

THE HARVARD FOREST

1907-1934

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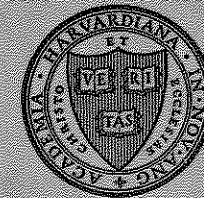
*A Memorial to its First Director*

RICHARD THORNTON FISHER

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PUBLISHED BY THE ALUMNI

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RICHARD THORNTON FISHER  
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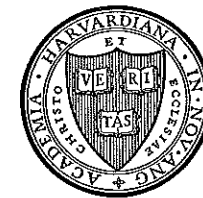
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## FOREWORD

This little book is the spontaneous manifestation by the Alumni of the Harvard Forest School of their unanimous admiration and loyal affection for Richard Thornton Fisher, the first Director of the Harvard Forest.

The Fisher Memorial Committee:

JOHN S. AMES, 1910.

*President of the Alumni Association.*

HAROLD O. COOK, 1907.

*Secretary of the Alumni Association.*

EDWARD S. BRYANT, 1907.

WILLIAM G. HOWARD, 1908.

WARD SHEPARD, 1913.

HENRY B. PEIRSON, 1920.

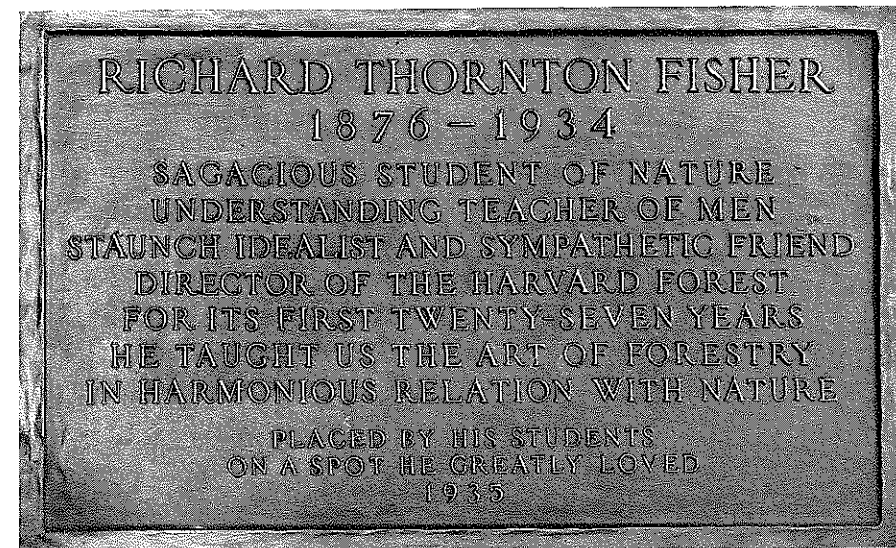
ALBERT C. CLINE, 1923.

CLIFFORD H. FOSTER, 1924.

ROBERT MARSHALL, 1925.

CLARENCE S. HERR, 1930.

HENRY H. TRYON, 1913, *Chairman.*



RICHARD THORNTON FISHER

1876 - 1934

SAGACIOUS STUDENT OF NATURE  
UNDERSTANDING TEACHER OF MEN  
STAUNCH IDEALIST AND SYMPATHETIC FRIEND  
DIRECTOR OF THE HARVARD FOREST  
FOR ITS FIRST TWENTY-SEVEN YEARS  
HE TAUGHT US THE ART OF FORESTRY  
IN HARMONIOUS RELATION WITH NATURE

PLACED BY HIS STUDENTS  
ON A SPOT HE GREATLY LOVED  
1935

THE FISHER MEMORIAL TABLET

## RICHARD THORNTON FISHER

ANY history of Harvard's work in forestry, written now or hereafter, will begin by naming Richard T. Fisher, whose untimely death occurred on the ninth of June, 1934. When the University undertook to teach forestry in 1903 he was selected by President Eliot to organize the course and was appointed Instructor. Soon after, when the Harvard Forest at Petersham was acquired in 1907, he became in fact what he was later to be in name, its director. With respect to all Harvard's doings in the field of forestry during the years that have rolled by since then, his has been the guiding mind, so that what has been accomplished has been largely his achievement. In retrospect it all seems to be tinged by the colors of his personality. Fisher and his work can no longer be thought of separately.

Richard Thornton Fisher, born in Brooklyn, New York, November 9, 1876, was the only son of Edward Thornton Fisher who had been the top boy in his form at Exeter and class poet of the Harvard Class of 1856. Bad health interfered with the elder Fisher's career, but during most of his life he engaged in teaching; first in Brooklyn and later in Lanesboro, Berkshire County, where from 1883 to 1912 he conducted the Home and Preparatory School for boys. He was a gentle soul and a man of native refinement of taste and intellect, just as was his son. His wife, Richard's mother, was Ellen Bowditch Thayer, a sister of Abbott H. Thayer, the painter.

Abbott Thayer, in whose company young Fisher spent a good part of many boyhood vacations at Dublin, New Hampshire, was an important influence in the nephew's development. He was, as some people know but many do not, a remarkable naturalist as well as a distinguished painter. His theories about concealing coloration went far beyond Wallace's, were truly original and have now, in the main,

been accepted.\* He not only saw birds and all other living things with a painter's highly trained eye, but he made what I think it is correct to call a truly scientific approach to the study of the relation of their shadow patterns and color patterns to concealment and therefore to their environment and their habits. Any scientist knows that it is hard to recognize what is before your eye if it is not supposed to be there, and that a large proportion of the "discoveries" have been made because this person or that had confidence enough in his own perceptions to recognize what countless other people might have noticed long before. Thayer could see that the colors in which a "conspicuous" bluejay is dressed are no brighter than the colors of a snowy landscape; that a scarlet tanager, who seems to demand attention if he pauses for a moment at the edge of the lawn, becomes almost invisible in the top of the tree in which he feeds or nests. And he knew, or thought he discovered, the whys of such things. In his company Fisher learned what was ultimately more valuable to him than would have been an orthodox education in systematic ornithology or botany. He acquired, along with a great love of nature, the art of honest, curious observation and the habit of considering the relations of things to each other.

Richard T. Fisher entered Harvard with the Class of 1898, and in due time received his A.B. degree. He was an editor of the *Advocate* and a member of the O.K. Society and Hasty Pudding club. He specialized in courses in the English Department and graduated with honorable mention in English composition. Those of us who knew him as an undergraduate assumed that he was likely to devote himself to English studies and teaching. As a matter of fact, during the first winter after he graduated, he did serve the College as an assistant in Professor Wendell's and Professor Copeland's courses. But meanwhile an accidental combination of events determined his career. He spent the summer of '98 with a small party that C. Hart Merriam, then at the head of the U. S. Biological Survey, took out for a season of collecting on the upper slopes of Mount Shasta, and

\*Thayer was the real originator of "camouflage." During the Spanish War he tried to persuade the Navy Department that a uniform "battleship gray" was not the right war paint for a cruiser—but in vain. By 1914 his ideas had many champions and all the navies then engaged covered their ships with patterns that were more broken and brilliant than those of a wood-duck.

the experience with Merriam, worth more than any ordinary course in zoölogy, awoke in him a realization that what he most desired was some occupation that had to do with nature. Coincidentally, while on Mount Shasta, Fisher encountered Gifford Pinchot, who had just become Chief of the Division of Forestry (later developed into the United States Forest Service), and Mr. Pinchot offered him field work for the ensuing summer. Thereafter Fisher continued either in the Forest Service or on leave of absence as a student in the Yale Forest School, until he was appointed Instructor at Harvard. Before he began to teach he had thus been one of the enthusiastic and "closely knit group of men who helped Mr. Pinchot get the practice of forestry under way." While in the Federal Service he had done field work in the west as well as in the east. His bulletin on the coast Redwood, "the first careful study of that important tree," and another bulletin called "The Woodlot," in the preparation of which he collaborated with H. S. Graves, were both brought out by the Bureau of Forestry in 1903. By that time he had also spent some months studying in European forests; and, as a member of the first class regularly graduated from the Yale Forest School, had received his Master's degree.

Although the first few years of teaching look somewhat fruitless from our present point in time, they were by no means wasted; for a teacher learns much, and although the University then had no outdoor laboratory of its own, Fisher was carrying on a consulting practice and could take his pupils to visit woodlots and operations on other people's lands. But his truly constructive period began as soon as the Petersham tract was given to Harvard. The Forest immediately became several things in one,—an indispensable aid to instruction, a field laboratory in which investigations could be carried on and observations could be accumulated without interruption, and a place where new methods of silviculture could be demonstrated. Soon thereafter elementary instruction ceased to be offered at Petersham and no more students were enrolled unless they were already prepared for advanced work. At first, it was the practice to move classes to Cambridge and the Bussey Institute during the winter months, but cold weather accommodations for a few men were later arranged at Petersham. The lack of accommodations for more has limited the annual enrollment of five students.

temptation to do something showy. And, in the course of fifteen or twenty years, valuable conclusions did begin to emerge at Petersham, and Fisher, who felt a normal craving for recognition, had the satisfaction of realizing that competent professional brethren all over this country and also abroad were welcoming these results and were beginning to discuss their implications. An honorary M.S. that Yale conferred upon him in 1929, pleased him greatly. During the decades that lie ahead of us, as more and more lessons come out of the experiments in the Harvard Forest, those who can understand will realize that they are, to no small extent, the ripening fruits of work that Fisher inaugurated but could not live to complete.

What were the results that were achieved?—achieved, be it always remembered, by the aid of a small though enthusiastic staff and very meagre funds. The question can be answered by citing a few facts and by quoting certain persons whose professional opinions are entitled to respect. I shall speak first of The Forest and professional connections, and last of the students, and of Fisher's personal influence.

Fisher was the first to recognize the importance of distinguishing between those local forest types which are purely temporary and hence transitional in character, and those which contain the elements necessary for stability and permanence. Outstanding among the former when the Forest was acquired by the University was the "old field" white pine type, which has reclaimed the abandoned fields and pastures throughout New England. So prevalent and productive was this type that one can readily understand, and forgive, much of the early propaganda that advocated planting white pine in pure stands, anywhere and everywhere. Fisher was one of the very first to see that an undergrowth of desirable hardwoods invariably became established under the pine canopy in advance of logging, and that, with equal certainty, this hardwood formed the bulk of the next volunteer crop. Recent studies have shown that fully eighty per cent of the area formerly occupied by "old field" pine now supports mixed hardwoods. With the very first cutting on the Forest, in 1908, Fisher began a quarter century of intensive study of the white pine-mixed hardwood succession, gradually evolving a complete system for replacing a temporary type, inherently poor in quality of product and

inimical to the maintenance of soil fertility, with a mixture of hardwoods of potentially high quality, possessing marked soil-building properties and a maximum of security and stability, all without recourse to planting.

Prior to 1920 American foresters, generally, paid little attention to a very definite link between the condition of the soil and the trees growing thereon. They had usually accepted forest soils as being simply good, bad, or indifferent. Fisher's early observations sharpened his interest in this and a visit which Dr. Henrik Hesselman, Director of the Swedish Institute for Forest Research, made to Petersham led him to focus attention on the problem of soil relationship. With the collaboration of Professor P. R. Gast special investigations were undertaken. Fisher emerged with an entirely new view point. It is owing to this that the Harvard School is to-day carrying on its fascinating researches in this field. And it is also on this account that similar investigative projects are being furthered at the Black Rock Forest. It is fair to say that Fisher stimulated a new and essential interest in forest soils.\*

The Forest has acquired a reputation, both within and beyond the boundaries of the United States. Mr. P. M. Barr, Chief of Research in the forest service of British Columbia, wrote in 1928 that it offered "more in the way of instruction and inspiration than any place he had visited." Dr. von Maltzahn, of the Mecklenburg Forest Service, said in that same year that he considered it the most instructive example of forestry in America, and added that if he were looking for examples of applied silviculture on this side of the Atlantic, he would mention one word: "Petersham!" Mr. R. S. Schonland, of South Africa, wrote to Mr. Fisher after his visit in 1927:—"I really do not think that I was ever able to collect so much information in so short a time." "Forest News," edited at the first thorough-going School of Forestry which was established in this country—that at Yale, where Fisher took his own M.F.—recently said that at Petersham

\* For guidance in making the statements in this and the preceding paragraph I am indebted to Mr. A. C. Cline of the Harvard Forest, Mr. H. H. Tryon, Director of the Black Rock Forest, and Dr. Austin Cary of the U. S. Forest Service. It has further been my privilege to read a large number of letters from men of professional standing and competence, some written before Fisher's death and some since; but unless I quote them directly, it seems unnecessary to retail their names.

the "record of continuity in intensive silvicultural practice is probably unequalled in America and it is to the cumulative results of this management that Fisher's contribution to forestry owes its great value. . . . The Harvard Forest gives to the profession that which is most needed now and which will continue to be our most urgent requirement for decades to come—a demonstration area where the actual working out of forestry practice as a successful business venture can be studied at first hand without having to visit a foreign country to convince ourselves that it can be done."

During the last few years Fisher and his assistants and an unnamed friend of the Harvard Forest have been making plans for a little museum at Petersham, and have been preparing exhibits in the form of scenes like the "habitat groups" that have been beautifully installed in the New York Museum of Natural History. When these are completed and shown, I am confident that they will be found to convey both historical information about the evolution of our New England forests and practical information about methods of management in such a revealing fashion as has never been before.

In addition to the work that was done on the Petersham tract itself, extension work that was carried on by rendering consultative services has undoubtedly been important. Fisher established advisory relations with a long list of private estates, lumber companies, wood-working industries and corporations controlling water supplies. Many of these people were skeptical and distrustful at the outset. Hard headed operators couldn't have been expected to approach forestry in any other spirit. Tact and salesmanship alone could never have won their respect. But Fisher convinced them that he could make their problems his, and that he had common sense to offer as well as knowledge. By means of these connections the range of experiment and experience open to the staff and students at the Forest was widely extended, and on the other hand the staff of the Forest was enabled to exert an active influence in the determination of methods of management.

The officers of the Massachusetts Forestry Association leaned on Fisher for advice. Although I think he seldom appeared at legislative hearings, he had a great deal to do with the formulation of all the early laws concerning forest matters that were enacted in Massachu-

setts, and he was especially helpful in connection with the forest taxation law of 1922 and the establishment in recent years of town forests.

Although a forester has to be rigorous about costs and returns, just like a thrifty farmer, Fisher was quite clear about the fact that a forest, enduring as it does for decades and perhaps centuries, should yield other benefits to the community besides logs and cord-wood that can be turned into dollars. It affects a water shed and the local atmosphere. It transforms its own soil. It harbors different kinds of game, according to its type, and similarly birds and beasts that matter to the farmer. The woodlands offer opportunities for recreation, and inasmuch as American tax payers will have something to say about the rapidly increasing number of Federal, State and town forests, it would be a practical mistake as well as a pity to overlook æsthetic values. All sorts of considerations should be taken into account. It was often a delicate matter for the Director of the Harvard Forest to maintain happy relations with the Petersham community, composed, as it is in part, of tax paying farmers who might easily be troubled by the withdrawal from the tax rolls of a large tract of land, and partly of summer residents who are inclined to be sentimentally resentful when handsome trees are felled. Both Harvard and Petersham will remember with gratitude that Fisher was endlessly patient and considerate about the relations of the Forest to its neighbors and to the town. So important was this that it seems relevant to note that Fisher went further and took such a part in the town's own affairs that he became one of its leading citizens.

