A Look at RESEARCH and MULTIPLE-USE MANAGEMENT

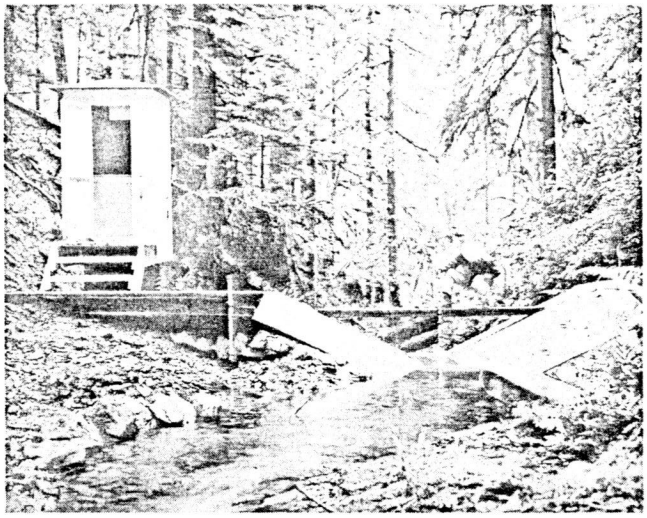
on the
H. J. Andrews Experimental Forest
located on the
Willamette National Forest

WOOD · WATER · FORAGE · WILDLIFE · RECREATION

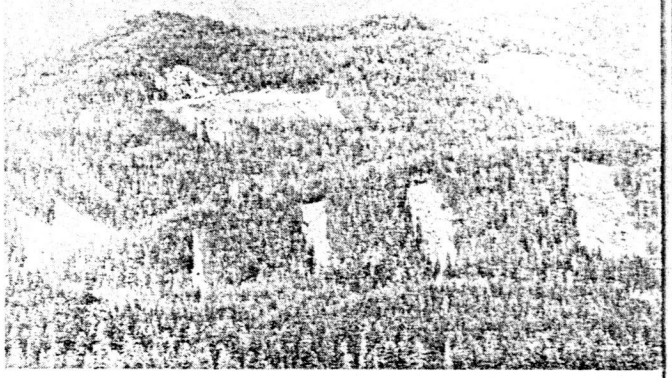
FOREST SERVICE
U S
DEPARTMENT OF AGRICULTURE

