

COMMENTS ON THE HARVARD FOREST

From Ward Shepard of the U. S. Forest Service, July 29, 1929:

"Cline's 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."

From M. Petitmermet, Departement federal de l'Interieur, Berne, Switz.
August 27, 1929:

"Before leaving for Europe, I wish to tell you how much I enjoyed the visit I had with you in the 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."

From T. E. Shaw, Extension Forester, Indiana, July 2, 1930:

"After leaving Petersham and talking to other people about your work, I found that a great many people of Pennsylvania and elsewhere appreciate the work which is being done at the Harvard Forest. When I left the Pennsylvania Forest Service I had a talk with Willis M. Baker, the newly appointed Director of the Institute at Mt. Alto. He told me that he was sorry to have me leave, and he followed this remark with the statement that he would have been very glad to have had a man on his staff who had been associated with you.

"Another Pennsylvania forester expressed his regard for the work at Petersham and in so doing he made a statement which I have thought of a good many times since. He said that he always felt that you and your associates knew what you were talking about, confining yourselves to matters with which you are intimately acquainted instead of talking in terms of continents."

From W. E. Hiley, English forester, May 22, 1931:

"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 round 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."

From Willis M. Baker, Director of the Mont Alto Forest Research Institute, Pennsylvania, August 12, 1931:

"I have just had occasion to refer to two of your publications, 'Forest Weeding' and 'Pruning for Profit.' It has been gratifying to me, and it may be of interest to you, to learn how completely your conclusions agree with the results I determined working for thirteen years under somewhat similar conditions in New Jersey, and for the last two years in Pennsylvania. These publications contain so much valuable information, that I would like to have copies for my personal library.."

From Miss Olive Simes, forest owner in Petersham, May 14, 1932:

"I have just been to Petersham and am very much pleased with the result of the winter's work on my forest. To show my appreciation of the time given by the school and of the personal interest which Mr. Cline has taken in carrying out my ideas I should like to make a small gift to the school. You and your associates have certainly made it a valuable asset to Petersham."

From Frank E. Winsor, Chief Engineer, Metropolitan District Water Supply Commission, Massachusetts, August 22, 1932:

"I congratulate you upon the work which is being done under your direction on the Petersham woodlands and which is a precedent for much similar work which should be done in the large areas to be held by this Commission for the protection of the water supply of the Swift River Reservoir."

The Engineering Camp at Squam Lake has proved highly successful: the students work, and learn much—including the important truth that, even in summer, a vigorous life may be as happy as a lazy one.

→ For the first time the Faculty offered courses in Forestry: Mr. Fisher instructed twenty-eight students in Silviculture, Mr. Jack eighteen in Forest Measurements and thirteen in Forest Botany. Moreover, a four years' programme in preparation for the profession of Forestry was devised in the Lawrence Scientific School. Since Forestry is a subject for which the University has in the Arnold Arboretum peculiar facilities, and is, besides, a subject of great and growing importance, the establishment of courses in Forestry last year and the increase in their number this year are matters of congratulation. As yet, however, the University has made merely a beginning. Such a school of Forestry as it might and should have would require more teachers and more money.

One marked difference between Forestry at Harvard University and Forestry at other large universities is in the students who study it. Instead of limiting the courses to graduates we design them for undergraduates; and though we thus gain the opportunity of interesting the student early, we run the risk of dealing with him while he is immature. To the youthful mind the name Forestry is sometimes falsely seductive. It suggests a charming out of door life vaguely associated with hunting, fishing, and other sylvan sport—something quite different from mathematical computation of the amount of timber in felled or standing trees. The profession of a forester, though it has its aesthetic side, is difficult and commercial, a profession that preserves forests for economical and lasting use and only incidentally for beauty. By limiting to Scientific Students the courses in Forestry—so far as they are counted for a degree—and by uniting them in a four years' programme with other courses known to be difficult, the University does what it can to clear the minds of undergraduates who are considering the choice of Forestry as a genteel and easy profession for people who like to camp out in the woods.

THE LARGE LECTURE COURSES.

The splitting of History 1, referred to below, resulted in a shrinkage from four hundred and eight students in the History 1 of 1902-03 to three hundred and forty-six students in the History 1b of 1903-04; but the course was still too large for the comfort and for the complete efficiency of any teacher who met all the members at

