

# Maine Forester



1959

# The Maine Forester

Published Annually

by

The Students of the  
School of Forestry  
University of Maine

Orono, Maine

# Maine Forester



1959

# Our Thanks

The School, its students and faculty, wish to extend sincere thanks to the forest industries and land owners whose generous contributions and advertisements have made this publication of "The Maine Forester" possible.

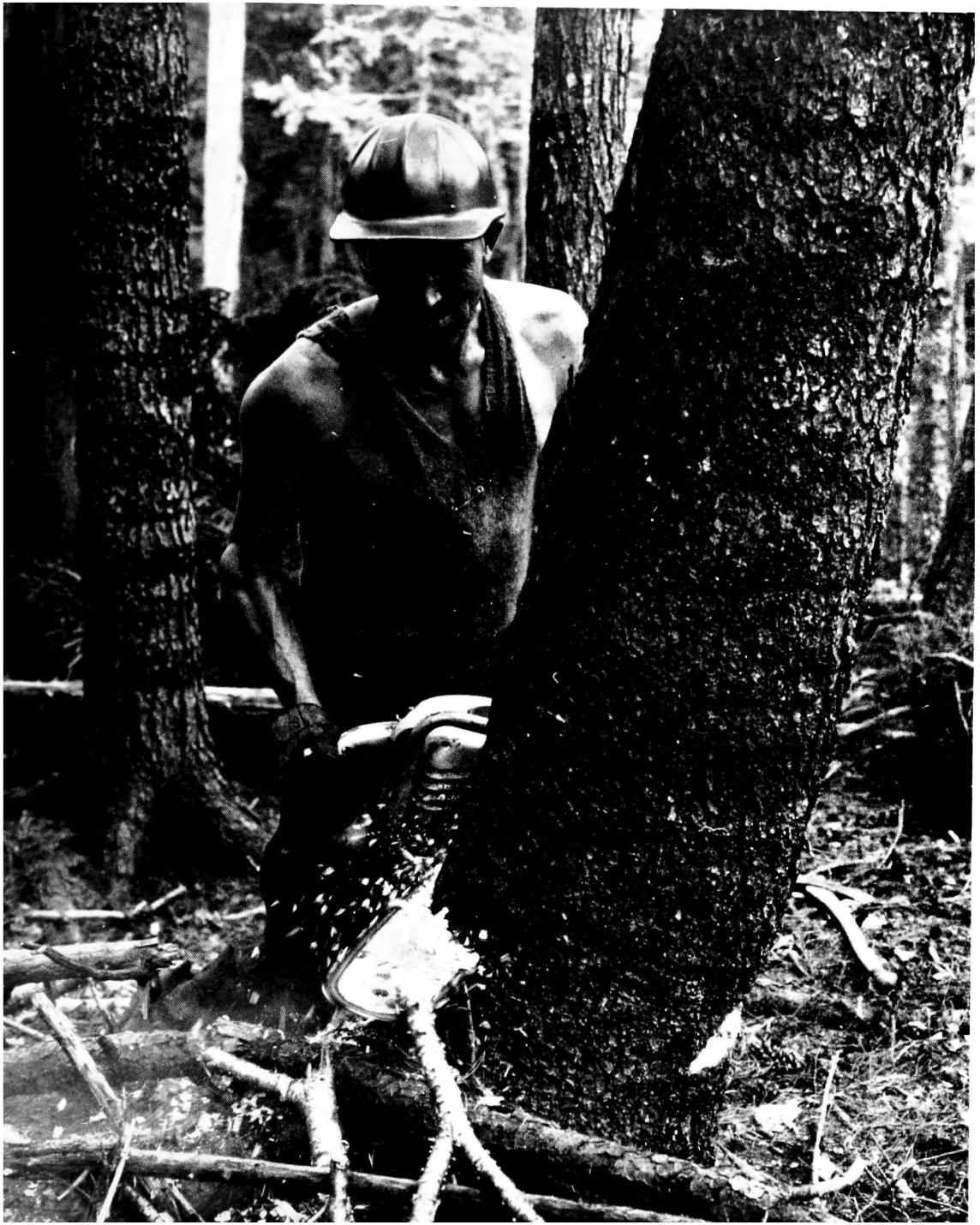
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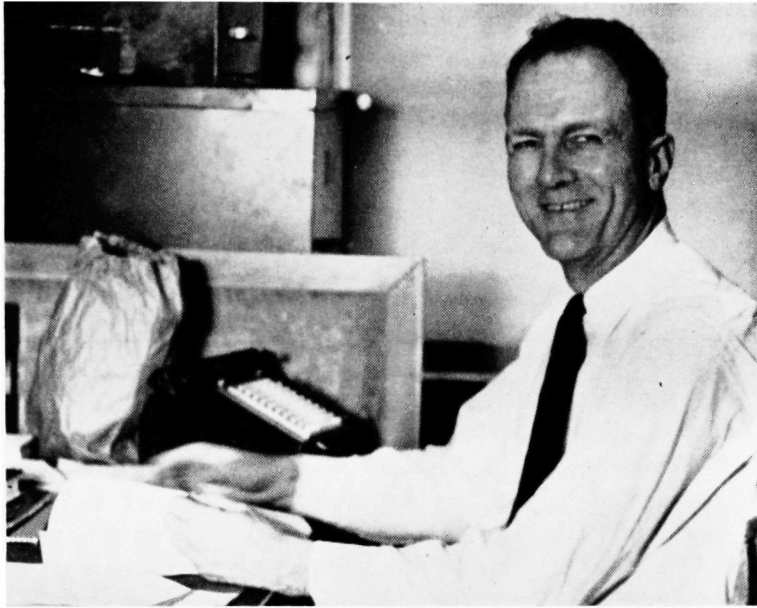
The paper used in this book is the generous contribution of the S. D. Warren Co., Westbrook, Maine.

Pictures given by the Great Northern Paper Co. and the Inland Fisheries and Game Department added much to our yearbook.









## Dedication

With sincere gratitude and appreciation, we, the members of the Class of 1959, dedicate this edition of "The Maine Forester" to Professor Arthur G. Randall. After receiving a B.S. from Yale in 1933, and his M.S. the following year, "Prof" began his career with the United States Forest Service. He first served as a Field Assistant at Kane, Pennsylvania in 1934, and then as a Junior Forester at the Allegheny Forest Experiment Station, Lebanon, New Jersey. Later "Prof" became T.S.I. Foreman of the CCC Camps in the Black Hills, and attended a Ranger Training Camp in Pactola, South Dakota. On furlough from the U.S.F.S., he taught one semester at Colorado State College. He returned to the Forest Service as Assistant Ranger on Boulder District of the Roosevelt National Forest, and then as a Project Ranger on the Laramie River tie sales. After District Ranger positions on the Washakie, Roosevelt, White River, and the Harney National Forests, "Prof" began his career at Maine as an instructor in 1946. Assistant Professorship came in 1948, and Associate Professorship of Forestry in 1952, his present position.

Congratulations, "Prof," and the best of luck to a man who so much deserves this honor.

