

HARVARD UNIVERSITY

Cambridge, Massachusetts

OFFICE OF THE PUBLICATION AGENT

LEHMAN HALL

May 13, 1935

Mr. Albert C. Cline
Petersham, Massachusetts

Dear Mr. Cline:

I am enclosing a pasted dummy of the section in the current Annual Catalogue dealing with the Harvard Forest. Could you have this brought up to date with the necessary marginal corrections and return it in the enclosed envelope?

Your revisions will be incorporated in next year's issue of the Catalogue, the descriptive sections of which will go to the printer the week of June 24. Since the Catalogue as a whole is to be extensively revised and reset this year, it will be helpful if you can have your copy in hand as far in advance of that date as may be conveniently possible.

Very sincerely yours,

Darwin Bailey

Publication Agent

THE HARVARD FOREST

ALBERT COLLINS CLINE, S.B., M.F., *Assistant Director.*
PAUL RUPERT GAST, Ph.B., S.M., S.D., *Assistant Professor of Forestry.*
NEIL WETMORE HOSLEY, S.B., M.F., *Instructor in Forestry.*
A. H. UPHAM, *Superintendent.*

The Harvard Forest was acquired in 1907 to serve as an experiment station and laboratory for research in forestry and allied problems and also as a model forest for demonstrating the results of developing practice in forestry. In respect to continuity of intensive silviculture, its history is longer than that of any other tract in America.

The Forest consists of 2200 acres of varied woodland, situated in the town of Petersham, in northern Worcester County, Massachusetts, about seventy-five miles west of Boston. Well timbered almost all over, it contains a greater variety of the different stages of forest represented in New England history than can be found on an equal area anywhere else in the region. Besides authentic fragments of the original primeval forest, it has phases of second growth and tree species representative of both the northern and central forests. In addition to the original tract, the Forest has had a number of accessions given for special purposes: in Winchester, New Hampshire, twenty acres of primeval pine and hemlock forest, one of the very last remnants of such forest in New England and of great value for scientific purposes; in Hamilton, Massachusetts, 120 acres of coniferous plantations, established and given to the Forest by the late Nathan Matthews and embodying one of the earliest and most extensive experiments with native and exotic softwoods yet made in this country; in Petersham, a fifty-acre tract of mixed woods, given by the late G. F. Schwarz for demonstrating adaptations of forestry to landscape architecture; and finally a valuable stand of timber covering more than 150 acres and contiguous to the main tract, loaned by the New England Box Company for an indefinite period for joint experimental work in forest management. Contained in the Petersham ownership is a thousand-acre bird refuge of unusual interest and value, which is jointly maintained by the University and the state. The Forest also conducts a nursery for the raising of tree seedlings. This contains usually about a quarter of a million trees, which are used in part for planting in the Forest and in part to supply neighboring land owners with planting stock.

The headquarters building provides dormitory for students and research workers, offices for the staff, work rooms, a small working library, and a laboratory for chemical and physical determinations. Instruction at the Forest is limited to men who have already had elementary training in forestry and who have received at least a bachelor's degree. Students may work either for the master's degree in forestry or in science, or for a doctorate, requirements in each case being based primarily on the completion of a project in research. The results of investigative work and of experience in the management of the Forest are published from time to time in a series of bulletins.

Application for admission as a student or inquiries for detailed information may be made to the Director.

May 29, 1935.

Mr. David W. Bailey,
Lehman Hall,
Cambridge, Mass.

My dear Mr. Bailey:

In response to your letter of May 13, I am enclosing a revised write-up on the Harvard Forest for inclusion in the new Catalogue.

