half-cut, and full-timbered stations on Jurgens Flats and also on the Koch plots up Benton Creek. Results were published as a Yale bulletin. All of the studies of natural regeneration from the time the Station started in 1911 were brought together in a major publication by Haig, Davis, and Weidman. Large-scale tests of silvicultural systems to favor western white pine were started on the Deception Creek Experimental Forest.

Studies to 1935 of natural regeneration and of growth and yield had left a gap in knowledge of stand development from the time seedlings became established until they formed a closed stand. In 1935, Ostrom established permanent plots in the Kaniksu, including one at Priest River on Jurgens Flat near the Knoll Area, and Coeur d'Alene Forests to obtain information on stand development. In 1940, the author established similar plots on the St. Joe and Clearwater Forests. Because overwood had such a major effect on reproduction, I made a study of how best to measure light intensity beneath forest canopies. I made another study of ways to measure stocking in young stands.



A



B

*A. C. A. Wellner, left, and I. T. Haig, right, taking measurements on seedling survival studies at clearcut flammability station, fire studies in background, 1932; B. I. T. Haig counting seed in a 1/4-milacre trap to determine seed production on a cutover area, 1932.*

Emergency programs provided labor for stand improvement work. The Station was hard pressed for information on thinning, weeding, improvement cutting, release cutting, and pruning. Past research had been limited to thinning studies at Priest River and in ponderosa pine on the Custer Forest. It was inevitable that the Station would increase research on stand improvement. Thinning tests were started on both the Priest River and Deception Creek Experimental Forests in 1933 and additional tests were added later. Tests at Priest River were in the 75-year-old stands near the Station headquarters and up Benton Creek near the transect. Additional thinning plots were established in the late 30's in extensive CCC thinnings in Canyon Creek. All Priest River thinnings gave especial attention to western redcedar.

Pruning was studied, too, both at Deception Creek and Priest River. Davis made a study of pruning equipment in 1936 and the author started tests at both Deception Creek and Priest River of rate of healing and effect of crown removal on growth. At Priest River the pruning tests were located near the Knoll Area and on Benton Flat. In addition, CCC crews pruned extensive areas in lower Canyon Creek, especially on the slopes of Priscilla and Margaret Gulches. Paired pruned and unpruned trees were set up in the extensive pruning areas.

Cleanings, or cuttings in young stands to increase the proportion of western white pine, were tested also. Some tests were established in Snow Valley on the Kaniksu Forest using Priest River as a work center, and other tests were set up on the Deception Creek Forest.

A major achievement in growth and yield was publication in 1932 of Haig's bulletin on normal yields. This provided a means to determine site quality in the western white pine type and yields to be expected in fully stocked stands. It also contained volume tables for the various species of the white pine type. Other research in growth and yield was a type-wide study of growth and mortality in cutover stands of the white pine type. In addition, the large number of permanent growth and yield plots, including a number on the Priest River Experimental Forest, were remeasured on schedule.

A stepped-up planting effort, again sparked by emergency programs, spurred renewed cooperative research by the Station and Region 1. Weidman headed up the initial work for the Station. He centered his investigations on planting of brushfields, especially on site preparation methods including burning and mechanical means. Some of these tests were made at Priest River in Fox Creek on the burn of the 1922 Highlanding Fire. After Weidman left, Schopmeyer studied direct seeding using poisons for rodent control. First McKeever, then Helmers, followed up on the direct seeding experiments.

The only continuing experiment of the early planting studies at Priest River, the study of racial variation in ponderosa pine, was analyzed by Weidman and a comprehensive report on results and implications was published in 1939.

Weidman also gave considerable time and personal attention to developing the arboretum at Priest River. Unfortunately, the arboretum received little attention after he left.

Increasing concern over damaging diseases and insects resulted in a number of cooperative studies. One of the first of these was a review of the effect of silvicultural practices on white pine blister rust; this resulted in a joint publication by Davis, and Virgil Moss of the Office of Blister Rust Conrol. Another was a cooperative study of a new disease in second-growth western white pine. This disease, later called pole blight, was seriously affecting stands on both the Priest River and Deception Creek Forests. Professor Ehrlich of the University of Idaho, Evenden of the Forest Insect Laboratory, and the author for the Station cooperated on studies of this problem. Still another cooperative effort, with Evenden of the Forest Insect Laboratory, that developed into a major study was investigation of light partial cutting in western white pine to prevent losses, mainly by the mountain pine beetle.

Before Davis left the Station, he pulled together silvicultural information in a case study (for his Ph.D.) of the economics of growing western white pine. Results of this study were published in 1942.

The Division of Silvics increasingly became involved with other divisions in the Station and with outside research agencies. Early in the period much time was given to forestry requirements of the Lumber Code. Continual assistance was given to Forest Survey in many ways. We cooperated with Forest Products on a number of studies. The author spent much time during 1940 working with the Office of Blister Rust Control on criteria for selecting stands to be given protection from rust. Cooperative studies with the University of Idaho and the Forest Insects Laboratory have already been mentioned.

A landmark of sorts was establishment in 1935 of the first research natural area in Region 1, Tepee Creek on Priest Lake. Davis prepared the report. The author prepared reports in 1937 on three more, Canyon Creek on the Priest River Forest, Montford Creek on the Deception Creek Forest, and Coram on the Coram Experimental Forest.

The following tabulation summarizes timber management research in white pine forests during this period, indicates responsibilities, and shows which studies were conducted on or near the Priest River Experimental Forest or drew on results from studies made there:

| Area of study | Responsibility | PREF involved |
|---|---|---|
| Natural regeneration | | |
| On burns and cutover areas | Haig, Wellner | x |
| Seedling survival | Haig | x |
| Summary publication | Haig, Davis, Weidman | x |
| Large-scale tests of silvicultural systems | Davis, James, Wellner | |
| Measures of stocking | Wellner | x |
| Artificial forestation | | |
| Brushfields | Weidman | x |
| Direct seeding | Schopmeyer, McKeever, Helmers | |
| Racial variation of ponderosa pine | Weidman | x |
| Arboretum | Weidman | x |
| Stand improvement | | |
| Thinning | Weidman, Davis, Wellner | x |
| Cleaning | Davis, Ostrom, Wellner | x |
| Pruning | Davis, Wellner | x |
| Growth and yield | | |
| Normal yield | Haig | x |
| Cut-over stands | Davis, Wellner | x |
| Light vigor selection cuttings | Wellner | |
| Insects and diseases | | |
| Pole blight | Wellner | x |
| White pine blister rust | Davis, Wellner | x |
| Mountain pine beetle | Wellner | |
| Economics of growing white pine | Davis | x |

## POSTWAR RECOVERY AND EXPANSION, 1945-1960

The Northern Rocky Mountain Station recovered rather quickly from World War II and grew in size and complexity. The Priest River Experimental Forest became only one of a number of field research facilities. From the discouraging maintenance level of World War II, research activities at the Forest increased to a very high level in 1956, then subsided rapidly to a depressed level again by 1960. Variety of research on the Forest increased markedly during this period. In addition to use in timber management studies and greatly expanded programs in forest fire research, the Forest was the center for special snow and soils investigations and was used for research on two serious diseases of western white pine. The Experimental Forest was also used to a limited extent in forest products studies of spiral grain in larch. The outstanding characteristic of research at Priest River during this period was that so much of it was cooperative between the Station and other agencies. The Forest again demonstrated its value during the period as a field facility for research, demonstration, and education. Yet, because of a movement in Forest Service research from field facilities to laboratories, by 1960 further use and need for the Priest River Forest was seriously questioned.

### *Funds*

Other than to mention that allotments to the Station increased substantially during this period, they will not be listed. They don't serve as a very useful indicator of use of the Priest River Forest because the Forest was but one of many Station field facilities and was used when it fitted the needs of a particular research program. Much of the use of the Forest, as already mentioned, was in cooperative research programs that resulted in heavy use by cooperators.

### *Personnel*

In previous periods a relatively few professional researchers used the Priest River Forest and these few often resided there for extended periods, especially during the field season. During the 1945-1960 period a great many more professionals, from the Station and cooperating agencies and organizations, used the Forest in their investigations. Some stayed for extended periods and others for only a short time. The following lists include people who were administratively responsible for research on the Forest, or who worked there, and also scientists from universities or private industry who conducted research there. Temporary personnel are listed in Appendix A.

Director's Office

| Name | Position | Period |
|---|---|---|
| Melvin I. Bradner | Director | -1946 |
| Charles L. Tebbe | Director | 1946-1950 |
| George M. Jemison | Director | 1950-1953 |
| Reed W. Bailey | Director | 1954- |

| | | |
|---|---|---|
| Harry T. Gisborne | Chief, Div. For. Protec. Res. | -1949 |
| Jack S. Barrows | Chief, Fire Research | 1949- |
| Russell K. LeBarron | Chief, For. Manage. Res. | 1946-1952 |
| Walter M. Zillgitt | Chief, For. Manage. Res. | 1953-1957 |
| Charles A. Wellner | Chief, For. Manage. Res. | 1958- |
| James W. Kimmey | Chief, For. Dis. Res. | 1957- |

Station Research Scientists

| Name | Research | Period |
|---|---|---|
| Chalmer K. Lyman | Forest Fire | -1945 |
| Austin E. Helmers | Silviculture | -1948 |
| | Snow Studies | 1948-1952 |
| | Soil Trafficability Studies | 1953-1954 |
| Charles A. Wellner | Silviculture | 1946-1948 |
| | Leader Inland Empire Res. Center | 1948-1958 |
| Marvin W. Foiles | Silviculture | 1947-1957 |
| Anthony E. Squillace | Silviculture & Genetics Studies | 1947-1958 |
| Richard F. Watt | Silviculture | 1948-1952 |
| Donald W. Lynch | Silviculture | 1948-1954 |
| DeWilton C. Smith | Snow Studies | 1948-1952 |
| William Taylor | Snow Studies | 1949-1950 |
| Lloyd Weir | Snow Studies | 1950-1951 |
| Richard Alvis | Snow Studies | 1950-1951 |
| Charles E. Hardy | Forest Fire | 1951- |
| George Fahnestock | Forest Fire | 1949 (on detail) 1951-1957 |
| John H. Dieterich | Forest Fire | 1952- |
| J. C. Holland | Soil Trafficability Studies | 1952-1954 |
| Raymond J. Boyd | Soil Trafficability Studies | 1953-1955 |
| | Silviculture | 1955- |
| Charles D. Leaphart | Forest Diseases | 1954-1960 |
| Otis L. Copeland | Pole Blight of White Pine | 1954-1957 |
| Donald Graham | Snow Studies | 1949-1950 |
| Merle G. Lloyd | White Pine Blister Rust | 1956- |
| Richard T. Bingham | Blister Rust Resistant White Pine | 1960- |
| Donald M. Fuquay | Forest Fire | 1958- |
| Arthur P. Brackebusch | Forest Fire | 1958- |
| Ed F. Wicker | Forest Diseases | 1959- |
| Robert Z. Callaham | Leader, Inland Empire Res. Center | 1958-1960 |

Clerk-Stenographers

The following Clerk-Stenographers had much to do with the Priest River Experimental Forest: Mary Jo Pershina (1945-1948), Florence Olson (1948-1951), Vandella Gordon (1951-1960), Edna Campbell (1948-1953), and Drucilla Otterson (1954-1957).

Superintendents of Priest River Experimental Forest

Superintendents during this period are given in Appendix A.

Scientists from Universities and Other Organizations

| Name | Organization | Period |
|---|---|---|
| **Pole Blight** | | |
| D. S. Welch | University of Idaho | 1947-1948 |
| T. S. Buchanan | University of Idaho | 1947-1951 |
| F. G. Hawksworth | University of Idaho | 1948 |
| R. W. Harder | University of Idaho | 1948-1950 |
| G. Harvey | University of Idaho | 1948-1951 |
| Lake S. Gill | Division of Forest Pathology | 1948-1953 |
| Stuart R. Andrews | Division of Forest Pathology | 1948 |
| Charles D. Leaphart | Division of Forest Pathology | 1949-1953 |
| Donald Graham | Division of Forest Pathology | 1950-1953 |
| F. D. Johnson | University of Idaho | 1951-1957 |
| Ernest E. Hubert | University of Idaho | 1949-1955 |
| William K. Ferrell | University of Idaho | 1948-1957 |
| C. S. Hodges | University of Idaho | 1952-1955 |
| E. Wholetz | University of Idaho | 1954-1957 |
| R. Gilbertson | University of Idaho | 1955-1957 |
| Hubert H. Bynum | University of Idaho | 1955- |
| **Breeding Blister Rust Resistant Western White Pine** | | |
| Richard T. Bingham | Blister Rust Control, BEPQ | 1946-1953 |
| | Blister Rust Control, Region 1 | 1954-1960 |
| **Project Skyfire** | | |
| Vincent J. Schaefer | General Electric Research Laboratories and Munitalp Foundation, Inc. | 1948-1960 |
| Paul B. McCready | Munitalp Foundation, Inc. | 1953-1959 |
| DeVer Colson | U.S. Weather Bureau | 1955-1960 |
| Ken Nagler | U.S. Weather Bureau | 1954 |
| Donald M. Fuquay | University of Washington | 1954-1955 |
| | Munitalp Foundation, Inc. | 1955-1958 |
| **Slash Disposal** | | |
| David Olson | University of Idaho | 1952-1957 |
| Conrad Buettner | University of Washington | 1955 |

Other university people worked out of the Forest on cooperative or personal research. Albert W. Slipp of the University of Idaho and Rexford Daubenmire of Washington State University were two frequent visitors.

### *Organization*

The first organizational change of this period came in 1945 with reestablishment of divisions in fire and silvicultural research, termed Division of Forest Protection and Division of Silviculture. Because of increased timber sale activities in Region 1, brought on by wartime requirements for forest products, the accumulated backlog of silvicultural betterment work on timber sales, and the possibility of a postwar work program, the new Assistant Regional Forester for Timber Management, Axel Lindh, pressed the Station to step up its program in applied silvicultural research. He specifically requested the Station to prepare a stand improvement handbook for all timber types of the region. Furthermore, he was willing to contribute some funds to get the Division of Silviculture reestablished. The result was that Russell K. LeBarron was transferred from the Lake States Experiment Station to become the Silviculture Division Chief.

Organizational changes occurred again in 1946. Director Bradner died and Gisborne served as Acting Director until C. L. Tebbe transferred from Region 6 to fill the position. Silvicultural research picked up momentum. The author returned from the Navy early in the year to team up with Austin Helmers in resuming studies in the western white pine type. Increased funding for silvicultural research resulted in organizing a new Western Montana Work Center staffed by A. L. Roe and K. N. Boe. The Division of Forest Protection added J. S. Barrows to its staff. It continued to have responsibility for operation and maintenance of the Priest River Experimental Forest.

In 1948, new appropriations for research in northeastern Washington resulted in opening an office in the Forest Service Warehouse at 157 South Howard Street in Spokane that included the northern Idaho silvicultural research, titled the Priest River Research Center, and the new northeastern Washington program called the Spokane Research Center. The Spokane Center included both silvicultural and range research. The author served as Center Leader of both units. Staff of the Priest River Center included Marvin W. Foiles, Richard F. Watt, and Albert W. Peiffer, the latter at the Priest River Forest. Staff of the Spokane Center consisted of Donald W. Lynch and Grant A. Harris. Florence R. Olson was clerk-stenographer for both units. Responsibility for operation and maintenance of the Priest River Experimental Forest was shifted from the Division of Fire Research to the Center in Spokane.

Another major event affecting the Priest River Forest was the establishment in 1948 of a Flood Control Surveys Division in the Station and the start of so-called "Advance Studies," concerning snow accumulation and melt, at the Priest River Experimental Forest under the direction of Austin E. Helmers. Helmers and DeWilton C. Smith moved to the Priest River Forest in November.

Still another significant event took place in 1948. The Office of Forest Pathology began cooperative investigations of the pole blight disease of western white pine and used Priest River facilities.

In 1949 the Priest River and Spokane Research Centers were combined and called the Inland Empire Research Center. This really made no change as the two units had been managed as one unit from the outset.

Harry T. Gisborne, pioneer in fire research, much of which he had conducted on the Priest River Experimental Forest, died in 1949. He had spent the summer on the Experimental Forest studying cloud formation and the occurrence of lightning. In November he had gone to the Helena National Forest to determine why the disastrous Mann Gulch Fire had killed 12 smokejumpers and one smokechaser. On November 9 he died of a heart attack while hiking down the trail from the burned area. Thus, careers of two pioneers and all-time greats in forest fire research came to an end by heart attacks on forest fires, Hornby on the Toboggan Creek fire of 1937 and Gisborne on the scene of a tragic fire in 1949.

A dedication ceremony was held on the summit of Lookingglass Mountain on July 8, 1951, to rename it Gisborne Mountain and to place a plaque there in his memory.

Other personnel changes soon occurred in positions affecting the Experimental Forest. In 1950, Director Tebbe was transferred to Washington, D.C., and was succeeded by George M. Jemison who had been with the Station in fire research from 1931 to 1937. Jack S. Barrows was appointed to Chief of the Division of Fire Research that same year. In 1952 Russell K. LeBarron, Chief of the Division of Forest Management Research, transferred to the California Station and was succeeded by Walter M. Zillgitt in 1953.

On January 1, 1954, the Northern Rocky Mountain Station was merged with the Intermountain Forest and Range Experiment Station. The combined Station took the name of the latter Station, and Reed W. Bailey, Director of Intermountain Station, became

A


B

C

*Dedication of Gisborne Mountain, July 8, 1951: A. Plaque on mountain honoring H. T. Gisborne; B. Mrs. Alice Gisborne, wife of H. T. Gisborne; C. Group at dedication.*

Director of the enlarged Station. The leader of the Inland Empire Research Center in Spokane continued to have responsibility for the Priest River Forest.

Other significant organizational changes occurred at this same time. The Office of Forest Pathology was transferred to the Forest Service. This brought Charles D. Leaphart and Donald Graham into the Inland Empire Research Center. Forest Insect Investigations and Blister Rust Control, both in the Bureau of Entomology and Plant Quarantine, were also transferred to the Forest Service. This transfer didn't have any immediate effect on the Research Center in Spokane or the Priest River Forest until 1956 when Merle G. Lloyd, a meteorologist, was added to the Center staff to work on the relationship of white pine blister rust infection to microclimate.

In 1953, the Station organized the Inland Empire Forest Research Advisory Committee to review annually the research program of the Inland Empire Research Center. Made up of representatives from Region 1, Spokane Chamber of Commerce, University of Idaho, Washington State University, cattlemen, a small timber company, a large timber company, the Idaho State Forester's office, and Bureau of Land Management, it met each year from 1953 to 1961 and then was discontinued when criticism of advisory committees developed nationwide. This advisory committee served the Research Center very well. It provided a forum for review and discussion of research by all agencies in the northern Idaho-northeastern Washington area. The group made solid and helpful recommendations to the Station each year. Meetings of the Committee were held at the Priest River Forest in 1953, 1957, and again in 1961.

There were other committees. The cooperative program on the pole blight disease of western white pine had its own steering committee composed of representatives of the University of Idaho, Division of Forest Pathology, Division of Forest Insect Investigations, Division of Blister Rust Control, Canadian Laboratory of Forest Biology, National Forest Administration, and the Northern Rocky Mountain Station.

The cooperative slash disposal research program also had an ad hoc committee of representatives from the University of Idaho, National Forest Administration, Protection Associations, lumber industry, Idaho State Forester's office, and the Station.

Project Skyfire with a long list of cooperators entered into a cooperative agreement with the President's Advisory Committee on Weather Control.

In 1954 Barrows organized a forest fire research laboratory in Missoula. Project Skyfire used the Priest River Forest heavily that year and the next but thereafter conducted the program out of the Missoula laboratory. The need for a new major fire research laboratory with adequate facilities was evident. This need came at a time when Forest Service research was making a drive to get adequate laboratory and office facilities. The Northern Forest Fire Laboratory in Missoula was dedicated September 12, 1960, and plans were underway to construct a laboratory in Moscow for the Inland Empire Research Center.

The move from experimental forests to laboratories and the fact that buildings and other improvements at Priest River were in need of costly maintenance raised a serious question as to the future need for the Priest River Experimental Forest at the time of a Washington Office inspection of Intermountain Station in 1960. A reorganization of Intermountain Station away from research centers into disciplinary projects, in another nationwide movement, and a sharp delineation of the objectives of each project sharpened the question. It was suggested that the Priest River Experimental Forest should be disestablished and turned back to the Kaniksu National Forest the same as two other experimental forests of the Station, the Bernice Forest in lodgepole pine on the Helena and the Piquette Forest in ponderosa pine on the Bitterroot.

Insistence by the Station that the Priest River Forest would still be needed resulted in a recommendation to the Station in the 1960 inspection report that the Priest River Forest be kept as an experimental forest, but that headquarters facilities be greatly reduced and operated as a summer facility.

### *Research Facilities*

During the 1945 to 1960 period, few improvements were made in the headquarters area. The buildings and grounds were kept neat and usable but maintenance funds were never sufficient to care for the buildings adequately. Major systems--water, sewage, power--continued to deteriorate until by 1960 the Station faced a major and costly maintenance job to keep the Priest River headquarters facility serviceable.

Headquarters improvements during this period consisted mainly of usual maintenance such as repainting of buildings; changes in lighting fixtures; replacing stoves, hot water heaters, and refrigerators; work on foundations; replacing some floors, etc. In 1952-1955, 3,070 feet of wood stave pipe were laid up Benton Creek, but this did not correct a water contamination problem. Chlorination units were installed in the buildings in 1959 and 1960. A new lookout tower was erected on Gisborne Mountain in 1958, 25 years after the original tower was built.

In another change, the old CCC camp, F-127, was completely demolished in 1950.

In 1953 white pine blister rust control crews spent 3 months on the Experimental Forest attempting to eradicate Ribes for the fourth time.

Major improvements were made on the experimental forest, however. Approximately 30 miles of access and utilization roads (Appendix C) were built as part of a plan for an intensive road network that had been developed in 1952. The roads were built partly from appropriated road funds and partly as a condition of timber sale contracts.

Use of the Experimental Forest for meetings, conferences, training, and education was at a high level during the 1945 to 1960 period. Classes in a variety of subjects were frequent visitors to the Forest. For several years after World War II, Iowa State College used old CCC Camp 127 as a summer forestry camp. Each year Dean McDonald brought three or four faculty members (usually including former Station Director Julius Larsen) and about 100 students to the camp.

The list of groups visiting during 1957 was typical:

February 9: University of Montana dendrology class.
May 7-8: Pole Blight Investigations Steering Committee.
May 25-26: Washington State College ecology class.
June 18: Priest River Girl Scouts.
June 25-27: Skyfire School.
July 19: Forestry School Deans tour.
Thursdays in July: Boy Scouts of America, Camp Cowles.
Several times during summer: Mount St. Michael's (Spokane).
September 9: Logging slash review for R-2 and Rocky Mountain Station.
September 10-11: Inland Empire Forest Research Advisory Committee.
September 27: White Pine Management School.
September 16: Turkish Foresters (5).

The above list for 1957 does not include five separate visits by inspection groups of various kinds and the following visit as reported by James W. Hanover, Superintendent:

"The experimental forest had the unique and pleasant experience of being 'home' for Secretary of Agriculture Ezra Taft Benson and his family for six weeks during 1957. The distinguished guests occupied the Lodge from July 2 to August 13. Secretary Benson's summer at the forest enabled him to become familiar with Forest Service programs by means of extensive and local trips scheduled for him. The Secretary spent many hours relaxing and enjoying the station's scenery and facilities."

### *Investigative Program*

The period 1945 to 1960 was marked by a recognition of the need to pool talents, resources, and facilities to solve difficult land management problems. Director Jemison in the introduction to the Station's annual report for 1952 summed up the situation as follows:

"...we have at least a partial solution to what would otherwise be a tremendous job. That answer is 'Cooperation.' Most researchers realize that the pooling of efforts under a coordinated plan is necessary if progress is to be most rapid and if needless duplication is to be avoided. Forest and range managers, industrial groups, and colleges, too, feel the need for supporting research and making it a truly cooperative activity."

The result was that many of the research programs that in whole or in part used Priest River Forest facilities were cooperative between the Station and other organizations.

Several Station divisions used the Priest River Forest during the 1945 to 1960 years. The Divisions of Fire Research and Silvicultural Research made use of the Forest throughout the period. Shortly after World War II a new Division of Flood Control Surveys used the Forest for two important programs. The Forest was used during this period for studying two important diseases of western white pine. It was also used in a forest utilization study of spiral grain in western larch trees.

#### Forest Influences

Over the years valuable climatic and streamflow records had been accumulated for the Priest River Experimental Forest. It was only natural, therefore, that the Priest River Forest should be the location of "advance studies" of snow accumulation and melt when the new Division of Flood Control Surveys was established in the Northern Rocky Mountain Station in 1948 after the disastrous Columbia River Flood. Austin Helmers moved to Priest River in November and he and his assistants, by working around the clock, established a network of weather stations and snow courses to take advantage of the winter that was already upon them. All the difficulties of winter work were encountered during the next four winters, but valuable records of snow accumulation and melt as influenced by altitude, aspect, and forest cover were obtained. Methods and instruments for measuring weather elements received a considerable amount of attention. Helmers cooperated with the University of Idaho Engineering Experiment Station in testing experimental wind-shields for precipitaton gauges on Gisborne Mountain. The snow studies program came to a sudden end in 1952 when funds for flood control surveys were seriously curtailed. Data from the Priest River snow studies were analyzed and reported later by Paul Packer after consolidation of the Northern Rocky Mountain and Intermountain Stations.

Just as the snow studies were folding, Helmers was assigned another emergency project to be conducted at Priest River. This was an extension of contract research the Forest Service was conducting for the U.S. Army Corps of Engineers' Waterways Experiment Station at Vicksburg, Mississippi, on soil infiltration as a means to estimate trafficability of soils for Army vehicles. Helmers, Holland, and Dieterich spent the next year studying soil infiltration at several sites on and near the Experimental Forest. The following year (1953) Boyd joined the project and emphasis was shifted to Palouse soils south of Spokane. Shortly before the study was completed in 1954, Holland resigned and Helmers transferred to Washington, D.C., leaving Boyd to complete the report and close out the project. Although the Forest Service furnished the Army the information it had contracted for, the Station got little in the way of research results in return. The Station did not have funds to pay for transforming good soil infiltration information into something useful to land managers.

Two other contributions during this period from research on the Priest River Experimental Forest should be mentioned under forest influences. The first was a report by Gisborne of wind records through and above the forest canopy taken on the fire weather tower. The second was a report by Stage, when he was Superintendent, of the Benton streamflow records. His results showed that for this heavily timbered watershed only 38 percent of the precipitation came out as runoff.