# Editor's Page

Never before has an edition of the Maine Forester been so rewarding to its creators. This issue is a culmination of many desires and plans; plans which would have been devoid of any possible chance of success in the past.

In recent years, insufficient funds have been the plague of this publication. At times lack of cooperation has taken its toll. This year, however, the Maine Forester has received excellent support from everyone. It would be false to assume that this support has reached its optimum, as I feel that there will always be the opportunity for improvement. The success of this edition should certainly be indicative of many fine publications in the future.

To the faculty:

We are all indebted to you for the excellent guidance and instruction that you have exposed us to during these past four years, such excellence being so well typified by the recipient of this year's dedication, Prof. Arthur G. Randall.

To my fellow students:

In your hands has been placed the legacy of all foresters, the task of utilizing and perpetuating all of Nature's Renewable Resources. It is your privilege and your duty to strive to your utmost to be a credit to the most valuable and rewarding of professions.

I want to thank the students, the faculty, and the many forest industries for their excellent support. Not only has this mutual cooperation resulted in an excellent yearbook, but it has shown us the interest of others in our endeavors.

BRUCE J. DUBOV

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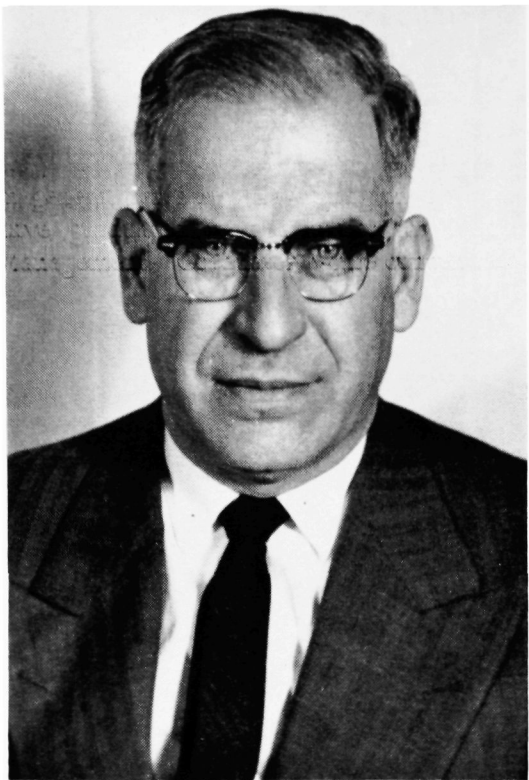
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# Prologue



# Our Forestry School

DIRECTOR ALBERT D. NUTTING

in the Northeast, are located throughout the country in forest positions of responsibility.

Our School has always drawn sizable numbers of students from other states. An important fact about these out-of-state students is that many of them have stayed in Maine and have become practicing foresters with private forest industries and public agencies in the State.

In this issue of the "Maine Forester," the major fields of training are reviewed by appropriate faculty members. The curriculum is being carefully reviewed to determine if helpful changes can or should be made. It is based on a sound foundation in basic science during the first two years of undergraduate training. Our objective is to continue the established policy of training students for both private and public employment.

The opportunities to study and observe forest management and product manufacture within a few miles of the campus as practiced by Maine forest landowners and plant managers are important phases of our training programs. The University campus is close to Bangor and Old Town, the headquarters of a number of large forest land-managing companies. The Eastern Maine Forest Forum, with an average attendance of one hundred persons connected with the growing, harvesting and manufacturing of forest crops, is held monthly in Bangor and is open to students. The School takes advantage of these opportunities to keep in close contact with nearby leaders in forestry.

The Penobscot Forest of the Bangor Research Center of the U. S. Forest Service with a competent professional staff is only ten miles away. This is a substantial information and observation resource for both students and faculty. The State operates a highly mechanized forest nursery with over a 10,000,000 tree annual production close to the campus, which is used for student observation.

The training of foresters began at the University of Maine in 1903. The University was one of the first institutions in the country to train foresters, which was logical in view of the importance of forests to the Maine economy. With over 80% of its land area in forests, wood is the State's most important money crop. Fish, game, water and recreation are also products of forest lands. Maine's forests and its forest industries provide excellent background and laboratory opportunity for student training and formal research. As a land grant institution, the University has an obligation to Maine citizens to provide leadership in the development of its natural resources. This makes the training of foresters as future forest operators and forest land managers important to the University in its desire to train men for their life work and to fulfill a major responsibility in the development of the State's greatest natural resource—its forests.

The University has graduated 1035 foresters. Most of these have received a degree in general forestry. Beginning in 1946, 159 have graduated with a major in Wildlife Management. Graduates, while concentrated

Several members of the forestry faculty are on the staff of the Agricultural Experiment Station. Their research projects provide information for forest owners and industry and at the same time broaden their background for their special fields of instruction. Other members of the staff are doing independent research in their fields of work. Due to the fact that research and training are so closely allied, the School hopes and expects to continue to broaden its efforts in research and graduate training. Too, research provides the essential answers so basic to a forward moving, dynamic forest industry.

The forests of this country will take on increasing significance as our population grows and the product demands of our society increase. Authorities who have studied future forest needs and uses, predict that forest products will be in much greater demand and that recreational uses of forest lands will greatly increase as populations grow.

Forest land managers of the future are going to be expected to manage forests so that they will produce more wood, more

game, and provide for more recreational use all from the same area. These demands indicate a need for foresters with good technical training, with ability to get along with people, with a liking or feel for forest land, with competence in the art of communication and with an appreciation for the cultural heritages of man.

The challenges and opportunities for young men who desire to become managers of timber, game and forest lands are greater today than ever before. Never have the opportunities for the University-trained forest scientist been greater. Never has society more freely acknowledged its needs for competent, college-trained forest managers.

The School of Forestry of the University of Maine has a proud heritage and a promising future. Its future depends on competent students, an able, dedicated faculty, and an administration which recognizes and promotes the role of the School within the framework of the institution. The School has these three elements and a dynamic future seems assured.

## Forestry Training

1903-1959



Forestry Department Secretaries — Mrs. D. Bromby and Mrs. I. Soper.



Dr. Quick, Professor Randall, Professor Beyer, Director Nutting, Professor Baker, Mr. Taylor, Mr. Zai, Professor Plummer.



# Forest Management

ARTHUR G. RANDALL

The general acceptance of forest management today and its intensive application by industrial owners would seem little short of revolutionary, had it come about less gradually than it did or at a time of fewer world-shaking events. Essentially since World War II, although its genesis goes back farther, the accepted way to manage an investment in timberland has become production, rather than liquidation. Huge investments, not only in timberland but in harvesting, manufacturing and distribution of products, are keyed to the production that can be obtained from fairly definite areas of land. The forester is expected to predict with reasonable assurance what the production will be and is made responsible for realizing it. Cutting budgets are demanded today by men who would not have given them a second glance twenty years ago. Some of the reasons for the change are the relative scarcity of high quality stumpage, the approaching end of virgin timber, and the increased prices and expanding uses of wood. In industry, forest management is on a par with wood procurement, if not integrated with it. Moreover the emphasis is shifting from merely supplying the mill with cheap raw material to making a profitable operation of timber production.