Very sincerely yours,

ACC.C

Assistant Director

THE HARVARD FOREST
ACCOMPLISHMENTS, FINANCIAL STATUS, AND FUTURE PLANS

In the last ten years the Harvard Forest, because of being the oldest forest experiment station and example of continuing intensive management in the United States, has made great contribution to the practice and technique of forestry (Appendix A). This has been done directly not only through its students and publications but even more through the large numbers of professional foresters who annually visit the Forest to see the methods and results of controlling and improving production in existing forests. Thus the Forest itself embodies and illustrates the progress of silviculture as the years go on. As a by-product of this process as well as special research projects, new and fundamental facts have been brought out which are rapidly being absorbed into the practice and policy of forestry. Among the more significant are

1. That evergreen forests in certain localities definitely impoverish the soil and cannot wisely be used as repeated crops; but on the other hand, mixtures of certain hardwoods, with or without evergreens, actively improve soil conditions and maintain fertility.
2. That the highest grade timber is the product of certain favorable mixtures of species and densities of stand, both of which can be maintained or brought about by the right kind of silviculture.
3. That many of the present types of forest found in New England, although temporarily productive, are actually unnatural and transitional, due more to certain human influences, such as repeated cuttings, fires, and neglect, than to natural factors of soil and climate; and that many of our present forests are therefore not to be taken as objectives of management.
4. Convincing demonstration of methods of converting young or potentially worthless forest growth into valuable crops.
5. That the prevalence and virulence of insects and disease are powerfully affected by the composition and health of forests, and that to a useful extent these can be controlled by silviculture.

6. Study of the relation of growth to solar radiation and varying soil nutrients, already several years in progress, indicates more exact ways of testing forest soils and connecting their improvement with changes in the composition and condition of the forest, the only practicable way to effect the equivalents of cultivation and fertilization.

7. Because of its long experience in the business management of a definite forest property as well as the technique of silviculture, the Forest staff has had much to do with the framing of state forestry legislation in Massachusetts, particularly the special forest tax law of 1921, the principle of which has been extensively copied in other states.

Although there have been many specific contributions to scientific knowledge underlying or connected with forestry, the biggest and most important service of the Harvard Forest has been the lessons from the forest itself with its records and demonstrations of successful maintenance and production; and these benefits, it cannot too often be repeated, have required time for their fruition and will inevitably show increasingly valuable and unique results in years to come.

The present program of research, which, because of lack of funds, has been only partially realized, is based upon uniform and continuing records which to a large extent embody a long time plan bearing upon (1) silvicultural technique, the actual handling of the forest, and (2) the physiological, chemical, and physical factors which underlie it. Thus there are the field and office records covering operating figures, silvicultural plans and results, financial outcomes, progress of growth and reproduction, maps, etc., and those records - even more important and difficult to maintain - applying to weather and climatic factors, soil samples and soil analyses, measurements and observations of growth, changes in vegetation, etc. Such data are indispensable in making future interpretations significant. They form the necessary background not only to the special research projects now going on but to any and all

biological investigations which may deal with the reactions of vegetation or animal life to environment. The purpose is to build up an analytical history of the environment itself so that experimental work, whether in forestry, ecology, or other biological studies, can be based upon material of known origin. The unique value of such continuing and uniform records on the same ground is illustrated by the agricultural experimental area at Rothampstead, England, where for eighty years and under the same system, results of world wide interest have been obtained that could not have been secured in any other way.

The following list contains the principal projects in research now in progress, all of which are derived from or are based upon the continuing records and observations on the Forest.

1. Growth as related to solar radiation and varying soil nutrients. This bears upon the control of soil fertility and cutting methods in the forest.
2. Artificial pruning: its physiological effects and relation to the quality and value of timber.
3. Analyses of methods and results of forest planting as relating to size of planting stock, site factors, competing vegetation, choice of species, etc.
4. Possible relation between the infestation of the white pine weevil and life history and chemical composition of trees attacked.
5. Food habits and local migrations of the Virginia deer. A preliminary study of the possibility of maintaining a deer population in a managed forest.
6. Results of ten years of selective cutting operations in white pine stands.
7. Life history and phases of succession in primeval forest.
8. Norway spruce in the Northeast: a study of existing plantations.
9. Cut-over pine lands in central New England. An analysis of changes in composition and potential value in production.
10. A plant survey of the Harvard Forest. A study of changes brought about by human agency and the relation of distribu-

tion to sites and soils (in cooperation with the Arnold Arboretum).