## Fire Research

The phenomenal growth of fire research during this period from a one-man division (Gisborne) in 1945 to a major forest fire laboratory in 1960 was largely the doing of one man, Jack S. Barrows. In March 1945, Lyman completed and published on his studies of fuel reduction. Gisborne was occupied with advice and guidance and service jobs. He made and sent out over 200 sets of fuel moisture sticks and serviced about 15 anemometers. He inspected several fire danger stations on each of six northern Idaho National Forests and checked the use of the model 6 fire danger meter. At the request of the Regional Office, he spent time on the Region's test of airplane detection of fires. He made exploratory tests of heat content of fuels and suggested that fuel weight per acre should be used in fuel type classification. He revised for publication a 30-year summary of Priest River weather records.

Activities in fire research began to accelerate. Barrows was added to the fire staff in 1946 to pick up research in fire control planning. He was soon involved in tests of bombing fires with water with cooperation of the Army Air Force. Gisborne continued work on fire danger measurement including the large log study at Priest River to determine differences in heavy fuel moisture content in wet and dry years. These lines of research were continued in 1947 and the water bombing tests were concluded.

Fire research took on the job in 1948 of manufacturing and distributing fuel moisture sticks for all fire protective agencies west of the Mississippi River. This job, involving about 2,000 sets of sticks, was done at the Priest River Forest from 1948 to 1952, then was turned over to the Forest Service Warehouse in Spokane. The Station, however, continued to monitor quality of Warehouse manufactured sticks at the Priest River Forest for several years.

The year 1948 also saw the beginnings of cooperation between Gisborne and Dr. Vince Schaefer of General Electric Research Laboratory, the originator of the dry ice method of cloud seeding. Dr. Schaefer spent three weeks at Priest River in July and August, with a C-47 airplane standing ready from which to seed and photograph thunder storms. Abnormally wet weather altered cloud behavior so that no seeding could be done. Nevertheless, this was the start of a very productive association between the Station and Schaefer.

In 1949 the dry-icing experiments were continued. Through the cooperation of the United States Air Force, a B-29 bomber equipped with a specially built dry-ice hopper was made available at the Spokane Base of the Strategic Air Command. For six weeks during July and August personnel in the Air Force and at Priest River were prepared to make dry-icing flights in the B-29. Gisborne maintained daily observations of cloud formation from Lookingglass Lookout at Priest River. The test required two individual lightning producing clouds having identical characteristics. One of these was to be seeded with dry ice and the other to be observed as a check. Unfortunately during the entire period these conditions did not materialize. However, Gisborne and the lookout observer at Lookingglass made detailed studies of cloud and lightning conditions.

Fire research was continued in 1950 along three broad fronts: fire behavior, fire danger rating, and fire control. Barrows completed a report on his analysis of 36,000 forest fire reports. An experimental model of a rate-of-spread computer was designed. The large log studies at Priest River were continued. A significant item forecasting future relationships was providing Dave Olson, who was starting slash disposal research at the University of Idaho, with basic data about slash fires.

The year 1952 marked the start of two major fire research programs at Priest River. A field laboratory for logging slash research was established primarily in cooperation with Dave Olson of the University of Idaho, but the Idaho State Forestry Department, Priest Lake Timber Protective Association, Potlatch Forests, Inc., Kaniksu National Forest, Region 1 smokejumpers, the U.S. Weather Bureau, and the California Forest and Range Experiment Station also assisted in the program. The site of old F-127 CCC camp and the area to the north along the river was developed as a field area for burning experiments.

The logging slash research program was supervised by George Fahnestock for the Station and Dave Olson for the University of Idaho. Most of the experimental work was completed by 1957 when Fahnestock transferred to the Southern Station. He returned in 1960, however, so that he could complete burning tests on 5-year-old slash. This ended the logging slash project. A number of publications resulted from this cooperative effort. A valuable contribution from this research for other lines of research was measurements of weight of slash for various sizes and species of trees. These measurements were taken to develop slash weight yield tables from stand cruise data.

In 1952, the cooperation between Gisborne and Schaefer resulted in a cooperative project between the Station, General Electric Research Laboratory, and the Munitalp Foundation. Objectives were a better understanding of lightning storms and lightning fires in the northern Rocky Mountain region, obtaining fire-weather information needed in research projects of the U.S. Forest Service and the Munitalp Atmospheric Research Project, and determining the possibility of preventing or reducing lightning fires by weather modification operations. Vincent J. Schaefer of the General Electric Research Laboratory and Jack Barrows of the Station were co-Directors of the project.

Interest and cooperation grew in the project until by 1955 it not only included the original three cooperators but the following as well: U.S. Weather Bureau; the Universities of Washington, Idaho, and Montana; the Boeing Airplane Company; the National Park Service; the California State Division of Forestry; Meteorology Research, Inc.; the California Forest and Range Experiment Station; and the western Regions of the Forest Service. It involved lightning fire research throughout the western United States. The lightning project used the Priest River Experimental Forest as a field base from 1952 to 1955. After 1955, however, Missoula became the base of operations and the lightning project made little use of Priest River thereafter.

Fire Research had also been using facilities at Priest River in fire-danger rating research, fire-weather equipment development and testing, and the logging slash flammability experiments. These activities continued but at a reduced level.

## Disease Research

Before World War II, the author had been involved in cooperative studies of pole blight (named in 1947 by Russell K. LeBarron) of white pine. Upon his return from the

Navy in 1946, he was dismayed with the spread of the disease and its seriousness. He prepared a publication to draw attention to the disease and to foster research on it. In 1947 and 1948 the Station cooperated with Dr. Welch of the University of Idaho in studying this mysterious disease and T. S. Buchanan joined the University of Idaho staff to give major attention to pole blight. In 1948 the Division of Forest Pathology assigned Lake Gill with two assistants to begin research on the disease. The Division of Forest Pathology investigators used the Priest River Forest as their headquarters. Within a few years a cooperative effort was underway by the following organizations to solve this disease: University of Idaho; Division of Forest Pathology; Division of Forest Insect Investigations; Division of Blister Rust Control; Canadian Laboratory of Forest Biology; National Forest Administration; and the Northern Rocky Mountain Station. The research program was agreed upon and coordinated by a steering committee.

Investigations of this disease continued through the period. After the Division of Forest Pathology was transferred to the Forest Service in 1954, Otis Copeland was assigned to Spokane to work with Leaphart on pole blight. They carried out most of their intensive studies of the disease on the Priest River Experimental Forest. These included studies of root systems, effects of induced drought on large white pines, and effects of moisture stress on root and top development of seedlings of white pine and associated species. The latter study was dismantled in 1960. Leaphart also cooperated with Stage in a dendrochronology study to gain information on the relation of pole blight to climatic conditions. Donald Graham of the Spokane Center surveyed distribution of the disease.

By the mid-1950's people close to the white pine blister rust control job began to be concerned about feasibility of control. Despite a thorough job of Ribes (the alternate host of the rust) eradication, in some stands rust infection on pine exceeded tolerable levels. Why? One possible answer was microclimatic conditions that permitted long-distance spread of pine-infecting spores.

A meteorologist with the Weather Bureau, Merle G. Lloyd, was transferred to the Inland Empire Research Center in 1956 to work on this problem. Most of his work was conducted on or near the Priest River Forest. Lloyd established a number of meteorological stations on the Experimental Forest to study microclimate in spore infecting levels near the ground. Atmospheric humidity and dew received special attention. He studied thermal structure of the atmosphere by means of instruments taken aloft by a captive balloon. Wind movements and simulated spore movements were investigated using smoke generators. By 1960 he had a good idea of the microclimate in white pine country and its possible influence on infection.

Other diseases studied during this period were: a thinning of the foliage and decline of white pine called white pine needle blight, by Leaphart and Denton, and severe injury to trees resulting from a drought during the summer of 1958, by Leaphart.

Climatic stress during this period had included a severe soil drought in the winter of 1952-1953 caused by a dry fall followed by freezing weather that did not permit soil moisture recharge until the spring of 1953, a sudden drop in temperature in 1955, and a summer drought in 1958.

Genetics

The study of racial variation of ponderosa pine started at Priest River in 1911 had been continued over the years. Kempff had reported on the study in the 1920's and Weidman in the 1930's. In 1957 Squillace summarized the records again and teamed up with Roy Silen of the Pacific Northwest Station to combine results from the Priest River study with results from a similar study at the Pacific Northwest Station. They prepared a major publication reporting on the results and implications of these studies.

The Priest River Forest also played a minor role in a major cooperative genetics program between the Office of Blister Rust Control, the Office of Forest Pathology, Region 1 of the Forest Service, and the Station to develop white pines resistant to blister rust. Richard T. Bingham of the Office of Blister Rust Control took the lead in resistant aspects and Anthony Squillace of the Station was responsible for growth and form attributes. The program was born in 1949 and really got underway in 1950. Bingham and Squillace worked as a team. When Blister Rust Control was transferred to the Forest Service, Bingham became a part of the Region 1 staff but had his office at the Research Center in Spokane. Squillace, who at first spent half time on the program, eventually moved to Spokane and worked full time with Bingham. In 1958 Region 1 and the Station cooperated with the University of Idaho to build a genetics center for the rust resistance program on the campus of the University of Idaho in Moscow, and Bingham moved to Moscow. Squillace transferred to the Southeastern Station that same year and Hanover transferred from Priest River to Moscow to take his place.

Although most research on the rust resistance program was not conducted at Priest River, the Forest did get in on the action when an outplanting of crosses from the program was made at Priest River to study their vigor and quality. This study area forms a fine plantation now along the South Ridge road near the Fox Creek switchback.

Another genetics study started at Priest River by Squillace in the early 1950's was a planting to determine growth rate of lodgepole pine x jackpine hybrids.

Forest Management Research

An increased timber business on the National Forests after World War II put pressure on the Station for silvicultural knowledge of all kinds. Silvicultural opportunities had greatly improved because all species had become marketable. Forest land managers were asking for information about regeneration systems, slash disposal and site preparation methods, planting, stand improvement, growth and yield, protection from white pine blister rust, and pole blight.

Much of the author's time throughout this period was given to advice and guidance about silvicultural practices to managers of white pine forests, and to coordination of such research activities as that on pole blight. He prepared marking rules for the white pine type for the Region in 1947 and a stand improvement manual for the Region for all forest types in 1949. Working in cooperation with Virgil Moss of Blister Rust Control, they rewrote an earlier publication on silvicultural aids to control of white pine blister rust. Each of these three reports drew heavily on past silvicultural studies made on the Priest River and Deception Creek Experimental Forests.

White pine blister rust continued to be an increasing threat to northern Idaho forests. In 1948 S. Blair Hutchison of the Station and Donald Mathews of Region 1 had made an exhaustive study of the economic feasibility of controlling the rust and had recommended continued control. But as time went by the feasibility of control, both economically and technically, continued to become more doubtful. White pine blister rust completely dominated management practices in the white pine type.

The Station continued studies of light vigor selection cuttings in mature white pine stands, but none of these were at Priest River.

Permanent plots on the Forest of other silvicultural studies were remeasured on schedule and results analyzed. Foiles in 1955 reported on the 1919 Larsen thinning test on the Priest River Forest and in 1956 on the 1914 Brewster test. Boyd in 1959 reported on cleaning experiments that had been established by Ostrom in 1935. Watt summarized all permanent plot growth records, several from the Priest River Forest, and reported an approach to normal (1950), apparent change in site index (1953), species compositional changes, and mortality (1954). All results were included in a major publication of 1960.

Timber management research also made several timber sales on the Priest River Forest to aid research, to build access and utilization roads, and to provide stand conditions for future research. For example, a timber sale was made in 1950 to test slash disposal methods in cooperation with Olson of the University of Idaho.

In 1953 Peter Stickney measured spiral grain in western larch trees on the Experimental Forest to determine if elevation and stand density affected this property. This study was part of a cooperative program arranged by I. V. Anderson between the Station and the pole industry to determine the relationships between spiral grain and twisting of transmission and telephone poles in service.

In 1952, Watt, Helmers, and the author prepared a booklet titled, "What to see and where to find it on the Priest River Experimental Forest." This publication, giving information about the Experimental Forest, was used for many years as a guidebook for visitors.

## A PLACE IN FORESTRY RESEARCH, 1961-1976

This was the period when the Priest River Experimental Forest finally found its place in the scheme of forest research. Once the question of its further value was settled at the start of the period by decisions that it was needed and should be maintained, use of the Forest grew steadily and tended to stabilize at a rather high level. By this time the Forest had a lot going for it. A long history of sustained, yearlong records of weather, streamflow, and vegetation development had increased its value. A great amount of information and knowledge about the Forest--its land, water, and vegetation--that had been building slowly over the years made it a valuable asset for research, study, and demonstration. A pleasant headquarters facility with living, office, and field laboratory space where scientists could work in the forest, and where meetings and conferences could be held to observe field conditions, added much to its research value. As a result, the record of use during this period widened to more disciplines and to a greater diversity of cooperators. Priest River Experimental Forest became recognized increasingly as a valuable research resource not only by scientists within the Forest Service but by those in other organizations.

Activities on the Experimental Forest settled down into a definite pattern concerned with either research and education, or maintenance of a plant to foster the other two activities.


*Resident research group, Priest River Experimental Forest, 1960: Standing from left to right: Bob Mutch, Jack Dieterich, Merle Lloyd, George Fahnestock, Harry Morton, Don Leaphart, Milo Koons, Art Brackebusch. Seated: Jerry Parker, Ed Wicker, John Fahnestock, Jean Fahnestock, Sally Mutch, Mary Lane Fahnestock, Millie Kinnery, Mary Dieterich. Front row: Alan, Polly, and Peggy Fahnestock, Phil Kinnery, Scott Brown, John Trojonowski, (?).*

### *Personnel*

Many of the scientists of the Moscow Forestry Science Laboratory used the Priest River Forest to some extent during this period. A few scientists in the Northern Forest Fire Laboratory in Missoula, and the Missoula and Bozeman Forestry Sciences Laboratories, found it of value in their studies. A number of scientists from the University of Idaho, Washington State University, and several other universities worked on the Forest, some on cooperative studies and others on independent studies. Appendix A lists most of those who worked in research at Priest River during this period, some year after year and for long periods, and others for only a few days.

Appendix A also includes names of people who were administratively responsible for the Forest or research on the Forest, those who worked there, and scientists from other organizations..

### *Organization*

A major decision affecting the future of the Priest River Experimental Forest was made in 1961 by Director Bailey. He decided that the Forest was needed in the program of the Station and should be maintained as a yearlong facility, retaining all major buildings for use. Thus, uncertainty about the immediate future of the Forest was settled, but how needed, expensive maintenance was to be financed was not.

Organizational changes that affected the Forest occurred early in this period. The first was reorganization of the Station in 1961 into functional (disciplinary) research projects, resulting from a Washington Office General Inspection of Intermountain Station by George Jemison and Thomas McLintock in 1960. For example, research programs in the Inland Empire Research Center were divided into the following research projects:

- Silviculture of western white pine
- Forest measurements
- Development of blister rust resistant white pines
- Forest diseases

The Research Center name and organization were discontinued. Glenn H. Deitschman, Leader of the white pine silviculture project was given responsibility for the operation, maintenance, and use of the Priest River Forest.

Fire Research organized the Intermountain Fire Research Council in 1961 to gain broad review of its program and to develop cooperation and coordination in fire research.

Two changes in 1963 also affected the Forest. The Station headquarters in Spokane were moved to Moscow when the office-laboratory on the University of Idaho campus was completed in 1963. This new laboratory provided facilities that the scientists had not had before or may have tried to satisfy in the office-laboratory at Priest River. The move to Moscow added travel distance to get to Priest River. New facilities at Moscow and the greater distance reduced use of the Priest River Forest to some extent.

New research projects were added to the Station organization in Moscow. Harold Haupt moved to Moscow in 1963 as Leader of a new watershed management project. That same year Malcolm Furniss moved to Moscow as a part of a Missoula-based project on bark beetles. In 1965 a research project on insect defoliation of trees was started with Richard Washburn as Project Leader. Each of these projects had some effect on the Priest River Forest, especially the new watershed project.

The research organization at Moscow has remained about the same since then. Along the way the title "research project" was changed to "research work unit." In 1972, as a part of another Station reorganization, research work units were combined to reduce the number from seven to five. The silviculture and mensuration units were combined with Albert Stage as Project Leader and the forest insect projects with Malcolm Furniss as Leader. Major changes affecting the Priest River Forest have come more from changes in research emphasis than change in research work unit organization.

As leader of the white pine silviculture project, Deitschman, who retired in early 1976, supervised the Priest River Forest from 1961 to 1973. He and Robert Pfister developed an effective management plan for the Forest in 1964. He aggressively pushed maintenance of the Station headquarters, development of roads, and the cutting of timber during this period.

In 1973 when Stage became leader of the combined silviculture-forest measurements project, he delegated responsibility for the Priest River Forest to Marvin W. Foiles.

The Forest provided work and in return was benefited by various work programs. Accelerated Work Program (AWP) funds were used to good advantage between 1962-1964 mainly for maintenance. In 1972 the Bureau of Indian Affairs, Office of Navajo Economic Opportunity, furnished three youth employees to work on the Forest during the summer. In 1973 a Youth Conservation Corps camp on the Priest River Forest was the first such camp in the branch of Forest Service research nationwide. It was part of a program to provide youth with practical work experience and environmental education. Twenty-four applicants were selected from 10 northern Idaho and 2 northeastern Washington counties. The camp, consisting of 12 male and 12 female members, participated in various work programs during a 7-week period, from June 18 to August 3. Schedules were planned to offer a variety in work activity, classroom studies, and recreation. YCC camps, consisting of members from northern Idaho, were conducted at Priest River again in 1974 and 1975 much the same as the 1973 camp. The Priest River Forest aided each of these programs and the work and education programs were of great benefit to the Station.

### *Research Facilities*

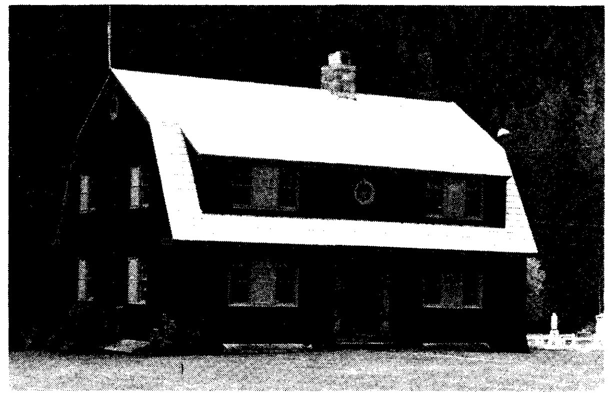
Once again, the Station was bailed out of a difficult maintenance situation at Priest River by a public works program. Because Bonner County, in which the Forest is located, was economically distressed, the Forest received $60,000 of Accelerated Public Works funds in November 1962 and $30,000 additional in January 1963. During the next two years these funds were used for various improvements to buildings, roads, and research facilities.

New water and sewage systems were major improvements. Benton Creek had furnished water for the headquarters area for 50 years. In the late 1960's water samples didn't always measure up to culinary standards and chlorination units were installed in some buildings in 1959 and 1960 to correct contamination. The work funds bought a new water system. An 8-inch well 180 feet deep was drilled near the office-laboratory and a 21,600 gallon concrete water storage reservoir was built on the hillside north of the headquarters area. These provided a pollution-free water supply adequate for fire protection.

A new sewage system, including a sewage lagoon, was also timely. The tight clay soils of the headquarters area had always provided poor drainage fields. The lagoon solved this problem, at least temporarily.

The value of roads for research access, demonstration, and utilization had been demonstrated over and over again. Construction of roads according to the 1952 plan was pushed vigorously, both by appropriated funds and as a requirement of timber sales. During the 1961-1975 period, 21 miles of road were built to harvest timber and to facilitate particular research studies.

*Buildings at Priest River Experimental Forest, 1976: A. Office-laboratory; B. Cottage 1; C. Cottage 2; D. Cottage 3; E. Cottage 4; F. Cook-house-bunkhouse; G. Shop.*



A

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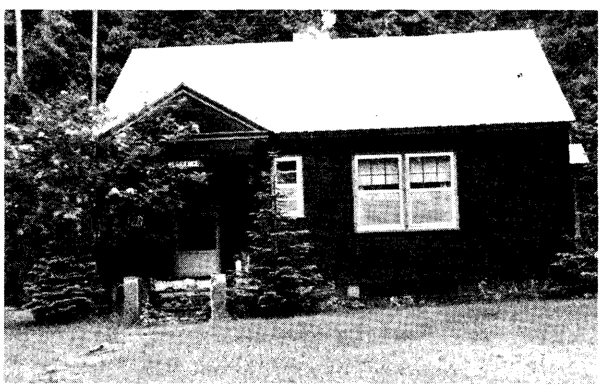

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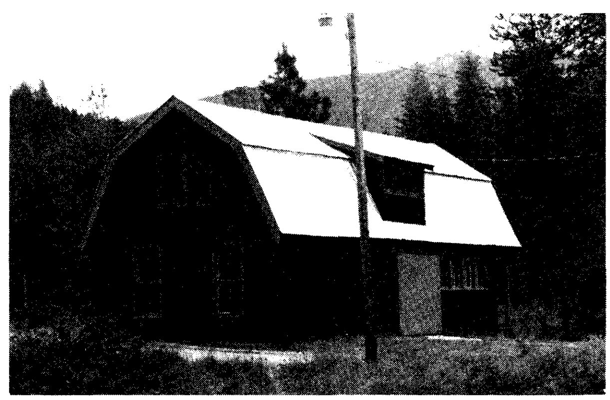

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We had long recognized the need to cut more of the Forest in regeneration cuttings in order to create stands for future research. Deitschman gave emphasis to regeneration cuttings during this period. A number of areas were clearcut to provide sites for particular studies. Other timber sales were made as tests and demonstrations of silvicultural systems. The Georgia-Pacific Corporation sale of 6/8/70 on East Ridge is a good example. It was made to test and demonstrate clearcutting, shelterwood cutting, seed tree cutting, and both individual tree and group selection cutting.

## *Investigative Program*

Diversity in use characterized the 1961-1975 period. Scientists in the research fields of fire control, timber management, watershed management, genetic improvement, forest insects, forest diseases, wildlife habitat, taxonomy of fungi, and forest ecology conducted studies on the Experimental Forest. Greatest use was for watershed management, timber management, and genetic research, in that order. Forest disease research made substantial use of the Forest with lesser use by scientists in the other fields of research. The diversity of this research emphasized the importance of land areas dedicated to research and a physical plant to support research.

### Timber Management

One of the major responsibilities of the timber management research group has been to provide suitable areas on the Experimental Forest for the research of various disciplines. This is accomplished largely through timber sales that provide cutting areas and access by road building. In 1965 Deistchman and Pfister prepared a guide for management of the experimental forest to systematize and organize forest management activities. This plan plus better information about the Forest resulting from the new soil survey in 1965, new base map of 1967, and the new habitat type map of 1968 all contributed to better management of the Forest. The result has been management activities on the Forest that provide areas for research, tests of silvicultural systems, and demonstration areas for education.

#### Silvicultural Systems

New cuttings made during this period tested a range of silvicultural systems. A large clearcutting was made at the head of Benton Creek and two additional clearcuttings were made in lower Benton Creek, one on a north slope and the other on a south slope. A small area was clearcut on the river bench near the mouth of Benton Creek. Two areas were clearcut in the Canyon Creek drainage, one in upper Canyon Creek and another near the mouth of the creek. Still another clearcutting was made in the Ida Creek drainage. All of these clearcuttings were made to provide areas for various studies. Another sale was made to enlarge the nursery area. Other cuttings were made at high elevations on East Ridge to provide comparisons between clearcutting, seed tree, shelterwood, and single tree and group selection cuttings.

In 1973, YCC crews inventoried regeneration success on some of the clearcuts. Other cutting areas were studied in 1974 in a cooperative research program between the Station and the University of Idaho of intensive timber culture.

#### Planting

Several of the clearcut areas were planted and the Weidman arboretum was maintained and observed. A European larch plantation was thinned.

#### Stand Improvement

Old studies were remeasured on schedule and new experiments were started. The Brewster, Larsen, Kempff, Weidman, and later thinning experiments were remeasured and the data used in a growth model. Cedar release thinnings, established in Canyon Creek in 1939, were given special attention in cooperation with scientists in disease research.

A new thinning and weeding experiment was established in 1967 by Deitschman in the young natural stand on the north-facing slope of the Benton Creek transect that had been cleared in 1940. This experiment was established to test thinning of four species, pure and in mixture, at two density levels. This same area was studied in 1974 by a crew of the cooperative intensive timber culture program.

Several other small areas on the Forest were thinned as a regular management measure.

Fertilization

In 1973 Deitschman established a test of fertilization in a thinned stand on lower Benton Creek. Urea was applied at a rate of 200 pounds of nitrogen per acre to three plots paired with unfertilized check plots.

Growth

Permanent growth plots on the Forest were remeasured on schedule. In addition, Stan Carpenter made specific gravity determinations on grand fir samples for Stage during the winter of 1960-1961.

Coniferous Biome Coordinating Site

Intensive studies by the University of Washington and Oregon State University had been underway in Douglas-fir forests for several years as a part of the International Biological Program. Purpose of the intensive work was to gain knowledge about functioning and productivity of coniferous forests. In order to extend the research of westside Douglas-fir forests to all coniferous forests, a number of coordinating sites were selected. The Priest River Experimental Forest was one of these, with Deitschman of the Station and Frederic Johnson of the University of Idaho responsible for coordinating site studies.

Measurements were started in 1973 at two environmental-grid stations on the Forest, one in the western hemlock/mountain-box habitat type and the other in Douglas-fir/ninebark habitat type. In 1974 additional stations were established in grand fir/mountain-box, subalpine fir/fool's huckleberry, and subalpine fir/beargrass habitat types. The five stations were continued in 1975. P. Shauer of the University of Idaho conducted these studies.

## Watershed Management Research

Harold Haupt began basic watershed management studies on the Priest River Forest in 1964. He immediately interested scientists at Washington State University and the University of Idaho in cooperative studies. Within the next 10 years a number of such studies were completed. Meanwhile calibration was started on two forks of Horse Creek on the Nezperce National Forest to obtain baseline information. This was to provide a place to make pilot tests of effects of roadbuilding and cutting on streamflow based on results from the studies at Priest River and elsewhere. By 1975 watershed research at Priest River had been reduced to a low level in order to focus effort on the pilot tests on Horse Creek.

