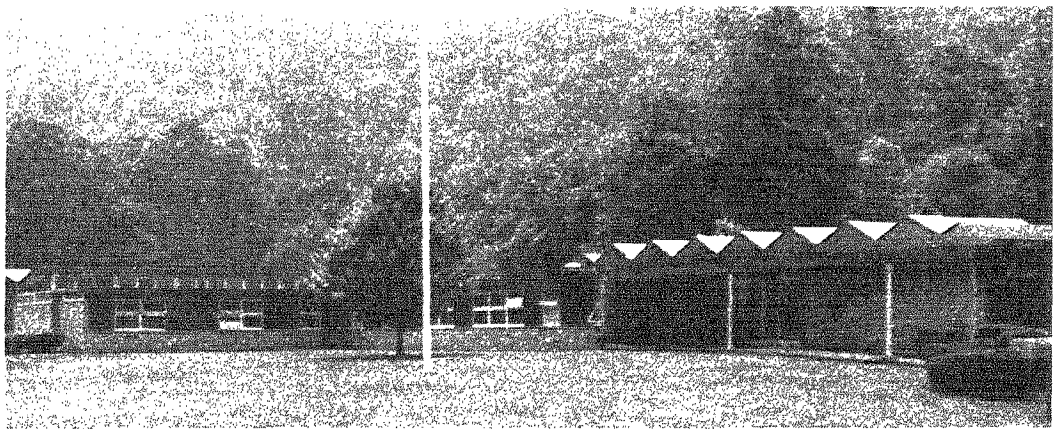
by GEORGE R. TRIMBLE, Jr.

A History of the FERNOW EXPERIMENTAL FOREST and the PARSONS TIMBER AND WATERSHED LABORATORY



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ABSTRACT

THIS IS A HISTORY of the people and the research they have carried out on the Fernow Experimental Forest during the past 43 years. The beginning of U.S. Forest Service timber-management research in West Virginia dates back to 28 May 1934, when the Fernow Experimental Forest was established. In 1950, watershed-management research was begun, and now both are carried out—along with additional multiple-use projects—as responsibilities of the Parsons Timber and Watershed Laboratory. Except for the war years in the 1940s, an ever-intensifying program of research has been carried out at this location. In the initial years, the old Appalachian Forest Experiment Station directed the program of research; since 1948 the Northeastern Forest Experiment Station has been responsible for this work.

Key words: research history, Fernow Experimental Forest, timber and watershed management.

ACKNOWLEDGMENT

Many people contributed to the preparation of this history. Librarians of both the Northeastern and the Southeastern Stations searched the files for reports and publications. Staff people of the Parsons Timber and Watershed Laboratory took pictures and reviewed the manuscript. Special thanks are extended to Kathleen Hammack, who labored hard and efficiently in assembling historic material, arranging photographs, and preparing the manuscript.

COVER PHOTOS.—Top: this rugged forest land, where the Fernow Experimental Forest is located, is typical of the forested mountains in Appalachia.
Bottom: present headquarters of the Parsons Timber and Watershed Laboratory, a research facility of the Northeastern Forest Experiment Station, Forest Service, U. S. Department of Agriculture.

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The Author

GEORGE R. TRIMBLE, JR., retired 3 years ago after 38 years with the U.S. Forest Service, 20 of them working at the Parsons Timber and Watershed Laboratory in West Virginia. He received a B.S. degree in forestry at the University of Maine and began his working career on the White Mountain National Forest. He later transferred to the Northeastern Forest Experiment Station and did both watershed- and timber-management research throughout the Northeastern States. He is the author or co-author of more than 100 publications. In 1973, he was named West Virginia Forester of the Year by the West Virginia Wildlife Federation. In 1974, he received the Society of American Foresters, Allegheny Section, annual award for outstanding service to forestry.

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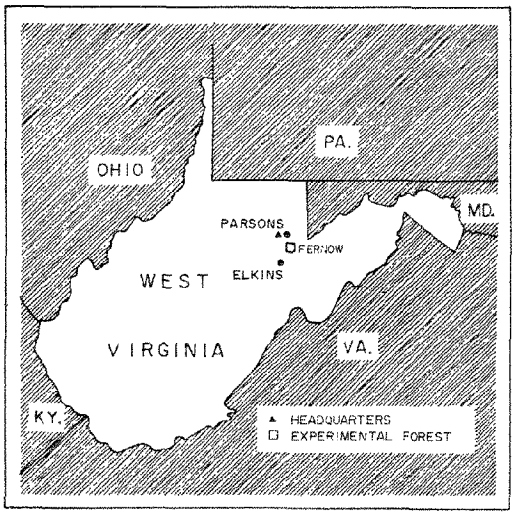
The Beginning

THIS IS A HISTORY of the Fernow Experimental Forest and the Parsons Timber and Watershed Laboratory. The Fernow Forest is an outdoor research area where the Laboratory staff carry out most of their studies. It lies 3 miles southeast of Parsons, W. Va., and 25 miles from Elkins. The laboratory is located on the Parsons Nursery Bottom just east of Parsons.

Named in honor of Bernhard E. Fernow, the well-known German-born forester who pioneered forestry in the United States, the 3,640-acre Fernow Experimental Forest has played a significant role in forest management in the Appalachian Region for a third of a century. Research work was started here in the early 1930s under the direction of the Appalachian Forest Experiment Station, with headquarters in Asheville, N.C. During World War II, the program was shut down. In 1945, when the Forest Service reorganized its system of experiment stations, the Northeastern Forest Experiment Station (with headquarters now in Upper Darby, Pa.) was assigned responsibility for research work in this area. And in 1948 a new program of studies was started in West Virginia.

Location of the Fernow Experimental Forest.



Many people have had a hand in the work that has been carried out here. In writing this history, I have tried—where it seemed appropriate—to identify individuals involved in specific activities.

During its existence, from 1934 to the present, the Fernow research unit has had three different organic structures.

First, as an *experimental forest.* Under this setup, a junior forester or an assistant forester, who lived in the locality and was supported by a local staff, administered the development and maintenance work, carried out research supporting programs—such as inventories and plot establishment—and made routine measurements. Most of the research planning, study development, and analysis of results were done in the Experiment Station office in Asheville by project leaders in the various disciplines such as fire control, silviculture, and mensuration. These men often spent long stretches of time on the Experimental Forest. The Fernow research program was operated in this way during the tenure of the Appalachian Forest Experiment Station (later renamed Southeastern Forest Experiment Station).

After the research program was reactivated on the Fernow Forest in 1948, the unit was administered as a *research center,* much like a miniature experiment station, with a center leader who was responsible for all projects. Project leaders in each discipline answered to center leaders, and center leaders answered to the Station director.

In the service-wide reorganization of research in 1959, a new structure was adopted. The position of center leader was abolished. Now each project leader was responsible for his research work unit, and he looked to a division chief—who later became an assistant director—for direction. An administrative assistant was brought in to handle many of the administrative duties that the center leader formerly performed or assigned to other personnel in the organization.

Elk Lick Run Watershed before Establishment as Fernow Experimental Forest

Elk Lick Run watershed, most of which now encompasses the Fernow Experimental Forest—along with part of the Otter Creek drainage—was originally granted to Francis and William Deakon by the State of Virginia in 1788. Jonathan Arnold paid the Deakon heirs $4,000 for the land in 1856; later he handed the property down to his son, Thomas J. Arnold. In 1901, Thomas Arnold sold the timber rights on this property to C.S. Vasbinder, one of the owners of the Elk Lick Lumber Company, who paid $11.50 per acre for the timber rights.

Logging was started about 1903 and was completed by the end of 1911. There is no indication that any cutting took place in Elk Lick before 1903. A logging railroad was built to haul the logs to the mill—as was customary in those days. Skidding was done with horses and chutes or log slides. The logs from the Elk Lick Run area were sawed at the Elk Lick Lumber Company mill, located between Hambleton and Parsons.

Cutting was heavy but variable. In areas easily accessible to the railroad, the forest was clearcut of all sawtimber-size trees except culls; from less accessible areas, only the better stems of preferred species were taken.

This Arnold tract was the first purchase unit of the Monongahela National Forest. In 1911 R.C. Bryant made a preliminary report on the area for the Forest Service. He recommended purchase by the government. In 1912, W.A.

Elk Lick Run, which drains the Fernow Forest.

Hopson, forest examiner, made an evaluation of this tract for the government in which he recommended purchase of 7,136 acres at his appraised price of $5.54 per acre. In 1913, the National Forest Reservation Commission considered purchase of this land, but turned it down as being priced too high. Attempts to attain it at a lower price were not successful.

The following year, a lumberman, C.D. Cushing, was commissioned to examine this tract and report why these lands were priced higher than most cutover lands. He justified the price, and his opinion was backed up by William L. Hall, assistant forester, who examined the tract in August 1914. Hall emphasized the good soil, the excellent young growth, and the ready access to many wood-using plants. He urgently recommended purchase of this tract at the asking price of $5.50 per acre—$4.50 for the land and $1.00 for stumpage.

The Forest Service purchased the Arnold Tract on 26 November 1915 at this asking price. The area had been split up into a number of appraising units, and the portion that comprises the present experimental forest—or at least the major part of it—was appraised at $7.00 per acre. Mineral rights were reserved.

Little descriptive material is available about the area as it was before logging. C.A. Abell, who in 1933 wrote one of the reports upon which was based the establishment of the area as an experimental forest, had this to say about the original forest:

> On lower elevations, the forest was mainly hardwoods with hemlock in mixture along creek bottoms and north slopes. The higher ridges were covered with an excellent stand of spruce and hemlock, while in small patches on the tops of the mountains were pure spruce stands. The tract averaged 15 M board feet per acre.

No information about tree size was included in the volume estimate, nor was there any indication of the board-foot rule used to estimate the volume.

Some idea of the condition of the forest after logging can be obtained from Abell's report on the area about 20 years after the cutting. Abell apparently drew on older reports for this after-logging description:

> Non-merchantable timber lands comprise the entire acreage offered [for sale to the government]. This land has not been cut as close as many tracts in the region and a few hundred feet of beech, birch, and maple remain. This is either defective, rather inaccessible, or under 10 inches in diameter . . . . There have been no fires since logging started and good growth of chestnut, chestnut oak, and black oaks are coming in. On small areas good stands of chestnut poles, 6 to 8 inches were noted. The tract is in better condition than the majority of cut-over areas that will be offered in this section. Light logging and no fires have given the forest a good chance to build up and recovery will be rapid if fire is kept out.

The black oaks Abell mentioned were mostly *Quercus rubra* L. Though members of the black oak group, they usually are called northern red oak.

Although there is evidence of some past fires in the area, fire damage has been slight, probably because the area came under Forest Service protection so soon after the original cutting. A Forest Service protection unit that was organized in 1916 included the Arnold Tract.

It would seem that Abell in his report underestimated the quantity of sawtimber left after logging; or—more likely—the standards of merchantability were stricter then than now. In 1948, when the Fernow Forest was reactivated, many areas—especially upper hollows a long way from the old railroad grades—had heavy stands of merchantable old-growth timber, predominantly sugar maple.

In September 1931, L.I. Barrett and I.H. Sims of the Appalachian Forest Experiment Station examined four areas on the Monongahela National Forest for possibilities as experimental forests, among which was Elk Lick Run watershed. They recommended this watershed for several reasons, among which were: good variety of sites and types of timber, particularly yellow-poplar; stands older than most on the Monongahela; typical north-central West Virginia topography; and good accessibility. Their report was submitted on 16 September 1931.

On 7 November 1931, Arthur A. Wood (Monongahela National Forest supervisor), Webb Myers (State game protector at Parsons), and Jesse H. Buell (assistant silviculturist with the Appalachian Forest Experiment Station) examined the Elk Lick Run watershed. They, too, recommended that this area be developed as an experimental forest.

On 8 July 1932, the director of the Appalachian Station, E.H. Frothingham, wrote to Assistant Regional Forester R.M. Evans, suggesting that a line-plot survey be made in which timber and topographic data be noted and mapped, the outcome of this survey to be the

basis for delineating the proposed experimental forest.

And in October and November 1932, Abell, his wife Mary S. Abell (herself a junior forester), V.E. Hicks, and W.E. Hodges inventoried the area and made a type map. Abell, chief-of-party, wrote up the notes on the survey and submitted them on 8 April 1933. He also made a report justifying the establishment of the experimental forest on the basis of the investigative possibilities there.

Eventually a recommendation went to the "Forester"—at that time the head of the U.S. Forest Service was called "Forester", not "Chief"—to set aside 3,640 acres in Elk Lick Run drainage as the Fernow Experimental Forest, to be administered under the direction of the Appalachian Forest Experiment Station. Forester F.A. Silcox signed the order establishing the Fernow Forest on 28 May 1934.

Fernow Experimental Forest as a Unit of the Appalachian Forest Experiment Station

The research unit that developed the program on the Fernow Forest during the period when the Appalachian Forest Experiment Station was in charge was known as a "Branch Station".

In the first 2 years after the Fernow Forest was set up, development work went on apace, aided by the Civilian Conservation Corps and the Civil Works Administration; a CCC camp on the Parsons Nursery Bottom supplied labor for years. Eight miles of road were built and another 5 miles started; much of this mileage was built on the old railroad grade that ran along Elk Lick Run.

The exterior boundary of the forest was marked by a 15-foot cleared firebreak. Narrower interior firebreaks were cleared along ridges, dividing the area into 25 compartments. An additional 10½ miles of foot trail was prepared. A combination log toolhouse and blacksmith shop was constructed beside the main Elk Lick road about 1/2 mile in from the lower boundary. Because open grazing was a way of life in West Virginia at that time, 1½ miles of woven wire fence was put up on the north boundary to prevent stock from drifting into the forest.