The people of Petersham could see that he was not a new fangled kind of lumber man, but a fellow townsman who loved their countryside and cared about the general welfare no less than they did. They were aware that, like some of themselves, he was a good fisherman, an excellent rifle-shot, and a true sportsman. The Petersham Country Club's recent resolution on his death is worth quoting:—"The golf links of the Club are the result of his imagination, of his enthusiasm, of his practical genius, and of his untiring effort and continuous care. The spirit and sportsmanship of the Club were fostered by his friendliness and his example. The Club can never regain in a single person what it has lost by his death." When, recently, the State Highway Commission proposed to straighten and widen the highway



passing through Petersham, Fisher's promptness, ingenuity and tact contributed largely to the adoption of a plan that will swing the road past on a detour and spare the village.

Apart from the development of the Forest and its affiliations with the local and the larger community, there was always the teaching. It will be recalled that elementary instruction was not given after 1907 and that since then the Forest has been a station for research where only a few men at a time have been accepted as students. About ninety of them have now received the Master's degree in Forestry on Fisher's recommendation and about thirty-five more have studied at the Forest without taking degrees. Modest as these numbers may seem at first glance, they represent a considerable contribution to the ranks of a small and young profession. Furthermore the contribution appears to have been a significant one. How generally the graduates have stuck to the profession is indicated by the fact that more than sixty of them are members of the Society of American Foresters, and at least twenty are engaged in research. One is a Senior Lecturer at Melbourne University; another is Director of the Pack Demonstration Forest at Warrensburg, New York; another is Director of the Black Rock Forest. One is Chief of the Indian Forest Service in the Interior Department; two are heads, respectively, of the New York and Massachusetts State Forestry Departments. Some are filling other positions of high responsibility in the Federal and State Services, and others are professors or instructors in Schools of Forestry or are leaders in the profession at large. Professor H. S. Graves, Director of the Yale School of Forestry, writes ". . . I regard Fisher's work in education as one of his largest contributions to forestry. He properly resisted the idea, still held by many, that a practical man with a moderate knowledge of forestry can meet the requirements of the profession. The great influence which the Harvard Forest has exerted and will continue to exert is derived from the high standards in education which Fisher set, from the character of his teaching, and from the vision of the broad significance of forestry in our national life which has been emphasized at the institution."

Such facts are what might be called the records of achievement, but it would be wrong not to speak of something that Fisher brought



The site of the Fisher Memorial by Tom Swamp Pond

to all his tasks and into all his relations with his students. I refer to certain personal qualities and to the influence of his own example. All the notices and letters about him that I have seen since his death remark on these things. Mr. Tryon adds to what I have already quoted from him: "I think his greatest gift to men like myself was the inspiration of his quiet, humorous, unceasing enthusiasm." Dr. L. G. Romell, a Swedish soil scientist, writes: "He had more of that biological feel for and with his forest than is usual with American foresters in particular. This, to my mind, is a very essential thing for a silviculturist and forest ecologist,—so essential, indeed, that only men gifted with that feel can be expected to show the way to newer and truer methods in silviculture." Another says:—"My own feeling on the subject of Professor Fisher's service to the profession is that his greatest contribution was the elevating and refining influence of his own character and personality and his philosophical and far-sighted approach to the innumerable problems that confront every new profession."

When Fisher was young he went about in a perpetual state of moral and æsthetic ebullience, quoting Wordsworth, Shakespeare, his uncle Abbott Thayer, Thoreau or R. L. Stevenson—the latter more than all the rest, for during a certain youthful period Stevenson came near to being his divinity. We used to laugh at him, and he would then join in the laugh with entire good nature, and the next minute he would invite us again to flutter upward toward the empyrean. Time (which means age), a happy marriage, children, family cares and innumerable work-a-day duties quieted him and hardened his gristle. The inner warmth remained but the ebullitions died down and, strange though it may sound to anyone who knew him only as an under-graduate, he became rather reserved. An anonymous correspondent of the *Transcript* has recently referred to him as "an idealist with the love of beauty so completely filling his life that in spite of his great gift of making all men his friends, he seemed a little apart from them all." This correspondent adds:—"A quiet dignity was his, and the real simplicity of a philosopher who looked for the good in all things and generally found it."

If I may offer my own testimony, I would add that he was the most interesting and delightful out-of-doors companion whose com-

pany I have ever enjoyed. He saw the sunlight at play among the leaves as well as the forms of the foliage. He noticed everything that went on about him and his mind was discursive rather than just systematic or analytical. Birds and beasts, plants and trees, earth worms and soils, streams and ponds and the history of the transformations that have been wrought on the New England hillsides—such matters were not divided and distributed into special compartments in Fisher's mind. Their interdependencies were as interesting to him as were their separate idiosyncracies. Although he looked like a professor—bald head, little blond beard, spectacles, and often a ruminative look in his blue eyes—he was not a bit pedagogical. He did not try to exhort or instruct; he wasn't forever dragging forth the nomenclature and technicalities of a specialty while leaving it to others to relate it to the realm of one's ordinary interests. Quite the contrary, he went about as if asking for nothing better than to take a walk and enjoy the scene. He entered into your interests, and not until you were wise enough to turn the talk upon what you found in the woods, did you begin to draw out his special wisdom. What he then imparted had the quality of suggestion rather than the quality of doctrine. Not that he was vague or inaccurate—to give that impression would be quite wrong. But his imagination was active, and it seemed to envelope any discrete splinter of reality in a halo and penumbra of fascinating relationships, discernible or still to be explored.

There lies before me a letter from a friend of Fisher's—not a forester it so happens—who knew him intimately for thirty-five years. "I did not realize until lately," he writes, "how much I owed to Dick. From those early days he opened, somehow, for me the doors of romance. Fields that were without limit. First of all in music. In biology, and everything that had to do with nature. To some extent in literature. And always he was on the side of appreciation rather than of criticism. He became a part, or a possible part, of all my recreations. (Incidentally he was my most sympathetic audience. He believed in me.) I shall miss Dick, but above all I shall miss what he understood and appreciated. The world and the sunlight seem poorer without his response." If the writer of these sentences were to be reminded that Dick Fisher didn't know a great deal about music

and was quite ignorant about vast areas in the field of biology, he would admit it, and would add:—"That didn't matter."

We learn most readily from those we revere and love. The seeds of their teaching fall upon soil that is already warmed and hospitable, and they are the ones who most often help our natures to unfold and



Tom Swamp Pond seen from a point near the Fisher Memorial

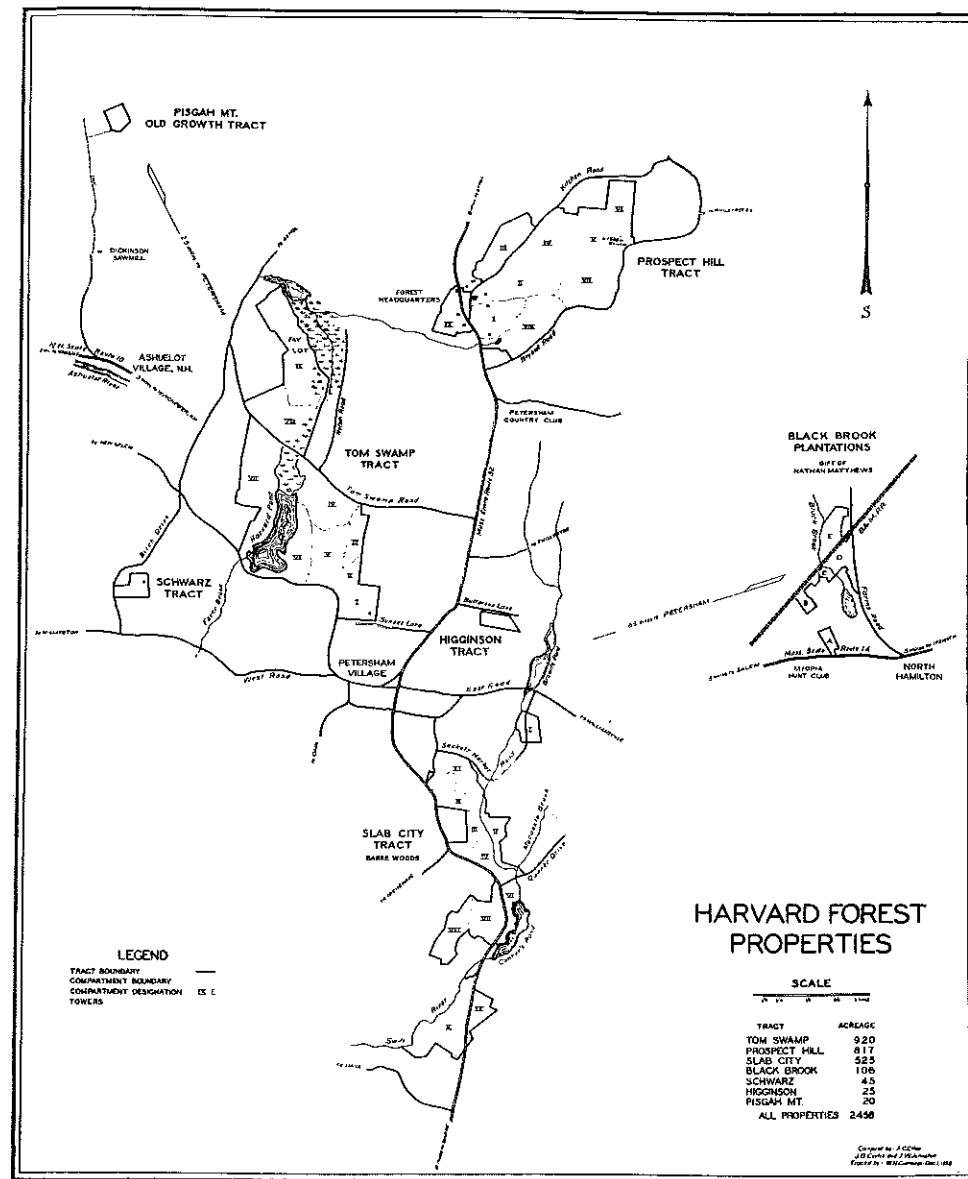
expand. After all, perhaps there is nothing more important to record by way of justice to Fisher's memory than that he possessed qualities which thus add immeasurably to a teacher's power of doing good. Although I doubt whether he was able to make himself count effectively in a formal classroom, I am sure that he shone at Petersham, where from day to day he and his assistants and pupils shared each other's work in an informal comradeship. So little of his time was

spent in Cambridge, so few officers of the University ever visited Petersham, and so very few of his students were graduates of the College, that the Harvard Community can hardly be expected to realize what he did or to perceive where his labors are bearing fruit. The men whom he trained and who were influenced by his spirit have entered a profession that is new in America. Preceded and led by only a dozen or so of his own contemporaries, the generation of foresters into which his pupils have been recruited will have to be reckoned as the pioneer generation.

Naturally Fisher had his troubles and his disappointments. But he never had a crushing sorrow to bear, and I think he would agree that his life was unusually happy. Sympathy and the companionship of people whom he could like and respect, which were very necessary to him, were offered him in good measure; for in addition to his own family he had a small host of friends. He was convinced that the work in which he had engaged was worth doing and knew that he could do it well. He enjoyed doing kind deeds and giving out sympathy and encouragement to others. And he always kept his eyes and his heart open to the beauties of both the visible and the invisible worlds.

HENRY JAMES, '99

*August, 1934.*



## THE HARVARD FOREST

1907-1934

### THE OBJECTS

THE HARVARD FOREST was acquired and developed with three objects in view. The first was a model forest which would represent the various stages of growth, demonstrate in successful operation various phases of forest culture, and afford a regular yield of forest products without depletion of the forest capital. The second was an experiment station for research in special problems of the growth, yield and habits of trees, and for the investigation of other biological problems associated with the forest. The third was a field laboratory in which students might learn from the woods, rather than books, and receive the additional advantage of "clinical" training.

For these purposes the Forest was given to the University in 1907. Mr. John S. Ames, '01, of North Easton, Massachusetts, generously supplied the money for its purchase together with an additional sum for repairing and outfitting buildings. About 1800 acres of the land were previously owned by Mr. James W. Brooks of Petersham. To perpetuate the forest and to render it useful both to the town and to the cause of forestry, Mr. Brooks offered it at a price substantially below its estimated value. At the same time, owners of certain adjoining parcels, Messrs. J. J. Higginson, Edwin C. Dexter, Joseph C. Smith, Henry S. Bennett, Charles S. Waldo, William Simes, and Mr. Brooks himself, gave contiguous lots and holdings totalling between 200 and 300 acres. These additional gifts simplified the boundaries, secured the approaches and increased the area to about 2100 acres. Three separate tracts, known as the Prospect Hill, Tom Swamp, (formerly Meadow Water,) and Slab City (or Barre Woods) Blocks composed the initial gift. These lie respectively northeast, northwest, and southeast of Petersham Village.

Of the three blocks, the Prospect Hill Block has the highest elevations, ranging from 1100 to 1400 feet, and the most uniform soils and growing stock. Much of it was logged a little more than forty years ago, and the cuttings seeded in, for the most part, to inferior hardwoods. The Forest has cleared off a large portion of this cordwood stand, and has replaced it with coniferous plantations, many of them now in the large sapling and small pole stages.

The Tom Swamp Block, which extends from Sunset Lane near Petersham Village westward across the valley and Tom Swamp Pond and thence northward to the Athol line, contains an extremely wide variety of soil, topography and growing stock. The permanent white pine type on gravelly soils and the permanent spruce type on sphagnum bogs—both types occurring at low elevations in the valley bottom—give way to splendid stands of mixed hardwoods, or of pine and hardwood on the rich mull soils of the lower slopes. This block has received more silvicultural treatment than the others, and is especially noted for its young mixed stands. It was here that Professor Fisher developed his method of replacing old-field white pine with mixed hardwood, or with mixed pine and hardwood. An observatory near Sunset Lane affords a view of nearly the entire area.

The Slab City Block, perhaps better known to-day as the Barre Woods, lies on either side of the East Branch of the Swift River. As with the other blocks, much of its area was formerly cultivated. There still remain many examples of old-field pine, but the outstanding feature is the fine stand of culled old growth mixed forest on either side of the state highway at the southern end of the block. The drive through the Barre Woods is one of the most attractive in the State, and is much admired by motorists every year.

