THE HARVARD FOREST, 1963-64

Harvard University

Annual Report

Petersham

Massachusetts

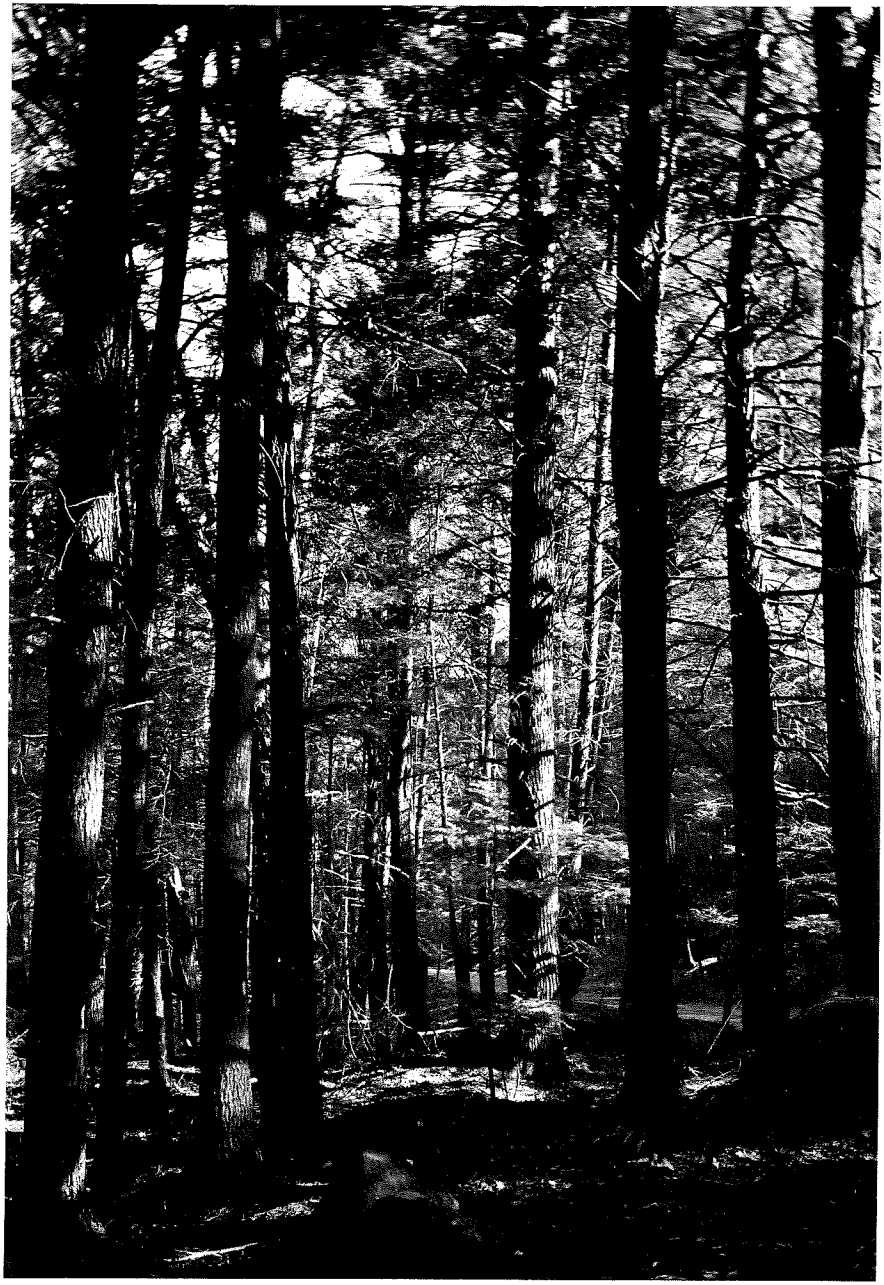
The Harvard Forest

Staff

The research staff of the Forest consists of Ernest M. Gould, Jr., Forest Economist; Walter H. Lyford, Soil Scientist; William F. Murison, Forest Biologist; Jack J. Karnig, Forest Manager for both the Harvard and Black Rock Forests; and myself. Charles F. Upham is Woods Superintendent, Barbara M. Kelley is Business Secretary and Librarian, and Julia W. Savage is Secretarial Assistant and Typist. Dorothy W. Waid, who has been for many years of great value as a part-time Librarian, resigned in June, 1964. The principal alteration in the staff during the year was the advancement of Mr. Lyford from a five-year term to an appointment without limit of time, effective July 1, 1964.