Forest headquarters buildings were constructed on the Parsons Nursery Bottom; they included a bunk house, a dwelling, and a combination work shop and garage. While this construction work was going on, the foresters had been busy. A topographic map of the Fernow Forest was prepared, with 40-foot contour intervals. On this map were indicated the locations of stakes marking the centers of about 800 1/4-acre plots from which the original cruise of 1932 had been made and a type map developed.

The only research work in progress as of March 1936 was a set of experimentally burned plots established by the Station's fire-damage project in 1935.

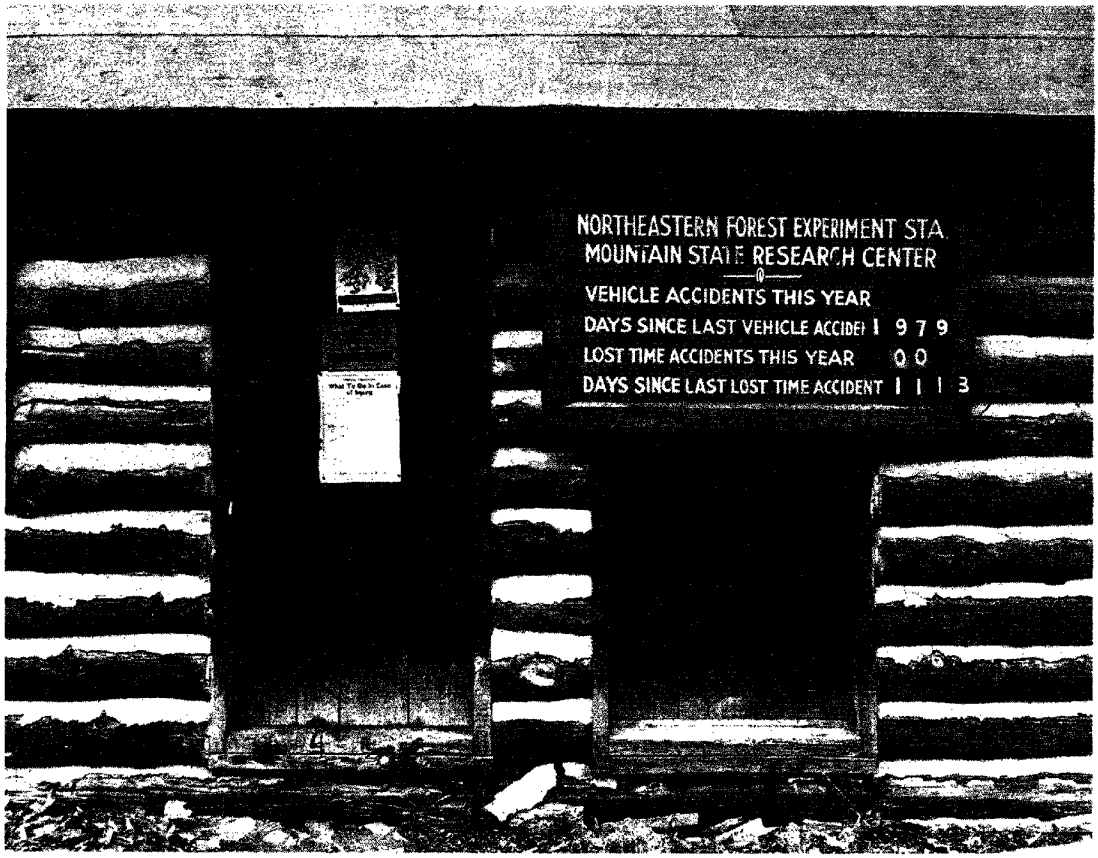
A water-supply reservoir for the town of Parsons was constructed on the Fernow Forest between 1934 and 1936 on a special-use permit from the Monongahela National Forest. Although it was not a research project, construction of this reservoir affected the research done above it, in that special care had to be taken so as not to damage the water supply.

In 1936, the personnel situation was as follows: C.A. Abell was silviculturist-in-charge at the Fernow Experimental Forest; Joseph O. Kirchner was regional forester of Region 7; Arthur A. Wood was supervisor of the Monongahela National Forest; Ralph Smoot was Cheat District ranger (he took over from Don Gaudineer in April 1936); and D.A. ("Sandy") Oliver was nurseryman at the Parsons Nursery.

From late 1936 on, the pace of development of the physical plant slowed, but the research program was stepped up.

Jesse Buell established an extensive network of crop-tree-release study plots in the Appalachian area, some of them on the Fernow Experimental Forest. In 1939, Buell established a thinning study in second-growth yellow poplar on the Fernow Forest, and the effects on a wide range of tree and stand characteristics were related to two kinds and two degrees of thinning. W.G. Wahlenberg later took over this study and published the results in two articles in the JOURNAL OF FORESTRY.

By 1941, Leon Minckler had established a number of reforestation study plots in the cut-over and burned-over spruce lands on the



The old log toolshed-blacksmith shop, first building on the Fernow Experimental Forest.

Early headquarters buildings—bunkhouse, dwelling, and garage—in the mid 1930s.

Monongahela National Forest (as well as on the Pisgah National Forest in North Carolina). Minckler published early results of this work, and in 1954 a final report was published on the results of this study in West Virginia by Thomas G. Clark, who at that time was a member of the Northeastern Forest Experiment Station.

In 1941, as the United States geared up for the war effort, reduction of funds forced the termination of work on the Fernow Forest, except for remeasurements of the spruce planting and yellow-poplar thinning plots. The buildings were boarded up, not to be opened again until after World War II.

Fernow Forest under the Northeastern Forest Experiment Station

After the war, in 1948, the Northeastern Forest Experiment Station established a branch unit, first known as the Mountain State Research Center, in Elkins, W. Va. Later the name was changed to the Elkins Research Center, a title that was retained until 1964, when the headquarters was moved to Parsons and the name was changed again, this time to the Parsons Timber and Watershed Laboratory. Although the headquarters were in the Forestry Building in Elkins from 1948 until 1964, most of the activity took place on the Fernow Experimental Forest, and most of the personnel lived in Parsons. Until an office building was erected in 1954, the bunkhouse was used as the Fernow office; it also housed official visitors. Some member of the staff, with family, has always occupied the residence on the nursery bottom.

The transition from the Appalachian to the Northeastern Forest Experiment Station was facilitated by the efforts of W.G. Wallenberg and W.T. Doolittle of the Appalachian Station. These two men worked closely with Northeastern personnel in completing old studies and in transferring records.

PERSONNEL

The Center started operations in 1948 with five people: Sidney Weitzman, center leader; Carl J. Holcomb, timber-management project leader; Thomas G. Clark, timber-management researcher; Carl R. Barr, logging superintendent; and Geraldine L. Trickett, clerk-typist.

During the 28 years of its existence, the research unit has expanded in size and grown in complexity. Including the people in the two projects—timber- and watershed-management research—and 3 full-time employees in administrative services, a total of 21 regular employees and 4 part-time and temporary employees now work at the Parsons Timber and Watershed Laboratory. From 1948 until now, more than 50 permanent Forest Service employees have worked in the organization. Temporary and part-time employees for the same period add up to about twice this number.

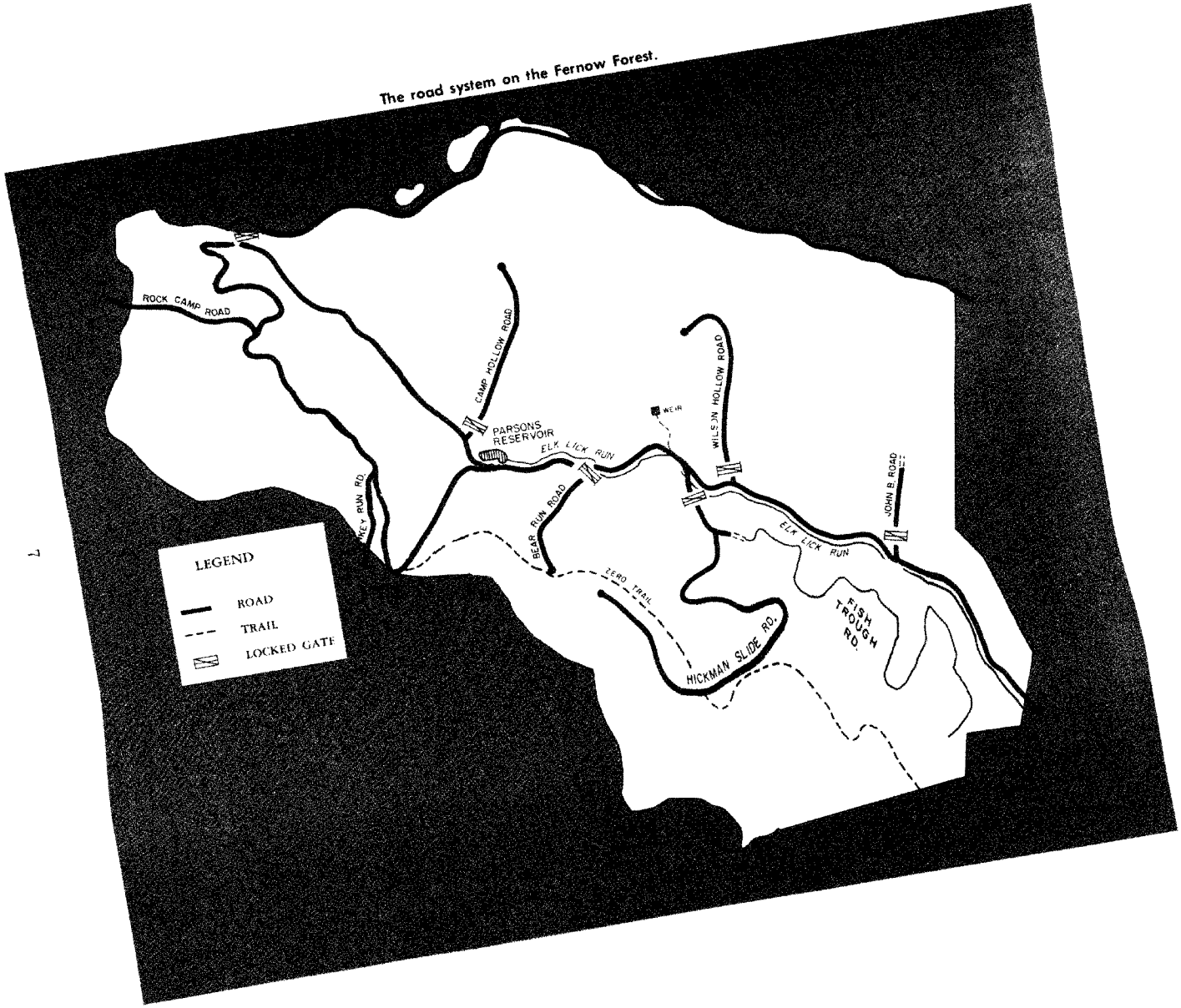
The increase in diversity of research personnel over the years is a measure of the specialization of the program. Initially, all the professional researchers were foresters; now the group also includes soil scientists and hydrologists. With the increased diversity of the professional staff has come diversity of the technician staff. For example, today the timber-management research project supports a statistical assistant, Kathleen P. Hammack; and the watershed-management project keeps a water-quality analyst, James D. Phillips, busy full time.

DEVELOPMENT OF PHYSICAL FACILITIES

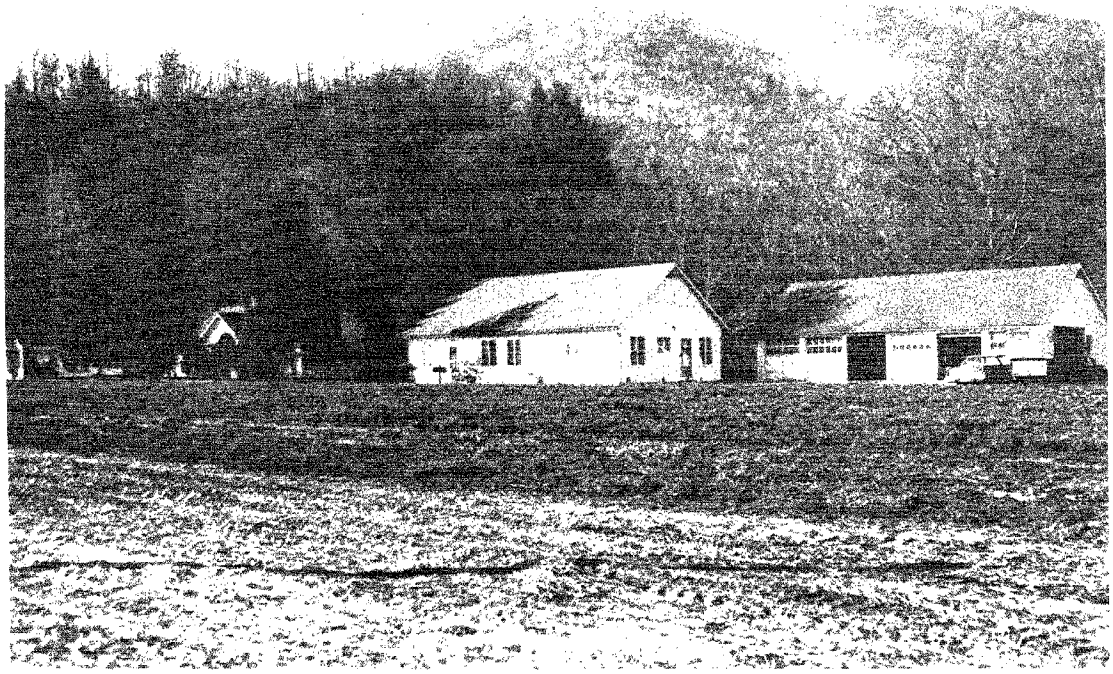
The Fernow Forest road system, well started by the Appalachian Forest Experiment Station, has been added to and improved upon over the years. The Rock Camp spur was constructed in 1950, and the Camp Hollow road was built the following year. The Bear Run and Hickman Slide roads were built in 1953. During the next 12 years, four more roads were added to the system: Wilson Hollow, John B. Hollow, Lower Fish Trough spur, and Upper Fish Trough spur. The last road to be built was the Fork Mountain spur. All these are National Forest System roads, and most of them have been gravelled. Together they add up to about 25 miles of road.