L. B. R. Briggs, Dean

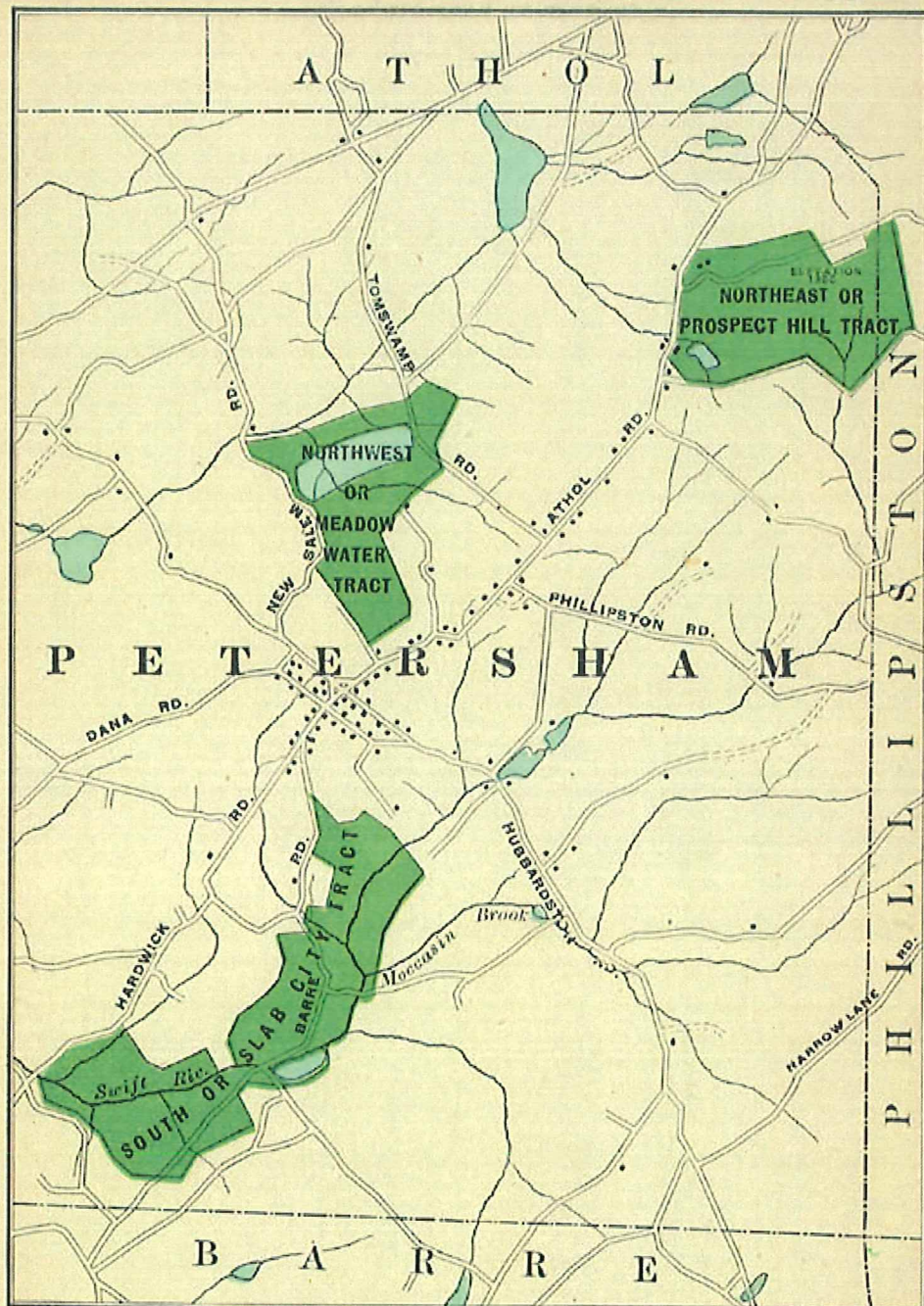
FORESTRY

TO THE PRESIDENT OF THE UNIVERSITY:—

SIR,—In the Division of Forestry the most notable development of the past year has been the acquisition of the Harvard Forest, a large tract of timberland situated in the town of Petersham, Mass. The land was secured in the autumn of 1907, through the generosity of Mr. John S. Ames of North Easton, Mass., of the Class of 1901, who gave the money necessary for its purchase, and an additional sum for the repair of buildings and for equipment. The area purchased, about 1800 acres, was previously owned by Mr. James W. Brooks, by whom the forest had for many years been protected and made accessible to the public. In order to preserve it, and render it useful both to the town and the cause of forestry, Mr. Brooks offered it to the University at a price substantially below its commercial value. At the same time, owners of adjoining land, Messrs. J. J. Higginson, Edwin C. Dexter, Joseph C. Smith, Henry S. Bennett, Charles S. Waldo, and William Simes, and Mr. Brooks himself, gave contiguous holdings amounting to between 200 and 300 acres. These gifts simplified the boundaries, secured the approaches, and rounded out the area of a demonstration-forest of about 2000 acres.

As a whole, the property combines, to an uncommon degree, the features desirable for the purposes of a forest school. Moreover, by virtue of the use to which it will be devoted, it constitutes, in effect, one of the most attractive public reservations of the State. With an elevation above sea level, ranging from 800 to 1400 feet, the forest offers great variety, both of topography and of woodland growth. It is divided into three separate blocks (see map) of (about) 850, 550, and 600 acres, which are located respectively, northeast, northwest, and south of the village. The northeast block covers the slopes and surrounding areas of Prospect Hill, the northwest block includes the basin of a small pond called Meadow Water, and the south block takes in about two miles of the narrow valley of the Swift River, with a pond and small water power along its course. The total stand of merchantable timber in the forest amounts to upwards of ten million board feet, nine-tenths of it white pine, and the rest chestnut, red and white oak, and other hardwoods. About fifteen miles of good wood-road provides access to almost any por-

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HARVARD UNIVERSITY: HARVARD FOREST, PETERSHAM, MASS., 2,000 ACRES

tion of the tract, which is thus peculiarly well adapted to logging. Besides the timbered areas, there are about a hundred acres of farm land and orchard, on which are a number of buildings, all located on the north of the Prospect Hill Tract.

For effective instruction in forestry, the possession of such a resource as the Harvard Forest is indispensable. The teaching of forestry in all well-equipped schools includes, as a matter of course, abundant experience in a forest, and involves a lumber business large enough to be typical for the region wherein it occurs. As related to a forest school, such a forest has two main functions: first, to offer a field for instruction in the elements and fundamentals of forestry, such as forest botany, the habits, requirements and silvicultural treatment of forest crops, estimation of timber, calculation of growth; and secondly, as an organized and permanent timber business, to present an example of conditions, methods, and results in scientific forest management. The first function could be fulfilled, to some degree, by almost any forest of reasonable size, even if it were not under management. To fulfil the second, which is much the more important as furnishing instruction, not only to students but also to the community, there must be enough forest land to justify by its production the maintenance of more or less constant lumber operations. In forestry, the ideal of a reasonably sustained yield cannot be approached except through a very gradual process of building up the crop and grouping it according to gradations of age. Thus, a forest in which this ideal is being pursued, and in which both commercial and silvicultural conditions are favorable, becomes steadily more valuable and instructive as a model, as an illustration of plans and principles whose outcome inevitably requires time. It ensures the accumulation and recording of experience in all the processes of forestry, and groups that experience about the central idea of sound business management. The forest must yield a profit, either present or future: otherwise as an object lesson to professional students and timber owners it can have no immediate value. The profit is essential to the instructiveness of the enterprise, but in the present case it cannot constitute either a large or a free surplus. All of it will be needed for the meeting of running expenses and the undertaking of useful experiments which cannot pay for themselves.