11. A serial photographic record of the evolution of successful cutting methods on the Harvard Forest.

In this list Nos. 8 and 9 are ready for publication. No. 5 is to be finished before July 1, and the field work is substantially finished for Nos. 3 and 6.

In respect to the Harvard Forest, the period of fruition is just beginning; and though the main fruits are so far in the form of knowledge pertaining to forestry, there is accumulating a legacy of material which should be of unique value to allied biological work - genetic and ecological problems such as are now being conducted jointly with the Arboretum as well as physiological and zoological studies already being undertaken with the departments in question. There is no other such forest laboratory in the United States, and nothing like it could be created except with a similar expenditure of years and work.

In respect to funds for research and publication, the Harvard Forest has had no direct contributions from the University until very lately. Since 1931 there has been an appropriation from the Department of Biology for research expenses of joint interest, amounting this year to about \$800.; and for the year 1934-35 a grant of \$1400. from the Milton Fund has been allotted to Dr. Gast for his work on radiation in relation to growth. The Forest has an endowment of \$100,000. (received in 1925) for research in forest production, the income of which has been applied: \$3500. to the salary of Dr. Gast and the remainder, now amounting to a little over \$500., for laboratory assistance, materials, etc. Aside from these resources there have been irregular gifts, of which the most important was \$3000. from the Massachusetts Society for the Promotion of Agriculture for

the study of life history and succession in primeval forest. Similarly there has been no definite fund for publication, and the bulletins of the Harvard Forest, which have been published to the number of seventeen, have been paid for by private gift averaging five or six hundred dollars a year for the last decade. The salaries of the other members of the staff (aside from the Director), namely, Assistant Director and Instructor, are paid very inadequately from an additional endowment of \$200,000. obtained in 1929-30. There is thus a total endowment belonging to the Forest, and exclusive of the so-called Bliss Fund for scholarships, of a little over \$300,000. The income of this covers these salaries and, at the present income rate, about \$2000. for house maintenance, equipment, materials, and assistance. The net income from the sales of the Forest, up to 1932 from \$1200. to \$2000., has been wholly spent for maintenance of plant and upkeep at Petersham with an occasional small surplus for experimentation or improvement in the forest. There has been no net income during the last two years. Thus, during the best times there was available for the various purposes of research a sum ranging from four to five thousand dollars annually. Under the present conditions of reduced income from the Forest and its endowments, the amount available is less than three thousand, which is not sufficient to meet necessary running expenses, even though the latter have been reduced nearly forty per cent in the last two years.

The Forest needs more funds to raise the salaries of its staff, for assistants to maintain indispensable records, observations and analyses, and for incidental expenses of upkeep, equipment, and materials of research. The present staff has to handle with inadequate aid in routine matters the following work:

1. Administration. The business of an organized forest; planning and marking cuttings; logging; sawmill operations; sales and deliveries; nursery work and planting; forest improvement; road maintenance; fire protection; accounts and bookkeeping; departmental and faculty relations.

2. Records. The necessary annual measurements, observations, written descriptions, serial photographs, computations, maps, operating costs, details of cuttings; plantations and other silvicultural work as well as physical and chemical data relating to soils, climate and weather, and necessary biological data.

3. Teaching and Research. The supervision of graduate students working on special projects or in collaboration on projects by members of the staff. This combines oversight of many continuing experiments and sample plots on the Forest itself with current specific studies, and includes preparation of results for publication.

4. Public Relations. Dealing with several hundred visitors annually; consultation on state and federal forest policies; technical advice to the town and local owners; service on committees, advisory boards, associations; lectures.

