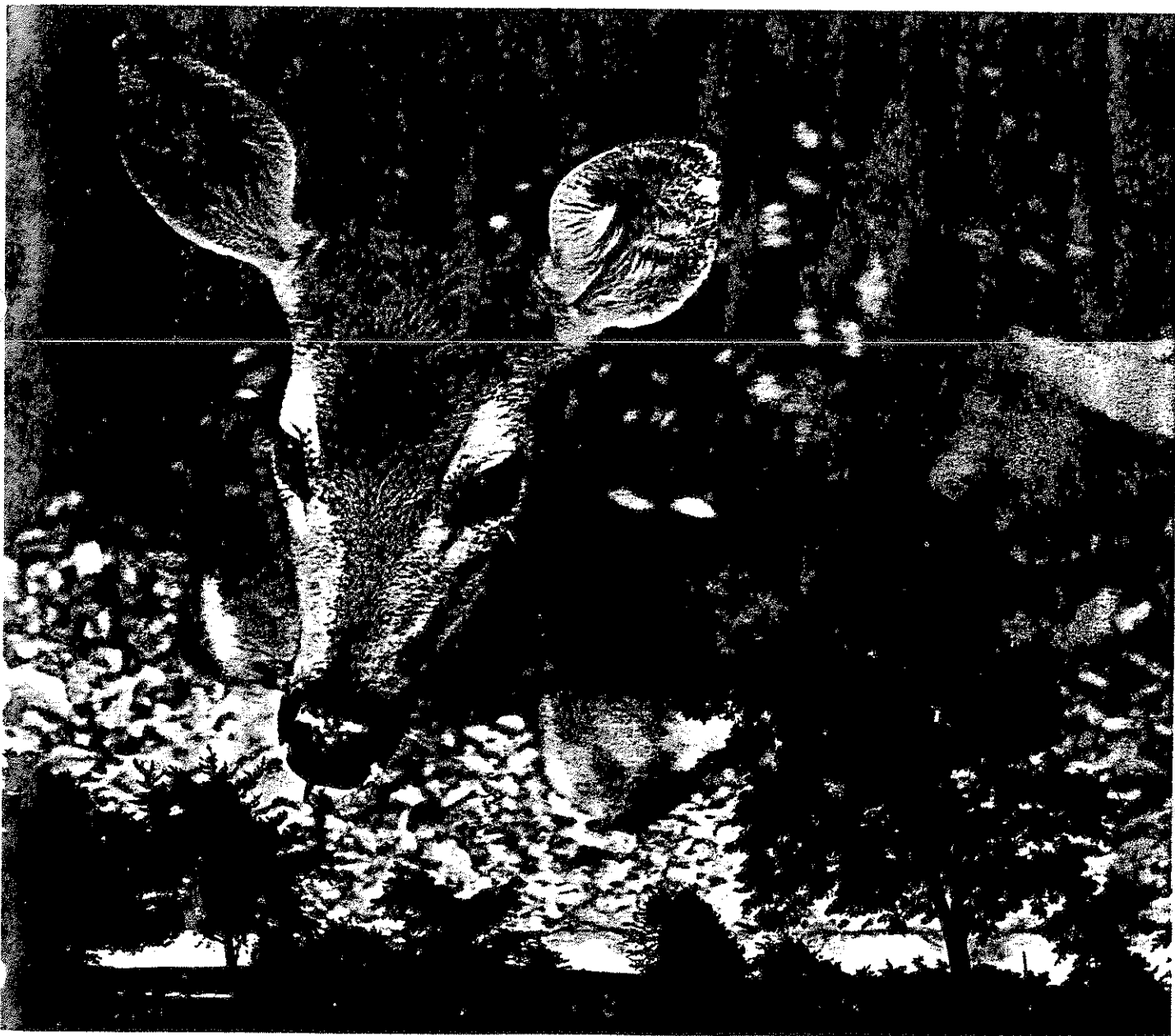


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# SITE AND YIELD INFORMATION APPLICABLE TO VIRGINIA'S HARDWOODS: A REVIEW



## PREFACE

This bulletin is based on a paper prepared by Thomas F. Evans in partial fulfillment of the requirements for the Master of Forestry degree at Virginia Polytechnic Institute and State University. The paper is a review and compilation of existing site and yield information which might prove useful to Virginia's landowners who wish to evaluate hardwood timber production as a land-use alternative. In compiling the paper, published results were taken as presented by the author(s)--it was not possible to check all results for errors or to evaluate the applicability of the many published results to forest conditions in Virginia. Within reason, the limitations of works presented are indicated; however, it would behoove the user to check original sources for geographic limits, stand condition ranges included in the sample data and other limiting factors in the published results prior to using the information for management decision making purposes.

The careful reader of this review will undoubtedly note that many of the results included were derived in areas somewhat removed from Virginia. However, it is the best available information and it hopefully is valid for comparative purposes, if not for exact predictive values in the Commonwealth. When attempting to pull together hardwood site and yield information which might be useful to landowners in Virginia, the paucity of good material became evident very quickly. In the opinion of the authors, additional research is needed on site, growth and yield information for Virginia's hardwoods in order that this valuable resource may be more prudently managed.

TABLE OF CONTENTS

LIST OF APPENDIX TABLES . . . . .	i
LIST OF APPENDIX FIGURES. . . . .	vii
INTRODUCTION. . . . .	1
YIELD PREDICTION TECHNIQUES . . . . .	1
Normal Yield Tables. . . . .	2
Empirical Yield Tables . . . . .	3
Variable Density Yield Tables. . . . .	3
Yield Equations. . . . .	4
SITE QUALITY. . . . .	4
Site Index . . . . .	5
Site Index Curves for Particular Species . . . . .	6
Site Index Comparisons . . . . .	8
Hardwood Soil-Site Studies . . . . .	9
HARDWOOD YIELDS . . . . .	14
Yields of Mixed Hardwood Stands. . . . .	17
Thinning Effects . . . . .	18
Yields of Uneven-Aged Hardwoods. . . . .	21
SUMMARY . . . . .	21
LITERATURE CITED. . . . .	23
APPENDIX. . . . .	28

LIST OF APPENDIX TABLES

Table	Page
1. Site index relationships for upland oak. . . . .	29
2. Site-index curves for eastern hardwood forest species. . . . .	30
3. Site index of important Piedmont species: Mean, range, and associated species . . . . .	31
4. Site index comparisons for species growing on the same mountainous site in northeast Georgia. . . . .	32
5. Yellow-poplar site index as related to elevation, slope position, and soil series. . . . .	33
6. White oak site index as related to elevation, slope position, aspect, and slope steepness. . . . .	34
7. Scarlet oak site index as related to elevation, slope position, and aspect . . . . .	35
8. Black oak site index as related to slope position and clay content of surface soil (A <sup>2</sup> horizon) . . . . .	36
9. Northern red oak site index as related to aspect and elevation	36
10. Chestnut oak site index as related to steepness of slope and slope position . . . . .	37
11. Some properties of Piedmont soils associated with mean site index and site index extremes. . . . .	38
12. Site index of oak as related to aspect, slope, and total soil depth. . . . .	39
13. Sweetgum site index on soils of the Delaware-Maryland-New Jersey Coastal Plain.	40
14. Classifications of subsoil properties by code number for black locust and black walnut site indexes . . . . .	41
15. Site indexes by subsoil properties and code numbers. . . . .	41
16. Yield per acre of upland oak in cubic feet, excluding bark (all trees 0.6 inch d.b.h. and larger included). . . . .	42
17. Yield per acre of upland oak in cubic feet of merchantable stem, including bark, to a 4-inch top outside bark . . . . .	42

Table	Page
18. Yield per acre of upland oak in board feet, International rule, 1/8-inch saw kerf, to a 5-inch top inside bark, including all trees having at least one 16-foot log. . . . .	42
19. Yield per acre of upland oak in board feet, Scribner rule, to an 8-inch top inside bark, including all trees having at least one 16-foot log. . . . .	43
20. Yield per acre of upland oak of merchantable stem in cords, including bark, to a 4-inch top outside bark . . . . .	43
21. Yield per acre of upland oak, excluding bark, by density classes, age, and site; all trees 0.6 inch d.b.h. and larger included . . . . .	44
22. Comparison of yield correlations for upland oak with and without density included as a variable . . . . .	45
23. Total cubic-foot yield of wood and bark for unthinned yellow-poplar stands of various stand densities, site indices, and ages . . . . .	46
24. Cubic-foot yield of wood and bark to a 4-inch top, outside bark, for unthinned yellow-poplar stands of various stand densities, site indices, and ages . . . . .	47
25. International 1/4-inch board-foot yield to an 8-inch top, outside bark, for unthinned yellow-poplar stands of various stand densities, site indices, and ages. . . . .	48
26. Cubic-foot yield of wood only to a 4-inch top, outside bark, for unthinned yellow-poplar stands of various densities, site indices, and ages. . . . .	49
27. Total yield per acre of yellow-poplar in tens of cubic feet, excluding bark, by basal area, age and site; all trees 0.5 inches dbh and larger . . . . .	50
28. Merchantable yield per acre, of yellow-poplar in tens of cubic feet, to a four-inch top outside bark, by basal area, age, and site; all trees 4.5 inches and larger. . . . .	56
29. Yield in hundreds of board feet per acre of yellow-poplar to a five-inch top inside bark, by basal area classes, age, and site; all trees 10.0 inches and larger . . . . .	62
30. Yield table for old-field sweetgum stands in New Jersey. . . . .	68
31. Average yield of hickory per acre. . . . .	69

Table	Page
32. Yield of pure, even-aged, well stocked stands of ash on different quality sites. . . . .	70
33. Cubic foot volume yield equations of the form $\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{UTRE} + b_3\text{MTRE} + b_4\text{BA} + b_5\text{AMH}$ , and their coefficients of determination and standard deviations for the ten working forest site types and for all site types combined. . . . .	71
34. Cubic foot volume yield equations of the form $\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{MTRE} + b_3\text{BA} + b_4\text{AMH}$ , and their coefficients of determination and standard deviations for the ten working forest site types and for all site types combined. . . . .	72
35. Yields in cubic feet per acre of the Muck Swamp working forest site type, as obtained from the equation: $\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{UTRE} + b_3\text{MTRE} + b_4\text{AMH}$ . . . . .	73
36. Yields in cubic feet of the Peat Swamp working forest site type, as obtained from the equation: $\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{UTRE} + b_3\text{MTRE} + b_4\text{AMH}$ . . . . .	73
37. Yields in cubic feet per acre of the Black River Bottom working forest site type, as obtained from the equation: $\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{UTRE} + b_3\text{MTRE} + b_4\text{BA} + b_5\text{AMH}$ . . . . .	74
38. Yields in cubic feet per acre of the Branch Bottom working forest site type, as obtained from the equation: $\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{UTRE} + b_3\text{MTRE} + b_4\text{BA} + b_5\text{AMH}$ . . . . .	74
39. Yields in cubic feet per acre of the Atlantic Coastal Plain Bottomland working forest site type, as obtained from the equation: $\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{UTRE} + b_3\text{MTRE} + b_4\text{BA} + b_5\text{AMH}$ . . . . .	75
40. Yields in cubic feet per acre of the Atlantic Piedmont Bottomland working forest site type, as obtained from the equation: $\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{UTRE} + b_3\text{MTRE} + b_4\text{BA} + b_5\text{AMH}$ . . . . .	75
41. Yields in cubic feet per acre of the Gulf Coastal Plain and Piedmont Bottomland working forest site type, as obtained from the equation: $\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{UTRE} + b_3\text{MTRE} + b_4\text{BA} + b_5\text{AMH}$ . . . . .	76
42. Yields in cubic feet per acre of the Atlantic and Gulf Piedmont Ridge working forest site type, as obtained from the equation: $\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{UTRE} + b_3\text{MTRE} + b_4\text{BA} + b_5\text{AMH}$ . . . . .	76
43. Yields in cubic feet per acre of the Mountain Bottomland and Cove working forest site type, as obtained from the equation: $\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{UTRE} + b_3\text{MTRE} + b_4\text{BA} + b_5\text{AMH}$ . . . . .	77

Table	Page
44. Yields in cubic feet per acre of the Mountain Ridge working forest site type, as obtained from the equation: Vol. = Constant + $b_1$ AGE + $b_2$ UTRE + $b_3$ MTRE + $b_4$ BA + $b_5$ AMH . . .	77
45. Yields in cubic feet per acre of all working forest site types COMBINED, as obtained from the equation: Vol. = Constant + $b_1$ AGE + $b_2$ UTRE + $b_3$ MTRE + $b_4$ BA + $b_5$ AMH . . .	78
46. Yields in cubic feet per acre of the Muck Swamp working forest site type, as obtained from the equation: Vol. = Constant + $b_1$ AGE + $b_2$ MTRE + $b_3$ BA + $b_4$ AMH. . . . .	78
47. Yields in cubic feet per acre of the Peat Swamp working forest site type, as obtained from the equation: Vol. = Constant + $b_1$ AGE + $b_2$ MTRE + $b_3$ BA + $b_4$ AMH. . . . .	79
48. Yields in cubic feet per acre of the Black River Bottom working forest site type, as obtained from the equation: Vol. = Constant + $b_1$ AGE + $b_2$ MTRE + $b_3$ BA + $b_4$ AMH. . . . .	79
49. Yields in cubic feet per acre of the Branch Bottom working forest site type, as obtained from the equation: Vol. = Constant + $b_1$ AGE + $b_2$ MTRE + $b_3$ BA + $b_4$ AMH. . . . .	80
50. Yields in cubic feet per acre of the Atlantic Coastal Plain Bottomland working forest site type, as obtained from the equation: Vol. = Constant + $b_1$ AGE + $b_2$ MTRE + $b_3$ BA + $b_4$ AMH . .	80
51. Yields in cubic feet per acre of the Atlantic Piedmont Bottomland working forest site type, as obtained from the equation: Vol. = Constant + $b_1$ AGE + $b_2$ MTRE + $b_3$ BA + $b_4$ AMH. . . . .	81
52. Yields in cubic feet per acre of the Gulf Coastal Plain and Piedmont Bottomland working forest site type, as obtained from the equation: Vol. = Constant + $b_1$ AGE + $b_2$ MTRE + $b_3$ BA + $b_4$ AMH. . . . .	81
53. Yields in cubic feet per acre of the Atlantic and Gulf Piedmont Ridge working forest site type, as obtained from the equation: Vol. = Constant + $b_1$ AGE + $b_2$ MTRE + $b_3$ BA + $b_4$ AMH. . . . .	82
54. Yields in cubic feet per acre of the Mountain Bottomland and Cove working forest site type, as obtained from the equation: Vol. = Constant + $b_1$ AGE + $b_2$ MTRE + $b_3$ BA + $b_4$ AMH. . . . .	82
55. Yields in cubic feet per acre of the Mountain Ridge working forest site type, as obtained from the equation: Vol. = Constant + $b_1$ AGE + $b_2$ MTRE + $b_3$ BA + $b_4$ AMH. . . . .	83

Table	Page
56. Yields in cubic feet per acre of the COMBINED working forest site type, as obtained from the equation: $\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{MTRE} + b_3\text{BA} + b_4\text{AMH}$ . . . . .	83
57. Yields per acre for upland oak; no thinning... . . . .	84
58. Yields per acre for upland oak. First thinning at age 10. . .	85
59. Yields per acre for upland oak. First thinning at age 20. . .	86
60. Yields per acre for upland oak. First thinning at age 30. . .	87
61. Yields per acre for upland oak. First thinning at age 40. . .	88
62. Yields per acre for upland oak. First thinning at age 50. . .	89
63. Yields per acre for upland oak. First thinning at age 60. . .	90
64. A comparison of yields per acre for even-aged upland hardwoods. Management period: 50 years, Cutting interval: 10 years. . .	91
65. A comparison of yields per acre at age 60 when thinning is begun at different ages (Source: tables 58 to 63). Thinning interval - 10 years . . . . .	92
66. Current annual basal-area increment per acre of upland oak for given age and basal area . . . . .	93
67. Net basal-area growth of upland oak in 10 years, by initial age and basal area . . . . .	94
68. Total cubic-foot volume of upland oak for all trees over 2.5 inches d.b.h. by age and basal area. . . . .	95
69. Net cubic-volume per acre of upland oak in 10 years, by initial age and basal area . . . . .	96
70. Total cordwood volume per acre of upland oak for all trees over 4.5 inches d.b.h., by age and basal area . . . . .	97
71. Net cordwood growth per acre of upland oak in 10 years, by initial age and basal area . . . . .	98
72. Total board-foot volume per acre of upland oak for all trees over 8.5 inches d.b.h., by age and basal area . . . . .	99
73. Net board-foot growth per acre of upland oak in 10 years, by initial age and basal area . . . . .	100



Table	Page
74. Regression equations used for growth and yield estimates of upland oak . . . . .	101
75. Total cubic-foot yield for thinned stands of yellow-poplar . .	102

LIST OF APPENDIX FIGURES

Figure	Page
1. Height curves used for upland oak site classification. . . . .	105
2. Site index curves for upland oak in the Southeast. . . . .	106
3. Site index curves for red oak in the Lake States . . . . .	107
4. Tree height-growth patterns for four species of upland oaks reveal decided differences in growth for older ages. Also shown is the Schnur (1937) site-index curve for upland oaks. . . . .	108
5. Site index curves for black oak in the Central States. . . . .	109
6. Site index curves for white oak in the Central States. . . . .	110
7. Site index curves for scarlet oak in the Central States. . . . .	111
8. Site index curves for chestnut oak in the Central States . . . . .	112
9. White oak curves for Boston Mountains compared with Schnur's curves . . . . .	113
10. Red oak curves for the Boston Mountains compared with Schnur's curves . . . . .	113
11. White oak site index curves. . . . .	114
12. Upland oak site index curves . . . . .	115
13. Red oak site index curves. . . . .	116
14. Site index curves at an index age of 50 years for yellow-poplar in the southern Appalachian Mountains. . . . .	117
15. Site index curves at index age of 50 years for yellow-poplar in the Piedmont of Virginia and the Carolinas . . . . .	118
16. Site index curves for West Virginia yellow-poplar. . . . .	119
17. Sweetgum site index curves for Midsouth soils. . . . .	120
18. Site index curves for sweetgum in fully stocked stands . . . . .	121
19. Site index curves (Age Base 50) developed for sugar maple from individual stem analysis . . . . .	122

Figure	Page
20. Site index curves for black walnut . . . . .	123
21. Site index curves for red maple. . . . .	124
22. Site index curves for black locust . . . . .	125
23. Site index curves for hickory. . . . .	126
24. Site index curves for beech. . . . .	127
25. A site index comparison study for important timber species in the Virginia-Carolina Piedmont . . . . .	128
26. Preliminary comparison of site indices for several different species on the same land in the Georgia Piedmont . . . . .	129
27. A comparison of site indices for 10 species on the same land in the Southern Appalachians. . . . .	130
28. Mean height-age curves based on soil-site equations for Piedmont upland species in mixed timber stands. . . . .	131
29. Effect of certain soil factors on the site index for sweetgum. . . . .	132
30. Average relation between site index and depth to subsoil . . . . .	133
31. Yields per acre of upland oak in cubic feet, excluding bark showing trends with age by site index. . . . .	134
32. Yield per acre of upland oak in cubic feet of merchantable stem, including bark (to a 4-inch top outside bark), showing trends with age by site index. . . . .	135
33. Yield per acre of upland oak in board feet, International rule (1/8-inch kerf) (to a 5-inch top inside bark), showing trends with age by site index . . . . .	136
34. Stand density chart for upland oak . . . . .	137
35. Yellow-poplar yield in cubic feet per acre, site index 75. . . . .	138
36. Yellow-poplar yield in cubic feet per acre, site index 95. . . . .	139
37. Basal area growth of yellow-poplar in square feet per acre per year . . . . .	140
38. Cubic-foot growth of yellow-poplar per acre per year, initial volume 3400 cubic feet . . . . .	141

Figure	Page
39. Projected basal area of yellow-poplar in square feet per acre.	142
40. Projected yield of yellow-poplar in cubic feet per acre, initial volume 3400 cubic feet . . . . .	143

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VIRGINIA'S HARDWOODS: A REVIEW

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and Robert C. Parker <sup>1/</sup>

INTRODUCTION

In 1966 Virginia had a hardwood growing stock volume of 10.5 billion cubic feet and a hardwood sawtimber volume of almost 26.3 billion board feet. Hardwood timber was distributed over more than 12.8 million acres of commercial forest land in the state (Knight and McClure, 1967).

This hardwood timber is converted into a multitude of finished products. Hardwoods comprise well over one-half of the total volume in Virginia's multi-million dollar forest products industry each year. Thus the hardwood resource is very important to the welfare of the citizens of the Old Dominion.

Despite the importance of hardwoods in Virginia's timber industry, most hardwood stands have not been placed under intensive forest management. An essential ingredient of a forest management program is information on the yields of timber products which can be achieved by the various tree species on different sites. Yield and site data which can be applied to Virginia's hardwoods are still relatively scarce. The purpose of this paper is to survey the primary works on the yields of hardwood species found in Virginia and to present results from studies on the relations of hardwood growth to various site conditions.

YIELD PREDICTION TECHNIQUES

Yield studies provide a basis for estimating the value of standing timber in terms of either its present or predicted future yield. Knowing the expected value of different products at any period in the life of the stand enables the forest owner to choose the rotation which best fits his objectives. Yield data can be used to render a fairly accurate appraisal of damages in case a stand is destroyed by fire,

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disease, or timber trespass. Yield information is helpful in choosing the proper species for a particular site. Forest taxation studies and determination of the need for thinning are other uses of yield information (Aughanbaugh, 1934).