Under present economic conditions, a Forest School constitutes one of the very few sorts of ownership which may and ought to undertake the organization of a model forest. It *may* do so because its tenure is permanent, its knowledge is sufficient, and its desire for immediate and large profits is secondary to that for a steady return.

plies his own bedding and takes care of his room. A charge of \$1.25 a week is needed to cover the costs of fuel, light, janitor service, and wear and tear of furniture. Daily routine, as well as accommodations, is camp-like. An early breakfast is followed by a lecture, after which each class works in the woods until four or half past. Not more than two courses are carried on during any one week, and usually the work of each occupies a full day at a time three days in the week. The academic year is divided into three terms, an autumn and a spring term, devoted to field work in Petersham, and a winter term devoted to lectures and laboratory work in Cambridge.

The effectiveness of this scheme, particularly in comparison with the method hitherto necessarily employed in Cambridge, can hardly be overestimated. Concentration on the work in hand with the minimum of interruption, and the rapid acquisition of experience are manifest advantages. But what will prove to be, in the long run, the greatest advantage derivable from the forest, is its quality of permanent business enterprise, to all the records and accounts of which, both financial and scientific, the student will have access.

R. T. FISHER, *Chairman.*

FORESTRY

TO THE PRESIDENT OF THE UNIVERSITY:—

SIR,—I submit to you herewith the report of the Division of Forestry for the academic year 1908-09.

On October 1st last the Division began its occupation of the Harvard Forest, and the new two years' course, based on the use of the forest as laboratory and object lesson, went into effect. The essential feature of the scheme was the organization and operation of a model forest from which a yield as nearly continuous as possible can be cut, and the arrangement of the technical instruction so that, through all its stages, the student may get training and experience from a forest actually under management. The change from the former scheme in force at Cambridge involved some crowding and confusion in individual courses, and some consequent hardship upon the second-year class. Nevertheless, the Division is convinced that the present plan of instruction, although still in need of improvement in detail, is, in essentials, thoroughly effective. The students made far more progress than ever before in the same time, and their general grasp of forestry as a profession was notably quickened. In all thirteen students were registered in the Division.

The forest operations of the year, in connection with which instruction was given, comprised the cutting and marketing of about 215 thousand feet of lumber and 250 cords of firewood. Nearly half of this cut consisted of diseased or over-mature timber, and the whole amount represents less than the total annual growth on the whole tract, and less than one-fiftieth of the present total merchantable stand. Only three and three-quarters acres were cut clean and about twenty-three were culled and thinned. In every case the method of cutting was calculated either to further reproduction or to improve growth in an existing stand. Besides these felling operations, a forest nursery was established; and the first-year class, in connection with their work in silviculture, performed most of the labor of preparation and seeding, besides planting up about four acres of vacant land to white pine. The nursery now contains altogether about 50,000 white pine seedlings and transplants, ranging in age from one to three years.

Equipment for Instruction.—The equipment necessary for the work at Petersham consists of a complete set of instruments used in field work, and of a good working library. In this particular the Division is still very inadequately supplied. It has instruments sufficient for ordinary and necessary field work, but there are a number of instruments for special purposes, and of foreign make, which would be extremely valuable to have. The library facilities have been insufficient, not only in Petersham, but at Cambridge as well. A great deal of the printed matter useful for instruction in forestry is contained in local or occasional publications, such as State and Government bulletins, periodicals, etc., and the working plan reports of organized forests in other parts of the world. To get an adequate amount of this material together does not require a large amount of money, but it does require a considerable amount of time and thought on the part of some one familiar with forestry and its history. Up to now it has been impossible to make more than a beginning of supplying this need, but for the course of instruction as now organized a larger and better reference library is urgently needed.

Logging Equipment.—The School already has a tolerably complete outfit of logging tools and the equipment necessary for woods work. It will be necessary, however, both to further the protection of the woods, and for the best results in woods operations, to have one or more portable shacks which can be used both for the storage of tools and for housing men when cutting is going on. As the general business connected with the forest grows, the need of equipment will also grow, but for the present, except for lack of these portable camps, the logging part of the enterprise is adequately supplied.

RICHARD T. FISHER, *Chairman.*

in the adjustment of the collateral courses in Architecture to its needs, and reciprocally the adjustment of its courses to the needs of the students of Architecture. The Department acquired a new strength by the transfer of Mr. B. M. Watson from the Bussey Institution, and by a satisfactory arrangement with the Division of Forestry for the instruction of its students at the beginning of the year at Petersham in silviculture and such subjects in Forestry as are of value in landscape gardening.

It is obvious that a travelling fellowship, comparable to the Nelson Robinson Jr. and Julia Amory Appleton Fellowships in Architecture, would be of the utmost value in such a subject as Landscape Architecture.

→ In the Division of Forestry there has been great improvement in respect to the physical equipment at Petersham, a gift of \$942.37 being of timely use in improving the buildings, grounds, and farm outfit. A second building has been made habitable for students, a shed added to the barn, and a considerable acreage of land put in shape to supply necessary hay and grain. Much remains to be done in the way of organizing the Harvard Forest, but the main enterprise, practical instruction in a forest actually under management, is now well under way. Its value as a laboratory, experiment station, and training ground exceeds expectation.