Benton Creek Model Watershed

The streamflow records since 1938 on Benton Creek and the 1948-1952 snow studies by Helmers provided a start for intensive studies of Benton Creek to understand the hydrology of a densely forested watershed of relatively stable soils. A network of stations--climatic, snow, soil, streamflow, sediment--was established over the watershed to obtain data on factors affecting the hydrologic cycle. By 1968 this network consisted of 13 different stations (not including headquarters), with a total of 58 instruments. This network was modified from year to year to be most effective. Measurements over a period of years provided a data base for understanding the hydrology of Benton Creek and also a framework for special cooperative studies.

Snow Interception Study

The first of these special studies was with Don Satterlund of Washington State University. He investigated snow interception by trees of different coniferous species in order to determine and calculate snow interception and evaporation losses in pure and mixed stands. This study was conducted from 1965 to 1971.

Effects of Precribed Burning on Water Quality

Planned broadcast burning of several clearcuts outside of the Benton Creek Model Watershed provided an opportunity to study the effects of burning on water quality. Gordon Snyder working under George Belt, both of the University of Idaho, carried out this study from 1970 to 1974. Water was sampled above, within, and below four broadcast burned areas before and after burning and the chemical makeup of each sample was determined.

Water Quality Modeling

This cooperative study with Gordon Snyder of the University of Idaho was started in 1972 to develop mathematical models of chemical processes in undisturbed streams in the northern Rocky Mountains. Sampling sites in the Benton Creek watershed were used as well as a number of other sites in northern Idaho and western Montana to develop this model.

Transpiration and Water Loss from Forest Soils

Another cooperative study started in 1972 was with Richard Kline of Washington State University. The purpose of this study was to determine the pattern of water loss from soils in clearcut versus forested sites on both north and south aspects, and also to determine the water loss from vegetation on forested sites. Forty soil moisture access tubes were installed in the upper portion of the Benton Creek drainage.

Antitranspirant Study

A three-way cooperative study between the Station, the University of Idaho, and the Dow Corning Corporation was conducted in 1974 to determine the effectiveness and side effects of a silicone emulsion as an antitranspirant to increase water yield. A 60-acre subdrainage of Benton Creek was sprayed and streamflow compared with an unsprayed small drainage. Biological effects of the material on vegetation, water quality, small mammal populations, aquatic and terrestrial insects were monitored.

## Genetic Improvement of Trees

Many fields of forest research require a full range of research facilities including laboratory, greenhouse, lathhouse, nursery, outplanting test sites, and pilot test sites. The forest genetics research program in the Forestry Sciences Laboratory at Moscow requires each of these research facilities and has used the Priest River Forest on an increasing scale to provide nursery space and outplanting test sites. Genetic studies at Priest River include both old and new studies.

### Ponderosa Pine Racial Variation

Brewster, McDonald, and Moyer might have endured the cold with tranquility as they shoveled 12 inches of snow from each planting spot on November 18, 1911, if they could have foreseen how many times the result of their labors would be studied. This experiment was established to determine performance of ponderosa pine trees from 22 sources in the West at one site. Much has been learned from this one simple experiment. Trees of the experiment were remeasured again by Steinhoff and 50-year results reported.

### Lodgepole Pine X Jack Pine Hybrids

This test comparing growth and performance of hybrids and their parents was established by Squillace in the 1950's. Trees were remeasured by Lotan and Hatch in 1966 and results of this and other tests were published.

### White Pine Vigor-Quality

The Priest River planting of this study, to determine genetic variation in vigor and quality characteristics of blister rust resistant crosses of western white pine and possible linkages between rust resistance and vigor-quality traits, was started by Squillace and Bingham in 1955. Performance of these plantings was observed, measured, and reported by Steinhoff.

### Rust-Resistant White Pines

White pine progenies that had survived intense artificial inoculations in the nursery at Moscow were outplanted on the Lower Canyon Creek clearcut. They will be observed to determine how resistance holds up and growth characteristics of rust resistant trees.

A progeny test to determine the rate of change in resistance in natural stands of white pine was established in the Priest River nursery in 1973. Infection intensity in the test was highest ever experienced in a rust resistant progeny test, most likely because Priest River conditions for infection are very favorable.

### Genetic Variation in Western White Pine

In the early 1960's Burton Barnes began an investigation of genetic variation in western white pine by elevation and aspect. This study was continued by Steinhoff and expanded to include latitude. The study required outplanting sites to test performance of progeny from the various parent study sites when planted side by side. The Priest River Forest was selected as one outplanting area. Plantings were made in 1971 at three elevational sites: Ida Creek, Lower Benton Creek, and Upper Benton Creek clearcuts.

### Genecologic Variation in Douglas-fir

The purpose of this investigation of variation in Douglas-fir, under the leadership of Gerald Rehfeldt, is to determine what part of the variation in Douglas-fir is genetic and what part is ecologic. The program includes both geographic variation and performance of interracial hybrids. The ultimate object of the program is to provide knowledge for better management of the Douglas-fir resource.

The Priest River Forest is being used in this program for studies of variation in performance of Douglas-fir seedlings from various sources in the nursery bed, and also for outplanting sites to study variation in performance as trees grow larger. The nursery was enlarged and improved to accommodate this program. In addition, outplantings of Douglas-fir progenies were made beginning in 1972 on the lower Canyon Creek clearcut.

### Inland-Coastal Hybrids of Douglas-fir

One study was started at the Priest River nursery in 1972 to determine if the fast growth of the coastal form and the hardiness of the inland form can be combined to develop a faster growing variety of Douglas-fir for inland forest lands.

## Disease Research

Research at Priest River on forest diseases during the 1961 to 1975 period was concerned with pole blight of white pine, white pine blister rust, dwarf mistletoes, *Armillaria* root rot, the Indian paint fungus, and *Poria* rot.

### Pole Blight of White Pine

Studies of the pole blight disease were completed during this period. One, a study of the effect of moisture stress on root and top development of seedlings of white pine and associated species, was conducted in the nursery area in beds that had been built up to simulate three soils. These beds were dismantled in 1960 and the results were reported by Leaphart and Wicker in 1966.

Another study was an attempt to induce pole blight in large white pine trees by creating drought conditions. The soil of three plots was covered over to prevent infiltration of precipitation, one by a wooden covering with roofing paper and the other two by plastic coverings. These were set up in the 1950's and were dismantled in 1968. Washing out root systems and studying these large trees were major undertakings in which the Station (Leaphart), the University of Idaho (Lowenstein), and the Victoria, B.C., Forest Research Laboratory (McMinn) cooperated. Partial results of this study were published by Leaphart.

### White Pine Blister Rust

Merle Lloyd continued studies at Priest River of the effect of microclimate on infection of white pine by blister rust. These studies were discontinued in 1963 when he transferred back to the U.S. Weather Bureau.

In 1967 Wicker planted 50 whitebark pine trees and 50 western white pine trees in the nursery area to study the relationship of *Tuberculina maxima* to white pine blister rust.

As a part of a type-wide study of natural inactivation of blister rust cankers, Roger Hungerford established an inactivation plot on the Priest River Forest near the vigor-quality planting along the South Ridge road. Trees on this plot were observed for several years.

### Dwarf Mistletoes

During the spring of 1961, Ed Wicker established a field plot in the nursery area to study the host specificity and age susceptibility of several dwarf mistletoes on a number of coniferous species. The inoculated trees were observed for several years and results were published by Wicker.

During the winters of 1968-1969 and 1969-1970 Cal Carpenter prepared 4,000 dwarf mistletoe infections from trees on a study plot on the Colville National Forest for microscopic examinations, and determined infection age.

## Armillaria mellea Root Rot

Western redcedar released in thinnings made in 1939 along the Center Ridge road made tremendous growth for a few years then growth declined to almost prethinning levels. Fruiting bodies of Armillaria mellea had been observed in profusion in the thinned area. Beginning in 1961, Jerry Koenigs studied this problem and reported on his findings.

## Indian Paint Fungus

Orson Miller trapped spores and collected sporophores occurring on grand fir trees on the Experimental Forest in 1962 to obtain material for a study of Echinodontium tinctorium. He published results of this study.

## Poria weirii Rot

During the summer of 1967 Don Leaphart mapped Poria weirii centers on an 80-acre block of timber on a south-facing slope in lower Benton Creek. The mapping was preliminary to a planned study of various treatments after logging to mitigate the damage caused by the root disease. Although the mapped area was cut, the study of treatments was dropped.

## Forest Insect Research

Scientists in Forest Insect Research used the Priest River Forest to some extent during this period. In 1963 Richard Schmitz studied mountain pine beetle in second-growth stands and Malcolm Furniss spent time on the Forest in his studies of the Douglas-fir beetle. In 1967 Robert Denton started a study to determine the effects of spraying larch trees with malathion to control larch casebearer. He maintained this study and retreated the trees in 1971.

## Forest Fire Research

The Fire Behavior and Fire Physics projects of the Northern Forest Fire Laboratory conducted field studies of rate of fire spread, temperature distribution, and convective column at Priest River in 1962. Fuel beds were constructed at the site of the old slash studies and a 12x24-foot portable bunkhouse was placed nearby to house recorders for instruments used in studying the test fires.

In 1964 Bob Mutch prepared planting sites and seeded cheatgrass. In 1965 he visited the seeded plots to follow the drying rates and coloration changes of curing cheatgrass. The purpose of the study was to develop field guidelines to aid fire weather observers in interpreting cheatgrass vegetation in terms of the spread index.

Personnel of the Fire Laboratory continued analyses of data from older studies at Priest River. Brackebusch completed analysis of data and a report on the large log study. Hayes' altitude and aspect data were restudied.

The Forest was also visited from time to time by crews from the Fire Laboratory to gather fuels of various kinds for use in the Laboratory.

## Wildlife Habitat Research

Jack Lyon and Peter Stickney have established a number of plots on cuttings and burns in the northern Rockies to study succession of vegetation after cutting and burning. In 1966 they established 12 permanent transects in five different areas in lower Benton Creek before broadcast burning. The study areas were burned in 1970. They reexamined the study areas in 1972.

## Collection and Taxonomy of Fungi

The Experimental Forest was used as headquarters for intensive studies of the fungi of northern Idaho, mainly under the leadership of Dr. Alexander H. Smith of the University of Michigan. Those participating in these studies are listed in Appendix A.

## Weather and Streamflow

Records were maintained, primarily by Cal Carpenter, throughout the period at the following stations:

- Control Weather Station.

  Recorded daily at 5 p.m. throughout the year, the record is unbroken since 1912.

- Precipitation Stations at Benton Dam and Benton Spring.

  Precipitation records maintained throughout the year.

- Fire Weather Station.

  Observations according to the National Fire Danger Rating System were made daily from May 1 through October 31. This Station, established by Gisborne in 1922, is the oldest fire weather station in the world. It is no longer used, however, in the Regional network.

- Snow Survey Courses

  These courses at Benton Spring and Benton Meadow were established by Lloyd Hayes in 1937. They have been maintained since then by Station personnel in cooperation with the Soil Conservation Service. They are measured each month starting January 1 and continuing through the snow-melt season.

- Benton Streamflow Station

  Established in 1938, records of streamflow are maintained throughout the year.

## THE EXPERIMENTAL FOREST AND ITS FACILITIES

### *How the Experimental Forest Was Set Aside*

The history of land reservation for the Priest River Experimental Forest is a story in itself, and a very tangled one at that. Only a complete review of a long list of executive orders, acts, agreements, more agreements, proclamations, a Supreme Court decree, and decisions concerning small parcels of land can tell the story completely. The major problem was that at the same time the Priest River Station was being established, officials of the State of Idaho and the Department of Agriculture were reaching an agreement to convey lands in which the experimental forest was located to the State. A large area of National Forest land east of Priest River and Priest Lake was to be excluded from the National Forest as indemnity land for selection by the State in lieu of unsurveyed school grant sections 16 and 36 within the National Forest. It took 17 years to unscramble the ensuing mess!

Part of the problem was that the exact area needed for an experimental forest was not really known when the Station was established. When it was realized that virtually the whole of the Benton and Canyon Creek drainages were to be included in lands open for selection by the State, an agreement was reached to withdraw 4,270 acres from selection. Fortunately, this area was excluded in the Presidental proclamation of March 3, 1913, which listed lands open for selection. Soon it was recognized that all of the Benton and Canyon Creek drainages were needed in the Experimental Forest. Again agreement was reached between the Forest Service and the State that the needed lands would not be selected by the State. But somehow this agreement never got to the right people and most of the needed lands were selected by the State and approved by the Secretary of the Interior. Now what was to be done?

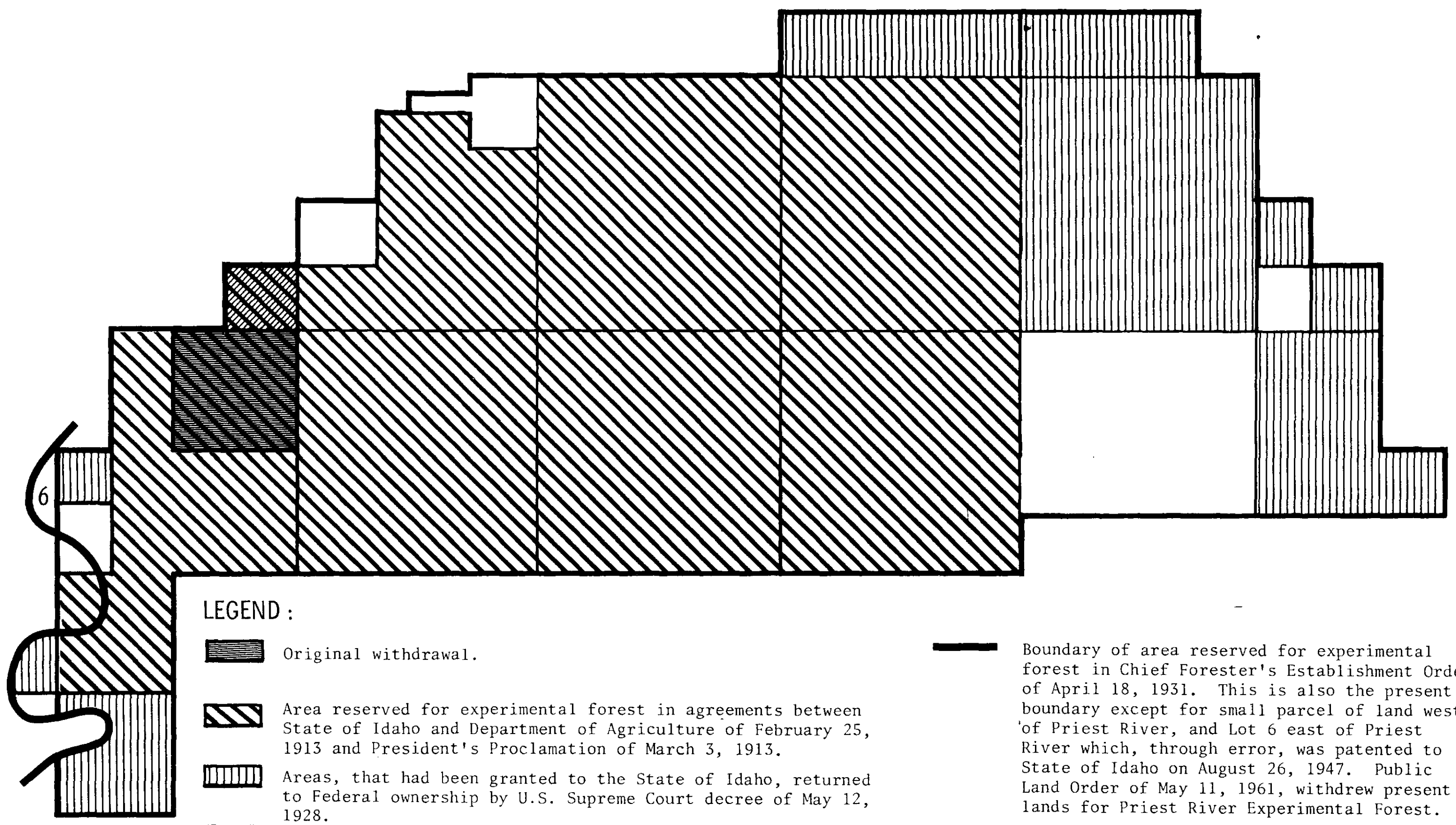
No one in the State had the authority to reconvey the selected lands within the experimental forest back to the Federal Government! It was finally decided that the United States would have to bring a friendly suit against the State to recover the lands. This was done and on February 27, 1928, the Supreme Court decreed certain lands within the Priest River Experimental Forest granted to the State should be eliminated from the selection lists and returned to United States ownership.

A few more tag ends remained before the present Experimental Forest came into being. Other parcels of land within the Forest have equally involved histories, but we will not take the space to review them here. On April 18, 1931, the Chief of the Forest Service, R. Y. Stuart, signed an Establishment Report reserving the Experimental Forest. Hence, 20 years after the Priest River Forest Experiment Station was established, the Experimental Forest became official! Small changes in the lands of that Establishment Order resulted in the present area. Public Land Order 2377 of May 11, 1961, withdrew present lands, totaling 6,368 acres for the Priest River Experimental Forest. The Order states 6,200.47 acres, but this is incorrect.

### *Place Names*

Where did names of features on the Experimental Forest come from? The following summarizes what is known:

# LAND RESERVATION FOR PRIEST RIVER EXPERIMENTAL FOREST




LEGEND:

Original withdrawal.

Area reserved for experimental forest in agreements between State of Idaho and Department of Agriculture of February 25, 1913 and President's Proclamation of March 3, 1913.

Areas, that had been granted to the State of Idaho, returned to Federal ownership by U.S. Supreme Court decree of May 12, 1928.

Not open for selection but selected in error by State and selection approved by Secretary of Interior.

Boundary of area reserved for experimental forest in Chief Forester's Establishment Order of April 18, 1931. This is also the present boundary except for small parcel of land west of Priest River, and Lot 6 east of Priest River which, through error, was patented to State of Idaho on August 26, 1947. Public Land Order of May 11, 1961, withdrew present lands for Priest River Experimental Forest.

Benton Creek: Named after Tom Benton who took up a claim in 1891 and built a cabin on Benton Flat where the Bengon Ranger Station later was built. The small meadow at the lower end of Benton Creek was a part of his claim. When the General Land Office survey was made, much of his claim was on railroad land. He moved to the Prater place at the old outlet of Big Creek and helped the Praters with the "Half-Way House."

Canyon Creek: 1908 - Map shows this as South Fork of East River. 1914 - Map also shows this as South Fork, but a fork is shown as Little South Fork. 1921 - Map (by Swartz and Ade) shows as East Fork of East River. 1926 - Annual Report refers to it as Canyon Creek. 1933 - Map still shows it as East Fork of East River. 1934 - First shown as Canyon Creek on map resulting from 1933-1934 survey by George Fisher and party.

Fox Creek: 1908 map shows this as Fox Creek. It was named for Barney Fox who had a homestead in the Fox Creek drainage.

Ida Creek: 1908 map does not show it, but it is shown on Brewster's map of 1914.

Priscilla Gulch: Named after Priscilla Brewster, the Brewster's first child.

Margaret Gulch: Named after Margaret Larsen, the Larsen's daughter.

Ernest Gulch: Named after Ernest C. Rogers who worked at Priest River as a field assistant in 1913.

The four preceding names were all mentioned in a memorandum of 1916 and are on the Swartz and Ade map of 1921.

Experimental Lookout: This point at the very southeasterly tip of the Experimental Forest was named on the 1908 map. Brewster's 1914 map shows it as "Lookout" as do succeeding maps. By 1932 it was known as "Experimental Lookout." The lookout was torn down in 1933(?) and thereafter the point was referred to as "Experimental."

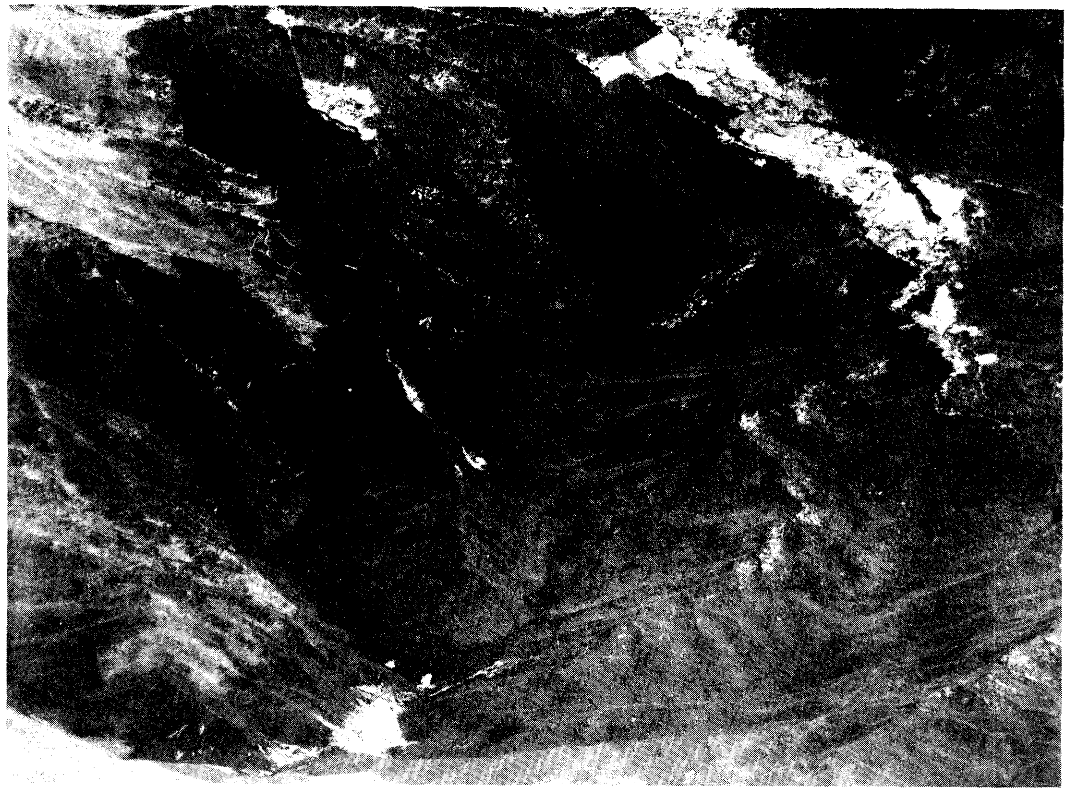
Gisborne Mountain: In the very early days it was known as "White Diamond." It is not named on the 1908 map. Brewster's map of 1914 shows it as Devil's Lookingglass, so named for the bare rock areas on the upper slopes. When the lookout tower was built at this location in the fall of 1932, it was called Lookingglass Lookout. After Gisborne died, the name was changed to Gisborne Mountain, by approval of the Board of Geographic Names, at a dedication ceremony on July 8, 1951. A plaque honoring Gisborne is mounted in a rock slightly east of the lookout tower.

Priest River Experimental Forest: 1911 - Priest River Experiment Station. 1921 - Priest River Branch Station. 1930 - Priest River Experimental Forest.

### *Surveys*

Several surveys of one kind or another have been made of the Experimental Forest as follows:

| | |
|---|---|
| 1897 | General Land Office survey. |
| 1914 | Timber survey by Joseph Kittridge and S. V. Fullaway. D. R. Brewster prepared a map. |
| 1921 | Map of enlarged forest prepared by Swartz and Ade. |
| 1925 | Soil survey of part of the Experimental Forest made by M. H. Lapham and F. C. Young of the Bureau of Soils, USDA. |



*Aerial view of Priest River Experimental Forest, 1935.*

| | |
|---|---|
| 1933-1934 | Timber survey by George Fisher, Hans Roffler, and party. New maps prepared. |
| 1965 | New soil survey made by R. C. McConnell and J. E. Eggleston of Forest Service, Region 1. |
| 1966 | Engineering Division of Region 1 took aerial photographs and prepared a new topographic map. |
| 1968 | Dr. Daubenmire of Washington State University mapped habitat types on a large part of the Experimental Forest. He also prepared a list of all vascular plants he had collected on the Experimental Forest up to that time. |

### *Physiography*

The following physiographic description is mainly from a soil survey by Lapham and Young. The Experimental Forest lies on the westward slope of a spur of the Selkirk Mountains. Elevation varies from 2,200 feet at Priest River on the west, to 5,900 feet 5-1/2 miles east at the site of the old Experimental Lookout. Mountainous land occupies approximately 90 percent of the area. This high land is cut by a number of streams flowing from east to west, leaving between them ridges which run in a general east and west direction. The ridges are further dissected by tributary gulches. Thus, though the main slopes are those facing north and south, there are also some of considerable extent having east and west exposures. The slopes range from moderately steep to very steep. There are a number of steep rocky escarpments, the chief of which lie on the middle courses of Benton Creek and Canyon Creek. Priest River cuts across the extreme southwest tip of the area, and receives the drainage of East River and the other streams draining the area. Along Priest River, Benton Creek, East River, and Canyon Creek are low, poorly drained alluvial bottoms, comparatively narrow and of small extent. A little higher are terraces or flats of stream-laid or lake-laid origin. These are somewhat eroded in places, but for the most part fairly flat. The drainage is fairly good, though in places poorly-drained depressions or swales occur.

Benton Creek and Canyon Creek drainages comprise most of the Experimental Forest with some lands draining into surrounding streams including East River, Ida Creek, Tarlac Creek, Big Creek, Fox Creek, and Priest River.

## *Soils*

A soil survey by R. C. McConnell described soils of the Experimental Forest as follows:

"Soils of the mountain slopes are underlain by rocks which grade on the coarse side into granites and imperceptibly into gneiss and schist. It appears that the major rock type is gneiss. The schist shows prominent biotite and muscovite mica, and is thinner bedded than the gneiss. Blocks of gneiss outcrop on south facing slopes because the less resistant schist beneath weathers back to a vertical joint and the gneiss drops down in blocks as talus. This, along with greater geologic erosion on south facing slopes, may explain the prominent rock outcrops in the area. Granitic rock is less resistant to weathering than gneiss and schist, and is usually associated with thick soil mantles.

"Soils of the lacustrine benches are associated with silt, clay, and sands in varves and strata, while the soils on stream terraces and bottomlands are associated with stratified sand and gravel substrata. Geologic erosion has actively attacked the edges of the lacustrine benches.

