

SUMMARY OF RESEARCH AND OTHER ACTIVITIES AT THE HARVARD FOREST

Harvard University
Petersham, Massachusetts

1907-1936

October 1936

FOREST MANAGEMENT

As a demonstration of practical, sustained yield forest management, the Harvard Forest has been in existence for almost thirty years. Each year during that period there has been a cut of sawtimber and cordwood from about 250,000 to 400,000 board feet. Nevertheless there is more timber now than there was when the Forest was acquired and there is a better distribution of age-classes.

Starting with an estimated ten million board feet of timber, mainly pine and largely mature, the Forest has been built up to an estimated volume of twelve million board feet with an increasing percentage of hardwoods in its composition. From an initial annual growth rate estimated to be 250,000 board feet, there has been an increase to 400,000. During the same period the Forest has acquired a much better representation of young and middle-aged stands, so its production can be more uniformly maintained. A set of card records has been developed which summarizes the amount, quality, and condition of the timber in each of about 700 distinct stands on the Forest. A detailed record system has also been worked out for all silvicultural operations and cuttings, so that there exists a complete silvicultural history of the Forest, supplemented by several thousand photographs.

In the field of general forest management, the work has been mainly in studying successful forests on private lands and making the results available. In several cases, estimates have been made of the growing stock on private properties and recommendations laid down for management.

MANAGEMENT OF HARVARD FOREST

Fisher, R. T.
1911

An account of operations in the Harvard Forest, '08-'09. Harvard For. Club Bull. 1: 1-10.

Fisher, R. T.
1921

Management of the Harvard Forest.
Harvard For. Bull. 1.

FOREST MANAGEMENT

- Cary, Austin
1907
Practical forestry on a spruce tract in
Maine. U. S. F. S. Cir. 131.
- Cary, Austin
1908
Influence of lumbering upon forestry.
Proc. S. A. F. 3:67-81.
- Cline, A. C.
1930
The William H. Walker Forest.
Am. For. & For. Life, December.
- Cline, A. C.
1931
The William H. Walker Forest and wood-using
industry. Jour. For. 29:611-612. April.

SILVICULTURE

When the Forest was established in 1907, there were no examples of silvicultural practice in the region, except for a few coniferous plantations. In fact, to the lay mind forestry consisted almost wholly in planting pine seedlings on idle farm land. By contrast, at the present time, such treatments as weeding, thinning, pruning, and reproduction ~~cutting~~ have been applied to tens of thousands of acres of "natural" second growth forest, to say nothing of the continued practice of planting. To this truly remarkable development and application of the art of growing tree crops, the Forest has been fortunately able to contribute substantially. Under the guidance of the late Director, Richard T. Fisher, a soundly conceived philosophy of silviculture, based on a harmonization of man's efforts with natural tendencies, together with the accumulation of a large body of factual information resulting from both research and practice on the Forest, has now become thoroughly ingrained in New England forestry, and a part of the professional equipment of hundreds of practising foresters.

Nor has the influence of the Forest in the art of silviculture been limited to the New England region. The general conceptions of the superiority of mixed over pure stands of trees in their influence upon soil fertility and upon crop security and yield, the frequent admonitions concerning the indiscriminate planting of conifers and the failure to appreciate the timber crop potentialities of volunteer second growth, and the strong stand in favor of a policy of high quality wood crop production have substantially influenced silvicultural policies and practices throughout the country.

Perhaps the greatest single contribution to regional silviculture has been the development of a complete system for converting "old field" white pine, a temporary forest type inherently poor in quality and conducive to soil impoverishment, into a vastly more stable mixture of valuable native hardwoods or of hardwoods with pine, having singularly beneficial effects on soil fertility, affording a high degree of crop security, and promising attractive financial returns from a final crop of excellent quality. In the course of developing this system, the Forest became the leading exponent of the art of utilizing the existing volunteer growth on cutover lands for a future timber crop, more specifically, of the art of forest weeding, which has for its purpose the elimination of the bad elements in the stand and the preservation of the good. The former have enormously increased in numbers in recent years through the combined effects of farm abandonment, clear-cutting, and fires. The control of forest weeds in existing volunteer stands, rather than the planting of new stands on open land, has now come to be recognized as the most needed and profitable cultural treatment for New England forests and the principal weapon to prevent their further deterioration.