The basic relationships of growth and yield are:

- (1) growth rate is a function of age, site, and stand characteristics, and
- (2) yield is a function of age, site, and stand treatment; or yield is the summation of annual increments (Curtis, 1972).

The primary ways through which the growth and yield relationships have been expressed are yield tables, yield curves, and growth and yield prediction equations.

Yield tables are "tabular presentations of volume per unit area for even-aged stands, according to age and other specified stand conditions" (Husch, 1963:214). These tables show the expected average quantities of timber which can be attained at the stated ages. There are several types of yield tables for even-aged stands: normal, empirical, and variable-density yield tables (ibid.). Yield tables provide growth estimates either at a lower cost than that of direct methods, or for periods of time longer than those for which diameter increment, ingrowth, and mortality can reliably be predicted (Spurr, 19

#### Normal Yield Tables

Normal yield tables relate a dependent variable such as volume to the two independent variables stand age and site index. The density variable in normal yield tables is held constant by taking sample plots for the study in stands which have approximately the same density. This density has been called full stocking or normal stocking. Supposedly a fully stocked stand completely occupies a given site and makes full use of its growth potential. A qualitative set of guides are used to facilitate recognition of a fully stocked stand. These guides, such as complete crown closure, no openings in the stand, and regular spacing of the trees, leave much to the judgment of the individual in selecting a fully stocked stand (Husch, 1963). Nelson and Bennett (1965) recommend that, since more powerful analytical tools are now available for considering simultaneously the effects of many variables, the normality or full stocking concept should be eliminated from yield solutions as well as from stocking and growth theory.

A normal yield table may be used to estimate the volume of an existing stand by measuring the stand's age, site index, and relative stocking percentage. Relative stocking is measured by comparing the volume, basal area, or number of trees per acre with the yield table values given for a stand with the same age and site index.

Basal area is the most convenient basis for expressing relative stocking because it is quickly and easily measured and is closely related to volume. The volume of an existing stand can be estimated by multiplying the stocking percentage times the yield table volume estimates (Husch, 1963).

Normal yield tables estimate growth and future yields reliably when age and site class may be accurately measured, and when the estimate is applied to stands similar to those from which the base tables were constructed. Normal yield tables are best applied to pure, even-aged, fully stocked stands. The more a stand deviates from this standard, the less satisfactory will be the yield table estimates. In practice, few hardwood stands are precisely even-aged. Site index values are not always easily assigned, particularly in uneven-aged stands. Also, normality of stocking is not easily recognized in the field. Therefore, it is often necessary to try to apply tables designed for even-aged, fully stocked stands to stands which are commonly understocked and often at least somewhat uneven-aged. For this reason, normal yield tables often give a high estimate of stand volume which is not generally found under natural conditions (Spurr, 1952).

Normal yield tables have been the only yield tables in general use until recently. The shortcomings of such yield tables are widely recognized, and few foresters believe that the stands represented in typical normal yield tables are rational management goals (Curtis, 1972). However, normal yield tables do provide a unified picture of stand structure and stand development for various species on different sites. Normal yield table comparisons are useful in determining the effect of site upon growth and the possibility of growing different species on a given site (Spurr, 1952).

#### Empirical Yield Tables

Empirical yield tables are similar to normal yield tables except that they are based on sample plots of average rather than full stocking. The need for judgment in selecting normally stocked stands is thus eliminated (Husch, 1963).

#### Variable-Density Yield Tables

Variable-density yield tables use stand density as an independent variable, along with age and site index. These tables show the yields for various levels of stocking. Sample plots need not be fully stocked (ibid.).

The advantages of variable density yield tables are:

- (1) any good sample plot data may be used,
- (2) the concept of normality can be eliminated, and
- (3) the resulting tables are derived from and are directly applicable to stands of any density (Spurr, 1952).

### Yield Equations

Yield equations based on more than two independent variables have been developed in recent years due to the use of statistical techniques and modern high-speed computers (Husch, 1963). Examples of these yield equations will be presented later in this paper.

Growth can be depicted by graphing size against time or age. Such growth curves are termed yield curves when they are used to predict future stand volumes (Spurr, 1952).

### SITE QUALITY

Since site quality is one of the independent variables upon which yield curves and yield tables are based, the conventional yield table is only as good as the classification of site. Site quality is estimated by one of four primary methods:

- (1) by measuring the environment. Among environmental factors which have been correlated to site quality are forest climate, soil properties, and soil series.
- (2) by indicator plants. Certain of the lesser plants of the forest are so sensitive to site quality that their presence or absence or relative abundance may serve to classify site. Understory vegetation is, to a large extent, affected by tree canopy and by forest history.
- (3) by volume. This technique is largely impractical for Virginia's hardwoods due to the lack of extensive areas of managed stands.
- (4) by stand height. This is the most commonly used measure of site quality and is usually referred to as site index (Spurr, 1952).

Jones (1969:4) compared the site index approach, vegetation approaches, and environmental approaches to site evaluation and concluded that

"even good site index curves used with proper regard for their limitations are a somewhat rough index to the productivity of sites. But it is the most direct method, and for most species in suitable stands, good site index curves probably are the best tool for evaluating productivity."

Precise site quality information is needed to estimate the quantity and quality of wood products which can be produced on specific forest areas. It is also needed in determining what species to grow and what products to favor on lands of different productivity. Finally, accurate site quality information enables the forest manager to concentrate intensive forest management on the most productive lands (Carmean, 1971a)



### Site Index

Site index, the most commonly used measure of site quality, is defined as "the average height that the dominant and codominant trees on an area will attain at key ages such as 50 or 100 years" (Husch, 1963:209). Fifty years is most commonly used as the index age for eastern hardwoods. Site index is determined from site index curves by measuring the average height of the dominant and codominant trees and their average age, and locating the position of these coordinates on the site index chart for the species. This technique is applicable only to species occurring in even-aged stands. The height growth of trees occurring in uneven-aged stands is more closely related to the varying stand conditions by which the trees have been affected during their lives than to age (ibid.).

The technique which has been used for years to construct site index curves is to use data from temporary yield-table plots from which a single curve of height over age is developed. A series of similar curves for the various height classes is then added; each curve having the same shape and other characteristics of the guiding curve, differing in magnitude only by a fixed percentage.

The assumptions of the harmonized, or anamorphic, site index curve technique are:

- (1) the sample plot data adequately sample the range in sites within each age class,
- (2) the effect of different sites on height growth is relatively the same at all ages, and
- (3) the growth curve on a good site has the same shape as that on a poor site.

None of these assumptions are usually valid; however, unless a high degree of accuracy is required, site index curves constructed from temporary plot data can be used to give a useful estimate of site quality (Spurr, 1952).

A number of polymorphic site index curves have been developed through stem analysis which differ in shape from site to site to show the actual trend of height growth. These natural site index curves, if they are available, are much to be preferred to harmonized curves when an accurate site determination is needed (ibid.).

Many hardwood stands lack suitable trees for site index determination due to poor stocking, fire or other damage, past cutting practices, young age, or uneven-aged condition. In addition, hardwoods occur over such large geographical areas that there are great differences in the soils, topography, and climate of the sites on which they occur. Patterns of tree growth may also differ, whereby trees arrive at the same height at 50 years, although growing at different rates. For these reasons, a single set of regional site index curves may not represent the various height-growth patterns which occur over wide geographical areas.

Site estimation for very old or very young stands may result in particularly large errors when using regional site index curves. No error can occur when the trees measured are the same age as the index age because their present height is site index. But site-curve errors can be progressively greater as the number of years from the index age increases. Therefore, when the applicability of region-wide curves is questioned, trees should be measured which are as close as possible to the index age (Carmean, 1970).

#### Site Index Curves for Particular Species

Schnur's (1937) site index curves for even-aged stands of upland oaks are still in wide use (Fig. 1). These harmonized, or anamorphic, curves were constructed for use over the entire range of upland oaks in the eastern and central United States. All oak species were grouped together in constructing these curves.

Olson (1959) developed site index curves for upland oaks in the Southeast, particularly the Virginia-Carolina Piedmont and the southern Appalachian Mountains (Fig. 2). He found no statistically significant differences in the rates of height growth of the various oak species, although the mean site indexes by species and regions did vary (Table 1).

Schnur's and Olson's oak site index curves, as well as those of Gevorkiantz (1957) for red oak in the Lake States (Fig. 3), have been compared at the same site index level (Fig. 4). These three sets of harmonized curves show somewhat different patterns of height growth. Due to the current lack of information on height growth patterns for particular areas, the forest manager must use any of these site index curves only as general approximations of site quality (Carmean, 1971a).

Polymorphic site index curves, which show different patterns of height growth for different levels of site index, were derived by Carmean (1971b) for black oak, white oak, scarlet oak, and chestnut oak in the Central States (Figs. 5-8). These curves show definite differences in height growth pattern when compared at the same site index level. The broken lines in these curves show where the site index curves were extended using the height growth equations, or where curves for very good or very poor sites were computed based on equations for adjacent site classes.

Carmean's site index curves do not show as much slowing of height growth of oaks as that predicted by Schnur's and Olson's harmonized site index curves. The differences in height growth patterns may be attributable to differences in climate, soils, and other factors in the Central States (Carmean, 1971b). Such curves should be used with caution outside the geographic range for which they were constructed.

An example of the superiority of local site index curves is given by Graney and Bower (1971), who constructed site index curves for red oaks (northern red oak and black oak) and white oak in the Boston Mountains of Arkansas. Their curves were derived through stem analysis. Height/age curves were then generated from regression equations. They

found that Schnur's upland oak site index curves fit their data fairly closely in the early years. Schnur's curves tended to underestimate height growth in the later years (after age 80), particularly on the better sites (Figs. 9 and 10).

Additional site index curves for oaks as presented by Hampf (1964) are shown in Figs. 11 through 13. These curves were compiled from the works of two or more separate researchers, and do not represent new developments in site index curves for oaks.

Yellow-poplar site index curves for the southern Appalachian Mountain region and the Virginia-Carolina Piedmont have been presented by Beck (1962). These curves were developed from the regression equations:

$$\log_{10} \text{ site index} = \log_{10} \text{ height} - 9.158(1/50 - 1/\text{age})$$

for the southern Appalachians, and

$$\log_{10} \text{ site index} = \log_{10} \text{ height} - 6.503(1/50 - 1/\text{age})$$

for the Piedmont, where " $\log_{10}$ " refers to the logarithm to base 10. Beck's site index curves are shown in Figs. 14 and 15.

Site index curves for yellow-poplar in five mountainous counties of eastern West Virginia are given by Schlaegel et al (1969). Their curves were derived from the regression equation:

$$\log_e \text{ site index} = \log_e \text{ height} - 17.7661(1/50 - 1/\text{age}),$$

where " $\log_e$ " is the natural, or Napierian, logarithm. Figure 16 shows the yellow-poplar site index curves as developed by Schlaegel et al. These curves do not appear to be substantially different from those published by Beck.

Broadfoot and Krinard (1959) published site index curves for sweetgum on Midsouth soils (Fig. 17). Likewise, a set of curves for sweetgum in the southeastern United States has been compiled by Hampf (1964) from the site index curves by Broadfoot and Krinard and those of Winters and Osborne (1935) for alluvial lands in the South (Fig. 18).

Sugar maple site index curves for northern lower Michigan were developed by Shetron (1969). These curves are compared with sugar maple site index curves of other authors in Fig. 19. The Curtis and Post (1962) curves are for the Green Mountains of Vermont. The Farnsworth and Leaf (1965) curves are for New York, and the Farrington and Montegue (1958) curves are for Vermont. None of these curves are strictly applicable to Virginia, but they do give a relative idea of how sugar maple grows on various sites.

Site index curves for several of the remaining commercially important hardwoods, as taken from Hampf (1964), are shown in Figs. 20 through 24. These curves were taken from the works of other researchers on hardwood site quality. Site index curves for other important species, particularly pines, which are applicable to Virginia, have not been published at this time. Carmean (1970) listed the site curves for eastern hardwoods which were published as of 1968 (Table 2). Apparently, species such as blackgum, black cherry, basswood, and elm so frequently occur as minor components of uneven-aged stands that a suitable number of trees for site index determination are not available.

#### Site Index Comparisons

Forest managers frequently need information which will enable them to choose which species to grow on a particular site. In the Piedmont, for example, natural forest succession leads to the replacement of pines by the more tolerant hardwoods. Since there is a diversified market in this area for both pine and hardwood products, the forest manager must decide whether pines or hardwoods are better suited for a specific site. A step towards determining relative productivity is to compare the site index of several species on comparable sites. Combining this information with knowledge about timber quality, yields per acre, and marketability will aid the landowner in deciding which species to grow.

Yellow-poplar, white oak, black oak, scarlet oak, southern red oak, northern red oak, sweetgum, plus shortleaf and Virginia pine, site index curves have been compared for the Virginia-Carolina Piedmont (Olson Della-Bianca, 1959). Site index equations, from which site index curves were constructed, were developed for oak, yellow-poplar, and shortleaf pine growing in mixed pine-hardwood forests. Published site index curves were used for sweetgum and Virginia pine. Site index information for all species is shown in Table 3.

Yellow-poplar was found to be the only reliable species to use as an independent variable in formulating site index prediction equations. If the site index of yellow-poplar is measured by conventional methods, the site index of the other species can be estimated from Fig. 25.

Nelson and Beaufait (1956) compared site indexes of species growing on the same plots in the Georgia Piedmont. They found no significant differences in the site index of sweetgum and yellow-poplar. Black oak, scarlet oak, and southern red oak had the same site index but northern red oak, white oak, and loblolly pine were charted separately. The comparisons of site indexes are shown in Fig. 26.

One significant result of this study is the observation that southern red oak and yellow-poplar will outgrow loblolly pine only on the better-than-average sites.

Further comparisons of the site indexes of scarlet oak, northern red oak, chestnut oak, white oak, black oak, yellow-poplar, white pine, Virginia pine, shortleaf pine, and pitch pine, have been made by DeLong (1957) primarily for western North Carolina and northern Georgia.

indexes of pairs of species occurring on the same plot were compared using regression coefficients and mean site index values of the species in each regression equation. Twelve equations of the form  $Y = \bar{y} + b(X - \bar{x})$ , where Y equals the site index of one species and X equals the site index of another species, were tested. No significant differences were found in the site indexes of scarlet, black, chestnut, and northern red oak. The relationship between the site index of these oaks and white oak was:

$$\text{white oak site index} = -1.088 + 0.929 (\text{scarlet, black, northern red, or chestnut oak site index}).$$

Similarly,

$$\text{scarlet, black, northern red, or chestnut oak site index} = 27.642 + 0.586 (\text{yellow-poplar site index}).$$

These equations can be used to estimate the site index of one species when the site index of the second species is known. These relationships are also shown in chart form in Fig. 27.

Ike's (1970) comparisons of site index for several species in northern Georgia, using scarlet oak as the index species, are given in Table 4.

#### Hardwood Soil-Site Studies

It is sometimes desirable to be able to estimate site index from observations or measurements of certain features of the land such as soil and topography, particularly when an area is not now occupied by trees suitable for site index determination (Phillips and Markley, 1963). Much information has been gathered relating tree growth to site factors such as soil, climate, and topography. Most of these soil-site studies are based on multiple-regression analysis of site index or tree height measurements and related soil, climatic, and topographic factors. From these regressions, site-prediction tables are developed for the field estimation of site quality of all potential forest lands regardless of present vegetation type. Species comparison studies then allow the site estimates to be extended to other species which might be considered for the site.

Certain trends in site quality changes associated with soil and topography can be observed. All tree species seem to respond favorably to better site conditions, although this response may vary between species.

The most important soil conditions are normally soil depth, soil texture and stone content, and soil drainage. In general, site quality increases as soil depth increases, especially the surface soil layers where most tree roots are concentrated. The best sites are usually associated with medium-textured soils, site index decreasing for both coarse texture and fine texture. Site index usually decreases as stone content increases and as soil drainage becomes poorer.

Topographic features which most affect site quality are slope position, aspect, slope steepness, slope shape, elevation, and latitude. Lower slopes, north and east aspects, and gentle concave-shaped slopes are usually the best sites. The poorer sites are commonly found on upper slopes, on narrow ridges, on south and west aspects, and on steep, convex-shaped slopes. Topography affects site quality only indirectly through microclimate, soil moisture, and soil development (Carmean, 1970).

Site features important in one area may be unimportant in another. Sometimes a feature may show positive effects on site in one area and negative effects in another. Because of the different results between areas, soil-site predictions are applicable only to the particular area studied, and to the specific soil and topographic conditions observed. For example, results obtained for upland oaks in Ohio should not be applied to oaks in Virginia, where soils, topography, and climate are different (Carmean, 1971a).

Height growth of northern red oak, scarlet oak, white oak, black oak, chestnut oak, and yellow-poplar were studied in relation to differences in soil and topography in the northeast Georgia section of the Blue Ridge Mountains by Ike and Huppuch (1968). The relations of soil and site factors to site index of these hardwoods are shown in Tables 5 through 10. These tables must be used with caution outside the area for which they were constructed.

Della-Bianca and Olson (1961) have formulated height-age curves for yellow-poplar, white oak, shortleaf pine, scarlet oak, and black oak in the Piedmont. Mean height-age curves based on soil-site equations are shown in Fig. 28. These curves are applicable only to undisturbed hardwood forests, or to recently cutover land which was formerly stocked with similar stands. They should not be extended to include recently abandoned fields or severely disturbed forests. Some properties of Piedmont soils associated with mean site index and site index extremes are shown in Table 11.

On the Bent Creek Experimental Forest in North Carolina, Doolittle (1957) found no significant differences in the site index of scarlet oak and black oak. He examined 20 properties of soil and topography in a preliminary analysis. Depth of the A horizon was found to be the independent variable most strongly influencing scarlet and black oak site index. Percent sand in the A horizon has the second highest correlation, and position on slope the third. The final equation he developed for predicting site index was:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_8X_8,$$

$$\text{or } Y = 38.7690 + 8.8057X_1 - 0.0477X_2 - 0.4620X_8;$$

where Y = site index,

$X_1$  = depth of A horizon,

$X_2$  = position on slope, and

$X_8$  = percent of sand in A horizon.

This equation accounted for 95.74 percent of the total variation in predicting site index for black oak and scarlet oak.

Trimble and Weitzman (1956), on a study area in West Virginia and western Maryland, compared the site indexes of other oaks to northern red oak as follows:

(Site index of northern red oak taken as 1.0)

white oak	.95
black oak	.97
chestnut oak	.98
scarlet oak	1.03.

Four variables were found to have important influences on oak site index in the Trimble and Weitzman study region: 1) aspect, 2) distance from ridge line, 3) slope percent, and 4) total soil depth to rock. The resulting site index equation was:

$$Y = 1.9702 - 0.0618X_1 + 0.0012X_2 - 0.0020X_3 - 0.1509X_4,$$

where  $Y = \log_{10}$  site index,

$X_1$  = sine of the azimuth clockwise from southeast + 1 (aspect),

$X_2$  = percent distance from ridge line (slope position),

$X_3$  = percent slope of the plot (grade), and

$X_4$  = 1/soil depth in feet.

The  $R^2$  for this equation is 0.8683. The highest correlation of the four variables was for slope position: 0.5299. From the above prediction equation, Table 12 was constructed.

The Trimble and Weitzman equation for oak site index in the Mountain Province of West Virginia and western Maryland was found by Yawney and Trimble (1968) to consistently overestimate oak site index in the Ridge and Valley Region of West Virginia and Maryland by 3 to 25 feet. This overestimation is most likely explained by climatic differences--higher temperatures and less rainfall in the Ridge and Valley Region.

A new site index prediction equation was developed for the Ridge and Valley region of West Virginia and Maryland which relates average tree height to five independent variables: stand age, aspect, slope position, thickness of the A + B horizon, and pH of the A<sub>2</sub> horizon. Stand age was by far the most important independent variable, accounting for more than half of the total explained variation in site index. The Yawney and Trimble equation relating age and soil and topographic variables to tree height is:

$$\log_{10} \text{ of average tree height} = 1.8807 - 9.7538X_1 - 0.0336X_2 \\ + 0.0006X_3 - 0.5071X_4 + 0.0261X_5;$$

where  $X_1$  = 1/stand age,

$X_2$  = the sine of the azimuth clockwise from southeast + 1,

$X_3$  = percent distance from the ridge line,

$X_4$  = reciprocal of thickness of A + B horizons in inches, and

$X_5$  = pH of the  $A_2$  horizon.

The multiple correlation coefficient for this equation is 0.824.

Yawney (1964) tested the Trimble and Weitzman equation for oak site index on Belmont limestone soils in the Allegheny Mountain region of West Virginia and found it incompatible with oak growing on these soils. He developed a regression equation for predicting oak site index on Belmont limestone soils using the following variables:

$Y$  =  $\log_{10}$  site index,

$X_1$  = sine of the azimuth clockwise from southeast + 1,

$X_2$  = percent of distance from ridge line,

$X_3$  = slope percent of the plot, and

$X_4$  = 1/soil depth in feet.

The resulting equation is:

$$Y = 1.9792 - 0.0146X_1 + 0.0002X_2 - 0.0007X_3 - 0.1691X_4.$$

The  $R^2$  for this equation is 0.503.