Since 1907, through exchanges, purchases and gifts, the area of these three main blocks has been further increased by about 194 acres. In addition the Forest has received the following donations of detached forest tracts: the Higginson Tract and the G. Frederick Schwarz Tract at Petersham, the Matthews Plantations at Hamilton, Mass., and the Pisgah Old Growth Tract at Winchester, N. H. To-day the total area of the Forest properties is 2458 acres.

## HISTORY OF GROWING STOCK

In the early days in north-central Massachusetts, the composition of the forest was vastly different from what now prevails. From the small remnants of original forest and from such scattered documentary evidence as is obtainable, it is clear that the primeval forest here was almost everywhere a mixed and many-aged stand containing both softwoods and hardwoods. White pine and hemlock with a scattering of spruce made up the bulk of the softwoods, the pine usually occurring as a very tall and scattered over-wood under which grew in great variety of size and age, hemlock, maple, beech, white ash, red and white oak, yellow and black birch and other hardwoods.

This original forest, covering probably 80-90% of the land, tended to become pure hardwood on the deeper and more moist soils and to merge into almost pure softwood on the upper ridge tops, slopes, or dryer and more sandy sites. With the advent of the first settlers, there was probably very little pure pine. What clearings existed were made by Indians and by uncontrolled forest fires.

The economic history of central New England has completely altered this forest composition. Petersham was settled in 1720. By 1820 agriculture had cleared approximately 60% of the total land area of the region. This figure was about 75% for Petersham, where the population in 1830 was nearly three times that of to-day. These cleared areas usually extended east and west from the ridgetops, sparing the bulk of the forest on the lower slopes and along the valley margins. The ensuing 40 years witnessed many important economic changes. Manufacturing began along the main streams. The Fitchburg and B. & A. railroads were built. The discovery of gold in California, the building of trans-continental railroads, the opening of the West and the Civil War came in quick succession, all drawing abundantly on the farming population of New England. Farm abandonment showed a rapid increase in Petersham and elsewhere; and to-day nearly 75% of the land is in forest.

Natural reforestation followed swiftly and steadily on this wholesale withdrawal of land from cultivation or pasturage. Owing to the reproductive habits of the various species, this natural planting

resulted in numerous temporary types which are in sharp contrast to the original forest. Large areas of field and pasture came up to pure white pine, producing the so-called woodlots which to-day make up the bulk of the commercial timber of the region. On other areas, where white pine seed was not promptly available, the weed trees such as gray birch, poplar, pin cherry and red maple have produced in later years stands clearly inferior in value and frequently defective in size and form. Some white pine is frequently present in this type, but much of it dies out in the first twenty years. Cut over forest land, whether original forest or second growth, and whether predominantly pine or hardwood, has steadily reverted to a larger and larger per cent of broad-leaved species except on light, sandy soils or on culled areas. Hence, when the Harvard Forest was first put under management, the outstanding factors were the following:

1. Save for a few fragments of original forest and much of the Prospect Hill Block, the stand was almost entirely second growth and over seventy years of age. On former fields and pastures the composition was chiefly white pine.

2. It was at least 90% even-aged and originated either on abandoned farms or on clear cuttings.

3. It was composed in large measure of temporary types; i.e., mixtures of species not truly characteristic of the soil and factors of locality. Old-field white pine was largely a temporary type, as is now evidenced by the fact that practically every pure pine stand sixty years or more old is full of hardwood advance growth, and, after cutting, the new stands are largely hardwood. Fully 80% of the cut over old-field pine land is now growing mixed hardwoods. Moreover, all the inferior species are now occupying much greater areas than in the original forest where competition was unrestricted, since extreme exposure, either through cutting or land clearing, has enormously increased the prevalence of the light-demanding weed species. The permanent types are the mixed old growth, the spruce bogs and the hardwood swamps.

In brief, at the time of its acquisition the Forest represented merely what some 200 years of local colonization had done to the original wilderness.

It is of peculiar interest to note that even on so small an area the

forest exhibits a remarkably wide range in physiography and forest types. The ridges run north and south. Geologically the area is a dissected peneplain. Elevations range from 700 feet along the Swift River to 1400 feet at the summit of Prospect Hill. Soils include practically all the gradations from light sands and gravels to heavy clay loams. The growing stock ranges from slow-growing spruce in sphagnum bogs to quick-growing hardwoods on the rich upland soils. The age classes now extend from one to upwards of two hundred and fifty years. The forest form varies from strictly even-aged to all-aged stands, while the composition ranges from stands composed entirely of one species to those made up of twenty or more. Included also are two sizable stands of old growth which have been lightly culled. It should also be noted that this north-central portion of Massachusetts is a most interesting transitional forest region. It is cold, and sufficiently well watered to favor a number of the most important commercial species of the North Woods. On the other hand, it contains a considerable number of trees which are more characteristic of the sprout hardwood and central hardwood region.

The protected sites in the northern part of this zone favor the growth of a number of northern species, including hard maple, beech, yellow and paper birch, red spruce, and balsam fir; while the more exposed sites to the south favor such central species as red, black, white, and scarlet oak, hickory, chestnut and pitch pine. Intermediate locations are characterized by an intermingling of these species, and, in addition, by several other species which have a fairly wide north-south range and cannot be classed as being typically northern or central. Among these are white pine, hemlock, white ash, black cherry and red maple. Less important species, as listed by Professor Jack and occurring on the Forest are: red pine, American larch, black spruce, red cedar, several species of willow, quaking aspen, large-toothed aspen, butternut, shagbark and pignut hickory, hop hornbeam, blue beech, gray birch, black birch, alder, chestnut oak (not on the Forest but nearby), American elm, sycamore, (very rare), mountain ash, amelanchier, hawthorn, pin cherry, black locust (escaped from cultivation), striped maple, mountain maple, basswood, black gum, and black ash.

## SPECIAL USE AREAS

### *Reserved Areas*

A 200-foot strip of untouched forest is maintained on either side of the state highway running through the Slab City Tract, thus affording an attractive approach to Petersham Village from the south. This reservation from cutting is much appreciated by motorists and by the local population. There are two small areas where camping is allowed under permit. Near the top of Prospect Hill, where is situated a steel fire tower owned and operated by the State, an area of several acres is to be kept open forever to perpetuate the excellent view, as agreed upon in the deed from the former owner. The culled old growth stands and representative examples of other forest types of particular interest or significance are also reserved from cutting. In all, some 300 acres are set aside for these special uses.

### *The Game Sanctuary*

In 1923 the entire Tom Swamp Block, with the exception of the recently-acquired Compartment IX, together with a small acreage owned by others, was established as a wild life sanctuary under the Massachusetts Department of Conservation. No hunting or trapping is permitted, nor may the nest, eggs, or young of any birds or mammals be disturbed or removed. With such protection and consideration for the rich fauna in this area, an excellent opportunity is afforded for the study of undisturbed wild life.

### *The Schwarz Tract*

In 1928, a 45-acre forest tract situated in the western part of Petersham was donated by the late G. Frederick Schwarz for the development and demonstration of landscape forestry. The composition and form of the stand, the presence of individual trees and of groups of striking character, unusual topographic features, the methods of regeneration and the location of roads and trails are among the many important considerations in planning the management of the area. Only the beginnings of a detailed plan have been formulated. Type and topographic maps have been completed, and



A bit of the Pisgah Old Growth Tract

a trail has been built from the Schwarz cabin to an observation tower near the eastern boundary.

It should be added here that Mr. Schwarz' idea arose from his appreciation of the interest that owners of forest estates often have in a method of handling which will yield some income and will, at the same time, keep the forest beautiful.

#### *The Pisgah Old Growth Tract*

In 1926 a 20-acre stand of virgin timber situated on Pisgah Mountain in the town of Winchester, New Hampshire, was acquired. The purchase required quite a sum of money, as the area was heavily stocked with old timber, and the Harvard Forest is much indebted to Dr. John C. Phillips for his generous assistance in making possible the addition of such an eminently desirable parcel to the Forest property. The stand is a mixture of pine, hemlock, and hardwoods, ranging from seedlings to 350-year veterans, and is one of the very few authentic cases of undisturbed original forest in this region. A more complete knowledge of the interrelations of natural phenomena under primeval conditions will be of inestimable value. This tract is strictly reserved for study and observation; no cutting of any kind is permitted.

#### *The Black Brook Plantations*

From the estate of the late Nathan Matthews, the Forest received in 1928 a gift of 106 acres situated at Hamilton, Massachusetts. Here are a large number and variety of closely spaced plantations set out by Mr. Matthews, beginning in 1897. Conifers and hardwoods are included, with the former much in the majority. Both groups are from the North Temperate Zone, and were planted in all manner of mixtures, furnishing an unequalled opportunity for the study of important exotics under forest conditions. Moreover, this arboretum differs distinctly in another respect from the usual arboretum plan in that the trees are planted in close groups, often in mixtures and not as isolated individuals. Three hundred thirty-six stands have been individually mapped and recorded.

Sample plots have been established to follow certain methods of treatment, and a good start has been made in thinnings and improve-

ment cuttings in the oldest and most dense stands. Unusually close spacing, in some cases only two or three feet, has produced conditions of crown and root development requiring thinnings of a type not practiced at the Forest. In fact, the differences in soil, climate, and growing stock, compared with those at Petersham, are such as to create an entirely new set of silvicultural problems. The Douglas fir, the European and Japanese larch, the Norway spruce and the Scots pine are the exotic species which have shown the best growth. It should be noted that it was here that the European larch canker was first discovered in this country.

#### FOREST RECORDS

Experience has proved that the value of any demonstration forest is in proportion to the completeness and accuracy of its records. To maintain such accounts is always difficult, and quite naturally becomes more so as the area under experiment increases, or as the field of research is widened. As time passes, new and unforeseen problems arise for solution. Where the history of a forest is accurately known, both from the economic and the silvical side, it is often possible to complete a significant study which would have been quite out of reach on an unmanaged area.

No suitable, or even recognized system of keeping such records existed when the Forest was first placed under management. Many valuable data were gathered from the reports compiled by the students of the first few classes. After a short interval an efficient and comprehensive system had been worked out, and to-day the Forest files may rightly be classed as adequate.

Under a sound scheme of management it became necessary to control the business phases of the operation as carefully as the silvicultural. In the system of records and accounts which has been developed this phase of the work is fully provided for. All labor costs, operating expenses, and the various forms of overhead, including interest on the invested capital, are currently posted and periodically summarized. Form sheets are provided for annual statements of the timber and other products cut in each block, compartment, and type. The status of the growing stock as regards volume, composi-



tion, age and growth is kept track of in a card file now totalling some 600 entries, with one card for each single uniform stand, a number of which may occur in a single compartment. Such a file makes it easy to summarize the condition of the growing stock at any time. In the silvicultural and biological aspects of management, the records are even more comprehensive. The stand is the unit of management throughout; each cultural operation is recorded by a specific stand reference. The forest as a whole is of necessity constantly changing, and fifty or more annual silvicultural operations require much detail work to keep the accounts up to date. Permanent sample plots, nursery stock, plantations, annual cuts and areas set apart for special study are given a special record form. A full set of 29 large scale compartment maps is maintained, on which all significant changes in the forest are plotted. Finally, and applying to all forms of forest operation, there is a photographic file of several thousand negatives and prints. Since there is no fireproof building at Petersham, duplicate records are kept at Cambridge, and the photographic negative file is stored in safe quarters in Athol.

#### SILVICULTURE

In 1908, when the Forest was first placed under management, the profession of forestry in this country was barely ten years old. Practically the entire array of knowledge bearing on the evolution of American silviculture was still to be obtained. Moreover, up to quite recent years the chief emphasis of forestry had been on furthering public policies and public education rather than towards developing the scientific and practical foundations of correct forest practice. The happy combination of an early start and favorable natural and market conditions has enabled the Forest to perform a unique service in demonstrating the methods of practical sustained yield management.

#### *Management Policy*

Starting out as a somewhat abused and wholly uncared-for area, the Forest has made substantial progress toward the ideal of a sustained and maximum yield. Meanwhile, sizable crops of timber and other products have been harvested in such fashion that to-day

the capital growing stock is slightly more than the original estimate. Until recent years the Forest has shown a profit on its operations. This quarter-century is a record of continued, intensive silvicultural practice probably unequalled in this country.

The production of high-grade timber has, from the outset, been the goal of silvicultural practice at Petersham. Never to work counter to nature, but rather to harmonize man's efforts with natural tendencies might accurately be called the keynote. As a result, various fascinating and successful methods of conversion, or of utilizing natural reproduction have been evolved from many carefully observed trends of natural type sequence, and have successfully duplicated nature's effort to replace the prevalent old-field white pine with a mixed forest.

It is interesting to note here that during a brief early period of management the emphasis was laid on obtaining pure white pine stands. A few pure pine plantations were established, and some of the earliest cuttings were started on a shelterwood system. But Professor Fisher quickly remarked the inconsistency between such a course and the natural trends, and soon after 1908 he inaugurated a quarter century of painstaking study and experimentation which centered in the white pine-mixed hardwood succession.

Gradually—that word so often applies in forest research—there was evolved a complete and successful system for the conversion of a temporary forest type, often inherently poor both in quality and in quantity of product and deleterious to the supporting soils, to a more stable association of valuable hardwoods, or perhaps of mixed pine and good hardwoods of potentially high quality and of marked soil-building propensities. It was by the Harvard Forest that the attention of foresters was first directed to the desirability of growing mixed stands as revealed by the original natural forests of the region. The Director set his face against the then widespread popular conception that forestry had little more in view than the setting of white pine plantations on idle land and leaving them to shift for themselves without further attention. The Forest became the outstanding exponent of the art of utilizing, by skillful cultural methods, the existing volunteer growth on cutover lands and abandoned fields. This prin-

ciple may be placed on record as one of the great contributions of the Forest to a more mature and balanced American forest policy.

#### *Cutting Methods*

Where pure pine stands of log size were involved, clearcutting has been the principal method used. This method has been used because much of the merchantable sawtimber growing stock was rather low grade old-field pine, even-aged in form, and a transitional type which would give way to hardwoods. This type is extremely difficult to reproduce, especially on the heavier soils where hardwoods are abundant and fast growing. Early attempts to employ the two-cut shelterwood method in old-field pine resulted either in complete failure, or at best in no more than a partial reproduction of pine. It is true, however, that in a few cases where the first cutting was timed precisely right with a seed year, dense reproduction followed. One strip shelterwood cutting worked out especially well. But in each case heavy losses in the reproduction have been caused by the pales weevil, which is invariably attracted to fresh cuttings.

Of late the Forest has practically abandoned the shelterwood method in favor of clearcutting, limiting the former to the lighter soils and to stands other than old-field pine. The seed tree method has been used scarcely at all, because on the heavier soils the chance of getting pine rather than hardwoods would be even less than with the shelterwood method. It does have some promise in old-field pine on the lighter soils. In fact, a recent cutting left seed trees spaced at about 100 feet. Two cases of clearcutting by strips on heavy soil also brought hardwood reproduction rather than pine.