of the superiority of mixed over pure stands of trees in their influence upon soil fertility and upon crop security and yield,

SILVICULTURE

- Carter, E. E.
1915 Notes on the relation of planting methods to survival. Proc. S.A.F. 10:9-17.
- Fisher, R. T.
1918 Silviculture for country roadsides. Mass. For. Ass. Bull. 123.
- Fisher, R. T.
1918 The yield of volunteer second growth as affected by improvement cutting and early weeding. Jour. For. 16:493-506. May.
- Fisher, R. T.
Terry, E. I.
1920 The management of second growth white pine in central New England. Jour. For. 18:358-366. April.
- Spaeth, J. N.
1922 Notes on the release of white pine in Harvard Forest, Petersham, Mass. Jour. For. 20:117-121. February.
- Cline, A. C.
1924 The group selection method with white pine. Jour. For. 22:128-134. February.
- Fisher, R. T.
1925 Note on Harvard Forest silviculture. Jour. For. 23:909-912. November.
- Powell, Grant
1925 Cases in the release of white pine from gray birch on old fields.
- Fisher, R. T.
1928 Pine plantations and New England forestry. Jour. For. 26:790-793. October.
- Cline, A. C.
Fletcher, E. D.
1928 Pruning for profit as applied to eastern white pine. Joint pub. of Harvard For. and Mass. For. Ass.
- Cline, A. C.
1929 Forest weeding. Joint pub. of Harvard For. and Mass. For. Ass.
- Cline, A. C.
1930 Conquering the forest weeds. The Empire Forester.
- Cline, A. C.
MacAloney, H. J.
1931 A method of reclaiming severely weeviled white pine plantations. Mass. For. Ass. Bull. 152.
- Cline, A. C.
MacAloney, H. J.
1933 The improvement of weeviled white pine plantations. Conn. For. & Park Ass. Pub. 24.

Silviculture (Cont.)

- Steed, A. V.
1933
Reproduction resulting from the group selection method in white pine.
- Curtis, J. D.
1934
A study of artificial forest pruning in white pine plantations.
- Cline, A. C.
MacAloney, H. J.
1935
Progress report of the reclamation of severely weeviled white pine plantations. Jour. For. 33.932-935. November.
- Duffield, J. W.
Kraemer, J. H.
1935
The uniform shelterwood method in pine and hemlock.
- Cline, A. C.
1936
Improvement cutting and thinning as applied to central New England hardwoods. Mass. For. & Park Ass. Bull. 155.

SILVICS

Silvics deals with the underlying principles which control the life of forest trees, thus furnishing the scientific bases on which the art of silviculture rests. In many instances, publications by the Harvard Forest unavoidably have contained a mixture of both the science and the art; for in the early developmental stages of silviculture an author can explain the outcome of silvicultural treatment and recommend a given practice only by frequent reference to the observed habits and behavior of trees in response to their environment.

By living continuously in close touch with the Forest itself, staff and students have been able to accumulate a body of silvical knowledge of local tree species and of the whole complex of climatic and biological factors operative in central New England forests which exceeds that available for any other forest region in the United States. And it is only by means of such painstaking observations over a period of many years that the Forest has contributed in such a significant way to the foundations of American silviculture.

The following list of titles is by no means inclusive of the work done in the field of silvics. Many other Forest publications, listed under related subjects, contain paragraphs or pages dealing essentially with the growth habits and behavior of the great variety of both coniferous and deciduous tree species which constitute the forest communities of the region.

SILVICS.