Not to maintain this program of work and to take care of the inevitable expansion of recorded material is to lose the value of twenty-five years of work that has not been duplicated anywhere else in the country. Moreover, the present federal program with respect to conservation, involving as it does the fundamental economic puzzle of land use - what to do with sub-marginal lands proposed to be withdrawn from production, water supply and flood control, soil degradation, compulsory silviculture, and timber quotas for lumber operators, in all of which forests, both in their economic and physiological functions are a controlling element, indicates the need in the University of new integrations and cross sections of research. In this direction two types of professorship are suggested, both of which would provide such a realignment of purpose. One may be called a professorship of natural resources, which would deal with forests as a part of the question of national land use in terms of economics and forestry. Another is a professorship of ecology or forest physiology to deal with the significance to man of living

environment. So far there has been little attempt by the biological sciences to integrate and interpret as a whole such functions of the forest and other natural environments as touch the life of man. This would give new life and meaning to biological study.

PRESENT STATUS

Director 4,000.
 Assistant Director 3,500.
 Assistant Professor of Forestry 3,500.
 Instructor 3,000.
14,000.

NEEDED STATUS*

Director 7,000.
 Assistant Director 6,000.
 Professor of Forestry 6,000.
~~Physiology~~
 Assistant Professor of Forestry 4,000.
 Secretary 1,500 - 2,000.
24,500 - 25,000.

* For salaries to equal present scale of competitive positions

Total Additional \$ 10,500 - 11,000.

PRESENT STATUS

8 1/2's scholarship ^{generally divided}
 4 Harvard Forest @ 150 600.

1,200.
 600.
1,800.

NEEDED ADDITIONS

2 Resident research fellowships
 Incumbents often serve as research assistants

2,000.
2,000.

Total Additional

2,000

PRESENT STATUS

1 Laboratory Assistant
 Part time forest assistant
 Equipment, materials
 Laboratory maintenance

1,000.
 300.
 1,500.
2,800.

NEEDED STATUS

Full time laboratory assistant for analyses chemical and physical records
 Full time forest assistant and bookkeeper
 Maintenance plant, materials, equipment

1200-1800
 1,500.
 3,000.
5700-6300

Total Additional

2900-3500

PRESENT STATUS

Bulletins, papers, embodying research results

none

NEEDED STATUS

Same purpose

1,000.

Total Additional

1,000.

Form No. 1

Form No. 2

HARVARD FOREST

Professorship of Natural Resources:

To deal with the ^{national} ~~problem~~ of land use, including the function of forest areas as a problem of economics and forestry.

Professorship of General Ecology or Forest Physiology:

To deal with the forest and other natural environment in terms of major fluctuations as well as successional changes as it touches the life of man.

NOTE: These professorships are ~~not~~ intended as suggestions for the proposed cross-departmental professorships.

Form No. 3

HARVARD FOREST

One or several resident fellowships
for graduate study at the Harvard
Forest or related departments of
the University,

\$2,000.

(Incumbent would often function in
part as an assistant.)

HARVARD FOREST

Full time forest assistant for upkeep of field and office records, book-keeping, etc.	\$1,500. - \$1,800.
One Full time laboratory assistant for routine chemical and physical records and analyses,	\$1,200. - \$1,800.
Maintenance of equipment, upkeep, materials, running expense of laboratory and office,	\$3,000.

Form No.5

HARVARD FOREST

For the preparation and publication of
bulletins and pamphlets embodying
results of research at the Forest
or by its staff

\$1,000.

Albert Collins Cline, S.B., M.F., Assistant Director
Paul Rupert Gast, Ph.B., S.M., S.D., Assistant Professor of Forestry.
Neil Wetmore Hosley, S.B., M.F., Instructor in Forestry.
Albert H. Upham, Superintendent.