Forest management started about fifty years ago in this country as an attempt to

transplant European practices of the last century. These comprised an extremely rigid or static type of management, involving plans covering a century or more. In this country, forest conditions change radically within a short time. Starting with either extreme of cutover, understocked stands or residual old-growth, the forest manager plans to bring about a very different stand. Economic conditions also change very rapidly, as anyone looking back over the last twenty years can see. Therefore the forest manager is less interested in figuring a cut that will hold for a century than in determining one for the immediate future that will be profitable and will also make some progress toward the desired stand conditions. Such practical considerations as the owner's need for income and need of a mill for raw material must receive attention. Thus there has been a change of emphasis in forest management.

Forest economics has come to have a greater place in management. It now enters into every management decision, essentially to aid in choosing among several alternatives that will produce the greatest benefit for the resources, labor and capital that will be used. For example, the pulp industry is facing the question of whether to make frequent light cuts with higher wood costs at least in the first cycle or whether to make heavier cuts less often and have to log at continuously greater distances from the mill. This and countless other decisions will be based upon economic analysis armed with the necessary technical knowledge. Other uses of the land such as water, recreation and wildlife will have to be considered. All of this indicates a tremendously wider field for forest land management.



# Silviculture

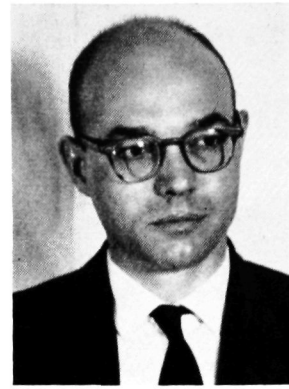
DR. RALPH H. GRIFFIN

Silviculture is that branch of forest management which is concerned directly with various techniques of securing a continuous yield of more profitable goods and services from a forest than would be produced during the same period of time by natural processes alone.

Through silvicultural practices, management endeavors to accomplish the following: first, to protect stands from the ravages of wild fires, insects, diseases, and animals; secondly, to secure adequate regeneration of mature stands either naturally through controlled harvest cuttings or artificially by planting seedlings or sowing seed; and thirdly, to improve immature stands by means of various types of cuttings designed not only to control the composition, density, and quality of residual stands but also to increase the total yield of merchantable wood products.

While adequate protection and satisfactory regeneration of forest stands are essential to sustained yield, the improvement of immature forest stands may not be necessary and under adverse circumstances may be unprofitable from an economic standpoint. Conversely, under favorable economic conditions, cuttings conducted in immature stands may provide the best means of increasing the net income from a forest property. The range between the minimum intensity of silvicultural practices required to secure a sustained yield of some benefits to society and the maximum intensity permitted without incurring unrecoverable losses to management may be quite broad. Somewhere between these two extremes lies an optimum intensity of practice which fulfills most nearly the needs of both management and society. A close approximation of this optimum intensity of treatment for each forest stand under management is a fundamental step to the efficient application of silviculture.

Since to know the forest is to control it, an important prerequisite to the practice of silviculture is a keen apperception of the



natural forces at work in the forest. This is acquired only through persistent study of the natural sciences coupled with careful observation in the field. Silvics—the study of the life history, characteristic behavior, and reaction to environmental influences of specific tree species both as individuals and as integral components of vegetational units—provides the immediate basis for a rational practice of silviculture. Supplementary information of immeasurable value to a clear understanding of the natural laws governing the establishment and development of forest stands is contributed to silviculture by the fields of ecology, physiology, soils, meteorology, entomology, pathology, and genetics. In addition to the biological and environmental aspects of producing forest crops, the silviculturist is faced with the problem of making inventories as well as evaluating the effects of various treatments upon the behavior of forest stands. This requires an understanding of forest mensuration, sampling procedures, and statistical methods of analysis. Thus, the skillful application of silvicultural practices requires study of both natural and abstract sciences.

Research in silviculture has been under way in the United States for a shorter period of time than is required to produce a mature crop in most forest types, yet significant progress has been made. The silvical characteristics of many commercial tree species have been ascertained and effective silvicultural practices have been developed for most of the major forest types. Correlations between growth and various soil properties have been established for a number of tree species. The uses of prescribed fire and chemicals to control undesirable vegeta-

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# Forest Mensuration

LUTHER ZAI

Forest Mensuration, an applied science based on mathematics, is concerned with the measurement of standing trees, forest products and the growth and yield of forests. While the botanical sciences investigate questions pertaining to "What kind?", forest mensuration answers the question "How much?"

By assigning numerical values to the components of the forest, and by predicting their change with time, it is possible to manage a forest with a certain degree of mathematical precision. By intelligently employing these numerical values, the forest manager can ascertain the economic worth of the forest, not only for current operations but also for future ventures. The woods workers, operators, and consumers are dependent on a reasonable means for negotiating work and sales agreements. It is evident that forest mensuration permeates every aspect of forestry from the pulpwood cutter's paycheck to the stockholder's dividends.

The two most common units of measurement in forestry are the cord and the board foot. Both of these mensural units are merely estimates. Nevertheless, they are used to evaluate Maine's most important natural resources. It has been demonstrated that the cord and the board foot are inaccurate to a variable extent when used in different types of log rules and volume tables. The cord volume estimate of a particular pile of wood may vary considerably due to inconsistencies in scaling techniques. Board foot volumes may also vary because of contradictory values obtained by using different log rules. From the mill operator's viewpoint the cord unit is unsatisfactory because it does not accurately define fiber content.

The accuracy of present mensurational techniques is limited because of a number of factors. One reason is the large number of trees per acre and the vast acreages which must be evaluated. If precise laboratory techniques were employed and the volume of each individual tree were merchantable, it is conceivable that the measurement costs alone would be more than the value of the wood products.

Consequently, sampling schemes have been devised to obtain adequate volume data. As the value of the forest and its products increase there will be a corresponding effort to provide more exact mensurational estimates by securing a minimum number of measurements without incurring prohibitive costs.

Today's highly complex industries require more accurate forest inventories, growth and yield predictions, and more realistic primary units of measurement to replace the cord and the board foot. During the past twenty years foresters have developed aerial photogrammetric and statistical techniques to make inroads on these major problem areas. The former has decreased the amount of fieldwork for making inventories, improved the accuracy of forest type maps and provided more complete information for planning logging operations. Photo interpretation techniques are being used to estimate volumes of pulpwood piles as well as pulpwood in water storage. Statistical methods are being employed to increase the accuracy of forest inventories and more accurate methods for predicting growth and yield. Weight has already been used successfully in some sections of the country as a unit of measurement for pulpwood sales instead of the cord and, in time, may supplant the cord entirely. The cubic foot is being used more and may eventually replace the board foot.