Forest Service, U.S. Department of Agriculture

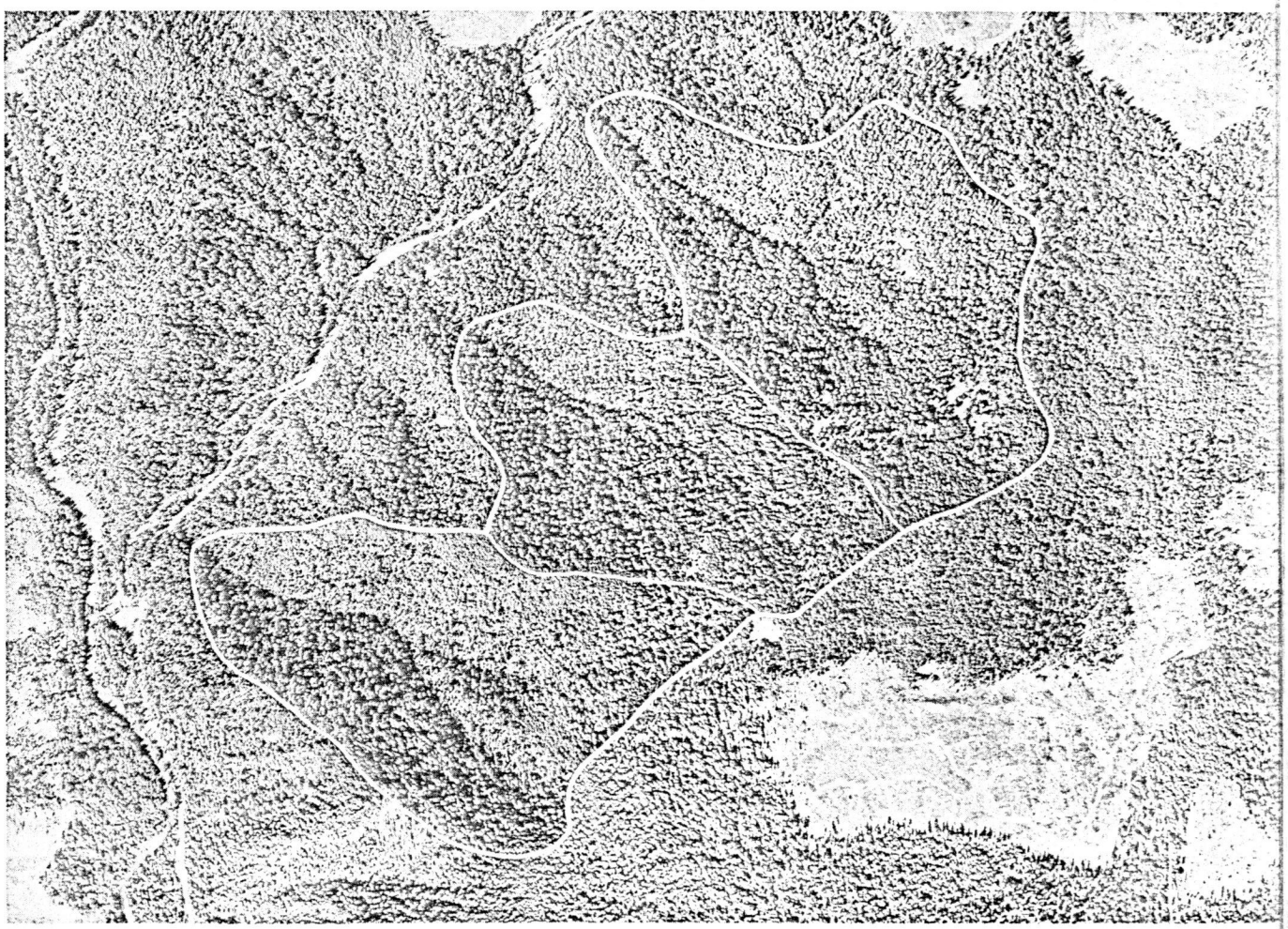
USDA SCS PORTLAND, OREG. 1958



Stream gauging stations are used on the experimental forest for determining effects of land management practices on stream flow



Different patterns and areas of timber cutting have been made to study the effects of these factors



Three small watersheds of nearly equal size, characteristics, and stream flow have been selected for comparative studies. To measure the effects of logging practices on water production two will be logged by different methods and one left in the natural state for comparison

A Look at Research and Multiple-Use Management
on the
H. J. Andrews Experimental Forest
Located on the
Willamette National Forest

Welcome to the Willamette National Forest and the H. J. Andrews Experimental Forest located on the Blue River Ranger District. The U. S. Forest Service is happy to be your host on this occasion and we hope that the tour will be both enjoyable and informative. The Willamette National Forest is one of some 150 in the United States and Alaska, and is one of 19 national forests in Oregon and Washington. As is the case with most national forests, those in Oregon and Washington are found in the mountainous areas. Willamette forest headquarters are in Eugene, Oregon. Its 1,800,000 acres of forest land are located on the western slopes of the central Oregon Cascade Mountains. The Willamette National Forest is now the largest producer of timber of all national forests in the United States. Many of its stands have a wood volume in excess of 100,000 board feet per acre.

The work of the Forest Service is split up into three branches: national forest administration, state and private forestry cooperation, and research. Today you will see research and national forest administration. The U. S. Forest Service aims to manage the national forests so that they will bring the greatest good to the greatest number of people in the long run. This means handling the basic elements--soil and water--carefully. And, dependent upon these two elements is a living and interrelated community of plants, animals and man. The products of our forest and range lands are wood, water, wildlife, forage, recreation and minerals.

The United States Census Bureau estimates that the increase in population in this country is one person every 11 seconds. Think of it! This is more than 7,000 new people per day, or nearly three million every year.