Yellow-poplar requires special qualities of site such as deep, permeable, well-drained, but moist soil, and shelter from drying winds. Auten (1945a) found that for Central States yellow-poplar, site index was directly correlated to depth of soil to tight subsoil as well as to thickness of the upper organic-enriched mineral horizon.

Tryon *et al* (1960) discussed the relationship between height growth of yellow-poplar and 1) thickness of the  $A_1$  horizon 2) depth to tight subsoil, and 3) depth to mottling. Tree height was found to be best correlated to thickness of the  $A_1$  horizon.

Soil characteristics related to site index of sweetgum were studied on Maryland's Eastern and Western Shores by Phillips (1966). Productivity expressed as height rather than site index, was estimated by a regression equation based on the percent of silt, clay, and sand in the  $B_2$  soil horizon. The results of this equation are shown in Table 13.



Phillips and Markley (1963) found for sweetgum in New Jersey that depth of soil to free water could be used to explain about half of the variation in site index. Average depths of 20 inches to free water were correlated to best site index values. Lowest site index values occurred on soils with very high or very low water tables and with fluctuations of 2 feet or more.

Soil factors were also correlated to sweetgum site index by Phillips and Markley. The best correlation was with texture and thickness of the B<sub>2</sub> horizon, along with a factor expressing permeability. The effect of soil factors on site index of sweetgum is shown in Fig. 29.

According to Losche (1973) the most favorable sites for black walnut include the following characteristics of topography and soils:

- (1) On smooth and gently rolling landscapes, site position is not as critical as soil characteristics.
- (2) On strongly rolling and mountainous landscapes the better sites are found on lower north- and east-facing slopes, stream terraces, and floodplains.
- (3) Sandy loams, loams, and silt loams are the most suitable topsoils. Subsoils should have the same texture or a sandy clay loam or clay loam.
- (4) Good soil drainage is essential for best walnut growth. Yellowish- or reddish-brown color to 3 feet or more indicates a well-drained soil. Soils with evidence of mottling within 2 feet of the surface or soils with red, yellow, or gray spots show evidence of poor drainage.

Auten (1945b) showed the correlation of site indexes of black walnut and black locust to variations in soil properties. Subsoil properties were classified by code number, and site indexes of black walnut and black locust were listed according to subsoil properties and code numbers (Tables 14 and 15). Thickness of the A horizon was also found to be positively related to site index. This relationship is shown in Fig. 30.

Some of Auten's conclusions regarding soil influences on black walnut and black locust site index were:

- (1) soils with slow drainage are unfavorable for both species;
- (2) excessively dry soils are poor sites for both species;
- (3) sandy loams, loams, and silt loams are preferable for both species over clay and silty clay loams;
- (4) soil reactions between pH 4.6 and 8.2 have little relation to site index;

- (5) growth is best for both species on lime-derived soils; and
- (6) soils without pronounced subsoil development are best for both species.

Soil-site studies for the remaining commercially important hardwoods are rather scarce, especially studies related to Virginia species. Among the works which may have some relevance to Virginia's hardwoods are Westveld's (1933) study of soil characteristics as they influence the growth of sugar maple in northern Michigan. The influence of certain topographic features on sugar maple site index in Vermont was described by Post (1969). Ward *et al* (1965) have described a technique for determining black cherry site index on good and medium sites in northern Pennsylvania.

In some soil-site studies difficulty relating hardwood site index to soil and topography has been experienced. Broadfoot (1969), for example, was unable to develop accurate height growth curves for southern hardwoods from quantifiable soil-site characteristics. His equation for predicting height growth of sweetgum, after examining 34 variables, explained only 34 percent of the variation in height growth. The site index prediction equation was tested on 126 plots and the correlation coefficient ( $r$ ) between observed and predicted site index was only 0.21.

Broadfoot felt that the lack of predictive ability was due to the inability to measure the true causes of productivity--moisture and nutrient availability during the growing season, soil aeration, and physical condition including root growing space. An incomplete sampling of the conditions under which southern hardwoods grow probably also contributed to the lack of precision in his prediction equations.

Equations which represent small geographic areas or restricted conditions, which is the case with most site index prediction equations based on soil-site factors, are of limited value to the forest manager. However, the Broadfoot study suggests that sites cannot be accurately evaluated for southern hardwoods with equations derived over extensive land areas. The hope for future soil-site studies is that new expressions of the determinants of productivity will be found (ibi

#### HARDWOOD YIELDS

In Schnur's (1937) study of even-aged stands of upland oaks, the average age of the dominant and codominant trees was used as the stand age. Site index was defined in the usual way, as the height attained by the average dominant and codominant oaks at the age of 50 years. The relationship between stand volume, age, and site is shown graphically in Fig. 31, and in tabular form in Table 16. Likewise, Fig. 32 shows the yields per acre in merchantable cubic volume, and Fig. 33 depicts the per acre yields in board feet, International rule (1/8-inch kerf). These curves show the steady increase in volume yields associated with advancing age. The same information, in table form, is presented in Tables 17 through 19.

Using an average factor of 85 cubic feet of solid wood per cord, the merchantable cubic foot yield was converted to cords, as shown in Table 20. A set of total cubic volume values by age, site index, and density classes is given in Table 21. The improvement which the inclusion of density makes in the estimates of yields is shown in Table 22. Figure 34 can be used to obtain the percent average density of a stand when the average tree diameter and the number of trees per acre are known (Schnur, 1937).

A normal yield table for second-growth yellow-poplar was published by McCarthy (1933). Included in this table are height-growth-age data, estimates of diameters, trees per acre, and basal area per acre, as well as cubic foot and board foot yields.

Present yields of natural, unthinned stands of yellow-poplar at various ages by site index and density class have been published by Beck and Della-Bianca (1970). Their data were collected in the Appalachian Mountains of Virginia, North Carolina, and Georgia. Yield estimates were obtained by determining volumes of individual trees of specified diameters and heights and applying these volumes to the number of trees in each diameter class for a given combination of age, site index, and stand density. These yield estimates are shown in Tables 23 to 26.

Schlaegel et al (1969) developed empirical yield tables for yellow-poplar in eastern West Virginia. The equation used for developing the cubic foot yield of the entire stem, inside bark was:

$$\text{Log}_e V = 4.7123 + 0.0071(S) + 0.6167(\text{Ln}B) - 7.7335(A^{-1});$$

where  $\text{Log}_e V$  = the natural logarithm of volume per acre,

S = the stand site index in feet,

B = the total stand basal area in square feet, and

A = the mean stand age, in years, of all dominants and codominants

This equation accounted for 99.9838 percent of the variation about the mean yield.

Merchantable cubic foot yield to a four-inch top outside bark was estimated by the equation:

$$\text{Log}_e V = 3.5273 + 0.0026(S) + 0.9797(\text{Ln}B) - 9.6732(A^{-1}).$$

And the board foot yield per acre, International 1/8-inch rule, was estimated by:

$$\text{Log}_e V = 8.1985 + 0.0164(S) + 0.2810(\text{Ln}B) - 68.0099(A^{-1}).$$

These two equations had respective  $R^2$  values of 99.9955 and 98.3454. Tables 27 through 29 are the empirical yield tables for West Virginia yellow-poplar.

In a related study on West Virginia yellow-poplar, Schlaegel and Kulow (1969) developed a model for predicting growth which gave compatible yield results. Clutter's (1963) procedure for developing equations to predict yield from growth was used in this study. The results were presented as a set of five equations which can be used to establish growth and yield relationships. These equations are:

Cubic foot yield,

$$\text{Log}_e V = 4.7123 + 0.0071(S) + 0.6167(\text{Log}_e B) - 7.7335(A^{-1});$$

Basal area growth rate,

$$dB/dA = B(5.9358 - \text{Log}_e B)A^{-1};$$

Cubic foot growth rate,

$$dV/dA = V(1.5261 - 0.0380 (\text{Log}_e B)A^{-1});$$

Projected basal area,

$$\text{Log}_e BP = 5.9358 - A^{\circ}A_p^{-1} (5.9358 - \text{Log}_e B^{\circ}); \text{ and}$$

Projected cubic foot volume,

$$\text{Log}_e VP = \text{Log}_e V^{\circ} + 1.3003(\text{Log}_e VP - \text{Log}_e V^{\circ}) + A^{\circ}(A_p^{-1} - A^{\circ^{-1}}) \\ (0.0380\text{Log}_e B^{\circ} - 0.2258),$$

where  $\text{Log}_e V$  = the natural logarithm of inside bark cubic foot plot  $v$

$S$  = site index in feet,

$A$  = stand age in years,

$B$  = stand basal area in square feet,

$dB/dA$  = instantaneous rate of basal area growth,

$dV/dA$  = instantaneous rate of cubic foot growth,

$B^{\circ}$  = initial basal area,

$A^{\circ}$  = initial age,

$BP$  = projected basal area,

$AP$  = predicted age,

$VP$  = projected cubic foot yield per acre, and

$V^{\circ}$  = initial cubic foot yield.

These equations are shown in graphical form in Figs. 35 through 40 (Schlaegel and Kulow, 1969).

Using data from pure, well-stocked, even-aged stands of sweetgum in New Jersey, Phillips (1961) developed several yield equations and constructed a cubic foot volume table for old-field sweetgum stands. Two types of yield equations were developed: those for estimating present stand volume, and those for predicting future volumes. Phillips' final equation for predicting future stand volumes is:

$$\text{Yield} = 580 + 0.813(\text{site index})^2(\text{age})(\text{basal area})(10^{-4}).$$

The error of estimate is  $\pm 385$  cubic feet. Solution of this equation for a range of values for each independent variable results in the yield table shown as Table 30. In this table two values of basal area and yield are given for each site index and age class. The normally expected basal areas and yield are halfway between the two (Phillips, 1961).

Boisen and Newlin (1910) calculated the average yields of hickory per acre based on measurements in pure, even-aged stands. Site index was not considered in their yield values, as shown in Table 31.

Yields of pure, even-aged, well-stocked stands of ash on different quality sites were tabulated by Sterrett (1915). The quality classes were high (Quality I), average (Quality II), and low (Quality III). No precise explanation was given as to how these quality classes were determined. Sterrett's yield table, shown as Table 32, represents conservatively the production possibilities of ash stands under management on fair to good sites.

#### Yields of Mixed Hardwood Stands

Yield tables for essentially even-aged, mixed stands of southern hardwoods on ten working forest site types were distributed as the first installment of the Hardwood Growth and Yield Study of the North Carolina State University--Industry Hardwood Research Program (Kellison, 1972). These tables were constructed through regression analysis from data on fully stocked or overstocked stands and stands showing the greatest potential for production; thus the average forest may not achieve these yields.

After examining nine variables with biological relationships to yield, five were chosen for inclusion in the yield equations: age, number of unmerchantable trees per acre, number of merchantable trees per acre, total basal area per acre, and average merchantable height of merchantable trees per acre. The yield equations for each of the ten working forest types and the single equation for all forest types combined were of the form:

$$\begin{aligned} \text{Volume (cu. ft.)} = & \text{Constant} + b_1 \text{ Age} + b_2 \text{ Unmerchantable Trees} \\ & \text{Per Acre} + b_3 \text{ Merchantable Trees Per Acre} + \\ & b_4 \text{ Basal Area Per Acre} + b_5 \text{ Average Merchantable} \\ & \text{Height of Merchantable Trees Per Acre.} \end{aligned}$$

The eleven yield equations, their coefficients of determination, and their standard deviations are shown in Table 33.

A second set of yield equations was developed with the unmerchantable trees variable deleted. These equations, with their coefficient of determination and standard deviations are shown in Table 34.

The yields of the ten working forest types developed from the first set of equations are shown in Tables 35 through 45. Yield values developed from the second set of equations are given in Tables 46 through 56.

#### Thinning Effects

Intensive forest management is seriously handicapped by a lack of information on either the quantitative or qualitative aspects of growth and yield of thinned hardwood stands. This information can be used in selecting a thinning practice from various thinning alternatives which best meets a particular objective. Information on the changes in physical yields resulting from thinning, plus information on the costs of thinnings and the values of yields, enables the forest manager to select the highest priority stand treatment (Dale, 1972).

Stand density is normally high in both even-aged and uneven-aged hardwood stands. Whereas many stands are considered understocked this term usually refers to an understocking of trees of high quality or desired species, and not to an understocking in terms of stems per acre.

Many desirable species such as black walnut and yellow-poplar are intolerant to shade; therefore, they succumb to natural mortality if unable to maintain a dominant crown position. Trees growing in dense stands are often of low vigor and grow far below their potential rates. Thinnings are designed to distribute the growth of a stand among the most desirable trees by removing the trees of less desirable species and those with poor form or slower growth rates.

Thinning may be done either for present gain or for future benefit. Thinning for future benefit involves improving the residual stand, giving top priority to the quality, vigor, and spacing of the residual trees. Thinning for present gain gives only secondary importance to the condition of the remaining stand.

Precommercial thinnings, usually undertaken in young, vigorous stands of desirable species on good sites, can lead to more favorable species composition and to improved tree spacing and vigor. These early thinnings can also lead to a decline in stem quality due to epicormic branching in less dense stands. Thinning hardwoods may therefore be a question of balance between volume production and quality yields.

In some instances, thinnings lead to no increases, or even to actual decreases, in total yields. However, thinnings have produced substantial growth responses in the South. Thinning results are evidently more dependent on species composition, tree vigor, and potential stem quality than on the increase in growth rates of the residual stems which result from lower stand densities. A thinning policy favoring the fast growing species seems to offer a substantial increase in yields over a policy which ignores species composition (Gingrich, 1970).

Some hardwoods are not favorable subjects for thinning, although species such as the oaks can survive for many years under high density conditions and respond positively to thinning. Holcomb and Bickford (1952) have developed a procedure for classifying yellow-poplars into vigor classes, and have found that trees in the high vigor classes produce substantially greater volume growth when thinned than trees in the low vigor class.

Gingrich (1971) found that for thinnings in oak stands, the age when thinnings begin is one of the most important factors to consider when managing for maximum timber production. He found the yield in cubic-foot volume and standard cords to be more than 50 percent greater when thinning starts at age 10 rather than at age 60.

In evaluating the effects of thinning oak stands in the Central States, Gingrich first gives, for comparison, the yields per acre of upland oak with no thinnings (Table 57). During the development of normal stands, about 90 percent of the trees present at age 20 will die during the next 60 years. In this table, mean annual growth culminates between ages 50 and 70. The average tree at age 80 on site 55 will be about 12 inches in diameter, whereas the dominant trees on site 75 at age 80 will average about 18 inches in diameter.

The yields which result in stands that have been thinned at 10 year intervals, beginning at different points in the life of an even-aged stand, are shown in Tables 58 through 65.

Information on the growth and yield of oak stands 10 years after initial thinning was presented by Dale (1972). All of the equations for growth and yield estimates were developed from a set of 154 permanent growth plots where responses were observed over 5- to 12-year periods. Although species composition does affect growth and yield, species differences were ignored for this study.

Cutting for thinning purposes varied from very light or none to removal of 70 to 80 percent of the original stand basal area. Basal area after thinning ranged from 20 square feet per acre up to about 110 square feet per acre. A "free thinning" procedure was followed, in which the marker removed trees in all crown classes, striving for a suitable number of desirable stems evenly spaced over the plot.

Growth and yield predictions in table form (Tables 66-73) were developed from the regression equations shown in Table 74. A wide range of stand age, site quality, and basal area classes is covered by the tables. The yield table data indicate that maximum growth in basal

area and total cubic foot volume occurs with a low stocking, usually between 30 and 60 square feet of residual basal area regardless of site or stand age. Initial thinnings to such low densities do, however, tend to increase stem taper, reduce height growth, delay natural pruning, and stimulate epicormic branching (ibid.).

At least 50 percent stocking in upland oak stands is necessary to fully occupy an area with potential crop trees. This stocking discourages the development of excessive understory vegetation and reduces the adverse effects of low densities on stem taper, height growth, natural pruning, and epicormic branching (Gingrich, 1971).

The effects of thinning on even-aged yellow-poplar stands in the Appalachian Mountains of North Carolina, Virginia, and Georgia were studied by Beck and Della-Bianca (1972). Each of their study plots was thinned at installation to obtain a range of basal area for various site-age combinations. Low thinning was used to reduce the stand basal area, and to concentrate the growing stock in the dominant and codominant crown classes.

Stand volume at some projected age was then predicted using the system of compatible growth and yield models developed by Clutter (1963) and later refined by Sullivan and Clutter (1972). These models predict basal area and volume at some projected age when site index, initial age, and basal area are given.

The growth and yield equations developed are:

total cubic foot yield per acre,

$$\log_e Y_2 = 5.36437 - 101.16296(S^{-1}) - 22.00048(A_2^{-1}) + 0.97116(A_1/A_2)(\log_e B_1) + 3.71796(1 - A_1/A_2) + 0.01619(S)(1 - A_1/A_2);$$

total cubic foot yield per acre when  $A_2 = A_1 = A$ ,

$$\log_e Y = 5.36437 - 101.16296(S^{-1}) - 22.00048(A^{-1}) + 0.97116(\log_e B)$$

and

projected basal area yield per acre,

$$\log_e B_2 = (A_1/A_2)(\log_e B_1) + 3.82837(1 - A_1/A_2) + 0.01667(S)(1 - A_1/A_2)$$

where  $Y_2$  = stand volume at some projected age  $A_2$ ,

$A_1$  = present age =  $A$ ,

$S$  = site index,

$B_1$  = present basal area =  $B$ ,

$B_2$  = stand basal area at some projected age  $A_2$ , and

$Y$  = present stand volume.

The fit of these equations to the data compares favorably with the results for loblolly pine reported by Sullivan and Clutter. Table 75 shows the estimates of present yellow-poplar stand volume in total cubic feet per acre for various combinations of site index, age and stand basal area. This table was developed using the total cubic foot yield equation when  $A_2 = A_1 = A$ .



### Yields of Uneven-Aged Hardwoods

Providing reliable yield functions for uneven-aged stands has proven to be much more difficult than developing yield functions for even-aged stands, since age is not a usable variable, and site index determination is questionable. Particularly desirable for uneven-aged stands are yield functions which incorporate results from new practices rather than traditional yield estimates in tabular form.

Moser and Hall (1969) discussed a method for deriving time dependent yield functions from the integration of rate equations which do not have time or age as an independent variable. They provide a yield function expressed in terms of elapsed time from a given initial condition, derived by solving a growth-rate equation expressed as a function of measurable size characteristics.

A predictive system for the components of net growth in uneven-aged forest stands was derived from data collected on 75 one-fifth acre permanent plots which had 19 consecutive annual remeasurements (Moser, 1971). These successive remeasurements record the history of the stands as progressive changes in the distribution of the system's components.

Recently there has been considerable interest in stand simulation models as yield prediction tools. A computer model, FOREST, for simulating the growth and reproduction of even- or uneven-aged mixed species forest stands has been developed by Ek and Monserud (1974).

#### SUMMARY

The hardwood timber resources of Virginia play an important part in the state's economy. Despite this importance, hardwoods have, for the most part, been placed under no type of intensive forest management. Essential components of a forest management program are information on the yields which can be expected of hardwood stands, and the ability to predict how well trees will grow on particular sites.

Yield data for hardwood species have been published in the form of yield tables, yield curves, and growth and yield prediction equations. The various types of yield tables are normal, empirical, and variable-density yield tables. Growth and yield prediction equations represent the latest development in predicting forest yields.

Site quality is one of the primary determinants of hardwood yields. Several methods have been used to estimate site quality, but site index is generally considered the most practical method. Site index is normally estimated from published curves for even-aged stands of one species. Site index curves for a number of hardwood species found in Virginia are included in this paper.

Site index comparisons enable the forest manager to choose the species which should do best on a given site. Several studies have been completed for the southern hardwoods which enable one to predict site index for one species when the site index of another species is known.

In the absence of a suitable stand of timber for site evaluation, site quality can be estimated from observations on certain features of soil and topography. These soil-site studies are applicable only to the specific area where measurements were made and to the specific features which were measured. Extension to wider area classification systems has not yet been accomplished.

Soil and site influences on hardwood site quality have been studied by numerous researchers. In general, these studies lead to the conclusion that all tree species respond favorably to better site conditions. Some of the features of soils associated with site quality are soil depth, soil texture and stone content, and soil drainage. Topographic features most often affecting site quality are slope position, aspect, slope steepness, slope shape, elevation, and latitude.

Prediction of hardwood yields through yield tables and growth and yield prediction equations have been made by several authors, especially for the oaks, yellow-poplar, and sweetgum. Yield data is not available for many of the commercially important hardwoods because they normally occur as minor components of uneven-aged stands.

Information on yields from thinnings is also an important consideration in forest management. Yields resulting from thinnings in oak and yellow-poplar stands are given.

Predicting yields in uneven-aged stands is more difficult than predicting the yields of even-aged stands. Examples of approaches taken to yield prediction in uneven-aged stands are cited.

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APPENDIX

Table 1.--Site index relationships for upland oak.

Oak species or group	Region	Plots	Mean site index	Site index equations <sup>1/</sup>	
				a-intercept	Slope coefficient (b)
		Number	Feet		
Chestnut	Mountains	105	58	1.953	<sup>2/</sup> -9.5639
White	Mountains	54	60	1.968	
Scarlet	Mountains	167	65	2.001	
Black	Mountains	60	68	2.022	
Northern red	Mountains	42	72	2.049	
White-southern red	Piedmont	133	69	2.028	
Black	Piedmont	59	72	2.052	
Scarlet-northern red	Piedmont	77	78	2.082	

<sup>1/</sup> Logarithm total height = a + b (reciprocal of total age).