In 1954, a new office building was completed on the nursery bottom; and in 1957, a combination garage, storage building, and workshop was

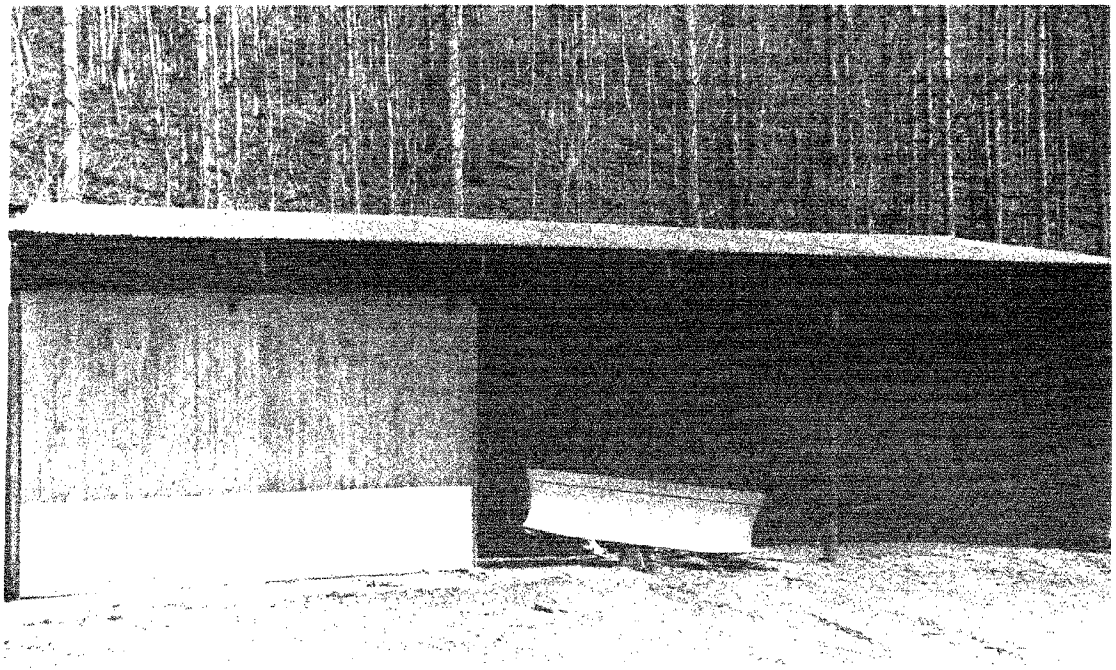
The road system on the Fernow Forest.



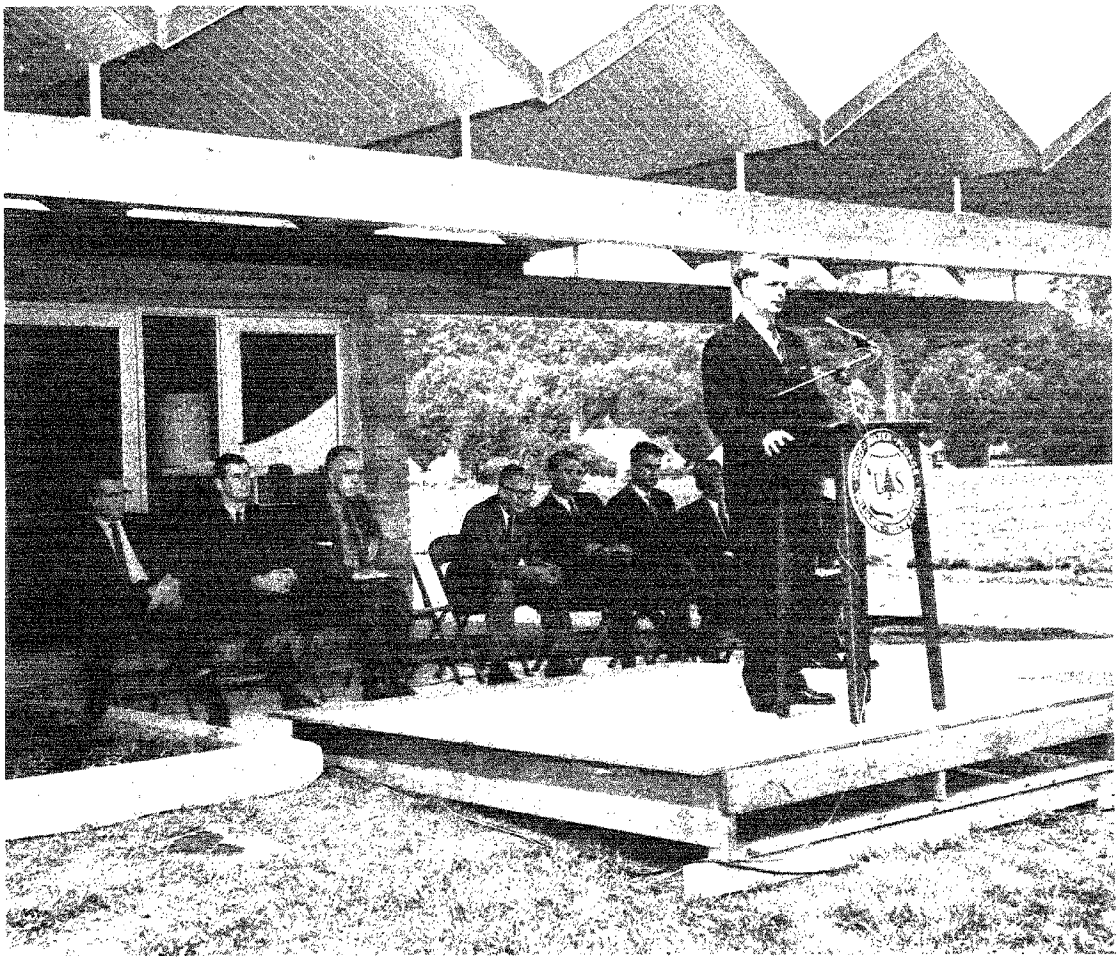
The first office building was erected in 1954, the garage in 1957.



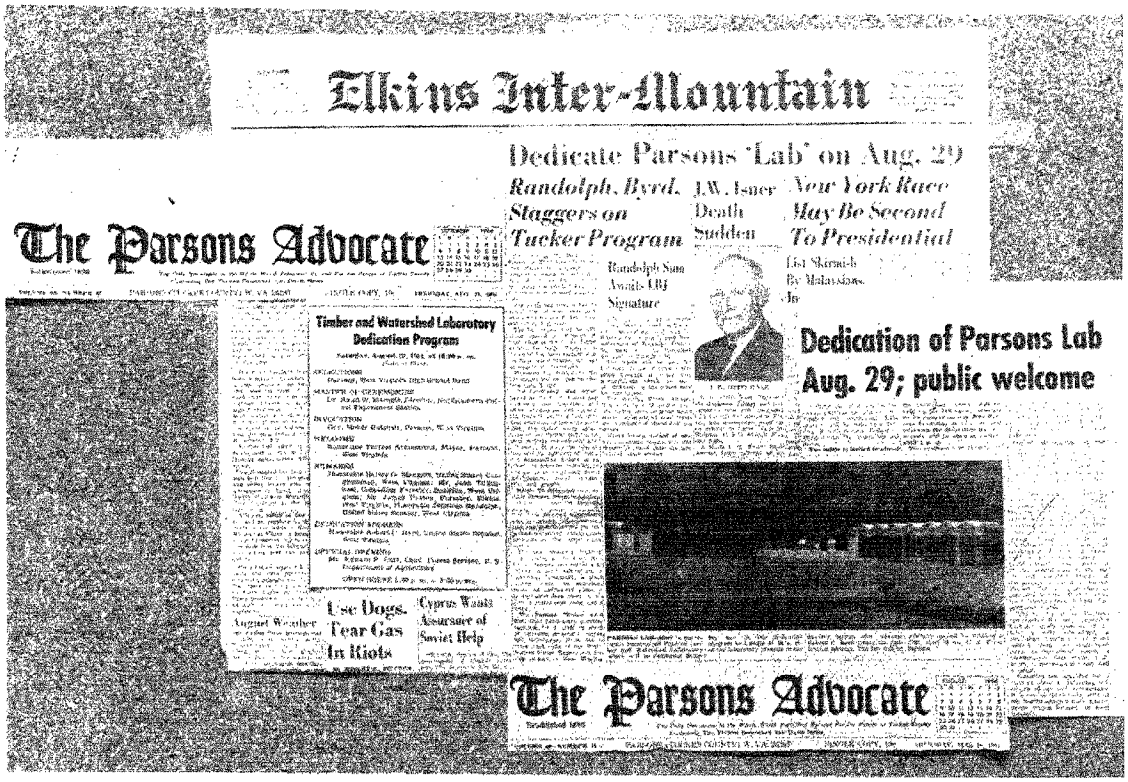
This tractor repair shed was erected in 1962, to replace the old log toolshed.



The present Timber and Watershed Laboratory, erected in 1964, as it appears today. A greenhouse (at left) is the latest building on the headquarters site.



U. S. Senator Robert C. Byrd of West Virginia keynoted the dedication of the Parsons Timber and Watershed Laboratory on August 29, 1964



constructed behind it. A concrete record-storage vault was also built.

In 1962, a tractor-repair shed, which combined workshop and storage space, was erected on the Fernow Forest across from the entrance to Hickman Slide hollow. This replaced the old log-cabin workshop, which had been torn down. In 1972, a storage building was erected a little farther up Elk Lick to house watershed-research equipment and materials.

In 1964, a modern laboratory and office building was erected on the nursery bottom. This building provided much-needed facilities for an intensified program of research. For the first time, the unit had adequate office space and laboratory equipment.

Many people had a hand in getting this Laboratory built in Parsons. Prominent among them were Senator Robert C. Byrd of West Virginia; V. L. Harper, Deputy to the Chief in charge of Forest Service research; and Ralph W. Marquis, Director of the Northeastern Forest Experiment Station. The Laboratory was dedicated on 29 August 1964. Carter B. Gibbs, then a timber-management researcher with the Parsons Timber and Watershed Laboratory and now an assistant director at the North Central Forest Experiment Station, master-minded the dedication program.

The last building constructed on the Parsons Nursery Bottom was a greenhouse erected in April 1976.

PROGRAM OF RESEARCH

Almost from the beginning, two lines of investigation have been carried out on the Fernow Forest: timber-management research and watershed-management research. It was recognized early that the two are closely related: manipulating the forest for timber-management purposes affects watershed relations and vice versa. For this reason, many of the large-area studies were conducted jointly by scientists in the two projects, with resultant gains in more widely applicable results as well as increased fiscal efficiency.

During the first 2 years, center personnel were concerned largely with making a timber inventory of the Fernow Forest, writing study work plans, selecting compartments for testing silvicultural systems on a large scale, hiring and training a logging crew, and building weirs on five watersheds. During this period, Sidney Weitzman prepared a detailed and comprehensive program analysis that served as a guideline for the research program. Toward the end of this period, cutting practice studies were begun. And George R. Trimble, Jr., was transferred from Upper Darby to develop the watershed-research program.

By mid-1951, the research program was well under way, and the basic pattern of research was established for both projects. A system of compartment studies of a long-range nature was combined with short-range studies designed to solve special problems or to determine the hows and whys of the gross effects measured on the compartments. To some extent, this is still the pattern of research today, especially in timber management; but the trend has been to put more emphasis on studies of a short-range nature and on research in depth.

The following are the main research contributions in timber and watershed management that have come from the Parsons unit in the period 1948 to the present.

Timber-Management Research

The present mission of the timber-management-research project is to learn how to establish, culture, and harvest high-quality central Appalachian hardwoods, in a way that is compatible with increasing public demand for other uses of the forest—multiple-use. Although the wording of the mission has been changed several times over the years, the research objectives have remained essentially the same.

During the first years of research, the Fernow

This 65-year-old even-age stand on the Fernow Forest is under intensive management.

Growth studies have been an important part of the research program from the beginning. From individual-tree growth studies we have determined the dbh growth rates of important species, and we have related tree growth to site quality and crown position. Stand growth studies, made on large plots and on compartments, have provided growth data for stands managed by individual-tree-selection practices and by some levels of diameter-limit cutting; and we have related these growth rates to site quality. Studies underway are designed to yield stand-growth information for areas of even-aged management, areas cut by selection systems based on different levels of financial maturity, and areas where small patch cutting or group selection is being practiced.