A population explosion of this magnitude means sharply greater demands for all of these products of the forest. It means conflicts of interest among groups of forest users. How can we meet these demands? Large as the national forests are, there simply is not enough area to supply all of the various interest groups with their desires under single-use management. But we believe that we can come close to meeting these vital needs of people if the forests are handled under the multiple-use principle. Multiple-use management is a concept--not a system. Its

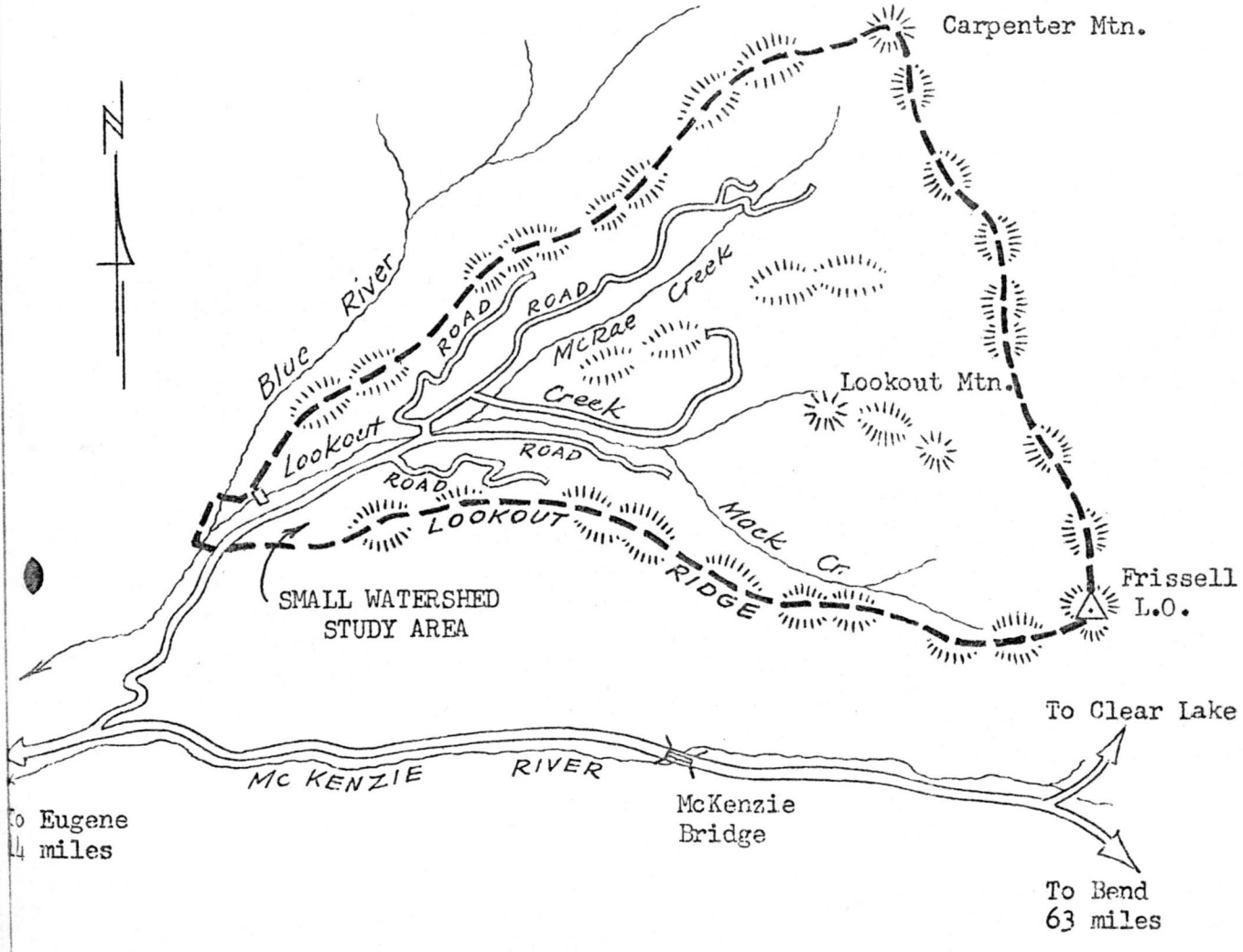
application does not require that all uses occur on every acre. But it does mean the coordination of all uses on a larger area, such as a ranger district or national forest. The different uses must be handled in a harmonious pattern.

Timber harvesting, properly done, can actually increase the forage for livestock and big game animals. It can make a campground a more safe place. Research indicates that proper timber harvesting can sometimes increase water yield from an area. Timber harvesting and grazing can be made compatible in the same watershed with recreation. Our job is to fit these uses together with proper limitations and safeguards on each. In this era of increasing populations we cannot afford the luxury of a single-purpose use of large segments of our public lands such as the Willamette National Forest.