Greatly in contrast to the general prosperous condition of affairs at Petersham, the accommodations of the Division at Cambridge, where a large amount of library and class-room work must be done, are seriously deficient. For its quarters, the Division has only the upper floor of the small extension to the north of Lawrence Hall, inconvenient and inadequately heated. One lecture room, a narrow reading room, and an office occupy its small floor space and are separated by partitions so thin that voices in one room are disturbingly audible in the others. A small reference library has been collected in the reading room, but it is inadequate and difficult to care for. It is of the utmost importance that a department so well provided for in every other respect should have the physical conveniences, rooms, tools, and books, with which to perform its Cambridge work.

The year 1909-10 was the second year of the activity of the Bussey Institution with its new purpose and under its new form of organization. During the first year the work of the Institution was carried on by Professor W. M. Wheeler in Economic Entomology and Professor W. E. Castle in Plant Genetics. In

Gordius, which in Vermont has assumed economic importance as a destroyer of grasshoppers.

Professor Brues, in addition to his teaching and in helping me to look after the research students in entomology, has worked up several collections of parasitic Hymenoptera and has completed his investigations on insects as carriers of poliomyelitis. His report has been published by the New York Health Department.

My own work on the taxonomy, distribution and behavior of ants has been continued. Several papers on the ant-faunas of Alaska, the Galapagos and Cocos Islands, Jamaica and Australia have been published or are in press. Considerable work has also been done on the ants of the Philippines and on a large collection made by the American Museum Expedition to the Congo. During July and August I took part in the Cornell Biological Expedition to New Mexico, Arizona and California, and secured many thousand specimens of several insect orders for the collections of the Bussey Institution.

In conclusion I beg leave to include Professor Fisher's report on the work that has been carried on under his direction in the Harvard Forest at Petersham.

WILLIAM MORTON WHEELER, *Dean.*

REPORT ON THE HARVARD FOREST

IN a year when technical work has been greatly interrupted, the most notable event in the Department of Forestry has been the gift of \$50,000 from Mrs. William H. Bliss, announced at Commencement. The significance and timeliness of this gift lie in the fact that by the stipulation of the donor "one half of the income is to be applied towards the establishment and support of scholarships in the Division of Forestry." Particularly since graduate research and specialization have replaced all undergraduate and formal instruction, the Department of Forestry, in common with other departments in the School of Applied Biology, has felt the need of funds available for aiding students, some of the most promising of whom are unable without aid to devote an unproductive year to higher training. In addition to substantial help toward the general expenses of instruction or research, for which the balance of the income is to be used, the new gift thus provides a generous sum (between \$1100 and \$1200) that may be assigned by the

Faculty of Applied Biology annually to qualified applicants, either as several assignments or at its discretion, and, in the case of a man capable of exceptional work, as a single scholarship.

Since late in the winter of 1917, the Director of the Forest and Mr. L. R. Grose, Assistant in Forestry, have devoted the greater part of their time to supervising the local campaign for increased food production. They have served respectively as chairman and secretary of the Petersham Committee on Food Production and Conservation organized at the request of the Massachusetts Committee of Safety. The response of the townspeople was prompt and effective. A fund of nearly \$2,000 was raised in a few days. The Committee established an office and storehouse, registered the needs and capacities for help of as many people as possible, and furnished at cost (giving credit where needed) seed, fertilizer, the use of farm machinery, the services of men and teams, and over 3,000 preserve jars. For three months of the summer Milton Academy maintained a camp of its older boys, whose services were distributed daily among the farms and collected for by the Committee. Nothing in the whole season's work was more satisfactory than the success of the Milton Camp. In spite of initial doubts on the part of the farmers, the boys gained the unanimous respect of their employers, who have all expressed the hope that the camp will be repeated next year. Either through supplies or labor the Food Committee dealt with nearly two hundred people between April and October. It organized also the house to house canvass for the Food Administration at Washington, and with the aid of the Milton Camp conducted a census of farm products and resources, and compiled a farm map and geographical mailing list. The tangible results of the year's work were an increase in staple crops over the previous season's figures of from ten to one hundred percent, and the beginnings of a consciousness of the possible benefits of community coöperation.

On the Forest itself the whole working force has been mainly occupied in farming; and no new projects have been undertaken. The routine of management and records of existing operations has required all the spare time that was available. The physical condition of the property continues to improve and the recent advance in lumber prices is making possible a still more intensive treatment of the Forest. A special effort is being made to meet the need of wood as a substitute for coal by cutting a larger amount during the coming winter. To facilitate deliveries both of wood and lumber and to take advantage of the improved roads lately completed

through the town, a two-ton motor truck has been purchased. It will thus be possible by reaching a wider market to utilize products that were formerly only an obstacle to the scientific handling of the forest crop.

In the last report there was given an approximate statement of the amount of increased forest production brought about up to date. Part of this increase has resulted from the cutting operations for improvement and reproduction. The rest is due to the gradual replanting, with nursery stock raised on the Forest, of vacant lands and areas where natural reproduction has not been sufficient. The extent of progress in this direction, including also plantations for experiment and not primarily for maintenance of the forest crop, is shown in the following summaries:—

SUMMARY OF PLANTATIONS — FALL, 1917

Vacant land afforested:

| | |
|--------------------------|------------|
| White pine | 31.9 acres |
| Red pine | 3.0 |
| Norway spruce | 5.2 |
| Scotch pine | 2.0 |
| European larch | 2.3 |
| | <hr/> |
| Total | 44.4 |

Cut-over land reforested wholly or in part by planting:

| | |
|-------------------------|-------|
| White pine | 8.1 |
| Norway spruce | 2.8 |
| | <hr/> |
| Total | 10.9 |

Experimental plantations:

| | | |
|-----------------------|---|------------|
| Western yellow pine | } | 5.0 |
| Douglas fir | | |
| Japanese larch | | |
| Red oak | | |
| White ash | | |
| Hardy catalpa | | |
| Pinus densiflora | | |
| Pinus thunbergii | | |
| White pine | | |
| Red pine | | |
| Norway spruce | | |
| Grand total | | 60.3 acres |