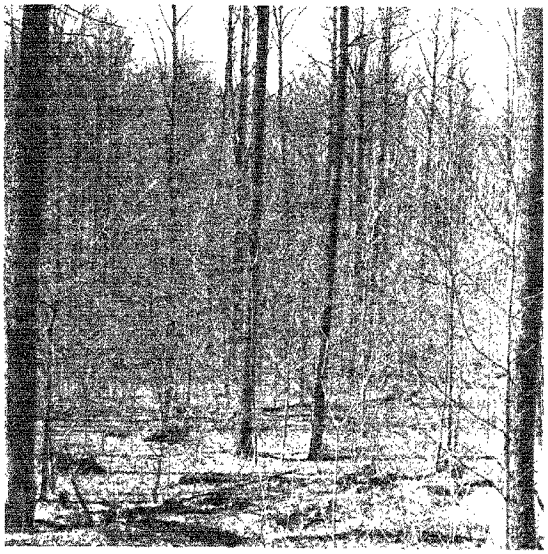
Only one study has been made to relate stand yield to stand density. This study, set up in 1954 by Sidney Weitzman and Robert Lindahl, was made on areas of site quality (in terms of oak site index) of 85 and 63 feet. The results showed that cubic-foot growth over a 10-year period was not affected by after-cutting ranges of density (in trees over 5.0 inches dbh) between 60 and 100 square feet basal area on the better site, and between 45 and 75 feet on the poorer site. However, on the 85-foot site, board-foot growth was significantly less on the plots of 60-square-foot density. But board-foot growth on the 63-foot site was unaffected by residual density within the range tested.

A series of precommercial crop-tree-release experiments on large areas of young even-aged hardwoods is providing valuable information. We have learned that only codominant and dominant trees are good risks for release, and then only if they are at least 15 feet tall, tall enough to stay ahead of sprout growth from stumps of competing trees cut in the release operation. Where grapevines are a serious problem, released stems should be 25 feet tall, or the grapevines will grow back up in them.

Although it was at no time a major effort, we

On the left, a stand of timber growing on an excellent site. On the right, a stand of timber growing on a very poor site. Both stands are the same age.

In this stand with sugar maple understory, a light selection cutting was made.



Forest logging crew pioneered a number of innovations in logging techniques and skidroad layout. Carl R. Barr and his loggers were the first in Appalachia to use tree-length skidding in combination with a carefully designed system of skidroads. Because it had a favorable cost record, this skidding system was adopted by many Appalachian loggers.

Reproduction studies have always been an important part of our research program. They are a part of every large-area study, and regeneration has been and is the subject of many special studies. We have found that clearcutting results in more reproduction, faster-growing reproduction, a greater variety of species, a higher proportion of high-value intolerants, and a higher proportion of stump sprouts than does selection cutting.

Overall, it appears that any cutting heavy enough to be economically feasible is heavy enough to result in adequate numbers of reproduction stems to regenerate the stand. We have discovered that black cherry seed lies dormant in the forest floor at least 3 years, and we have found that dormant-season logging favors yellow-poplar reproduction more than spring and summer logging does.

For a number of years, we have been trying to find better methods to artificially regenerate oak. A big problem is that young oak stems grow so slowly the first few years that they succumb to faster-growing competition. Among the methods being tested are application of fertilizers, top-pruning, outplanting of containerized stock, outplanting nursery stock of several age classes, and selection of stock that in the nursery bed displayed more than one flush of annual height growth. George W. Wendel, assisted by Robert L. Rosier, is handling this program.

The results of three site-quality studies have been published. They relate site index of the upland oaks to soil and topographic features within defined physiographic provinces. This permits site identification without recourse to measurement on standing trees. The early establishment of a site-identifying method by Trimble and Weitzman has facilitated silvicultural research because site quality is one of the main factors determining the growth rates of stands and trees and the species composition and development of reproduction. Moreover, since the establishment of oak site index as a valid indicator of forest response to treatment, it has been used widely by practicing foresters in the central Appalachians. Two of the four site-quality studies made to date were made by Harry W. Yawney, who later transferred to the Station's laboratory at Burlington, Vt.

A sapling stand that developed after clearcutting.

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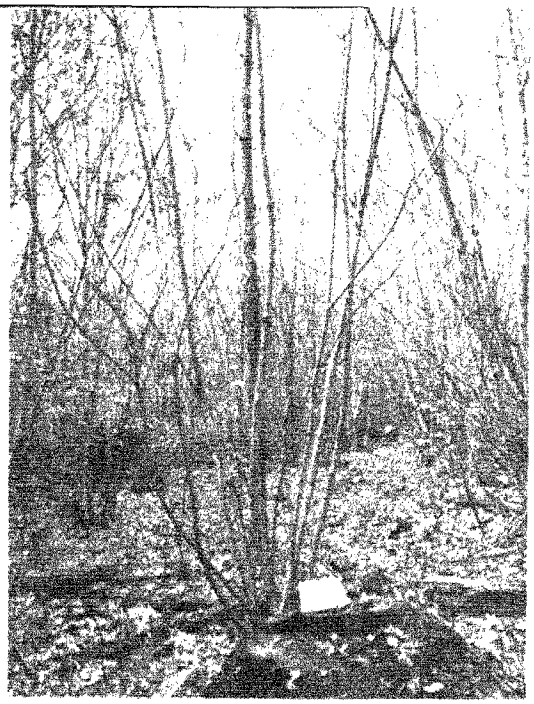
Although it was at no time a major effort, we

On the left, a stand of timber growing on an excellent site. On the right, a stand of timber growing on a very poor site. Both stands are the same age.



A red oak sprout clump at 10 years. Sprouting is under intensive study on the Fernow Experimental Forest.

have made a number of studies on how to control culls and noxious plants. Recently, considerable pioneering work has been done on grapevine control.

Grapevines may be the biggest cultural-treatment problem on good and better sites in the central Appalachians when even-aged practices are used. Grapevine seeds can germinate after lying dormant many years on the forest floor, but it is the fast-growing sprouts from cut vines that give the most trouble in young clear-cut stands. Unless controlled, grapevines may destroy or severely damage as much as three-fourths of the new tree stems. We have found that the intolerant grapevines will die if cut off under the old stand 4 years before the overstory is harvested. Their demise is caused by the shading effect of the overstory.

A number of economic evaluations of forestry returns have been made by laboratory personnel in cooperation with economists from other units. G. R. Trimble, Jr., worked with Station economists in publishing four evaluations of

Grapevines are a source of serious damage in hardwood stands on good sites.

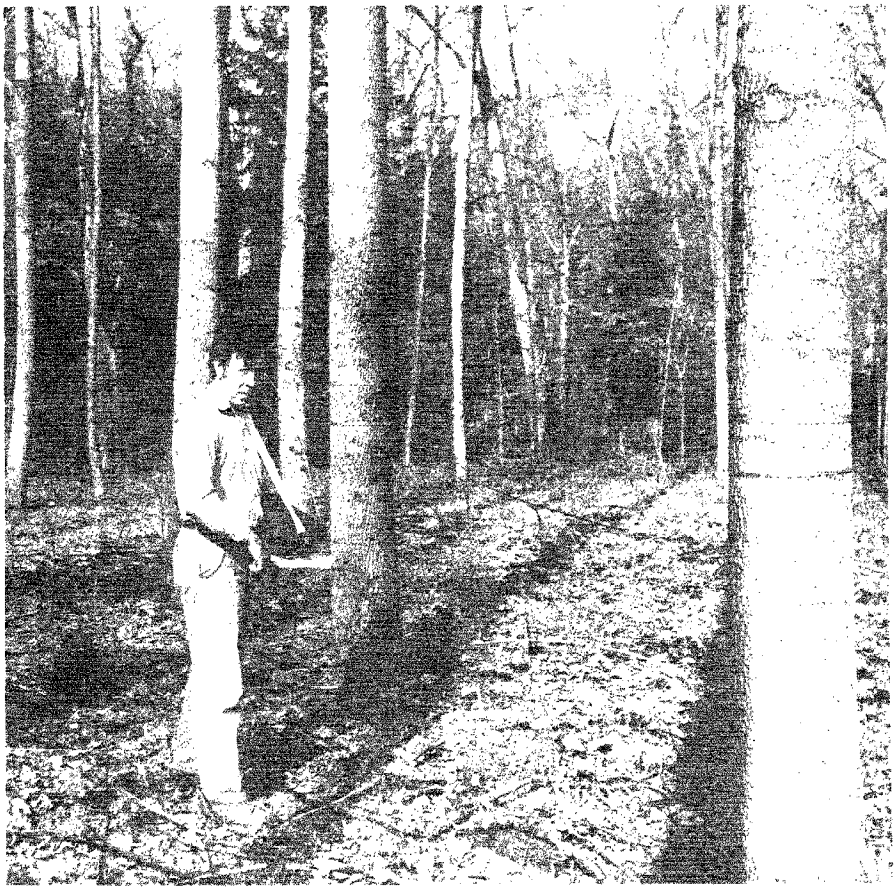
forestry costs and returns based on large-area cutting on the Fernow Forest. Other research results in the economic area that were published include: development of financial-maturity information for half a dozen important hardwood species; a field-tested method of selection marking based on financial maturity; and cost figures for a wide range of forestry operations such as tree-marking, cull-killing, and foliar-spraying to control undesirable understories.

Our genetics research has been limited to clonal testing of hybrid poplars *(Populus)* and to provenance and progeny studies involving white pine, sugar maple, and—very recently—white ash and black walnut. The hybrid poplar research identified seven clones that are very high-yielding in this area. In all of this work except the white pine tests, the Parsons unit has been cooperating with other groups that have had primary responsibility for conducting the studies.

Fertilization studies were started by Luther R. Auchmoody, soil scientist, who arrived in 1966. Auchmoody laid the groundwork for forest-nutrition research before he was replaced by Neil Lamson. To date, the work has been largely an attempt to determine what nutrient deficiencies exist in the major forest soils, as indicated by growth response of the important hardwood species.

Studies have been carried out in search of an acceptable method of converting poor-site hardwood stands to white pine. To date, underplanting several years before the hardwood

Broadcast application of fertilizer to surface of a study plot in a young stand of yellow-poplar.



White pine provenance test on an area of low site quality for hardwoods.

canopy is removed seems to be the most promising procedure, more promising than direct-seeding either before or after hardwood removal and better than planting after the overstory is harvested.

We recognize that the amount of profit in hardwood management depends heavily on the quality of the lumber that can be cut from the wood produced. In all large-area comparisons of cutting practices, we have incorporated measurements of log grade and stand defect. It has been established through studies on the Fernow Forest that intensive practice of selection silviculture on good sites produces sawtimber yields in which at least 60 percent of the harvested volume is composed of log-grade 1 and 2 material. Under the same type of silvicultural practice, defective material in the stand stabilized at about 4 percent.

Information that has been published defines for the more important species the trend of butt-log-grade improvement with increase in tree diameter.

It has been shown that understory sugar maple saplings show an improvement in stem form with an increase in height where selection cutting provides some overhead release.

It has been established that stump-sprouting after clearcutting produces a larger number of good-quality stems than has generally been believed.

Cull trees have been identified by condition classes: (1) those likely to die soon, and (2) those that will live and compete with other trees.

A number of studies produced information that permitted rating species by susceptibility to epicormic branching. And relationships have been established between epicormic branching and crown class, height on tree bole, and degree of release.

The type of study that has been emphasized most on the Fernow Forest and has taken up more time than any other has been large-area comparisons of different silvicultural systems. Because long-term comprehensive studies of both even-age and uneven-age systems have been under study for many years, considerable information was available for use in the Monongahela controversy that triggered a revision of the Organic Act of 1897. Because research results could be substantiated by on-the-ground observation of large areas treated by a wide range of practices, many Fernow data were highly effective in convincing legislators and other influential people of the general soundness of the foresters' viewpoints. Although these studies have not yet produced all the definitive results that can be expected of them, they have pointed out many strong and weak points of the two general methods of management practiced in Appalachian hardwoods—even-age versus uneven-age.

Watershed-Management Research

The present mission of the watershed-management research project is "to determine the effects of forest-resource management and use on quality, yield, and timing of streamflow; and develop methods for improving water yield and timing of forest streams without detriment to water quality".

Because research emphasis has changed with the years, I have divided this discussion into three parts to reflect this change. They correspond roughly to the tenures of the three watershed project leaders who have worked in the Parsons unit: 1950-54, G. R. Trimble, Jr.; 1955-67, Kenneth G. Reinhart; and 1968-present, James H. Patric.

Weir, stilling basin, and gage house on a study watershed.

1950-54

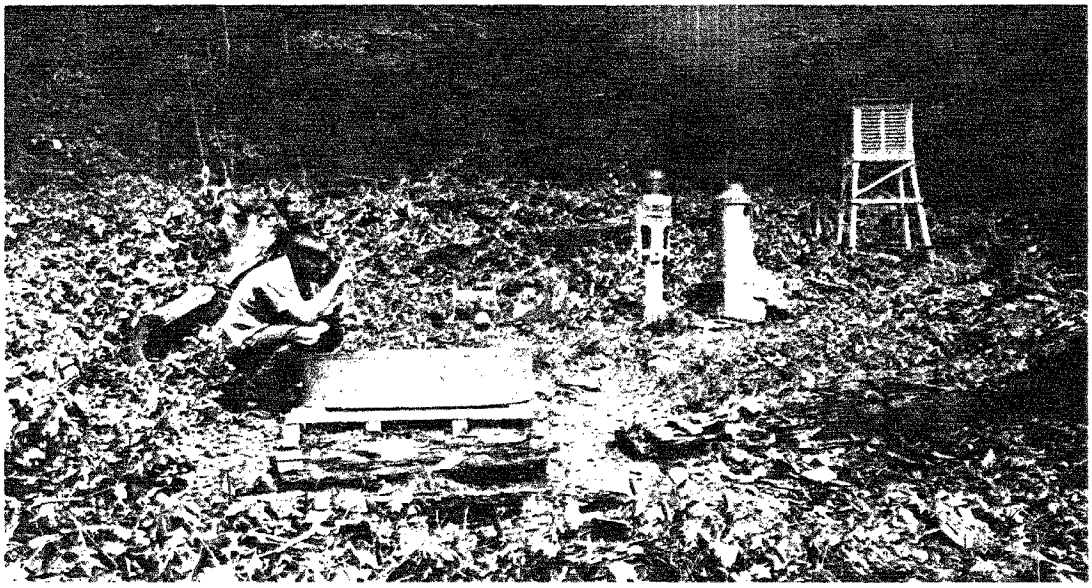
During this period, weirs were built in five watersheds, runoff-measuring and weather-recording equipment was installed, and calibration was begun. It was during the first bustle of instrumentation that Burley D. Fridley, watershed technician, demonstrated the talents that were later to earn him wide recognition—a master touch for installing and maintaining equipment used in hydrologic research.