A number of new mensurational techniques and instruments are being developed. Point sampling, a new method of collecting field data reduces field work and improves

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# Timber Harvesting

HENRY A. PLUMMER

Wood is one of this country's most valuable and renewable resources. In the utilization of the products from the forests, the harvesting of the trees has always played a very important part. One of the earliest full-scale "Hand-Logging" operations is recorded in the Bible. This took place during the 4th century B.C. when the cedar and fir trees in the mountains of Lebanon were felled, shaped with axes, lashed together to form rafts, floated to the seaport of Joppa and then moved inland to the site of King Solomon's Temple.

Since the building of King Solomon's Temple, the ever increasing demand for low cost timber has necessitated continued improvement in logging methods and logging equipment. Thus, mechanization in the cutting and harvesting of timber crops has been taking place steadily but slowly through the years. During the past decade, perhaps the greatest step forward in mechanization has been the introduction and acceptance of the power saw by the woods worker. Today, on most logging and pulpwood operations, the power (chain) saw has replaced the crosscut and bow saws as well as the axe in felling, bucking and topping the tree.

The introduction of the tractor to replace animal-power in moving logs away from the stump, first occurred in California in 1894. The early Lombard and Linn log-haulers were introduced in winter hauling of sled-trains of logs in Maine around 1900. Thus, steady improvement and changes in design and power application have resulted in today's mobile, faster-moving, rubber-tired tractor to supplement the improved but slower crawler-type. These modern tractors are designed to provide more efficiency with greater safety and a higher production during the initial movement of timber out of the forests.

Continued research and experimenting with devices for hooking, holding and handling logs, have speeded up this phase of log movement. This has also increased safety and led to greater and more efficient wood



production at a lower operating cost.

The wide acceptance of the truck as the major prime mover of logs and other products from the forest to the mill, places all major phases of the timber harvesting or logging operation in line to become fully mechanized.

It is believed that in the very near future, lighter weight models of power saws will be available, which will be safer to use, and will operate at a lower cost for fuel and repair parts.

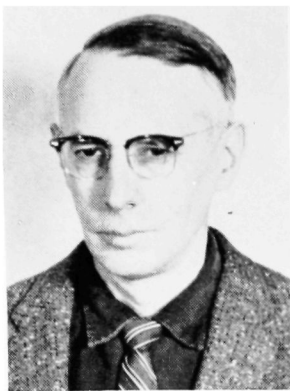
Tractors will become faster, integrated units for moving logs or trees to an assembly point where conversion will take place by new mechanical devices especially designed to eliminate most of the laborious hand work.

Better constructed access and haul roads built into and out of timbered areas will permit trucks and other mobile equipment to move more closely to the base of all harvesting and conversion centers.

The development of more efficient road-building equipment and the demand to keep all costs within definite limits will require that trucks be more flexible with an increase in hauling power and load capacity. This will be necessary to meet effectively the speed-up of the primary transport phase. Highly skilled machine operators and well-trained drivers of mobile equipment are the men who will be depended upon to keep the "show moving" in the woods operations of the future.

Preventive maintenance, care of equipment and its safe use will be stressed as logging becomes more completely mechanized. With the approach to full mechanization, there certainly will be a need for automatic control

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# Forest Products

FRANK K. BEYER

The array of industries, exclusive of saw-mills, that draw upon our forests for raw materials presents a scene of activity striking in its variation and impressive in its scope. They range from multi-million-dollar corporations controlling great factories filled with intricate equipment, down through lesser organizations and small shops, to single independent workers equipped with a few hand tools. These are the Forest Product industries that will be covered in this statement. They compete with or contribute to all other industries of the United States and supply the consumer with numberless necessities and conveniences.

These industries use a great variety of raw forest products converting them by diverse processes into materials and articles essential to our way of life. Wood may be sawed, planed, carved, bent, joined and fastened to make furniture, boats, woodenware, toys and other items. It may be separated into thin veneers and re-united as plywood superior to its original form for many uses. By chemical means, wood may be converted into plastics, industrial solvents and other chemicals, pulp fibers for paper and artificial boards, and even into food stuff. Valuable extractives may be taken from wood or drawn from the living tree. Roots, bark, leaves and fruits also are made to contribute in this way. Resins, oils, tannins, dyes, drugs, sugars, and gums are found among the useful materials secured. Completing the list we find industries using products as they come from the forest with a minimum of processing. These range from utility poles to Christmas trees, each important in its own way.

The forest products industries are highly

important to our economy, contributing employment to workers, income to owners and investors, and tax income to government. In many areas of our country, these industries equal or exceed the contribution made by the lumber industry, and with it constitute the major economic base. This is especially true in the state of Maine where all forest industries produce over \$500,000,000 worth of goods annually.

This heavy contribution to the wealth of the United States by the sawmills and the great group of other forest industries require a vast supply of raw material amounting to more than 10,000,000,000 cubic feet of wood annually. Nearly half of this is claimed by the lesser industries.

It is of great importance to forest owners that many products are derived from material unsuitable for sawmill products. Because of this, the forest products industries are essential to forest management by supplying profitable markets for material that otherwise would be unused. In so doing, they encourage more intensive management and increase forest productivity.

In direct competition with producers using metals, ceramics, synthetics, and other materials, these industries must be constantly seeking better methods and new products. Advances have been and are being made. Plastics made from wood provide widely used textile fibers, adhesives, films and moulded items. Wide panels made from chips or wood fibers yield new economies in construction and improved performance, or combined with veneer or plastic faces they provide new beauty and utility. Chemical investigation is disclosing secrets that promise new materials for industry from constituents of wood such as lignin and from bark. Chemical conversion of residues from woods operations and from mills in the future may help to offset the growing demands upon the forest wood crop and other natural resources.

The practicing forester must understand  
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# Wood Technology

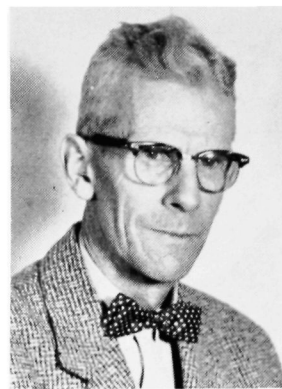
GREGORY BAKER

The first question asked when wood technology is mentioned is: "What is wood technology?" The several fields of wood technology include structure and identification; physical, chemical, and mechanical properties; wood-moisture relations; machining properties; glueing, painting and finishing properties. There are many branches of each of these phases of the subject.

Wood is the basic material with which the forester works. His major objective, at least in industrial forestry, is to produce wood fiber for useful purposes. Obviously he needs to have a working knowledge of what wood properties are, what particular properties a given industry requires, and the properties of individual species. For example, the chemical pulp industry is interested in wood which will yield a high return in pulp fiber per unit volume of raw material and at the same time furnish the quality of fiber demanded. A wood turner, on the other hand, would be interested in a wood which turns smoothly in a lathe and has desirable color and dimensional stability qualities. One lumber manufacturer may want wood of high and uniform strength for structural timbers. Another may want a soft textured wood which will machine readily for interior trim, molding and patterns.

Frequently there are wide variations in the technical qualities of wood within a given species. Many of these variations can be traced back to the conditions under which the tree grew. Here the forester enters the picture since by his manipulation of growing conditions through silvicultural practices he can exert some influence upon wood quality.