<sup>2/</sup> Constant for all equations.

Source: Olson, David F., Jr. 1959. Site index curves for upland oak in the Southeast. U.S.F.S. Southeastern Forest Exp. Sta., Res. Note 125. 2p.

Table 2.--Site-index curves for eastern hardwood forest species.

Tree species	Area	Author(s)
Upland oaks . . . . .	Eastern States	Schnur
	Piedmont & South Appalachians	Olson
Red oak . . . . .	Lake States	Gevorkiantz
Hickory . . . . .	Central States & Appalachians	Boison & Newlin
Yellow-poplar . . . . .	Central States & Appalachians	McCarthy
	Piedmont & South Appalachians	Beck
Sugar maple . . . . .	Vermont	Curtis & Post
	Vermont	Farrington & Howard
	Vermont	Hawes & Chandler
	New York	Farnsworth & Leaf
Red maple . . . . .	Connecticut & Massachusetts	Foster
Yellow birch. . . . .	Vermont	Curtis & Post
White ash . . . . .	Vermont	Farrington & Howard
		Curtis & Post
Black walnut. . . . .	Central States	Kellogg
Black locust. . . . .	Central States	Kellogg
	Long Island	Hopp & Grober
Sweetgum. . . . .	Maryland	Trenk
	Southern alluvial soil	Winters & Osborne
	Mississippi Valley	Broadfoot & Krinard
Cottonwood. . . . .	Mississippi Valley	Broadfoot
	Central States	Neebe & Boyce
Cherrybark oak. . . . .	Mississippi Valley	Broadfoot
Water oak . . . . .	Mississippi Valley	Broadfoot
Swamp blackgum and tupelo-gum . . . .	Southeastern Georgia	Applequist

Source: Carmean, Willard H. 1970. Site quality for eastern hardwoods. In: The silviculture of oaks and associated species. U.S.F.S. Northeastern Forest Exp. Sta., Res. Paper NE-144:36-56.

Table 3.--Site index of important Piedmont species: Mean, range, and associated species.

Species	Code number	Plots	Mean site index	Highest site index	Lowest site index	Associated Species	
						Plot with highest site index	Plot with lowest site index
		<u>Number</u>	<u>Feet</u>	<u>Feet</u>	<u>Feet</u>	<u>Code Number</u>	<u>Code Number</u>
Yellow-poplar	1	97	83	122	55	2,9	5,7,8
White oak	2	99	69	90	49	1,9	3
Black oak	3	59	73	98	50	1,4,7	2
Scarlet oak	4	55	76	96	56	1,2,3,6,7	1,2,3,7
Southern red oak	5	36	69	88	52	1,2,3,4,6	1,8
Northern red oak	6	23	83	102	72	1,4	1,2,7,8
Shortleaf pine	7	103	64	82	44	1,6,9	3
Virginia pine	8	28	72	93	51	7	2,3,4,5,7
Sweetgum	9	12	90	112	69	1	1,7

Source: Olson, D. F., Jr. and L. Della-Bianca. 1959. Site index comparisons for several tree species in the Virginia-Carolina Piedmont. U.S.F.S. Southeastern Forest Exp. Sta., Res. Paper 104. 9p.

Table 4.--Site index comparisons for species growing on the same mountainous site in northeast Georgia.

Scarlet Oak Site Class	Black Oak	Pitch Pine	Chestnut Oak	White Oak	:	Shortleaf Pine	:	Yellow- Poplar	:	Eastern White Pine	:	Virginia Pine
----- Total Height at 50 Years (Feet) -----												
40	-	-	-	35	:	-	:	-	:	-	:	-
50	-	45	45	40	:	50	:	-	:	-	:	-
60	60	55	55	50	:	60	:	-	:	-	:	70
70	65	65	60	60	:	65	:	-	:	-	:	-
80	75	-	70	70	:	70	:	75	:	90	:	75
90	80	-	75	75	:	80	:	90	:	95	:	80
					:	90	:	100	:	100	:	85

Note: Site index for scarlet oak is used to estimate site index (to nearest 5 feet) for oaks, pitch pine, and shortleaf pine. Shortleaf site index is used to estimate site index of yellow-poplar, eastern white pine, and Virginia pine.

Source: Ike, Albert F. 1970. Species-site relationships for southern Appalachian hardwoods. In: Proc. of Symposium on Southern Appalachian Hardwoods, Sept. 22-23, 1970. p.23-37.

Table 5.--Yellow-poplar site index as related to elevation, slope position, and soil series.

Elevation (feet)	Slope Position	Soil Series		
		Burton	Tusquitee	Other
2,000	U	89	83	78
	M	91	85	80
	L	93	88	82
2,500	U	92	86	81
	M	94	88	83
	L	96	90	85
3,000	U	94	89	83
	M	96	91	85
	L	99	93	88

If site is in sheltered cove, multiply site index by 1.066; if site is on ridge, multiply site index by 0.938.

Adapted from: Ike, A. F., Jr. and C. D. Huppuch. 1968. Predicting tree height growth from soil and topographic site factors in the Georgia Blue Ridge Mountains. Georgia Forest Res. Council Paper 54. 11p.

Table 6.--White oak site index as related to elevation, slope position, aspect, and slope steepness.

Elevation (feet)	Slope Position	Aspect-Slope Factor <sup>1</sup>			
		100	1,000	4,000	7,000
2,000	L	79	77	71	65
	M	79	77	71	65
	U	79	77	70	64
2,400	L	76	74	68	62
	M	72	70	64	59
	U	68	66	61	55
2,800	L	73	71	65	59
	M	65	63	58	53
	U	57	56	51	47
3,200	L	69	67	62	57
	M	59	58	53	48
	U	50	49	45	41

<sup>1</sup>Obtained by multiplying steepness of slope (percent) by ASP (degrees east or west of magnetic north). Thus, a site with a due west exposure (ASP = 90) and a 10-percent slope, would have an aspect-slope factor of 900.

Adapted from: Ike, A. F., Jr. and C. D. Huppuch. 1968. Predict tree height growth from soil and topographic site factors in the Georgia Blue Ridge Mountains. Geor Forest Res. Council Paper 54. 11p.

Table 7.--Scarlet oak site index as related to elevation, slope position, and aspect.

Elevation (feet)	Slope Position	Aspect				
		N	NE NW	E	SE SW	S
2,000	U	75	67	61	55	49
	M	89	80	72	65	59
	L	106	96	86	78	70
2,400	U	74	66	60	53	48
	M	85	76	70	63	56
	L	99	89	80	72	65
2,800	U	73	65	59	53	48
	M	83	74	67	61	55
	L	93	84	76	69	62
3,200	U	72	65	58	53	47
	M	81	73	65	58	53
	L	90	81	73	66	60

Adapted from: Ike, A. F., Jr. and C. D. Huppuch. 1968. Predicting tree height growth from soil and topographic site factors in the Georgia Blue Ridge Mountains. Georgia Forest Res. Council Paper 54. 11p.



Table 8.--Black oak site index as related to slope position and clay content of surface soil (A2 horizon).

Slope Position	A2 Clay Content (percent)					Ignoring Clay Content
	10	15	20	25	30	
U	59	63	66	70	75	65
M	64	68	72	76	81	71
L	71	75	80	84	89	77

Table 9.--Northern red oak site index as related to aspect and elevation.

Elevation (feet)	Aspect				
	N	NE NW	E W	SE SW	
2,000	102	93	84	77	
2,400	93	84	77	70	
2,800	84	77	70	63	
3,200	76	70	63	58	

Adapted from: Ike, A. F., Jr. and C. D. Huppuch. 1968. Predicting tree height growth from soil and topographic site factors in the Georgia Blue Ridge Mountains. Georgia Forest Res. Council Paper 54. 11 p.

Table 10.--Chestnut oak site index as related to steepness of slope and slope position.

Steepness of Slope (percent)	Slope Position <sup>1</sup> (percent)					
	0	20	40	60	80	100
10	46	50	55	60	66	72
20	47	52	57	62	68	75
30	49	54	59	64	71	77
40	51	56	61	67	73	80
50	52	58	63	69	76	83
60	54	60	65	72	78	86

<sup>1</sup>Percent of distance from ridge to stream with ridge as zero.

Adapted from: Ike, A. F., Jr. and C. D. Huppuch. 1968. Predicting tree height growth from soil and topographic site factors in the Georgia Blue Ridge Mountains. Georgia Forest Res. Paper 54. 11p.

Table 11.--Some properties of Piedmont soils associated with mean site index and site index extremes.

Species	Site index <sup>1</sup> group	Plots	Organic matter in A <sub>1</sub>		Thickness A <sub>1</sub> Inches	Depth to B <sub>2</sub> Inches	IWV <sup>2</sup> B <sub>2</sub> Percent	Soil separates in A <sub>2</sub> <sup>3</sup>		
			Number	Percent				Sand	Silt	Clay
Yellow-poplar	Mean (83)	98	10.6	2.3	12.9	6.7	54	25	21	
	Low (64)	9	10.9	1.6	11.2	7.1	56	23	21	
	High (108)	8	8.9	3.2	19.4	5.8	55	26	19	
White oak	Mean (69)	97	12.3	1.9	12.6	7.0	53	26	21	
	Low (55)	11	17.8	1.1	10.0	6.6	43	34	23	
	High (84)	5	6.8	3.5	15.0	6.0	57	23	20	
Scarlet oak	Mean (76)	54	13.3	1.8	12.2	7.3	52	27	21	
	Low (63)	12	17.5	1.4	13.1	6.9	42	33	25	
	High (94)	5	9.9	2.4	11.4	7.7	55	24	21	
Black oak	Mean (73)	59	12.6	1.7	12.1	6.9	52	27	21	
	Low (60)	9	16.1	1.4	9.6	7.8	44	32	24	
	High (91)	5	10.1	2.1	10.9	7.5	57	23	20	
Shortleaf pine	Mean (64)	101	12.8	1.9	12.5	7.3	52	26	22	
	Low (49)	9	17.6	1.2	13.6	5.9	46	30	24	
	High (80)	12	7.9	3.4	16.2	6.8	57	23	20	

<sup>1</sup>Average height of dominant and codominant trees at 50 years of age.

<sup>2</sup>Inbibitional water value.

<sup>3</sup>According to International size classification: (2.0-0.02 mm)=sand; (0.02-0.002 mm)=silt; (less than 0.002 mm)=clay.

Source: Della-Bianca, L. and D.F. Olson, Jr. 1961. Soil-site studies in Piedmont hardwood and pine-hardwood upland forests. For. Sci. 7:320-329.

Table 12.--Site index of oak as related to aspect, slope, and total soil depth.

Aspect	Soil depth (feet)	Slope percent							
		10	30	50	70	10	30	50	70
		TOP OF SLOPE				UPPER SLOPE			
SW (225°)	0.5	34	31	28	26	37	33	31	28
	1.0	46	43	40	36	52	47	43	39
	2.0	57	52	47	43	62	56	51	47
	3.0	60	55	50	45	65	60	54	50
NW (315°) and SE (135°)	0.5	39	35	32	29	42	39	35	32
	1.0	55	50	46	42	60	55	50	45
	2.0	65	59	54	49	71	65	59	54
	3.0	69	63	57	52	75	69	63	57
NE (45°)	0.5	45	41	37	34	49	44	41	37
	1.0	63	58	53	48	69	63	57	52
	2.0	75	69	63	57	82	74	68	62
	3.0	80	73	66	60	87	79	72	66
		LOWER SLOPE				BOTTOM OF SLOPE			
SW (225°)	0.5	40	37	33	30	44	40	37	33
	1.0	57	52	47	43	62	57	52	47
	2.0	68	62	56	51	74	68	62	56
	3.0	72	65	59	54	78	72	65	60
NW (315°) and SE (135°)	0.5	46	42	39	35	50	46	42	38
	1.0	66	60	55	50	72	66	60	54
	2.0	78	71	65	59	85	78	71	65
	3.0	83	75	69	63	91	83	75	69
NE (45°)	0.5	53	49	44	41	58	53	49	44
	1.0	76	69	63	57	83	76	69	63
	2.0	90	82	75	68	99	90	82	75
	3.0	95	87	79	72	104	95	87	79

Source: Trimble, G.R., Jr. and S. Weitzman. 1956. Site index studies of upland oaks in the northern Appalachians. For. Sci. 2:162-173.

Table 13.--Sweetgum site index on soils of the Delaware-Maryland-New Jersey Coastal Plain.<sup>1</sup>  
(In feet at 50 years of age)

A					
Clay in B <sub>2</sub> horizon (percent)	Alluvial soils with silt contents in B <sub>2</sub> horizon of--			Residual soils with silt contents in B <sub>2</sub> horizon of--	
	50 percent or more	16-49 percent	15 percent or less	16 percent or more	15 percent or less
5	65	75	71	65	61
10	68	77	73	68	64
20	73	82	78	73	69
30	78	88	83	78	74
40	83	93	88	83	79
50	88	98	94	83	84
55	—	100	96	91	86

B		
Fine sand in B <sub>2</sub> horizon (percent)	Depth to tight B <sub>2</sub> horizon	
	13 inches or more	12 inches or less
5	+ 1	- 2
10	+ 2	- 2
20	+ 4	0
30	+ 6	+ 2
40	+ 8	+ 4
50	+10	+ 6
60	+11	+ 8
70	+13	+10
75	+14	+11

<sup>1</sup> First obtain base value in A; then correct as indicated in B. Estimated site index is the result of adding these two values.

Source: Phillips, John J. 1966. Site index of Delaware-Maryland sweetgum stands in relation to soil characteristics. U.S.F.S. Northeastern Forest Exp. Sta., Res. Note NE-48. 5p.

Table 14.--Classifications of subsoil properties by code number for black locust and black walnut site indexes.

Code no.	Internal drainage	Code no.	Plasticity when wet	Code no.	Compactness when moist	Code no.	Color <sup>2</sup>
1	Very slow	1	Very highly plastic. Practically impossible to knead into a ball in hands.	1	Very compact. Breaks into lumps, very difficult or impossible to pulverize in hands.	1	Blue or drab-mottled below 8 inches.
2	Slow	2	Highly plastic. Kneads into a ball with difficulty, very fatiguing to hands.	2	Moderately compact. Reduced only by considerable pressure to coarse granules which are pulverized only by considerable pressure.	2	Yellowish gray, mottled gray to rusty brown below 14 inches.
3	Fair	3	Moderately plastic. Kneads stiffly.	3	Friable. Pulverizes with moderate pressure to mass of moderately resistant granules.	3	Grayish yellow to yellow, mottled gray to yellow below 14 to 24 inches.
4	Moderate	4	Slightly plastic. Kneads into a ball easily; can be rolled into a wire between palms.	4	Mellow. Pulverizes to mass of fine soft granules.	4	Grayish brown to yellow and mottled below 36 inches.
5	Good to fast	5	Very slightly plastic. Wire barely formable between palms without crumbling.	5	Slightly coherent. Pulverizes completely with slight pressure.	5	Yellow to yellow-brown with little or no mottling.
6	Good to very fast	6	Non-plastic. Crumbles and cannot be rolled into a wire.	6	Non-coherent, loose.	6	Yellowish brown to reddish brown; no B horizon, no mottling.

Table 15.--Site indexes by subsoil properties and code numbers. (as given in Table 14).

Subsoil property	Black locust						Black-walnut					
	1	2	3	4	5	6	1	2	3	4	5	6
Drainage .....	46	57	62	68	92	110	45	57	53	61	64	65
Plasticity .....	48	66	77	83	108	117	56	56	63	60	67	7
Compactness .....	56	69	79	97	101	117	56	61	61	62	63	69
Color .....	47	56	65	72	84	103	43	54	57	62	61	69
Profile number <sup>1</sup> .....	50	51	66	86	80	97	50	56	59	63	66	76

<sup>1</sup>Profile number is a general expression of the composite effect of all other soil properties governing drainage.

<sup>2</sup>Subsoil plasticity 6 is not represented here because all plasticity 6 subsoils were in the excessively drained group that was removed as explained in the section on dry sites.

Source: Auten, John T. 1945b. Some soil factors associated with site quality for planted black locust and black walnut. J. For. 43:592-598.

Table 16.--Yield per acre of upland oak in cubic feet, excluding bark (all trees 0.6 inch d.b.h. and larger included).

Total age (years)	Yield per acre by site index--					Total age (years)	Yield per acre by site index--				
	40	50	60	70	80		40	50	60	70	80
	Cu. ft.	Cu. ft.	Cu. ft.	Cu. ft.	Cu. ft.		Cu. ft.	Cu. ft.	Cu. ft.	Cu. ft.	Cu. ft.
10.....	205	270	345	410	490	60.....	1,540	2,040	2,590	3,115	3,690
15.....	345	450	575	695	815	65.....	1,660	2,210	2,785	3,350	3,950
20.....	495	635	805	975	1,145	70.....	1,765	2,355	2,970	3,575	4,225
25.....	625	820	1,010	1,250	1,470	75.....	1,875	2,500	3,150	3,795	4,480
30.....	755	1,000	1,265	1,525	1,785	80.....	1,975	2,645	3,325	4,000	4,735
35.....	900	1,180	1,495	1,800	2,120	85.....	2,075	2,770	3,490	4,205	4,975
40.....	1,030	1,360	1,725	2,075	2,440	90.....	2,175	2,900	3,655	4,400	5,200
45.....	1,165	1,540	1,945	2,350	2,760	95.....	2,275	3,020	3,810	4,595	5,420
50.....	1,300	1,720	2,165	2,610	3,035	100.....	2,375	3,140	3,970	4,780	5,650
55.....	1,420	1,895	2,385	2,870	3,400						

Table 17.--Yield per acre of upland oak in cubic feet of merchantable stem, including bark, to a 4-inch top outside bark.

Total age (years)	Yield per acre (merchantable) by site index--					Total age (years)	Yield per acre (merchantable) by site index--				
	40	50	60	70	80		40	50	60	70	80
	Cu. ft.	Cu. ft.	Cu. ft.	Cu. ft.	Cu. ft.		Cu. ft.	Cu. ft.	Cu. ft.	Cu. ft.	Cu. ft.
10.....	0	0	0	10	20	60.....	1,420	2,050	2,500	3,480	4,160
15.....	0	20	40	80	190	65.....	1,590	2,220	3,050	3,770	4,480
20.....	20	70	170	360	620	70.....	1,750	2,510	3,290	4,030	4,770
25.....	100	250	510	820	1,170	75.....	1,900	2,710	3,510	4,280	5,060
30.....	270	540	880	1,270	1,690	80.....	2,050	2,900	3,730	4,510	5,340
35.....	480	820	1,240	1,890	2,160	85.....	2,200	3,070	3,920	4,740	5,600
40.....	680	1,090	1,580	2,090	2,610	90.....	2,330	3,230	4,120	4,960	5,870
45.....	870	1,350	1,910	2,470	3,040	95.....	2,460	3,380	4,300	5,180	6,130
50.....	1,080	1,600	2,230	2,870	3,450	100.....	2,590	3,520	4,480	5,400	6,380
55.....	1,240	1,840	2,520	3,180	3,820						

Table 18.--Yield per acre of upland oak in board feet, International rule, 1/8-inch saw kerf, to a 5-inch top inside bark, including all trees having at least one 16-foot log.

Total age (years) <sup>1</sup>	Yield per acre by site index--					Total age (years) <sup>1</sup>	Yield per acre by site index--				
	40	50	60	70	80		40	50	60	70	80
	Bd. ft.	Bd. ft.	Bd. ft.	Bd. ft.	Bd. ft.		Bd. ft.	Bd. ft.	Bd. ft.	Bd. ft.	Bd. ft.
15.....	0	0	0	0	50	60.....	2,700	5,600	9,700	13,900	18,000
20.....	0	0	0	150	350	65.....	3,450	6,900	11,500	15,800	20,500
25.....	0	0	300	700	1,450	70.....	4,250	8,150	12,800	17,700	23,100
30.....	100	350	850	1,750	3,350	75.....	5,100	9,200	14,200	19,500	25,200
35.....	300	800	1,900	3,550	5,950	80.....	6,000	10,450	15,650	21,200	27,250
40.....	600	1,400	3,200	5,500	8,600	85.....	6,750	11,550	17,200	22,900	29,150
45.....	950	2,250	4,700	7,850	11,200	90.....	7,600	12,600	18,300	24,500	30,950
50.....	1,400	3,250	6,300	9,750	13,770	95.....	8,350	13,600	19,800	26,100	32,700
55.....	2,000	4,350	8,000	11,850	16,250	100.....	9,200	14,700	21,200	27,650	34,400

<sup>1</sup>No trees containing a 16-foot log with a top diameter inside bark of 5.0 inches below 15-year class.

Source: Schnur, G.L. 1937. Yield, stand, and volume tables for even-aged upland oak forests. U.S.D.A. Tech. Bull. 560. 87p.

Table 19.--Yield per acre of upland oak in board feet, Scribner rule, to an 8-inch top inside bark, including all trees having at least one 16-foot log.