INVENTORY OF NURSERY STOCK — FALL, 1917

| Species | Seedlings 1 and 2 years old | Transplants, 3, 4, and 5 years old |
|--------------------|--------------------------------|---------------------------------------|
| White pine..... | 28,000 | 20,200 |
| Red pine..... | 25,000 | 20,800 |
| Norway spruce..... | | 3,900 |
| Totals..... | 53,000 | 44,900 |

R. T. FISHER, *Director.*

THE HARVARD FOREST

TO THE PRESIDENT OF THE UNIVERSITY:

SIR, — It is a satisfaction to record that the needs of the Harvard Forest for endowment, as set forth in the last report, have been substantially met. Early last year the Charles Lathrop Pack Forestry Trust offered \$100,000, provided a like sum could be raised before July 1, 1930. With the generous aid of many friends of the Forest, this stipulation was met so that the income of \$200,000 is now available. This will be sufficient not only to pay the salaries of certain members of the Forest staff which have hitherto been precariously met by annual gifts, but also to provide modest allowances for janitor and commissary service at the headquarters building, for equipment and materials needed in research, and for meeting the cost of occasional reductions in the amount of the annual timber cut. In addition to the new endowment there was a welcome gift from the estate of the late George E. Henry — \$7,410.57 — contributed for the specific purpose of constructing in the headquarters building a fireproof vault for the safe keeping of the accumulating records — maps, photographs, etc. — which embody the history and development of all Forest operations both scientific and otherwise.

In a season of almost unprecedented fire hazard the various properties of the Forest have not been entirely unscathed. In April a fire on the Matthews Plantation at Hamilton, originating at the railroad right of way and immediately after the passage of a freight train, destroyed three acres of the most valuable and oldest portion of the plantations, mainly a series of experimental mixtures of coniferous trees which could not be matched anywhere in the United States. Threatening fires occurred also in the neighborhood of the Pisgah Forest in New Hampshire, but none reached the Harvard tract. In Petersham although a number of fires broke out, it was possible, with the aid of the portable pumping engine given to the Forest two years ago and by having crews and equipment always ready, to prevent all fires from spreading beyond a very small area.

The research projects now going on at the Forest and the ways in which they are organized are significant of the growing fruitfulness of coöperation by experts in related fields of science. Six students are registered at the Forest: three connected with the

U. S. Forest Service or its experiment stations, one with the U. S. Division of Forest Entomology, one with the Forestry Branch of the Province of Ontario, and one with the Cason J. Calloway Company of Georgia. Two of these men are making a study of the history of forest fire damage on a number of classes of forest property as a basis for the possible application of insurance against fires. In this work both the Harvard Business School and the National Fire Protection Association are contributing advice and supervision. The project is also contributory to the program of economic research now being undertaken by the U. S. Forest Service under the terms of the so-called McSweeney Bill. Another man is investigating the micro-fauna of forest soils and its effect upon the metabolisms which make for fertility. The entomological aspects of this work are being supervised by Professors Brues and Wheeler at the University Museum. A third project is in the field of forest pathology. It concerns the life history, effects, and ecological controls of a serious disease of coniferous timber and is being carried on under the direction of Professor Faull of the Arnold Arboretum. The field work is being done in part in the forests of Ontario and in part at Petersham. A fourth undertaking, in charge of Professor Gast, concerns a study of degraded forest soils on the Black Rock Forest at Cornwall, New York, belonging to Dr. E. G. Stillman. The last of the current investigations deal with the property of a wood-working industry in Winchendon, the purpose being to determine to what extent and by what modifications of management the forest area can supply the annual requirements of the factory for timber. The combinations of knowledge and point of view represented by the persons involved in these studies are at once stimulating to the student and productive of additional significance in the results. Of the students engaged in these researches two are candidates for the doctorate and four for the master's degree.

The following publications from the Forest have been issued during the year by the Harvard University Press: Bulletin No. 14, A Thermoelectric Radiometer for Silvical Research, with preliminary results on the relation of insolation to the growth of white pine, by P. R. Gast; and Bulletin 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.

R. T. FISHER, *Director.*

North America has been accepted for publication by the American Academy of Arts and Sciences.

At Commencement, 1916, the degree of Doctor of Science in Botany was conferred on Mr. Owen Francis Burger and Mr. Jay Boardman Park, the degree of Master of Science in Zoölogy on Mr. James Percy Baumberger and Mr. Iu Tso Wang, the degree of Master of Science in Botany on Mr. Nathaniel Ogden Booth, and the degree of Master of Forestry on Mr. Laurence Rich Grose. Mr. Burger's thesis is entitled "The Variations of *Colletotrichum Lindemuthianum* in Relation to Those of the Host"; Mr. Park's, "Studies in Self-sterility."

During the course of the year the Bussey library has been rearranged and increased by the addition of a number of books and pamphlets, and considerable additions have been made to the study collection of insects and to the collection of lantern slides and microscopical preparations used in demonstration.

The Visiting Committee of the Bussey Institution succeeded in raising \$1,260 during the past spring. Of this amount, \$250 is to be used in procuring additional furniture and equipment for the dormitory, the remainder for the improvement of the Bussey grounds, especially for the preparation of garden plots for experimental purposes. These plots were prepared during the past summer under Dr. East's supervision and will be planted as soon as weather conditions permit. When the garden is completed it will not only furnish much needed facilities for the work in plant breeding, forestry, and economic botany but will greatly improve the appearance of the grounds between the laboratory buildings.