Recent studies have been made of the specific gravity of southern pine, involving the analysis of thousands of increment cores. A method has been developed whereby a stand of timber can be estimated in terms of the number of pounds of dry wood fiber per acre. The rates of growth, the species of southern pine, and the sites which will produce the greatest amount of wood in terms of weight have been worked out. This is a value which is of more significance than volume to the pulp industry since, in



the South, practically all buying of pulpwood is on a weight basis and the finished product is sold by weight. Inevitably more attention is going to be paid to those sites and species which produce the greatest poundage of wood fiber at the least cost. Silvicultural and management practices will be modified in light of these findings.

It is difficult to pinpoint the status of knowledge and development in the field of wood technology. Basic and applied research is daily producing new knowledge and new products. Some phases of the subject appear at times to advance more rapidly than others. For a period, not too much new information concerning the structure of wood was published. Then, with the advent of the electron microscope a whole new field of investigation was opened up. Ideas about cell wall structure which formerly were postulates suddenly became proven facts—or were disproved. It opened up vistas far beyond the limits of the light microscope.

The utilization of wood residues at wood-using plants has made rapid progress in recent years and this trend will continue. One large sawmill operator recently wrote: "The day is coming when failure to make use of residues will determine the success or failure of a sawmilling enterprise, and even the use of residues for fuel will be as inexcusable as the dissipation of natural gas in oil fields some years back."

Most of the approved forestry schools in the United States give work in wood technology in their forest management curriculum varying from two to several credit hours. This indicates that a knowledge of wood properties as well as a knowledge of how to grow it and manage the whole forest complex is considered to be an essential part of the training of a practicing forester.





# Game Management

DR. HORACE F. QUICK

Land has always been the basis of Man's existence. Whatever the nature of the land and whatever the kind of use Man makes of it, it must first produce food, clothing and shelter. Forest lands yield these essentials and a high order of technology for the maintenance of this production has been developed.

The marshaling of several sciences has produced the technologies of Game Management and Forestry. These have been designated with other uses as "Multiple Land Use." The compatibility of these uses of land has been demonstrated in Europe for several centuries and is illustrated by the fact that the major technical treatise of Game Management was written by a consulting forester, Aldo Leopold. Modern Game Management employs a technology based on the ecological principles of land utilization. Forestry, too, is a form of land utilization based on natural biological principles.

It is, thus, left to human ingenuity to apply this knowledge to achieve desirable objectives. Land management techniques are well known, proved, and can be applied to meet the needs of people, whether these needs be the essentials of life or the recreational requirements of modern society.

The disciplines of forest science are older than those of Game Management. Yet early efforts to develop forest science were stimulated by hunting in recognition of the food and shelter that forests provided for game animals. With the development of silviculture, the habitat management phases of Game Management came into focus. What happened to the forest influenced the welfare of the game animals. German *jagermeisters*,

foresters, discovered that the implementation of the "Geldbaume" (money-tree) policy of pure forest stands yielded less wood in the long run and, further, wrought the doom of their game stocks. They replaced this single-purpose practice with a multiple-land use policy that included game production with wood production.

While the techniques of land management and forest management provide an adequate technology by which means we can provide game habitat, we have, to some extent, neglected the animals themselves. We do not know enough about the actual management of stocks of animals. Rotations and cutting cycles are understood for stocks of timber but not for stocks of game. The rooted tree, fixed in space and tied to time by its own record of growth rings, makes it possible to develop a high order of forest management but the elusive deer by contrast poses quite a problem, indeed.

Greater progress could be made, too, along such lines, were there not legal limitations to hamper the application of what is already known. Whereas in America we have seen the desirability of private property rights in land, and written this into every state constitution, we have curiously developed an attitude of public ownership in game animals. And this, despite the fact we recognize that game is a product of the land. By contrast, under European conditions both game and timber are accorded legal private ownership status as products of the land and this has permitted an efficient application of game management and forest management practices.

The precedent was set in Europe long ago and a trend in this direction in America is reflected in the establishment of private shooting preserves in many parts of the United States. Game biologists have been hired by the American Box Board Company and by the Weyerhaeuser Timber Company to assist with the implementation of multiple land use practices. These private industrial  
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# The Maine Extension Forestry Program

LEWIS P. BISSELL

Education has been termed the key to better woodlot management. Farmers, forest industries, woodlot owners, and foresters have long emphasized the need of teaching woodlot owners an appreciation of the dollar values and the methods of good forestry for the benefit of all the people of Maine. Growing trees as a crop means more than stumpage payments to the landowners, and jobs to the logger and mill worker who manufactures timber into articles for sale. It also means water and wildlife, and a beautiful countryside to attract tourists from other states.

Since 1923, the University of Maine Extension Service has been helping farmers and rural people to learn about better woodlot management and its benefits. This program of forestry education is planned and carried out by the Forestry Specialist, county agents, and county 4-H club agents with the advice and assistance of local leaders. Basically, this program is one of selling the ideas of good woodlot care by demonstrations, publications, news stories, radio and television. 4-H Club forestry projects have been of interest to the boys and girls, and at times have been the way to reach parents with new ideas.

Perhaps the most difficult job of any teacher is to get and hold the interest of his students so that they will be receptive to new ideas. The subject matter of forestry meetings and publications must be timely, interesting and stimulating enough to the listener or reader to get him to use the information himself. A part of the job is the interpretation and use of research results.

Costs and returns are often the determining factors influencing land-owners to adopt new forestry practices. With many farmers, the county agent has a hand in farm management planning, and can sell forestry as a part of the farm business. Then there are other owners whose interest in conservation is the dominant reason for practicing good forestry.



The measurement of changing ideas on the part of thousands of people is a difficult task. It is all the more difficult with the large number of agencies, public and private, engaged in woodlot education and service. Progress is being made in getting good forestry onto the woodlots of Maine, as shown by the steadily increasing amount of selective cutting and cultural work, the number of Tree Farms and the growing public interest in forest conservation.

The University of Maine Extension Service has had a part in this progress. As a measure of accomplishment, some of the cooperative projects of the biennium 1957-58 included 49 woodlot meetings, 13 Christmas tree meetings, the organization of the Maine Christmas Tree Association, and the continued activity of the Maine Maple Producers Association. Nearly 200 boys and girls worked on 4-H forestry projects, and 30 Cumberland County boys and girls attended a 4-H Conservation Camp at the Freeman-Waterhouse Campus in Bryant Pond with the sponsorship of the S. D. Warren Paper Company.

What of the future? It seems likely that the University of Maine will continue its work with farmers and rural woodlot owners, and with 4-H boys and girls, for the demands for forest products from small woodlots are predicted to increase over the years ahead. Small and scattered though they are, the small woodlots of Maine loom large in the demands of the forest industries. The Extension Service can help woodlot owners to better income, the industries to better wood supplies, and the State of Maine to a more stable economy by teaching better woodlot care as it has in the past.