The old-field pine areas have been replaced, after clear-cutting, by planted conifers, mixed hardwoods and mixed conifers and hardwoods. In general, the lighter soils now support the planted conifers, the medium support the mixed conifers and hardwoods, and the heavier soils the mixed hardwoods. With few exceptions the hardwoods are of volunteer origin, the best elements starting as advance growth under the previous stand. A small amount of white ash and tulip poplar has been planted in recent years. The principal conifers planted on cut over old-field pine land are white and red pine, European and Japanese larch and white and Norway spruce. Full

advantage is taken of all natural reproduction present on a cutting, whether it be volunteer or from some reproduction system, and planting is resorted to chiefly to supplement the natural reproduction. On some cuttings one may find both planted and natural conifers, and planted and natural hardwoods. In all, 262 acres have been so handled.

In all cases the aim has been to develop mixtures into which each element is so fitted as to afford it the optimum conditions for growth and protection. Where the topography is uneven, the conifers are usually favored on the higher and drier spots, and the hardwoods on the lower and more moist. With but very few exceptions a group-wise distribution is sought, especially where hardwoods and conifers are in mixture. In the early years the hardwood element on new cuttings was almost invariably under-estimated, and all told, some 20 acres of planted conifers were finally abandoned to the hardwoods. Also, the need of segregating the softwood and hardwood elements into groups was not fully sensed for upwards of a decade. Some of the older cultivated stands, which were originally intended to be a stemwise pine and hardwood mixture, have gradually altered to nearly pure hardwood.

Comparatively small acreages of mixed hardwoods (3 acres) and mixed pine and hardwood (25 acres) have been clear cut. Where such treatment has been applied the ensuing stands are chiefly of the same composition as the previous stand, or of mixed hardwoods, all elements being of natural origin. In some mixtures, pine often seeds in under hardwood, and hardwood invariably does so under pine, thus indicating the possibility of developing mixed pine and hardwood as a permanent type.

Partial cuttings (excluding shelterwood, seed tree, and clear-cutting by strips, which result in even-aged stands) have been generally limited to white pine, hemlock, or mixed pine and hemlock on the light, sandy soils where hardwood competition is least serious. Both uniform selection and group selection have been used with fairly good results. It has been found that with group selection the openings should be small, since otherwise there is a strong tendency for blueberry and other undesirable ground plants to become established and thus reduce the chances of good reproduction. It is fair to say,

however, that even on the lightest soils in the Forest, the reproduction resulting from selection cuttings has included more hardwoods than are desired.

In the early years some coppice with standards cuttings were made in hardwood swales, but in general the outcome was unsatisfactory. So-called bunch cuttings were also common at the start, and where weeding was applied to the young growth developing in the openings, this method worked out essentially as planned.

By way of summary, it may be stated that the almost exclusive use of clearcutting on the heavy soils has been dictated by expediency rather than principle. Had the Forest at the start been covered with uneven-aged stands resulting from culling instead of even-aged stands resulting from the seeding of abandoned farm land, it is quite likely that partial cutting systems would have been adopted. It is not to be inferred, however, that the clearcutting policy will be given up as soon as the old-field pine is gone, nor that there is at present any tendency to convert the ensuing young stands from the even to the uneven-aged form. The even-aged form unquestionably permits the greatest possible control of bole form, natural pruning, and growth rate, especially with young hardwoods; and the Forest staff has always held to the belief that, at least on the heavy soils, the advantages of the even-aged form outweigh its disadvantages. The present mixed hardwood and pine-hardwood stands, which have followed the clearcutting of old-field pine, are being invariably handled as even-aged crops. When mature, these areas will probably be reproduced by the group shelterwood rather than the uniform shelterwood system.

#### *Cordwood Cuttings*

Cordwood stands are of two classes: inferior hardwood on clearcuttings made prior to 1907, and red maple in hardwood swales. The former is a temporary type which is rapidly being converted through planting. The latter is a permanent type. One hundred seven acres of cordwood in the first class have been cleared off to make way for coniferous plantations. Comparatively little of this form of conversion remains to be done. These swales will be permanently maintained as cordwood areas.

#### *Nursery Stock Production*

The nursery has always been an essential part of the Forest and with but few exceptions has supplied all planting stock used. Any year's surplus has been sold to neighboring forest owners or occasionally to more distant parties. There has been no attempt to increase sales or to compete with commercial nurseries. In the early days comparatively little planting was done, and the nursery consisted of a few seed and transplant beds located near the Headquarters Building, and later near the Forest Cottage. With the increased planting program started in 1924, a larger space was needed. A suitable site was found near Riceville, several miles northwest of Headquarters, in a field adjoining the Adams-Fay Lot (now listed as Compartment IX of the Tom Swamp Block). In 1932 the Riceville nursery was abandoned and the seed beds and a few transplant beds were established between the Benson House and the Superintendent's House, and the other transplant beds were located in a large field near the Doe Valley Road. This arrangement has proved to be more satisfactory, but it is still hoped that a nearer, and more suitable site can be found.

The policy has always been to grow high grade planting stock. Such stock requires a somewhat greater outlay than commercial nurseries usually consider justified, but the high rate of survival and the excellent growth of the Forest plantations probably warrant the extra cost. The nursery has been devoted to growing native species and the most promising exotics, such as Norway spruce and European and Japanese larch. No attempt has been made to raise samples of all the conifers which might grow in this climate, or to establish stands on other than what promised to be a sound economic basis. Approximately 650,000 seedlings and transplants, largely conifers, have been produced thus far.

#### *Planting of Open Land*

The systematic planting of open land and cut over cordwood areas increased the potential sawtimber area of the Forest by about 200 acres. The first plantings on open land were chiefly with white pine. In those days the destructiveness of the white pine weevil was not fully recognized. In later years the policy has been to plant open

lands with species not subject to weevilling, and in any case to employ mixtures rather than a single species. Since 1925 all planting has been done with the Harvard Forest planting tool and basket with satisfactory results.

#### *Weeding, Releasing, and Improvement Cuttings*

About 300 acres have been weeded, the majority of them several times. Three is the average number of treatments required to control the weeds in a stand. All stands on cut over land require weeding. In this section of New England two centuries of cutting, burning, clearing, and farm abandonment have enormously increased the forest weed population.

Releasing, as the term is used on the Forest, applies to a special case where a stand is made up of two elements, one a desirable, and the other an undesirable species. White pine overtopped by gray birch is the most common condition where releasing is applied. Some 66 acres have been so treated.

Improvement cuttings are merely weedings applied to stands beyond the sapling stage, and the 68 acres in this category comprise chiefly the young stands started since 1907 and which have but recently attained small pole size. It is to be emphasized that the main purpose of all these treatments is to improve composition and hence quality, in accord with the basic economic and silvicultural policy of high grade sawtimber production.

#### *Pruning*

Pruning has also been employed as another means of improving quality. It has been applied intensively to some 34 acres of white pine, and thus far is the only method known of obtaining clear lumber on a short rotation. The first pruning in the Forest, aside from a small experimental area, was done in 1930. The practice is regarded with increasing favor, and research projects are being carried on to perfect the details of technique.

#### *Thinnings*

The majority of thinnings in softwoods (92 acres) were in older stands of old-field pine, which have since been clear cut. Only in one

or two cases have the oldest plantations reached the point where thinning is needed. The thinnings to be seen to-day are those which have been made during the past five years in mixed hardwoods (8 acres) or mixed softwoods and hardwoods (9 acres). Much interest is being shown in the crown thinning method as applied to even-aged mixed hardwoods. One stand in particular, which dates back to 1908, the year of the first logging operation, and now twenty-seven years old, has been so handled. Full endorsement has been accorded to this method for hardwoods, and more recently the tendency has been to favor the Danish method of crown thinning, which is a heavier grade than ordinarily employed.

It is by no means unseemly that we who studied under Fisher should experience a pardonable feeling of pride since, perhaps unwittingly at the time, we have each had some small share in helping to found these various policies which are to-day established practice. One of us recalls vividly how, in the autumn of 1913, he went with Fisher to the Tom Swamp Tract and there assisted in laying out the first experimental test of the now widely-used system of weeding mixed hardwoods on cut-over lands. Space will not permit of added citations, but there are many other similar instances.

#### FOREST PROTECTION

The Forest has been very fortunate as regards fire. One in 1917 and another in 1918 burned less than  $\frac{1}{8}$  acre each. Both were surface fires in old timber and caused no damage. In 1920 a fire burned  $3\frac{1}{2}$  acres of young growth before it was controlled, causing a loss of about \$75.00. In 1922 a surface fire ran over about  $\frac{1}{4}$  acre in mature hardwood, causing no damage. No woods fires have occurred since, but in April, 1931, the entire annual cut of 369,000 board feet of piled lumber was consumed on the lot where it was awaiting delivery. Although the Forest is frequented by the general public, such a good fire record evidences a sense of responsibility on the part of visitors. Special protection is afforded by posters requesting the public to be careful of starting fires, by permitting camping only at designated places, and by maintaining a highway patrol during periods of extreme hazard.

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The Forest owns a portable power pump purchased in coöperation with neighboring forest owners, together with hand equipment, including pump cans and chemical extinguishers. In addition, the Town has forest fire equipment, a forest warden, and an effective volunteer fire department. The signal is sounded in the Village, and the men of Petersham are very prompt in responding to an alarm. Probably the most effective protection is afforded by the steel fire tower owned and operated by the State and situated on Prospect Hill, from which every part of the Town may be seen.

The Forest has contributed much to the control of the white pine weevil, and the methods recommended have met with wide acceptance. The infestation of the gipsy moth has but recently reached serious proportions, and as yet a definite policy of control has not been adopted. It seems probable, however, that control through silviculture will be favored rather than the more costly direct control methods of cresoting and spraying. The former involves reducing the quantity of favored food plants, chief among which are the oaks, gray birch, and poplar. At present a special effort is being made to sell gray birch and poplar stumpage to cordwood buyers. The policy of creating mixed stands is, in itself, one method of combating this pest.

Thus far, with the exception of about a quarter acre of pine plantation, only scattered white pines have been attacked and killed by the blister rust. The Forest has been thoroughly checked over for currants and gooseberries at two different times separated by a period of years, but constant care must be taken to avoid heavier losses.

Considerable damage has been caused by red squirrels feeding on the buds of planted conifers, especially Norway spruce, larch and Scots pine. Occasionally both white and red pine have been attacked. Porcupines are abundant and frequently cause serious damage in the larch stands. Their numbers have been reduced by trapping, in several instances as many as 20 or 30 being taken in a small locality in one winter. Deer have sometimes damaged the leaders in young white ash stands.

## STATISTICS

### *Growth and Yield*

The first cruise of the tract, in 1908, showed a total merchantable stand of 10.5 million board feet, of which 10 million feet were old field pine.

Being almost entirely second growth, the Forest could everywhere be classified into blocks of uniform age. The growing stock was therefore summarized by area into three periods of twenty years, covering together the duration of the rotation. Since quality increment in most of the pine type was relatively unimportant, and further, because this interval was sufficient for a stand to bear seed and was not far from the point of commercial maturity, the rotation for the greater part of the Forest was fixed at 60 years. The summary by age and area made it possible to determine in which periods of the rotation, as compared with a normal age-class representation, the growing stock was deficient and by how much. Subsequent operations were planned to bring about the necessary corrections. Considering the total volume and the surplus of volume in the third period, the theoretical allowable annual cut would have been about 335 thousand board feet. Owing to the lack of tested silvicultural methods, coupled with the need for a reserve of sizable timber for silvicultural investigations, the annual cut was placed at the conservative figure of 250 thousand board feet, or the annual increment of the pine-bearing lands alone. For ten years following 1911 cuttings were held at this figure.

A second cruise, (1919,) showed 12.5 million feet, of which 11.25 million were pine. In the interim practically all the cut over areas had been reproduced. The absolute area of productive land had been increased by some 150 acres through plantings and release cuttings. A land exchange had reduced the area of the youngest age group and had raised that of the middle group, and lastly, a considerable amount of young growth not reckoned in the first cruise had grown to merchantable size. The annual growth, computed on this new basis, totalled 400 thousand board feet, making possible some increase in the annual cut.

A third reassessment made in 1927 gave a total of 2,067 million

cubic feet. Applying the usual converting factor, this volume equals about 12 million board feet, indicating the careful maintenance of the forest capital.

Shortly before this estimate was made, a 15-year age-class period was adopted. The various forest types were then allocated under "Working Groups" with suitable rotations and proper allowances for reserved areas. These groups with their rotations are:—

| <i>Working Group</i>    | <i>Rotation</i>                               |
|-------------------------|---|
| Softwood .....          | 60 years                                      |
| Softwood-Hardwood ..... | 70 "  |
| Hardwood .....          | 70 "  |
| Spruce Bog .....        | 80 "  |
| *Hardwood Swamps .....  | 40 "  |
| Reserve .....           | Not included in<br>annual cut<br>computations |

Over the past twenty-seven years there may have been some slight decrease in the capital growing stock. If this be true, it is amply justified, since at the beginning a very large portion of the Forest was covered with merchantable white pine of approximately the same age, and of such form and quality that nothing could be gained by holding it for a longer rotation. The outstanding fact is that nearly 7 million board feet have been harvested from the Forest without seriously reducing the growing stock.

The total cut to date has been made up as follows:—

| <i>Lumber</i>               |                                  |
|-----------------------------|----------------------------------|
| Softwood (white pine) ..... | 6,415,000 board feet             |
| Hardwood .....              | 457,000 " "                      |
| Mixed .....                 | 96,000 " "                       |
| <br>Total .....             | <br>6,968,000 " "                |
| Average (1907-1934) .....   | 258,000 " "                      |
| <br><i>Other Products</i>   |                                  |
| Poles .....                 | 750 pieces                       |
| Cordwood .....              | 3,500 cords inferior<br>hardwood |

\*The permanent cordwood type.

### *Disposal of Cut*

With the exception of a few years, sawtimber cuts have been made annually. Over 90% of the cut has been old-field white pine which, because of its low quality was usually sawn round-edge and sold for boxes, toys, pails, and match stock. All pine has been sold to local wood-using industries.

Since much of the hardwood on the Forest is young or middle-aged, only comparatively small amounts have been harvested. The bulk of this cut was also sold locally.

Fuelwood cuttings have been made annually, averaging about 130 cords. A very small amount has come from release cuttings, but the great bulk has been derived chiefly from stands cleared in preparation for planting to conifers, from the so-called maple swales (the hardwood swamp type) and from hardwoods of scattered occurrence in the old-field white pine type.

### *Changes in Markets and Stumpage Prices*

The stumpage price of white pine box lumber, the principal product of the Forest for the past twenty-seven years, has recently sunk to the low figure which obtained when the first cut was made in 1908. Between these lows, marked by stumpage values of \$4.00 to \$5.00 per M.B.F., the graph of changing values rose to a peak in 1920, when prices ranged between \$10.00 and \$15.00. The subsequent decline has brought a progressively lower profit to the forest owner than in the pre-war days, unaccompanied by a corresponding decline in wages and material costs. Present operating costs are nearly double those of 1908.