Total age (years) <sup>1</sup>	Yield per acre by site index--					Total age (years) <sup>1</sup>	Yield per acre by site index--				
	40	50	60	70	80		40	50	60	70	80
	Bd. ft.	Bd. ft.	Bd. ft.	Bd. ft.	Bd. ft.		Bd. ft.	Bd. ft.	Bd. ft.	Bd. ft.	Bd. ft.
25.....	0	0	0	50	150	65.....	650	1,700	4,350	8,550	13,700
30.....	0	0	50	200	500	70.....	800	2,350	5,650	10,550	15,900
35.....	0	50	200	550	1,250	75.....	1,100	3,150	7,690	12,400	17,850
40.....	50	150	500	1,100	2,500	80.....	1,450	4,000	8,350	14,100	19,700
45.....	100	300	900	2,000	4,300	85.....	1,800	4,850	9,700	15,700	21,400
50.....	150	500	1,400	3,250	6,650	90.....	2,200	5,800	11,050	17,200	23,050
55.....	250	750	2,150	4,950	9,000	95.....	2,700	6,700	12,350	18,600	24,600
60.....	400	1,100	3,150	6,700	11,350	100.....	3,350	7,750	13,700	19,900	26,100

<sup>1</sup>No trees containing a 16-foot log with a top diameter inside bark of 8.0 inches below 25-year class.

Table 20.--Yield per acre of upland oak of merchantable stem in cords, including bark, to a 4-inch top outside bark.

Total age (year)	Yield per acre of merchantable stem by site index--					Total age (years)	Yield per acre of merchantable stem by site index--				
	40	50	60	70	80		40	50	60	70	80
	Cords	Cords	Cords	Cords	Cords		Cords	Cords	Cords	Cords	Cords
10.....	0.0	0.0	0.0	0.12	0.24	60.....	18.71	24.47	32.94	40.94	48.94
15.....	.0	.24	.47	.94	2.24	65.....	18.71	26.94	35.88	44.35	52.71
20.....	.24	.82	2.00	4.24	7.29	70.....	20.59	29.53	38.71	47.41	56.12
25.....	1.18	2.94	6.00	9.65	13.76	75.....	22.35	31.88	41.29	50.35	59.53
30.....	3.18	6.35	10.35	14.94	19.88	80.....	24.12	34.12	43.88	53.06	62.82
35.....	5.65	9.65	14.59	19.88	25.41	85.....	25.68	36.12	46.12	55.70	65.83
40.....	8.09	12.82	18.59	24.59	30.71	90.....	27.41	38.00	49.47	58.35	69.06
45.....	10.24	15.88	22.47	29.66	35.78	95.....	28.94	39.36	50.59	60.94	72.12
50.....	12.47	18.82	26.24	33.29	40.59	100.....	30.47	41.41	52.71	63.53	75.06
55.....	14.50	21.65	29.65	37.41	44.94						

Source: Schnur, G.L. 1937. Yield, stand, and volume tables for even-aged upland oak forests. U.S.D.A. Tech. Bull. 560. 87p.



Table 21.--Yield per acre of upland oak, excluding bark, by density classes, age, and site; all trees 0.6 inch d.b.h. and larger included.

POOR SITE--INDEX 40										
Age (years)	Yield per acre by density class <sup>1</sup>									
	50	60	70	80	90	100	110	120	130	
	Cubic feet	Cubic feet	Cubic feet	Cubic feet	Cubic feet	Cubic feet	Cubic feet	Cubic feet	Cubic feet	Cubic feet
10	0	0	0	0	0	0	0	75	180	
15	0	0	0	0	0	70	162	262	365	
20	0	0	0	73	175	260	350	460	570	
25	0	5	141	248	350	440	540	650	775	
30	22	175	305	415	525	615	720	842	975	
35	182	328	495	587	700	800	908	1,050	1,180	
40	335	450	630	763	885	995	1,120	1,270	1,430	
45	485	645	805	940	1,075	1,190	1,330	1,480	1,650	
50	630	810	970	1,125	1,275	1,400	1,540	1,710	1,900	
55	775	955	1,140	1,300	1,460	1,590	1,740	1,920	2,110	
60	865	1,090	1,280	1,460	1,620	1,760	1,920	2,100	2,300	
65	1,010	1,225	1,425	1,640	1,770	1,930	2,075	2,260	2,450	
70	1,150	1,350	1,550	1,740	1,920	2,000	2,200	2,420	2,620	
75	1,235	1,460	1,670	1,870	2,040	2,200	2,340	2,500	2,750	
80	1,325	1,550	1,775	1,970	2,160	2,310	2,475	2,670	2,880	
85	1,420	1,650	1,880	2,075	2,270	2,420	2,590	2,780	3,010	
90	1,500	1,750	1,975	2,180	2,370	2,530	2,690	2,910	3,150	
95	1,600	1,850	2,080	2,290	2,475	2,635	2,820	3,035	3,275	
100	1,675	1,935	2,175	2,380	2,575	2,730	2,925	3,150	3,400	

FAIR SITE--INDEX 50										
Age (years)	Yield per acre by density class <sup>1</sup>									
	50	60	70	80	90	100	110	120	130	
	Cubic feet	Cubic feet	Cubic feet	Cubic feet	Cubic feet	Cubic feet	Cubic feet	Cubic feet	Cubic feet	Cubic feet
10	0	0	0	0	20	105	198	300	402	
15	0	0	7	120	220	302	390	507	622	
20	0	60	190	302	402	495	595	710	840	
25	85	230	365	450	592	685	795	915	1,065	
30	252	508	643	822	785	885	1,000	1,150	1,320	
35	405	570	715	830	975	1,080	1,220	1,375	1,535	
40	480	750	910	1,060	1,260	1,325	1,470	1,630	1,810	
45	740	920	1,100	1,270	1,420	1,540	1,690	1,875	2,060	
50	905	1,110	1,300	1,470	1,630	1,770	1,930	2,120	2,310	
55	1,070	1,280	1,480	1,665	1,845	1,980	2,180	2,340	2,540	
60	1,220	1,440	1,650	1,845	2,010	2,170	2,340	2,530	2,730	
65	1,345	1,575	1,785	1,980	2,180	2,335	2,500	2,695	2,920	
70	1,475	1,715	1,945	2,148	2,335	2,490	2,660	2,870	3,100	
75	1,590	1,845	2,080	2,285	2,460	2,630	2,805	3,050	3,285	
80	1,680	1,970	2,215	2,400	2,595	2,765	2,925	3,165	3,415	
85	1,760	2,060	2,350	2,505	2,695	2,870	3,060	3,300	3,560	
90	1,845	2,160	2,440	2,610	2,810	2,965	3,200	3,445	3,720	
95	1,940	2,270	2,540	2,725	2,945	3,130	3,345	3,595	3,890	
100	2,060	2,360	2,640	2,840	3,050	3,240	3,460	3,730	4,020	

AVERAGE SITE--INDEX 60										
Age (years)	Yield per acre by density class <sup>1</sup>									
	50	60	70	80	90	100	110	120	130	
	Cubic feet	Cubic feet	Cubic feet	Cubic feet	Cubic feet	Cubic feet	Cubic feet	Cubic feet	Cubic feet	Cubic feet
10	0	0	30	145	215	230	322	540	650	
15	0	95	215	340	415	540	655	755	880	
20	140	258	375	540	648	738	845	985	1,135	
25	305	480	604	728	850	955	1,080	1,225	1,385	
30	475	635	764	928	1,070	1,180	1,320	1,478	1,670	
35	650	822	960	1,148	1,300	1,425	1,570	1,740	1,925	
40	840	1,090	1,290	1,480	1,650	1,800	1,975	2,170	2,410	
45	1,020	1,290	1,490	1,685	1,875	1,995	2,085	2,275	2,470	
50	1,215	1,485	1,685	1,885	2,070	2,210	2,325	2,525	2,720	
55	1,390	1,670	1,875	2,070	2,240	2,390	2,565	2,765	2,985	
60	1,555	1,765	1,960	2,200	2,425	2,560	2,735	2,975	3,220	
65	1,835	1,950	2,185	2,404	2,560	2,720	2,915	3,170	3,420	
70	1,845	2,110	2,360	2,603	2,760	2,930	3,130	3,370	3,635	
75	1,970	2,240	2,485	2,690	2,870	3,060	3,260	3,535	3,850	
80	2,065	2,360	2,610	2,820	3,045	3,240	3,445	3,725	4,020	
85	2,190	2,465	2,710	2,955	3,175	3,370	3,600	3,890	4,205	
90	2,305	2,585	2,840	3,080	3,320	3,530	3,770	4,085	4,390	
95	2,410	2,675	2,940	3,210	3,450	3,665	3,920	4,235	4,580	
100	2,495	2,765	2,970	3,330	3,580	3,820	4,070	4,400	4,775	

<sup>1</sup> Density is percentage of average number of trees.

Source: Schnur, G.L. 1937. Yield, stand, and volume tables for even-aged upland oak forests. U.S.D.A. Tech. Bull. 560. 87p.

Table 21.--Yield per acre of upland oak, excluding bark, by density classes, age, and site; all trees 0.6 inch d.b.h. and larger included (continued).

GOOD SITE—INDEX 70									
Age (years)	Yield per acre by density class <sup>1</sup>								
	50	60	70	80	90	100	110	120	130
	Cubic feet	Cubic feet	Cubic feet	Cubic feet	Cubic feet	Cubic feet	Cubic feet	Cubic feet	Cubic feet
19	270	179	310	420	532	622	728	850	983
15	219	368	559	828	715	848	960	1,105	1,253
23	410	593	718	850	975	1,070	1,225	1,390	1,543
25	398	765	925	1,073	1,229	1,350	1,480	1,625	1,833
29	790	670	1,155	1,320	1,475	1,610	1,770	1,945	2,145
35	975	1,180	1,380	1,555	1,730	1,875	2,050	2,225	2,423
40	1,210	1,430	1,615	1,830	2,005	2,160	2,335	2,525	2,725
45	1,415	1,650	1,880	2,080	2,279	2,425	2,595	2,795	3,023
59	1,640	1,920	2,125	2,335	2,530	2,680	2,870	3,050	3,340
55	1,845	2,165	2,360	2,550	2,740	2,925	3,125	3,370	3,680
60	2,020	2,295	2,545	2,755	2,950	3,165	3,375	3,590	3,903
65	2,175	2,460	2,695	2,930	3,170	3,360	3,580	3,870	4,185
70	2,340	2,620	2,880	3,125	3,365	3,575	3,825	4,120	4,460
75	2,475	2,755	3,035	3,265	3,530	3,790	4,090	4,390	4,730
80	2,590	2,890	3,190	3,450	3,720	3,950	4,235	4,570	4,950
85	2,690	3,010	3,315	3,585	3,870	4,120	4,405	4,770	5,180
90	2,810	3,140	3,460	3,760	4,040	4,320	4,615	4,995	5,420
95	2,940	3,270	3,605	3,925	4,225	4,505	4,825	5,225	5,655
100	3,080	3,395	3,745	4,060	4,390	4,680	5,020	5,440	5,890

EXCELLENT SITE—INDEX 80									
19	288	435	530	705	830	930	1,055	1,200	1,360
15	482	842	800	940	1,080	1,200	1,335	1,495	1,670
20	683	892	1,015	1,190	1,345	1,470	1,620	1,785	1,970
25	890	1,080	1,277	1,450	1,610	1,762	1,915	2,090	2,285
30	1,120	1,340	1,540	1,725	1,910	2,050	2,215	2,405	2,610
35	1,345	1,575	1,795	1,990	2,180	2,335	2,500	2,690	2,920
40	1,605	1,860	2,090	2,360	2,480	2,645	2,825	3,040	3,275
45	1,845	2,100	2,340	2,550	2,740	2,920	3,125	3,365	3,625
50	2,090	2,360	2,610	2,820	3,035	3,270	3,450	3,725	4,020
55	2,310	2,580	2,830	3,080	3,325	3,530	3,775	4,065	4,410
60	2,450	2,770	3,070	3,320	3,570	3,795	4,045	4,350	4,740
65	2,660	2,980	3,260	3,535	3,810	4,045	4,355	4,660	5,055
70	2,815	3,135	3,470	3,760	4,050	4,325	4,620	5,000	5,420
75	2,985	3,325	3,660	3,970	4,290	4,565	4,900	5,310	5,770
80	3,120	3,475	3,825	4,160	4,490	4,800	5,130	5,555	6,030
85	3,280	3,625	3,990	4,350	4,700	5,010	5,380	5,800	6,325
90	3,460	3,790	4,180	4,540	4,915	5,250	5,620	6,100	6,590
95	3,540	3,950	4,360	4,745	5,140	5,480	5,870	6,370	6,880
100	3,670	4,100	4,520	4,930	5,340	5,680	6,120	6,600	7,120

<sup>1</sup> Density is percentage of average number of trees.

Table 22.--Comparison of yield correlations for upland oak with and without density included as a variable.

Item	Total cubic volume yield correlated with—	
	Age and site index	Age, site index, and density
Correlation index	0.906	0.969
Percent of variation accounted for	85	94
Standard error of estimate:		
Cubic feet	321	227
Percent	16	11.5

Source: Schnur, G.L. 1937. Yield, stand, and volume tables for even-aged upland oak forests. U.S.D.A. Tech. Bull. 560. 87p.

Table 23.--Total cubic-foot yield of wood and bark for unthinned yellow-poplar stands of various stand densities, site indices, and ages.<sup>1</sup>

SITE INDEX 90						
Trees per acre (number)	Age (years)					
	20	30	40	50	60	70
	..... Cubic feet per acre .....					
50	....	....	1,560	2,170	2,850	3,590
100	730	1,510	2,330	3,180	4,080	5,020
150	860	1,810	2,760	3,710	4,660	5,580
200	980	2,020	3,050	4,030	4,950	5,780
250	1,110	2,210	3,280	4,260	5,130	5,870
300	1,250	2,400	3,490	4,450	....	....
350	1,410	2,600	3,710	....	....	....
SITE INDEX 100						
50	....	....	1,920	2,730	3,640	4,670
100	840	1,810	2,870	4,020	5,270	6,610
150	990	2,180	3,430	4,730	6,080	7,450
200	1,120	2,450	3,820	5,180	6,540	7,840
250	1,270	2,700	4,140	5,540	6,870	8,090
300	1,430	2,950	4,460	5,870	....	....
350	1,620	3,220	4,770	....	....	....
SITE INDEX 110						
50	....	....	2,340	3,380	4,600	5,990
100	960	2,150	3,500	5,020	6,720	8,600
150	1,130	2,600	4,210	5,960	7,840	9,830
200	1,280	2,940	4,740	6,610	8,550	10,540
250	1,450	3,270	5,200	7,160	9,130	11,060
300	1,650	3,610	5,650	7,670	....	....
350	1,870	3,980	6,120	....	....	....
SITE INDEX 120						
50	....	....	2,810	4,150	5,730	7,600
100	1,090	2,530	4,230	6,200	8,470	11,070
150	1,290	3,080	5,130	7,440	10,020	12,870
200	1,470	3,520	5,830	8,360	11,100	....
250	1,670	3,960	6,480	9,170	....	....
300	1,910	4,410	7,120	9,960	....	....
350	2,180	4,910	7,790	....	....	....
SITE INDEX 130						
50	....	....	3,360	5,040	7,080	9,530
100	1,240	2,970	5,080	7,600	10,590	14,130
150	1,460	3,630	6,210	9,220	12,700	....
200	1,680	4,190	7,140	10,490	....	....
250	1,920	4,760	8,020	11,660	....	....
300	2,220	5,370	8,920	12,830	....	....
350	2,560	6,030	9,850	....	....	....

<sup>1</sup>Only trees 4.5 inches d.b.h. and larger are included.

Source: Beck, D.E. and L. Della-Bianca. 1970. Yield of unthinned yellow-poplar. U.S.F.S. Southeastern Forest Exp. Sta., Res. Paper SE-58. 20p.

Table 24.--Cubic-foot yield of wood and bark to a 4-inch top, outside bark, for unthinned yellow-poplar stands of various stand densities, site indices, and ages.<sup>1</sup>

SITE INDEX 90						
Trees per acre (number)	Age (years)					
	20	30	40	50	60	70
	----- Cubic feet per acre -----					
50	---	---	1,470	2,050	2,700	3,410
100	640	1,380	2,170	2,990	3,860	4,750
150	730	1,640	2,560	3,470	4,380	5,260
200	810	1,810	2,800	3,740	4,620	5,420
250	900	1,960	2,990	3,930	4,760	5,470
300	1,010	2,110	3,160	4,080	---	---
350	1,130	2,270	3,330	---	---	---
SITE INDEX 100						
50	---	---	1,810	2,590	3,460	4,450
100	740	1,670	2,690	3,800	4,990	6,280
150	860	1,990	3,190	4,440	5,740	7,050
200	950	2,220	3,540	4,850	6,150	7,400
250	1,060	2,430	3,820	5,160	6,430	7,610
300	1,180	2,640	4,090	5,440	---	---
350	1,330	2,860	4,360	---	---	---
SITE INDEX 110						
50	---	---	2,210	3,220	4,380	5,720
100	860	2,000	3,300	4,760	6,380	8,190
150	990	2,400	3,950	5,620	7,430	9,340
200	1,100	2,700	4,420	6,220	8,080	9,990
250	1,240	2,980	4,830	6,710	8,600	10,460
300	1,390	3,230	5,240	7,180	---	---
350	1,570	3,600	5,650	---	---	---
SITE INDEX 120						
50	---	---	2,670	3,950	5,470	7,260
100	980	2,370	4,000	5,890	8,070	10,570
150	1,140	2,860	4,830	7,050	9,520	12,260
200	1,280	3,250	5,470	7,900	10,530	---
250	1,440	3,640	6,060	8,640	---	---
300	1,640	4,040	6,650	9,370	---	---
350	1,870	4,490	7,250	---	---	---
SITE INDEX 130						
50	---	---	3,190	4,810	6,770	9,110
100	1,120	2,780	4,810	7,240	10,110	13,500
150	1,310	3,390	5,870	8,760	12,100	---
200	1,480	3,900	6,730	9,950	---	---
250	1,690	4,410	7,540	11,040	---	---
300	1,940	4,960	8,380	---	---	---
350	2,230	5,560	9,240	---	---	---

<sup>1</sup> Only trees 4.5 inches d.b.h. and larger are included.

Source: Beck, D.E. and L. Della-Bianca, 1970. Yield of unthinned yellow-poplar. U.S.F.S. Southeastern Forest Exp. Sta., Res. Paper SE-58. 20p.

Table 25.--International 1/4-inch board-foot yield to an 8-inch top, outside bark, for unthinned yellow-poplar stands of various stand densities, site indices, and ages.<sup>1</sup>

SITE INDEX 90						
Trees per acre (number)	Age (years)					
	20	30	40	50	60	70
	----- Board feet per acre -----					
50	---	---	5,180	8,490	12,240	16,480
100	260	2,480	6,260	10,750	15,670	20,920
150	140	2,090	5,960	10,690	15,730	20,830
200	80	1,630	5,210	9,750	14,530	19,120
250	40	1,230	4,370	8,540	12,920	17,000
300	20	880	3,520	7,230	---	---
350	10	590	2,670	---	---	---
SITE INDEX 100						
50	---	---	7,120	11,590	16,790	22,830
100	460	3,760	9,020	15,270	22,270	29,990
150	290	3,420	9,100	15,940	23,370	31,170
200	180	2,930	8,540	15,430	22,770	30,150
250	120	2,460	7,780	14,510	21,580	28,460
300	80	2,040	6,960	13,410	---	---
350	50	1,640	6,070	---	---	---
SITE INDEX 110						
50	---	---	9,400	15,310	22,370	30,720
100	750	5,340	12,380	20,810	30,520	41,580
150	520	5,160	13,070	22,580	33,190	44,760
200	370	4,750	12,950	22,890	33,740	45,150
250	270	4,330	12,550	22,670	33,550	44,630
300	210	3,940	12,050	22,230	---	---
350	170	3,550	11,450	---	---	---
SITE INDEX 120						
50	---	---	12,070	19,740	29,080	40,440
100	1,120	7,250	16,390	27,530	40,710	56,250
150	850	7,370	17,970	30,830	45,640	62,420
200	660	7,170	18,570	32,420	48,000	---
250	550	6,960	18,870	33,410	---	---
300	470	6,780	19,080	34,200	---	---
350	420	6,600	19,190	---	---	---
SITE INDEX 130						
50	---	---	15,160	24,950	37,190	52,270
100	1,600	9,500	21,120	35,590	53,220	74,650
150	1,310	10,070	23,880	40,940	61,220	---
200	1,100	10,270	25,560	44,350	---	---
250	990	10,470	26,960	47,180	---	---
300	940	10,740	28,320	---	---	---
350	920	11,050	---	---	---	---

<sup>1</sup>Only trees 11.0 inches d.b.h. and larger are included.

Source: Beck, D.E. and L. Della-Bianca. 1970. Yield of unthinned yellow-poplar. U.S.F.S. Southeastern Forest Exp. Sta., Res. Paper SE-58. 20p.