# Forest Entomology

DR. CHARLES O. DIRKS

Many remarkable changes have come to our forests and forestry during the last 30 to 40 years. This statement applies especially well to forest entomology for the period since 1945.

First, of outstanding importance, is the airplane and the technique of mist spraying of extensive areas of forest primarily for control of foliage-destroying insects. Today this operation is quite commonplace across the nation. In the last 10 years, airplane spraying has saved many millions of acres of valuable forests in both the East and the West. It is now possible to oppose a forest scourge effectively. This was not the case until recently. Improvements in airplanes and insecticides will make aerial spraying even more common in the future and on small areas especially.

At present, more and more emphasis is being placed on a phase of insect study known as "forest insect surveys." These surveys are relatively new and are made more comprehensive and complete each year. Trained and experienced persons carry on the work. The data and other information gathered become very helpful in appraising the future trends of insect infestations. The surveys are particularly helpful in determining the beginnings of outbreaks of insects. They are also used extensively to determine insect and tree conditions preliminary to insect control operations.

On forest insect surveys the airplane has a wide field of service. It is especially useful

in mountain areas and other places where observation of tree conditions from the ground is difficult. While the plane is in flight, the insect infestations are usually mapped by trained observers.

Aerial photography, along with color film and other devices have greatly extended the effectiveness of the airplane in forest insect surveys. Improvements are coming rapidly. Some experienced aerial observers in the Pacific states can identify tree damage caused by 21 different kinds of insects.

The application of forest genetics to insect control is a comparatively new field but will expand in the future. The development of strains or hybrid trees resistant to insects is now known. Certain insects destructive in forest plantations in the West are controlled by the use of hybrid trees.

Recently entomologists have learned how to collect, preserve, and propagate disease-causing virus organisms. This study in its application to forest insects is in its infancy yet it gives much promise for the future. A few insects such as sawflies of pines and spruces are now controlled when solutions of virus are applied by means of airplanes to the plantations.

In the years ahead, forest entomologists, working with specialists in forest management will intensify their efforts to devise management practices to lessen insect outbreaks. Management methods of control are already known for some of the insects found under the following conditions: those that tend to attack trees of low vigor, those that are encouraged by naval stores operations, and those that follow in the wake of fire, storms and drought.

In the future, control of insects will become more and more successful through prevention, but to reach this goal many fields of knowledge will have to be utilized.

# Forest Soils

R. A. STRUCHTEMEYER

The study of forest soils is in its infancy in this country. In the literature, a considerable amount of information is cited on forest soils by European Soil Scientists. Actually, very little if any American work will be found dating prior to 1920. The majority of the papers published will have dates which will be post World War II.

The question logically arises then as to whether the recent nature of the work is an indication of its lack of importance. My answer to this would be an emphatic NO! It does mean that as long as the natural supplies of timber could satisfy the needs of the wood-using industries, people were not interested in the study of forest soils. Now, as competition becomes keener and timber production becomes an intensive operation rather than one left to nature, the interest in soil-tree relationships is increasing and will continue to increase.

This means that those scientists interested in Forest Soils will have to know the soil, adaptability of various species, nutrient requirements of various species, the organism in the soil, and many other factors as well as the interaction between all of them.

Much of the soils work to date has been of a physical nature. This means that soil characteristics such as texture, bulk density, structure, porosity and drainage have been studied. These soil characteristics have been correlated with site quality and in many cases have provided good correlations. In some cases, however, these measurements have not provided a positive correlation with site, indicating that some data were missing. In recent years, it has been proven that the chemical and biological properties of the soil are as important and in some cases more important than the physical properties.

Since most of the work on the biological properties of soil as related to tree growth has been done by Canadian scientists, I will not expand on this area. In passing, however, it is well to note that Americans in the future must expand this area of study.

The development of interest in the chem-



ical properties has been interesting to watch the past few years. As an example Lutz and Chandler in their text "Forest Soils" make the statement that the use of commercial fertilizer on forest stands is an uneconomical procedure. It is a certainty that in a revision, this statement will be changed and the area considering the fertilization of forest stands will be expanded.

Why the change in attitude? The reason for the change in attitude stems primarily from research results obtained by workers in the Southeastern and Western sections of the United States. The application of fertilizer to both plantations and natural stands has produced an appreciable increase in tree growth. Other things that have influenced the present-day thinking are the readily available supply of fertilizer, particularly nitrogen, and then the gathering of data that proves the feasibility of fertilizing forest stands by planes at a cost of only a few cents an acre.

What does all of this mean to the young man interested in forestry as an occupation? For certain, it means that he is entering an area of increasing specialization. If one isn't afraid to crystal gaze, it is possible that the future raw products for the wood using industries will come from hybrid or exotic species, with growth rates not now dreamed of. These tree species will be grown only on soil adapted to them in areas adjacent to permanent roads where fertilization and irrigation can be practiced.

The forest industries in the next few years will be bidding for well trained soil scientists and as these well trained men go forth and make their contribution there will be a demand for others.



# Forest Pathology

DR. RICHARD J. CAMPANA

resources dwindled, the emphasis in forest pathology has undergone many changes.

One of the most significant changes in forest pathology within recent years has been a growing concern with tree disease problems of unknown origin. Although certain of these have been recognized for several decades, others are relatively recent in their appearance and some of the earlier known ones have become increasingly serious. The inability to determine positive, primary causes for such diseases as littleleaf of Southern pines, birch dieback, needle blight of eastern white pine, pole blight of Western white pine and sweet gum dieback, indicates that such troubles may have resulted from environmental disturbances directly or indirectly associated with commercial practices or cultural adaptations.

Other indications in this direction are numerous disease problems of unknown origin incident to large-scale nursery culture and establishment of planting stock under conditions unnatural and often unfavorable to optimum growth of trees. The occurrence of many disease problems from causes not exclusively or even basically pathological can be expected to increase. At the same time disease losses from decay of standing timber and deterioration of forest products should be expected to decrease. It is not likely that responsible forest management will allow standing timber of merchantable species to reach rotting age and most of the overmature, virgin stands that once formed important parts of our great natural resource are now gone. Also, more effective prevention of spoilage and rot of forest products with newer chemicals, techniques and machinery can be predicted with confidence.

The relation of pathology to forestry as indicated above is clear, but the relation of forest pathology to other aspects of plant and animal science is often overlooked. This is especially true of physiology, entomology and nematology. The pathologist must al-

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Although the forest pathologist is usually thought of as being concerned primarily with disease and decay of forest trees and their products, actually he is concerned with injury from many sources. It matters little what the factors may be that are adverse to the health, vigor and stability of living trees; in the final analysis, the results are always of a pathological nature. The scope of his studies is wide including: the biology of microscopic plants and animals in the soil; the tender seedling in competition with the dynamic plant and animal life in and about the forest floor; the vigorous sapling thrusting its crown toward the canopy above; the towering column of gnarled wood destined to rot with advanced age; and the products of wood exposed to decay. Throughout the entire life of the tree and the durable life of its products, the pathologist is concerned with prevention of losses resulting from their death or destruction.