In conclusion, I beg leave to include Professor Fisher's report on the condition of the Harvard Forest at Petersham: —

"A report upon the Harvard Forest for 1915-16 may properly restate the ends to which the property is devoted. These are: (1) a practical demonstration of forestry in operation, including both the silvicultural process of reproducing and tending the crop and the business process of marketing the product; (2) an experiment station for the investigation of problems in forest management; (3) a laboratory for the use of advanced students who wish to get specialized training through research or the study of records and results in an organized forest; (4) advice and assistance to the local community in the handling of trees and forests.

"During the year ending July 1, considerable progress has been made in the development of these purposes. The condition of the Forest as a business unit is satisfactory. The loan advanced by

the Corporation for operating expenses has been paid off, with a surplus which would have been larger but for the continued interference of the bad weather of late spring with lumber deliveries. The Forest is therefore now running on its own funds; and although an annual gift of \$700 for the maintenance of roads is made to the town, there will usually be a small amount available for experimental work. Conditions with respect to the volume and increment of the growing stock have also been improved. A careful reassessment of the timber with reference to these two features is due to be made within a couple of years. Meanwhile a rough estimate based on the amount of land afforested, reproduced to satisfactory young growth by cutting, and added to producing areas through thinnings results in the conclusion that the operations to date have maintained the total volume of timber on the Forest and have increased the total current wood-production or increment by nearly 50,000 board feet per annum. The areas under treatment in various stages of forest work, reproduction cuttings, thinnings, plantations, and so forth, have become so numerous and in many cases have reached so instructive a condition that a systematic summary or catalogue is being prepared to show in brief form and for ready reference in study or inspection the location, purpose, and progress of the different classes of work. The photographic record, including wherever possible a series of successive views of the same area, has been much enlarged, and there will soon be a sufficient series of pictures in respect to certain silvicultural processes to make a very graphic publication and one which should be of particular usefulness to the layman and ordinary forest owner.

“In the experimental and investigative field, several publications have been made, others are in preparation, and more are projected. A paper bearing on the management of softwood timberlands in New England, and containing facts entirely new to forestry was completed during the past winter by E. E. Carter and published in the *Proceedings of the Society of American Foresters* for July, 1916, Volume XI, Number 3, under the title, ‘Hylobius Pales as a Factor in the Reproduction of Conifers in New England.’ In the same periodical, Volume XI, Number 4, is a paper on ‘Utilization and Round Edge Lumber’ by R. T. Fisher. This is intended as the first of a series dealing with the technique of silviculture and forest management through the study of concrete cases. Material for publications on the following subjects is nearly complete: a collection of tables for the measurement of

logs and standing trees; the future value of volunteer stands of mixed young growth as influenced by early cleanings; the history of forest types in central New England, with an account of some existing remnants of primeval forest. The appointment of an assistant in forestry, Mr. L. B. Grose, M.F., has greatly facilitated the conduct of these special studies, which would otherwise be hampered by the increasing routine involved in the management and records of the Forest.

“The student work of the year, when considered in relation to the present overdevelopment of elementary training throughout the country, has been gratifying. Of the students registered under the Faculty of Applied Biology for research in forestry, and not including those who elected the general course given for the Business School, three carried on work at the Forest. All of these showed a high order of ability and secured or were offered positions of greater emolument and importance than falls to the lot of the ordinary graduate in forestry. By-products of the specialized work done by these students will be published contributions to the knowledge of trees and forestry. Such results are a matter of course in the advanced training of other scientific fields; but in forestry they mark a new type of technical preparation, and one which is no less favorable to the advancement of a still undeveloped science than to the professional future of the student. In addition to these research men, students registered for the lumbering course in the Business School make an annual visit to the Forest for a demonstration in the manufacture and utilization of ‘round edge’ lumber. For men who wish special training in this branch of the business, there is abundant opportunity for advanced study both on the Forest and in the varied wood-working industries of the adjacent towns.

“The relations of the Forest to the town of Petersham, as well as to professional workers in more distant regions, have been considerably multiplied. The Forest has recently offered gratis to any citizen of the town advice and assistance in any question connected with the handling of trees or woodland. In response to this offer, a number of pieces of woodland have been valued for their owners, and advice has been given on the care of trees, the establishment of plantations, and protection against disease. In one case, a considerable body of timber was cut and marketed for the owner in combination with the regular operation on the Forest. The Director is serving as tree warden of the town, as deputy fire warden, and as an officer of the Village Improvement Society.

Although these services are offered and given without charge, there are persons who none the less desire to make payment for the professional advice. In such cases, the money is to be received with the understanding that it will be devoted to the conduct of investigative or experimental work on the Forest. Also, for professional reasons, a number of persons from other institutions have visited the Forest, both foresters who wished to study our operations, and men who wished merely to collect field material. The interest of the property to such men will become greater every year.

"In conclusion, it may be pertinent to report on the situation with regard to the insects and diseases which now threaten New England forests.

"The chestnut blight continues to spread, somewhat less rapidly, it appears, than in the region of New York where it got its start, but still steadily enough to make the final elimination of the species as a commercial timber almost certain. Chestnut in the Forest is being cut annually in moderate amounts so as to remove the most infected or mature of the timber without unduly threatening the price. So far, the loss from the disease promises to be in future growth rather than in existing merchantable timber.

"The white pine blister rust, now widespread in Massachusetts, has not so far been discovered on the Harvard Forest or near it. A thorough examination is being conducted with a view both to the location of any possible infection and to the destruction of all plants of the genus *Ribes*, which is the alternate host of the disease. The fact that this genus is comparatively scarce in the Petersham region makes it likely that the blister rust can be checked or perhaps warded off entirely through the eradication of currant and gooseberry.

"In the past two years the gypsy moth has become established in several colonies in the town, though not as yet within the boundaries of the Forest. So far, owing to the very efficient work of the scouting crews of the Federal Bureau of Entomology, these colonies have been either destroyed or held in check. Whether a general infestation in so unsettled and largely forested region could be conquered is doubtful; but the presence of so large a percentage of pine and of species such as ash and red maple, all of which the gypsy moth feeds upon with difficulty, are circumstances which greatly conduce to the safety of the Forest."