"The soils of the mountain slopes show little or no evidence of glaciation such as occurred in the main Purcell Trench and Priest River Valley. However, the effects of nivation may have effected some characteristics of the drainage at higher elevations particularly on north and west facing slopes of both Benton and Canyon Creeks. Here smooth concave slopes approaching drainageheads could be evidence of obliteration of former drainage channels which are now slowly being rejuvenated. South facing slopes show less effects of former cold environments, and geologic erosion has continued to progress, with stream channels more definitely entrenched, and bedrock areas prominently exposed by the fluvial cycle of erosion. Marked differential erosion of granite, schist, and gneiss is also most apparent on the south slopes as previously noted. This could help explain the rock fields and talus on Gisbourne Peak [Gisborne Mountain] talus and rock outcrop north of the peak on steep slopes.

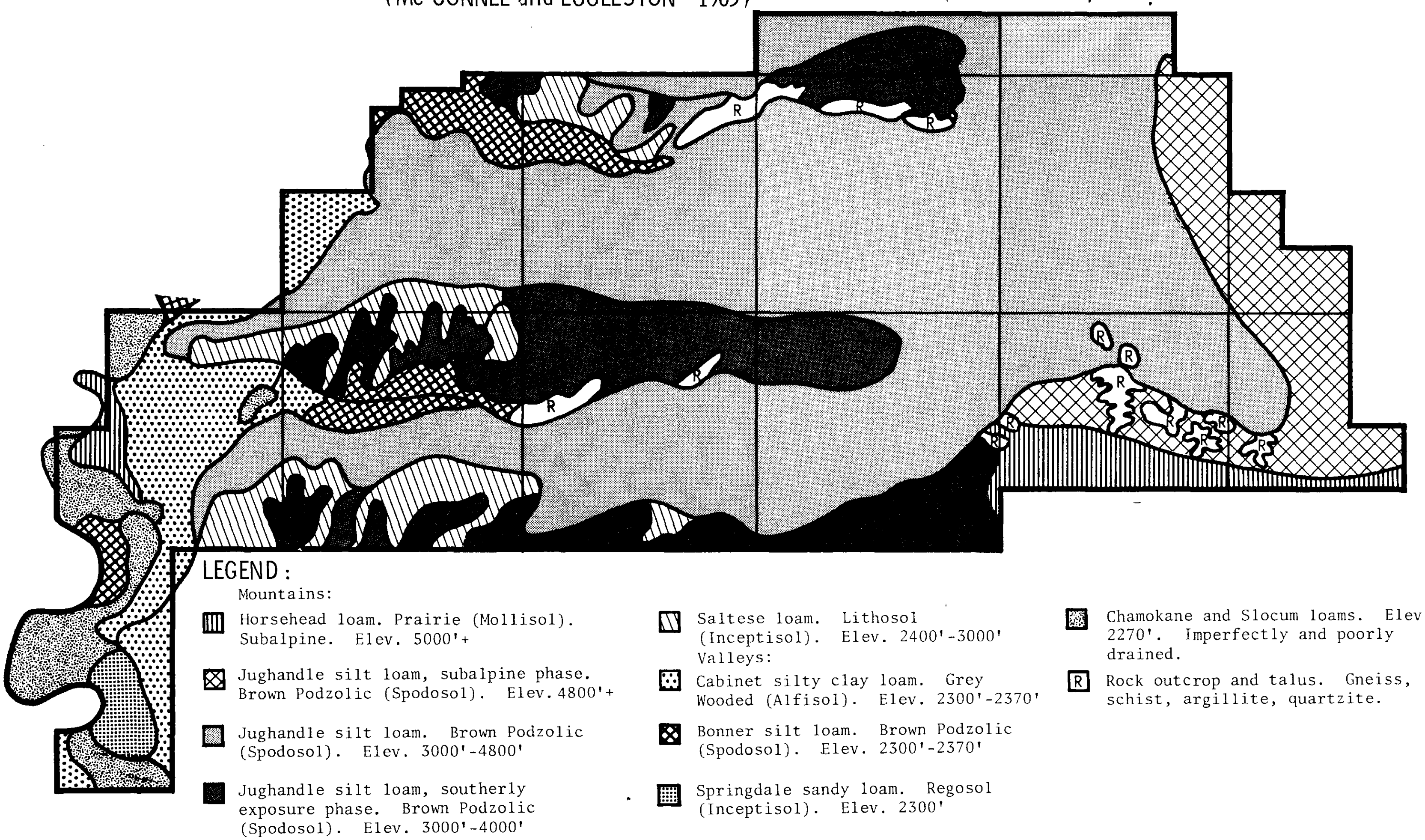
"It may be noted that soils of the southerly facing slopes contain smaller areas than northerly slopes. This can be partially attributed to less dense plant cover and increased opportunity for soil and rock exposure with greater geologic erosion, particularly on mountain slopes below about 3500 feet which had least effects of glaciation or nivation.

"It is apparent that certain soils are associated with flat or gentle slopes on elevations 2400 feet and below, and they are also closely associated with specific kinds of geologic materials found there. These are the

# SOIL TYPES

## PRIEST RIVER EXPERIMENTAL FOREST

(Mc CONNEL and EGGLESTON 1965)



warmest soils, with longest growing season, but moisture is often limiting except for soils on the bottomland position with high water tables. Soils of the mountain slopes range in steepness from 35 to 70 percent with ridgetops, local benches, and saddles on 6 to 10 percent slopes.

"Soils of elevations up to about 3500 feet on south exposures are associated with shallow Saltese soils with minor amounts of deeper Jughandle soils on concave slopes of the drainages. Above about 3500 feet the Jughandle soils and associated phases of exposure, except the subalpine phase above about 4600 feet, are mapped in the zone of maximum soil moisture and soil temperature effectiveness. Fertility is high. Above about 4600 feet the colder soils predominate though moisture is near maximum. South facing slopes near this elevation and above contain the Horsehead soils which represent a prairie-forest transition of the subalpine.

"Soils of the lower elevation on benches, terraces, and bottomlands and middle elevation slopes with their variety of habitat types and varied flora offer good wildlife forage with opening up of timber stands. South facing slopes of lower elevations together with soils on terraces, bottomlands, and benches are favorable for winter range.

"Moisture is usually limiting to high timber productivity on soils of the river terraces and lacustrine benches, and south facing slopes at lower elevations. Relatively high evaporation from prevailing southwest winds helps make south facing slopes dry. The stream terraces and fans of Benton and Canyon Creeks have favorable run-in moisture from side slopes and fertility and productivity are near maximum in the area. Soils of the middle elevations and on northerly, easterly, and westerly slopes have highest fertility productivity associated with favorable moisture-temperature relationships.

"Soils of the high elevations have less favorable soil temperature and lowest fertility.

"Adaptability of conifer species closely follows the habitat type and these are generally associated with the soils.

"Road construction involves relatively few problems in the area. Bedrock is shattered, weathered, and relatively easily moved. The road bed materials are usually high in rock fragments and sand, with favorable stability for roads. However, pockets of deeply weathered soils on some slopes particularly associated with granitic types of rock present some stability problems of slump and slide particularly on areas where moisture is high. Some areas have high amounts of mica which is associated with stability problems. The present road systems offer few problems; however, if roadbeds are widened considerably, serious problems of slide and slump can develop on substrata of highly weathered schist and granitic rock materials."

Soils of the Experimental Forest are shown on the accompanying map. The Jughandle, Cabinet, Springdale, Chamokane soils are extensively mapped in forest lands in northern Idaho. Saltese and Horsehead soils have been mapped in Montana in the St. Regis and Ninemile area.

### *Forest Cover Types*

Almost all of the Experimental Forest is forested, with the exception of south-slope "balds," rock outcrops, and recent clearcuts all of which are restocking. The interesting balds, which have been studied by Dr. Daubenmire, occur on the south-facing slope of the ridge from Gisborne Mountain eastward to old Experimental Lookout point. Rock outcrops occur on the upper slopes of Gisborne Mountain and also along Benton Creek and especially Canyon Creek whence it gets its name. Recent clearcuts are spotted over the Forest.

Many of the forest cover types of the northern Rocky Mountains are found within the Forest's boundaries. The last cruise of the Forest in 1933-1934 gave an accurate estimate of cover types. Considerable change has occurred since then by cutting, white pine pole blight, white pine blister rust, forest insects, and natural changes in species composition. Although we have no recent cruise of the Forest, following are accurate figures on principal cover types with their percentage area distribution as of 1934 and an estimate of distribution as of 1976:

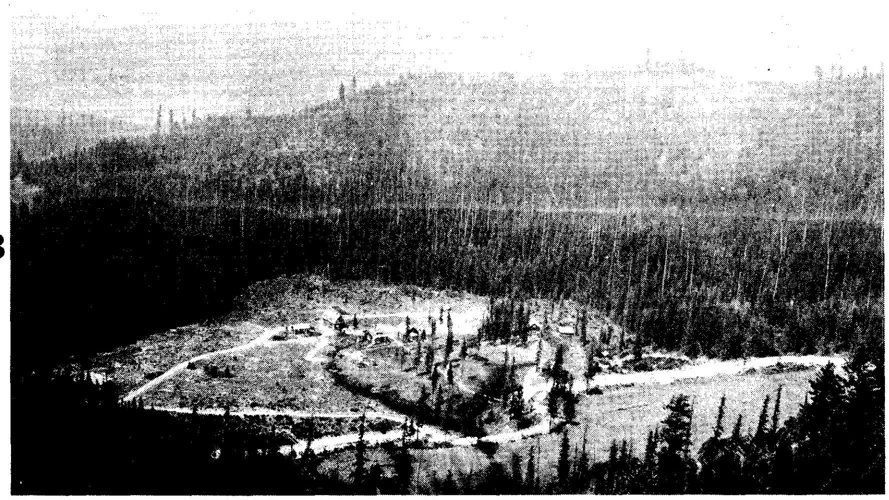
| | Percent of total area | |
|---|---|---|
| Timber Type | 1933 Survey | 1976 Estimate |
| Western white pine | 32 | 5 |
| Western larch-Douglas-fir | 19 | 35 |
| Douglas-fir | 10 | 15 |
| Ponderosa pine | 7 | 6 |
| Western hemlock-grand fir | 4 | 9 |
| Western redcedar-grand fir | 1 | 5 |
| Western redcedar | 2 | 3 |
| Lodgepole pine | 7 | 6 |
| Subalpine fir | 7 | 8 |
| Whitebark pine | T | T |
| Engelmann spruce | T | T |
| Other | 11 | 7 |
| Total | 100 | 100 |

About two-thirds of the Forest is covered with timber over 100 years old. Most of this is timber in the 100- to 120-year age class (resulting from an 1860 fire) and the remainder is timber over 200 years old. The other third of the Forest is in non-stocked areas or young timber on cutovers and burns that have occurred since the Forest was established.

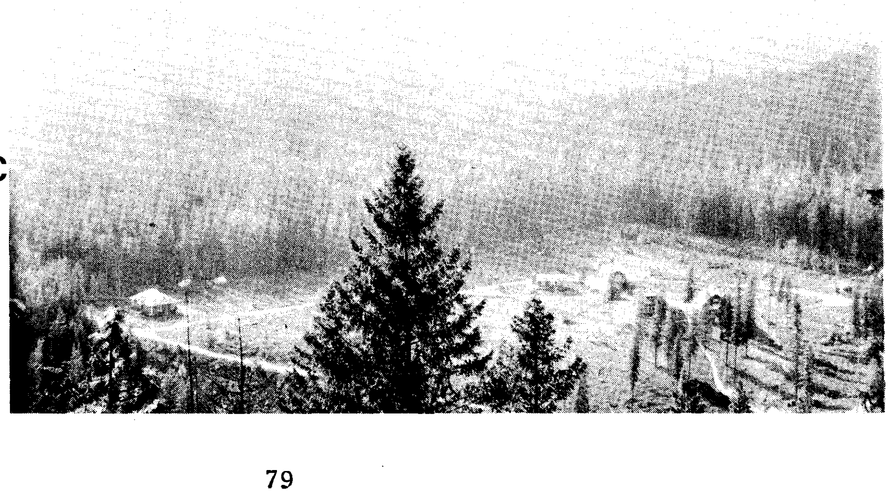
*Headquarters area from Crow's Nest hill: A. 1911; B. 1923; C. 1928; D. 1935; E. 1941; F. 1954.*

A

B

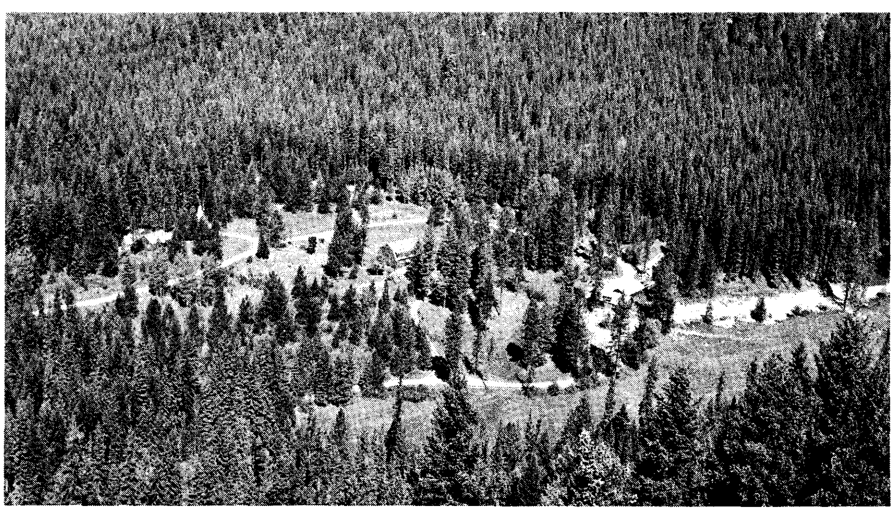


C



D

E



F

## *Habitat Types*

Dr. Daubenmire mapped vegetation habitat types on much of the Experimental Forest in 1968. His map shows the following habitat types:

Pseudotsuga-Physocarpus
Abies grandis-Pachistima
Thuja-Pachistima
Tsuga-Pachistima
Abies lasiocarpa-Pachistima
Abies lasiocarpa-Xerophyllum
Abies lasiocarpa-Menziesia
Grassland

Daubenmire's map also shows a rather large area as ecotones between habitat types.

## *Weather and Climate*

Most forestry research conducted in the field requires records of weather (atmospheric conditions at a definite time and place) and climate (average weather conditions over time at a particular place) to interpret results. Weather records at the Priest River Experimental Forest control weather station (in cooperation with the U.S. Weather Bureau) have been maintained uninterrupted since the Forest was established. Additional weather records taken for shorter periods at many locations over the Forest provide valuable information about how weather and climate vary from place to place within the Forest. The long-term records at the control station and the many additional records for shorter periods are an asset for conducting research on the Forest. Since 1916, the Control Station has been located near the headquarters building.

Climatic means for the Station are as follows:

| Precipitation (1912-1971) | Inches | Centimeters |
|---|---|---|
| Mean annual | 31.10 | 78.99 |
| Maximum annual (1955) | 41.81 | 106.20 |
| Minimum annual (1929) | 16.02 | 40.69 |
| Mean June through August | 4.24 | 10.77 |
| Maximum June through August (1948) | 9.26 | 23.52 |
| Minimum June through August (1934) | 0.87 | 2.21 |

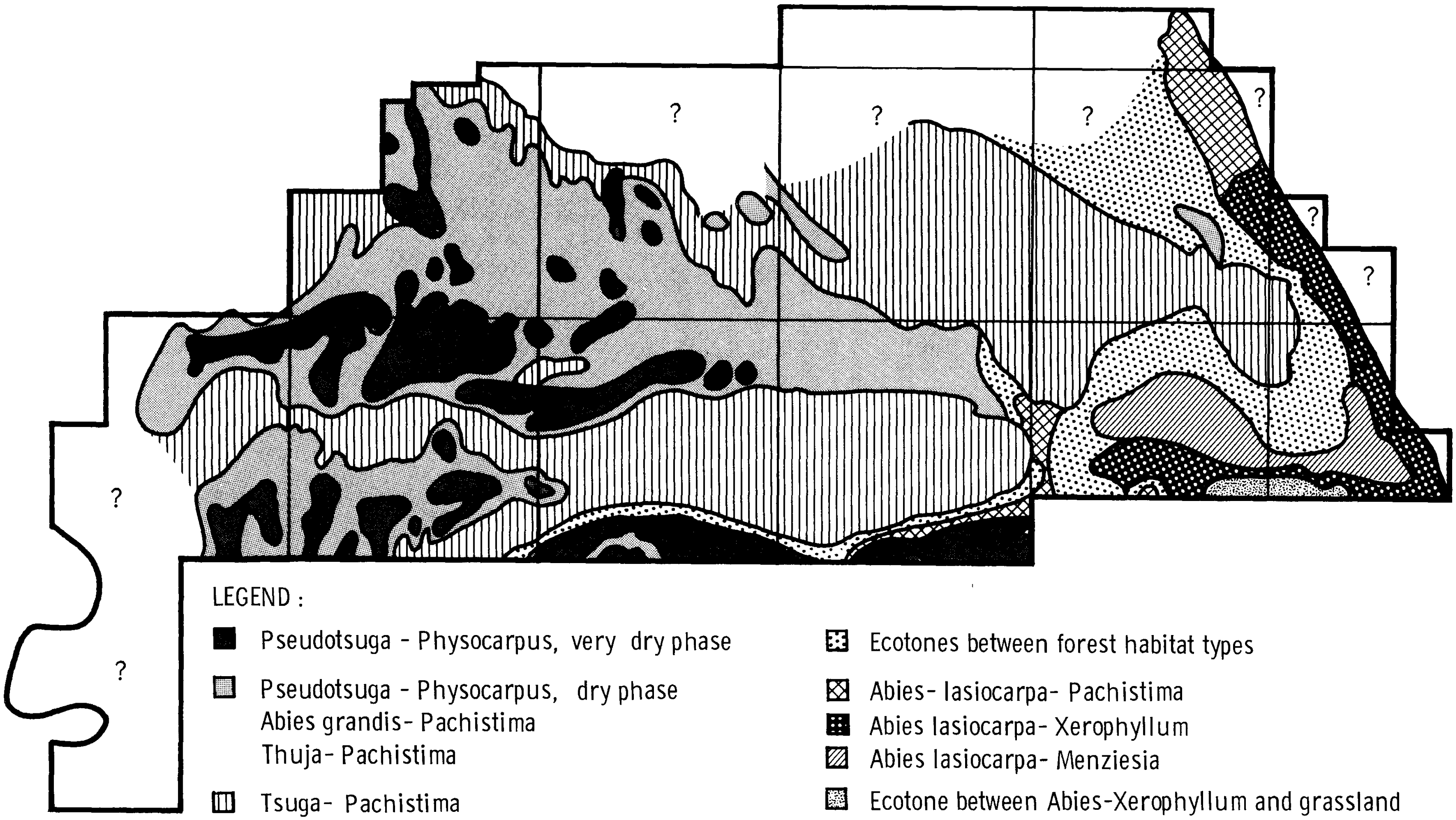
| Temperatures (1912-1971) | ° Fahrenheit | ° Celcius |
|---|---|---|
| Mean annual | 43.8 | 6.6 |
| Mean January | 23.7 | -4.6 |
| Mean July | 64.3 | 17.9 |
| Mean January minimum | 17.0 | -8.3 |
| Mean July maximum | 83.1 | 28.4 |
| Maximum (August 1961) | 103 | 39.4 |
| Minimum (December 1968) | -36 | -37.8 |

Additional data on weather and climate are presented in Appendix B, including monthly summaries of temperature and precipitation, comparisons among weather stations, and snow course measurements.

# HABITAT TYPES

# PRIEST RIVER EXPERIMENTAL FOREST

( DAUBENMIRE 1968 )



### *Streamflow*

Another valuable record is the streamflow of Benton Creek. The dam and gaging station were built by CCC enrollees in 1938 under Gisborne's direction. Always interested in forest influences, Gisborne was concerned that not one "Little Water" was being gaged or studied in the entire northern Rocky Mountains. Benton Creek became the first gaged small stream in the area. The gaging dam is equipped with two weirs. A small V-shaped weir accommodates low flows. When its capacity is reached, excess water flows over a large, broadbased weir. A water-stage recorder gives a continuous record of runoff from this 960-acre watershed. The record since 1938 has been useful in many studies.

### *Natural Areas*

Research natural areas are important research facilities. They are tracts of land and water on which natural features are preserved in as nearly an undisturbed state as possible. They serve several purposes:

- As baseline areas for comparison with those influenced by man.
- As gene pools for typical as well as rare and endangered species.
- As research and educational areas for ecological and environmental studies and training.
- For preservation of natural diversity, both the usual and the unusual.

Natural areas are especially important within experimental forests to provide undisturbed terrestrial and aquatic baseline areas for judging environmental consequences of land management practices.

Natural areas have been set aside within the Priest River Forest for these purposes. The Canyon Creek Research Natural Area was established in 1937 and has long been recognized in the national system of Federal research natural areas. It reserves an area of 982 acres in the southeast part of the Forest and surrounds Gisborne Lookout. The Lookout area itself is excluded, however, from the natural area in order to permit and accommodate activities at the Lookout and research that is conducted there from time to time. The establishment report states:

> "The tract is in an upper altitudinal zone with rugged mountainous terrain, so dissected by streams and ridges that all major exposures are represented and slopes vary from moderately steep to very steep. Water from the Natural Area flows into four streams: Canyon Creek to the north, Benton Creek to the west, Big Creek to the south, and Tarlac Creek to the east. Two of these, Canyon Creek and Benton Creek, originate within its boundaries. Elevation ranges from 4150 feet at the point where Canyon Creek flows out of the tract to 5000 feet on the ridge at the extreme southeast corner."

The Canyon Creek Natural Area contains the following habitat types:

| Habitat Type | | Area | |
|---|---|---|---|
| | | Acres | Hectares |
| Subalpine fir-mountain box | | 40 | 16.0 |
| Subalpine fir-beargrass | | 153 | 61.2 |
| Subalpine fir-fool's huckleberry | | 336 | 134.4 |
| Western hemlock-mountain box | | 380 | 152.0 |
| Green fescue | | 17 | 6.8 |
| Talus slopes | | 56 | 22.4 |
| | Total | 982 | 392.8 |

Ten coniferous trees occur in the area: Western white pine, western larch, Douglas-fir, grand fir, western hemlock, western redcedar, Engelmann spruce, subalpine fir, lodgepole pine, and whitebark pine. The whitebark pine is seriously damaged by white pine blister rust.

Two other undisturbed areas have been reserved on the Experimental Forest, one in Benton Creek, and one in Lower Canyon Creek. The one in Benton Creek is near the south end of the transect. It reserves a small drainage of hemlock-mountain box habitat type on the north-facing slope and Douglas-fir-ninebark habitat type on the southerly slope. The other reserved area in lower Canyon Creek includes some old stands of ponderosa pine, steep rocky canyon slopes, and a scenic stretch of rapids and falls of Canyon Creek. Habitat types here include Douglas-fir-ninebark, a bit of Douglas-fir-pine grass, grand fir-mountain box, hemlock-mountain box, and a very small area of western redcedar-devilsclub habitat type.

Two additional very small relatively undisturbed areas are at the western end of the Forest. One is the climax western hemlock stand near the full-timbered station. The other is the Fox Creek Knoll Area of old-growth white pine.

## EXPERIMENTAL FOREST MANAGEMENT

The Experimental Forest is a part of the Kaniksu National Forest that has been set aside for research purposes. Use of the Forest and maintenance of the headquarters facilities are the responsibilities of the Director, Intermountain Forest and Range Experiment Station, who has delegated these responsibilities to Station people closer to the Experimental Forest. Yet, because the Forest is a part of the Kaniksu National Forest, the Supervisor of the Kaniksu Forest also has certain responsibilities to the Experimental Forest. He has delegated these to the Ranger of the local District. The Kaniksu National Forest provides fire protection, builds and maintains roads, administers timber sales, supervises various kinds of forest management work, and generally assists in many ways. Obviously, successful management of the Experimental Forest depends on close working relations between Station and Kaniksu Forest personnel. The responsibilities of the Station and the Kaniksu Forest are contained in a memorandum of understanding.

Management of the Experimental Forest over the years is a tribute to the willingness of both Kaniksu Forest and Station people to work together. However, Kaniksu Forest people deserve special praise for their patience and tolerance in working with often impractical and impatient scientists, who generally are not the easiest people to work with at times! Adequate credit cannot be given to the many administrative people who have provided a multitude of services over the years. Certainly Kaniksu Forest Supervisors and Rangers (see Appendix A) should be recognized, but they are but a fraction of a much larger number of Kaniksu and Regional Office people who deserve much credit.

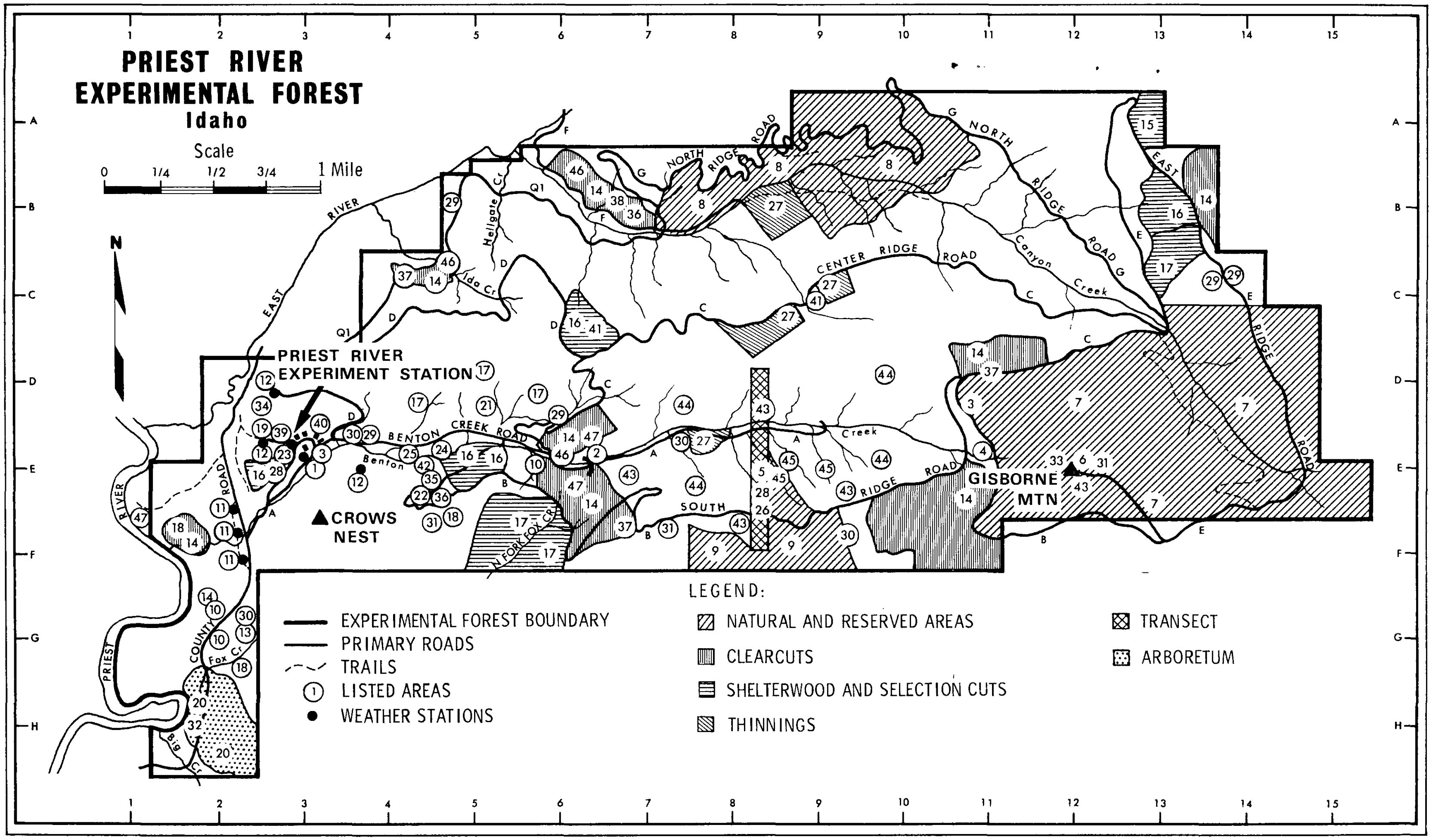
### *Management Plan*

Already mentioned in the accounts of the 1912-1920 and 1921-1930 periods was the drive to make the Forest a model of intensive forest management and how that objective went down to defeat because of inadequate funding, lack of access, and especially lack of markets for trees of low value species and small diameters. Yet the Forest was used over the years as a site for intensive experiments and studies of many kinds, and for demonstration and educational purposes. Trails and roads were built to provide access for fire protection and use of the Forest.