Table 26.--Cubic-foot yield of wood only to a 4-inch top, outside bark, for unthinned yellow-poplar stands of various stand densities, site indices, and ages.<sup>1</sup>

SITE INDEX 90						
Trees per acre (number)	Age (years)					
	20	30	40	50	60	70
	-----Cubic feet per acre-----					
50	---	---	1,220	1,700	2,240	2,840
100	520	1,140	1,790	2,480	3,200	3,950
150	590	1,340	2,110	2,870	3,620	4,360
200	650	1,480	2,300	3,090	3,820	4,490
250	720	1,600	2,460	3,240	3,930	4,520
300	800	1,710	2,590	3,360	---	---
350	890	1,840	2,730	---	---	---
SITE INDEX 100						
50	---	---	1,500	2,150	2,880	3,700
100	600	1,380	2,230	3,150	4,150	5,220
150	690	1,640	2,640	3,680	4,760	5,860
200	760	1,820	2,920	4,010	5,090	6,140
250	840	1,990	3,150	4,260	5,320	6,300
300	940	2,150	3,360	4,490	---	---
350	1,060	2,330	3,580	---	---	---
SITE INDEX 110						
50	---	---	1,840	2,670	3,640	4,760
100	700	1,650	2,730	3,950	5,300	6,810
150	800	1,970	3,270	4,660	6,170	7,760
200	890	2,220	3,650	5,150	6,710	8,290
250	990	2,450	3,990	5,560	7,130	8,680
300	1,110	2,690	4,320	5,930	---	---
350	1,260	2,940	4,650	---	---	---
SITE INDEX 120						
50	---	---	2,220	3,290	4,550	6,040
100	810	1,960	3,320	4,900	6,710	8,790
150	930	2,360	4,000	5,850	7,910	10,190
200	1,040	2,680	4,530	6,550	8,740	---
250	1,160	2,990	5,010	7,170	---	---
300	1,320	3,330	5,500	7,760	---	---
350	1,500	3,690	5,990	---	---	---
SITE INDEX 130						
50	---	---	2,650	4,000	5,630	7,590
100	920	2,300	3,990	6,010	8,410	11,230
150	1,070	2,800	4,870	7,280	10,060	---
200	1,200	3,200	5,580	8,260	---	---
250	1,370	3,640	6,250	9,160	---	---
300	1,570	4,090	6,940	---	---	---
350	1,800	4,580	7,640	---	---	---

<sup>1</sup>Only trees 4.5 inches d.b.h. and larger are included.

Source: Beck, D.E. and L. Della-Bianca. 1970. Yield of unthinned yellow-poplar. U.S.F.S. Southeastern Forest Exp. Sta., Res. Paper SE-58. 20p.

Table 27.--Total yield per acre of yellow-poplar in tens of cubic feet, excluding bark, by basal area, age and site; all trees 0.5 inches dbh and larger.

SITE INDEX = 60														
Basal Area Sq. Ft.	Age in Years													
	30	34	38	42	46	50	54	58	62	66	70	74	78	82
80	196	202	207	211	214	217	220	222	224	226	227	228	230	231
82	199	205	210	214	218	221	223	225	227	229	231	232	233	234
84	202	208	213	217	221	224	227	229	231	232	234	235	237	238
86	205	211	216	221	224	227	230	232	234	236	237	239	240	241
88	208	214	219	224	227	230	233	235	237	239	241	242	244	245
90	211	217	223	227	231	234	236	239	241	243	244	246	247	248
92	214	220	226	230	234	237	240	242	244	246	248	249	250	252
94	216	223	229	233	237	240	243	245	247	249	251	252	254	255
96	219	226	232	236	240	243	246	248	251	252	254	256	257	258
98	222	229	235	239	243	246	249	252	254	256	257	259	260	262
100	225	232	237	242	246	249	252	255	257	259	261	262	264	265
102	228	235	240	245	249	252	255	258	260	262	264	265	267	268
104	230	238	243	248	252	256	258	261	263	265	267	269	270	271
106	233	240	246	251	255	259	262	264	266	268	270	272	273	275
108	236	243	249	254	258	262	265	267	270	272	273	275	277	278
110	239	246	252	257	261	265	268	270	273	275	277	278	280	281
112	241	249	255	260	264	267	271	273	276	278	280	281	283	284
114	244	251	258	263	267	270	274	276	279	281	283	284	286	287
116	247	254	260	265	270	273	277	279	282	284	286	287	289	290
118	249	257	263	268	273	276	279	282	285	287	289	290	292	293
120	252	260	266	271	275	279	282	285	288	290	292	294	295	297
122	254	262	269	274	278	282	285	288	291	293	295	297	298	300
124	257	265	271	277	281	285	288	291	294	296	298	300	301	303
126	259	267	274	279	284	288	291	294	296	299	301	303	304	306
128	262	270	277	282	287	290	294	297	299	302	304	305	307	309
130	265	273	279	285	289	293	297	300	302	305	307	308	310	312
132	267	275	282	287	292	296	299	302	305	307	309	311	313	315
134	270	278	285	290	295	299	302	305	308	310	312	314	316	317
136	272	280	287	293	298	302	305	308	311	313	315	317	319	320
138	274	283	290	295	300	304	308	311	314	316	318	320	322	323
140	277	285	292	298	303	307	311	314	316	319	321	323	325	326

Source: Schaeffel, B.E., D.L. Kulow, and R.N. Baughman. 1969. Empirical yield tables for West Virginia yellow-poplar. W. Va. Univ. Agric. Exp. Sta. Bull. 574T. 24p.

Table 27.--Total yield per acre of yellow-poplar in  
tens of cubic feet, excluding bark, by basal  
area, age and site; all trees 0.5 inches  
dbh and larger (continued).

SITE INDEX = 70														
Basal Area Sq. Ft.	Age in Years													
	30	34	38	42	46	50	54	58	62	66	70	74	78	
80	210	217	222	227	230	233	236	238	240	242	244	245	247	248
82	214	220	226	230	234	237	240	242	244	246	248	249	250	252
84	217	224	229	233	237	240	243	246	248	250	251	253	254	255
86	220	227	232	237	241	244	247	249	251	253	255	257	258	259
88	223	230	236	240	244	247	249	253	255	257	259	260	262	263
90	226	233	239	244	248	251	254	256	259	261	262	264	265	267
92	229	236	242	247	251	254	257	260	262	264	266	267	269	270
94	232	240	245	250	254	258	261	263	266	268	269	271	272	274
96	235	243	249	254	258	261	264	267	269	271	273	275	276	277
98	239	246	252	257	261	264	268	270	273	275	276	278	280	281
100	242	249	255	260	264	268	271	274	276	278	280	282	283	284
102	244	252	258	263	267	271	274	277	279	281	283	285	287	288
104	247	255	261	266	271	274	278	280	283	285	287	289	290	291
106	250	258	264	270	274	278	281	284	286	288	290	292	293	295
108	253	261	267	273	277	281	284	287	289	292	294	295	297	298
110	256	264	270	276	280	284	287	290	293	295	297	299	300	302
112	259	267	273	279	283	287	291	293	296	298	300	302	304	305
114	262	270	276	282	286	290	294	297	299	301	304	305	307	308
116	265	273	279	285	290	294	297	300	302	305	307	309	310	312
118	268	276	282	288	293	297	300	303	306	308	310	312	314	315
120	270	279	285	291	296	300	303	306	309	311	313	315	317	318
122	273	281	288	294	299	303	306	309	312	314	316	318	320	322
124	276	284	291	297	302	306	309	312	315	318	320	322	323	325
126	279	287	294	300	305	309	312	316	318	321	323	325	327	328
128	281	290	297	303	308	312	316	319	321	324	326	328	330	331
130	284	293	300	306	311	315	319	322	324	327	329	331	333	335
132	287	296	303	309	314	318	322	325	328	330	332	334	336	338
134	289	298	306	312	317	321	325	328	331	333	335	337	339	341
136	292	301	308	314	319	324	328	331	334	336	338	340	342	344
138	295	304	311	317	322	327	331	334	337	339	342	344	345	347
140	297	306	314	320	325	330	333	337	340	342	345	347	349	350

Source: Schaefer, B.E., D.L. Kulow, and R.N. Baughman.  
1969. Empirical yield tables for West Virginia  
yellow-poplar. W. Va. Univ. Agric. Exp. Sta.  
Bull. 574T. 24p.



Table 27.--Total yield per acre of yellow-poplar in  
tens of cubic feet, excluding bark, by basal  
area, age and site; all trees 0.5 inches  
dbh and larger (continued).

Basal Area Sq. Ft.	SITE INDEX = 60													
	Age in Years													
	30	34	38	42	46	50	54	58	62	66	70	74	78	82
80	226	232	237	243	247	250	253	256	258	260	262	263	265	266
82	227	236	242	247	251	254	257	260	262	264	266	267	269	270
84	233	240	246	251	255	258	261	264	266	268	270	271	273	274
86	236	244	250	254	258	262	265	268	270	272	274	275	277	278
88	240	247	253	258	262	266	269	271	274	276	278	279	281	282
90	243	250	257	262	266	269	273	275	278	280	282	283	285	286
92	246	254	260	265	269	273	276	279	281	284	285	287	289	290
94	250	257	264	269	273	277	280	283	285	287	289	291	293	294
96	253	261	267	272	277	280	284	285	289	291	293	295	296	298
98	256	264	270	276	280	284	287	290	293	295	297	299	300	302
100	259	267	274	279	284	288	291	294	296	299	301	302	304	305
102	262	271	277	283	287	291	294	297	300	302	304	306	308	309
104	266	274	281	286	291	295	298	301	304	306	308	310	311	313
106	269	277	284	289	294	298	302	305	307	309	312	313	315	317
108	272	280	287	293	297	302	305	308	311	313	315	317	319	320
110	275	284	290	296	301	305	308	312	314	317	319	321	322	324
112	278	287	294	299	304	308	312	315	318	320	322	324	326	328
114	281	290	297	303	308	312	315	319	321	324	326	328	330	331
116	284	293	300	306	311	315	319	322	325	327	329	331	333	335
118	287	296	303	309	314	318	322	325	328	331	333	335	337	338
120	290	299	306	312	317	322	326	329	332	334	336	338	340	342
122	293	302	310	316	321	325	329	332	335	338	340	342	344	345
124	296	305	313	319	324	328	332	335	338	341	343	345	347	349
126	299	308	316	322	327	332	335	339	342	344	347	349	351	352
128	302	311	319	325	330	335	339	342	345	348	350	352	354	356
130	305	314	322	328	334	338	342	345	348	351	353	356	357	359
132	308	317	325	331	337	341	345	349	352	354	357	359	361	363
134	311	320	328	334	340	344	348	352	355	358	360	362	364	366
136	314	323	331	338	343	348	352	355	358	361	363	366	368	369
138	316	326	334	341	346	351	355	358	361	364	367	369	371	373
140	319	329	337	344	349	354	358	362	365	367	370	372	374	376

Source: Schaegel, B.E., D.L. Kulow, and R.N. Baughman.  
1969. Empirical yield tables for West Virginia  
yellow-poplar. W. Va. Univ. Agric. Exp. Sta.  
Bull. 574T. 24p.

Table 27.--Total yield per acre of yellow-poplar in tens of cubic feet, excluding bark, by basal area, age and site; all trees 0.5 inches dbh and larger (continued).

SITE INDEX = 90														
Basal Area Sq. Ft.	Age in Years													
	30	34	38	42	46	50	54	58	62	66	70	74	78	82
80	243	250	256	261	265	269	272	275	277	279	281	283	284	286
82	246	254	260	265	269	273	276	279	281	284	285	287	289	290
84	250	258	264	269	273	277	280	283	286	288	290	291	293	294
86	254	261	268	273	277	281	284	287	290	292	294	295	297	299
88	257	265	272	277	281	285	289	291	294	296	298	300	302	303
90	261	269	275	281	285	289	293	296	299	300	302	304	306	307
92	264	273	279	285	289	293	297	300	302	304	306	308	310	311
94	268	276	283	289	293	297	301	304	306	309	311	312	314	316
96	271	280	287	292	297	301	305	308	310	313	315	317	318	320
98	275	283	290	296	301	305	308	311	314	317	319	321	322	324
100	278	287	294	300	305	309	312	315	318	321	323	325	326	328
102	282	291	298	303	308	313	316	319	322	324	327	329	330	332
104	285	294	301	307	312	316	320	323	326	328	331	333	334	336
106	289	298	305	311	316	320	324	327	330	332	335	337	338	340
108	292	301	308	314	319	324	327	331	334	336	338	340	342	344
110	295	304	312	318	323	327	331	335	337	340	342	344	346	348
112	299	308	315	321	327	331	335	338	341	344	346	348	350	352
114	302	311	319	325	330	335	339	342	345	347	350	352	354	356
116	305	315	322	329	334	338	342	345	348	351	353	356	358	359
118	308	318	326	332	337	342	346	349	352	355	357	360	362	363
120	312	321	329	335	341	346	350	353	356	359	361	363	365	367
122	315	325	332	339	344	349	353	357	360	362	365	367	369	371
124	318	328	336	342	348	353	357	360	363	366	369	371	373	375
126	321	331	339	346	351	356	360	364	367	370	372	374	376	378
128	324	334	342	349	355	360	364	367	371	373	376	378	380	382
130	327	338	346	352	358	363	367	371	374	377	379	382	384	386
132	331	341	349	356	362	366	371	374	378	380	383	385	387	389
134	334	344	352	359	365	370	374	378	381	384	387	389	391	393
136	337	347	355	362	368	373	378	381	385	388	391	393	395	397
138	340	350	358	365	372	377	381	385	388	391	393	395	397	400
140	343	353	362	369	375	380	384	388	392	395	397	400	402	404

Source: Schaegel, B.E., D.L. Kulow, and R.N. Baughman.  
1969. Empirical yield tables for West Virginia  
yellow-poplar. W. Va. Univ. Agric. Exp. Sta.  
Bull. 574T. 24p.

Table 27.--Total yield per acre of yellow-poplar in  
tens of cubic feet, excluding bark, by basal  
area, age and site; all trees 0.5 inches  
dbh and larger (continued).

SITE INDEX = 100														
Basal Area Sq. Ft.	Age in Years													
	30	34	38	42	46	50	54	58	62	66	70	74	78	82
80	260	268	275	280	285	289	292	295	298	300	302	304	305	307
82	264	273	279	285	289	293	297	300	302	304	307	308	310	312
84	268	277	283	289	294	298	301	304	307	309	311	313	315	316
86	272	281	288	293	298	302	305	309	311	314	316	318	319	321
88	276	285	292	297	302	306	310	313	316	318	320	322	324	325
90	280	289	296	302	306	311	314	317	320	322	325	327	328	330
92	284	293	300	306	311	315	318	322	324	327	329	331	333	334
94	288	297	304	310	315	319	323	326	329	331	333	335	337	339
96	292	300	307	314	319	323	327	330	333	336	338	340	342	343
98	295	304	312	318	323	327	331	334	337	340	342	344	346	348
100	299	308	316	322	327	331	335	339	342	344	346	349	350	352
102	303	312	320	326	331	336	339	343	346	348	351	353	355	356
104	306	316	323	330	335	340	344	347	350	353	355	357	359	361
106	310	319	327	334	339	344	348	351	354	357	359	361	363	365
108	314	323	331	338	343	348	352	355	358	361	363	366	367	369
110	317	327	335	341	347	352	356	359	362	365	367	370	372	373
112	321	331	339	345	351	356	360	363	366	369	372	374	376	378
114	324	334	342	349	355	359	364	367	370	373	376	378	380	382
116	328	338	346	353	358	363	367	371	374	377	380	382	384	386
118	331	341	350	356	362	367	371	375	378	381	384	386	388	390
120	335	345	353	360	366	371	375	379	382	385	388	390	392	394
122	338	348	357	364	370	375	379	383	386	389	392	394	396	398
124	341	352	360	368	374	379	383	387	390	393	396	398	400	402
126	345	355	364	371	377	382	387	391	394	397	400	402	404	406
128	348	359	368	375	381	386	391	394	398	401	404	406	408	410
130	352	362	371	378	385	390	394	398	402	405	407	410	412	414
132	355	366	375	382	388	393	398	402	405	409	411	414	416	418
134	358	369	378	386	392	397	402	406	409	412	415	418	420	422
136	361	373	382	389	395	401	405	409	413	416	419	421	424	426
138	365	376	385	393	399	404	409	413	417	420	423	425	428	430
140	368	379	389	396	403	408	413	417	420	424	426	429	431	433

Source: Schaeffel, B.E., D.L. Kulow, and R.N. Baughman.  
1969. Empirical yield tables for West Virginia  
yellow-poplar. W. Va. Univ. Agric. Exp. Sta.  
Bull. 574T. 24p.

Table 27.--Total yield per acre of yellow-poplar in  
tens of cubic feet, excluding bark, by basal  
area, age and site; all trees 0.5 inches  
dbh and larger (continued).

SITE INDEX = 110														
Basal Area Sq. Ft.	Age in Years													
	30	34	38	42	46	50	54	58	62	66	70	74	78	82
80	290	288	295	301	306	310	314	317	320	322	324	326	328	329
82	284	293	300	306	311	315	318	322	324	327	329	331	333	334
84	288	297	304	310	315	320	323	326	329	330	334	336	338	339
86	292	301	309	315	320	324	328	331	334	337	339	341	343	344
88	297	306	313	319	324	329	333	336	339	341	344	346	348	349
90	301	310	318	324	329	333	337	341	344	346	349	351	353	354
92	305	314	322	328	334	338	342	345	348	351	353	355	357	359
94	309	318	326	333	338	343	347	350	353	356	358	360	362	364
96	313	323	330	337	342	347	351	355	358	360	363	365	367	369
98	317	327	335	341	347	351	356	359	362	365	367	370	372	373
100	321	331	339	346	351	356	360	364	367	370	372	374	376	378
102	325	335	343	350	355	360	364	368	371	374	377	379	381	383
104	329	339	347	354	360	365	369	372	376	379	381	383	385	387
106	333	343	351	358	364	369	373	377	380	383	386	388	390	392
108	337	347	355	362	368	373	378	381	385	388	390	392	395	396
110	340	351	359	367	372	377	382	386	389	392	395	397	399	401
112	344	355	363	371	377	382	386	390	393	396	399	401	404	405
114	348	359	367	375	381	386	390	394	398	401	403	406	408	410
116	352	363	371	379	385	390	395	399	402	405	408	410	412	414
118	356	366	375	383	389	394	399	403	406	409	412	415	417	419
120	359	370	379	387	393	398	403	407	410	414	416	419	421	423
122	363	374	383	391	397	402	407	411	415	418	421	423	425	427
124	367	378	387	395	401	406	411	415	419	422	425	427	430	432
126	370	382	391	399	405	410	415	419	423	426	429	432	434	436
128	374	385	395	402	409	415	419	423	427	430	433	436	438	440
130	377	389	399	406	413	418	423	428	431	435	437	440	442	445
132	381	393	402	410	417	422	427	432	435	439	442	444	447	449
134	385	396	406	414	421	426	431	436	439	443	446	448	451	453
136	388	400	410	418	425	430	435	440	443	447	450	452	455	457
138	392	404	413	422	428	434	439	444	447	451	454	457	459	461
140	395	407	417	425	432	438	443	448	451	455	458	461	463	465

Source: Schaegel, B.E., D.L. Kulow, and R.N. Baughman.  
1969. Empirical yield tables for West Virginia  
yellow-poplar. W. Va. Univ. Agric. Exp. Sta.  
Bull. 574T. 24p.

Table 28.--Merchantable yield per acre, of yellow-poplar in tens of cubic feet, to a four-inch top outside bark, by basal area, age, and site; all trees 4.5 inches and larger.

SITE INDEX = 60														
Basal Area Sq. Ft.	Age in Years													
	30	34	38	42	46	50	54	58	62	66	70	74	78	82
80	210	219	225	231	235	239	243	246	249	251	253	255	257	258
82	216	224	231	236	241	245	249	252	255	257	259	261	263	265
84	221	229	236	242	247	251	255	258	261	263	265	267	269	271
86	226	235	242	248	253	257	261	264	267	269	272	274	276	277
88	231	240	247	253	259	263	267	270	273	276	278	280	282	284
90	236	245	253	259	264	269	273	276	279	282	284	286	288	290
92	241	251	258	265	270	275	279	282	285	288	290	292	294	296
94	246	256	264	270	276	280	285	288	291	294	296	299	301	303
96	252	261	269	276	282	286	290	294	297	300	303	305	307	309
98	257	267	275	282	287	292	296	300	303	306	309	311	313	315
100	262	272	280	287	293	298	302	306	309	312	315	317	320	321
102	267	277	286	293	299	304	308	312	316	319	321	324	326	328
104	272	283	291	299	305	310	314	318	322	325	327	330	332	334
106	277	288	297	304	310	316	320	324	328	331	334	336	338	340
108	282	293	302	310	316	321	326	330	334	337	340	342	345	347
110	288	299	308	315	322	327	332	336	340	343	346	348	351	353
112	293	304	313	321	328	333	338	342	346	349	352	355	357	359
114	298	309	319	327	333	339	344	348	352	355	358	361	363	366
116	303	315	324	332	339	345	350	354	358	361	364	367	370	372
118	308	320	330	338	345	351	356	360	364	367	371	373	376	378
120	313	325	335	344	350	356	362	366	370	374	377	380	382	384
122	318	331	341	349	356	362	367	372	376	380	383	386	388	391
124	323	336	346	355	362	368	373	378	382	386	389	392	395	397
126	329	341	352	360	368	374	379	384	388	392	395	398	401	403
128	334	347	357	366	373	380	385	390	394	398	401	404	407	410
130	339	352	363	372	379	386	391	396	400	404	407	411	413	416
132	344	357	368	377	385	391	397	402	406	410	414	417	420	422
134	349	363	374	383	391	397	403	408	412	416	420	423	426	428
136	354	368	379	388	396	403	409	414	418	422	426	429	432	435
138	359	373	385	394	402	409	415	420	424	428	432	435	438	441
140	364	378	390	400	408	415	421	426	430	435	438	442	444	447

Source: Schaegel, B.E., D.L. Kulow, and R.N. Baughman. 1969. Empirical yield tables for West Virginia yellow-poplar. W. Va. Univ. Agric. Exp. Sta. Bull. 574T. 24 p.