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The Forest consists of 2287 acres of varied woodland, situated in the town of Petersham, in northern Worcester County, Massachusetts, about seventy-five miles west of Boston. Well timbered all over, it contains a greater variety of the different stages of forest represented in New England than can be found on an equal area anywhere else in the region. Besides authentic fragments of the original primeval forest, it has phases of second growth and tree species representative of both the central hardwood and northern forests. In addition to the original tract, the Forest has had a number of accessions given for special purposes: in Winchester, New Hampshire, twenty acres of primeval pine, hemlock and hardwood forest, one of the very last remnants of such forest in New England and of great value for scientific purposes; in Hamilton, Massachusetts, 166 acres of coniferous plantations, established and given to the Forest by the late Nathan Matthews and embodying one of the earliest and most extensive experiments with native and exotic softwoods yet made in this country; and finally a 45 acre tract of mixed woods in Petersham, given by the late G. F. Schwarz for demonstrating adaptations of forestry to landscape architecture. Part of the Petersham ownership is in a thousand-acre wild life sanctuary of unusual interest and value, which is maintained by the University and abutting owners under the law of the Commonwealth.

From the beginning the Forest has been managed according to the policy of sustained yield, that is, keeping the land in continuous production and cutting no more than the annual growth. Unusual opportunity is offered students to observe or participate in numerous cultural treatments applied to stands of various types and ages. The annual lumber cut provides for acquaintance with local lumbering practices and utilization. The Forest also conducts a nursery for the raising of tree seedlings. This contains usually about a quarter of a million trees, which are used in part for planting in the Forest and in part to supply neighboring land owners with planting stock.

The headquarters building provides dormitory for students and research workers, offices for the staff, work rooms, a small working library, and a laboratory for chemical and physical determinations. Upon the completion with credit of a project in research or special study involving work equivalent to four full courses, professional students ordinarily receive the degree of Master in Forestry. To become a candidate for this degree the student must possess a bachelor's degree in forestry or equivalent academic training. Instruction and the facilities for research at the Forest are also available to candidates for the degrees of Master of Arts or Doctor of Philosophy who may work on studies in Botany, Zoology, Physiology or Economics which bear on forest culture or utilization. In the case of candidates for either of these degrees, the requirements both for admission to candidacy and for securing the degree are the same as those obtaining in the Division of the Graduate School of Arts and Sciences which awards the degree. The results of investigative work by the staff and students of the Harvard Forest and of experience in its management are published from time to time in a series of bulletins.

Applications for admission as a student or inquiries for detailed information should be made to the Director of the Harvard Forest, Petersham, Massachusetts.

SCHOLARSHIPS

BLISS (1917). Mrs. William H. Bliss of New York, "To be applied to the establishment and support of scholarships in the Division of Forestry." Grants are awarded to candidates who are specializing in Forestry or to candidates in Botany, Zoology or Economics whose research bears upon the growth or distribution of forests, the structure, physiology or pathology of forest plants, forest entomology, forest wildlife management, or the industrial or social aspects of forest utilization. A recipient of an award who is not specializing in Forestry will register in Biology 120 for a minimum credit of one full course.

One or more, from an income of \$1100

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One or more, from an income of 1100.

FEEES AND EXPENSES

HARVARD FOREST. The tuition fee is that of the Graduate School of Arts and Sciences, \$400. There is an annual instrument and transportation fee of \$10. Lodging in the dormitory at Petersham is \$2 per week; board is charged at cost, now slightly less than \$6 per week. The dormitory rooms are furnished with the essentials but occupants provide linen and blankets.

The Stillman infirmary fee is not chargeable to students in residence in Petersham. A bond for \$200 must be filed with the Bursar. The term bills are payable quarterly.

THE HARVARD FOREST

Albert Collins Cline, S.B., M.F., Assistant Director.
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of the lower slope. The southeast block follows the narrow valley of the east branch of the Swift River for nearly two miles. This area is marked by rugged topography, sharp contrasts in elevation, and extensive stands of lightly culled old growth timber. The variety of situation and soil, the economic history of the region, which includes the clearing and subsequent abandonment of nearly three-quarters of the land area, and the location of the Forest in a transitional zone characterized by the overlapping of two major forest regions, combine to create forest conditions of unusual complexity and interest.