With passage of time, most of the forested area grew into mature timber and the Forest did not contain the range of age classes and conditions needed for research. After World War II markets developed for all species. Timber sale activities on the Forest were stepped up in an attempt to put stands under management, build roads to provide access, and create new age classes and conditions for future research.

An important principle in experimental forest management had emerged: the need to manage the Forest as a forest property, often times apart from research activities, in order to maintain the Forest as a dynamic research asset.

Management activities were systematized in 1965 by Pfister and Deitschman in a management plan for the Forest. It brought together existing information about the Forest, summarized Forest Service policies regarding experimental forests, stated existing objectives, and established guidelines for management of the Forest. The objectives and elaboration of those objectives into management guidelines are given in condensed form in Appendix D.



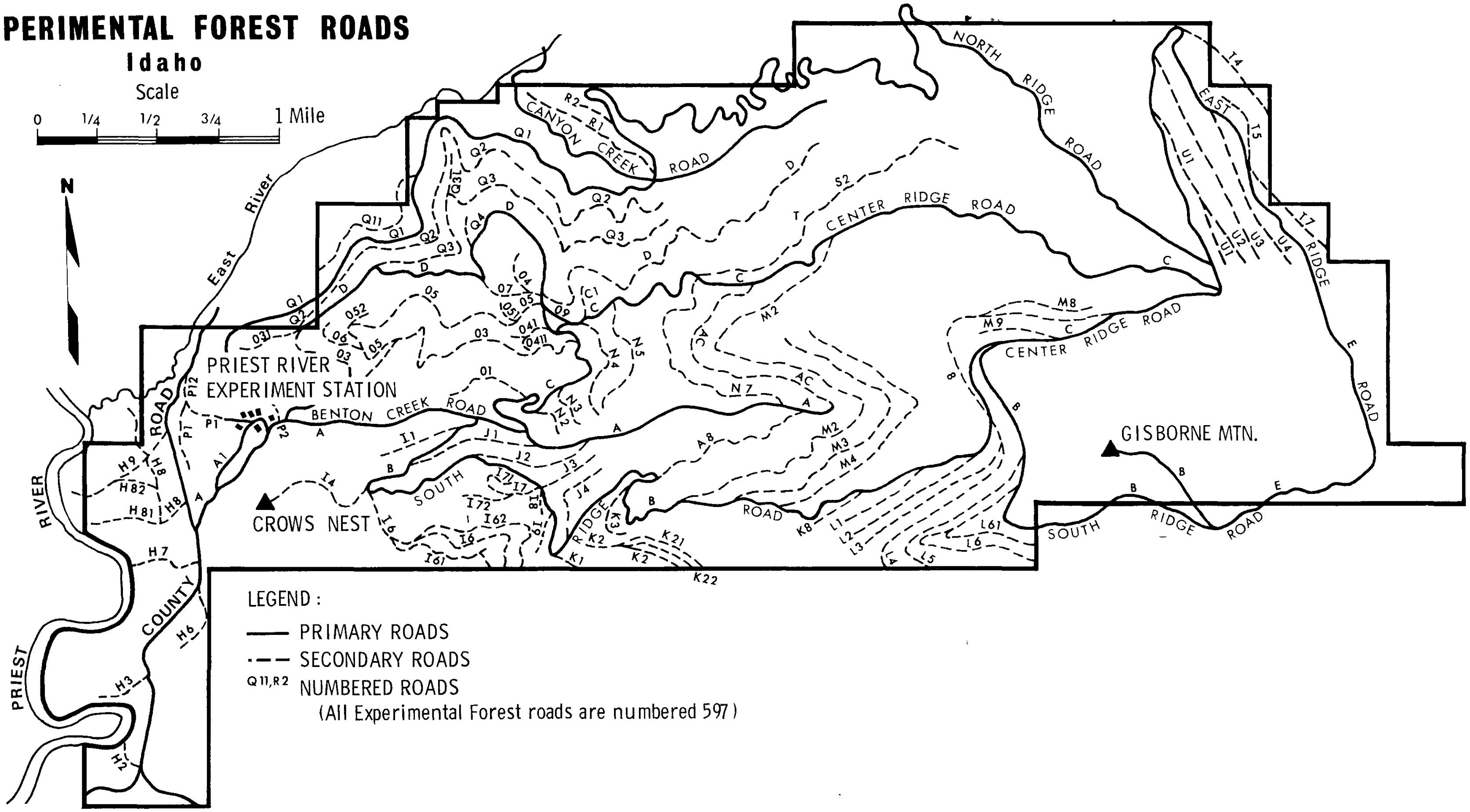

*Areas of special interest on the Priest River Experimental Forest.*

## INDEX TO NUMBERED AREAS ON MAP

| Area Number | Map Location | Subject |
|---|---|---|
| 1 | E3 | Control weather station |
| 2 | E6 | Benton Creek streamflow gaging station |
| 3 | E3, DF11 | Cooperative snow courses |
| 4 | E11 | Benton spring measurement station |
| 5 | DF8-9 | Cleared transect |
| 6 | E12 | Gisborne plaque |
| 7 | CF11-15 | Canyon Creek research natural area |
| 8 | AB7-11 | Canyon Bluffs reserved area |
| 9 | F8-10 | Benton Creek reserved area |
| | **SILVICULTURAL STUDIES** | |
| 10 | G2, E6 | Natural regeneration |
| 11 | EF2 | Haig seedling survival |
| 12 | DE2-3 | Larsen site factors |
| 13 | G2 | Knoll seed group |
| 14 | FG2, B6-7, C4, E6, E11, D11, B14 | Clear cuttings |
| 15 | A13 | Seed tree cuttings |
| 16 | E5, C6, B13, E2 | Shelterwood cuttings |
| 17 | C13 | Selection cuttings |
| 18 | G2, F2, F5 | Plantations |
| 19 | D3 | Tests of planting stock |
| 20 | H2 | Weidman arboretum |
| 21 | D5 | Pruning |
| 22 | E4 | Fertilization |
| 23 | E3 | Brewster thinning test |
| 24 | E5 | Larsen thinning test |
| 25 | E4 | Kempff thinning test |
| 26 | EF8 | Transect thinnings |
| 27 | BE9, B9, CD9, E8 | Other thinning tests |
| 28 | E8, E3 | Intensive timber culture plots |
| 29 | E4, B5, D6, C14 | Coniferous Biome environmental grid stations |
| 30 | E7, E3, F10, G2 | Growth and yield plots |

| Area Number | Map Location | Subject |
|---|---|---|
| | **FOREST FIRE STUDIES** | |
| 23 | E3 | Forest weather tower |
| 11 | F2 | Flammability stations |
| 31 | F4-5, F7, E12 | Altitude and aspect stations |
| 32 | H2 | Outdoor slash laboratory |
| 33 | E12 | Gisborne Mountain Lookout |
| | **GENETICS STUDIES** | |
| 34 | D2 | Racial variation in ponderosa pine |
| 35 | E5 | Lodgepole pine hybrids |
| 36 | E5, B7 | Blister rust resistant white pines |
| 37 | C4, F7, D11 | Genetic variation in white pine |
| 38 | B7 | Genetic variation in Douglas-fir |
| 39 | E3 | Nursery |
| | **FOREST DISEASE STUDIES** | |
| 40 | E3 | Pole blight |
| 39 | E3 | Dwarfmistletoes |
| 41 | C6, C9 | Root rots |
| | **FOREST INSECTS STUDIES** | |
| 42 | E4 | Larch casebearer |
| | **WATERSHED MANAGEMENT STUDIES** | |
| 43 | DF6-12 | Snow studies |
| 33 | E12 | Precipitation gages |
| 44 | D10, E10, D7, E8 | Benton Creek watershed |
| 45 | E9-10 | Benton Creek subwatersheds |
| 46 | B6, E6, C5 | Water quality |
| | **WILDLIFE HABITAT STUDIES** | |
| 47 | E1, E6 | Development of vegetation after burning |
| 28 | E3, E8 | Intensive timber culture plots |

## PRIEST RIVER
## EXPERIMENTAL FOREST ROADS
**Idaho**



## *Timber Sales*

The management guidelines give direction to timber sale activities. A five-year timber sale plan is maintained and revised annually in conference with the District Ranger. All timber sales since the Forest was established are shown in Appendix E. Figures are approximate: some early sales were partly on what is now the Experimental Forest and partly on land that is not within the Forest. Also records for some sales may have been overlooked. Nearly half of the total volume has been sold since 1960. Timber sale totals, not including dead and down timber, are as follows:

| | |
|---|---|
| Sawlogs (MBF) | 22,482 |
| Posts | 4,611 |
| Poles (lineal feet) | 635,891 |
| Pilings (lineal feet) | 3,940 |

## *Roads*

Developing access into all parts of the Experimental Forest was an important goal from the time the Forest was established. Access was needed to control forest fires, to permit use of the Forest for research, to harvest timber, and to show results of research. A trail system was built in the early years but roads were more expensive; during the first 22 years the only road built was a 3-mile stretch up Benton Creek.

The Civilian Conservation Corps provided the manpower and funds to build roads. Main climbing roads, primarily for fire protection and access for research, were soon under construction.

The first comprehensive road plan for the Forest was prepared in 1935 by I. V. Anderson. Anderson planned a system of fire protection roads, and utilization roads for truck logging. The latter were especially significant because logging trucks were rapidly replacing log chutes, flumes, river driving, and railroads at this time.

The new logging system, a combination of an Idaho jammer for skidding by cable and a truck for hauling, evolved rapidly for logging on the steep topography of northern Idaho and western Montana. The Idaho jammer was a ground skidding system; it required closely spaced roads along which the jammer progressed, decking logs below the road. The jammer often doubled as a loader. Roads were the key ingredient of this system.

We gained experience with this logging system before and after World War II, especially on the Deception Creek Experimental Forest. There we learned how intensive road systems for permanent access should be built to fit the land.

In 1952 Austin Helmers and the author replanned a permanent road system for the Priest River Forest. The plan utilized the climbing roads, mostly already built, as main haul roads. Taking off from these main roads were slightly undulating contour roads spaced from 400 to 500 feet apart. The major change from Anderson's plan was a greater emphasis on contour roads.

Our specifications for the contour roads attempted to keep them simple. They were to be narrow, the roadbed not over 12 feet in width, and fitted to the contours of the land and without excessive cuts and fills. Water drainage received special attention by a slight outslope of the road surface, by slightly undulating the grade, and by adequate metal culverts across drainage channels. At a time when logging roads tended to be built to accommodate logging equipment, not the land, our specifications were not always well received. Sometimes the resulting roads were exactly what we wanted; sometimes they were overbuilt. Gradually a road system was built on the Forest following Anderson's and the 1952 plans, partly by means of appropriated funds and partly as a condition of timber sale contracts. Of 140 miles of road planned for the Forest, 76 miles had been constructed by 1975. Only key roads of the system are maintained for current use. The others are reopened and maintained when an activity requires access.

The record of road construction by periods is as follows:

| Period | Miles constructed |
|---|---|
| 1911-1920 | 0.5 |
| 1921-1930 | 3.1 |
| 1931-1944 | 21.3 |
| 1944-1960 | 29.8 |
| 1961-1975 | 21.0 |
| Total | 75.7 |

In recent years forest roads across clearcuttings have become the symbol of indifference to environmental quality. Effects of roads in causing intolerable soil movement into streams and in destroying esthetic values have received widespread attention. Much research, in which a unit in Missoula of Intermountain Station is participating, is now directed toward logging systems that require a minimum of roads. All logging systems require roads; even helicopter logging generally requires roads within a mile of timber to be logged. The hard questions have to do with the intensity of roads and how they are built. The dilemma is that intensive timber culture requires frequent light-volume cutting, yet "roadless" systems depend on expensive equipment that requires a sizable harvest volume per acre to justify its use. There are no easy answers. Mountain forestry is a different ball game than flat-land forestry.

Little erosion has resulted from the roads on the Priest River Forest for two reasons: the soils are very stable, and the roads have been carefully planned and built as part of a network. Over much of the Forest they have little effect on esthetic values because they are not visible. Where they are exposed by recent clearcutting, they are in full view. Yet even where exposed, roads built well in advance of logging that have had time to heal with vegetation on cut and fill slopes are much less apparent than roads built at the time of logging. In addition, the most recent clearcuts on the Forest have been planned and executed in a way to minimize their impact on esthetic values.

### *Damaging Factors*

Fire, insects, diseases, animals, and climatic factors have seriously affected forests on the Experimental Forest. Protection from damaging agents is a continuing part of forest management. Usually it is not so much a matter of protection, per se, but rather of management to mitigate damaging effects. Protection activities on the Forest are largely the responsibility of the Kaniksu Forest.

#### Fire

Only one fire burned a substantial acreage in the Experimental Forest since it was established in 1911. The Highlanding Fire of August 1-4, 1911, burned 400 acres within the Forest. The fire started in the southwest corner of the Experimental Forest from a campfire abandoned by picnickers. It spread to an area of piled slash, and from there sparks from burning snags blew across the county road. The fire roared over a cut-over area into the standing timber on Fox Creek and burned over the ridge into the Benton Creek drainage.

Although many other fires have started, they have been detected early and controlled rapidly. The main reason for the excellent fire control record is the effective protection provided by the Kaniksu Forest organization.

The Freeman Lake Fire of 1931 seriously threatened the Forest. This fire, which started not far from Newport, Washington, swept over the ridge from the Pend Oreille River valley and in one day burned completely across the lower Priest River valley, destroying many ranch buildings in its path. Fortunately, for the Forest, winds carried it toward Big Creek south of the Experimental Forest.

## Diseases

Forest diseases have taken a tremendous toll of trees on the Forest. White pine blister rust, first discovered in Idaho in 1927 on *Ribes inermis* a few miles south of the Experimental Forest, gradually infected white pine on the Forest until by the 1950's damage was serious. Despite repeated attempts to control the disease on the Forest by eradicating *Ribes* bushes, the alternate host of the disease, mortality of both western white pine and whitebark pine has been very great, and continues at the present time.

Another disease of western white pine, pole blight, has been almost as damaging as white pine blister rust. First discovered on the Forest in 1937, it damaged and killed pole-size white pine in the stands that had resulted from the 1860 fire. Large areas in Benton, Canyon, and Ida Creeks were affected. Much of the damaged timber was sold and logged in salvage sales. A cooperative research program, mentioned in the accounts of the 1931-1944 and 1945-1960 periods, chalked up the disease as a result of the unprecedented drought during the 1917-1940 period. Effects of the disease diminished by 1960 and, except for dead white pines, there is little sign of the disease today.

Dwarf mistletoes, especially on western larch and Douglas-fir, are everywhere on the Forest. The damage from the disease is great, and the disease must constantly be taken into account in all management practices.

Root rots, especially *Poria weirii* and *Armillaria mellea*, have also been active in certain situations on the Forest.

Other tree diseases, especially the needle blights, sporadically show on the Forest.

## Insects

Tree-damaging insects have not slighted the Forest, either. Several insects, including the Douglas-fir beetle, the mountain pine beetle, the Engelmann spruce beetle, and larch casebearer, have been prime offenders. Each has caused great losses. Possibly larch casebearer, an introduced insect, has and is causing the most serious losses, mainly by defoliating larch trees and thus reducing their growth rates.

## Climatic Factors

Climatic factors not only affect trees directly, but have an indirect influence on the effects of fire, insects, and diseases. For example, windthrow in the winter of 1949-1950 resulted in a buildup of Engelmann spruce beetle in windthrown trees and subsequent damage to standing spruce in stands at the heads of Canyon and Benton Creeks. A few of the more obvious climatic events at Priest River include the following:

- *Sharp drops in temperature* in December 1924, October 1935, and November 1955 resulted in much foliage kill and growth loss. A few trees of indigenous species were killed and many trees of certain nonindigenous species. This phenomenon is the result of the passage of a sharp cold front followed by cold continental air. Severe damage results when vegetation has not "hardened off" in the fall.

- *Generally severe drought* during the period 1917 to 1940.

- Winter drought in the winter of 1952-1953. This was caused by a very dry fall. When precipitation came, weather was cold so a snowpack developed over very dry soil. By spring many small trees, especially on gravelly flat land, were straw colored and died. Larger trees that had root systems to greater depths survived. Especially affected were small trees of grand fir, white pine, Douglas-fir, hemlock, and western redcedar.

- Winter physiological drought has occurred from time to time; it was unusually severe in the early 1950's. This kind of damage occurs during very cold weather in winter when stems of trees are frozen. Physiological activity starts on bright, clear days when sunshine is reflected from the snow surface and thaws foliage of trees. Damage to trees occurs in a layer from the snow surface to about 10 or 15 feet. Trees frequently are killed back to the snow surface. An example of severe damage occurred in the Weidman arboretum. Here a plantation of native ponderosa pine and one of California Jeffrey pine were growing side by side about 8 feet in height. Winter physiological drought browned foliage to some extent on the ponderosa pine but killed the Jeffrey pine back to snow level.

- Summer drought damage occurs occasionally on the Forest, especially on gravelly soils on flats. Drought conditions were so severe during the summer of 1961 that white pine plantations on well drained soils were badly damaged.

## Animals

Pocket gophers, porcupines, deer, livestock, and occasionally bears have at times damaged trees on the Forest. Weidman had great difficulty establishing the arboretum because of pocket gopher damage. Livestock also grazed the arboretum area at times and trampled the young trees. Porcupines occasionally peel trees throughout the Forest, but damage has never been severe. During winters of heavy snow deer at times yard up in forests at lower levels and severely browse understory western redcedar. Occasional stripping of bark from trees by bear occurs. Although locally severe at times, it is not a serious problem.

## THE NUMBSKULL CLUB

In the summer of 1932, Morris Huberman had driven the crew car up Benton Creek to the end of the road to recover some tree seed that had been placed in the duff near there to determine how long the seed would remain viable. In turning around he worked the car crosswise of the road with the rear against the cut bank and the front wheels at the very edge of the steep fill slope. Not an inch was left in which to maneuver. On the three-mile walk back to headquarters for help he found an old bleached skull to which he tied a string and hung the skull from his neck as he explained his predicament to Superintendent J. B. Thompson. So was born the Numbskull Club of America, Parent Chapter No. 0.0001!

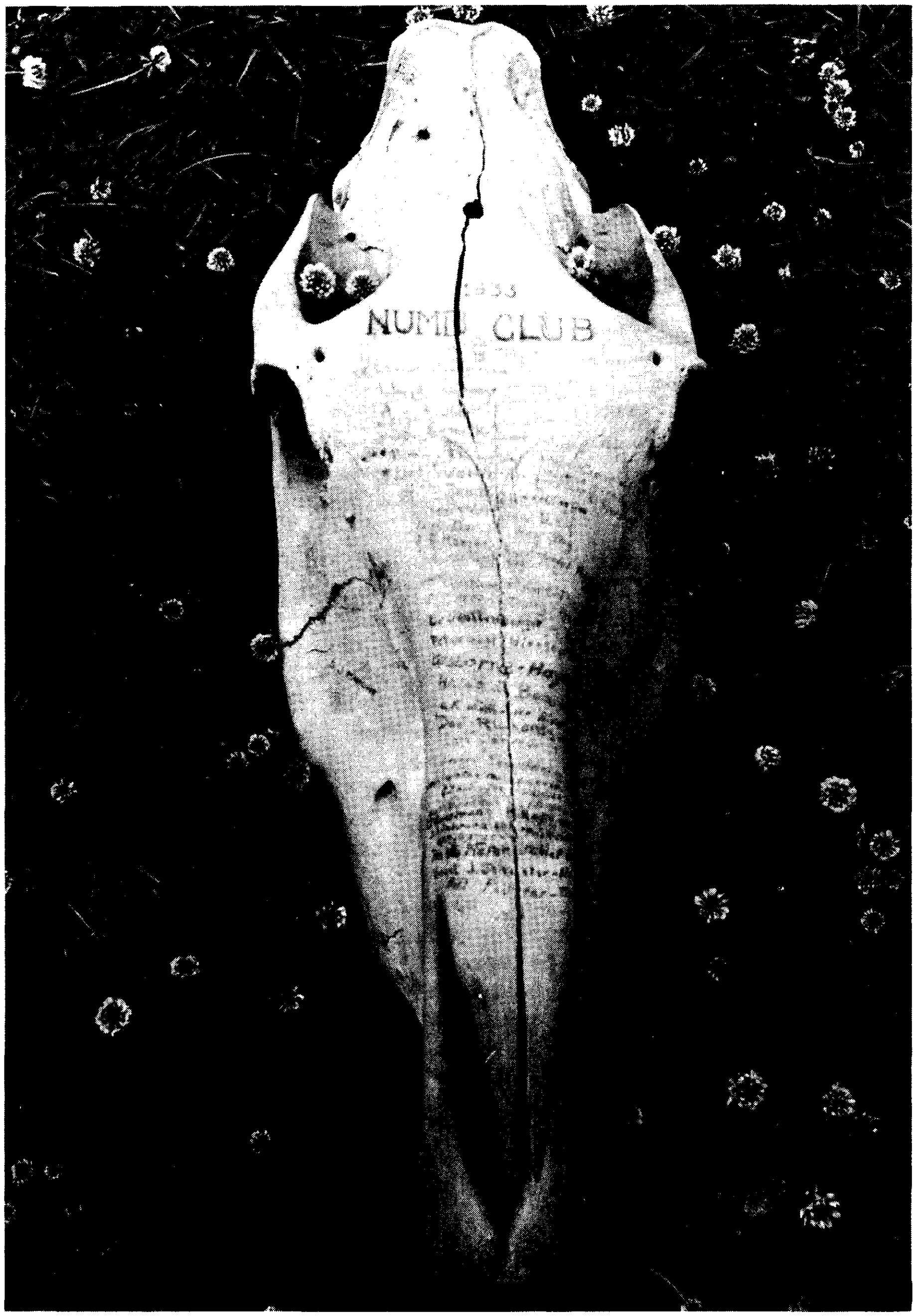
Soon exploits that ordinarily were deeply hidden or denied were offered (usually by "friends") as proof of eligibility for membership in the Numbskull Club. A horse's skull was needed to accommodate names of the growing membership. Although standards for eligibility were raised, there never was a dearth of eligible people.

There was the Station Director who, after promising to take a Station researcher from Priest River back to Missoula, drove away leaving the researcher stranded at Priest River. The Director barely squeaked through to membership on that exploit.

Another candidate for membership complained bitterly about how hard it was to row the boat across Chase Lake. His fishing friend remained silent until the full width of the lake had been traversed than asked why he rowed with the anchor out!

Still another potential member really outdid himself in seeking membership. It was in the mid-1930's when the Army was ridding itself of World War I gear and equipping for a new war. It issued long lists of property that could be had by other Federal agencies for the mere payment of shipping charges. To dollar-poor Forest Service researchers, these lists were like free candy to a child. Our hero elatedly spotted and checked a paper cutter on a list from an Army base in New Jersey. Weeks later he received a frantic call from the Station's administrative assistant in Missoula informing him that she was trying to stop the railroad flat car loaded only with a multi-ton power paper cutter in Missoula in order to save on the freight bill. But the car rattled on to Spokane, and the paper cutter, a monstrous piece of equipment, was unloaded at the Forest Service warehouse. The researcher's name was carefully inscribed on the whitened skull of a horse. A charter, beautiful in detail, for a new Numbskull chapter was prepared, rolled, and placed in the skull which was tenderly wound with several rolls of toilet tissue, boxed, and mailed collect from Priest River to the new Numbskuller at the Deception Creek Experimental Forest near Coeur d'Alene, Idaho.

After 44 years, the Numbskull Club still flourishes, never seeming to want for candidates!




*Numbskull!*

## REFLECTIONS

The Priest River Experimental Forest was the northern birthplace of the present Intermountain Forest and Range Experiment Station of the USDA Forest Service. The Experimental Forest has been and continues to be a valuable facility for forest research in the northern Rocky Mountains. A review of events at the Priest River Forest during the last 65 years may contain something of value for the future. Following are some reflections that came to mind as this chronicle was being written.

### *The Role of an Experimental Forest*

Forest research today requires access to several kinds of support facilities: office-library-laboratory complexes; experimental forests, ranges, or watersheds; pilot test sites; and the forest where results are to be applied. Usually all of these facilities are needed; to only a limited extent can facilities substitute one for another.

Some forestry problems require only the facilities provided by the office-laboratory complex for solution. Other problems may be partly solved in the laboratory complex and partly solved or results verified on experimental forests. Results may need further field testing or pilot testing under controlled conditions before they are ready for application. Research on some problems does not require laboratories at all; actual forest conditions may provide a better experimental setting. Research on still other problems can best be conducted by sampling the range of conditions of the forest where results are to be applied.