During the past half century the major problems in forest pathology involved study and effort to control fast-spreading, lethal forest tree diseases, and to prevent losses from the mistletoes and decay of living trees. The successive invasion of American forests by chestnut blight, white pine blister rust and Dutch elm disease, the overmaturity of many forest stands in the West and South, and the unfortunate culling of most commercial forests in the East, were primary factors in efforts of pathologists to prevent loss of trees and timber. As the chestnut blight eliminated an entire commercial timber tree, as the control of white pine blister rust became a reality, as the Dutch elm disease became largely the concern of municipal foresters, and as overmature timber



# Plant Anatomy

FAY HYLAND

What can a study of Plant Anatomy (the structure of plants) contribute to the field of forestry and what are the benefits, direct or indirect, to the student who chooses forestry as a profession? How is this specialized area of knowledge related to other areas, and what new horizons are opening up which would demand an understanding of plant structure? These are questions which may logically be posed regarding an evaluation of a course in Plant Anatomy.

Aside from cultural aspects, a study of plant structure may be useful to the forester in the following ways:

1. To gain a basic concept of the internal make-up of the plant, followed by a more detailed study of the various parts, toward a view of using this knowledge as a background in subjects such as physiology (function), pathology (disease), and wood identification which follow later in the college program.

2. In addition to the aid afforded as a "tool" or "building block" for other courses, anatomy, as a subject, offers much of value "per se". A few more questions and answers may be in order:

- (a) How does a tree increase in diameter? A study of the growth layer (cambium) located between the bark and wood will answer this question. Of course, one can easily strip the bark from the wood during the growing season and identify the slimy layer occurring there as that responsible for diameter increase, but a careful study of text materials and microscope slides is



essential for a full understanding of the process.

- (b) How do the stem and root increase in length? Where do the leaves and flowers come from? A study of the growing points located at the tips of stems and roots will answer these queries.
- (c) How does heartwood differ from sapwood? Why are some woods stronger or more durable than others and why are some preferred for specific purposes such as paper-making? The answers to these and numerous other questions are reflected in the general make-up and specific structure of the wood.

3. More and more students are going on for advanced study in Forestry. For those who are interested in and qualified for research work in wood structure, there are many anatomical problems to be solved. The advent of the electron microscope, radio isotopes, fluorescence microscopy, to name a few, provide valuable tools with which to attack anatomical problems. These rather recently-developed techniques offer a challenge to the research-minded student whose interest lies not only in basic research but also in that of a more immediate or practical nature.





## Special Articles



## The Origin and Future of Trained Wildlife Managers

MALCOLM W. COULTER

Interest in training men for scientific management of natural resources has, in the past, developed only when misuse of the resource in question caused public concern. For example, by the time that numbers of professional foresters had been trained, much of the pristine forest had already been exploited. The soil technician found, upon his arrival, gullies by the hundreds of thousands. Likewise, the need for men trained in wildlife management was not recognized until after wildlife resources had been depleted.

Prior to the mid-thirties very little instruction concerning game management was given at any university. In December, 1935, the Cooperative Wildlife Research Unit was organized at the University of Maine. It was one of nine such units, located on a regional basis at land grant colleges from Maine to Oregon. This new plan, initiated by the Bureau of Biological Survey (predecessor of the U. S. Fish and Wildlife Service), involved the support and cooperation of the Biological Survey, the American Wildlife Institute (now the Wildlife Management Institute), certain land grant colleges and the local state fish and game departments. Location of the units at universities encouraged the much needed assistance of college specialists from other sciences in the development of an entirely new field of resource management. In the agricultural mid-west the units were often administered through colleges of agriculture or departments of zoology and entomology. In forested states such as Maine and Idaho (and later, others) administration was effected through schools of forestry.

From the beginning the objectives of this nation-wide cooperative wildlife program

have been: 1. to facilitate the training of potential wildlife managers; 2. to conduct research basic to intelligent management; 3. to promote public education about wildlife management through demonstrations, lectures and publications and by providing technical assistance to other agencies.

Each cooperating organization in this new venture furnished whatever support it could best render—personnel, facilities, equipment, cash, or combinations of these. With this stimulus the wildlife program at Maine was well underway by the spring of 1936. Extension, or the public education part of the program, began with a speaking engagement at the Bangor Kiwanis Club in June, 1936. It is interesting to note that the subject of the first lecture was "Why some of our wildlife is becoming scarce and what can be done about it". The next year the first publication appeared—also in the extension field—entitled *Wildlife in Maine*, co-authored by C. M. Aldous, Leader of the new Unit, and A. D. Nutting, then extension forestry specialist. Since that date 102 publications have appeared, including two books, several Extension Service Bulletins and a variety of technical and semi-popular articles. Most of them describe the results of research by the staff or by graduate students.

Initial research probed details of the life histories and management of woodcock, deer, beaver and waterfowl. During the past 18 years a variety of problems have been studied ranging from census techniques to experimental management of wildlife habitats. The results have been applied to management programs and to drafting hunting regulations.

Teaching wildlife management by Unit personnel, at both the undergraduate and graduate levels, began in 1936. Because of the increased demands for research and for trained graduates after World War II, an additional member was provided on the forestry staff in 1947 to teach undergraduate courses.

Since the inception of formal study in wildlife, 159 men have received B.S. degrees and 30 men have earned M.S. degrees in wildlife management. A high proportion of these men are currently employed in responsible positions in wildlife management, or closely allied fields throughout this country and in Canada.

The graduate program offers an exceptional opportunity for qualified men to gain further training and experience. Financially attractive fellowships and assistantships are available to students who have demonstrated an aptitude for this work. At Maine, for example, graduate assistantships carry stipends of \$1800 to \$2100 per year plus tuition and reimbursement for certain expenses incurred while engaged in study on approved projects. The student devotes part of his time to work on regular Unit projects; the remainder to completion of formal courses and to critical study of a thesis problem. In addition, each man is expected to participate in public speaking engagements, answer routine inquiries from people seeking help, write detailed reports, and engage in other activities that help to develop skill in speaking and writing.

Wildlife management today involves several kinds of work including research, extension, teaching, administration and law enforcement. Each kind of work requires men with different aptitudes and levels of training or experience. Successful completion of a graduate training program is necessary for men who enter research or teaching. There is an evident trend for employers also to seek men with advanced degrees for some types of management and public relations work. This is not intended to imply that there is no place for people who complete only the 4-year course. The important point is that the technology of wildlife management is becoming more complex and employers are seeking more highly trained people for some kinds of jobs than was the case 15 years ago. This trend is illustrated by the fact that approximately 23 per cent of the men who graduated from leading wildlife schools in the 1956-57 school year returned to college for graduate study.

As of 1959 the Unit program has grown from 9 to 16 units scattered from Maine to Oregon, Alabama to Alaska. Research and

training also have been expanded in many other universities in the United States and Canada. In 1956-57, the most recent period for which data are available, more than 500 men earned degrees in wildlife management. Do all of these men find jobs in their chosen field? And, what are the opportunities for the future? These are logical questions often asked by students and their parents. We can answer the first question with facts. The second question — what about the future — cannot be answered as directly. Some current facts and trends, however, certainly provide clues about what lies ahead for wildlife managers.