In addition to the main blocks, the Forest has had a number of accessions given for special purposes: in Winchester, New Hampshire, twenty acres of primeval pine, hemlock, and hardwood forest, one of the very last remnants of such forest in New England and of great value for scientific purposes; in Hamilton, Massachusetts, 106 acres of coniferous plantations, established and given to the Forest by the late Nathan Matthews and embodying one of the earliest and most extensive experiments with native and exotic softwoods yet made in this country; and finally a 45-acre tract of mixed woods in Petersham, given by the late G. F. Schwarz for demonstrating adaptations of forestry to landscape architecture. Part of the Petersham ownership is in a thousand-acre wild life sanctuary, which is maintained by the University and abutting owners under the laws of the Commonwealth.

From the beginning the Forest has been managed according to the policy of sustained yield, that is, keeping the land in continuous production and cutting no more than the annual growth. Unusual opportunity is offered students to observe or participate in numerous cultural treatments applied to stands of various types and ages. The annual lumber cut provides for acquaintance with local lumbering practices and utilization. The Forest also conducts a nursery for raising tree seedlings.

The headquarters building at Petersham provides dormitory for students and research workers, offices for the staff, work rooms, a small library, and a laboratory for chemical and physical determinations. Upon the completion with credit of a project in research or a special study involving work equivalent to four full courses, professional students ordinarily receive the degree of Master of Forestry. To become a candidate for this degree, the student must possess a bachelor's degree in forestry or equivalent academic training. Instruction and the facilities for research at the Forest are also available to candidates for the degrees of Master of Arts or Doctor of Philosophy who undertake studies in botany, zoology, physiology, or economics which bear on forest culture or utilization. In the case of candidates for either of these degrees, the requirements both for admission to candidacy and for securing the degree are those of the Division of the Graduate School of Arts and Sciences concerned. The results of investigative work by the staff and students of the Harvard Forest and of experience in its management are published from time to time in a series of bulletins.

Applications for admission as a student or inquiries for detailed information should be made to the Director of the Harvard Forest, Petersham, Massachusetts.

THE HARVARD FOREST

*University
Guide*

The Harvard Forest was acquired by the University in 1907, largely through the generosity of Mr. John S. Ames of the Class of 1901. It lies mostly in the town of Petersham in northern Worcester County, Massachusetts, about seventy miles distant from Cambridge and nine miles from Athol, the nearest railroad connection. The Forest headquarters is situated midway between Athol and Petersham village on state highway number 32.

The original area of 2058 acres has been increased by gift and purchase to the present total of 2287 acres. This is divided among three main blocks which are located respectively northeast, northwest, and southeast of the village. The northeast block includes Prospect Hill, the highest point in the town (elevation 1400 feet), together with rolling land to the west, an area of moderately fertile soils devoted chiefly to plantations of conifers. The northwest block occupies the eastern slope and bottom of a broad valley known locally as Tom Swamp. Its principal features are a 100-acre pond, a spruce bog forest, pine and hemlock on light sandy soils, and exceptionally fine mixed hardwoods on rich upland loams. The southeast block follows the narrow valley of the east branch of the Swift River for nearly two miles and affords sharp contrasts in elevation, rugged topography, and extensive areas of lightly culled old growth forest. It would be difficult to find anywhere in the region a tract of similar size which provides such a diversity in forest cover, soil, and topography. Moreover, central New England in general presents a complexity of forest conditions not to be found elsewhere in the Northeast. The extremely varied composition of the forests is due in part to the economic history of the region, which includes the

clearing of nearly three-quarters of the land for agricultural use, followed by its abandonment and reversion to forests, and to the fact that the region lies in a transition zone marked by an overlapping of the northern forest and the central hardwood forest. No less than forty tree species occur indigenously on the Forest.