In the early days of Forest Service research probably too great a reliance was placed on field research. With emphasis on laboratory complexes 10 to 20 years ago the pendulum may have swung too far in support of laboratories at the expense of field facilities provided by experimental forests, ranges, and watersheds. The lesson from the use of the Priest River Forest is that the full range of support facilities are needed to carry out a viable program in forest research.

Experience on the Priest River Forest in recent years has pointed up another important development. The Priest River Forest is not a facility just for Forest Service research, but is used by other research agencies for cooperative and independent research. The Forest has become a valuable public research asset, not limited to use by the Forest Service.

This value goes much beyond a facility composed of buildings and a forest dedicated to the conduct of research. Of greater value is the knowledge that has accumulated about this particular forest area. The records of climate, streamflow, plants, fungi, insects, diseases, growth of individual trees--these provide a living, dynamic kind of knowledge that is invaluable for new research efforts.

What is the role of an experimental forest? Based on the record at Priest River an experimental forest serves several roles:

<u>It is a place to conduct fundamental studies</u>. Some examples from the Priest River record are: Brewster's study of racial variation in ponderosa pine, Gisborne's studies to determine important factors affecting fire danger, Haig's studies of factors controlling seedling survival, and Leaphart's studies of effects of induced drought on small trees.

<u>It is a place to test and extend results developed in the laboratory, greenhouse, and nursery</u>. Some Priest River examples: Squillace's and Bingham's tests of vigor-quality performance of rust-resistant white pines, Steinhoff's studies of genecological variation in western white pine, and Hoff's studies of genetic resistance in western white pine to blister rust.

<u>It is a place to test silvicultural systems and methods of management</u>. Brewster's thinning tests and Deitschman's experiments of silvicultural systems are examples.

<u>It is a place for interdisciplinary research</u>. Most of the recent tests of silvicultural systems combine considerations and recommendations of several disciplines.

<u>It is a place to accumulate knowledge about a specific tract of forest land</u>. Records of weather, streamflow, insects, diseases, growth of trees, species performance in an arboretum, environmental grid stations, vegetation, fungi, etc., etc., add up to an invaluable knowledge base for research and management of similar forest lands.

<u>It is a place to demonstrate results of research</u>. The long list of individuals and groups that visit the Priest River Forest and the meetings and conferences that are held there attest to its educational values.

<u>It is a place to train future researchers</u>. The list of people who started their careers at Priest River and attained eminence as scientists is evidence of the value of the Forest as a training center.

### *Increasing Need for Experimental Areas*

Time was when a researcher had little trouble establishing experiments or long-time study plots just about where he wished. Those days are gone. Research use today is in competition with other uses, and with increasing frequency proposals for research use lose out.

It is critically important, therefore, that land areas for research use become a part of any regional land use plan. Only a few experimental areas with headquarters facilities, such as those at Priest River, are needed. A greater number of land areas that can be used for investigations and controlled experiments of land use are needed scattered over the range of major ecosystems of any region. Where research natural areas, to serve as undisturbed baseline areas, can be paired with experimental areas, that should be done. The research value of experimental areas, such as the Priest River Forest, continues to increase as the competition for land sharpens.

### *The Cost of Experimental Areas*

The cost of supporting experimental areas, such as the Priest River Forest, has been only partially accepted by the Forest Service. Headquarters facilities on the Experimental Forest have been built and maintained to a great extent by emergency relief funds. I doubt if Priest River would have substantial headquarters facilities today if they had been wholly dependent on regular funds. In the competition for research dollars in the Forest Service during the last 20 years, field facilities, such as Priest River, have come out second best to office-laboratory complexes. Perhaps this is as it should be, but it would seem that balanced support should be given to the full range of facilities needed for research.

A serious problem of experimental areas, exemplified by the Priest River Forest, is uneven use. During some periods the studies of many scientists take them to the Forest and heavy use is the result. During other periods their studies may take them elsewhere and use of the Forest may be light. In these periods of light use the long-time need for the Forest is questioned as well as the funds needed for its operation and maintenance. It appears to be a dead horse. Use at Priest River has tended to stabilize at a fairly high level in recent years because use has diversified among scientists of more disciplines from both the Forest Service and other research institutions. But ups and downs in use are certain to occur and should be expected. The increasing value of the Forest for research over time is the important consideration.

### *About Success in Research--*

The record of research at Priest River illustrates that tenure of researchers and structure and focus of research programs contribute decisively to success.

Almost all studies at Priest River that contributed substantially to solution of land management problems were carried out by scientists who had lived for years with the problem to be solved. Short timers contributed to solution of parts of problems and added to knowledge. Solutions to problems came from those who knew the region and its problems thoroughly.

Equally contributory to success has been organization and focus of research. Those research efforts, large or small, that were planned and conducted as research, development, and application programs were most successful. Cutting the land manager into the program at the start insured that it dealt with an important problem. His involvement as the research moved along maintained focus and made certain that results would be in use when the research was completed. A statement in the 1917 report of the District One Investigative Council summarizes this key to success:

> "As a matter of fact, many of the results which have been received by the experiments are already a part of the actual nursery and planting practice in the District, such, for instance, as the method of extracting white pine seed, the most effective depth of cover and shade to use in the nursery for raising stock for field planting. These experiments have, therefore, accomplished the object for which they were started. The publication of the results will merely make a printed record of them available for the future use of all foresters."

Gisborne's research program, in factors affecting fire danger, lightning, and weather forecasts, is an even better example. At every step of the way he worked with land managers. He focused his research on critical problems of fire control. He expected involvement and help from forest administrators and they, in turn, expected research results, and they got them. He worked with the Weather Bureau to get better forecasts but set up stations on National Forests to supply information that would improve forecasts. By the time he developed his first fire danger meter in 1932 he had worked with the National Forests to establish fire danger stations to measure key factors. They were able to use the danger meter immediately. He worked with Hornby so that fire control planning reflected the build up and decline of fire danger.

Timing of the research by Gisborne and Hornby in cooperation with administrative people of Region One was near perfect. The cooperative program had developed a knowledge base in fire control planning that was used to channel emergency relief programs to develop fire control facilities and to use manpower effectively. An efficient and effective fire control organization emerged. Research results and the means to implement the results came together at the right time. But it happened only because of outstanding creative people in research working in harmony with equally dedicated people in the fire control organization.

Research on white pine pole blight, much of it conducted at Priest River, is still another example. This was a multi-disciplinary, multiple agency program that was planned and conducted each step of the way as a cooperative effort between research agencies and land managers. It, too, proved the merit of conducting problem-oriented research as RD&A efforts.

### *--And People*

Research is a very personal thing. It is dependent on the creativity, the consuming interest and curiosity, the motivation and drive of individual scientists. A favorable research organization can help. Facilities can speed and lighten the effort. Leadership is a great assist. A favorable research climate can be a positive aid. But the very core of successful, productive research is a creative, highly motivated scientist. Outstanding research contributions from the Priest River record are the stories of gifted and dedicated scientists such as Larsen, Gisborne, Haig, and Schaefer.

Too frequently the necessary trappings that go with research receive most attention. Facilities especially are a matter of great interest. Research organization is changed frequently in an attempt to find a better system. Critical mass is pondered and discussed, often overlooking the fact that critical mass for some problems is one able scientist and for others a dozen interacting scientists. Yet the lesson from Priest River or any research organization is that greater attention must be focused on recruitment of potentially outstanding scientists. Many scientists are good scientists and add to knowledge, but only a few are the outstanding that add to ideas. Greater emphasis on selection should increase the percentage of the gifted.

Leadership can help. People at Priest River were very fortunate to experience the superb leadership of such people as Lyle Watts, George Jemison, and Joseph Pechanec. Research leadership is somewhat different. It must embrace widely varying personalities and highly individualistic, independent people. It must know when to give strong direction without stifling creativity, how to build a minimum organization that administratively holds things together and channels effort toward objectives and goals yet permits scientists to exercise freedom of thought. It must build belief in the program, and espirit de corps in the organizaton. These leaders encompassed these skills.

The story of Priest River is the story of people.

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[1]Compiled by David Gruenhagen, Glenn Deitschman, and Charles A. Wellner. Most of the references are based wholly or in part on research on the Priest River Experimental Forest or nearby areas. Exceptions are some publications by early workers who lived or did most of their research at Priest River, and those by Wahlenberg and others at Savenac Nursery because the work there was for many years supervised by Directors of the Priest River Station.

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# APPENDIX A

## PERSONNEL WHO WORKED AT THE PRIEST RIVER EXPERIMENTAL FOREST OR HAD RESPONSIBILITY FOR THE FOREST IN ADDITION TO THOSE LISTED IN THE TEXT

### *Rangers and Superintendents*

When the Station was established, the Kaniksu Forest had a ranger stationed at the Benton Ranger Station. This was continued for two years, then the ranger became part of the Station staff and served only the Experiment Station. Apparently, beginning with Pauley in 1918 the Ranger at Benton became the District Ranger again, and Gerhardt Kempff became the resident Ranger at the Station. Rangers during this period were:

| Ranger | Period |
|---|---|
| Dean Gregory | 1911 |
| Al J. Feary | 1912-1913 |
| Douglas McDonald | 1913-1916 |
| Bill Simons | 1916 |
| J. K. Ward | 1916 |
| W. B. Hillman | 1916-1918 |
| Art Pauley | 1918 |
| Gerhardt Kempff | 1918-1928 |
| **Superintendent** | |
| John B. Thompson | 1928-1937 |
| G. Lloyd Hayes | 1937-1938 |
| Donald G. McKeever | 1938-1941 |
| Elton E. Bentley | 1941-1942 (winter) |
| John D. Crowe | 1942-1944 |
| L. H. Whetsler | 1944-1945 |
| A. W. Peiffer | 1945-1948 |
| A. E. Helmers | 1948-1953 |
| J. H. Dieterich | 1953-1954 |
| A. R. Stage | 1954-1956 |
| J. W. Hanover | 1956-1958 |
| R. W. Mutch | 1958-1958 (3 months) |
| W. Mueggler | 1958-1959 (2 months) |
| E. F. Wicker | 1959-1959 (4 months) |
| R. W. Mutch | 1959-1960 |
| Stan Carpenter | 1960-1961 |
| Robert Doty | 1961 (Sept.-Nov.) |
| Robert Pfister | 1961-1962 |
| Robert Doty | 1962 (June-Sept.) |
| Phil Gustafson | 1962 (Sept.-Oct.) |
| Robert Pfister | 1962-1963 |
| Bill Shambo | 1963 (June-Oct.) |
| Stan Carpenter | 1963 (Oct.)-1964 (Feb.) |
| Robert Doty | 1964 (Feb.-June) |
| Dave Crukovich | 1964-1965 |
| Cal Carpenter | 1965-Present |

*Forest Supervisors and Rangers Responsible for the Priest River Experimental Forest*

Supervisors

| Name | Period |
| --- | --- |
| **Kaniksu National Forest** | |
| Willis N. Millar | 1909-1912 |
| Mallory N. Stickney | 1912-1915 |
| Fred Forsythe | 1915-1918 |
| Howard R. Flint | 1918-1920 |
| J. A. Fitzwater | 1920-1924 |
| J. C. Whitham | 1924-1928 |
| James E. Ryan | 1928-1943 |
| Roy A. Phillips | 1943-1944 |
| Percy E. Melis | 1944-1952 |
| Karl A. Klehm | 1952-1960 |
| John D. Beebe | 1960-1966 |
| Harold E. Anderson | 1966-1970 |
| Ralph D. Kizer | 1971-1974 |
| **Panhandle National Forests** | |
| Ralph D. Kizer | 1974- |

Rangers of District that Included Priest River Experimental Forest

| Ranger | Period |
| --- | --- |
| **Benton** | |
| Dean Gregory | 1911 |
| Al J. Feary | 1912-1913 |
| Douglas McDonald | 1913-1916 |
| Bill Simons | 1916 |
| J. K. Ward | 1916 |
| W. B. Hillman | 1916 |
| A. E. Pauley | 1916-1918 |
| Mark Kelley | 1918 |
| J. J. Murray | -1924 |
| E. J. Jost | 1924-1927 |
| C. H. Tracy | 1927-1928 |
| **Coolin** | |
| J. K. Ward | 1928-1932 |
| **Falls** | |
| L. R. Vanairsdale | 1928-1936 |
| Roy Space | 1937-1938 |
| Alfred E. Spaulding | 1938-1943 |
| Edd Helmers | 1943-1944 |
| John L. Emerson | 1944-1947 |
| Ray L. Hilding | 1947-1948 |
| J. Frank Meneely | 1948-1951 |

| Ranger | Period |
|---|---|
| Samuel S. Evans, Jr. | 1951-1956 |
| Robert A. Cook | 1956-1957 |
| Andrew J. Arvish | 1957-1963 |
| John W. Hauer | 1963-1968 |
| Lloyd A. Swanger | 1968-1974 |

Priest Lake

| | |
|---|---|
| Dan V. Montgomery | 1974- |

*Scientists and Technicians*

| Name | Position or Research Program | Period |
|---|---|---|
| F. E. Spellenberg | Silviculture | 1912 |
| H.J.A. Grossman | Silviculture | 1912-1913 |
| C. F. Bliss | White pine management | 1915 |
| A. O. Benson | Western larch management | 1915 |
| P. C. Kitchen | Nursery and planting | 1916-1920 |
| Carlin C. Delavan | Silviculture | 1917-1919 |

1961-1975 Period

Director's Office

| | | |
|---|---|---|
| Reed W. Bailey | Director | 1961-1962 |
| Joseph F. Pechanec | Director | 1962-1971 |
| Robert W. Harris | Director | 1971-1974 |
| Roger R. Bay | Director | 1974- |
| Jack S. Barrows | Chief, Div. For. Fire Res. | 1961-1964 |
| James W. Kimmey | Chief, For. Dis. Res. | 1961-1963 |
| | Project Leader | 1963-1965 |
| Otis L. Copeland | Assistant Director | 1961-1974 |
| Charles A. Wellner | Assistant Director | 1961-1972 |
| Ralph A. Klawitter | Assistant Director | 1972- |
| Arthur P. Brackebusch | Chief, Div. For. Fire Res. | 1964-1965 |
| | Chief, Fire Lab. and Proj. Leader | 1965-1972 |

Station Research Scientists and Technicians

| | | |
|---|---|---|
| Glenn H. Deitschman | Silviculture (responsible for Forest 1961-1973) | 1961-1975 |
| Raymond J. Boyd | Silviculture | 1961- |
| Marvin W. Foiles | Silviculture (responsible for Forest 1973- Present) | 1967- |
| Robert D. Pfister | Silviculture | 1961-1967 |
| Albert R. Stage | Project Leader | 1973- |
| Russell A. Ryker | Silviculture | 1969 |
| Arthur P. Brackebusch | Forest fire | 1961-1963 |
| Robert W. Mutch | Forest fire | 1961- |
| Richard J. Barney | Forest fire | 1962-1963 |
| Hal E. Anderson | Forest fire | 1962 |
| Richard C. Rothermel | Forest fire | 1962 |
| Erwin H. Breuer | Forest fire | 1962 |

| Name | Research Program | Period |
| --- | --- | --- |
| D. S. Stockstad | Forest fire | 1965-1966 |
| James Brown | Forest fire | 1964-1967 |
| Robert Schuette | Forest fire | 1964-1965 |
| James Nelbach | Forest fire | 1964 |
| Al Hartong | Forest fire | 1967 |
| Merle E. Lloyd | Forest diseases | 1961-1965 |
| Charles D. Leaphart | Forest diseases | 1963-1975 |
| Ed F. Wicker | Forest diseases | 1963- |
| Jerome W. Koenigs | Forest diseases | 1961-1965 |
| Orson K. Miller | Forest diseases | 1962-1963 |
| Roger D. Hungerford | Forest diseases | 1966-1973 |
| J. M. Wells | Forest diseases | 1972 |
| Richard T. Bingham | Genetics | 1961-1974 |
| James W. Hanover | Genetics | 1963-1964 |
| Burton V. Barnes | Genetics | 1961-1962 |
| Raphael J. Steinhoff | Genetics | 1966- |
| Raymond J. Hoff | Genetics | 1971- |
| Gerald E. Rehfeldt | Genetics | 1970- |
| Geral I. McDonald | Genetics | 1972- |
| James E. Lotan | Genetics | 1962, 1966 |
| Charles Hatch | Genetics | 1966 |
| Dale Coffen | Genetics | 1972- |
| Duane Andrews | Genetics | 1972- |
| S. P. Wells | Genetics | 1973- |
| Melvin Morton | Genetics | 1973 |
| Kenneth Wise | Genetics | 1961-1973 |
| Richard F. Schmitz | Forest insects | 1963 |
| Robert E. Denton | Forest insects | 1967- |
| Malcolm M. Furniss | Forest insects | 1963 |
| Jack Lyon | Wildlife habitat | 1966- |
| Peter F. Stickney | Wildlife habitat | 1966- |
| Harold F. Haupt | Watershed management | 1966- |
| Edward R. Burroughs, Jr. | Watershed management | 1963-1968 |
| Gordon Snyder | Watershed management | 1971-1975 |
| Bud Jeffers | Watershed management | 1964-1974 |
| W. R. Wykoff | Forest measurements | 1974- |
| David Hamilton | Forest measurements | 1975- |
| Russell Graham | Silviculture | 1975- |

*Scientists From Universities and Other Organizations Who Worked On The Priest River Experimental Forest On Cooperative Research Programs in the 1961-1975 Period*

| Name | Organization | Period |
| --- | --- | --- |
| Rexford Daubenmire | Washington State University | 1961-1975 |
| Jack Rogers | Washington State University | 1963 |
| E. Roy Tinney | Washington State University | 1962 |
| Don Satterlund | Washington State University | 1965-1970 |
| Boyd Hill | Washington State University | 1966-1970 |
| James Miller | Washington State University | 1971 |
| Richard Kline | Washington State University | 1972-1974 |
| Chi Wu Wang | University of Idaho | 1961-1966 |
| J. A. Schenk | University of Idaho | 1966 |
| J. Gosz | University of Idaho | 1966 |

| Name | Organization | Period |
|---|---|---|
| S. Hammond | University of Idaho | 1966 |
| A. D. Partridge | University of Idaho | 1967-1968 |
| Elmer Canfield | University of Idaho | 1967-1968 |
| Frederic Johnson | University of Idaho | 1967-1968 |
| Burton Barnes | University of Michigan | 1967 |
| George Belt | University of Idaho | 1968-1974 |
| H. Lowenstein | University of Idaho | 1968 |
| Frank Pitkin | University of Idaho | 1968 |
| Gordon Snyder | University of Idaho | 1971-1974 |
| Ted L. Esslinger | University of Idaho | 1969 |
| C. M. Norman | University of Idaho | 1969 |
| F. W. Campbell | University of Idaho | 1969 |
| Patrick Owens | University of Idaho | 1969 |
| M. Molnau | University of Idaho | 1970 |
| P. Schauer | University of Idaho | 1973-1975 |
| Jack King | University of Idaho | 1973-1975 |
| M. Anderson | University of Idaho | 1973 |
| D. Woodring | University of Idaho | 1974 |
| J. Black | University of Idaho | 1974 |
| W. J. Haigh | Dow Corning | 1974 |
| J. Heinlain | Dow Corning | 1974 |
| B. Rottink | Dow Corning | 1974 |
| Don Hanley | University of Idaho | 1975 |
| Peg Harris | University of Idaho | 1975 |

*Scientists Who Worked at the Priest River Experimental Forest on Mycological Investigations*

| Name | Organization | Period |
|---|---|---|
| Alexander H. Smith | University of Michigan | 1964,1966,1968,1972 |
| Helen Smith | University of Michigan | 1964,1966,1968,1972 |
| Harvey Thiers | San Francisco State College | 1964,1966 |
| Orson K. Miller, Jr. | U.S. Forest Service | 1964,1966 |
| Edmun Tylutki | University of Idaho | 1964,1972 |
| Harold Burdsall | Cornell University | 1964 |
| Paul Miller | Washington State University | 1964 |
| John Paden | University of Idaho | 1964 |
| Kenneth Harrison | Can. Dep. Agric. | 1964 |
| Robert Gilbertson | New York University | 1964 |
| Roy Watling | Royal Botanical Gardens, Scotland | 1966 |
| Ronald Peterson | University of Tennessee | 1966,1968,1969 |
| Kenneth Harrison | Nova Scotia | 1966 |
| Samuel Muzzer | University of Michigan | 1966 |
| Larry Grand | Washington State University | 1966 |
| James Dodd | University of Tennessee | 1969 |
| M. A. Donk | The Hague, Netherlands | 1969 |
| Paul Alexi | Kalamazoo College | 1969 |
| James Weber | University of Michigan | 1972 |
| Nancy Weber | University of Michigan | 1972 |
| Emil Zavorsky | University of Michigan | 1972 |
| Kent M. Knight | USDA, Beltsville | 1972 |

*Supporting Personnel*

| Period | Name | Position |
|---|---|---|
| 1913 | L. C. Hamill | Clerk and handyman |
| 1914-1916 | Lee Stratton | Clerk and handyman |
| 1921-1926 | J. Peterson | Clerk in Missoula |
| 1927-1928 | Margaret H. Troop | Clerk in Missoula |
| 1929-1930 | A. J. Bramseth | Clerk in Missoula |
| 1929-1936 | Roland Huff | Handyman and CCC Camp Foreman |
| 1929-1936 | Min Rowles | Cook |
| 1961-1963 | Milo Coons | Station maintenance |
| 1962 | Phil Gustafson | Station maintenance |
| 1964 | Bud Jeffers | Station maintenance |
| 1964-1967 | Stephen Booth | Station maintenance |
| 1964-1975 | Jane Knoke | Station maintenance |
| 1968 | Pat Murray | Station maintenance |
| 1969 | John Bonez, Roger Booth | Station maintenance |
| 1972 | Philip Wilson | Station maintenance |
| 1972 | Peter Redhouse | Station maintenance |
| 1972 | Thomas Gorman | Station maintenance |
| 1963-1967 | S. Dagmar Nelson | Support serv., Moscow |
| 1964- | Bill Carver | Support serv., Missoula |
| 1968-1971 | Robert M. Erny | Support serv., Moscow |
| 1972-1975 | Fred Olness | Support serv., Moscow |
| 1975- | W. Paige Ballard | Support serv., Moscow |
| 1972- | Vic Hager | Support serv., Moscow |
| 1970- | Helen Perryman | Support serv., Moscow |

*Temporary Field Assistants*

Following is an incomplete list, pieced together from many sources:

| Year | Field assistant | Research program |
|---|---|---|
| 1912-1913 | F. E. Spellenberg | Silviculture |
| 1912 | Arlie Decker ) | Rockwell's yield |
| | Herman ) | study crew |
| | "Ikey" Schneider ) | |
| 1913,1915 | Chas. J. Brewster | Silviculture |
| 1913 | Hubbard | do. |
| 1914 | C. C. Delavan | do. |
| 1914 | C. A. St. Marie | do. |
| 1915,1916 | T. Schantz Hansen | do. |
| 1915 | Harry Rigdon | do. |
| 1915 | Lloyd Hornby | do. |
| 1916 | W. D. Richardson | do. |
| 1916 | R. R. Lyman | do. |
| 1916 | H. K. Harriman | do. |
| 1917 | E. M. Davis | do. |
| 1918 | Gerhard Kempff | do. |
| 1919 | Herman Bauman | do. |
| 1920 | Wm. J. McCarthy | do. |
| 1920 | A. H. Larson | do. |
| 1921 | Herman Flodberg | do. |

| Year | Field assistant | Research program |
|---|---|---|
| 1922 | Herman Flodberg | Silviculture |
| | Meyers | do. |
| | Wood | do. |
| 1923 | Tom Rowland | do. |
| | Brown | do. |
| | Sutter | do. |
| | Herman Flodberg | do. |
| | Buchanan | do. |
| | P. O. Sharma | do. |
| 1924 | Herman Flodberg | do. |
| | Hicks | do. |
| | Leffelman | do. |
| | Brown | do. |
| 1925 | Fred Dickman | do. |
| | Wyman Croy | do. |
| | Thomas Van Meter | do. |
| | Herman Flodberg | do. |
| 1926 | E. L. Roe | do. |
| | Chapman | do. |
| | Field | do. |
| | L. C. Correll | do. |
| | Huntington | do. |
| | C. C. Averill | do. |
| 1927 | A. B. Hatch | do. |
| | C. C. Averill | do. |
| | L. Ellison | do. |
| | W. Saling | do. |
| | C. W. Waters | do. |
| | J. W. Zehnder | do. |
| 1928 | A. G. Bowman | do. |
| | C. W. Waters | do. |
| | L. Ellison | do. |
| | F. H. Eyre | do. |
| | E. Ernst | do. |
| | J. W. Zehnder | do. |
| | J. Thaanum | do. |
| | G. Garin | do. |
| 1929 | Barry Park | do. |
| | George Garin | do. |
| | Wendell Moran | do. |
| | C. W. Waters | do. |
| | John Stobie | do. |
| 1930 | George M. Fisher | do. |
| | William D. Miller | do. |
| | George M. Jemison | Fire |
| 1931 | Ross Williams | Silviculture |
| | F. Agri | do. |
| | J. White | do. |
| | H. Willison | do. |
| 1932 | C. M. Genaux | do |
| | K. P. Davis | do. |
| | M. A. Huberman | do. |
| | C. A. Wellner | do. |
| | M. Carstens | do. |
| | L. Ellison | do. |

| Year | Field assistant | Research program |
|---|---|---|
| 1933 | M. A. Huberman | Silviculture |
| | L. Ellison | do. |
| | C. A. Wellner | do. |
| | J. Ramskill | do. |
| | E. Fosdal | do. |
| | C. Jensen | do. |
| 1934 | S. E. Brown | do. |
| | G. L. Hayes | do. |
| | W. Roberts | do. |
| | C. E. Ostrom | do. |
| 1935 | Gordon Watts | do. |
| | J. Schmidt | do. |
| | D. Stegner | do. |
| 1937 | Preston | do. |
| | Van Camp | do. |
| | Gordon Watts | do. |
| | John Sammi | do. |
| 1938 | Loren Baker | do. |
| | Leo Shames | Fire |
| | V. L. Benton | Silviculture |
| 1939 | G. Weyerman | Fire |
| 1941 | V. L. Benton | Silviculture |
| | S. Gajan | do. |
| 1942 | J. Timm | do. |
| 1944-1948 | Colleen McCarthy | Fire |
| 1945 | Roy Dubisch | do. |
| 1947 | James Dick | Silviculture |
| | Donald Schofield | do. |
| | Gordon Hutton | do. |
| | Marvin Foiles | do. |
| | Francais J. Baudelaire | do. |
| | David D. Olson | Fire |
| 1948 | Houghtaling | Silviculture |
| | Art Pirsko | Fire |
| 1949 | Floyd Larson | Silviculture |
| | Mike Kageorge | do. |
| | William R. Taylor | do. |
| | Edmund P. Harshman | do. |
| 1950 | Jack Gillette | do. |
| | Robert O. Curtis | do. |
| 1951 | Louis Gaby | do. |
| | Walter Riley | do. |
| | Andrew Post | do. |
| | A. R. Stage | Fire |
| 1952 | James Hilton | Silviculture |
| | H. J. Williams | do. |
| | Larry Linde | do. |
| | Burton Barnes | do. |
| | Jack H. Dieterich | Fire Weather Asst. |
| 1953 | Peter F. Stickney | Spiral grain in larch |
| | Jack H. Deiterich | Fire Weather Asst. |
| | Larry Linde | Silviculture |
| | Peter Black | do. |
| | Larry Davis | do. |
| | Jan Keyser | Disease |
| | Joe Daniels | Silviculture |
| | A. H. Westing | Disease |
| | H. F. Mehlert | Disease |