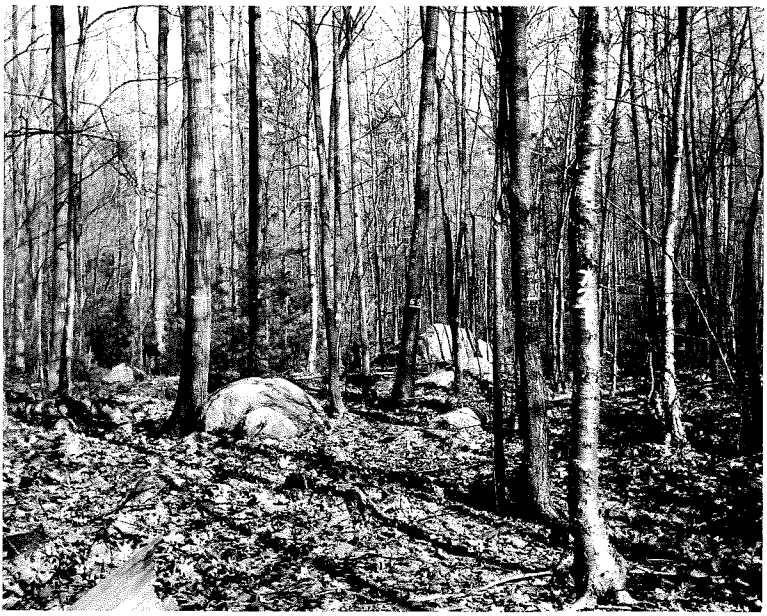
Staff Activities and Research

Dr. Gould supervised the continuation and elaboration of the Harvard Forest Simulation Project mentioned in my report for 1962–63. A grant of $5,000 from the U.S. Forest Service, and a $4,000 IBM Fellowship, enabled us to bring a graduate student, Mr. Gerald Walton, to the project, and the Harvard Computing Center generously contributed time on the 7094 computer. During the year Dr. Gould and Dr. William O'Regan of the Forest Service completed the manuscript for an initial paper on the project describing the first model produced and the basic methods used. The more elaborate model developed during the year contains a "forest generator" that will respond to such forest practices as planting, pruning, weeding, thinning, and partial harvest cutting. Dr. Gould contributed a paper entitled "Conservation



Old growth forest maintained without treatment, for observation and research. The trees are 120–130 years old.

and Sustained Yield" to a Ford Foundation Conference on Natural Resources in New York in February, 1964. He spent three months in England, Scotland, and northwestern Europe during the late winter and spring of 1964, visiting numerous institutions and persons concerned with the economic and social implications of modern forests, wood using industries, and forestry research. Some of his findings are in a paper on "The Future of Forests in Society," to be presented as the principal address at a meeting of the Canadian Institute of Forestry in October.



A stand kept under close observation and intensive management since 1908. These trees, and others like them in the Harvard Forest, are producing basic information on growth and behavior available only from such long-term experiments.

Mr. Lyford's major research in the year 1963–64 was on the root systems and root-soil relationships of the red maple (*Acer rubrum*) in the Harvard Forest. This resulted in a paper, pre-

pared jointly by him and Dr. Wilson of the Cabot Foundation, which went to press in June, 1964. He also began a series of studies in the spring of 1964 on the growth of red maple roots still attached to mature parent trees. These roots are being grown under differing soil and moisture conditions in such a way that measurements can be made. A major investigation of fragipan soils in North America was outlined by Mr. Lyford during the year, and preliminary work on it was started. He also carried on reconnaissance in the spring of 1964 on two other programs: "Boulder Distribution in the Vicinity of the Harvard Forest," and "Beaver as a Geomorphic Agent." The first of these grew out of his detailed studies of the relation of boulder distribution to soil patterns in the Harvard Forest reported in *Harvard Forest Bulletin* No. 30. The second was stimulated by observations of the activities of reintroduced beaver, and by some recent studies

Red maple trees with their major roots exposed by removal of leaf litter and humus from the forest floor.

by geomorphologists on the earlier effects of beaver populations. Mr. Lyford published three papers within the year: "Water Table Fluctuations in Periodically Wet Soils of Central New England", *Harvard Forest Paper* No. 8; "Coarse Fragments in the Gloucester Soils of the Harvard Forest," *Harvard Forest Paper* No. 9; and (with Charles S. Denny) "Surficial Geology and Soils of the Elmira-Williamsport Region, New York and Pennsylvania," *U.S. Geological Survey Professional Paper* No. 379.