In addition to working on the gaging study, the researchers spent many months defining the problem of skidtrail and logging-road erosion and learning how to control it—and in determining ways to keep the eroded soil out of streams. Fifteen years later, James Kochenderfer built on this information and authored a comprehensive paper on erosion control on logging roads.

It was also during this period that a study was made that showed the effect of a hardwood tree canopy in reducing the intensity of rainfall at the ground level.

1955-67

This 12-year period of watershed research at Parsons encompassed the end of the calibration period for the original five gaged watersheds and included their treatment period; it also saw the establishment of four more gaged areas and the treatment of two of them; and foremost of all, it was a time of streamflow analysis based on gaging records. Ken Reinhart, and the other men who came and went in the project during



A microclimate station on the Fernow Forest.

this period, did an outstanding job of analysis and reporting.

On the five original watersheds, four levels of cutting (one watershed was a control) showed streamflow increase to be roughly proportional to the amount of timber cut. The rate of return to pretreatment streamflow conditions also varied with the severity of treatment, less than a year being needed after the lightest cutting and a little more than 5 years required for the commercial clearcut area, where 85 percent of the cubic-foot volume was removed.

The results of this gaging study also indicated—and these findings were substantiated by later work—that road location and management, not degree of cutting, control sedimentation during and after logging. As with streamflow, the rate of sedimentation returned to pretreatment conditions rapidly, even in watersheds where road management had been very bad. This illustrated the influence of the rapid recovery of vegetation that is typical of the central Appalachians.

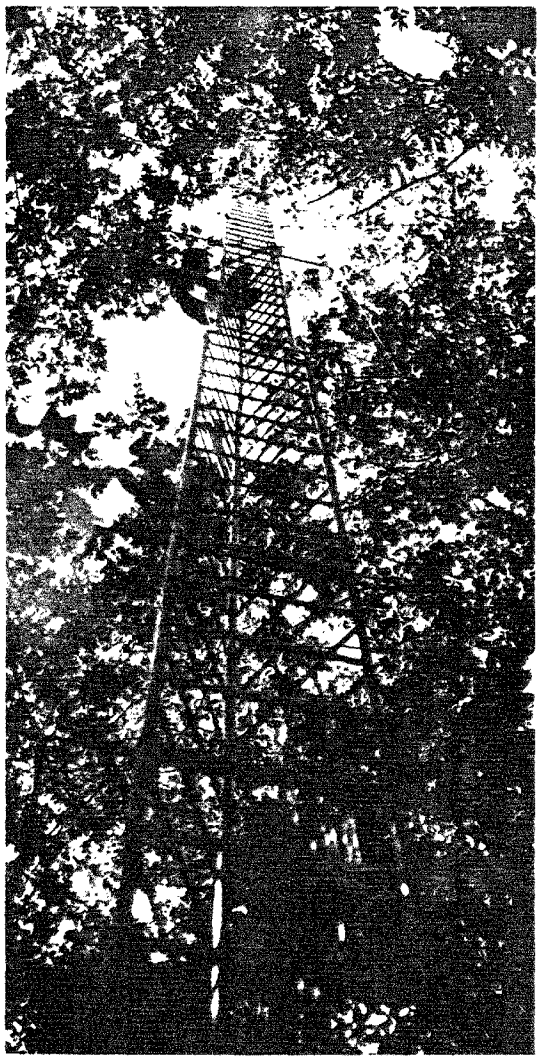
Of great importance, and creating considerable surprise, was the discovery that water increases from cutting were limited mostly to the growing season, when they were most needed and least likely to cause flood risk.

During this time of intensive involvement with gaging studies, the staff was busy also with other research, much of it concerned with reporting on analysis techniques and on the development of measuring equipment. Reinhart wrote a manual with Robert Pierce (now stationed at Hubbard Brook in New Hampshire) on the construction and use of stream-gaging stations in watershed research; this was published as a Department of Agriculture Handbook. Other developments of an inventive nature included a simple sediment filter for small streams, automatic devices to take water samples and raise trash screens at weirs, and a method of evaluating the effect of stones when making soil-moisture measurements.

In the early 1960s, James W. Hornbeck installed sophisticated weather-recording equipment, which he used to accumulate data for developing a radiant-energy budget for clearcut and forested sites in West Virginia.

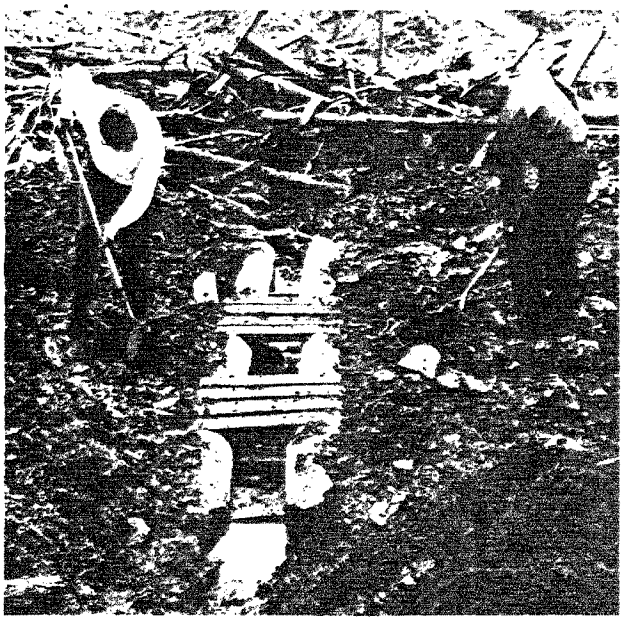
This was a period of great interest in watershed relationships by many organizations and agencies and by the general public. Because of this, our watershed scientists were in great demand for talks and reports.

A weather-observation tower on an experimental watershed.



Bulldozing a water bar. Careful designing of skid roads was an important feature of watershed research on the Forest.

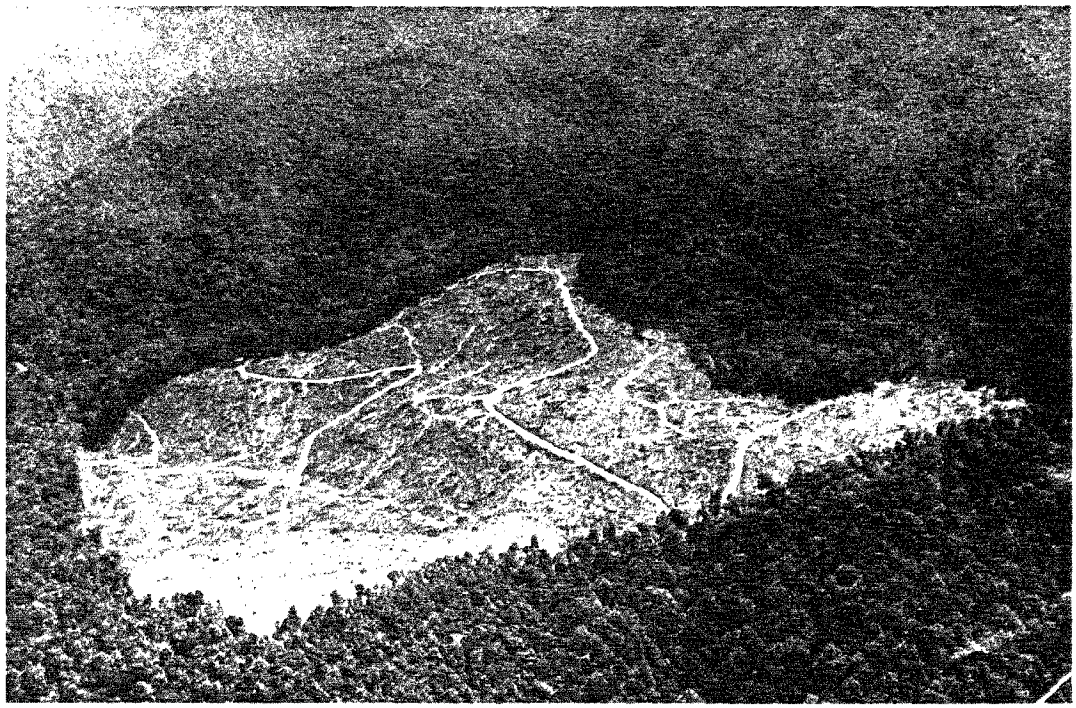
Installing an open-top culvert, one of the devices to control erosion on logging roads.



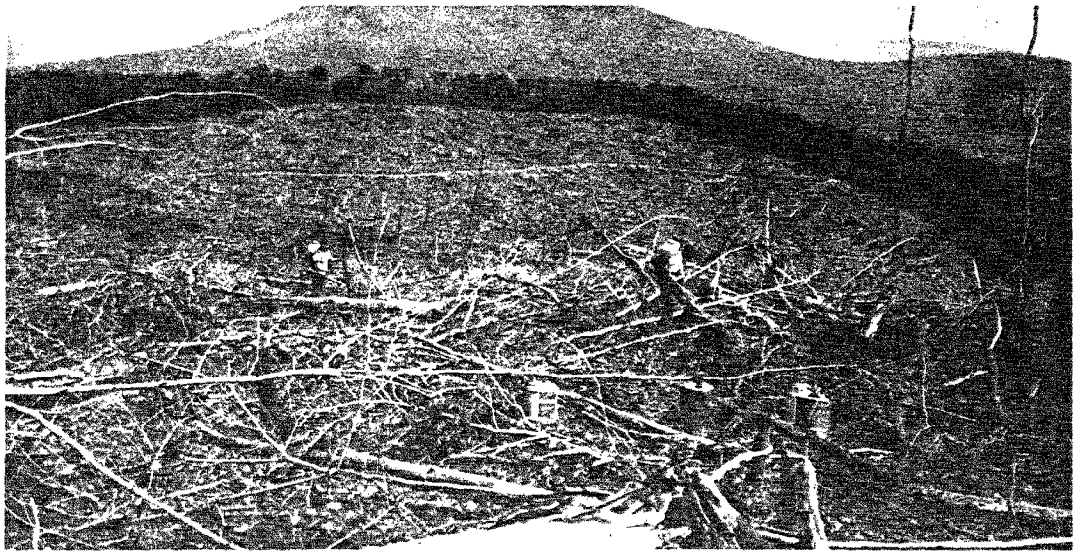
1968-Present

This was a period of research expansion and diversification, a trend that was facilitated by the increase in professional staff from three to four men, one of whom, Gerald Aubertin, was well trained in soil and water chemistry. The new project leader, James Patric, had the diverse background to lead an expanded program, having participated in watershed research in North Carolina, California, and Alaska.

A clearcut watershed where both timber and watershed studies are being carried out.



Killing low vegetation with a mistblown herbicide on an area where transpiration is being studied.



The late 1960s witnessed decreased interest in amounts of water produced on forest land, and increased interest in its quality. Only two studies concerned primarily with water yield have been carried out since 1970. In the first of these, the upper half of one watershed and the lower half of another had been clearcut in 1963; all vegetation was killed with herbicides for the next 3 years. In 1966, the remaining forested halves also were clearcut, and both watersheds were treated with herbicides *in toto* for 3 more years. Because timber on both watersheds had been removed on carefully designed and managed roads, there was no evidence of accelerated soil erosion or of sedimentation in either watershed. Water yields were about 10 inches greater after cutting than before, but the excess dropped to 7 inches 2 years after we ceased applying herbicides.

We discontinued annual use of herbicides on these two watersheds in 1970. Since then, close observation of biomass on one of the watersheds is providing a record of hardwood revegetation. Norway spruce was planted in 1972 on the other watershed to measure the transpiration difference between conifers and hardwoods. This watershed was sprayed with 2,4,5-T in 1975 to release the spruce from overtopping hardwoods. Logan Norris' project at the Pacific Northwest Forest and Range Experiment Station provided funding and analytical facilities for a full-scale test of herbicide effects on vegetation, soil, water, and small-mammal populations.

Hydrologic record-keeping for two openland watersheds begun in 1957 was discontinued in 1971. These watersheds had been reverting from farmland to forest since abandonment in the 1930s. Careful analysis of the hydrologic data indicated that observation had begun too late in the reversion process to demonstrate measurable effects of reforestation on the quantity or quality of streamflow. This study did show that, at least under the conditions extant, abandoned farm lands recover hydrologically very well naturally.

Several studies, begun early in the 1970s, dealt with water quality. On one watershed, water-quality analyses, before and after the timber was clearcut, refuted at least for this area the widely-held belief that clearcutting diminishes the productive capability of forest land by accelerating the loss of soil fertility through streamflow. No appreciable increase in the outflow of nutrients was found.

Helicopter application of urea to an 80-acre watershed increased the nitrate content of the stream, but not enough to exceed public health standards. Analyses of data from several follow-up studies designed to further test the effects of other timber-harvesting and fertilization measures on water quality are incomplete.