| Name | Field assistant | Research program |
|---|---|---|
| 1954 | Vincent Casieri | Fire Weather Asst. |
| | Drucilla Otterson | Fire-secretary |
| | Kenneth Krueger | Silviculture |
| | William E. Marlatt | Disease |
| | Gene L. Kuhns | do. |
| | Gerald G. Wright | do. |
| 1955 | W. E. Marlatt | Fire |
| | K. J. Egerman | do. |
| | R. J. Newman | do. |
| | R. D. Lindberg | do. |
| | G. H. Finley | do. |
| | M. R. Alsleben | do. |
| | Peter E. Black | Silviculture |
| | James Noel | do. |
| | William C. Fischer | do. |
| | Richard J. Manley | do. |
| | Richard H. Waring | do. |
| 1956 | Orson Miller | Silviculture |
| 1957 | Peter Chidsey | Fire |
| | W. R. Core | do. |
| | R. L. Ross | do. |
| | G. Farnsworth | do. |
| | D. P. Savell | Silviculture |
| | Charles Chambers | do. |
| | Max Rader | Forest diseases |
| | Ed Wicker | do. |
| | Jack Rucker | do. |
| | Dave Moehring | do. |
| 1958 | Stan Carpenter | Silviculture |
| | Harold Wisdom | do. |
| 1959 | Vin Hoeman | do. |
| | Harold Wisdom | do. |
| | Ron Babich | Fire |
| | Dave Norris | do. |
| 1960 | Harry Morton | Forest diseases |
| | John Trojonowski | do. |
| | Scott Brown | do. |
| | Richard Baier | Silviculture |
| | Bob Bartz | Forest diseases |
| | Kristian Wales | Silviculture |
| | Jerry Parker | Fire |
| | Phil Kimery | do. |
| | Don Fusket | do. |
| | Paul Edgerton | do. |
| 1961 | Robert L. Arnold | do. |
| | Richard J. Baier | Silviculture |
| | Robert D. Doty | do. |
| | Phil Wollwine | do. |
| 1962 | Robert D. Doty | General |
| | Hink | Fire |
| | Rausch | do. |
| | Ralph Williams | Silviculture |
| | Ted Price | Forest diseases |
| | Glenn McDonald | do. |
| 1963 | Bill Shambo | General |
| 1964 | Dave Crukovish | General |

| Year | Field assistant | Research program |
|---|---|---|
| 1968 | William Manly | Watershed |
| 1969 | William Manly | do. |
| | Richard Brown | do. |
| | Andy Eatman | Silviculture |
| | Pat O'Conner | do. |
| 1970 | John Finley | do. |
| | Wendell Nierman | do. |
| | Frank Salinas | do., watershed |
| | John Broncz | do. |
| | Richard Brown | Watershed |
| 1971 | Eric Eldenberg | General |
| | Wayne Thompson | Watershed |
| | Richard Kracht | do. |
| 1972 | Eric Eldenberg | General |
| | Garry Elliot | Watershed |
| | Richard Kracht | do. |
| | Wayne Thompson | do. |
| 1973 | Wayne Thompson | do. |
| | Steve Johnson | do. |
| | Eric Eldenberg | General |
| | Gary Duke | Silviculture |
| | Matt Fields | do. |
| | Ed Kelley | do. |
| | Dave Gruenhagen | do. |
| | Roger Davis | Genetics |
| 1974 | Eric Eldenberg | General |
| | B. G. Hilde | Watershed |
| | G. Hockmuht | do. |
| | D. Woodring | do. |
| | Dave Burnell | Fire |
| | J. A. Kendell | do. |
| | Bobbie Granger | do. |
| 1975 | Joel King | Silviculture-ITC |
| | Scott Little | do. |
| | Mark Novak | do. |
| | Tim Hall | do. |
| | Susan Kesti | do. |
| | Dave Mattson | do. |
| | Chuck Scholl | do. |
| | Craig Steedman | do. |
| | Jonalea Tonn | do. |
| | Tom Wilkinson | do. |
| | David Jackson | Wildlife habitat |
| | Richard Hardy | do. |
| | John Davis | do. |

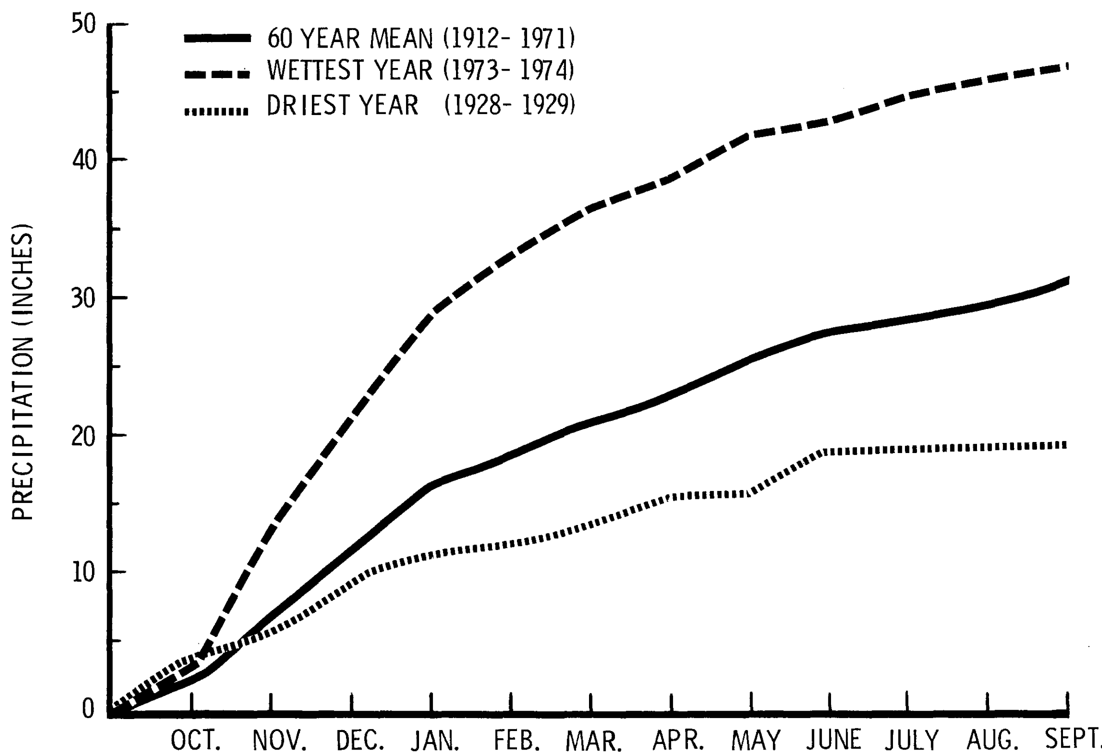
*YCC Personnel*

| Year | Camp director | Asst. director | Group leaders | Cook |
|---|---|---|---|---|
| 1973 | Joseph Crowley | Dick Kracht | Eric Eldenberg<br>Dan Butler<br>Claire Williams<br>Nancy Kondo | Neva Boyer |
| 1974 | James Phillips | Vern Melvin | Eric Eldenberg<br>Dan Butler<br>Claire Williams<br>Nancy Kondo | Harriet Smith |
| 1975 | James Phillips | Steve Booth | Doug Marousek<br>Melissa Mackey<br>Catherine Hunter | Maxine Rookstool |

APPENDIX B

CLIMATIC RECORDS FOR THE PRIEST RIVER EXPERIMENTAL FOREST

The "control" weather station was one of three cooperative Weather Bureau stations established in October 1911. Station I was on a steep northeast slope, Station II on a southwest aspect, and Station III on Benton Flat about 1,400 feet west of the present office at the headquarters site. Station III was designated as the "control" station "since it is in most ways an average between the other two and will furnish the best data on climate." A fourth station was established near the headquarters building in 1914. Published records for the Priest River Experimental Forest were taken at Station III from 1911 through November 1916 and at the present headquarters station from December 1916 to the present. Stations I, II, and III were discontinued in 1916.




*Mean precipitation of 60 years at the Priest River Experimental Forest, with wettest and driest years.*

Average Monthly Precipitation and Temperature,
Priest River Experimental Forest, 1912-1971

| Month | Temperature °F | Temperature °C | Precipitation Inches | Precipitation Centimeters |
|---|---|---|---|---|
| January | 23.7 | -4.6 | 4.16 | 10.57 |
| February | 28.0 | -2.2 | 2.99 | 7.60 |
| March | 34.4 | 1.3 | 2.69 | 6.83 |
| April | 43.4 | 6.3 | 2.01 | 5.11 |
| May | 51.8 | 11.0 | 2.16 | 5.49 |
| June | 58.2 | 14.6 | 2.28 | 5.79 |
| July | 64.3 | 17.9 | 0.88 | 2.24 |
| August | 62.7 | 17.1 | 1.08 | 2.74 |
| September | 54.5 | 12.5 | 1.68 | 4.27 |
| October | 44.2 | 6.8 | 2.87 | 7.29 |
| November | 33.1 | 0.6 | 3.86 | 9.80 |
| December | 26.8 | -2.9 | 4.44 | 11.28 |
| Annual | 43.8 | 6.6 | 31.10 | 79.00 |

Precipitation (Means) at Three Weather Stations,
Priest River Experimental Forest, 1960-1974

| Month | Control Station 2344 feet 715 meters | | Benton Dam 2640 feet 805 meters | | Benton Spring 4775 feet 1456 meters | |
|---|---|---|---|---|---|---|
| | Inches | Cm | Inches | Cm | Inches | Cm |
| January | 4.78 | 12.14 | 5.35 | 13.59 | 4.65 | 11.81 |
| February | 2.76 | 7.01 | 2.85 | 7.24 | 3.38 | 8.59 |
| March | 2.90 | 7.37 | 3.10 | 7.87 | 3.61 | 9.17 |
| April | 1.98 | 5.03 | 2.17 | 5.51 | 2.72 | 6.91 |
| May | 2.45 | 6.22 | 2.53 | 6.43 | 3.23 | 8.21 |
| June | 2.02 | 5.13 | 2.15 | 5.46 | 2.69 | 6.83 |
| July | 0.85 | 2.16 | 0.89 | 2.26 | 1.13 | 2.87 |
| August | 1.23 | 3.12 | 1.40 | 3.56 | 1.57 | 3.99 |
| September | 1.67 | 4.24 | 1.65 | 4.19 | 1.86 | 4.72 |
| October | 2.33 | 5.92 | 2.25 | 5.72 | 2.55 | 6.48 |
| November | 5.05 | 12.83 | 5.10 | 12.95 | 5.17 | 13.13 |
| December | 4.97 | 12.62 | 5.30 | 13.46 | 5.73 | 14.55 |
| Annual | 32.99 | 83.79 | 34.74 | 88.24 | 38.29 | 97.26 |

Average Snow Depth and Water Content at Two Snow Courses
Maintained in Cooperation with the Soil Conservation Service, 1937-1963

| Date | Benton Meadow Snow depth | | Benton Meadow Water content | | Benton Spring Snow depth | | Benton Spring Water content | |
|---|---|---|---|---|---|---|---|---|
| | In | Cm | In | Cm | In | Cm | In | Cm |
| First of: | | | | | | | | |
| January | 12.0 | 30.5 | 2.7 | 6.9 | 30.9 | 78.5 | 8.4 | 21.3 |
| February | 19.4 | 49.3 | 4.8 | 12.2 | 46.8 | 118.9 | 13.7 | 34.8 |
| March | 19.3 | 49.0 | 6.0 | 15.2 | 55.3 | 140.5 | 18.4 | 46.7 |
| April | 6.2 | 15.7 | 2.3 | 5.8 | 55.6 | 141.2 | 20.4 | 51.8 |
| May | 0.0 | 0.0 | 0.0 | 0.0 | 34.0 | 86.4 | 14.8 | 37.6 |

## APPENDIX C

## ROAD CONSTRUCTION ON THE PRIEST RIVER EXPERIMENTAL FOREST

| Road number | Location | Miles | Year | Built by |
|---|---|---|---|---|
| 597- | | | | |
| A,A1 | Station area roads | 0.5 | 1911 | Forest Service |
| A | Benton Creek | 3.1 | 1922-1924 | Forest Service |
| H2 | CCC Camp entrance | 0.1 | 1933 | CCC |
| B | South Ridge to lookout | 7.1 | 1933 | CCC |
| H3 | Arboretum | .1 | 1933 | CCC |
| C | Center Ridge | 5.6 | 1934 | CCC |
| 04 | Ida Point | .4 | 1934 | CCC |
| A1 | New entrance | .5 | 1934 | CCC |
| H9 | SW1/4 S27 | .5 | 1934 | CCC |
| I4 | Crow's Nest | .5 | 1934 | CCC |
| E | East Ridge | 4.1 | 1935 | CCC |
| F | Canyon Creek | 1.5 | 1935 | CCC |
| P2 | Storage - Priscilla Gulch | .1 | 1935 | CCC |
| AB | Benton-South Ridge connecting | .8 | 1941 | Timber Operator |
| D | Canyon Creek Midslope | 4.9 | 1949-1951 | Road Funds, Force Acct. |
| I6 | Fox Creek, logging | .9 | 1950-1951 | Timber Operator |
| I61 | do. | .6 | 1950-1951 | Timber Operator |
| I62 | do. | .8 | 1950-1951 | Timber Operator |
| I7 | do. | .2 | 1950-1951 | Timber Operator |
| I71 | do. | .3 | 1950-1951 | Timber Operator |
| I8 | do. | .1 | 1950-1951 | Timber Operator |
| I9 | do. | .2 | 1950-1951 | Timber Operator |
| K2 | do. | .5 | 1950-1951 | Timber Operator |
| K21 | do. | .2 | 1950-1951 | Timber Operator |
| K22 | do. | .1 | 1950-1951 | Timber Operator |
| Q1 | Benton-Canyon Creek | 2.6 | 1951 | Road Funds, Force Acct. |
| 01 | Lower Center Ridge, South Slope, logging | .3 | 1953 | Timber Operator |
| 03 | do. | 1.7 | 1953 | Timber Operator |
| 031 | do. | .1 | 1953 | Timber Operator |
| 041 | do. | .2 | 1953 | Timber Operator |
| 05 | do. | 1.2 | 1953 | Timber Operator |
| 06 | do. | .2 | 1953 | Timber Operator |
| 07 | do. | .3 | 1953 | Timber Operator |
| 09 | do. | .2 | 1953 | Timber Operator |
| L6 | Upper South Ridge, logging | 1.0 | 1954 | Timber Operator |
| L61 | do. | .4 | 1954 | Timber Operator |
| T7 | Tarlac Creek, logging | .7 | 1954 | Timber Operator |
| Q3 | Lower Canyon Creek, logging | 1.5 | 1954-1956 | Timber Operator |
| Q4 | do. | .1 | 1955 | Timber Operator |
| AC | Benton-Center Ridge Connection | 1.1 | 1955 | Contract |
| S2 | Canyon North Slope, logging | 1.4 | 1956 | Contract |

(continued next page)

| Road number | Location | Miles | Year | Built by |
|---|---|---|---|---|
| Q11 | Lower Ida, logging | .7 | 1957 | Timber Operator |
| Q2 | Lower Canyon North Slope, logging | 2.8 | 1957 | Road Funds, Force Acct. |
| N5 | Middle Center Ridge, South Slope, logging | | 1958 | Road Funds, Force Acct. |
| N7 | do. | | 1958 | Road Funds, Force Acct. |
| M2 | Upper Benton, logging | 2.6 | 1959 | Contract |
| N7 | Middle Center Ridge, South Slope, logging | .1 | 1960 | Road Funds, Force Acct. |
| G | North Ridge | 1.0 | 1962 | APW Funds |
| G | North Ridge | 0.9 | 1964 | Contract |
| L2 | Upper Benton, North Slope Logging | .3 | 1965 | Logging Operator |
| L3 | do. | .4 | 1965 | Logging Operator |
| L4 | do. | .5 | 1965 | Logging Operator |
| L5 | do. | .5 | 1965 | Logging Operator |
| M8 | Upper Benton-Canyon, logging | 1.2 | 1965 | Logging Operator |
| M9 | do. | .3 | 1965 | Logging Operator |
| R1 | Lower Canyon, logging | .6 | 1965 | Logging Operator |
| R2 | do. | .1 | 1965 | Logging Operator |
| J2 | Middle South Ridge, North Slope, logging | .5 | 1967 | Logging Operator |
| J3 | do. | .3 | 1967 | Logging Operator |
| J4 | do. | .4 | 1967 | Logging Operator |
| K3 | do. | .2 | 1967 | Logging Operator |
| N2 | Middle Center Ridge, South Slope, logging | .1 | 1967 | Logging Operator |
| N3 | do. | .4 | 1967 | Logging Operator |
| N4 | do. | .6 | 1967 | Logging Operator |
| M3 | Upper Benton, logging | .7 | 1969 | Road Funds |
| M4 | do. | 1.1 | 1969 | Road Funds |
| K8 | Upper South Ridge, logging | .2 | 1969 | Road Funds |
| L1 | do. | .5 | 1969 | Road Funds |
| L2 | do. | .4 | 1969 | Road Funds |
| L3 | do. | .3 | 1969 | Road Funds |
| G | North Ridge | 5.0 | 1971 | Road Funds |
| U1 | East Ridge, logging | .5 | 1971 | Logging Operator |
| U2 | do. | .8 | 1971 | Logging Operator |
| U3 | do. | .9 | 1971 | Logging Operator |
| U4 | do. | .5 | 1971 | Logging Operator |
| T4 | do. | .5 | 1971 | Logging Operator |
| T5 | do. | .3 | 1971 | Logging Operator |
| C1 | Center Ridge, logging | .3 | 1975 | Logging Operator |
| I1 | Lower South Ridge, North Slope, logging | .1 | 1975 | Logging Operator |
| J1 | do. | .6 | 1975 | Logging Operator |
| | Total built by appropriated funds | 51.5 | | |
| | Total built as a requirement of timber sales | 24.2 | | |
| | Total | 75.7 | | |

## APPENDIX D

### EXCERPTS FROM THE 1965 MANAGEMENT PLAN FOR THE PRIEST RIVER EXPERIMENTAL FOREST BY PFISTER AND DEITSCHMAN

| Major Considerations | Objectives |
|---|---|
| Multifunctional use: The facilities of PREF offer special research advantages to scientists in the fields of fire, disease, insects, watershed and wildlife as well as timber management. Also of major importance is the opportunity for demonstration and training. | Management will be directed toward development of desirable conditions for effective research. The forest will generally be available for all research functions and cooperative studies, demonstrations and show-me trips. |
| Basic resource data: For maximum efficiency in finding suitable experimental locations, detailed information on soils, habitat type, and stand conditions are needed. | Arrangements will be made to obtain detailed surveys of soils and ecological associations. Stand inventories and management records (Stage II Surveys) for the entire forest will be set up as early goals. |
| Improving forest conditions: About 75% of the forest is occupied by near-mature and over-mature timber. Regeneration cuttings are needed to provide a more diverse research base of species, age classes, stocking, and sites. | Approximately one-sixth of the unreserved area will be harvested and regenerated within each 20-year period. |
| Multiple-use management: General management activities should recognize multiple-use opportunities. | To the extent possible, cuttings will be planned to fit in a multiple-use framework. |
| Access: Accessibility to all parts of the experimental forest is basic to research use, protection, and intensive management. | Continued major stress will be placed upon orderly expansion of the road system. |
| Protection: In addition to timber values there is a large investment in long-term research installations which warrant a high degree of protection from fire, insects, and disease. | Current protection plans will be maintained in conjunction with NFA. |
| Special-area limitations: Certain areas (natural areas, Benton Creek Watershed, Weidman Arboretum, research plots, headquarters area, etc.) have long-term values for specific purposes. | Conflicting activities will be excluded on these special areas. |

The foregoing major considerations and objectives provide the framework for detailed management planning. More specific guidelines for preparation of action plans are detailed below. Reference should also be made to the Memorandum of Understanding with the Kaniksu National Forest concerning cooperative aspects of Experimental Forest administration.

## Multifunctional Research Utility

1. All divisions and projects involved should provide information on anticipated research environment needs--what, where, and when. To the extent possible, these will be incorporated in subsequent management planning.

2. Special effort will be made to create or maintain specifically needed study conditions upon request.

3. Plans for management activities will be circulated to the various interested projects for their review and comment. Where feasible, the plans will be modified as needed to facilitate desired objectives.

## Transportation System

1. Recommended construction standards, and an experimental forest road program dated March 3, 1960, are on file at Moscow and Priest River Experimental Forest and will be followed in all road development planning.

2. Priority allocation of appropriated road-building funds will be to locations where (a) existing timber cannot carry construction costs, (b) requirements are higher than needed simply for timber-removal, and (c) greatest research use is anticipated.

3. In setting up cutting plans, the need to use existing mature stands effectively for maximum road development will be recognized.

## Timber Cutting and Regeneration

1. About 800 acres will be scheduled to receive regeneration cuttings during a 20-year period. (This amounts to an annual average of approximately 40 acres.)

2. Harvests and regeneration efforts will be geared to provide a more diverse research base of species and age classes located on a variety of aspects, topographic situations, and soil types.

3. Cutting methods aimed at both artificial and natural regeneration will be used. Artificial regeneration will be favored to provide (1) faster and more dependable seedling establishment, and (2) greater uniformity of age, stocking, and species composition for later study installations. However, provision for natural regeneration will also be made on most areas so that young natural stands will be available for study and for comparisons with planted stands in regard to development and response to cultural treatments.

4. The experimental forest will be managed for species best suited to each site, except where studies involve comparisons of species. Western white pine will not be favored or regenerated until rust-resistant planting stock is available.

5. Areas and boundaries of cutting units will be planned with regard to efficiency of future management operations, e.g., prescribed burning, when this does not interfere with specific research objectives.

6. Large sales will be needed in some areas to develop access. Small sales will be used to fulfill specific study area requirements and broaden the range of similarly treated sites for later experimental use.

7. Where possible, management operations will be modified to take advantage of good opportunities to demonstrate multiple-use coordination involving stream side zones, wildlife habitat, scenic points, etc.

8. Salvage and sanitation cuttings will be arranged promptly as needs develop.

9. Sufficient flexibility of cutting plans will be maintained to permit good response to changed research needs, and to adapt to advantageous market opportunities for marginal timber.

10. Sales of post and pole material will be limited to areas where they will not hinder experimental forest activities nor create undesirable conditions in terms of research or management.

11. Small natural areas representative of important ecological associations will be reserved as soon as possible on the Experimental Forest. Management limitations imposed by special long-term values of these areas and others (Canyon Creek Natural Area, Benton Creek Watershed, research installations, and the headquarters vicinity) will be adhered to.

## Forest Protection

1. Knowledge of current NFA planning in regard to control of fire, insects, and disease will be maintained.

2. The District fire plan will be reviewed periodically to see that it meets the needs of the experimental forest.

3. Sanitation cuttings to remove diseased, insect-infested, or wind-throw-susceptible trees will be arranged for promptly, as needs arise.

4. Chemicals for pest control will not be applied widely to the experimental forest without prior consultation with the insect or disease research project directly involved.

## Management Action Plans

Because of the need for frequent revision or modification of scheduled management activities, action plans will be handled as periodic supplements prepared on a five-year basis. These supplements will be proposed by the Project Leader responsible for the Experimental Forest, approved by the Assistant Directors concerned, and concurred in by the Director. Included will be plans for cutting, planting, timber stand improvement, and forest road development. They should be given joint review each year by Station and Kaniksu National Forest personnel and should be revised and up-dated in accordance with circumstances.

The Experimental Forest Superintendent will be primarily responsible for (a) noting the development of conditions requiring special management action (insects, disease, etc.), and (b) maintaining accurate records of timber, place, and other needed data on forest management operations. Other research personnel using the forest will be expected to assist in this regard and to provide all pertinent information on study installations.