In addition to the main blocks in Petersham, the Forest has had a number of accessions given for special purposes: in Winchester, New Hampshire, 20 acres of primeval mixed forest, one of the last remnants of such in New England; in Hamilton, Massachusetts, 106 acres of plantations, established by the late Nathan Matthews and embodying one of the earliest and most extensive experiments with exotic and native conifers and hardwoods yet made in the country; and in Petersham, a 45-acre tract of second growth forest formerly owned by the late G. Frederick Schwarz and given for use in demonstrating adaptations of landscape architecture to forestry.

From 1907 to 1934 the Forest was under the continuous direction of the late Professor Richard T. Fisher, whose ability to analyze and interpret the complex conditions of forest growing stocks, in the light of land history and successional trends, contributed greatly towards the development of a sound regional silviculture. Of outstanding value are his carefully developed methods of handling the young volunteer stands which follow the clear-cutting of "old field" white pine, the predominating growth on the Forest at the time of its acquisition. Under Professor Fisher's stewardship the Forest became a model to demonstrate the practice of forestry, an experiment station for research, and a field laboratory for students.

From the beginning it has been conducted on a sustained yield basis, that is, cutting at a rate not to exceed the growth; and in this respect as well as in the continuity of intensive silviculture

its history is longer than that of any other forest in America. The original growing stock of some ten and one-half million board feet has been substantially maintained throughout the past twenty-eight years, notwithstanding the removal of over seven and one-half million feet of lumber and four thousand cords of wood. At the same time, new stands have been established on all open and cut-over land and subsequently weeded, thinned, or otherwise cultivated, in accordance with the adopted policy of producing the highest quality product. The principal silvicultural problem has been to deal successfully with numerous temporary and inferior second growth stands, more specifically, to determine what species should be encouraged on the various soils in the process of conversion to more stable and valuable associations, and to perfect the measures necessary for their development as profitable timber crops. Some fifty or more operations are carried on annually, thus affording other forest owners, practising foresters, and students opportunity to study and observe on the ground the methods and the results of intensive cultural treatment. The value of the Forest as a continuous demonstration is greatly enhanced by records covering the silvicultural and biological aspects of management, as well as the financial and practical. A file of several thousand photographs vividly portrays the changes which a quarter century have wrought.

The Forest is part of the Division of Biology of the Graduate School of Arts and Sciences, and, as such, instruction is wholly on a graduate basis. Candidates for the professional degree, Master of Forestry, must possess a bachelor's degree in forestry or equivalent academic training. Instruction and the facilities for research at the Forest are also available to candidates for the degrees of Master of Arts and Doctor of Philosophy who undertake studies in botany, zoology, physiology, or economics which bear on forest growth or utilization.

The headquarters building, situated on the Forest, provides dormitory for students, offices for the staff, work rooms, a small library, and a laboratory for chemical and physical determinations. Living on a forest in intimate contact with its management is considered especially valuable for students preparing for professional practice. By tutorial instruction and intensive apprenticeship the student becomes acquainted with the techniques of forest culture. In order that he may develop his proficiency in the methods of scientific investigation, he also undertakes a project in research. This may be in the general field of silviculture and forest management or in such underlying or related fields as tree physiology, experimental silvics, forest soils, forest mensuration, forest entomology, forest pathology, wild-life management, and forest utilization. The results of these researches are published from time to time in a series of bulletins.

Visitors may see examples of the numerous forest cover types characteristic of the region, and the applications and results of the various cultural treatments systematically applied to tree crops. Also of interest are carefully controlled pot culture experiments on the influence of varying intensities of sunlight and the fertility of soils, both natural and artificial, on the growth rate of tree seedlings. Similarly, the demonstrable influence of changing vegetative cover on the transformation of soil from a tilth characteristic of a fertile garden to a peculiar layered condition and then back to tilth, is an impressive illustration of man's control over soil productivity. Those interested in wild life will find an unusual wealth of birds and quadrupeds in a large sanctuary maintained by the Forest under the protection of state laws.

Persons wishing to see particular phases of the work at Petersham or to visit one of the outlying tracts should notify the Director in advance of their intended arrival, so that provision may be made for their guidance.