- Jack, John G.
1911
Trees and other woody plants found in the Harvard Forest, 1908-09. Harvard For. Club Bull. 1:10-26.
- Kimball, G. W.
Carter, E. E.
1913
Influence of shade and other factors on plantations. For. Quar. 11:176-184.
- Cline, A. C.
1924
Pure white pine versus pine in mixtures. Am. For. & For. Life 30:557-558.
- Tarbox, E. E.
1924
Quality and growth of white pine, as influenced by density, site, and associated species. Harvard For. Bull. 7.
- Cline, A. C.
Lockard, C. R.
1925
Mixed white pine and hardwood. Harvard For. Bull. 8.
- Altpeter, L. S.
1926
Growth and reproduction in slash on old field pine cuttings.
- Reed, Paul M.
1926
Red pine in central New England. Harvard For. Bull. 9.
- Hall, R. C.
1927
Pitch pine on Cape Cod.
- Hunt, Stuart S.
1931
European larch in the northeastern United States. A study of existing plantations. Harvard For. Bull. 16.
- MacKinnon, F. S.
Hyde, Gerald R.
Cline, A. C.
1935
The cutover old field pine lands of central New England: a study of the composition and stocking of the ensuing stands. Harvard For. Bull. 18.
- Hosley, N. W.
1936
Norway spruce in the northeastern United States: a study of existing plantations. Harvard For. Bull. 19.

FOREST ECOLOGY

Successful practice and teaching of silviculture at the Harvard Forest has been materially aided by a study of the line of descent of the local types of forest. Thus, the old field pine forests present problems quite different from those connected with forests originating on land which has never been cleared. These problems are most effectively comprehended when oriented in the scheme of dynamic changes shown by successive generations of forests.

The Pisgah Tract of original forest in New Hampshire, one of the few remnants of the primeval forest of the region, has furnished vital clues to the manner in which forests maintain themselves naturally. Their life histories can be read in the composition of the stands according to species, in the changing rates of growth of the individual trees, and in the character of the soil. Quite different types of forest may succeed each other as each reaches maturity. Each succeeding stand tends towards a higher proportion of shade-enduring species, such as hemlock and beech. But in the case of a catastrophe involving destruction of the stand and especially of the soil, the succession reverts to an earlier stage. From the forester's point of view there is sometimes an economic advantage in doing this, or in arresting the natural succession at a given point. Study of natural forest successions reveals the places where the forester is attempting "to go against nature", and the conditions under which he may intervene and return an area to a forest type characteristic of an early place in the series.

FOREST ECOLOGY

- Fisher, R. T.
1925
Descent of the white pine woodlot. Introduction to Harvard For. Bull. 8.
- Smith, Hollis A.
1928
Study of old growth sample plots on the Pisgah Tract, Winchester, New Hampshire.
- Branch, W. C.
Daley, R. K.
Lotti, Thomas
1930
Life history of the climax forest on the Pisgah Tract, Winchester, New Hampshire.
- Fisher, R. T.
1933
New England forests: biological factors. Am. Geo. Soc. Sp. Pub. 16.

SOILS, NUTRITION, AND LIGHT

To the knowledge of the changes in soils under the quite different influences of coniferous and broadleaf forests, the Forest has made a special contribution. It has been shown that the activity of earthworms and soil-inhabiting insects is favored by the hardwood leaves, which provide preferred food. The maceration of the debris is the first step in returning it to the soil. By mixing the organic and mineral material together, the earthworms produce the excellent tilth found in forest soils where they are abundant. The needles of conifers are fed upon to a smaller extent by the larger earth-working insects, and scarcely ever by earthworms. The soils under conifers, therefore, exhibit a quite different condition from that under hardwoods. In the absence of maceration and the admixture with mineral material, the decomposition of the needle debris depends upon fungal and bacterial action. The organic material is stratified on the top of the mineral soil, preventing its full use in maintaining the potential fertility of the soil because the chemical action is localized, as shown by a sterile zone formed in the top of the mineral soil. Evidences of this decreased soil fertility have been demonstrable very early in the life of pure coniferous stands in the Harvard Forest.

For the study of forest soil fertility and the related factors of the environment, a continued project has been maintained at the Forest for fourteen years. The work started with the study of the effect of variation in light intensity on the growth of tree seedlings. At the time when the study was begun, the methods for the measurement of light were unsatisfactory. Work at the Forest contributed to the final form of the "pyrheliometer" which is now the standard instrument of the U.S. Weather Bureau for measuring solar radiation.