WILLIAM MORTON WHEELER, *Dean.*

REPORT ON THE HARVARD FOREST

OCTOBER 1916

Original Received June 4, 1917
copy

A report upon the Harvard Forest for 1915-16 may properly restate the ends to which the property is devoted. These are: (1) a practical demonstration of forestry in operation, including both the silvicultural process of reproducing and tending the crop and the business process of marketing the product; (2) an experiment station for the investigation of problems in forest management; (3) a laboratory for the use of advanced students who wish to get specialized training through research or the study of records and results in an organized forest; (4) advice and assistance to the local community in the handling of trees and forests.

During the year ending July 1, considerable progress has been made in the development of these purposes. The condition of the Forest as a business unit is satisfactory. The loan advanced by the Corporation for operating expenses has been paid off, with a surplus which would have been larger but for the continued interference of the bad weather of late spring with lumber deliveries. The Forest is therefore now running on its own funds; and although an annual gift of \$700. for the maintenance of roads is made to the town, there will usually be a small amount available for experimental work. Conditions with respect to the volume and increment of the growing stock have also been improved. A careful reassessment of the timber with reference to these two features is due to be made within a couple of years. Meanwhile a rough estimate based on the amount of land afforested, reproduced to satisfactory young growth by cutting, and added to producing areas through thinnings results in the conclusion that the operations to date have maintained the total volume of timber on the Forest and

have increased the total current wood-production or increment by nearly 50,000 board feet per annum. The areas under treatment in various stages of forest work, reproduction cuttings, thinnings, plantations, and so forth, have become so numerous and in many cases have reached so instructive a condition that a systematic summary or catalogue is being prepared to show in brief form and for ready reference in study or inspection the location, purpose, and progress of the different classes of work. The photographic record, including wherever possible a series of successive views of the same area, has been much enlarged, and there will soon be a sufficient series of pictures in respect to certain silvicultural processes to make a very graphic publication and one which should be of particular usefulness to the layman and ordinary forest owner.

In the experimental and investigative field, several publications have been made, others are in preparation, and more are projected. A paper bearing on the management of softwood timberlands in New England and containing facts entirely new to forestry was completed during the past winter by F.F.Carter and published in the "Proceedings of the Society of American Foresters" for July, 1916, volume XI, number 3, under the title "Hylobius Pales as a factor in the reproduction of conifers in New England." In the same periodical, volume XI, number 4, is a paper on "Utilization and round edge lumber" by R.T.Fisher. This is intended as the first of a series dealing with the technique of silviculture and forest management through the study of concrete cases. Material for publication on the following subjects is nearly complete: a collection of tables for the measurement of logs and standing trees;

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The student ^{work} of the year, when considered in relation to the present overdevelopment of elementary training throughout the country and the dearth of employment for men so trained, has been gratifying. Of the students registered under the Faculty of Applied Biology for research in forestry, and not including those who elected the general course given for the Business School, three carried on work at the Forest. All of these showed a high order of ability and secured or were offered positions of greater emolument and importance than falls to the lot of the ordinary graduate in forestry. By-products of the specialized work done by these students will be published contributions to the knowledge of trees and forestry. Such results are a matter of course in the advanced training of other scientific fields; but in forestry they mark a new type of technical preparation, and one which is no less favorable to the advancement of a still undeveloped science than to the professional future of the student. In addition to these research men, students registered for the lumbering course in the Business School make an annual visit to the Forest for a demonstration in the manufacture and utilization of "round edge" lumber. For men who wish special training in this branch of the business,

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R. T. Fisher,
Director.

At Commencement, 1915, the degree of Master of Science in Botany was bestowed on Messrs. Owen Francis Burger and John Douglas More, the degree of Master of Science in Forestry on Mr. Senekerim Madiros Dohanian, and the degree of Doctor of Science in Zoölogy on Messrs. William M. Mann, Francis X. Williams, and Sewall Green Wright. Mr. Mann's thesis is entitled "The Ants of Brazil, including a Catalogue of the Known Species and Descriptions of those taken on the Stanford Expedition"; Mr. Williams', "Studies in Fire-Flies, with Special Reference to the Development of the Photogenic Organs," and Mr. Wright's, "Studies on Inheritance in Guinea-pigs."

The dormitory and mess established for the students of the Bussey Institution through the aid of the Visiting Committee has proved to be a great convenience both to students and members of the Faculty, not only in furnishing many of the comforts of a home but also in bringing the students and Faculty into more intimate contact with each other.

In conclusion I beg leave to include Professor Fisher's report on the condition of the Harvard Forest at Petersham:—

"The inclusion of all work in forestry under the newly created Faculty of Applied Biology of the Bussey Institution, and the consequent change of aim from elementary instruction to research and specialization, has brought about a greatly enlarged usefulness for the Harvard Forest.

"At the time of the acquisition of the Forest in 1908, it was stipulated by the Corporation that the maintenance of the property should not be a burden upon the general funds of the University. Owing to the unusually favorable situation and condition of the Forest, both as to supply of timber and accessibility to market, this stipulation could be fulfilled. Furthermore, it was desirable both as a means of instruction and for the benefit of other forest-owners, to conduct a demonstration of forestry on a practical and commercial scale. Therefore, up to the recent change of plan, the main policy of management was first to derive what income from wood and timber the forest could continuously produce, and, second, to use both the land and the practical operations for elementary instruction in silviculture, forest measurements, surveying, and so forth. At the outset, the amount of annual growth, disregarding cordwood, was estimated to be 250,000 feet. Up to the year 1914-15 there have been cut approximately 1,200,000 feet of lumber, and 1000 cords of wood, yielding a net annual return over the cost of marketing of \$1500 to \$2000, most of which has had to

be spent upon the maintenance of the School plant. Since from seven months to a year are required to market one cut of lumber, it was necessary to have operating capital for the first year. This the University advanced to the amount of \$3000, at $4\frac{1}{2}$ per cent. In another year, this loan should be entirely paid off, and the Forest will then be running on its own funds.