Several of the consumers to whom the Forest sold its lumber in the early years no longer exist. Despite these losses in nearby markets, the Forest has been able to sell its full cut of products without materially increasing the delivery distance. However, there is no gainsaying the severe and probably permanent decline in the wooden box business. The disposal of future cuts of low grade old-field pine is shrouded in uncertainty. On the other hand, the market for the higher grades of both softwood and hardwood has continued to be satisfactory and gives promise of a bright future. Owing to the

early adoption by the Director of a policy of high quality sawtimber production, it is firmly believed that the opportunities for profitable sales will be greatly enhanced when the present cultivated stands come into bearing, for high quality lumber would show a profit even at present prices.

Some shrinkage has also been experienced in the local cordwood market. This is generally attributed to the increased use of fuel oil. Since a large portion of the cordwood stands on the Forest have already been harvested and, in part, converted to other species, such a shrinkage has not materially affected the cutting plan.

#### *The Forest Buildings*

Besides the Headquarters Buildings, the Forest owns three houses: the Benson House, one of the original buildings, now occupied by Harry Upham; the Forest Cottage, built in 1922; and the Superintendent's house, built in 1930 and occupied by A. H. Upham. As many of the older alumni will recall, the Headquarters Building was originally a farmhouse which later was enlarged to accommodate a religious sect known as the Adonai Shomo Community, or Fullerites. These folk cultivated a good portion of the land lying immediately to the east, and had at one time a rather extensive vineyard.

#### *Logging, Milling, and Delivery Equipment*

In the early days the Forest owned one span of horses for use in logging and other woods work. Later it was found to be cheaper to hire a team as needed, and this plan worked successfully for a number of years. But a time arrived when teams were scarce and sometimes unobtainable when most needed, and it was decided to buy a tractor. Such a machine has been a valuable part of the Forest equipment for the past five years.

In 1924 the Forest purchased its first sawmill. Prior to that time the sawing of the annual cut had been contracted out to portable mills, usually owned and operated by local lumbermen. Some five years after the mill was purchased, a change in economic conditions favored a return to the earlier policy. The decline of the wooden box business, combined with the depression, put many mills out of work and

greatly reduced the price of contract sawing. The mill was sold in 1930.

Since about 1918 the Forest has owned one or two motor trucks for use in hauling logs, lumber and cordwood. Almost without exception the Forest has delivered with its own men and equipment the annual cuts of wood and lumber.

#### INSTRUCTION

The year 1903 saw the first organized instruction in forestry. Vast changes have come about since then, when classes, consisting almost entirely of lectures, were held in the basement of Robinson Hall. The department was under the old Lawrence Scientific School when the first M.F. degree was awarded in 1907. Late that year students in forestry were transferred to the newly-established Graduate School of Applied Science. Field instruction in the Forest was first held during 1908-09. From 1908-1912 we find mention of the Division of Forestry, R. T. Fisher, Chairman. It was then that winter classes were shifted to the north wing of Lawrence Hall—the "piggery." In 1912 the Division became the School of Forestry, and in 1914 degrees were conferred thereunder. Courses then offered made up two years' intensive graduate work in fundamental forestry. Until July, 1913, surveying was given at the Harvard Engineering Camp. For a summer or two thereafter, this work was given at Petersham. In 1914 the School was again transferred, becoming this time a part of the Bussey Institution.

In this same year the curriculum was reshaped to offer fundamental forestry for the first year and to permit specialization during the second year in four fields: the operation of forest lands, entomology, wood technology, and dendrology. This curriculum made it possible for holders of degrees from the undergraduate forest schools to enter on a par with the second-year men and thus secure the M.F. degree after one year of specialization.

Also in this year the Faculty of Applied Biology was created by combining the Bussey and Forestry faculties. This group granted degrees, and the School was then listed as the Department of Forestry. Simultaneously, it was made an institution exclusively for research



and the training of advanced students in silviculture and management, wood technology, forest entomology, dendrology, and lumbering. Courses in the last subject were given under the Business School, Professor Fisher being a member of that Faculty from 1914 to 1924. The last change occurred in 1931, when the Forest became a part of the Division of Biology of the Graduate School of Arts and Sciences.

These changes superficially give the appearance of a fluctuating policy. Yet, viewed in the larger sense, they clearly outline the gradual ripening of the Director's conception of the special rôle which forestry should play at Harvard. The most arresting step was the curricular change of 1914. It is relevant to quote here from the memorandum submitted to the Corporation during February of that year:—

"After a year's further study of the situation, both here in the University and in the country at large, the staff of the School is unanimous in believing that the time has come to . . . organize squarely and exclusively as an institution for research and the training of advanced specialists. Their reasons for this belief are, first, that on the old basis we were competing in a field in which too many other schools offered nominally equivalent training; second, that while the market for men of general training is shrinking, the market for men of special training, particularly in problems relating to the lumber business, is growing; third, that a general course precludes research and special training by the same corps of instructors; fourth, that with the resources now for the first time available, through alliance with the Bussey Institution and its staff, through proximity to the Arnold Arboretum, and through the possibility of cooperation with other scientists in the University, the School has equipment for certain lines of research and specialization that is unrivalled in this country. The School of Forestry, therefore, proposes to give up entirely its general course, to devote itself strongly to the research which the elementary teaching has hitherto precluded."

An unusually broad outlook—the biological "feel" for the Forest which the Director possessed to a most extraordinary degree—has always formed the basis of the instructional policy. Fisher's deep interest in the larger interdependencies of plants and animals and their environment, rather than in the idiosyncrasies of any one of them, gave him the ideal viewpoint from which to expound in extensive fashion. Many will recall him as the Mark Hopkins of the ideal university, for literally the student often occupied the other end of the log. It afforded him keen delight to develop the observational

sense so indispensable to a forester through the use of seemingly impromptu quizzes on the life history of some interesting bit of woodland. All of us can remember the many subtle, searching questions and suggestions by which he greatly contributed not only to our knowledge, appreciation and understanding of the forest, but also to the formation of a broad and tolerant point of view.

#### *The Headquarters Building*

With the acquisition of the Forest, students were required to spend the spring and autumn terms in the field and the mid-winter term at Cambridge. Living accommodations at Petersham, in the old Community House—once characterized by Mr. F. L. Olmsted as being "so far as he knew, the ugliest house in the world," were not sumptuous, but were entirely comfortable. Since 1923, the men have spent the entire term in residence at the Forest. This rather unique arrangement makes it possible for students to form an unusually close acquaintance with the woods—to develop to a high degree the "biological feel" already mentioned. It is difficult to over state the value,



The Headquarters Building

to the professional student, of being able to live constantly with, and so close to, his work; to take a daily hand in the many cultural operations constantly under way.

The Community House, with its 30 rooms, contains the library, the laboratory, offices, storerooms, living quarters both for students and for the caretaker's family. The Forest now has laboratory facilities for fundamental work in experimental silvics and in tree and soil physiology suitable for the doctorate.

#### *The Curriculum To-day*

Students now registered at the Forest may be candidates for either the M.F. or the Ph.D. degree. Students registered for the M.F. in the general field of professional forestry invariably spend their entire term of residence at Petersham. Those specializing in forest entomology or pathology must necessarily spend part of their time at either Cambridge or Jamaica Plain, where the instructors in these fields are located. Students registered for the Ph.D. also spend some time in Cambridge, owing to course work, though the thesis problem may be pursued at the Forest. The Forest itself serves as a laboratory and class room for the one-year M.F. candidates. The first part of the fall term is devoted to field trips in the Forest, during the course of which special emphasis is placed on forest history, forest types and silvicultural methods. Following this introductory period of instruction, each student conducts a research project under the supervision of, or in collaboration with a member of the staff. Award of the degree depends largely upon the proficiency demonstrated in a thesis on the subject of the research. Candidates for the M.F. degree who desire to continue their preparation for professional work ordinarily study in the field of silviculture and forest management. Candidates for the M.F. and Ph.D. degrees, who desire to prepare for scientific work in fields related to forestry may study in experimental silvics, forest soils, wild-life management, forest pathology, forest entomology, and other subjects offered by the Division of Biology. A candidate for the M.F. degree whose research project and thesis is in one of these fields is required to demonstrate his professional competence by a report on a case in silviculture and management dealing with local conditions.

Provision is made for each student to obtain experience in the various silvicultural operations currently carried on in the Forest, such as planting, weeding, marking for improvement cuttings and thinnings. In times past, when larger funds were available, students were paid for their labor after gaining sufficient experience. It has long been customary to take the students to other forest properties in the neighborhood where conditions of special interest are found.

#### RESEARCH

Research work of the staff and students has been directed toward both empirical and fundamental studies, the latter lying principally in the field of soil and tree physiology and intended to provide a sounder basis for work in silviculture.

As might be expected, much of the earlier research dealt with the old-field pine type and its natural successor, the mixed hardwood or mixed pine and hardwood. The series of bulletins and articles dealing with the various phases of the old-field pine—mixed hardwood succession is undoubtedly the most complete of its kind in American forestry literature. It includes "The Yield of Volunteer Second Growth as Affected by Improvement Cutting and Early Weeding," by Fisher, 1918; "The Management of Second Growth Pine in Central New England," by Fisher and Terry, 1920; "Growth Studies and Normal Yield Tables for Second Growth Hardwood Stands in Central New England," by Spaeth, 1920; "Red Oak and White Ash: A Study of Growth and Yield," by Patton, 1922; "Mixed White Pine and Hardwood," by Cline and Lockard, 1925; "Growth and Reproduction in Pine Slash on Old-Field Pine Cuttings," by Altpeter, 1926; "The Evolution of Soils as Affected by the Old-Field White Pine—Mixed Hardwood Succession in Central New England," by Griffith, Hartwell, and Shaw, 1930; "Cut Over Pine Lands in Central New England; A Regional Study of the Composition and Stocking of the Ensuing Volunteer Stands," by McKinnon, Hyde, and Cline, 1935; and a study of the distribution of soil fauna under old-field pine and succeeding hardwood, currently being undertaken by Johnston.

Probably the outstanding finding of this long series of studies is that volunteer stands on the better soils of the region almost invari-

ably contain at the start practically all the requisites of a sawtimber crop of high quality and value. The Harvard Forest, more than any other New England organization, has promoted the policy of improving existing wild stands and has persistently endeavored to correct the early conception of forestry. Another important discovery was the critical rôle played by weed trees in central New England forests and the need of controlling them if the forests are to be rehabilitated. It may be said without hesitation that in the Harvard Forest the art of weeding has reached the highest stage of its development in this country.

Another series deals with the conditions and methods under which high quality products may be grown. Studies of the growth and management of oak and ash by Patton, 1922, by Kempff, 1927, and Holsøe, 1933; "The Quality and Growth of White Pine as Influenced by Density, Site and Association Species," by Tarbox, 1924; "The Form and Development of White Pine Stands in Relation to Growing Space," by Gevorkiantz and Hosley, 1929; and several studies of artificial pruning by Cline and Fletcher, 1928, Cline and MacAloney, 1931 and 1933, and Curtis and Cline, 1934 (in preparation), all constitute a beginning in laying the foundation for the perfection of silvicultural methods to improve form and quality.

A third series, as yet incomplete, comprises studies of important coniferous species, either foreign to the region or of rare occurrence, which have been commonly planted in the Forest or in the region. In this series are "Red Pine in Central New England," by Reed, 1926; "European Larch in the Northeastern United States," by Hunt, 1931; and "Norway Spruce in the Northeastern United States," by Hosley, 1933 (now ready for publication).

Studies of the silvicultural systems for natural reproduction have received attention from the beginning. Early experience in the clear cuttings of various types, in the uniform and strip shelterwood method, and in the coppice with standards method have been reported in bulletins of the Harvard Forestry Club and in "The Management of the Harvard Forest, 1909-1919," by Fisher, 1921. More recently, research has been undertaken in "The Group Selection Method in White Pine on Light Soil," by Steed and Cline, 1933 (in preparation)

and "The Uniform Shelterwood Method in Pine and Hemlock," by Duffield and Kraemer, 1935 (in preparation).

Under fundamental research, the attack has been centered largely on problems of soil and tree physiology. It is such knowledge that the forester must use in making any accurate solution of his problems of local silviculture. Insofar as this knowledge can become quantitative, insofar as the relations are so well understood that the factors of soil and climate can be given numerical values, from which in turn we can deduce an effect numerically measurable in terms of growth, just so far can we measure our advance in scientific knowledge. In the field laboratory where plants have been grown under measured conditions of radiation and nutrient supply, the work of the Forest and coöperating agencies has shown that growth can be predicted within 2 per cent. The factors of soil involved in the nutrition of plants are daily becoming clearer. It is the task of the Forest to do its share in translating work which is mostly done with field crops into terms applicable to tree crops. The agriculturist can control the soil conditions through tilling. With tree crops we depend upon the skillful use of axe and machete, with which we may control the access of radiation to the soil and the composition of the vegetation which covers it. A rapid conversion from a soil deterioration to a soil improvement has been demonstrated in the change from old field pine to hardwood. A study of the microfauna in the two types is one which logically follows the demonstration of the difference between them. Such a project is now well under way. In these studies, by their nature, we can make progress but slowly, and no revolutionary idea can be expected to spring from them over-night. But we may expect that as they develop, their impact on the practice of silviculture will become progressively more marked.

Studies in the above field include "A Thermoelectric Radiometer for Silvical Research," by Gast, 1930; "The Occurrence of Nitrogen in Soil Profiles under Pines," by Gottlieb, 1927; "Physical Properties of Cove Soils on the Black Rock Forest," by Scholz, 1932, in coöperation with the Black Rock Forest, Cornwall-on-Hudson, N. Y.; "Growth of Scots Pine in Sand Culture with Varied Radiation Intensity and Nitrogen Supply," by Mitchell, 1932; "Preliminary Study of Phosphorus, Nitrogen, Potassium, and Moisture Content of Foli-

age of Northern White Pine in Weevilled Plantations," by Cummings, 1934; "Statistical Analysis of the Distribution of Soil Fauna in the Soil Profile and their Effect on the Decomposition of Organic Matter" and "The Influence of Temperature upon Respiration of the Larva of *Chrysopilus quadratus* (Sav.)," by Johnston, 1935.

In the field of forest protection, early studies of the life history and control of the pales weevil by Peirson, 1921, and the control of the white pine weevil through forest management by the same author, 1922, have greatly contributed toward the effective restraint of these two forest pests. Other and later studies have dealt with the damage caused by mound-building ants in plantations; with damage by red squirrels and porcupines and the means of control; and with the fungus, *Trametes pini*, the red rot of conifers. Under this heading should also be included coöperative studies with members of the Northeastern Forest Experiment Station staff on the relation of weather and stand condition to forest fire hazard, on the improvement of severely weevilled plantations, and on the European larch canker and the twig disease of oaks, the latter in the preliminary stage of investigation.