The interaction of radiation intensity and the supply of certain of the nutrients (nitrogen, potassium, phosphorus) have been studied in pot cultures under screens admitting various light intensities. Under these simplified conditions, regular relations have been discovered. They can be expressed in formulae estimating within 2% the weights achieved by the seedlings under the various conditions. By the various fertilization of seedlings in nursery beds, both theoretical knowledge and practical information result. Further tests of the conclusions from the pot experiments are being made on a large scale at Enfield in a state nursery.

In nature, the conditions of tree nutrition are complicated by the kind of organic matter and the manner in which the nutrients are bound in the soil. Heath plants and trees exhibit a peculiar development of the fine roots caused by the invasion of the thread-like tissues of mushrooms. The "mycorrhizae" thus formed are a characteristic feature of the tree roots. There is an unsettled controversy as to the part they play in the nutrition of trees. Evidence from a series of experiments started at the Forest indicates that they are favorable under certain conditions, and probably exceedingly important in the initiation of natural forest reproduction.

SOILS NUTRITION AND LIGHT

- Gottlieb, A. W.
1927 The occurrence of nitrogen in soil profiles under pines.
- Fisher, R. T.
1928 Soil changes and silviculture on the Harvard Forest. Ecology 9:6-11. January.
- Gast, P. R.
1929 A correlation between solar radiation intensities and relative humidities. Monthly Weather Review 57:464-465.
- Griffith, B. G.
Hartwell, E. W.
Shaw, T. E.
1930 The evolution of soils as affected by the old field white pine - mixed hardwood succession in central New England. Introduction by R. T. Fisher. Conclusion by P. R. Gast. Harvard For. Bull. 15.
- Gast, P. R.
1930 A thermoelectric radiometer for silvical research. Harvard For. Bull. 14.
- Scholz, H. F.
1931 The physical properties of the cove soils on the Black Rock Forest. Comment by P. R. Gast. Black Rock For. Bull. 2.
- Mitchell, H. L.
1931 Growth of Scots pine in sand cultures with varied radiation intensity and nitrogen supply.
- Cummings, W. H.
1934 Preliminary study of phosphorus, nitrogen, potassium, and moisture content of foliage of northern white pine in weeviled plantations.
- Johnston, J. W., Jr.
1935 I. Statistical analysis of the distribution of soil fauna in the soil profile and their effect on the decomposition of organic matter.
II. The influence of temperature upon respiration of the larva of *Chrysopilus quadratus*.
- Gast, P. R.
1936 Pyrhelimeters - when invented, types and characteristics, and uses to which their records have been put. Proc. New Eng. Soc. Am. Soc. Plant Phys. May. 8-9:13-25.
- Gast, P. R.
1936 Studies on the development of conifers in raw humus. III. The growth of Scots pine. Seedlings in pot cultures of different soils under varied radiation intensities. Medd. Statens Skogsförsöks. 29.

FOREST PROTECTION

Protection against such destructive agencies as fires, insects, and diseases constitutes an essential part of the administration of every organized forest, and requires a thoroughgoing knowledge of the factors involved, particularly so since protection costs must be kept within low bounds. The costly measures of direct control, such as may be employed in public parks or small private estates, are not available to managers of large tracts of commercial timber. The Forest has long appreciated the manifold advantages of indirect or silvicultural control through altering the character of the forest itself, and has taken a leading part in studying the habits of important insects and fungi in relation to environmental conditions. In several instances the highly destructive nature of forest pests was traced to the temporary and unstable composition of the existing volunteer stands on abandoned farms or cutover land, or to an unwise choice of species in the establishment of new stands by planting. Thus the seeding of old fields and pastures to pure white pine and the planting of additional thousands of acres to the same species brought about a concentration of food supply which resulted in enormously increased damage by the white pine weevil. A long series of studies led to the development of practicable measures of silvicultural control and important changes in former planting policies. Similarly, the early discovery of a member of the Forest staff of the destructive feeding by an insect (the Pales weevil) on coniferous seedlings planted on areas recently logged for pine gave rise to a new planting practice which prevented further losses.