Dr. Murison prepared the first draft of a paper on the application of aesthetics in forest land management. He conceives that basic concepts in aesthetics are essential to the development of theory in land planning for recreational use, and has attempted to state this. In another project he assembled material for a short biography of G. E. Schwarz, who bequeathed a parcel of land to the Harvard Forest in Petersham for the express purpose of developing aesthetic principles in forest management. Dr. Murison spent considerable time assisting with operations at the Black Rock Forest during the year, and took a large share of routine supervision of Harvard Forest operations. He also supervised summer work on the Black Brook Plantations in Hamilton, Massachusetts. He gave informal lectures to graduate students of landscape architecture in the School of Design, and took part in several jury sessions in that department.

I prepared and presented two symposium papers during the year. One of these was at an International Conference on Permafrost held at Purdue University, November 11–15, 1963. It is based on a phase of my arctic research on the development of turf hummocks in Greenland, and will be published in the Proceedings of the Conference. The other was at a Conference on Natural Resources held by the Ford Foundation in New York, February 27–March 1, 1964. Also during the year I completed the manuscript, in collaboration with Frederick Johnson of the R. S. Peabody Foundation for Archaeology, of *Geobotanical and Archaeological Reconnaissance in Southwest Yukon.* This paper went to press in June 1964. Otherwise I gave what research time was available to my studies of the vegetation of Northeast Green-

land, preparing a paper on the general geography of the flora of the Mesters Vig district in that area.

An experiment on the translocation of sap in the conducting tissues of an artificially defoliated ash tree in the Harvard Forest. Dr. Martin H. Zimmermann of the Cabot Foundation.

Research under the aegis of the Cabot Foundation, described more fully in another report, continued at the Forest in the capable hands of Dr. Martin Zimmermann and Dr. Brayton F. Wilson. Early in 1964 Miss Veronika Oswald came from Switzerland to serve as laboratory assistant to Dr. Zimmermann. *The Formation of Wood in Forest Trees*, edited by Dr. Zimmermann, was published in the spring of 1964 under the auspices of the Cabot Foundation. It contains the results of the Second Symposium held by the Foundation at the Forest in April, 1963. Collaborative research by Harvard Forest and Cabot Foundation staff and students continued to grow, and is embodied in three papers that went to the press in June 1964. One is under the joint authorship of Mr. Lyford and Dr. Wilson, and another is by Dr. Wilson alone. Both of these deal with the structure and development of the root systems of large living trees, particularly with relation to soils. A third is by Dr. Wilson and Mr. Ronald W. Sorensen who was a graduate student here in 1962–63. It is on "The Position of Eccentric Stem Growth and Tension Wood in Leaning Red Oak Trees."

Students and Research Fellows

Two candidates for the Degree of Master of Forest Science were in residence at the Forest during the year: George J. Knight and Edward A. Norberg. Knight prepared a thesis on the "Distribution of *Osmunda cinnamomea* and *Osmunda Claytoniana* in Relation to Natural Soil Drainage." In this he was able to relate the growth and development of the long-lived ferns of the genus *Osmunda* to the distribution of soil textures and moisture regimes, and to changes in land use patterns during the last century. He was a recipient of a Fisher Fellowship, while Norberg received a special fellowship given by an anonymous donor for the study of forest fire conditions in the Harvard Black Rock Forest. Norberg's thesis was an "Assessment of Forest Floor Fuels" at Black Rock. Both of these men completed their work in the late spring of 1964, and received their degrees at the June Commencement. Both are going on to further graduate work in biology: Knight at

Syracuse University, and Norberg at the University of California in Berkeley.

Three recipients of Charles Bullard Research Fellowships in forestry lived and carried on all or most of their work at the Forest during the year. Mr. John H. Chinner is head of the Forestry School at the University of Melbourne, Australia. His work was concerned in part with a study of silvicultural methods in this country, but mainly with an evaluation of American methods in forestry education. Dr. Horst Schulz is Beamteter Privatdozent at the University of Göttingen. His research was primarily on wood anatomy, especially on the anatomical characteristics of American deciduous trees in relation to growing conditions. Dr. Arthur H. Westing was from Purdue University, where he was Assistant Professor of Forestry. He prepared several research papers while here on the physiology and anatomy of wood production in trees, and a larger review volume on the study of reaction wood. A fourth Bullard Fellow, Mr. J. E. M. Arnold, a Forestry Officer in the Food and Agriculture Organization at Rome, spent most of his year in Cambridge, but was a frequent visitor at the Forest. He made use of our Library on many weekends, and in the spring term took a half-credit course with us dealing with problems in forest economics. All of these men have returned to the institutions from which they came except Dr. Westing who has accepted a new post at the University of Massachusetts. Those from overseas were able to travel widely in this country in pursuit of their special interests.