In the field of utilization and marketing the Forest has surveyed the needs of local wood-using industries, pointed out the weaknesses of existing methods in manufacturing and marketing, and suggested remedies. "Lumber Consumption in the Springfield District," 1925, "The Marketing of Lumber in New Hampshire," by Cline, 1926, and "The Wood-using Industries of Massachusetts," by Downs and Gutchess, 1928, were the most important utilization studies undertaken by the Forest.

Other researches include "The Growth of Hemlock before and after Release from Suppression," by Marshall, 1927; "A Statistical Forest Survey of Seven Towns in Central Massachusetts," by Averill, Averill, and Stevens, 1923; "Some Factors Underlying Forest Fire Insurance in Massachusetts," by Averill and Frost, 1933; "Successional Trends in the old Growth Forest on Pisgah Mountain," by Branch, Daley, and Lotti, 1930; "Pitch Pine on Cape Cod," by Hall, 1927; "Influence of Land History and Legislative Enactments on the Character and Condition of the State Forests of Massachusetts," by Hick, 1927; "The Economic Possibilities for Wood-using Industries

in Central New England," by Bauer, 1931; "Growth and Condition of the Coniferous Plantations on the Harvard Forest," by Breckenridge, 1932; "Studies in the Genus *Fraxinus*; A Preliminary Key to Winter Twigs for Sections *Melioides* and *Brumelioides*," by Wheldon, 1934.

During 1934 a study of "Some Winter Relations of the White-tailed Deer to the Forests of North Central Massachusetts," by Ziebarth and Hosley, was the first to be undertaken by the Forest in the new field of wild-life management.

#### RELATIONS WITH THE UNIVERSITY

The Forest has now been a part of Harvard's equipment for nearly twenty-eight years. It has seemed at times that the degree of official recognition granted to it has not always been quite proportionate to its increasingly outstanding scientific value. But to-day, as a part of the Division of Biology of the Graduate School, with the power of recommending for the degrees of M.F., and Ph.D., its position and future seem fully assured.

On the business side, the Bursar's office assists with the bookkeeping as well as with the student fees and scholarship payments. All receipts and expenditures are allocated to the proper account by the bookkeeper at the Forest and forwarded to the Bursar's office for summation and presentation in a financial statement prepared thrice yearly. There are nearly 40 principal forest accounts, many of them subdivided. By means of these fine divisions, a complete cost record of all operations on the Forest is available.

It is of added historic interest to note here that, while up to the early 1900's the University had occasionally published books bearing the imprint "Harvard University," it was the publication of Dr. Austin Cary's "Manual for Northern Woodsmen" that furnished the financial nest-egg of what was usually styled the "General Publication Fund." At that time this Fund was the only unrestricted money at the command of the University's publication agent. Hence Dr. Cary's book, which was completed during his term on the forestry faculty, and which can probably be found in the personal library of

90 per cent of American foresters, may fairly be regarded as the starting point of the present Harvard University Press.

#### THE FOREST FINANCES

About one third of the funds available to carry on the work are obtained from the sale of forest products. The balance is supplied by the income from three endowment funds which have been established through the action of generous friends of the Forest.

Under the present greatly reduced income from these funds coupled with much lower prices for lumber, the Forest cannot meet more than the most necessary expenditures. It is not now possible to continue the high standards of research which have been adhered to until recently.

A small sum is also available yearly for scholarships. This is usually divided among three or four students.

#### THE STAFF OF INSTRUCTION IN FORESTRY AND LUMBERING

- RICHARD THORNTON FISHER, A. B., M. F., S. M.  
Instructor in Forestry, 1903-05.  
Assistant Professor of Forestry, 1905-20.  
Assistant Professor of Lumbering and Forestry, 1921-24.  
Director of the Harvard Forest, 1915-34.
- JOHN GEORGE JACK  
Instructor in Forestry, 1903-05.  
Instructor in Forest Botany, 1906-08.  
Assistant Professor of Dendrology, 1908—
- EDWARD EDGECOMBE CARTER, A. B., M. F.  
Instructor in Forestry, 1904-05.  
Assistant Professor of Forestry, 1910-15.
- AUSTIN CARY, A. B., A. M., S. D.  
Assistant Professor of Forestry, 1905-09.  
Lecturer in Lumbering and Forestry, 1910-11.
- RALPH CHIPMAN HAWLEY, A. B., M. F.  
Instructor in Forestry, 1905-06.
- BENTON MACKAYE, A. B., A. M.  
Instructor in Forestry, 1906-10.
- IRVING WIDMER BAILEY, A. B., M. F., S. D.  
Instructor in Forestry, 1909-12.  
Assistant Professor of Forestry, 1912-20.  
Associate Professor of Forestry, 1920-27.
- JOHN MATTHEW GRIES, A. B., A. M.  
Lecturer in Lumbering, 1914-16.  
Assistant Professor of Lumbering and Forestry, Graduate School of  
Business Administration, 1916-21.
- LAURENCE RICH GROSE, A. B., A. M., S. M. F.  
Instructor in Forestry, 1916-17.
- JOHN NELSON SPAETH, S. B., M. F., Ph. D.  
Assistant in Forestry, 1920-21.  
Assistant to the Director, 1921-24.  
Instructor in Lumbering, Graduate School of Business Administration,  
1921-23.

- ALBERT COLLINS CLINE, S. B., M. F.  
 Research Assistant, 1923-24.  
 Assistant to the Director and Instructor in Forestry, 1924-30.  
 Assistant Director, 1930-
- PAUL RUPERT GAST, Ph. B., S. M., S. D.  
 Research Assistant, 1923-24.  
 Instructor in Forestry, 1924-29.  
 Assistant Professor of Forestry, 1930-
- NEIL WETMORE HOSLEY, S. B., M. F.  
 Forest Assistant, 1925-30.  
 Instructor in Forestry, 1930—
- WILLIAM HAWKE CUMMINGS, A. B., B. F., M. F.  
 Forest Assistant, 1934-35.

INSTRUCTORS ASSOCIATED WITH THE DIVISION OF  
 FORESTRY, OR THE SCHOOL OF FORESTRY.

- CHARLES THOMAS BRUES, S. B., S. M.  
 Instructor in Economic Entomology, 1909-13.  
 Assistant Professor of Economic Entomology, 1913-26.  
 Associate Professor of Economic Entomology, 1926-
- EDWARD CHARLES JEFFREY, A. B., Ph. D., S. D.  
 Professor of Plant Morphology, 1907-33.
- HECTOR JAMES HUGHES, S. B.  
 Assistant Professor of Civil Engineering, 1908-13.  
 Director of the Harvard Engineering Camp, 1909-30.
- JAY MORRISON, A. B., C. E.  
 Instructor in Surveying, 1913-14.
- JOHN ROBERT NICHOLS, A. B., C. E.  
 Instructor in Civil Engineering, 1912-13.

A. H. UPHAM

This account would not be complete were the name of Albert H. Upham omitted. "Bert," as he has always been known to the students, has been Woods Superintendent since April, 1910. His unflagging loyalty to Professor Fisher and to the advancement of the Forest interests have been noteworthy; his proverbially shrewd New England judgment, coupled with his unusual ability as a woodsman, has more than once helped the Forest to show a surplus, while his pungent humor has not infrequently relieved the occasional tense

situations which inevitably arise where practical and technical men are working to a common end. He has long been a valued member of the Forest staff.

OUTSIDE CONTACTS AND LABOR

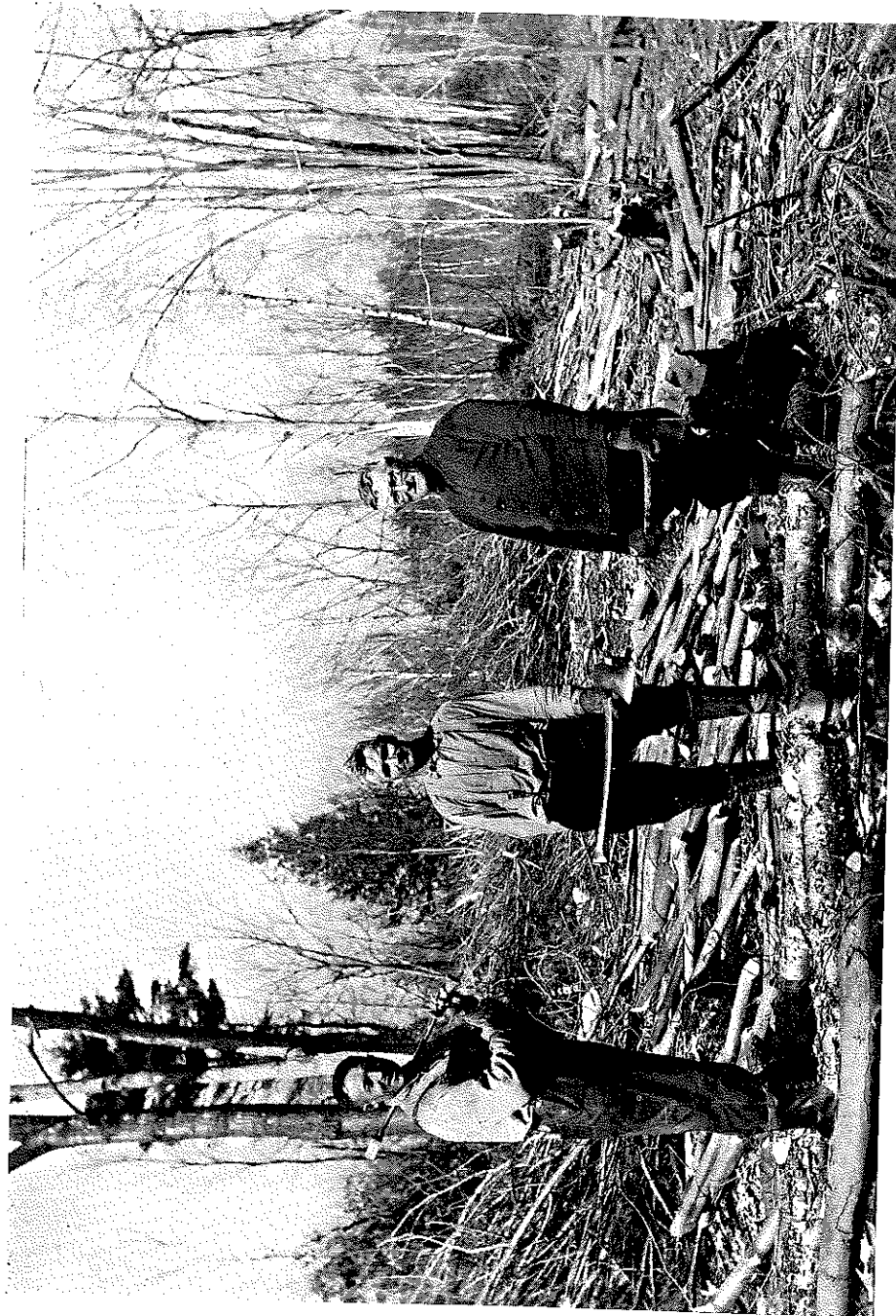
Since the Forest was first established, it has been the policy of the staff to give advice free to the forest owners of Petersham, but to charge at cost for any labor performed by the students or Forest crew. Such work has included type mapping, surveying, cruising, planting, weeding, and thinning.

Prior to the depression, many outside jobs called for type mapping, cruising, and other work which, under the supervision of the staff members, furnished excellent experience for the students, as well as much needed pocket money. Both parties gained by such an arrangement. Numerous forest owners in Petersham and neighboring towns have had the advantage of skilled supervision and labor by the Forest crew in establishing plantations, weeding, and occasionally other operations. In several cases sawtimber operations on outside properties were arranged for and supervised by the Forest.

Besides giving advice on the ground, the staff has answered thousands of inquiries covering all branches of forestry. In many cases publications are requested. A number of the earlier bulletins have been out of print for years, and the supplies of later ones are being rapidly exhausted. Some of the cooperative publications such as "Pruning for Profit" and "Forest Weeding" have also had wide circulation.

THE FOREST AS A DEMONSTRATION AREA

The success of the Forest as a model of correct forest practice is common knowledge to the alumni of the School. Its influence on the public conception of forestry has been both wide and salutary. The Director's projects were neither grandiose nor ill-considered. They were invariably planned with the utmost care, employing and weighing every scrap of existing information, and with the definite objective of filling some known silvical or economic need. Nor was the financial side of forestry overlooked. Moreover, Professor Fisher's per-



Harry Upham, Rodney Stevens and Bert Upham

fect frankness carried such sincerity that visitors were strongly impressed with the atmosphere of intellectual honesty prevailing among the Forest staff. Although an attitude of academic reserve was for years the order of the day at Petersham, the combination of the foregoing factors eventually brought the Forest well into the limelight. During the past fifteen years it has become an accepted part of the education of many American foresters to visit Petersham and to see, with their own eyes, the conversion of worn-out New England pastures and run-down stands into thrifty forests.

#### THE FOREST MODELS

An anonymous and generous friend has arranged to give the Forest twenty-two forest models. The first ten have already been completed and presented. They, and others completed during the year will be on display at the University Museum in Cambridge during the coming Tercentenary Celebration in 1936. It is hoped that the Fisher Memorial Museum, planned to be located on the Forest as a repository for the models, may some day become a reality.

The first ten models were designed by Messrs. Fisher and Cline and executed by the firm of Guernsey and Pitman, of Cambridge. They represent the highest degree of perfection yet attained in small scale modelling of major forest vegetation, and the wide array of knowledge accumulated at the Forest during a quarter century of intensive management has been brought into full play in assisting the artists in reproducing the complicated details of individual tree form and stand composition.

The first seven models constitute the historical series and are illustrative of the major steps in land history in south central New England. In this series the topographic features are identical and represent a synthesis of the outstanding elements in local landscapes. The titles are as follows:

1. The primeval forest.
2. The forest being cleared by the first settlers.
3. Height of cultivation for farm crops.
4. An abandoned farm reverting to forest.
5. Merchantable crop of old-field pine being logged.



Twenty-year old mixed Hardwood on cut over old-field Pine land, as illustrated by one of the Forest Models

6. Cut over old-field pine land five years after logging.

7. Young stands of mixed hardwood on cut over old field pine land.

The remaining fifteen models comprise the silvicultural series. Three have been completed and the next two are under construction. They illustrate the most significant and generally applicable methods of silviculture developed at the Forest. In each case the scene of action, the stand of trees, and the silvicultural method employed are in full accordance with actual conditions and practices to be seen at Petersham. All the more important silvicultural operations will be represented, such as planting, weeding, releasing, improvement cutting, thinning, pruning, and girdling, together with the natural reproduction of stands. In addition to being a most appropriate memorial to Professor Fisher, these models, when completed and arranged in proper sequence will give an entirely unique picture of the forest succession in central New England, and of the silvicultural methods which years of experience at Petersham have developed. Such an exhibit will be of incalculable educational value.