FOREST PROTECTION

- Kittredge, J., Jr.
1913
Notes on the chestnut bark disease in Petersham, Mass. Harvard For. Club Bull. 2:13-22.
- Carter, E. E.
1916
Hylobius pales as a factor in the reproduction of conifers in New England. Proc. S.A.F. 11:297-307.
- Feirson, H. B.
1921
The life history and control of the Pales weevil. Harvard For. Bull. 3.
- Feirson, H. B.
1922
Control of the white pine weevil by forest management. Harvard For. Bull. 5.
- Hosley, N. W.
1928
A preliminary study of borer damage in stacked white pine lumber. Jour. For. 26:888-891. July.
- Gast, P. R.
Stickel, P. W.
1929
Solar radiation and relative humidity in relation to duff moisture and forest fire hazard. Monthly Weather Review 57:466-468.
- MacAloney, H. J.
Hosley, N. W.
1934
Experiments in simplified control of mound-building ants in the forest. Jour. For. 32:1003-1006. September.
- Spaulding, Perley
MacAloney, H. J.
Cline, A. C.
1935
Stereum sanguinolentum: a dangerous fungus in pruning wounds in northern white pine. U.S.D.A. Northeastern For. Ex. Sta. Tech. Note 19.
- Behre, C. E.
Cline, A. C.
Baker, W. L.
1936
Silvicultural control of the gypsy moth. Mass. For. & Park Ass. Bull. 157.
- Baker, W. L.
Cline, A. C.
1936
A study of the gypsy moth in the town of Petersham, Mass., in 1936. Jour. For. 34:759-765. August.

MENSURATION - STUDIES IN GROWTH AND YIELD

The approach to the science of forest measurement in the Harvard Forest has been dynamic as contrasted with the common one of the analysis of measurements as such. Our studies have been largely correlated with silvicultural practice, aiming to interpret by means of mensuration methods the growth relations of trees throughout their lives. One of the main contributions has been in the little known field of the growing space needed by red oak and white ash at various ages for the best growth and the highest quality of timber. Another line of investigation has been with white pine, duplicating the growing space work and developing a method for determining the rate of taper of the stem from measurement taken from the ground of crown width and length of the bole on which branches were dead. Rate of taper is a very important factor in accurately determining the volume of standing trees, and accurate volume measurement is in turn essential to forest management. Tables of volumes were made up on this new basis.

It has been known for some time that hemlock would recover from suppression after being released, but it remained for Marshall to show that the growth rate of individuals long suppressed was fast enough to reach sizes at later ages that were greater than those of trees free to grow for the same length of time.

In 1930-31, the growth and development of each of the one hundred odd plantations on the Forest were measured. This information based on many species, some of which are exotic, and on varied soil and cultural conditions, has already been of great value. As the stands get older, this study if repeated will become increasingly valuable.

MENSURATION - STUDIES IN GROWTH AND YIELD

- Gould, Harry F.
1911
Some preliminary investigations concerning the ratio between DBH and DIB at stump for white pine in Massachusetts. Harvard For. Club Bull. 1:44-45.
- Carter, E. E.
1913
A volume table for red maple on the Harvard Forest. Harvard For. Club Bull. 2:1-8.
- Bailey, I. W.
Heald, P. C.
1914
Graded volume tables for Vermont hardwoods. For. Quar. 12:5-23.
- Carter, E. E.
1914
The use of yield tables in predicting growth. Proc. S.A.F. 9:177-188.
- Spaeth, J. N.
1920
Growth study and normal yield tables for second growth hardwood stands in central New England. Harvard For. Bull. 2.
- Cook, H. O.
Fisher, R. T.
1921
Forest mensuration. Mass. Div. For. Bull.
- Patton, R. T.
1922
Red oak and white ash: a study of growth and yield. Harvard For. Bull. 4.
- Albright, W. A.
Hosley, N. W.
1925
Studies in bole form of white pines: relation between form point and form class.
- Marshall, Robert
1927
The growth of hemlock before and after release from suppression. Harvard For. Bull. 11.
- Gevorkiantz, S. R.
Hosley, N. W.
1929
Form and development of white pine stands in relation to growing space. Harvard For. Bull. 13.
- Breckenridge, C. C.
1931
Growth and condition of the coniferous plantations on the Harvard Forest.
- Holsoe, Torkel
1933
Management of red oak and white ash with special reference to thinning.