Table 28.--Merchantable yield per acre, of yellow-poplar in tens of cubic feet, to a four-inch top outside bark, by basal area, age, and site; all trees 4.5 inches and larger (continued).

SITE INDEX = 70														
Basal Area Sq. Ft.	Age In Years													
	30	34	38	42	46	50	54	58	62	66	70	74	78	82
80	216	224	231	237	242	246	249	252	255	258	260	262	263	265
82	221	230	237	243	248	252	255	259	261	264	266	268	270	272
84	227	235	242	248	253	258	262	267	268	270	272	275	276	278
86	232	241	248	254	259	264	268	271	274	277	279	281	283	285
88	237	246	254	260	265	270	274	277	280	283	285	287	289	291
90	242	252	259	266	271	276	280	283	286	289	292	294	296	298
92	248	257	265	272	277	282	286	290	293	295	298	300	302	304
94	253	263	271	277	283	288	292	296	299	302	304	307	309	311
96	258	268	276	283	289	294	298	302	305	308	311	313	315	317
98	264	274	282	289	295	300	304	308	311	314	317	319	322	323
100	269	279	288	295	301	306	310	314	318	321	323	326	328	330
102	274	285	293	301	307	312	316	320	324	327	330	332	334	336
104	279	290	299	306	313	318	323	327	330	333	336	339	341	343
106	285	296	305	312	319	324	329	333	336	339	342	345	347	349
108	290	301	310	318	324	330	335	339	343	346	349	351	354	356
110	295	307	316	324	330	336	341	345	349	352	355	358	360	362
112	300	312	322	330	336	342	347	351	355	358	361	364	367	369
114	306	318	327	335	342	348	353	357	361	365	368	370	373	375
116	311	323	333	341	348	354	359	363	367	371	374	377	379	382
118	316	328	338	347	354	360	365	370	374	377	380	383	386	388
120	322	334	344	353	360	366	371	376	380	383	387	390	392	395
122	327	339	350	358	366	372	377	382	386	390	393	396	399	401
124	332	345	355	364	371	378	383	388	392	396	399	402	405	407
126	337	350	361	370	377	384	389	394	398	402	406	409	411	414
128	343	356	367	376	383	390	395	400	405	408	412	415	418	420
130	348	361	372	381	389	396	401	405	411	415	418	421	424	427
132	353	367	378	387	395	402	407	413	417	421	425	428	431	433
134	358	372	383	393	401	408	414	419	423	427	431	434	437	440
136	364	378	389	399	407	414	420	425	429	434	437	440	443	446
138	369	383	395	404	413	420	426	431	436	440	443	447	450	453
140	374	388	400	410	418	426	432	437	442	446	450	453	456	459

Source: Schaegel, B.E., D.L. Kulow, and R.N. Baughman. 1969. Empirical yield tables for West Virginia yellow-poplar. W. Va. Univ. Agric. Exp. Sta. Bull. 574T. 24 p.

Table 28.--Merchantable yield per acre, of yellow-poplar in tens of cubic feet, to a four-inch top outside bark, by basal area, age, and site; all trees 4.5 inches and larger (continued).

SITE INDEX = 80														
Basal Area Sq. Ft.	Age in Years													
	30	34	37	42	46	50	54	58	62	66	70	74	78	82
80	222	230	237	243	248	252	256	259	262	264	267	269	270	272
82	227	236	243	249	254	258	262	265	268	271	273	275	277	279
84	233	242	249	255	260	265	269	273	275	277	280	282	284	286
86	238	247	255	261	266	271	275	278	281	284	286	288	290	292
83	243	253	261	267	272	277	281	284	288	290	293	295	297	299
90	249	258	266	273	278	283	287	291	294	297	299	302	304	305
92	254	264	272	279	284	289	293	297	300	303	306	308	310	312
94	260	270	278	285	291	295	300	303	307	310	312	315	317	319
96	265	275	283	291	297	302	306	310	313	316	319	321	323	325
98	271	281	290	297	303	308	312	316	320	323	325	328	330	332
100	276	287	295	303	309	314	319	322	326	329	332	334	337	339
102	281	292	301	309	315	320	325	329	332	336	339	341	343	345
104	287	298	307	315	321	326	331	335	339	342	345	347	350	352
106	292	303	313	320	327	332	337	341	345	348	351	354	356	359
107	298	309	319	326	333	339	344	348	352	355	358	361	363	365
110	303	315	324	332	339	345	350	354	358	361	364	367	370	372
112	308	320	330	338	345	351	356	360	364	368	371	374	376	378
114	314	326	336	344	351	357	362	367	371	374	377	380	383	385
116	319	332	342	350	357	363	368	373	377	381	384	387	389	392
118	325	337	347	356	363	369	375	379	383	387	390	393	396	398
120	330	343	353	362	369	375	381	386	390	394	397	400	403	405
122	335	348	359	368	375	382	387	392	396	400	403	406	409	412
124	341	354	365	374	381	388	393	398	403	406	410	413	416	418
126	346	360	371	380	387	394	400	405	409	413	416	419	422	425
128	352	365	376	385	393	400	406	411	415	419	423	426	429	431
130	357	371	382	391	399	406	412	417	422	426	429	432	435	438
132	362	376	387	397	405	412	418	423	428	432	436	439	442	445
134	368	382	394	403	411	418	424	430	434	439	442	446	449	451
136	373	388	399	409	417	425	431	436	441	445	449	452	455	458
138	378	393	405	415	423	431	437	442	447	451	455	459	462	464
140	384	399	411	421	429	437	443	449	453	458	462	465	468	471

Source: Schaeffel, B.E., D.L. Kulow, and R.N. Baughman. 1969. Empirical yield tables for West Virginia yellow-poplar. W. Va. Univ. Agric. Exp. Sta. Bull. 574T. 24 p.



Table 28.--Merchantable yield per acre, of yellow-poplar in tens of cubic feet, to a four-inch top outside bark, by basal area, age, site; all trees 4.5 inches and larger (continued).

SITE INDEX = 90														
Basal Area Sq. Ft.	Age in Years													
	30	34	38	42	46	50	54	58	62	66	70	74	78	82
80	228	236	244	250	255	259	263	266	269	271	274	276	278	279
82	233	242	249	256	261	265	269	272	275	278	280	282	284	286
84	239	248	255	262	267	272	276	279	282	285	287	289	291	293
86	244	254	261	268	273	278	282	285	289	291	294	296	297	300
88	250	259	267	274	280	284	287	292	295	298	300	303	305	307
90	255	265	273	279	286	291	295	297	302	305	307	309	312	313
92	261	271	279	285	292	297	301	305	308	311	314	316	317	320
94	267	277	285	292	299	303	307	311	315	318	321	323	325	327
96	272	283	291	298	304	310	314	317	321	325	327	330	332	334
98	278	289	297	304	311	316	321	325	328	331	334	336	339	341
100	283	294	303	311	317	322	327	331	335	338	341	343	345	348
102	289	300	309	317	323	329	333	337	341	344	347	350	352	354
104	294	306	315	323	329	335	340	344	348	351	354	357	359	361
106	300	311	321	329	336	341	346	350	354	358	361	363	365	367
108	305	317	327	335	342	348	353	357	361	364	367	370	373	374
110	311	323	333	341	348	354	359	363	367	371	374	377	379	382
112	317	329	339	347	354	360	365	370	374	377	381	384	386	388
114	322	335	345	353	360	366	372	376	380	384	387	390	393	395
116	328	340	351	359	367	373	378	383	387	391	394	397	400	402
118	333	346	357	365	373	379	385	389	394	397	401	404	406	409
120	339	352	363	371	379	385	391	395	400	404	407	410	413	416
122	344	358	369	377	385	392	397	402	407	411	414	417	420	422
124	350	363	374	384	391	398	404	409	413	417	421	424	427	429
126	355	369	380	390	398	404	410	415	420	424	427	430	433	435
128	361	375	386	395	404	411	417	422	426	430	434	437	440	443
130	366	381	392	402	410	417	423	428	433	437	441	444	447	450
132	372	386	397	407	416	423	429	435	439	444	447	451	454	457
134	377	392	403	413	422	429	436	441	446	450	454	457	460	463
136	383	398	410	420	428	436	442	447	452	457	461	464	467	470
138	388	404	416	426	435	442	448	454	459	463	467	471	474	477
140	394	409	422	432	441	448	455	460	465	470	474	477	481	483

Source: Schaegel, B.E., D.L. Kulow, and R.N. Baughman. 1969. Empirical yield tables for West Virginia yellow-poplar. W. Va. Univ. Agric. Exp. Sta. Bull. 574T. 24 p.

Table 28.--Merchantable yield per acre, of yellow-poplar in tens of cubic feet, to a four-inch top outside bark, by basal area, age, site; all trees 4.5 inches and larger (continued).

Site Index 100														
Basal Area Sq. Ft.	Age, In Years													
	30	34	38	42	46	50	54	58	62	66	70	74	78	
80	234	243	250	256	261	266	270	277	276	279	281	283	285	287
82	239	249	256	262	268	272	276	280	283	285	288	290	292	294
84	245	254	262	269	274	279	283	286	289	292	294	297	299	301
86	251	260	268	275	280	284	287	290	293	295	298	300	302	304
88	256	266	274	281	287	292	295	298	300	303	306	308	311	313
90	262	272	281	287	293	298	303	306	310	313	315	318	320	322
92	268	278	287	294	300	305	309	313	316	319	322	325	327	329
94	274	284	293	300	306	311	316	320	323	326	329	331	334	336
96	279	290	299	306	312	318	322	326	330	333	336	338	341	343
98	285	296	305	313	319	324	329	333	337	340	343	345	348	350
100	291	302	311	319	325	331	336	340	343	347	350	352	355	357
102	296	308	317	325	332	337	342	346	350	353	356	359	362	364
104	302	314	323	331	338	344	349	353	357	360	363	366	369	371
106	308	320	329	337	344	350	355	360	364	367	370	373	375	377
108	313	326	335	344	351	357	362	366	370	374	377	380	382	385
110	319	332	342	350	357	363	368	373	377	381	384	387	389	392
112	325	337	347	356	363	370	375	380	384	387	391	394	396	399
114	331	343	354	363	370	376	382	386	391	394	398	401	403	406
116	336	349	360	369	376	383	388	393	397	401	404	407	410	413
118	342	355	366	375	383	389	395	400	404	408	411	414	417	420
120	348	361	372	381	389	396	401	406	411	415	418	421	424	427
122	353	367	378	387	395	402	408	413	417	421	425	428	431	434
124	359	373	384	394	402	408	414	420	424	428	432	435	438	441
126	365	379	390	400	408	415	421	426	431	435	439	442	445	448
128	370	385	396	406	414	421	427	433	438	442	445	449	452	454
130	376	391	402	412	421	428	434	439	444	448	452	455	459	461
132	382	396	407	417	427	434	441	446	451	455	459	462	465	468
134	387	402	413	423	433	441	447	453	458	462	466	469	473	475
136	393	408	421	431	440	447	454	459	464	469	473	476	479	482
138	399	414	427	437	446	454	460	465	471	475	479	483	486	489
140	404	420	433	443	452	460	467	473	478	482	486	490	493	496

Source: Schaegel, B.E., D.L. Kulow, and R.N. Baughman. 1969. Empirical yield tables for West Virginia yellow-poplar. W. Va. Univ. Agric. Exp. Sta. Bull. 574T. 24 p.

Table 28.--Merchantable yield per acre, of yellow-poplar in tens of cubic feet, to a four-inch top outside bark, by basal area, age, and site; all trees 4.5 inches and larger (continued).

SITE INDEX = 110														
Basal Area Sq. Ft.	Age in Years													
	30	34	36	42	46	50	54	58	62	66	70	74	78	82
80	240	249	257	263	268	273	277	280	283	286	288	290	292	294
82	246	255	263	269	275	279	283	287	290	293	295	298	300	301
84	251	261	269	276	281	285	290	294	297	300	302	305	307	309
86	257	267	275	282	288	293	297	301	304	307	309	312	314	316
88	263	273	282	289	294	299	304	308	311	314	317	319	321	323
90	269	279	288	295	301	306	311	314	318	321	324	326	328	330
92	275	286	294	301	308	313	317	321	325	328	331	333	335	337
94	281	292	301	308	314	319	324	328	332	335	338	340	343	345
96	287	298	307	314	321	326	331	335	339	342	345	347	350	352
98	292	304	313	321	327	333	338	342	346	349	352	354	357	359
100	298	310	319	327	334	339	344	349	352	356	359	362	364	366
102	304	316	326	334	340	346	351	356	359	363	366	369	371	373
104	310	322	332	340	347	353	358	362	366	370	373	376	378	381
106	316	328	338	346	353	359	365	369	373	377	380	383	385	388
108	322	334	344	353	360	366	371	376	380	384	387	390	392	395
110	328	340	351	359	367	373	378	383	387	391	394	397	400	402
112	333	346	357	366	373	379	385	390	394	398	401	404	407	409
114	339	352	363	372	380	386	392	397	401	405	408	411	414	416
116	345	358	369	378	386	393	398	403	408	412	415	418	421	424
118	351	365	376	385	393	399	405	410	415	419	422	425	428	431
120	357	371	382	391	399	406	412	417	421	426	429	432	435	438
122	363	377	388	398	406	413	419	424	428	432	436	439	442	445
124	368	383	394	404	412	419	425	431	435	439	443	446	449	452
126	374	389	401	410	419	426	432	437	442	446	450	454	457	459
128	380	395	407	417	425	433	439	444	449	453	457	461	464	466
130	386	401	413	423	432	439	445	451	456	460	464	468	471	474
132	392	407	419	430	438	446	452	458	463	467	471	475	478	481
134	398	413	426	436	445	452	459	465	470	474	478	482	485	488
136	403	419	432	442	451	459	466	471	477	481	485	489	492	495
138	409	425	438	449	458	466	472	478	483	488	492	496	499	502
140	415	431	444	455	464	472	479	485	490	495	499	503	506	509

Source: Schaeffel, B.E., D.L. Kulow, and R.N. Baughman. 1969. Empirical yield tables for West Virginia yellow-poplar. W. Va. Univ. Agric. Exp. Sta. Bull. 574T. 24 p.

Table 29.--Yield in hundreds of board feet per acre of yellow-poplar to a five-inch top inside bark, by basal area classes, age, and site; all trees 10.0 inches and larger.

SITE INDEX = 60														
Basal Area Sq. Ft.	Age in Years													
	30	34	38	42	46	50	54	58	62	66	70	74	78	82
80	34	45	55	65	75	85	94	103	111	118	126	132	139	145
82	34	45	56	66	76	86	95	103	112	119	126	133	140	146
84	35	45	56	66	77	86	95	104	112	120	127	134	141	147
86	35	46	56	67	77	87	96	105	113	121	128	135	142	148
88	35	46	57	67	78	87	97	105	114	122	129	136	143	149
90	35	46	57	68	78	88	97	106	114	122	130	138	144	150
92	35	46	57	68	79	88	98	107	115	123	131	138	144	151
94	36	47	58	69	79	89	98	107	116	124	131	139	145	152
96	36	47	58	69	79	89	99	108	117	125	132	139	146	153
98	36	47	58	69	80	90	100	109	117	125	133	140	147	153
100	36	47	59	70	80	91	100	109	118	126	134	141	148	154
102	36	48	59	70	81	91	101	110	119	127	135	142	149	155
104	37	48	59	71	81	92	101	111	119	127	135	143	149	156
106	37	48	60	71	82	92	102	111	120	128	136	143	150	157
108	37	49	60	71	82	93	102	112	121	129	137	144	151	158
110	37	49	60	72	83	93	103	112	121	130	137	145	152	158
112	37	49	61	72	83	93	103	113	122	130	138	146	153	159
114	38	49	61	72	83	94	104	113	122	131	139	146	153	160
116	38	50	61	73	84	94	104	114	123	131	139	147	154	161
118	38	50	62	73	84	95	105	115	124	132	140	148	155	162
120	38	50	62	73	85	95	105	115	124	133	141	148	156	162
122	38	50	62	74	85	96	106	116	125	133	141	149	156	163
124	39	50	62	74	85	96	106	116	125	134	142	150	157	164
126	39	51	63	74	86	97	107	117	126	135	143	150	158	165
128	39	51	63	75	86	97	107	117	126	135	143	151	158	165
130	39	51	63	75	87	97	107	117	127	136	144	152	159	166
132	39	51	64	75	87	98	108	118	128	136	145	152	160	167
134	39	52	64	76	87	98	109	119	128	137	145	153	161	168
136	40	52	64	76	88	99	109	119	129	138	146	154	161	168
138	40	52	64	76	88	99	110	120	129	138	146	154	162	169
140	40	52	65	77	88	100	110	120	130	139	147	155	163	170

Source: Schaegel, B.E., D.L. Kulow, and R.N. Baughman. 1969. Empirical yield tables for West Virginia yellow-poplar. W. Va. Univ. Agric. Exp. Sta. Bull. 574T. 24 p.

Table 29.--Yield in hundreds of board feet per acre of yellow-poplar to a five-inch top inside bark, by basal area classes, age, and site; all trees 10.0 inches and larger (continued).

SITE INDEX = 70														
Basal Area Sq. Ft.	Age in Years													
	30	34	38	42	46	50	54	58	62	66	70	74	78	82
80	40	53	65	77	89	100	111	121	131	140	148	156	164	171
82	40	53	66	78	90	101	112	122	131	141	149	157	165	172
84	41	53	66	79	90	102	112	123	132	142	150	158	166	173
86	41	54	66	79	91	102	113	124	133	142	151	159	167	174
88	41	54	67	79	91	103	114	124	134	143	152	160	168	175
90	42	54	67	80	92	104	115	125	135	144	153	161	169	177
92	42	55	68	80	93	104	115	126	136	145	154	162	170	178
94	42	55	68	81	93	105	116	127	137	146	155	163	171	179
96	42	55	69	81	94	106	117	127	137	147	156	164	172	180
98	43	56	69	82	94	106	117	128	138	148	157	165	173	181
100	43	56	69	82	95	107	118	129	139	149	158	166	174	182
102	43	56	70	83	95	107	119	130	140	149	159	167	175	183
104	43	57	70	83	96	108	119	130	141	150	159	168	176	184
106	44	57	70	84	96	109	120	131	141	151	160	169	177	185
108	44	57	71	84	97	109	121	132	142	152	161	170	178	186
110	44	58	71	85	97	110	121	132	143	153	162	171	179	187
112	44	58	72	85	98	110	122	133	144	153	163	172	180	188
114	44	58	72	85	98	111	123	134	144	154	164	172	181	189
116	45	58	72	86	99	111	123	134	145	155	164	173	182	190
118	45	59	73	86	99	112	124	135	146	156	165	174	183	191
120	45	59	73	87	100	112	124	136	146	156	166	175	183	191
122	45	59	73	87	100	113	125	136	147	157	167	176	184	192
124	46	60	74	87	101	113	126	137	148	158	168	177	185	193
126	46	60	74	88	101	114	126	138	148	159	169	177	186	194
128	46	60	74	88	102	114	127	138	149	159	169	178	187	195
130	46	60	75	89	102	115	127	139	150	160	170	179	188	196
132	46	61	75	89	103	115	128	139	150	161	171	180	188	197
134	47	61	75	89	103	116	128	140	151	161	171	181	189	197
136	47	61	76	90	103	116	129	141	152	162	172	181	190	198
138	47	61	76	90	104	117	129	141	152	163	173	182	191	199
140	47	62	76	90	104	117	130	142	153	163	173	183	192	200

Source: Schaegel, B.E., D.L. Kulow, and R.N. Baughman. 1969. Empirical yield tables for West Virginia yellow-poplar. W. Va. Univ. Agric. Exp. Sta. Bull. 574T. 24 p.

Table 29.--Yield in hundreds of board feet per acre of yellow-poplar to a five-inch top inside bark, by basal area classes, age, and site; all trees 10.0 inches and larger (continued).