Several graduate students from institutions other than Harvard have used the Forest at various times during the year, but only two of these will be mentioned. Miss Sherry Hessler, of the Department of Geography at Johns Hopkins University, spent the month of August, 1963, working in our Library which she found rich in source material for a dissertation dealing with relations between wood using industries and the development of the American conservation movement. Miss Anita Mook, a graduate student in geology at the University of Michigan, used the Forest as a base for field studies in the Athol-Royalston district during the month of June, 1964.

Meetings and Conferences

The Forest was the scene of many meetings and conferences during the year, only a few of which can be mentioned here. The New England Section of the Society of American Foresters came on July 25, 1963, on the occasion of its summer field excursion. There were about 40 people in this group. On September 20 we were hosts to a small advisory planning group that serves the Department of Natural Resources of Massachusetts. From October 6 to 18 we held the 10th Harvard Conference on Forest Production. Seventeen Foresters attended the conference, 11 of them representing public services, both federal and state, three of them from universities, and three from wood using industries. Four came from Canadian institutions; two of them from universities and two from the Forest Service of Canada. The U.S. Forest Service contributed the services of Dr. William O'Regan to this Conference, sending him from his California station for the purpose.

About 30 Swedish foresters came on October 20, in the course of an extended tour of U.S. and Canadian Forestry schools and research institutions. From October 24 to 27 we were hosts to seven Regional Woodland Conservationists of the Soil Conservation Service. The Friends of the Harvard Forest met for their annual Field Day on September 7, 1963. The Board of Overseers' Committee to visit the Department of Biology held a meeting at the Forest on June 12, 1964.

Approximately 175 students from Harvard and other institutions made use of the Forest's facilities for field excursions in the past year. Most of these came in groups ranging in numbers from 10 to 40, and about two-thirds of them were supplied with lodging and meals.

In the month of August, 1963, Dr. Margaret Davis of the University of Michigan and Dr. John C. Goodlett of Johns Hopkins University used the Forest as a base for their research on pollen deposition in lake beds. This is a continuation of research on fossil pollen deposits begun by Dr. Davis while she was a graduate student at Radcliffe.

An Addition to the Harvard Forest

A gift of approximately 66 acres of land in the town of Royalston, Massachusetts, came to the University during 1963 from Mrs. Beirne B. Brues, widow of the late Professor Charles T. Brues of Harvard. This land borders on the Tully Reservoir, and contains a stand of mature and maturing hemlock. It is to be held for the use of the Harvard Forest as a memorial to Professor Brues, and to be available also for field studies under the auspices of the Museum of Comparative Zoology.

Woods Operations and Building Improvements

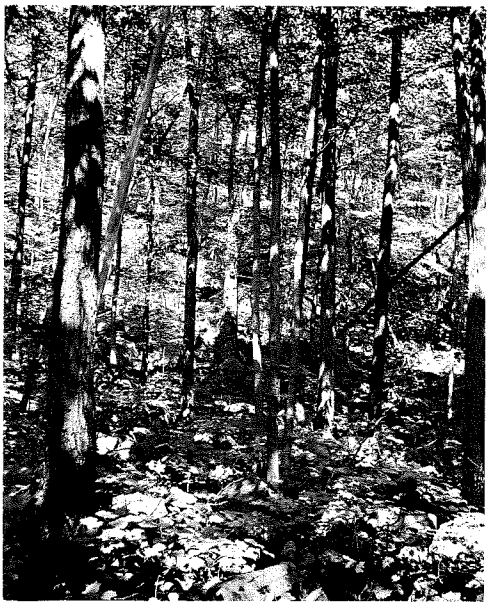
Woods operations during the year produced 256 cords of fuelwood, and about 32,000 board feet of sawtimber. About 60 cords of the fuelwood were sold off the Forest, and about 7,330 board feet of logs. Other logs were sawn at our own mill, and the lumber sold or used for our own purposes. Most of the cutting was done at various places in the Prospect Hill tract, though a small amount came from Compartment IX of the Tom Swamp tract.

Improvements in the heating arrangements of Shaler Hall and Fisher Museum, begun in 1959, were completed in the autumn of 1963. This involved the conversion of the steam heating system, by stages, to a zoned hot water system. The entire building complex is now heating far more effectively than it has ever been. With increased use of the Forest in the past few years, office and laboratory space has become crowded. To relieve some of the pressure we began building rooms in the basement in 1961. This was continued in 1963–64, with the completion of two new offices there, and new storage cases for publications. Most of the work was done by our own men, using our own materials. Other than these changes in the headquarters buildings, improvements have consisted of painting, repair, and minor alterations.