#### VISITORS

It is difficult to say how many people have come to the Forest during past years. A conservative estimate would place the current average number per year at between two and three hundred. For the most part, visitors have been American and foreign foresters, men interested in the biological sciences, and the better informed type of forest owner, with occasional groups representing lumbermen, outing clubs, bird clubs, garden clubs, forestry associations, and recently C.C.C. officers.

The Memorial Committee is proud to insert here the following excerpts from numerous appreciative letters received from visitors.

"I can say . . . that the research work which is being done at the Harvard Forest and which no individual can afford to do, is going to have a very important place in the reproduction of timber for New England. We are convinced of its practicability because it has made profits for us."

"Professor Fisher is spending a good deal of time to improve the marketing of Forest Products and has demonstrated to us a possible saving of \$30,000.00 a



year in the lumber being used by us. . . . At the Harvard Forest they show results and not theory."

"Every forester in the United States ought to visit the Harvard Forest to see the possibilities not merely of growing timber but of forestry as a craft, an art, a satisfying pursuit."

"Experience in the Harvard Forest and the facts it has proven in field and laboratory give to the results actually achieved by Director Fisher and his co-workers a value that is as intensively practical as it is thoroughly scientific."

"Even up to a comparatively few years ago the methods involved in actually growing and maintaining timber crops had been scantily developed in this country, and to find an organized forest where the various methods of silviculture were in successful operation it was necessary to turn to the Old World. It is because to-day the Harvard Forest is very close to that unique condition that it so admirably serves as a model forest to demonstrate the practice of forestry."

"The Harvard Forest at Petersham is a perfect forest laboratory, the most interesting in the United States."

"I cannot resist thanking you once more for the interesting and profitable two days at Petersham. They were thought and discussion stimulating days, for you had much that was new to show us."

"Your policy of aiding rather than violating nature appealed to us as sound; but if you are right in your methods of handling hardwood and mixed hardwood and softwood stands (and you had the evidence to prove your points) then we are wrong in a lot we have done. You may rest assured that we are going to give your ideas a trial, making such adaptations as may seem necessary to fit north woods and Virginia conditions."

"Asked what he considered the most instructive example of forestry in America, Baron von Maltzahn (of the Mecklenburg Forest Service) stated that he was most impressed by the Harvard Forest at Petersham, Mass., and that every German forester might be able to learn in this forest. He particularly noted that Mr. Fisher is closely studying the ecological conditions and basing his management plans on 'working with nature.'"

"The bulletin on 'Forest Weeding' is one more of the eminently useful and finished contributions of the Harvard Forest to the development of American silviculture. It will be useful and effective far beyond the range of the particular species with which it deals. The average lay reader won't, of course, realize the many years of thought and labor and research that have gone into this simple presentation. Congratulations to Harvard Forest."

"Everything you have shown me has interested me very much, and I was particularly glad to note that you have selected the same principle of forestry that we have adopted in Switzerland."

"The more I think about your Harvard Forest the more I know that you are doing a wonderful work for forestry. I have seen no forest in America which interested me nearly so much and I cannot tell you how much I appreciate your kindness in taking me around and giving up so much time to discussing it. I am awfully glad that you have been able to raise the necessary money for developing your methods and I don't think money could be better spent. I am not clever at being polite but I am saying this because I think that you are doing for American forestry just what, at present, it most needs and I would like you to know how I feel."

#### THE PRESENT—AND THE FUTURE

It is impossible accurately to measure the value of the Forest in terms of the work which has been done there. It is natural for the mind to turn, in this connection, to the technical knowledge which has been acquired. Of this there has been full measure, both in quality and in quantity. Nor has it all appeared in print. The unofficial service bureau maintained at Petersham for so many years has contributed greatly to the development and application of sound silvicultural policies over a steadily increasing area. The visible effects of applied cultural treatments which may be studied in the Forest itself, combined with the written and other records, have formed a contact between this laboratory and the public and professional consciousness the full effect of which is beyond appraisal. It is obvious that there exists a steadily widening diffusion of knowledge regarding the proper handling of forest properties. It is not an exaggeration to say that the numerous contributions from the Harvard Forest have played a perceptible part in the formation of a sound American forest policy. Lastly, a yardstick which should also be considered is the knowledge and grasp of fundamentals absorbed and applied by the professional students who have come to Petersham for graduate training and research.

To-day, after nearly twenty-eight years of increasingly intensive study and treatment the Harvard Forest is an established and widely recognized source of accurate and authoritative information. The three objectives set up with the acquisition of the area have drawn steadily nearer. As a model to demonstrate forest practice, as an experiment station for research in forestry, and as a field laboratory

for students, the Forest has attained, through the clear vision, quiet persistence, and firm faith of its first Director the stage of development where it is now nationally known and commonly referred to as "the oldest and best example of a managed forest in America."

The Harvard Forest as it stands to-day represents the partly fulfilled dream of its first Director—partly, we say, because no forester ever lives long enough to see his whole dream become real. The Fisher Memorial Committee closes with the statement—the unanimous sentiment of the alumni—that the great work here envisioned by Fisher and achieved with the help of his associates and students must not be permitted to decline.

## DIRECTORY OF FORMER STUDENTS

- ALBRIGHT, WESLEY A.—M.F. 1925.  
R. D. No. 1, Voorheesville, N. Y.  
Hwy. Eng'r., N. Y. State Dept. Public Works, 353 Broadway, Albany,  
N. Y.
- ALLEN, ARTHUR F.—S.M. 1921.  
14 Stoneleigh Circle, Watertown, Mass.
- ALLEN, G. M.—1906-07.  
Museum of Comparative Zoology, Cambridge, Mass.
- ALTPETER, L. STANFORD—M.F. 1926.  
225 Sandwich St., Plymouth, Mass.  
Cultural Foreman, C.C.C., Miles Standish Forest, Plymouth, Mass.
- AMES, JOHN S.—M.F. 1910.  
North Easton, Mass.  
96 Ames Bldg., Boston, Mass.
- AVERILL, CLARENCE C.—M.F. 1931.  
District Ranger, U.S.F.S., Grand Mesa N. F.  
Colorado Springs, Colo.
- AVERILL, ROBERT W.—M.F. 1922.  
Stillwater, Me.  
Care of Prentiss & Carlisle Co., Bangor, Me.  
Consulting Forester.
- AVERILL, WALTER B.—M.F. 1922.  
Stillwater, Me.  
Supt., Gale River C. C. C. Camp, Gale River, N. H.
- BAILEY, IRVING W.—M.F. 1909.  
17 Buckingham St., Cambridge, Mass.  
Bussey Institution, Jamaica Plain, Mass.  
Professor of Plant Morphology.
- BAKER, GEORGE Y.—M.F. 1911.  
Deceased.
- BARRACLOUGH, KENNETH E.—1927-28.  
Durham, N. H.  
Extension Forester.

- BAUER, EITEL—M.F. 1931.  
403 Hale St., Spartanburg, S. C.  
District Forester, State Forest Service, 311 Federal Bldg., Spartanburg,  
S. C.
- BLAKE, CHARLES B.—1911-13.  
West Medway, Mass.  
Forest Supervisor, Jamestown, Tenn.
- BRADLEY, LEVERETT—1907-08.  
Lakeville, Conn.  
Teacher, Indian Mountain School.
- BRANCH, WILLIS C.—M.F. 1930.  
206 N. Madison St., Marion, N. C.  
Dist. Ranger, U.S.F.S., Marion, N. C.
- BRECKENRIDGE, CLARENCE G.—M.F. 1932.  
Walton, N. Y.  
Forester, C.C.C. Camp No. 3, Oxford, N. Y.
- BROOKS, PHILIP P.—M.F. 1912.  
125 Edgell Rd., Framingham Center, Mass.  
Wood Preservation; 141 Milk St., Boston, Mass.
- BRYANT, EDWARD S.—M.F. 1907.  
Care of Harvard Club, Boston, Mass.  
Consulting Forester.
- BUTLER, JOSEPH W.—M.F. 1909.  
Data not received.
- CHAFFEE, REGINALD R.—M.F. 1910.  
Apt. 208, 1133 13th St. N. W., Washington, D. C.  
Code Examiner, Victor Building, Washington, D. C.
- CHUN, WOON YUNG—S.M.F. 1919.  
Nanking University, Nanking, China.
- CLARK, KENNETH McR.—M.F. 1913.  
50 Grove Street, Bangor, Me.  
Inspector, Regional Office U.S.F.S., Amherst, Mass.
- CLARK, WILLIAM A.—S.B. 1906.  
31 West Cedar Street, Boston, Mass.
- CLINE, ALBERT C.—M.F. 1923.  
Millerton, N. Y.  
Assistant Director, Harvard Forest, Petersham, Mass.
- COLE, PHILIP—1912-13.  
Data not received.

- COLTON, WM. W.—S.B. 1907.  
53 Bothfield Rd., Newton Center, Mass.  
Gen. Mgr., Trumbull Hospital, 68 Allerton St., Brookline, Mass.
- COOK, HAROLD O.—M.F. 1907.  
20 Fern Street, Auburndale, Mass.  
Chief Forester, Mass. Dept. of Conservation, 20 Somerset Street, Boston,  
Mass.
- COOLIDGE, J. R., III—M.F. 1912.  
141 Milk Street, Boston, Mass.  
Wood Preservation; 141 Milk St., Boston, Mass.
- CUMMINGS, WILLIAM H.—M.F. 1934.  
Care of Mrs. M. B. Torchiana, Moylan-Rose Valley, Penn.  
Forest Assistant, Harvard Forest, Petersham, Mass.
- CURTIS, JAMES D.—M.F. 1935.  
Nob Hill, Comox, British Columbia.
- DALEY, RAYMOND K.—M.F. 1930.  
55 Central Street, Forestville, Conn.  
Cultural Foreman, E. C. W., Pachaug State Forest, Voluntown, Conn.
- DAVIS, ARTHUR A.—1924-25.  
East Jaffrey, N. H.  
Private lumber business, Reading, Vt.
- DEARBORN, JOSEPH J.—S.B. 1907.  
Deceased.
- D'ESTE, JULIAN L.—1911-12.  
Care of Boston Excelsior Co.  
11th Ave. and 29th Street, N. Y. City, N. Y.
- DOHANIAN, SENEKERIM M.—S.M.F. 1915.  
42 Cedar Street, West Somerville, Mass.
- DOWNES, JOHN B.—M. F. 1927.  
Pine St., Lakehurst, N. J.  
Mgr., Lakehurst Motors Inc., Lakehurst, N. J.
- DUFFIELD, JOHN W.—M.F. 1935.  
119 Berkeley Place, Brooklyn, N. Y.
- FOSTER, CLIFFORD H.—M.F. 1924.  
Director, Pack Demonstration Forest, Warrensburg, N. Y.
- FREEDMAN, LOUIS J.—M.F. 1908.  
Old Town, Me.  
Woods Supt., Penobscot Development Co., Great Works, Me.

- FROST, LEE M.—M.F. 1931.  
Forest Ranger, U.S.F.S., Red Cliff, Colo.
- FULLER, EDWIN J.—1913-15.  
Groveland, Mass.
- FULLER, FRANCIS S.—M. F. 1912.  
Staff Assistant, Forest Management, U.S.F.S., 73 Lincoln St., Laconia,  
N. H.
- GABRIEL, ROGER P.—M.F. 1926.  
Odessa, N. Y.  
Cultural Foreman, C.C.C., Yorktown, Va.
- GAST, P. R.—S.D. 1927.  
Assistant Professor of Forestry, Harvard Forest, Petersham, Mass.
- GEVORKIANTZ, SUREN R.—M.F. 1928.  
1612 7th St., S.E., Minneapolis, Minn.  
Assistant Silviculturist, U.S.F.S., Lake States Forest Exp. Sta., University  
Farm, St. Paul, Minn.
- GOTTLIEB, ALBERT W.—M.F. 1927.  
1 Cornelius Ave., Schenectady, N. Y.  
Forester, C.C.C., 191st Co., Waterbury, Vt.
- GOULD, HARRY F.—M.F. 1908.  
8 Palfrey St., Watertown, Mass.  
Treasurer, Franklin Forestry Co., 89 State Street, Boston, Mass.
- GRIFFITH, BRAHAM G.—M.F. 1929.  
4511 13th Ave. West, Vancouver, B. C.  
Junior Forester, B. C. Forest Service, Victoria, B. C., Canada.
- GROSE, LAURENCE R.—S.M.F. 1916.  
Kendall Green, Mass.  
Teacher, Fenn School, Concord, Mass.
- GUTCHESS, CLAIR B.—M.F. 1926.  
Cortland, N. Y.  
Private Lumber Business.
- HADDOW, WILLIAM R.—M.F. 1930.  
125 Clifton Rd., Toronto, Ontario.  
Forest Pathologist, Botany Dept., Univ. of Toronto, Toronto, Ont., Can.
- HALE, WARREN F.—M.F. 1911.  
Concord, N. H.  
Assistant State Forester, State House, Concord, N. H.
- HALL, HORACE W.—M.F. 1913.  
150 Ridge Ave., Newton Center, Mass.  
Manufacturing.

- HALL, RALPH C.—M.F. 1927.  
75 Clement Ave., Columbus, Ohio.  
Forest Entomologist, Central States Forest Exp. Sta., O.S.U., Columbus,  
Ohio.
- HALL, STANLEY B.—M.F. 1909.  
North Pembroke, Mass.  
Lawyer; forester.
- HALLEY, ERSKINE B.—1911-12.  
Data not received.
- HAMMATT, RICHARD F.—S.B.F. 1906.  
24 California St., San Francisco, Calif.
- HARTWELL, EDWARD W.—M.F. 1929.  
1726 Ashland Ave., St. Paul, Minn.  
Forester, Minn. and Ont. Paper Co., 1100 Builders Exchange, Minne-  
apolis, Minn.
- HATCH, ALDEN B.—PH.D. 1935.  
Data not received.
- HEALD, PHILIP C.—M.F. 1913.  
Wilton, N. H. (Fruit grower.)
- HELLER, CHARLES J.—S.B. 1909.  
3008 6th St., Port Arthur, Tex.  
Forest Engineer, The Texas Co., Port Arthur, Texas.
- HERR, CLARENCE S.—M.F. 1930.  
22 Governors Terrace, Lancaster, N. H.  
Assistant Extension Forester, Lancaster, N. H.
- HERRICK, DANIEL A.—1911-12.  
27 Agassiz St., Cambridge, Mass.  
Mechanical Engineer, 6 Spice St., Charlestown, Mass.
- HICK, R. MILTON—M.F. 1927.  
151 East St., Oneonta, N. Y.  
District Forester, N. Y. Cons. Dept., 140 Main St., Oneonta, N. Y.
- HOLSØE, TORSEL—M.F. 1935.  
Div. of Forestry, State Library Building, Indianapolis, Ind.  
Forester, E. C. W.
- HOSLEY, NEIL W.—M.F. 1925.  
Harvard Forest, Petersham, Mass.
- HOWARD, WILLIAM G.—M.F. 1908.  
68 Brookline Ave., Albany, N. Y.  
Director, Lands and Forests, State Conservation Dept., Albany, N. Y.
- HUNT, STUART S.—M.F. 1927.  
41 Van Buren Ave., Albany, N. Y.  
District Forester, Conservation Dept., Albany, N. Y.