Capable students who have demonstrated their potential as wildlife managers have always found employment. Referring again to the 1956-57 graduates from a sample of 46 schools, 7 in every 10 either found employment in wildlife or returned to school to pursue graduate study. The remainder entered military service, accepted employment outside of the conservation field, or, in a few cases, were in the "unknown" category. The number of men who have found employment in wildlife during recent years has varied, but in general it is agreed that the better men are in demand; the poorer students often end up in other types of work. The implication is clear; any capable person who is willing to work hard to prepare for a career in wildlife can find employment. Those who do not view their college training seriously, or who are unable to earn more than mere passing grades, will find little opportunity in this field.

As to the future, I believe that this trend will continue and that well-trained wildlife managers will always be in demand. For those who question this thesis I suggest consideration of the following:

1. The use of wildlife resources and participation in outdoor recreation in general is very popular. A recent survey, conducted for the U. S. Fish and Wildlife Service by an independent professional survey company, revealed some interesting facts. *One in every 5 people* over age 12 in this country hunted or fished in 1955! This represents a total of 25 million sportsmen. These people spent approximately 3 billion dollars for hunting and fishing in 1955.

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## Forestry, The Far West, and Air Defense

DR. HAROLD E. YOUNG

When I was an undergraduate student at the University of Maine during the depression years, there were few summer forestry jobs for students and practically none were available in the Far West. Since my return to the University in 1948 as a member of the faculty, virtually every student has been able to obtain summer forestry employment and a sizable number of the freshmen and sophomores have worked in the Far West. After hearing, for nearly a decade, of the experiences of dozens of students who vividly and glowingly described the western forests and terrain, I just *had* to see the region.

Knowing that my training and experience had been confined to the East Coast, each fall I would recognize the broadening effect of travel on my professional perspective that would come from seeing some of the West. By translating my experience in photogrammetry into military reconnaissance I have been a consultant for the Office of Operations Analysis, Headquarters, United States Air Force, for some years. From this office I received an opportunity to work with the North American Air Defense Command in Colorado Springs, Colorado, for ten months while one of the regular operations analysts took academic leave. The University granted me a leave of absence to cover this period of time. So we rented our home in Orono and in late August the entire family and I drove away on our adventure.

In Minnesota and South Dakota we saw the shelterbelts which were so controversial during my student days. The Black Hills, the meeting place of eastern and western species, was all that had been said of it. Geologically interesting and surrounded as it is by plains and prairies, it is mysterious

as to how the tree seed got there. From the top of Pike's Peak we have seen the backbone of the continental divide some 125 miles away. In addition to numerous weekend trips in this general vicinity we have traveled to California by way of Nevada and returned through Arizona. Now I really know, from observation, the importance of slope aspect. Virtually nothing grows on parched south slopes and not much on many arid east slopes. Magnificent stands of timber clothe the north slopes and west slopes. During our trip to California I could really see the effect of a slight change in the moisture regime on the composition and growth of the vegetation. These things have been described in textbooks for years; however, when you are interested in such matters as I am, it means so much more to see them.

My work has confined me to a desk and consequently I have not seen as much of the forests and western foresters as I had hoped. The very rugged western mountains and the generally dry climate are factors which make me look more objectively at the excellent growing conditions in Maine and the relatively easy operating conditions. It will not be possible for us to visit the Pacific Northwest on this trip but I hope to see some of the magnificent stands of timber there at some future time.

National security regulations prevent me from discussing my work, which is so challenging, with North American Air Defense Command. Most Americans, upon sober reflection, appreciate the freedom of our way of life. I believe that this is particularly true of those who enter the forestry profession. Unfortunately, I feel that the vast majority of the people in this great country of ours do not recognize the effort that is necessary to maintain our preferred way of living. The apparent unwillingness of our young men to serve in the armed forces for

relatively short periods is one of many indications of my previous statement. The present worldwide situation should not be taken lightly.

We intend to return to Maine via Washington and New York City. Beginning next fall discussions of prairies, deserts, plains, Ponderosa Pine, Lodgepole Pine, etc. will

probably make inroads on mensuration laboratory work even though the present senior class will doubt it. For those of you who have never seen the West, I encourage you to take any opportunity that comes your way to do so. I am enjoying it now but wish that my first trip west had been twenty-five years ago.







## Maine's University Forest

ROGER TAYLOR

The University Forest is an area of about 1700 acres of forest land located in Orono and Old Town, Maine. It is used primarily for student instruction, research, and demonstrations of various methods of harvesting forest crops.

Originally purchased by the Federal government under the Resettlement Administration, Division of Land Utilization, for the purpose of returning submarginal land to productive forest, the area was leased to the University in 1939 through the efforts of Mr. D. B. Demeritt, Forestry Department Head at the time. Later the land was deeded to the University and presently is supervised by the School of Forestry.

About 100 acres of plantations were established in 1936 by the Resettlement Administration. Since 1939 and up to the present time, a continuing program of planting non-productive areas has been in effect. These plantings have been made partly by students during laboratory field instruction, and partly by paid crews establishing experimental plantations of various spacings and species.

An extensive series of sample plots demonstrating various methods of harvesting forest products has been established throughout the Forest. These plots are remeasured periodically to obtain information on growth, mortality, regeneration and various other factors resulting from the type of treatment. Much of the original cutting done on these plots is part of the laboratory training of Forestry students in marking, cutting and management of forest stands.

Larger portions of forested areas not designated as sample plots are marked and operated to leave the best stand possible for a future crop, with special attention to

improving quality and accelerating growth. Operations on these areas are carried on either by local residents who buy stumpage and cut the timber themselves, or by University Forest crews who handle all the various phases of harvesting under the supervision of the Forest Superintendent.

In the current year a cut of about 150 M BF of sawlogs and 250 cords of pulpwood is being completed by a crew composed entirely of Maine Forestry school students working in their spare time. This crew consists of cutters working with their own chain saws, yarding crews on an hourly basis, and trucking by a student who owns his own truck. The yarding crews work with a crawler tractor, logging sulky, and metal scoot which are either leased or owned by the University. Ambitious and conscientious students are thus afforded an excellent opportunity to earn money while attending college and also gain valuable experience in the Forestry profession.

A small sawmill is another very important piece of equipment located on the University Forest. Short sawlogs from tops and thinnings which are not merchantable locally can be processed at this mill and a considerable volume of good lumber is obtained which otherwise would be either waste or at best low value pulpwood. The logs used and lumber produced are also valuable in teaching the techniques of scaling logs, and lumber tallying and grading.

Among several other important functions of the University Forest are its use by students and research staff interested in game management, entomology and forest soils. Game Management classes are taught various methods of game census, rodent control and other facts pertinent to their profession. There are opportunities to observe the habits of several species of wildlife, from the drumming of grouse to the construction of beaver dams. The Entomology Department is presently engaged in research projects on white pine weevil and sawyer beetles. Soil pits

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