ECONOMICS AND UTILIZATION

The science of forest economics permeates the whole structure of forest production and utilization, in the broadest meanings of these terms, controlling the extent to which they shall be brought to serve human needs at any given time or place, and governing the ebb and flow of the myriad of commercial transactions incident to the distribution and consumption of forest products.

To date the Forest has scarcely touched upon the broadest fields of economics; but it has made noteworthy contributions to the solution of a number of regional problems having to do with the manufacture and marketing of forest products, the future of the forests owned by wood-using industries, and the conservative use of land for the sustained production of wood crops. Several important surveys of wood-using industries have been conducted, which were of benefit not only in providing timber growers and lumber manufacturers with a better knowledge of consumer demands, but in bringing into sharp focus the many weaknesses of the lumber business in New England. Publications by the Forest were among the very first to point out the need for better sawing, grading, and seasoning of native lumber, for improved selling practices, for cutting only larger, older trees, for growing higher grade timber for the future, and for creating cooperative associations of timber growers. While many of the weaknesses in utilization and of the maladjustments between production and consumption still persist, they are now at least commonly recognized and means for their correction are gradually becoming available.

During the current year the Forest has assisted in formulating forestry practices for farm woodlands under the Agricultural Conservation Program of the Federal Government. It is believed that only through some form of public aid can the depleted and deteriorated farm woods of New England be restored to productiveness, and the Forest's long experience with regional conditions is proving to be of great usefulness in furthering this important program.

ECONOMICS AND UTILIZATION

- Steel, Francis R.
1911 Lumber flumes.
Harvard For. Club Bull. 1:31-35.
- Bailey, I. W.
1913 The preservative treatment of wood.
For. Quar. 11:5-20.
- Fisher, R. T.
1916 Utilization and round edge lumber.
Proc. S.A.F. 11:386-393. October.
- Averill, R. W.
Averill, W. B.
Stevens, W. I.
1923 A statistical forest survey of seven towns in
central Massachusetts. Harvard For. Bull. 6.
- Cline, A. C.
Reed, P. M.
Lockard, C. R.
1924 The proportion of lumber grades found in a
typical run of "box boards".
- Staff Publication
1925 Lumber consumption in the Springfield District.
Harvard For. Misc. Pub.
- Fisher, R. T.
1926 Lumber consumption in the Springfield District.
The Hampden, February.
- Cline, A. C.
1926 The marketing of lumber in New Hampshire.
Part I by R. T. Fisher. Harvard For. Bull. 10.
- Downs, J. B.
Gutchess, C. B.
1926 The wood-using industries of Massachusetts.
Harvard For. Bull. 12.
- Hick, R. M.
1927 Influence of land history and legislative
enactments on the character and condition of
the state forests in Massachusetts.
- Fisher, R. T.
1928 Prospects for utilization of land for timber in
New England. Mimeo. address to New Eng.
Research Council, December.
- Fisher, R. T.
1930 Summarized sample survey of natural resources
in town of Holden and vicinity. Mass. For. &
Park Ass.
- Bauer, Eitel
1931 The economic possibilities of forestry for
wood-using industries in central New England.
- Averill, C. C.
Frost, L. M.
1933 Some factors underlying forest fire insurance
in Massachusetts. Harvard For. Bull. 17.

WILDLIFE

The work with wildlife in the Harvard Forest has grown out of the obvious interdependence of forests and the animals living in them. Wildlife work has largely been developed either empirically by those who believed that simple measures such as restrictive legislation are all that are necessary for the production of abundant wildlife or by zoologists who were interested mainly in the animals as such and not particularly in their environment.

Of late years a newer conception of the problem has developed, the manipulation of the environment to provide the many necessities for the protection, nutrition, and reproduction of the animal species. It is along this line that the work at Petersham is being conducted. Many silvicultural practices can, by proper planning and arrangement, be made to favor wildlife. A start has been made toward evaluating these practices from the standpoint of wildlife production and toward determining the reverse effect of the animals on the woodlands. Studies have covered the use for food and cover of the various forest types by the white-tailed deer and the ruffed grouse. The production of wildlife foods in the various forest types according to age, density of stocking, and cultural treatment are being analyzed at the present time, and a two-year study of the red fox as a forest animal has been started.