- HYDE, GERALD R.—M.F. 1932.  
18 Sumner St., Goffstown, N. H.  
Junior Forester, Region 9, Harrisburg, Ill.
- JOHNSTON, JAMES W., JR.—M.F. 1932.  
Petersham, Mass.  
Harvard Forest, Petersham, Mass.  
Graduate Student.
- KEMPF, GERHARD—M.F. 1927.  
Priest River Branch, Northern Rocky Mt. Forest and Range Exp. Sta.,  
Priest River, Idaho.
- KIMBALL, GEORGE W.—M.F. 1913.  
215 So. 14th St., Albuquerque, New Mexico.  
Regional Inspector, U.S.F.S., Albuquerque, N. M.
- KITTREDGE, JOSEPH, JR.—M.F. 1913.  
2508 Benvenue Ave., Berkeley, Calif.  
Professor of Forestry, Univ. of California, Berkeley, Calif.
- KNEELAND, PAUL D.—M.F. 1912.  
110 Beeching St., Worcester, Mass.  
340 Main St., Worcester, Mass. (Wholesale Lumber)
- KRAEMER, J. HUGO—M.F. 1935.  
288 Lark St., Albany, N. Y.
- LAFERRIERE, ALFRED I.—1911-12.  
196 Willard St., Berlin, N. H.
- LEIGHTON, FREDERICK E.—S.B. 1909.  
785 Forest Ave., Portland, Me.
- LOCKARD, CHARLES R.—M.F. 1924.  
76 Albermarle Ave., Springfield, Mass.  
National Park Service, 293 Bridge St., Springfield, Mass.
- LOTHROP, ROLAND I.—M.F. 1911.  
Deceased.
- LOTTI, THOMAS—M.F. 1930.  
University Farm, St. Paul, Minn.
- LUCAS, GUY W.—S.B. 1909.  
620 Tremont St., Boston, Mass.  
Forest and Type Surveyor, Mass. Conservation Dept., 20 Somerset St.,  
Boston, Mass.
- MACDONALD, ALFRED—1915-17.  
202 E. First St., Wichita, Kan.  
Director of Parks and Forestry, City Bldg., Wichita, Kan.
- MACKAYE, BENTON—A.M. 1905.  
Shirley Center, Mass.  
Regional Planner, T.V.A., Knoxville, Tenn.
- MARBLE, RICHARD M.—M.F. 1914.  
Woodstock, Vt.  
Principal, High School.
- MARSHALL, ROBERT—M.F. 1925.  
Director of Forestry, Office of Indian Affairs, Washington, D. C.
- MARTIN, JAMES E.—M.F. 1908.  
1254 W. Sixth St., Los Angeles, Calif.
- McKINNON, FINDLAY S.—M.F. 1932.  
Junior Research Forester, Forest Branch, Victoria, B. C.
- MILES, HERBERT J.—M.F. 1910.  
Putnam, Conn.
- MILLINGTON, DANIEL K.—1909-11.  
Peru, Vt.  
Cultural Foreman, Vt. State Park No. 5, Proctorsville, Vt.
- MILLS, KNOWER—M.F. 1911.  
Teacher, Loomis School, Windsor, Conn.
- MINUSE, JOHN M.—M.F. 1914.  
501 Franklin St., Port Chester, N. Y.  
Principal, Thos. A. Edison School, Port Chester, N. Y.
- MITCHELL, HAROLD L.—M.F. 1932.  
Cornwall-on-Hudson, N. Y.  
Assistant Director, Black Rock Forest, Cornwall-on-Hudson, N. Y.
- MUNRO, WILLIS—1912-13.  
80 Boylston St., Boston, Mass.
- MURDOCK, JOHN, JR.—A.B. 1906.  
Deceased.
- PARKER, GORDON—M.F. 1911.  
1401 Wood Ave., Colorado Springs, Colo.  
Director, Manitou Forest, Colorado College, Colorado Springs, Colo.
- PATTON, REUBEN T.—S.M.F. 1921.  
13 Hartley Ave., Caulfield, Victoria, Australia.  
Senior Lecturer, Botanical Dept., Botany School, University of Melbourne,  
Victoria, Australia.

- PEIRSON, HENRY B.—S.M. Zoöl. 1920.  
112 State St., Augusta, Me.  
State Entomologist, State House, Augusta, Me.
- PERRY, CARL C.—M.F. 1914.  
362 Waltham St., West Newton, Mass.  
State Leader, Blister Rust Control, 136 State House, Boston, Mass.
- POWELL, GRANT M.—M.F. 1925.  
Dist. Forester, N. Y. Conservation Dept., 139 Park Ave., Lowville, N. Y.
- REED, PAUL M.—M. F. 1924.  
R. No. 1, Bennington, Vt.  
Forester, Fillmore Farms, Inc., Bennington, Vt.
- RICHARDSON, ARTHUR HERBERT—S.M. Silv. 1920.  
31 Rivercrest Rd., Toronto, Ont.  
In charge reforestation; Forestry Branch, Toronto, Ont.
- RICHMOND, WINTHROP C.—S.B. 1906.  
First Parish Rd., Scituate, Mass.  
Fruit Importer, 264 Devonshire St., Boston, Mass.
- RITCHIE, JOHN—M.F. 1909.  
565 Arbor Vitae Rd., Winnetka, Ill.  
19 So. LaSalle St., Chicago, Ill.
- ROBBINS, HERMAN—M.F. 1914.  
66 Hutchings St., Roxbury, Mass.
- ROGERS, JAMES S.—1910-12.  
Forester, Supt. of private estate, Center Sandwich, N. H.
- SCHOLZ, HAROLD F.—M.F. 1931.  
Denmark, Ia.  
Lake States For. Exp. Sta., University Farm, St. Paul, Minn.
- SHAW, T. EDWARD—M. F. 1929.  
206 West Lutz Ave., West Lafayette, Ind.  
Extension Forester, Purdue University, Lafayette, Ind.
- SHEPARD, HAROLD B.—M.F. 1914.  
4707 Conn. Ave., Wash., D. C.  
Forest Economist, U.S.F.S., Wash., D. C.
- SHEPARD, WARD—M. F. 1913.  
104 Leland St., Chevy Chase, Md.  
Specialist in Land Policy, Indian Service, Dept. of Interior, Wash., D. C.
- SMITH, HOLLIS A.—M. F. 1928.  
Box 123, Vineyard Haven, Mass.  
Supt., R. L. Bigelow Estate, West Chop, Mass.

- SNIDER, PAUL H.—1910-11.  
Data not received.
- SOUTHARD, FREDERICK D.—1909-11.  
601 Tremont Bldg., Boston, Mass.
- SPAETH, J. NELSON—M.F. 1920.  
209 Bryant Ave., Ithaca, N. Y.  
Professor of Forestry, Fernow Hall, Cornell University, Ithaca, N. Y.
- STABBNER, RALPH C.—M.F. 1912.  
Falls Church, Va.  
Valuation Eng'r., Internal Revenue Bldg., Wash., D. C.
- STALKER, WILLIAM A.—1907-10.  
Shoreham, Vt.  
Appraiser, F.C.A., Springfield, Mass.
- STARR, FREDERICK R.—M.F. 1909.  
Data not received.
- STEED, ALVIN V.—M.F. 1935.  
719 22nd St., Ogden, Utah.  
U.S.F.S., Range Exp. Sta., Ogden, Utah.
- STEVENS, WINGATE I.—M.F. 1922.  
69 Washburn Ave., Portland, Me.
- SWAN, KENNETH D.—M. F. 1911.  
Missoula, Mont.  
Office of Public Relations, Region 1, U.S.F.S., Missoula, Mont.
- TARBOX, ERROL E.—M.F. 1923.  
Chisenessick Farm, West Greenwich, R. I.  
Cultural Foreman, C.C.C., Nooseneck Camp, Washington, R. I.
- TERRY, ELWOOD I.—M.F. 1918.  
Professor of Economic Geography and Conservation, Winthrop College,  
Rock Hill, S. C.
- TONG, HUGH YUNG-HEE—1911-12.  
Chinese Gov't. Railways, Peiping, China.
- TRYON, HENRY H.—M.F. 1913.  
Director, Black Rock Forest, Cornwall-on-Hudson, N. Y.
- TUFTS, JOSEPH A.—1909-11.  
Edann Rd., North Hills, Montgomery Co., Pa.  
Insurance; 110 S. 4th St., Philadelphia, Pa.
- UEKI, HOMIKI—M.F. 1922.  
Agricultural and Forestry College, Suigen, Korea.

- WARD, ROBERT W.—A.M. 1933.  
Kentville, Nova Scotia.  
Horticultural Research, Central Experiment Farm, Ottawa, Ontario.
- WESTON, RAY F.—S.B. 1908.  
Bay Rd., Duxbury, Mass.  
Camp. Supt., C.C.C. Camp S-56, Plymouth, Mass.
- WHELDEN, CHARLES M., JR.—M.F. 1934.  
Data not received.
- WORTHLEY, IRVING T.—S.B. 1905.  
R. D. 2, Phoenixville, Pa.  
Inspection, Pa. Stock Survey, E. C. W.
- WYMAN, LENTHALL—M.F. 1914.  
919 West South St., Raleigh, N. C.  
Professor of Forestry, N. C. State College, Raleigh, N. C.
- ZIEBARTH, R. KURT—M.F. 1934.  
408 East 29th Place, Davenport, Ia.  
Assistant Research Forester, Dept. of Forestry, State College, Pa.

## HARVARD FOREST PUBLICATIONS

### BULLETINS

- No. 1. THE MANAGEMENT OF THE HARVARD FOREST, 1909-1919. By Richard Thornton Fisher, Director of the Harvard Forest. 1921.
- No. 2. GROWTH STUDY AND NORMAL YIELD TABLES FOR SECOND GROWTH HARDWOOD STANDS IN CENTRAL NEW ENGLAND. By J. Nelson Spaeth. 1920.
- No. 3. THE LIFE HISTORY AND CONTROL OF THE PALES WEEVIL (*HYLOBIUS PALES*). By H. B. Peirson. 1921.
- No. 4. RED OAK AND WHITE ASH. By Reuben T. Patton. 1922.
- No. 5. CONTROL OF THE WHITE PINE WEEVIL BY FOREST MANAGEMENT. By H. B. Peirson, 1922.
- No. 6. A STATISTICAL FOREST SURVEY OF SEVEN TOWNS IN CENTRAL MASSACHUSETTS. By R. C. Averill, W. B. Averill, and W. I. Stevens. 1923.
- No. 7. QUALITY AND GROWTH OF WHITE PINE, AS INFLUENCED BY DENSITY, SITE, AND ASSOCIATED SPECIES. By E. E. Tarbox, with field assistance by P. M. Reed. 1924.
- No. 8. MIXED WHITE PINE AND HARDWOOD. By A. C. Cline and C. R. Lockard. With an Introduction by R. T. Fisher. 1925.
- No. 9. RED PINE IN CENTRAL NEW ENGLAND. A PRELIMINARY STUDY WITH VOLUME AND YIELD TABLES. By Paul M. Reed. 1926.
- No. 10. THE MARKETING OF LUMBER IN NEW HAMPSHIRE, 1925. By A. C. Cline. A Survey Conducted for the New Hampshire Lumbermen's Association. 1926.
- No. 11. THE GROWTH OF HEMLOCK BEFORE AND AFTER RELEASE FROM SUPPRESSION. By Robert Marshall. 1927.
- No. 12. THE WOOD-USING INDUSTRIES OF MASSACHUSETTS. By J. B. Downs, with field assistance by C. B. Gutchess. 1928.
- No. 13. FORM AND DEVELOPMENT OF WHITE PINE STANDS IN RELATION TO GROWING SPACE. By S. R. Gevorkiantz and N. W. Hosley. 1929.
- No. 14. A THERMOELECTRIC RADIOMETER FOR SILVICAL RESEARCH. By P. R. Gast. 1930.

No. 15. THE EVOLUTION OF SOILS AS AFFECTED BY THE OLD FIELD WHITE PINE—MIXED HARDWOOD SUCCESSION IN CENTRAL NEW ENGLAND. By B. G. Griffith, E. W. Hartwell, and T. E. Shaw. 1930.

No. 16. EUROPEAN LARCH IN THE NORTHEASTERN UNITED STATES. A STUDY OF EXISTING PLANTATIONS. By Stuart S. Hunt. 1931.

No. 17. SOME FACTORS UNDERLYING FOREST FIRE INSURANCE IN MASSACHUSETTS. By C. C. Averill and L. M. Frost. 1933.

*Publications of the Harvard Forestry Club*

BULLETIN OF THE HARVARD FORESTRY CLUB, Vol. I. 1911.

BULLETIN OF THE HARVARD FORESTRY CLUB, Vol. II. 1913.

*Miscellaneous Publications*

CATALOGUE OF REPRESENTATIVE OPERATIONS ON THE HARVARD FOREST, by the Forest Staff. 1924.

LUMBER CONSUMPTION IN THE SPRINGFIELD DISTRICT: REPORT ON A MARKET SURVEY, by A. C. Cline, H. B. Shepard, Consulting Forester, and the Students at the Forest. 1925.

*Coöperative Publications*

FOREST MENSURATION: TABLES FOR THE MEASURING OF LOGS, TREES, AND GROWTH OF STANDS (in coöperation with the Massachusetts State Forester). 1921.

PRUNING FOR PROFIT AS APPLIED TO EASTERN WHITE PINE, by A. C. Cline and E. D. Fletcher (in coöperation with the Massachusetts Forestry Association). 1928.

FOREST WEEDING WITH SPECIAL REFERENCE TO YOUNG NATURAL STANDS IN CENTRAL NEW ENGLAND, by A. C. Cline. Prepared at the Harvard Forest for the Massachusetts Forestry Association. 1929.

*Bulletins Ready for Publication*

No. 18. CUT OVER OLD-FIELD PINE LANDS IN CENTRAL NEW ENGLAND: A REGIONAL STUDY OF THE COMPOSITION AND STOCKING OF THE ENSUING VOLUNTEER STANDS, by F. S. McKinnon, G. R. Hyde, and A. C. Cline.

No. 19. NORWAY SPRUCE IN THE NORTHEASTERN UNITED STATES: A STUDY OF EXISTING PLANTATIONS, by N. W. Hosley.