Forest administrators need to know the answers to many questions in land management to make the proper decisions as to what to do and how to do it. This is where research comes in. Forest scientists conduct research studies to supply these answers. Here in Oregon and Washington, Forest Service research work is carried on by the personnel of the Pacific Northwest Forest and Range Experiment Station and its six research centers in both States. The Willamette Research Center is one of them, with headquarters in Corvallis. Part of the research work being done by the Willamette Research Center takes place on the H. J. Andrews Experimental Forest, named for former Regional Forester H. J. Andrews. It was established in 1948 to learn and demonstrate improved methods of multiple-use management, particularly in old growth Douglas-fir forests on mountain watersheds. Studies are under way to determine the effects of timber harvest and road building on streamflow and soil loss. The related effects on fish and game habitat are being studied by the Oregon Cooperative Wildlife Research Unit and the Oregon Game Commission. These studies will be explained to you on your trip.

We have included a more detailed statement of the important research studies on the H. J. Andrews Experimental Forest.

Sketch Map - H. J. Andrews Experimental Forest



Pacific Northwest Forest and Range Experiment Station
Forest Service
Portland, Oregon
August 24, 1955

September 16, 1958

Research Program

H. J. ANDREWS EXPERIMENTAL FOREST
Blue River, Oregon

FOREST SERVICE
U. S. DEPARTMENT OF AGRICULTURE

This 15,000-acre experimental forest includes the entire drainage of Lookout Creek. It was established in 1948 to serve as a pilot plant where the most promising timber-growing and watershed-management practices could be tested on a commercial scale. The 400-year-old stand of Douglas-fir, which occupies two-thirds of the forest, is representative of the old-growth forests in the Oregon Cascades. All land in the watershed is under the administration of the Willamette National Forest. Research is planned and carried out by the Pacific Northwest Forest and Range Experiment Station.

In 1948, the area was a near wilderness reached by a single fire road and a few ridgetop trails. The first step in the research program was to develop a carefully thought out forestry-logging plan to bring the area under management. This resulted in construction of a permanent road system, which opened the drainage for intensive study. To date, some 30 miles of road have been completed. These roads provide access for harvest of overmature timber, regeneration of cutover areas, fire protection, and establishment of new studies. A wide variety of forestry problems are now being studied on the experimental area.

Research Program

The research program has been focused on problems of converting old-growth timber stands to fast growing, productive young forests. This must be done in such a way as to protect the basic soil and water resources. One high-priority problem is the need for prompt and abundant restocking of cutover areas. Another is the reduction of losses to standing timber from wind, insects, and disease and the salvage of those trees that do die. Still another, of utmost importance, is the study of timber management practices that will assure adequate flows of usable water for towns and industries downstream. Of special interest are studies of the effects of active management of forest lands on fish and other wildlife.

tremendous values in terms of jobs and final product. Most remaining old-growth is on slopes too steep for tractors. Salvage with a mobile high-lead yarder, tested recently on the Andrews, recovered 1,063,000 board feet, including 65,000 board feet of defective but peelable Douglas-fir, from a 111-acre study area. This operation yielded more than $500 worth of logs per acre. Logging damage to the live trees was kept to reasonable limits and direct logging costs were not excessive.

Watershed Management

In a broad sense, watershed management involves almost all activity within a watershed that influences quantity and quality of water. In a narrower sense it usually refers to the activities more directly influencing our streams. On the Andrews, studies are being made to determine the effects of logging and road construction on streamflow, sedimentation, and fish.

The effect of the staggered-setting logging system on streamflow is being measured on two large watersheds. Recorders have been established on Lookout Creek and on the adjoining part of upper Blue River to compare a watershed being logged with an unlogged one. Statistical analysis shows that originally streamflow from these two drainages was very closely correlated. Since records began in 1950, 30 miles of road have been built in the Lookout Creek drainage. This road system has been used to log approximately 95 million board feet from 1,265 acres of clear-cut and road right-of-way, and 846 acres of partial-cut areas (salvage of dead and down timber). In all, 8.2 percent of the Lookout Creek drainage has been cleared since 1950. This rate of logging, which is somewhat greater than the allowable cut for the drainage, does not appear to have appreciably changed the relationship between the streamflows from the two drainages.