Harvard Black Rock Forest

The Harvard Black Rock Forest is owned and administered by a separate educational corporation in New York State. It is supported by funds held in trust for the purpose by the President and Fellows of Harvard College.

Locally the Forest is supervised by Mr. Jack J. Karnig, Forest Manager. Woods operations and research are planned in consultation with Harvard Forest personnel who have visited Black Rock frequently during the year. Cutting and other woods operations were done by local contractors except for those carried out by one employee.



A stand of mixed hardwoods in the Harvard Black Rock Forest, Cornwall, New York.

Research

The pitch pine progeny experiment begun in 1961–62 was continued successfully, and is now regarded as about half-completed. During May, 1964, about half of the 1–1 transplants were lifted from the nursery beds and transferred to the Harvard Forest where it is thought that site conditions may be more favorable for their growth and development.

Edward Norberg, one of the resident graduate students mentioned in my report on the Harvard Forest, lived at Black Rock during part of the summer and all of the autumn of 1963. He also spent some time there in the spring of 1964. In these periods he gathered the materials for his research on forest floor fuels, the results of which are embodied in his thesis.

Mr. Karnig continued his bi-weekly measurements, during the growing seasons, on selected trees in mixed hardwood stands that had been rather heavily thinned and the understory removed. He plans an evaluation of these data after the 1964 growing season to determine whether the study should be pursued further. He has also continued his experiments with herbicides in the control of forest composition. Using undiluted 2, 4-D with a tree injector he successfully thinned a plantation of red pine at very small cost, and now plans to extend the method to other coniferous plantations.

A stimulating and useful conference among some 15 persons representing Harvard, Johns Hopkins, and Columbia Universities, and the U. S. Geological Survey was held at the Black Rock Forest on May 15–16, 1964. Both faculty and students were present. Dr. Charles Hunt and Dr. John C. Goodlett of the Department of Geography at Johns Hopkins led the discussions, which were concerned primarily with the interrelations of late glacial history, soils and vegetation.

Notable changes in research emphasis have occurred at the Black Rock Forest in the 36 years of its life as an institution. Its initial purpose, clearly stated at the time, was "to bring the land to the highest possible point of sustained yield, profitable forest

crop production." The idea that the land might also be used for other purposes such as recreation was mentioned, but scarcely any provision for it was made in the operating plans. In the late 1920's and early '30's, although the Forest was only 60 miles from New York City, it was rather remote in terms of easy transportation. Within the past two decades new motor highways have completely surrounded it, making it readily accessible to the many millions of people who reside in southern New York and adjacent states. It is now subject to the ever-growing pressures exerted by these people for suburban recreation and living space. Its function as a research station aimed at producing wood products, in this milieu, can hardly remain realistic. Rather it should turn its attention to forest land management of a much broader kind, embracing the theory and design of various aesthetic and recreational values, and to watershed and erosion control.

During the past few years, in our forest thinning operations, we have carried out some modest experiments along these lines. They have taken the form, first, of opening vistas by judicious cutting in carefully selected areas. These areas have been kept open by the use of herbicides to prevent the regrowth of the understory shrubs and small trees. The success of these simple procedures suggests that they should be greatly expanded. Our Forest is used extensively by hikers, fishermen, and hunters. For many years we have permitted a local Fish and Game Club to use the property as their preserve, in return for services in protection against fire and trespass. With the aid of this club Mr. Karnig made during the year a general survey of the recreational use of the Forest.

Woods Operations and Building Improvements

Cutting operations produced about 20,000 board feet of sawtimber and 38 cords of fuelwood from the Forest. By agreement with the Village of Cornwall, our contractors also cut 16,800 board feet of timber and 11 cords of wood from its lands, and we received stumpage value for this wood.

About 1.4 miles of road were completed during the year. This finished the building of a road, begun by the former owner of the Forest, connecting the Sutherland Pond and Continental Roads. It gives access to the Sackett Mountain area in the westerly part of the Forest, a district that we have thus far not been able to operate. The total mileage of roads in the Forest now useable for passenger automobiles is 14.3.

Late in the summer of 1963, Mr. Karnig moved into the newly renovated house owned by the Forest on the Continental Road in the Town of Cornwall. At the same time the office and library were moved to another building owned by the Forest on Shore Road in the Village. The latter building is satisfactory only as a temporary expedient, and it is hoped that in the near future combined office-library-living quarters can be built on the parcel of land now containing the residence and equipment sheds.

HUGH M. RAUP
Director