Another widespread belief—that an unvarying supply of virtually pure water is assured by severe curtailment of timber harvesting—is countered by observing water quality from catchments only minimally influenced by human activity. Thus, variation in chemical and physical properties of the stream draining the Fernow control watershed demonstrates some natural fluctuation in quality of water from a catchment protected from timber harvesting for 65 years. Other studies, in close collaboration with Monongahela National Forest hydrologists, are adding much understanding of this natural variation.

Chemical properties of precipitation, particularly its acidity, not only influence chemical properties of streams, but also provide a frequently overlooked source of plant nutrients to forest soils. Precipitation chemistry is being measured on the Monongahela National Forest as well as on the Fernow Forest.

Recent technological advances have contributed greatly to our efforts to understand how water moves from the atmosphere, through forest soil and rock, to streams. By 1970, most forest hydrologists had concluded that surface runoff or overland flow has little to do with this movement. Development of the neutron moderation method permitted rapid, repetitive, and nondestructive sampling of soil moisture, helping greatly to enhance our understanding of water movement through forest soil. Under the leadership of Charles Troendle, the continuing effort to understand stream generation on forest land has progressed from investigation on crudely instrumented plots to heavily automated observation over entire small watersheds. Now our understanding of watershed processes and computer processing is sufficiently advanced that we can begin the mathematical modeling of baseflow as well as stormflow from properly instrumented watersheds.

SPECIAL ACTIVITIES AND UNIQUE ASPECTS OF THE LABORATORY'S PROGRAM

Logging Crew

Because we control the logging crew that does the research cutting on the Fernow Forest, we are able to get treatments made how and when we want. We exercise this control by hiring and supervising the men and by owning the logging equipment. We do this through a cooperative agreement with a private sawmill operator who contracts for the timber we cut. He reimburses us for the wages paid to the loggers and for the cost of equipment. Because the Fernow Forest is part of the Monongahela National Forest, he also pays appraised stumpage to the Treasury of the United States for the timber. In this way, we finance our research cuttings, except when small products are involved, such as pulpwood and charcoal wood. To harvest them, we sell stumpage.

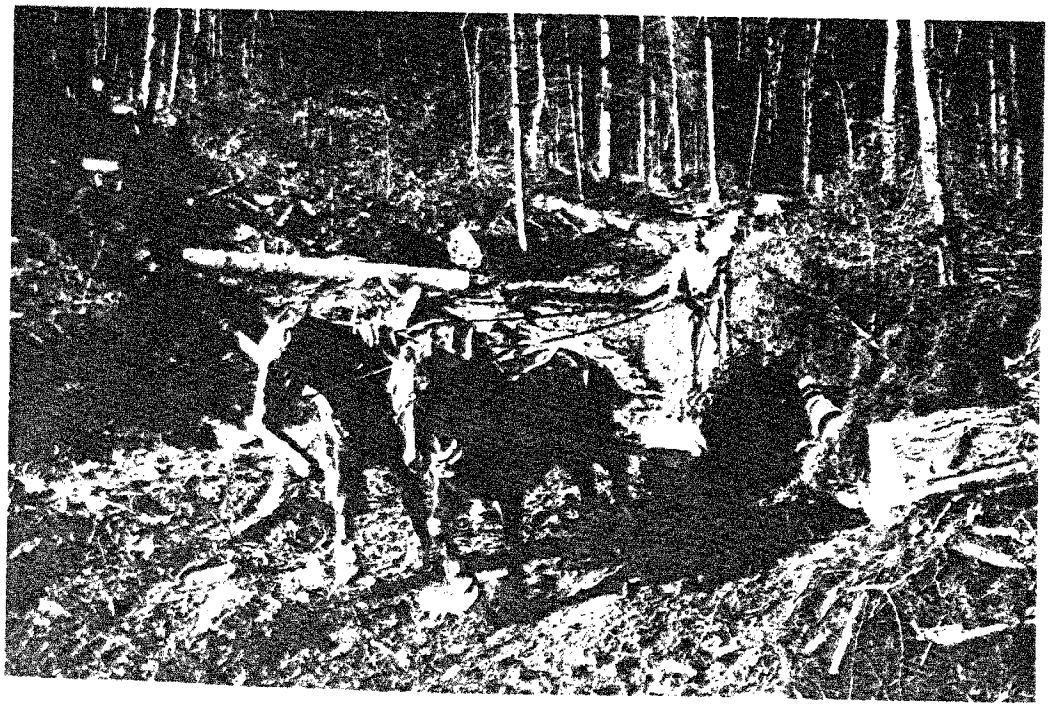
From 1949 until 1974, Woodrow Price was our cooperator; since then Elmer Mullenax has been.

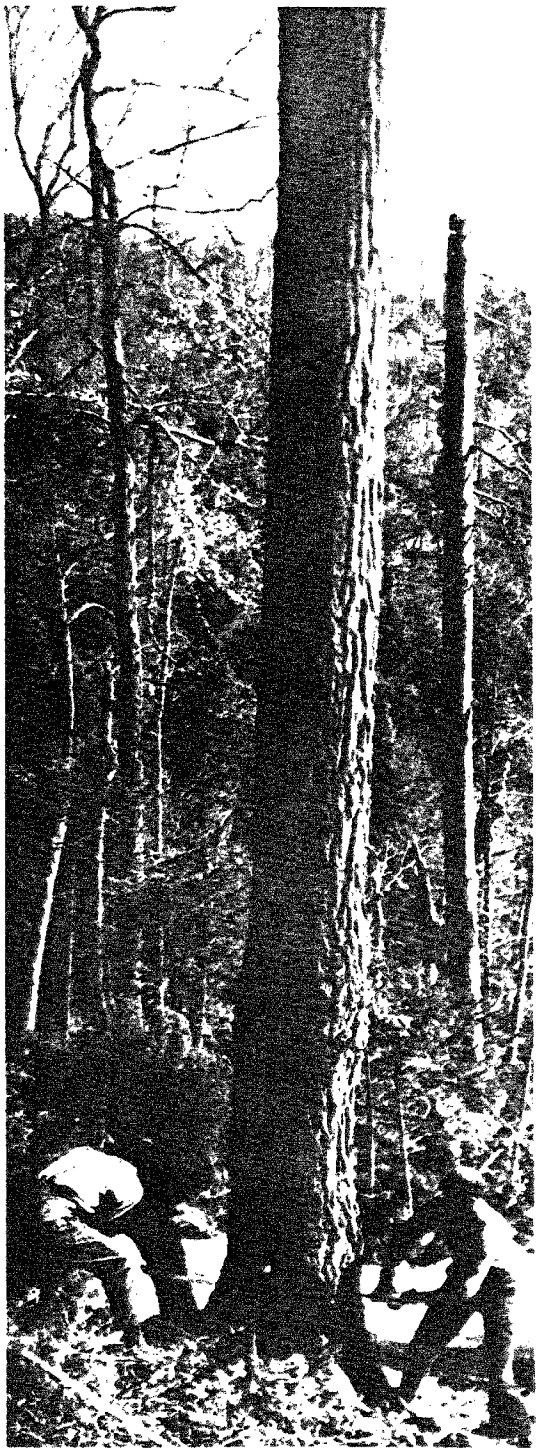
Another advantage derived from close control of the logging crew is that we are able to carry out studies in timber-harvesting methods, road layout, and equipment use. The loggers are available also for transfer to the research payroll when they are needed for use on jobs such as weir maintenance and timber-stand-improvement work.

Still another advantage of this arrangement is the practical training the researchers get through association with a real logging operation. This association undoubtedly has helped the foresters set timber-management-research priorities on a more realistic basis.

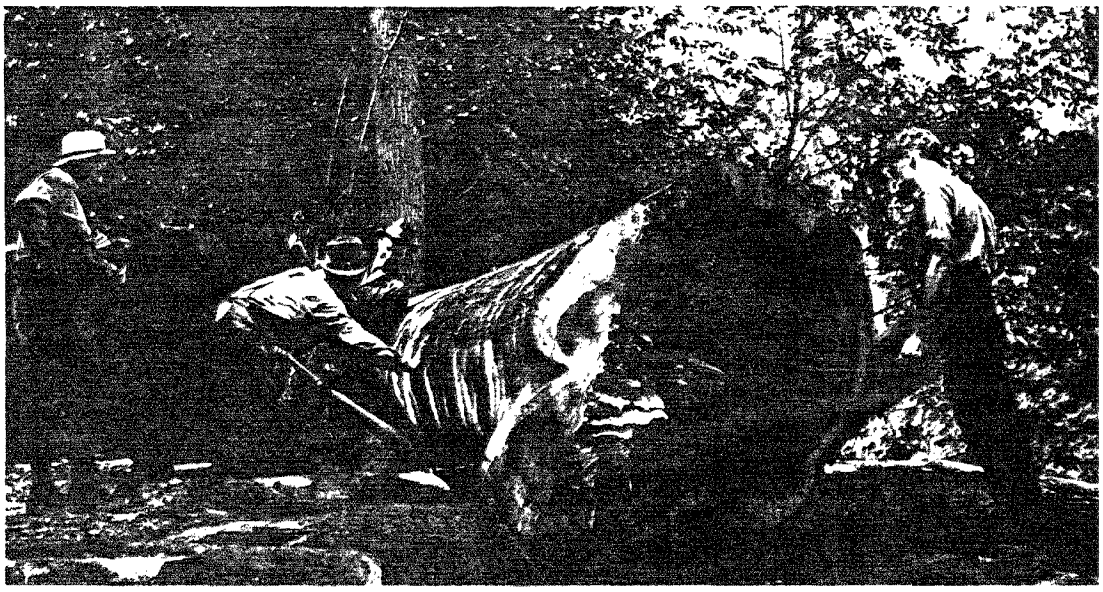
From 1949 until the present—the period of logging—we have harvested 17,600,000 board feet of sawtimber (International 1/4-inch kerf rule), and 5,600 cords of small products from the Fernow Forest. From the stumpage paid for this wood, 25 percent goes to the county for roads and schools—a very welcome income for them.

In the early days of logging, horses and oxen were used to skid logs out to the landing.



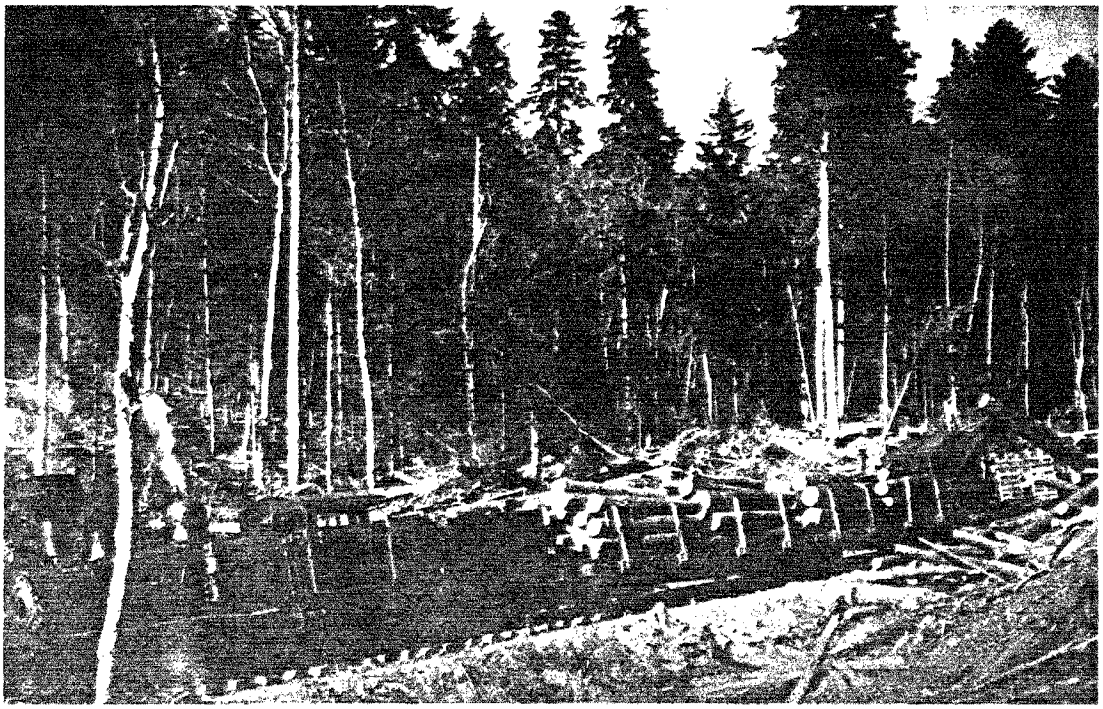


Felling a tree the old way, with a two-man crosscut saw.