Three small watersheds, all tributaries of Lookout Creek, have been selected for intensive study. The first step was a calibration period of about 5 years to learn the natural characteristics of the drainages. They are now ready for treatment and measurement of results. First treatments are planned for next summer with the construction of a road system across Experimental Watershed #3. The three small experimental watersheds lie adjacent to each other on the south side of Lookout Creek near the entrance to the Experimental Forest. All three have a northerly slope extending from the top of Lookout Ridge at 3,000 ft. elevation to Lookout Creek at 1,500 ft. elevation. They range in size from 150 to 250 acres. Each is equipped with a trapezoidal flume designed to carry the maximum flow of water and yet measure the low flows with reasonable accuracy. This type of flume was installed here because it is self-cleaning. In high water, considerable debris movement occurs, even in these small streams in virgin watersheds. At each flume, there is a stage recorder which gives a continuous record of the depth of water flowing through the flume.

Some research has been directed toward reducing the amount of soil disturbance caused by road construction. One study showed that advanced planning of a systematic system of roads can reduce by six-tenths of a mile, the total road mileage required to log a square mile. Another study of the key sources of erosion from roads is being made to determine what factors contribute most to sedimentation and how they can be controlled.

Other studies of total precipitation, rainfall, intensity, and interception of rainfall by trees have been started. In the lower end of Lookout Creek drainage, most of the precipitation occurs as rain. The total averages 83 inches but ranges from a low of 52 to a high of 114 inches per year. Intensities are generally low, seldom exceeding 1 inch per hour, but storms of long duration may produce as much as 6 inches per day. Because of the low intensities and the high natural infiltration rate of the soil, there is seldom any surface runoff under undisturbed conditions. As a result, erosion under natural conditions is limited to stream banks and unstable soils where slides have occurred. Of the total rainfall during the summer, approximately 25 percent is intercepted by the trees and bushes found in the virgin stands of timber. During winter months, this may be considerably less.

Fish and Wildlife

Effects of forest management practices on production of fish and game has been under study for several years by the Oregon Cooperative Wildlife Research Unit. A study of trout in Lookout Creek and its tributaries has shown that the native cutthroat use some very small streams. Continuous trapping on 5 small tributaries took 334 spawners in 1957. The spawning migration occurred from late March until early June and most of the trout used only the lower 200 yards of the tributaries for spawning. Cutthroat move out of tributaries in all months of the year. Of 131 cutthroat trout taken in downstream traps on 6 tributaries, 73 per cent were fry.

The abuse of stream channels by logging operations often results in excessive siltation, blanketing gravel habitat necessary for aquatic animal production. Insect life in the stream may be temporarily lost and silt layers are known to have smothered trout eggs developing in gravel.

Under study at the present time is the exact biological effect of silt loads on spawning gravels in a clear-cut area. The study is designed to determine how much silt deposited in gravel is injurious to embryonic survival. The measurement of silt loads and subsurface permeability and oxygen content is expected to produce guide lines in silt tolerance levels, beyond which fish life is adversely affected.

Some types of logging cause serious changes in water quality. Temperature increases are known to occur after logging has removed streamside cover.

The introduction of silt and debris from road building and logging activities may affect water quality for several years, particularly in periods of heavy runoff. Where water quality is affected, changes in the biological composition of aquatic life often occur to the detriment of the dominant species.

The Wildlife Research Unit is also studying the large game animals in the area. During the summer months, unit personnel periodically make a spotlight census of the deer population. Before logging, there were very few deer in the Lookout Creek drainage; since logging more than 60 have been recorded in one night. The large increase is in summer population, with most of the deer migrating out of the area in late September and returning again in the spring. An occasional elk has been observed at the higher elevations, but there is no indication the elk population is increasing.

The small mammals of the forest are under intensive study by the U. S. Fish and Wildlife Service. These studies deal with (1) population trends as affected by logging, and (2) the relation of birds and rodents to forest regeneration.

Chipmunks do not like the logged and burned units and either move out into the green timber or decrease in number. Redback mice also disappear from the logged areas. On the other hand, deer mice continue to live in the logging units and show signs of an increase in population.

Studies of the seed used by small mammals indicate that following good seed years, reasonably large numbers of seed survive rodent depredations. After germination, many seedlings are lost because of heat, damping-off, insect cutting, and drought.

In Conclusion

Research on the H. J. Andrews Experimental Forest has led to the development of improved techniques for conversion of overmature forests to managed young-growth stands. For those interested in detailed results of research projects, several publications are available from the Director, Pacific Northwest Forest and Range Experiment Station, P.O. Box 4059, Portland 8, Oregon.