WILDLIFE

- Hosley, N. W.
1925 A mystery of the tree tops.
Am. For. & For. Life 31(380):455-457.
- Hosley, N. W.
1928 Red squirrel damage to coniferous plantations
and its relation to changing food habits.
Ecology 9(1):43-48.
- Fisher, R. T.
1929 Our wildlife and the changing forest.
The Sportsman, March.
- Hosley, N. W.
1931 Wild animal damage to New England forests.
Jour. For. 29:700-708. May.
- Hosley, N. W.
Ziebarth, R. K.
1934 Some winter relations of the white-tailed deer
to the forests in north central Massachusetts.
Ecology 16:535-553. April.
- Hosley, N. W.
1935 The essentials of a management plan for forest
wildlife in New England. Jour. For. 33:985-
989. December.
- Hosley, N. W.
Mitchell, H. L.
1936 Differential browsing by deer on plots various-
ly fertilized. Black Rock Forest Papers 1
(5):24-27.
- Hosley, N. W.
1936 Forest wildlife census methods applicable to
New England conditions. Jour. For. 34:467-
471. May.
- Hosley, N. W.
1936 Food and cover for wildlife.
Am. Wild. 25(3):36, 44-46. May-June.
- Turberville, H. W.
1936 Some winter relations of the ruffed grouse in
Petersham.

PROFESSIONAL AND PUBLIC EDUCATION

From 1907 to 1914, instruction in forestry consisted of a general professional training covering the requirements of a practising forester and leading to the degree of Master of Forestry. It became gradually apparent, however, that the Harvard Forest had unique facilities for advanced, specialized training and research which could in the long run make a far more important contribution to forest conservation than a continuance of general "practitioner" training, an already overcrowded field. In 1914, therefore, the general curriculum was abandoned, entrance was restricted to students already possessing the bachelor's degree in forestry, and instruction thenceforth took the form of advanced research projects in forestry or in contributory fields such as entomology, soils, and game management, leading to the master's or doctor's degree. The unique quality of forestry education at the Harvard Forest remains what it has always been - an overwhelming emphasis on learning in the woods rather than largely from lectures and books. The great and increasing range of silvicultural treatment and of research projects in forestry and contributory sciences gives an unrivalled collection of "cases" for this time-tested method of instruction. In all, 137 students have studied at the Harvard Forest.

The educational influence of the Forest has extended far beyond the training of its students. An average of about 300 visitors come to the Forest each year, and many thousands have already viewed the Forest models at Cambridge. Lectures, articles, and bulletins by members of the staff have reached in the aggregate a very large audience. Staff members have given technical advice to many forest land owners and in some cases have made and supervised the execution of detailed forest management plans for such owners. Training courses have been given at Petersham to many forestry foremen of the Civilian Conservation Corps in "stand improvement", and a member of the staff supervised the silvicultural work in 12 CCC camps for several months, thus greatly extending the practical application of silvicultural principles derived from the Harvard Forest.

PUBLIC EDUCATION

- Fisher, R. T.
1920 The Harvard Forest at Petersham.
Harvard Alumni Bull. 22:829-35.
- Fisher, R. T.
1931 The Harvard Forest as a demonstration tract.
Quar. Jour. For. (Brit.), April.
- Cline, A. C.
1934 Weeding the farm woodlot.
Old Farmer's Almanac, 142nd edition.
- Cline, A. C.
1936 Opportunities for profit in New England
forestry. Old Farmer's Almanac, 144th edition
- Cline, A. C.
1936 The Harvard Forest at Petersham, Mass.
Harvard Alumni Bull. March 13.
- Cline, A. C.
1936 The Forest Models.
Harvard Alumni Bull. June 12.
- Cline, A. C.
1936 The Harvard Forest Models, special pamphlet on
the occasion of the Tercentenary Celebration.
Harvard For. Pub.