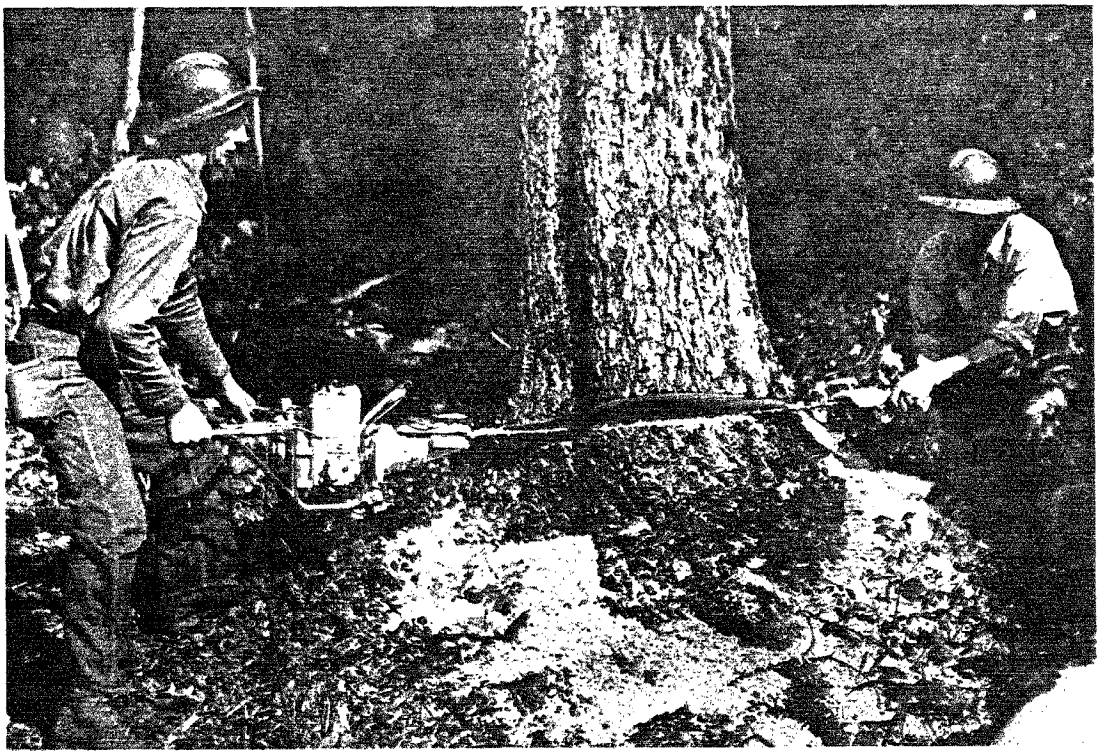


Moving logs on the deck the old hard way, with peavy and man-muscle.

In the early days of logging in West Virginia, logging railroads were built to haul logs from the forest to the mill, and some of the present roads on the Fernow Forest are built on the old railroad grades. This Shay steam locomotive and its load of logs are typical of early logging.

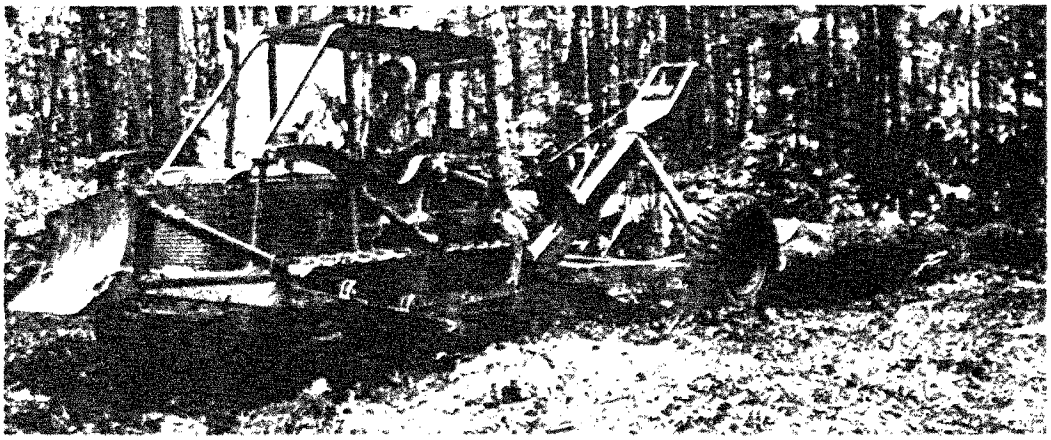


An improvement over the backbreaking crosscut saw: a two-man gasoline powered chainsaw.



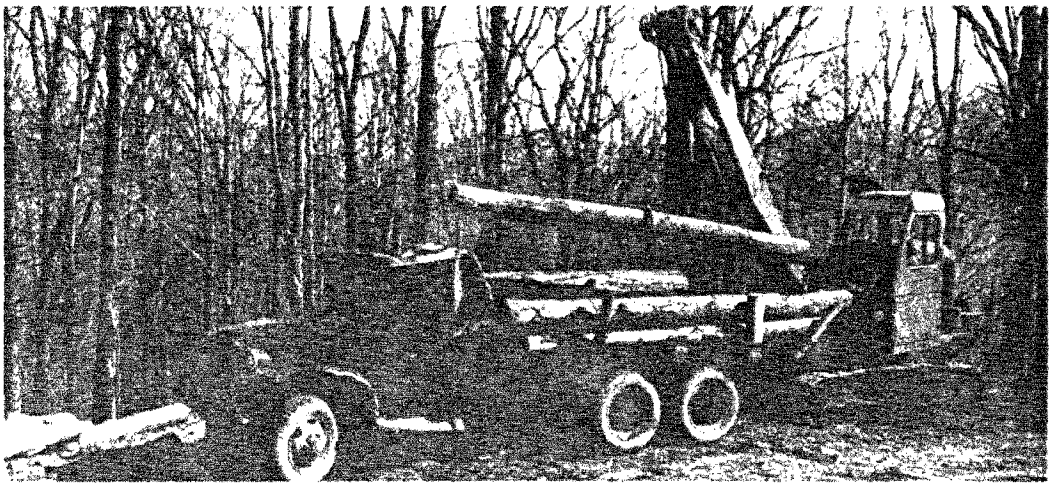
Felling timber the modern way, with a one-man chainsaw.

Skidding logs with a tractor on the Fernow Forest. The tree-length skidding pioneered on the Forest has been adopted by many Appalachian loggers.



Bucking tree lengths into logs on the deck.

Loading a truck the modern way with a loader.



Advisory Committee

In early 1948, station director V.L. Harper asked the members of the forest research committee of the West Virginia Forest Council (an organization now defunct) to act also as an advisory committee to the Mountain State Research Center. They agreed. The members of this first advisory committee were: W.C. Percival, head of the Division of Forestry at West Virginia University—chairman; W. B. Sayers, state forester; Arch Boyce, landowner; John Tillinghast, consulting forester; A.S. Wilson, vice-president and general manager of the Boone County Coal Corporation; and Arthur A. Wood, supervisor of the Monongahela National Forest. From this beginning, the Committee was expanded gradually over the years.

Until 1973, this group met annually with the Laboratory staff to review the research program. At this time the Forest Service discontinued formal advisory committees in favor of an *ad hoc* committee approach for soliciting advice.

At the time of the last meeting of the committee, the following were members: John Adams, Jr., forester, Western Maryland Railroad; Robert Schirck, timber staff officer, Monongahela National Forest; Tunis J. Lyon, chief of forest management, state of Maryland; Lester D. McClung, state forester of West Virginia; Raymond Menendez, fishery biologist, West Virginia Department of Natural Resources; Wilmer A. Stanley, manager, Beckley Water Company; John Tillinghast, consulting forester; R. P. True, professor of plant pathology, West Virginia University; David White, head of Division of Forestry, West Virginia University; and John B. Genys, Natural Resources Institute, University of Maryland.

Throughout the years, the advisory committee has functioned as a source of ideas, a sounding board, and a bulwark of support.

Meeting of the research unit's Advisory Committee members and guests in 1954.

Cooperative Studies

Cooperative studies have been part of the program from the beginning. The first cooperative research was with the West Virginia Department of Natural Resources—a study of the effect on deer browse of a range of cutting practices. Clay Smith (then a forest researcher and now timber-management project leader at the Laboratory) and Jack Cromer (deer biologist with the West Virginia Department of Natural Resources) published the results of the study, which, in essence, indicated that any cutting heavy enough to be economically feasible was heavy enough to produce sufficient browse to support a deer herd of reasonable size.

A number of studies have been made in cooperation with the Monongahela National Forest. The Monongahela people have been particularly helpful in designating several hundred acres for research—in addition to the Fernow Forest.

Perhaps our most consistent cooperator has been the Division of Forestry of West Virginia University. E. H. Tryon, of the staff there, has worked cooperatively with us for more than 20 years. Other departments of the University and many individual professors have cooperated in research with the Laboratory staff. Several graduate students have written theses based on work done on the Fernow Forest.

It is impossible to mention all the agencies and individuals who have enhanced the research program through their cooperation. Following are some of the many: Soil Conservation Service, other research units of the Northeastern Station, Allegheny National Forest, Jefferson National Forest, State and Private Forestry, Maryland Department of Forests and Parks, Shippensburg State College, Virginia Polytechnic Institute, Pennsylvania State University, Glenville College, Davis and Elkins College, AGRICO, Kaiser Chemical Company, WESTVACO, Union Carbide-Olefins Company, Ohio State University, Muskingum Conservancy District, New York State University College of Forestry, and University of Georgia.

Multiproject Program

In 1970, Warren Doolittle, at that time director of the Northeastern Forest Experiment Station, appointed a four-man committee to: (1) explore the feasibility of developing an interproject or multiproject program of research; (2) to propose areas of potential cooperation; and (3) to suggest an organizational structure to get the job done. The committee was composed of the following project leaders: Donald Cuppett (Forest Products Marketing Laboratory at Princeton, W. Va.), James Patric (Parsons Timber and Watershed Laboratory), John Gill (Forestry Sciences Laboratory at Morgantown, W. Va.), and G.R. Trimble, Jr. (Parsons Timber and Watershed Laboratory). Within 6 months, a report was prepared, submitted, and approved—with a few minor changes made by the Upper Darby and Washington offices.

Two reasons triggered the proposal of a multiproject program: (1) the greatly expanded interest in use of forest land by a large number of people who are oriented to different uses; and (2) the need to present research results in a more complete form so that they would be more easily usable by practitioners.

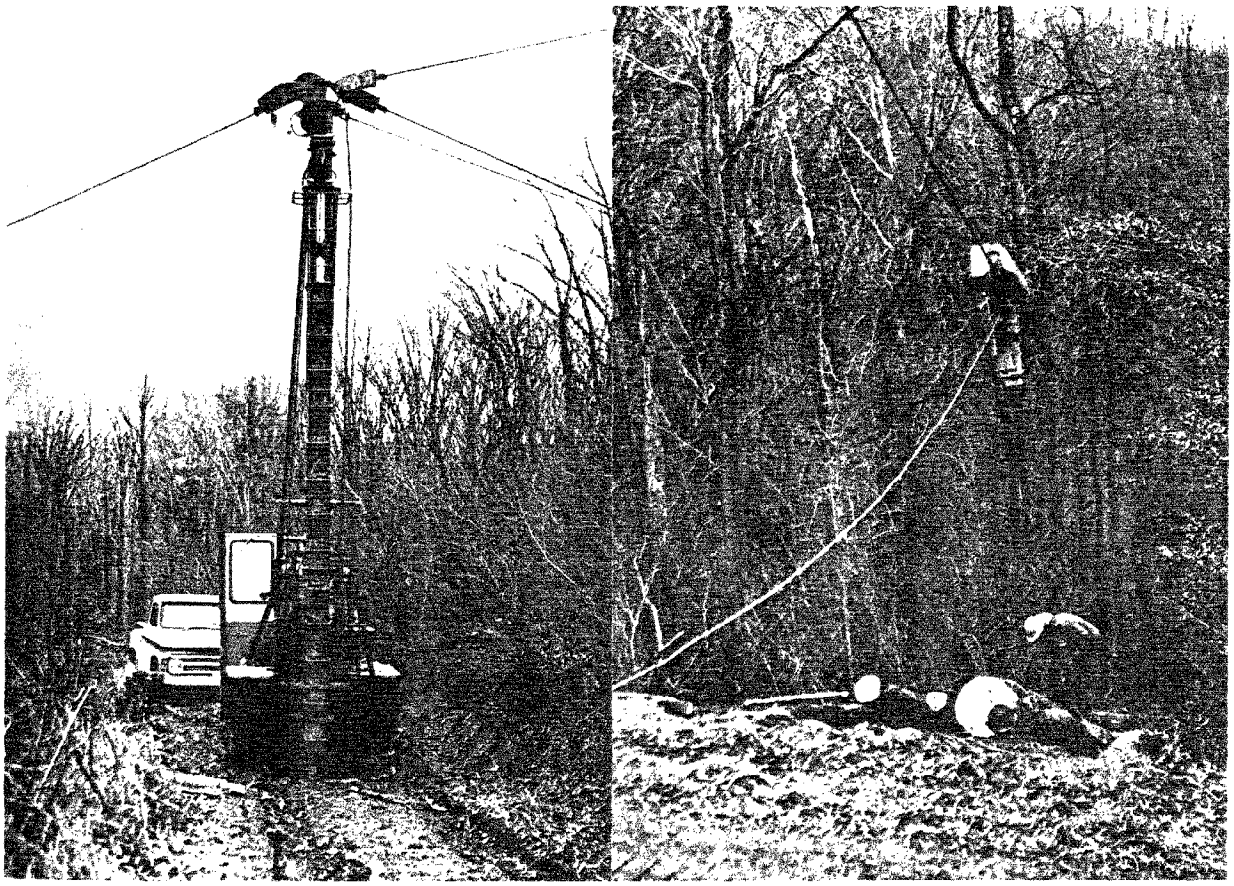
The following problem areas were approved for cooperative research:

1. Assemble and evaluate existing knowledge about resource management and synthesize it into recommendations and an array of options for multiresource management.
2. Determine the ecological consequences of alternative timber-management systems.
3. Develop methods of displaying and comparing alternatives for use in allocating forest-resource capabilities.
4. Develop more economical logging systems with emphasis on thinning in pole-size stands and on esthetic considerations in all situations.
5. Evaluate, from physical-site and recreation-user standpoints, administrative and management alternatives that can be used to restore overused recreation sites.