"The operations so far conducted on the Forest have considerably increased the area of woodland and the rate of production, notwithstanding the fact that the chestnut disease has almost eliminated the growth at present accruing from this species. About thirty acres of waste and vacant land have been restocked by plantations. Of about thirty acres from which mature timber has been cut, more than half is satisfactorily restocked by natural reproduction, and the remainder will be reproduced in part by natural seeding and in part by planting. Incidental to the main cutting of mature timber and the reforestation of vacant land, thinnings and improvement cuttings have been carried out in young and mixed growth as fast as market and resources would permit, and have resulted in converting a substantial area, between forty and fifty acres, into producing condition. The net result of these three kinds of operation has been to increase both the amount and the quality of the total yield from the Forest.

"From the standpoint of scientific result as well as practical instructiveness to the forest owner, the operations above outlined have a value that increases each year. In every case, forest conditions at the outset, method and purpose of the treatment, costs, yield and returns, together with results as observed by subsequent observation, are all available in systematic records. Already a number of useful conclusions concerning the relation of planting methods and planting stock to conditions of soil, exposure, and vegetation, the reproduction of pine and hardwoods by various cutting methods, and the possibilities of increasing growth and future value by early thinnings have been reached. Supplemented by a file of photographs and by the machinery of a good cost-accounting system, such records form the material upon which a large number of special researches can be based. Under the former plan, with the large amount of elementary and routine teaching and of administrative work which was necessary, the conduct of these special investigations and even the upkeep of the routine records were greatly hampered. Yet even before the change of plan, it was increasingly apparent that not to develop

the Forest as an experiment station was to miss its greatest possibility. From now on, in addition to the strictly commercial operations, special investigations into problems bearing on the handling and protection of woodlands will be added to the ordinary activities of record and management."

WILLIAM MORTON WHEELER, *Dean.*

The Harvard Forest.

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The operations so far conducted on the Forest have considerably increased the area of woodland and the rate of production, notwithstanding the fact that the chestnut disease has almost eliminated the growth at present accruing from this species. About 80 acres of waste and vacant land have ^{been} restocked by plantations. Of about 80 acres from which mature timber has been cut, more than half is satisfactorily restocked by natural reproduction, and the remainder will be reproduced in part by natural seeding and in part by planting.

Incidental to the main cutting of mature timber and the reforesting of vacant

land, thinnings and improvement cuttings have been carried out in young and mixed growth as fast as market and resources would permit, and have resulted in converting a substantial area, between 40 and 50 acres, into producing condition. The net result of these three kinds of operation has been to increase both the amount and the quality of the total yield from the Forest.

From the standpoint of scientific result as well as practical use to the forest owner, the operations above outlined have a value that increases each year. In every case, ~~exact~~ forest conditions ~~before~~ at the outset, method and purpose of the treatment, costs, yield and returns, together with results as observed by subsequent observation are all available in systematic records. Already a number of useful conclusions ^{concerning} relating to such matters as the relation of planting methods and planting stock to conditions of soil, exposure, and vegetation, the reproduction of pine and hardwoods by various cutting methods, and the possibilities of increasing growth and future value by early thinnings have been reached.

Supplemented by a file of photographs and by the machinery for a good cost-accounting system, such records form the material ^{upon} from which a large number of special researches can be based. Under the former plan, with the large amount of elementary and routine teaching, and the ~~great amount~~ of administrative work which were necessary, the conduct of these special investigations and even the upkeep of the routine records were greatly hampered. Yet even before the change of plan, it was increasingly apparent that not to develop the Forest as an experiment station was to miss its greatest possibility.

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2077] End here
A number of these are already under way, ~~several~~ dealing with methods of reforestation, ^{the adaptability of Exotic species,} the board foot yield of logs as related to lumber thickness, and the results in yield and money of weeding young mixed growth. The following is a list of studies

completed or in progress by members of the staff:

Published:

- A Volume Table for Red Maple, Bulletin of the Harvard Forestry Club,
E. E. Carter.
- The Use of Yield Tables in Predicting Growth, Proceedings of the Society
of American Foresters, E. E. Carter.
- Results of Planting Experiments on the Harvard Forest, (two papers)
Forestry Quarterly, E. E. Carter.
- Graded Volume Tables for Beech, Birch, and Maple, *Forestry Quarterly*, I. W. Bailey.
- The Effects of Climate on Vegetation in Different Parts of the World,
Annals of Botany, I. W. Bailey.
- Studies of Fiber Length of Certain Conifers, Forestry Quarterly, I. W.
Bailey and H. B. Shepherd.
- Relation of Wood-structure to Penetration of Preservatives, Paper for
American Railway Engineering and Maintenance of Way Association,
I. W. Bailey.
- Differential Stains for Wood-destroying Fungi, Paper for Annual Meeting
of Phytopathologists, I. W. Bailey.
- A Check-list of Trees and Other Woody Plants Found on the Harvard Forest,
Bulletin of the Harvard Forestry Club, J. G. Jack.
- An Account of Operations on the Harvard Forest, Bulletin of the Harvard
Forestry Club, R. T. Fisher.

In preparation:

- Relation of Insects of the Genus Hylobius to the Reforestation of Cut-
over Softwood Lands, E. E. Carter in collaboration with C. W. Brues.
- The Financial Possibilities and Silvicultural Methods of Weeding Mixed
Young Growth, R. T. Fisher.
- Comparative Board-foot Yield in Sawing as Related to Thickness of Lumber,
E. E. Carter.