## APPENDIX E

## TIMBER SALES ON THE PRIEST RIVER EXPERIMENTAL FOREST

### Live Timber

| Date of sale | Purchaser | Location | Volume: Sawlogs | Posts | Poles | Piling |
|---|---|---|---|---|---|---|
| | | Sections | MBF | Number | Lineal feet | Lineal feet |
| 1/3/14 | J. W. Myers | 34,27 ) | | | | |
| 1/24/14 | J. W. Myers | 34,27 ) | 39 | 4,611 | | |
| 10/17/16 | L. E. Huot | ? | 42 | | | |
| 3/4/18 | B. L. Willis | 27 | 268 | | 4,020 | |
| 7/3/19 | V. I. Pierson | 27,34 | 3,459 | | | |
| 4/26/20 | McEwen-Kuckerbecker | 33,34 | 2,020 | | 21,600 | 3,165 |
| 12/27/20 | Gilbert-Kittelson | 34 | 188 | | | |
| 10/5/22 | W. M. Burns | 27 | 301 | | | |
| 3/21/23 | Humbard Lbr. | 26,27 | 1,569 | | | |
| 11/12/23 | Falkinghor-Branham | 26 | 225 | | 14,500 | 775 |
| 1926 | Kaniksu Cedar | 26 | 15 | | | |
| 1937 | Sutliff | 27 | 45 | | | |
| 12/13/33 | S. W. Jones | 25,26 | | | 14,670 | |
| 10/4/39 | R. Larson | 26 | 20 | | | |
| 10/18/39 | R. Larson | 34 | 58 | | | |
| 1940 | Exworthy | 33,34 | 15 | | | |
| 1941 | Clark | 27,34 | 15 | | | |
| 1941 | Exworthy | 25 | 61 | | | |
| 1943 | Haskins | 26,27 | 118 | | | |
| 1946 | Smith | 23 | 6 | | | |
| 1946 | E. River Lbr. | ? | 50 | | | |
| 9/29/47 | C. Wear | 23,24 | <1 | | | |
| 1948 | Wear | 34 | 134 | | | |
| 1948 | Branning | ? | 10 | | | |
| 1949 | Wear | ? | 134 | | | |
| 5/29/50 | Priest River Lbr. | 25,26 | 860 | | | |
| 8/12/50 | R. Heininger | 24,25 | | | 373,000 | |
| 8/16/51 | Priest River Lbr. | 30 | 70 | | | |
| 1/16/52 | Schafer-Hitchcock | 26 | | | 19,000 | |
| 9/8/52 | Straalsund-Thesman | 23,25,26,27 | 1,047 | | | |
| 11/20/52 | Schafer-Hitchcock | 26 | | | 16,560 | |
| 7/3/53 | R. MacDonald | 23,24 | 452 | | | |
| 7/6/53 | E. Thesman | 23 | 121 | | | |
| 1/4/56 | R. MacDonald | 23 | 428 | | | |
| 11/5/57 | R. Derrick | 23,24 | 121 | | | |
| 1959 | Hedlund Lbr. | 15,30 | 190 | | | |
| 1962 | Turnbull | (salvage) | 67 | | | |
| 1963 | Erdman | 27 | 61 | | | |
| 4/29/63 | Larsen | | 102 | | | |
| 11/18/63 | Hedlund Lbr. | 19,20,29,30 | 3,962 | | 12,915 | |
| 5/25/65 | R. MacDonald | 23,24 | 585 | | 9,676 | |

(continued next page)

| Date of sale | Purchase | Location | Volume | | | |
|---|---|---|---|---|---|---|
| | | | Sawlogs | Posts | Poles | Piling |
| | | Sections | MBF | Number | Lineal feet | Lineal feet |
| 11/28/66 | Hedlund Lbr. | 25,26 | 2,465 | | | |
| 1/25/67 | H. E. Peterson | 27 | 37 | | | |
| 7/1/68 | Hedlund Lbr. | 30 | 145 | | 910 | |
| 8/8/69 | Peterson Br. Lbr. | 30 | 90 | | | |
| 6/15/70 | Diamond Int. | 23 | 169 | | | |
| 6/8/70 | Georgia-Pacific | 17,20,21 | 1,716 | | | |
| 8/31/70 | East River Lbr. | | 572 | | | |
| 5/27/71 | D. Campbell | (pipeline) | 26 | | | |
| 6/21/71 | Nelson Lbr. | ("G" road) | 331 | | | |
| 8/14/72 | K. Dawson | 27 | 15 | | | |
| 10/23/64 | Oliver Contr. | ("G" road) | 50 | | | |
| | Totals | | 22,482 | 4,611 | 635,891 | 3,940 |

Dead Timber

| Date of sale | Purchaser | Location | Volume | | |
|---|---|---|---|---|---|
| | | | Logs | Fuel | Posts |
| | | Sections | MBF | Cords | Lineal feet |
| 4/10/19 | E. Gilbert | ? | | 4 | |
| 12/6/19 | O. D. Purcell | 27 | | 6 | |
| 10/11/20 | W. M. Burns | 27 | | 4 | |
| 3/3/21 | R. E. McCann | 27 | 4 | | |
| 11/25/20 | C. I. Mears | 27 | | 2 | |
| 11/28/20 | E. Gilbert | 27 | | 2 | |
| 11/30/23 | W. M. Burns | 27 | | 50 | |
| 7/24/24 | W. M. Burns | 27 | | 60 | |
| 2/3/25 | W. M. Burns | 27 | | 50 | |
| 2/4/47 | F. K. Clark | | | | 700 |
| 2/5/47 | S. Hartly | | 6 | | |
| 7/31/47 | F. K. Clark | | | | 3,000 |
| 9/12/47 | A. P. Walker | | | | 1,000 |
| 1945 | L. S. Harold | | | | 4,426 |
| 1944 | J. T. Reynolds | | | | 1,000 |
| 1940 | R. Larson | | | | 20,000 |
| 5/26/50 | C. Wear | | 20 | | |
| 3/14/51 | F. K. Clark | 27 | | | 289 |
| 1950 | H. D. Jacobus | | | | 110 |
| 12/1/52 | L. J. Branning | 26 | | | 1,069 |
| 1953 | Naccarato | | | | 2,000 |
| 1957 | Going | 27 | | | 605 |
| 1962 | Ring | | | | 3,000 |
| 1962 | Naccarato | | | | 5,363 |
| 1962 | Mickelson | | | | 110 |
| 1972 | Al Sims | | 40 | | |
| 1974 | Hahn & Hahn | | 11 | | |
| | Totals | | 81 | 178 | 42,682 |

## APPENDIX F

### VASCULAR FLORA OF THE PRIEST RIVER EXPERIMENTAL FOREST

R. Daubenmire
Washington State University, Pullman

November 8, 1968

The following is a list of vascular plants collected in the Priest River Experimental Forest, Bonner County, Idaho, up to August, 1968. A voucher for each taxon has been deposited in the herbarium at Washington State University in Pullman, Washington. Nomenclature follows C. L. Hitchcock et al., "Vascular plants of the Pacific Northwest" for dicots, and R. J. Davis "Flora of Idaho" for other vasculares. Jean B. Daubenmire assisted with the herbarium work involved. C. A. Wellner added the common names from C. L. Hitchcock.

| | |
|---|---|
| ACERACEAE | |
| Acer glabrum | Mountain maple |
| APOCYNACEAE | |
| Apocynum androsaemifolium var. pumilum | Dogbane |
| ARACEAE | |
| Lysichitum americanum | Skunk cabbage |
| ARALIACEAE | |
| Aralia nudicaulis | Wild sarsaparilla |
| ARISTOLOCHIACEAE | |
| Asarum caudatum | Wild ginger |
| BALSAMINACEAE | |
| Impatiens ecalcarata | Balsam |
| BERBERIDACEAE | |
| Berberis aquifolium | Shining Oregongrape |
| B. nervosa | Dull Oregongrape |
| B. repens | Creeping Oregongrape |
| BETULACEAE | |
| Alnus incana | Mountain alder |
| A. sinuata | Sitka alder |
| Betula papyrifera var. commutata | Western paper birch |
| BORAGINACEAE | |
| Amsinckia menziesii | Menzies' fiddleneck |
| Cryptantha affinis | Slender cryptantha |
| Mertensia paniculata | Tall bluebells |
| CALLITRICHACEAE | |
| Callitriche verna | Spring water-starwort |

| | |
|---|---|
| CAMPANULACEAE | |
| Campanula rotundifolia | Scotch bellflower |
| Triodanis perfoliata | Venus-looking-glass |
| CAPRIFOLIACEAE | |
| Linnaea borealis var. longiflora | Twinflower |
| Lonicera ciliosa | Trumpet honeysuckle |
| L. involucrata | Bearberry honeysuckle |
| L. utahensis | Utah honeysuckle |
| Sambucus cerulea | Blue elderberry |
| S. racemosa var. melanocarpa | Black elderberry |
| Symphoricarpos albus | Common snowberry |
| S. mollis | Creeping snowberry |
| CARYOPHYLLACEAE | |
| Arenaria capillaris var. americana | Mountain sandwort |
| A. macrophylla | Bigleaf sandwort |
| Cerastium nutans | Nodding chickweed |
| C. vulgatum | Common chickweed |
| Silene antirrhina | Sleepy cat |
| S. oregana | Oregon silene |
| S. menziesii var. menziesii | Menzies' silene |
| S. scouleri var. scouleri | Scouler's silene |
| Spergularia rubra | Red sandspurry |
| Stellaria crispa | Crisped starwort |
| CELASTRACEAE | |
| Pachistima myrsinites | Mountain box |
| CHENOPODIACEAE | |
| Atriplex patula | Common orache |
| Chenopodium album | Lambsquarter |
| COMPOSITAE | |
| Achillea millefolium ssp. lanulosa | Yarrow |
| Adenocaulon bicolor | Trail-plant |
| Agoseris aurantiaca | Orange agoseris |
| A. glauca var. laciniata | Pale agoseris |
| A. heterophylla | Annual agoseris |
| Anaphalis margaritacea | Pearly-everlasting |
| Antennaria alpina | Alpine pussy-toes |
| A. luzuloides | Woodrush pussy-toes |
| A. neglecta var. attenuata | Field pussy-toes |
| A. racemosa | Raceme pussy-toes |
| A. rosea | Rosy pussy-toes |
| A. umbrinella | Umber pussy-toes |
| Arnica latifolia var. latifolia | Mountain arnica |
| Aster conspicuus | Showy aster |
| A. engelmannii | Engelmann's aster |
| A. laevis | Smooth aster |
| A. modestus | Few-flowered aster |
| A. subspicatus | Douglas' aster |
| A. stenomeres | Rocky Mountain aster |
| Centaurea maculosa | Spotted knapweed |
| Chrysanthemum leucanthemum | Marguerite |
| Cirsium arvense (not coll.) | Canada thistle |
| C. edule | Indian thistle |
| C. foliosum | Elk thistle |
| C. vulgare | Common thistle |

COMPOSITAE (continued)

| | |
|---|---|
| Conyza canadensis | Horseweed |
| Erigeron acris var. asteroides | Bitter fleabane |
| E. peregrinus ssp. callianthemus | Subalpine daisy |
| E. strigosus var. strigosus | Daisy fleabane |
| Filago arvensis | Filago |
| Gnaphalium microcephalum var. thermale | Slender cudweed |
| G. palustre | Lowland cudweed |
| G. viscosum | Sticky cudweed |
| Hieraceum albertinum | Western hawkweed |
| H. albiflorum | White-flowered hawkweed |
| H. canadense | Canada hawkweed |
| H. gracile | Slender hawkweed |
| Lactuca pulchella | Blue lettuce |
| Madia exigua | Little tarweed |
| M. glomerata | Cluster tarweed |
| Matricaria matricarioides | Pineapple weed |
| Microseris nutans | Nodding microseris |
| Senecio hydrophilus | Alkali-marsh butterweed |
| S. indecorus | Rayless mountain butterweed |
| S. integerrimus var. exaltatus | Western groundsel |
| S. pseudaureus | Streambank butterweed |
| S. triangularis | Arrowleaf groundsel |
| Solidago canadensis var. salebrosa | Meadow goldenrod |
| S. gigantea | Smooth goldenrod |
| Sonchus asper | Prickly sow-thistle |
| Tanacetum vulgare | Common tansy |
| Tragopogon dubius | Yellow salsify |

CORNACEAE

| | |
|---|---|
| Cornus canadensis | Bunchberry |
| C. stolonifera | Creek dogwood |

CRASSULACEAE

| | |
|---|---|
| Sedum stenopetalum | Wormleaf stonecrop |

CRUCIFERAE

| | |
|---|---|
| Arabis glabra | Towermustard |
| A. holboellii var. retrofracta | Holboell's rockcress |
| A. lyallii | Lyall's rockcress |
| Barbarea orthoceras | American wintercress |
| Cardamine pennsylvanica | Pennsylvania bittercress |
| Lepidium virginicum var. medium | Tall peppergrass |
| Sisymbrium altissimum | Jim Hill mustard |

CYPERACEAE

| | |
|---|---|
| Carex aquatilis | Water sedge |
| C. bolanderi | Dewey's sedge |
| C. brunnescens | Brownish sedge |
| C. concinnoides | Northwest sedge |
| C. festivella | Small-winged sedge |
| C. geyeri | Elk sedge |
| C. jonesii | Jones' sedge |
| C. laeviculmis | Smooth-stem sedge |
| C. nigricans | Black alpine sedge |
| C. phaeocephala | Dunhead sedge |
| C. piperi | Piper's sedge |

| | |
|---|---|
| CYPERACEAE (continued) | |
| C. podocarpa | Payson sedge |
| C. rossii | Ross sedge |
| C. rostrata | Beaked sedge |
| C. scoparia | Pointed broom sedge |
| C. stipata | Sawbeak sedge |
| C. vesicaria | Inflated sedge |
| Scirpus microcarpus | Small-fruit bulrush |
| ELEAGNACEAE | |
| Sheperdia canadensis | Canada buffalo-berry |
| EQUISTEACEAE | |
| Equisetum arvense | Common horsetail |
| E. sylvaticum | Wood horsetail |
| ERICACEAE | |
| Arctostaphylos uva-ursi | Kinnikinnick |
| Chimaphila menziesii | Little pipsissewa |
| C. umbellata var. occidentalis | Prince's-pine |
| Gaultheria ovatifolia | Slender wintergreen |
| Hypopitys monotropa | Pinesap |
| Menziesia ferruginea | Fool's huckleberry |
| Monotropa uniflora | Indian-pipe |
| Phyllodoce glanduliflora | Yellow mountain-heather |
| Pterospora andromedea | Pinedrops |
| Pyrola aphylla | Leafless pyrola |
| P. asarifolia | Alpine pyrola |
| P. picta | White vein pyrola |
| P. secunda | One-sided wintergreen |
| P. uniflora | Woodnymph |
| P. virens | Greenish wintergreen |
| Rhododendron albiflorum | White rhododendron |
| Vaccinium membranaceum | Thin-leaved blueberry |
| V. myrtillus | Dwarf bilberry |
| V. scoparium | Grouseberry |
| GERANICEAE | |
| Geranium bicknellii | Bicknell's geranium |
| GRAMINEAE | |
| Agropyron spicatum | Bluebunch wheatgrass |
| Agrostis hiemalis | Winter bentgrass |
| A. stolonifera | Creeping bentgrass |
| A. tenuis | Colonial bentgrass |
| Bromus marginatus | California brome |
| B. mollis | Soft brome |
| B. racemosus | Soft brome |
| B. tectorum | Cheat grass |
| B. vulgaris | Columbia brome |
| Calamagrostis inexpansa | Marsh reedgrass |
| C. rubescens | Pinegrass |
| Cinna latifolia | Woodreed |
| Dactylis glomerata | Orchard-grass |
| Danthonia intermedia | Timber danthonia |
| Deschampsia atropurpurea | Mountain hairgrass |
| D. danthonioides | Annual hairgrass |
| D. elongata | Slender hairgrass |
| D. flexuosa | Crinkled hairgrass |

| | |
|---|---|
| GRAMINEAE (continued) | |
| Elymus glaucus | Blue wildrye |
| Festuca idahoensis | Idaho fescue |
| F. occidentalis | Western fescue |
| F. viridula | Green fescue |
| Glyceria elata | Tall mannagrass |
| G. grandis | American mannagrass |
| Hordeum jubatum | Squirrel-tail |
| Melica spectabilis | Showy oniongrass |
| M. subulata | Alaska oniongrass |
| Oryzopsis asperifolia | Roughleaf ricegrass |
| Phleum pratense | Common timothy |
| Poa compressa | Canada bluegrass |
| P. nervosa | Wheeler's bluegrass |
| P. palustris | Fowl bluegrass |
| P. pratensis | Kentucky bluegrass |
| P. scabrella | Pine bluegrass |
| Trisetum canescens | Tall trisetum |
| T. spicatum | Spike trisetum |
| GROSSULARIACEAE | |
| Ribes lacustre | Swamp gooseberry |
| R. viscosissimum | Sticky currant |
| HYDRANGEACEAE | |
| Philadelphus lewisii | Mockorange |
| HYDROPHYLLACEAE | |
| Hydrophyllum capitatum var. capitatum | Ballhead waterleaf |
| Phacelia hastata var. leucophylla | Whiteleaf phacelia |
| P. linearis | Threadleaf phacelia |
| HYPERICACEAE | |
| Hypericum perforatum | Klamath weed |
| JUNCACEAE | |
| Juncus drummondii | Drummond's rush |
| J. ensifolius | Dagger-leaf rush |
| J. parryi | Parry's rush |
| J. tenuis | Slender rush |
| Luzula divaricata | Spreading woodrush |
| L. glabrata | Smooth woodrush |
| L. parviflora | Smallflowered woodrush |
| L. wahlenbergii | Piper's woodrush |
| LABIATAE | |
| Mentha arvensis | Corn mint |
| Prunella vulgaris | Self-heal |
| LEGUMINOSAE | |
| Astragalus canadensis var. mortoni | Canada milk-vetch |
| Lathyrus latifolius | Everlasting peavine |
| Lupinus laxiflorus var. laxiflorus | Spurred lupine |
| L. laxiflorus var. pseudoparviflorus | Spurred lupine |
| L. sericeus var. sericeus | Silky lupine |
| L. sulphureus var. sulphureus | Sulfur lupine |
| Medicago lupulina | Black medic |
| Trifolium agrarium | Yellow clover |

| | |
|---|---|
| LEGUMINOSAE (continued) | |
| T. dubium | Suckling clover |
| T. pratense | Red clover |
| T. repens | White clover |
| LEMNACEAE | |
| Lemna minor | Water lentil |
| LILIACEAE | |
| Clintonia uniflora | Queen's cup |
| Disporum oreganum | Hooker fairy-bell |
| D. trachycarpum | Wartberry fairy-bell |
| Erythronium grandiflorum | Pale fawn-lily |
| Lilium columbianum | Columbia lily |
| Smilacina racemosa | False spikenard |
| S. stellata | Starry Solomon-plume |
| Streptopus amplexifolius | Clasping-leaved twisted-stalk |
| Trillium ovatum | White trillium |
| Veratrum viride | American false hellebore |
| Xerophyllum tenax | Beargrass |
| Zigadenus venenosus | Deadly zigadenus |
| LORANTHACEAE | |
| Arceuthobium campylopodum f. laricis | Western dwarf mistletoe |
| LYCOPODIACEAE | |
| Lycopodium annotinum | Interrupted clubmoss |
| L. clavatum | Elk-moss |
| MALVACEAE | |
| Iliamna rivularis | Streambank globemallow |
| ONOGRACEAE | |
| Circaea alpina | Enchanter's nightshade |
| Clarkia pulchella | Pink fairies |
| C. rhomboidea | Rhombic-petaled clarkia |
| Epilobium minutum | Small-flowered willow-herb |
| E. watsonii var. occidentale | Watson's willow-herb |
| E. angustifolium | Fireweed |
| E. glandulosum | Common willow-herb |
| Gayophytum nuttallii | Dwarf groundsmoke |
| OPHILOGLOSSACEAE | |
| Botrychium lunaria | Moonwort |
| ORCHIDACEAE | |
| Calypso bulbosa | Fairy-slipper |
| Corallorhiza maculata | Pacific coral-root |
| C. mertensiana | Western coral-root |
| C. striata | Hooded coral-root |
| C. trifida | Early coral-root |
| Goodyeara oblongifolia | Western rattlesnake-plantain |
| Habenaria orbiculata | Large round-leaved rein-orchid |
| H. saccata | Slender bog-orchid |
| H. unalascensis var. elata | Alaska rein-orchid |
| Listera caurina | Western twayblade |
| L. cordata | Heart-leaf listera |
| Spiranthes romanzoffiana | Hooded ladies-tresses |

PINACEAE (not collected)

| | |
|---|---|
| Abies grandis | Grand fir |
| A. lasiocarpa | Subalpine fir |
| Larix occidentalis | Western larch |
| Picea engelmanni | Engelmann spruce |
| Pinus albicaulis | Whitebark pine |
| P. contorta | Lodgepole pine |
| P. monticola | Western white pine |
| P. ponderosa | Ponderosa pine |
| Pseudotsuga menziesii | Douglas-fir |
| Thuja plicata | Western redcedar |
| Tsuga heterophylla | Western hemlock |

PLANTAGINACEAE

| | |
|---|---|
| Plantago lanceolata | English plantain |
| P. major | Common plantain |

POLEMONIACEAE

| | |
|---|---|
| Collomia grandiflora | Large-flowered collomia |
| C. linearis | Narrow-leaf collomia |
| Microsteris gracilis | Pink microsteris |

POLYGONACEAE

| | |
|---|---|
| Eriogonum umbellatum var. subalpinum | Sulfurflower |
| Polygonum aviculare | Doorweed |
| P. bistortoides | American bistort |
| P. majus | Wiry knotweed |
| Rumex acetosella | Sheep sorrel |
| R. crispus | Curly dock |
| R. salicifolius ssp. triangulivalvis var. mexicanus | Willow dock |

POLYPODIACEAE

| | |
|---|---|
| Athyrium filix-foemina | Lady-fern |
| Cryptogramma acrostichoides | Rock-brake |
| Cystopteris fragilis | Brittle bladder-fern |
| Dryopoteris spinulosa | Mountain wood-fern |
| Phegopteris dryopteris | Oak-fern |
| Polypodium hesperium | Polopody |
| Polystichum andersoni | Anderson's sword-fern |
| P. lonchitis | Mountain holly-fern |
| P. munitum | Common Christmas-fern |
| Pteridium aquilinum var. languinosum | Bracken |
| Woodsia oregana | Woodsia |

PORTULACCACEAE

| | |
|---|---|
| Claytonia lanceolata var. lanceolata | Western springbeauty |
| Montia cordifolia | Broadleaved montia |
| M. perfoliata | Miner's lettuce |

RANUNCULACEAE

| | |
|---|---|
| Aconitum columbianum | Columbian monkshood |
| Actaea rubra | Western red baneberry |
| Clematis columbiana | Columbia clematis |
| Coptis occidentalis | Western goldthread |
| Delphinium nuttallianum | Upland larkspur |
| Ranunculus aquatilis var. capillaceus | White water-buttercup |
| R. uncinatus | Little buttercup |

| | |
|---|---|
| RANUNCULACEAE (continued) | |
| Thallictrum occidentale | Western meadowrue |
| Trautvetteria carolinensis | False bugbane |
| RHAMNACEAE | |
| Ceanothus sanguineus | Redstem ceanothus |
| C. velutinus | Mountain balm |
| Rhamnus alnifolia | Alder buckthorn |
| R. purshiana | Cascara |
| ROSACEAE | |
| Amelanchier alnifolia | Western serviceberry |
| Crataegus douglasii | Black hawthorn |
| C. douglasii var. suksdorfii | Black hawthorn |
| Fragaria vesca var. bracteata | Woods strawberry |
| F. virginiana var. platypetala | Broadpetal strawberry |
| Geum macrophyllum var. macrophyllum | Largeleaved avens |
| Holodiscus discolor | Creambush ocean-spray |
| Physocarpus malvaceus | Mallow ninebark |
| Potentilla glandulosa | Sticky cinquefoil |
| Prunus emarginata | Bittercherry |
| P. virginiana var. melanocarpa | Common chokecherry |
| Rosa gymnocarpa | Baldhip rose |
| R. nutkana var. hispida | Nootka rose |
| Rubus leucodermis | Black raspberry |
| R. parviflorus | Thimbleberry |
| R. pedatus | Fiveleaved bramble |
| R. idaeus | Red raspberry |
| Sanguisorba occidentalis | Annual burnet |
| Sorbus scopulina | Cascade mountain-ash |
| S. sitchensis | Sitka mountain-ash |
| Spiraea betulifolia var. lucida | Shiny-leaf spiraea |
| S. douglasii | Menzies' spiraea |
| RUBIACEAE | |
| Galium aparine | Cleavers |
| G. boreale | Northern bedstraw |
| G. trifidum var. trifidum | Small bedstraw |
| G. triflorum | Sweetscented bedstraw |
| SALICACEAE | |
| Populus tremuloides | Quaking aspen |
| P. trichocarpa (not coll.) | Black cottonwood |
| SAXIFRAGACEAE | |
| Heuchera cylindrica var. glabella | Roundleaf alumroot |
| Lithophragma parviflora | Smallflower fringecup |
| Mitella breweri | Brewer's mitrewort |
| M. caulescens | Leafy mitrewort |
| M. stauropetala | Side-flowered mitrewort |
| Saxifraga occidentalis var. idahoensis | Western saxifrage |
| Tiarella unifoliata | Coolwort foamflower |
| SCROPHULARIACEAE | |
| Castilleja miniata | Scarlet paintbrush |
| Collinsia parviflora | Small-flowered blue-eyed Mary |
| Gratiola neglecta | Common American hedge-hyssop |
| Linaria vulgaris | Butter and eggs |

| | |
|---|---|
| SCROPHULARIACEAE | |
| Mimulus floribundus | Purple-stem monkey-flower |
| M. moschatus | Musk-flower |
| Pedicularis bracteosa var. bracteosa | Bracted lousewort |
| P. contorta | White coiled-beak lousewort |
| P. racemosa var. alba | Leafy lousewort |
| Penstemon confertus | Yellow penstemon |
| P. fruticosus var. scouleri | Shrubby penstemon |
| Scrophularia lanceolata | Lance-leaf figwort |
| Verbascum thapsus | Common mullein |
| Veronica americana | American brooklime |
| V. officinalis | Common speedwell |
| V. peregrina var. xalapensis | Purslane speedwell |
| V. serplyllifolia | Thyme-leaved speedwell |
| SELAGINELLACEAE | |
| Selaginella wallacei | Wallace's selaginella |
| SPARGANIACEAE | |
| Sparganium simplex | Narrowleaf bur-reed |
| TAXACEAE | |
| Taxus brevifolia (not coll.) | Western yew |
| UMBELLIFERAE | |
| Angelica arguta | Lyall's angelica |
| Cicuta douglasii | Douglas' water-hemlock |
| Heracleum lanatum | Cow parsnip |
| Ligusticum canbyi | Canby's lovage |
| Lomatium ambiguum | Swale desert-parsley |
| L. dissectum var. multifidum | Fern-leaved lomatium |
| Osmorhiza chilensis | Mountain sweet-root |
| Sanicula marilandica | Black snake-root |
| URTICACEAE | |
| Urtica dioica ssp. dioica | Stinging nettle |
| VALERIANACEAE | |
| Valeriana sitchensis | Mountain heliotrope |
| VIOLACEAE | |
| Viola adunca | Early blue violet |
| V. glabella | Stream violet |
| V. orbiculata | Round-leaved violet |
| V. palustris | Marsh violet |

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Headquarters for the Intermountain Forest and Range Experiment Station are in Ogden, Utah. Field programs and research work units are maintained in:

- Billings, Montana
- Boise, Idaho
- Bozeman, Montana (in cooperation with Montana State University)
- Logan, Utah (in cooperation with Utah State University)
- Missoula, Montana (in cooperation with University of Montana)
- Moscow, Idaho (in cooperation with the University of Idaho)
- Provo, Utah (in cooperation with Brigham Young University)
- Reno, Nevada (in cooperation with the University of Nevada)

AMERICAN REVOLUTION BICENTENNIAL
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