It was decided to make no changes in the structure of the projects to accomplish the additional research entailed in this new activity. Instead, because each problem would call for a somewhat different mix of talents, different people would be needed to work on each problem. The multiproject problems would be solved, not by shifting people around, but by assigning duties to people in existing projects. This meant some changes in work loads, and the new activities had to be planned for.

The work called for in problem 1 was completed in 1974 with the publication of a paper describing some options for managing forest land in central Appalachia. The final report covering the work called for in problem 3 is almost complete. Work on problem 4 has been under way on the Fernow Forest for about 2 years. This work, to date, has included the testing of two different types of logging equipment: Chuball, or ball skidding; and overhead cable skidding with the URUS skyline equipment. The Chuball proved to be impracticable, but the URUS definitely has possibilities. The success of the equipment-testing research rests in considerable measure on the ingenuity and mechanical ability of Paul Smithson, current logging boss.

The URUS cable skyline system, developed in Europe for logging steep mountainous terrain, is being tested on the Fernow Forest.



Foreign Forester Training Program

A number of foreign foresters have visited the Parsons Timber and Watershed Laboratory. For a 10-year period, during the mid and late 1950s and the early 1960s, this was considered to be the foremost location in the United States where foreign foresters were sent for training in mountain hardwood forestry. Primarily, they came to study logging methods and watershed management.

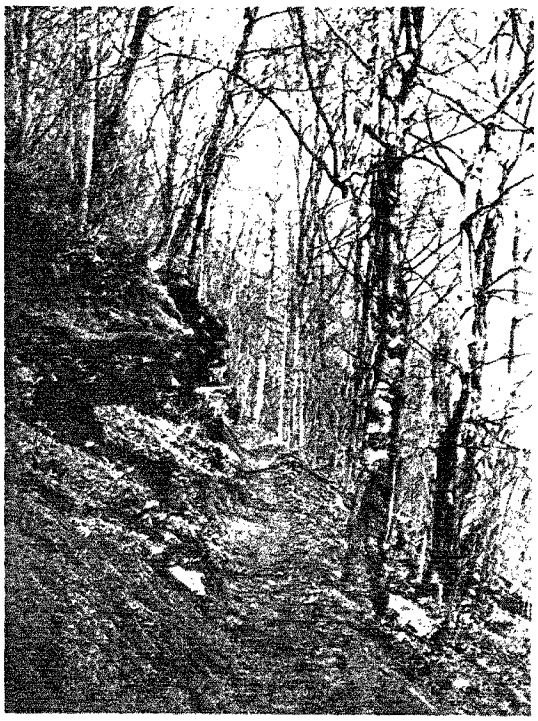
We have hosted a total of more than 500 foreign visitors. Among them were student foresters and chiefs of national forestry agencies; included also were university professors, private foresters, and foresters working for the United Nations. The length of their stays ranged from a couple of hours to 6 months; and they came from more than 35 countries.

Dissemination of Research Results

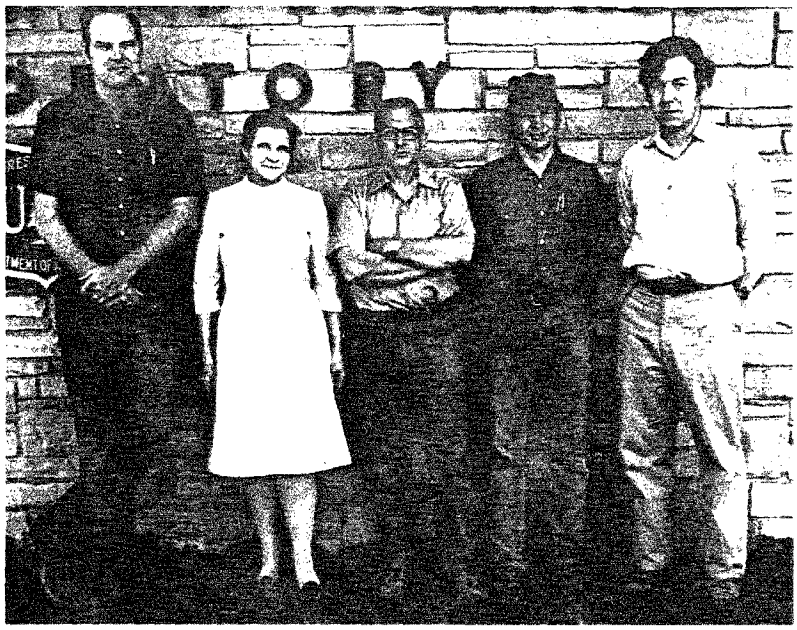
The results of our research are disseminated by word of mouth, through publications, and by demonstrations on the ground—what we call show-me trips. In addition to the many informal discussions, Laboratory personnel present 5 to 10 formal papers a year at meetings of various groups. From the unit's inception in 1948 until 1976, Laboratory people have authored or coauthored 259 published papers. Ten of these were of a general nature; 108 were watershed papers; and 141 were on timber-management subjects.

Discussion and publication undoubtedly result in widespread application of research results; but for many users, demonstration on the ground is the real clincher that determines whether or not the information will be applied. For this reason, we have stressed the development of meaningful show-me trips. Because many of our studies are carried out on large areas and are long-range in nature, our type of program is ideal for the practical demonstration of research results. About 500 information seekers participate annually in these trips.

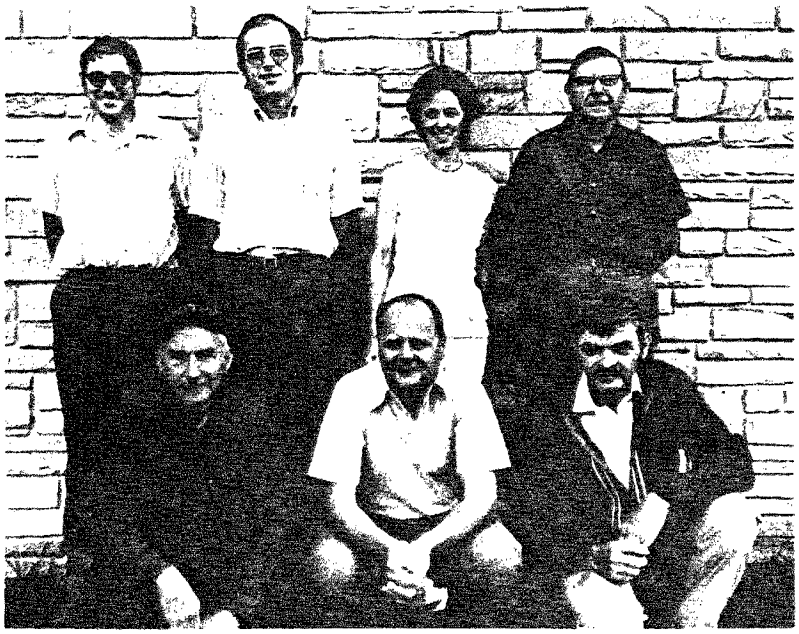
The Zero Trail on the Fernow Forest—originally an access trail—runs 7 miles through steep country on a zero grade.



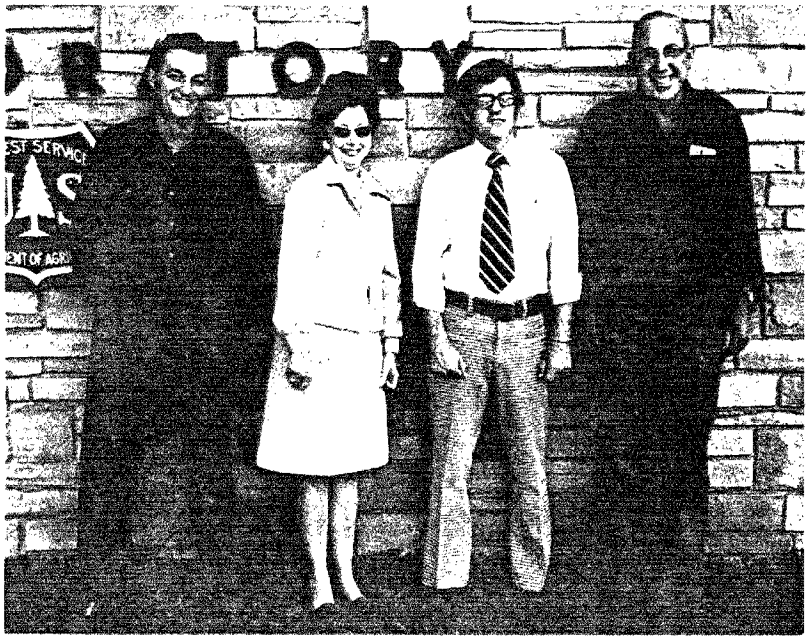
The timber-management research staff in 1976. Left to right: H. Clay Smith, Kathleen P. Hammack, George W. Wendel, Robert L. Rosier, and Neil I. Lamson.



The watershed management research staff in 1976. Front row, left to right: Burley D. Fridley, James H. Patric, James D. Phillips. Rear row, left to right: James N. Kochenderfer, Charles A. Troendle, Anne C. Denison, John Campbell. Gerald M. Aubertin was not present when photograph was taken.



The research support services staff in 1976. Left to right: Kenneth L. White, Dovie M. Fansler, Eddie S. Canterbury, Delbert Little.



The Fernow Forest logging crew in 1976. Left to right: Paul M. Smithson, Lee Long, Norman A. Long, Ronald C. Miller.

Roster of Regular Personnel

[TMR = timber-management research
WMR = watershed-management research]

Name	*Dates*	*Position*
Sidney Weitzman	1948 – 1956	Center leader
Thomas G. Clark	1948 – 1950	Research forester, TMR
Carl J. Holcomb	1948 – 1955	Project leader, TMR
Carl R. Barr	1948 – 1962	Logging superintendent
Geraldine Trickett	1948 – 1951	Clerk-typist
Daniel Hardy	1949 – 1963	Tree faller-choker setter
Norman Long	1949 – —	Tree faller-choker setter
Roy Hardy	1949 – 1954	Tree faller-choker setter
Burley Fridley	1950 – —	Forestry technician, WMR
George R. Trimble, Jr.	1950 – 1954	Project leader WMR
	1957 – 1973	Center leader; project leader, TMR; chief of laboratory
Kathleen P. Hammack	1951 – —	Clerk-stenographer; statistical assistant, TMR
Ronald C. Miller	1951 – —	Tree faller-choker setter
Letus Sherman	1951 – 1961	Tree faller-choker setter
Eli Fenchak	1952 – 1955	Forestry technician, TMR
Robert Lindahl	1952 – 1956	Research forester, TMR
Russell Hutnik	1954 – 1957	Project leader, TMR
Kenneth G. Reinhart	1955 – 1967	Project leader, WMR
James D. Phillips	1955 – 1958	Tree faller–choker setter
	1965 – —	Forestry technician, WMR
Wilfred Mitchell	1956 – 1961	Research forester, TMR
George E. Hart	1956 – 1961	Research forester, TMR & WMR
John Phillips	1956 – 1960	Research forester, WMR
Harry Yawney	1957 – 1962	Research forester, TMR
John Staley	1958 – 1962	Forest pathologist, TMR
Arthur Eschner	1958 – 1961	Research forester, WMR
Frank Roberts	1958 – 1961	Forestry aide
Carter Gibbs	1960 – 1964	Research forester; Project leader, TMR
Kathleen Polino	1960 – 1962	Clerk-typist
Gary Corcoran	1960 – 1967	Forestry technician, TMR
Robert Brisbin	1961 – 1961	Research forester, TMR
Diana Simmons	1962 – 1964	Clerk-typist
Paul Smithson	1962 – —	Logging superintendent
George W. Wendel	1962 – —	Research forester, TMR
John Campbell	1962 – 1965	Tree faller-choker setter
	1965 – —	Forestry technician, WMR
James Hornbeck	1962 – 1967	Research forester, WMR
H. Clay Smith	1962 – 1967	Research forester, TMR
	1973 – —	Project leader, TMR
Dovie M. Fansler	1964 – —	Clerk-typist; administrative clerk
Sandra Barr	1964 – 1968	Clerk typist; statistical clerk, WMR
Delbert Little	1965 – —	Maintenance worker

Benjamin O. Backus	1965 – 1967	Administrative assistant
Allen Hopkins	1965 – 1966	Forestry aide, WMR
Lee Long	1966 – —	Tree faller-choker setter
Charles Troendle	1966 – —	Research forester, WMR
Luther Auchmoody	1966 – 1971	Research forester, TMR
Robert Rosier	1967 – —	Forestry technician, TMR
Merle Grant	1967 – 1969	Administrative assistant
James Patric	1967 – —	Project leader, WMR; chief of laboratory
James Kochenderfer	1967 – —	Research forester, WMR
Anne Denison	1969 – —	Clerk-typist, statistical assistant, WMR
Eddie S. Canterbury	1969 – —	Administrative assistant; business-management specialist
Gerald M. Aubertin	1970 – 1976	Research soil scientist, WMR
Cecil A. Yockey	1970 – 1972	Forestry technician, WMR
Kenneth White	1973 – —	Maintenance worker
Neil I. Lamson	1974 – —	Research forester, TMR

SOME OF THE PEOPLE

who have served on the Fernow Experimental Forest and at the Parsons Timber and Watershed Laboratory.

Sidney Weitzman

Thomas G. Clark

Carl J. Holcomb

Carl R. Barr

George R. Trimble, Jr.

Robert R. Lindahl

Russell J. Hutnik

Kenneth G. Reinhart

Wilfred C. Mitchell

George E. Hart

John J. Phillips

Harry W. Yawney

Arthur R. Eschner

Carter B. Gibbs

James W. Hornbeck

Benjamin O. Backus

Luther R. Auchmoody

Merle B. Grant

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1962

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