SITE INDEX = 80														
Basal Area Sq. Ft.	Age in Years													
	30	34	38	42	46	50	54	58	62	66	70	74	78	82
80	47	62	77	91	105	118	131	143	154	165	175	184	193	201
82	48	63	77	92	106	119	132	144	155	166	176	185	194	203
84	48	63	78	92	106	120	133	145	156	167	177	187	196	204
86	48	63	78	93	107	121	133	146	157	168	178	188	197	205
88	49	64	79	94	108	121	134	147	158	169	179	189	198	207
90	49	64	79	94	108	122	135	147	159	170	180	190	199	208
92	49	65	80	95	109	123	136	148	160	171	182	191	201	209
94	50	65	80	95	110	124	137	149	161	172	183	193	202	211
96	50	65	81	96	110	124	133	150	162	173	184	194	203	212
98	50	66	81	96	111	125	138	151	163	174	185	195	204	213
100	51	66	82	97	112	126	139	152	164	175	186	196	205	214
102	51	66	82	98	112	127	140	153	165	176	187	197	207	216
104	51	67	83	98	113	127	141	154	166	177	188	198	208	217
106	51	67	83	99	114	128	142	154	167	178	189	199	209	218
108	52	68	84	99	114	129	142	155	168	179	190	200	210	219
110	52	68	84	100	115	129	143	156	168	180	191	201	211	220
112	52	68	84	100	115	130	144	157	169	181	192	202	212	221
114	52	69	85	101	116	131	145	158	170	182	193	203	213	222
116	53	69	85	101	117	131	145	158	171	183	194	204	214	224
118	53	69	86	102	117	132	146	159	172	184	195	205	215	225
120	53	70	86	102	118	133	147	160	173	184	196	206	216	226
122	53	70	86	103	118	133	147	161	173	185	197	207	217	227
124	54	70	87	103	119	134	148	161	174	186	197	208	218	228
126	54	71	87	104	119	134	149	162	175	187	198	209	219	229
128	54	71	88	104	120	135	149	163	176	188	199	210	220	230
130	54	71	88	104	120	136	150	164	177	189	200	211	221	231
132	55	72	88	105	121	136	151	164	177	189	201	212	222	232
134	55	72	89	105	121	137	151	165	178	190	202	213	223	233
136	55	72	89	106	122	137	152	166	179	191	203	214	224	234
138	55	72	90	106	122	138	153	166	179	192	204	215	225	235
140	56	73	90	107	123	138	153	167	180	193	204	215	226	236

Source: Schaegel, B.E., D.L. Kulow, and R.N. Baughman. 1969. Empirical yield tables for West Virginia yellow-poplar. W. Va. Univ. Agric. Exp. Sta. Bull. 574T. 24 p.

Table 29.--Yield in hundreds of board feet per acre of yellow-poplar to a five-inch top inside bark, by basal area classes, age, and site; all trees 10.0 inches and larger (continued).

SITE INDEX = 90														
Basal Area Sq. Ft.	Age in Years													
	30	34	38	42	46	50	54	58	62	66	70	74	78	82
80	56	73	91	107	124	139	154	168	181	194	206	217	227	237
82	56	74	91	107	125	140	155	169	183	195	207	219	229	239
84	57	74	92	109	125	141	156	171	184	197	209	220	231	241
86	57	75	92	110	126	142	157	172	185	198	210	221	232	242
88	58	75	93	110	127	143	158	173	186	199	211	223	234	244
90	58	76	94	111	128	144	159	174	188	201	213	224	235	245
92	58	76	94	112	129	145	160	175	189	202	214	226	236	247
94	59	77	95	112	129	146	161	176	190	203	215	227	238	248
96	59	77	95	113	130	147	162	177	191	204	217	228	239	250
98	59	78	96	114	131	148	163	178	192	205	218	229	240	251
100	60	78	96	114	132	148	164	179	193	207	219	231	242	253
102	60	78	97	115	133	149	164	180	194	208	220	232	243	254
104	60	79	97	116	133	150	166	181	195	209	222	234	245	255
106	61	79	97	116	134	151	167	182	196	210	223	235	246	257
108	61	80	98	117	135	152	168	183	197	211	224	236	247	258
110	61	80	99	118	135	152	169	184	198	212	225	237	249	260
112	62	81	100	118	136	153	169	185	199	213	226	238	250	261
114	62	81	100	119	137	154	170	186	200	214	227	240	251	262
116	62	81	101	119	137	155	171	187	201	215	228	241	252	263
118	62	82	101	120	138	155	172	188	202	216	230	242	254	265
120	63	82	101	120	139	156	173	189	203	217	231	243	255	266
122	63	83	102	121	139	157	174	189	204	218	232	244	256	267
124	63	83	102	122	140	158	174	190	205	219	233	245	257	268
126	64	83	103	122	141	158	175	191	206	220	234	246	258	270
128	64	84	103	123	141	159	176	192	207	221	235	248	260	271
130	64	84	104	123	142	160	177	193	208	222	236	249	261	272
132	65	84	104	124	143	160	178	194	209	223	237	250	262	273
134	65	85	105	124	143	161	178	195	210	224	238	251	263	274
136	65	85	105	125	144	162	179	195	211	225	239	252	264	275
138	65	85	106	125	144	162	180	196	212	226	240	253	265	277
140	66	86	106	126	145	163	180	197	212	227	241	254	266	278

Source: Schaegel, B.E., D.L. Kulow, and R.N. Baughman. 1969. Empirical yield tables for West Virginia yellow-poplar. W. Va. Univ. Agric. Exp. Sta. Bull. 574T. 24 p.

Table 29.--Yield in hundreds of board feet per acre of yellow-poplar to a five-inch top inside bark, by basal area classes, age, site; all trees 10.0 inches and larger (continued).

SITE INDEX = 100														
Basal Area Sq. Ft.	Age in Years													
	30	34	38	42	46	50	54	58	62	66	70	74	78	82
80	66	86	107	127	146	164	182	198	214	229	243	256	268	280
82	66	87	107	128	147	165	183	200	215	230	244	257	270	282
84	67	88	108	128	148	167	184	201	217	232	246	259	272	284
86	67	88	109	129	149	168	185	202	218	233	248	261	273	285
88	68	89	110	130	150	169	187	204	220	235	249	263	275	287
90	68	89	110	131	151	170	187	205	221	236	251	264	277	289
92	69	90	111	132	152	171	189	206	222	237	252	266	279	291
94	69	90	112	133	153	172	190	207	223	239	254	267	280	292
96	70	91	112	133	154	173	191	208	224	241	255	269	282	294
98	70	91	113	134	154	174	192	210	226	242	257	271	284	296
100	70	92	114	135	155	175	194	211	228	243	258	272	285	298
102	71	93	114	136	156	176	195	212	229	245	260	274	287	299
104	71	93	115	136	157	177	196	213	230	246	261	275	289	301
106	72	94	116	137	158	178	197	215	232	247	263	277	290	303
108	72	94	116	138	159	179	198	216	233	249	264	278	292	304
110	72	94	117	139	160	180	199	217	234	250	265	280	293	306
112	73	95	117	139	160	181	200	218	235	251	267	281	295	307
114	73	95	118	140	161	181	201	219	236	253	268	282	296	309
116	73	96	119	141	162	182	202	220	237	254	269	284	298	310
118	74	96	119	141	163	183	203	221	239	255	271	286	299	312
120	74	97	120	142	164	184	204	222	240	256	272	287	300	313
122	74	97	120	143	164	185	205	223	241	257	273	288	302	315
124	75	98	121	143	165	186	206	224	242	259	274	289	303	316
126	75	98	121	144	166	187	207	225	243	260	276	290	305	318
128	75	99	122	145	167	188	207	226	244	261	277	292	306	319
130	76	99	122	145	167	188	208	227	245	262	278	293	307	321
132	76	99	123	146	168	189	209	227	246	263	279	294	308	322
134	76	100	123	146	169	190	210	229	247	264	280	295	310	323
136	77	100	124	147	169	191	211	230	248	265	282	297	311	325
138	77	101	124	147	170	192	212	231	249	267	283	298	312	326
140	77	101	125	148	171	192	213	232	250	268	284	299	314	327

Source: Schaegel, B.E., D.L. Kulow, and R.N. Baughman. 1969. Empirical yield tables for West Virginia yellow-poplar. W. Va. Univ. Agric. Exp. Sta. Bull. 574T. 24 p.



Table 29.--Yield in hundreds of board feet per acre of yellow-poplar to a five-inch top inside bark, by basal area classes, age, site; all trees 10.0 inches nad larger (continued).

SITE INDEX = 110														
Basal Area Sq. Ft.	Age in Years													
	30	34	38	42	46	50	54	58	62	66	70	74	78	82
80	78	102	126	149	172	194	214	234	252	269	286	301	316	330
82	78	103	127	150	173	195	216	235	254	271	288	303	318	332
84	79	103	128	151	174	196	217	237	256	273	290	305	320	334
86	79	104	129	152	176	198	219	238	257	275	292	307	322	336
88	80	105	129	153	177	199	220	240	259	277	294	309	324	339
90	81	105	130	154	178	200	221	242	261	279	295	311	326	341
92	81	106	131	155	179	201	223	243	262	280	297	313	328	343
94	82	107	132	156	180	203	224	245	264	282	299	315	330	345
96	82	107	132	157	181	204	225	246	265	284	301	317	332	347
98	82	108	133	158	182	205	227	247	267	285	303	319	334	349
100	83	108	133	158	183	206	228	249	268	287	304	321	336	351
102	83	109	135	160	184	207	229	250	270	289	306	323	338	353
104	84	110	136	161	185	208	231	252	271	290	308	324	340	355
106	84	110	136	162	186	210	232	253	273	292	309	326	342	357
108	85	111	137	162	187	211	233	254	274	293	311	328	344	359
110	85	111	138	163	188	212	234	256	276	295	313	330	345	360
112	86	112	138	164	189	213	235	257	277	296	314	331	347	362
114	86	113	139	165	190	214	237	258	279	298	316	333	349	364
116	87	113	140	166	191	215	238	259	280	299	317	334	351	366
118	87	114	140	167	192	216	239	261	281	301	319	336	352	368
120	87	114	141	167	193	217	240	262	283	302	320	338	354	369
122	88	115	142	168	194	218	241	263	284	303	322	339	356	371
124	88	115	142	169	195	219	242	264	285	305	323	341	357	373
126	89	116	143	170	195	220	243	266	286	306	325	342	359	375
128	89	116	144	170	196	221	245	267	288	308	326	344	360	376
130	89	117	144	171	197	222	246	268	289	309	328	345	362	378
132	90	117	145	172	198	223	247	269	290	310	329	347	364	379
134	90	118	145	173	199	224	248	270	291	312	330	348	365	381
136	90	118	146	173	200	225	249	271	293	313	332	350	367	383
138	91	119	147	174	201	226	250	272	294	314	333	351	368	384
140	91	119	147	175	201	227	251	274	295	315	335	353	370	386

Source: Schaegel, B.E., D.L. Kulow, and R.N. Baughman. 1969. Empirical yield tables for West Virginia yellow-poplar. W. Va. Univ. Agric. Exp. Sta. Bull. 574T. 24 p.

Table 30.--Yield table for old-field sweetgum stands in New Jersey<sup>1</sup>.

(Merchantable cubic-foot volume in trees larger than 5.5 inches  
d.b.h. to a 4.0-inch top, outside bark)

Stand age (years)	60-foot sites		70-foot sites		80-foot sites		90-foot sites	
	Basal area	Yield	Basal area	Yield	Basal area	Yield	Basal area	Yield
	<u>Sq. ft.</u>	<u>Cu. ft.</u>	<u>Sq. ft.</u>	<u>Cu. ft.</u>	<u>Sq. ft.</u>	<u>Cu. ft.</u>	<u>Sq. ft.</u>	<u>Cu. ft.</u>
30	115	1590	130	2130	140	2770	155	3650
	155	1940	170	2610	180	3390	195	4430
40	130	2100	140	2810	150	3700	165	4930
	170	2570	180	3450	190	4530	205	5980
50	140	2630	150	3570	160	4740	175	6340
	180	3220	190	4370	200	5780	215	7660
60	150	3220	160	4400	175	6040	190	8080
	190	3910	200	5360	215	7300	230	9670

<sup>1</sup>Dotted lines indicate limits of basic data.

Source: Phillips, J. J. 1961. Prediction of yield in old-field sweetgum stands in southern New Jersey. U.S.F.S. Northeastern Forest Exp. Sta., Res. Note 126. 4p.

Table 31.--Average yield of hickory per acre.

Age.	Average diameter breast-high.	Average height.	Trees.	Total volume.	Merchantable volume.
Years:	Inches	Feet	Number	Cubic feet	Cubic feet
30 . . . . .	4.0	33	700	800	100
40 . . . . .	5.0	41	480	1,100	300
50 . . . . .	6.2	49	320	1,400	500
60 . . . . .	7.2	57	230	1,700	700
70 . . . . .	8.1	64	180	2,000	850
80 . . . . .	9.0	69	155	2,300	1,000
90 . . . . .	9.8	74	135	2,600	1,150
100. . . . .	10.5	78	120	2,900	1,300
120. . . . .	11.8	85	100	3,500	1,650
150. . . . .	13.4	92	75	4,400	2,000
200. . . . .	19.0	100	65	5,700	2,700

Source: Boisen, A. T. and J. A. Newlin. 1910. The commercial hickories. U.S.F.S. Bull. no. 80. 64p.

Table 32.--Yield of pure, even-aged,  
well stocked stands of ash<sup>1</sup>  
on different quality sites.<sup>1</sup>

QUALITY I.					
Age.	Number of trees per acre 3" and over.	Average diameter breasthigh 3" and over.	Yield per acre.		
			Scribner Decimal C		Cords.
			7" and over.	3" and over.	
Years.	Number.	Inches.	Board feet.	Cubic feet.	
20	427	5.4	2,000	2,200	24.4
25	391	6.5	4,200	3,100	34.4
30	375	7.5	6,500	3,900	42.3
35	361	8.3	9,000	4,600	51.1
40	341	9.1	11,700	5,250	58.3
45	322	9.9	14,700	5,830	64.8
50	288	10.5	18,000	6,350	70.6
55	271	11.2	21,700	6,860	75.6
60	224	11.8	25,700	7,220	80.2
65	203	12.4	29,500	7,490	84.4
70	188	13.0	33,800	7,950	88.3
75	175	13.5	35,600	8,280	92.0
80	166	14.0	38,000	8,600	95.6

## QUALITY II.

20	482	4.0	1,000	850	9.4
25	435	5.0	1,900	1,680	18.7
30	415	5.8	2,200	2,400	26.7
35	395	6.6	3,600	3,080	33.9
40	378	7.4	5,300	3,630	40.3
45	367	8.0	7,500	4,150	45.9
50	361	8.7	9,900	4,550	51.0
55	339	9.3	12,700	5,000	55.6
60	349	9.8	15,700	5,380	58.8
65	298	10.4	19,100	5,720	66.8
70	309	10.9	22,600	6,010	66.8
75	288	11.5	25,500	6,270	69.7
80	268	12.0	28,000	6,520	72.4

## QUALITY III.

25	409	3.5	1,000	470	5.2
30	423	4.2	1,500	910	10.8
35	422	4.9	2,000	1,470	16.2
40	426	5.5	2,500	1,930	21.7
45	410	6.2	3,000	2,400	26.7
50	402	6.8	3,500	2,700	31.0
55	382	7.3	4,000	3,150	35.9
60	382	7.9	4,500	3,470	38.6
65	377	8.4	5,000	3,760	41.8
70	371	8.9	5,500	4,020	44.7
75	345	9.3	6,000	4,280	47.3
80	330	9.8	6,500	4,490	49.2

<sup>1</sup>Based on 18 plots, Quality I; 30 plots, Quality II; 14 plots, Quality III; with a total area of 16.9 acres.

Source: Sterrett, W.D. 1915. The ashes: their characteristics and management. U.S.D.A. Bull. 299. 88p.

Table 33.--Cubic foot volume yield equations of the form  
 $\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{UTRE} + b_3\text{MTRE} + b_4\text{BA} + b_5\text{AMH}$ ,  
 and their coefficients of determination and standard deviations  
 for the ten working forest site types and for all site types combined.

<u>Working Forest Site Type</u>	<u>Cubic Foot Volume Yield Equation</u>	<u>Coefficients of Determination (R<sup>2</sup>)</u>	<u>Standard Deviations (Cu.Ft.)</u>
Muck Swamp	- 3154.701 + 9.578AGE - 0.124UTRE - 0.246MTRE + 18.088BA + 69.744AMH	0.91	531
Peat Swamp	- 1766.069 + 11.129AGE - 0.712UTRE - 0.758MTRE + 17.207BA + 37.801AMH	0.98	227
Black River Bottom	- 2804.769 - 2.816AGE - 0.364UTRE + 0.912MTRE + 15.020BA + 84.350AMH	0.96	371
Branch Bottom	- 1588.957 - 3.525AGE - 0.530UTRE + 0.623MTRE + 16.121BA + 48.227AMH	0.94	267
Atlantic Coastal Plain Bottomland	- 2084.189 + 12.988AGE - 0.544UTRE + 0.601MTRE + 15.675BA + 45.871AMH	0.95	278
Atlantic Piedmont Bottomland	- 1186.118 + 0.603AGE - 0.925UTRE - 0.841MTRE + 17.467BA + 39.143AMH	0.94	226
Gulf Coastal Plain and Piedmont Bottomland	- 1768.901 + 3.536AGE - 0.378UTRE + 0.376MTRE + 15.684BA + 49.251AMH	0.95	201
Atlantic and Gulf Piedmont Ridge	- 1097.345 - 1.708AGE - 1.032UTRE - 1.437MTRE + 19.693BA + 32.919AMH	0.96	117
Mountain Bottomland and Cove	- 1969.985 + 4.610AGE - 1.025UTRE + 1.377MTRE + 16.149BA + 48.640AMH	0.98	160
Mountain Ridge	- 1232.567 + 0.219AGE - 0.182UTRE - 0.986MTRE + 16.628BA + 37.127AMH	0.94	172
Combined	- 1837.872 + 3.341AGE - 0.618UTRE + 0.480MTRE + 16.395BA + 47.707AMH	0.94	306

Source: Kellison, Bob. 1972. Cubic volume yield tables of naturally regenerated, mixed hardwood stands of the southern United States. A report of the N.C. State Univ.- Industry Hardwood Research Program. 33p.

Table 34 .--Cubic foot volume yield equations of the form  
 $\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{MTRE} + b_3\text{BA} + b_4\text{AMH}$ ,  
and their coefficients of determination and standard deviations  
for the ten working forest site types and for all site types combined.

Working Forest Site Type	Cubic Foot Volume Yield Equation	Coefficients of Determination ( $R^2$ )	Standard Deviations (Cu. Ft.)
Muck Swamp	- 3331.753 + 11.893AGE - 0.330MTRE + 18.125BA + 70.583AMH	0.91	527
Peat Swamp	- 3423.044 + 26.978AGE + 2.103MTRE + 11.084BA + 55.716AMH	0.92	412
Black River Bottom	- 3886.480 + 13.973AGE + 1.169MTRE + 14.517BA + 87.760AMH	0.95	443
Branch Bottom	- 2271.051 + 2.201AGE + 1.194MTRE + 14.854BA + 56.515AMH	0.92	304
Atlantic Coastal Plain Bottomland	- 2710.550 + 19.394AGE + 0.842MTRE + 15.755BA + 48.813AMH	0.94	308
Atlantic Piedmont Bottomland	- 2067.751 + 8.906AGE + 0.812MTRE + 12.350BA + 54.412AMH	0.90	294
Gulf Coastal Plain and Piedmont Bottomland	- 2058.802 + 5.261AGE + 0.339MTRE + 15.859BA + 51.932AMH	0.94	211
Atlantic and Gulf Piedmont Ridge	- 2012.455 + 10.285AGE - 0.589MTRE + 19.056BA + 32.021AMH	0.92	217
Mountain Bottomland and Cove	- 2603.650 + 11.311AGE + 1.228MTRE + 14.303BA + 54.661AMH	0.95	237
Mountain Ridge	- 1350.042 + 0.540AGE - 1.025MTRE + 16.918BA + 38.350AMH	0.94	169
Combined	- 2470.305 + 9.591AGE + 0.659MTRE + 15.621BA + 53.857AMH	0.92	351

Table 35.--Yields in cubic feet per acre of the Muck Swamp working forest site type, as obtained from the equation:

$$\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{UTRE} + b_3\text{MTRE} + b_4\text{BA} + b_5\text{AMH.}$$

Age Class (Years)	Yield (Cu.Ft./ Acre)	Unmerch. Trees (Number/ Acre)	Merch. Trees (Number/ Acre)	Basal Area (Sq.Ft./ Acre)	Avg. Ht. Merch. Trees (Feet)	Avg. DBH Merch. Trees (Inches)
20	1500.9	1050.7	286.0	157.6	26.0	7.79
30	1915.9	756.5	294.6	149.7	32.1	8.58
40	2556.1	523.7	299.0	158.8	37.2	9.35
50	3421.6	352.3	299.2	184.8	41.2	10.10
60	4512.5	242.2	295.1	227.7	44.1	10.85

Table 36.--Yields in cubic feet of the Peat Swamp working forest site type, as obtained from the equation:

$$\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{UTRE} + b_3\text{MTRE} + b_4\text{BA} + b_5\text{AMH.}$$

Age Class (Years)	Yield (Cu.Ft./ Acre)	Unmerch. Trees (Number/ Acre)	Merch. Trees (Number/ Acre)	Basal Area (Sq.Ft./ Acre)	Avg. Ht. Merch. Trees (Feet)	Avg. DBH Merch. Trees (Inches)
20	150.9	1861.6	140.5	106.5	34.2	6.27
30	1202.6	1202.3	203.6	138.8	33.3	7.51
40	2024.9	703.7	255.7	159.9	34.1	8.37
50	2617.8	365.9	296.9	170.0	36.7	8.86
60	2981.4	188.8	327.1	168.9	41.2	8.98

Source: Kellison, Bob. 1972. Cubic volume yield tables of naturally regenerated, mixed hardwood stands of the southern United States. A report of the N.C. State Univ. - Industry Hardwood Research Program. 33p.

Table 37.--Yields in cubic feet per acre of the Black River Bottom working forest site type, as obtained from the equation:  
 $\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{UTRE} + b_3\text{MTRE} + b_4\text{BA} + b_5\text{AMH.}$

Age Class (Years)	Yield (Cu.Ft./ Acre)	Unmerch. Trees (Number/ Acre)	Merch. Trees (Number/ Acre)	Basal Area (Sq.Ft./ Acre)	Avg. Ht. Merch. Trees (Feet)	Avg. DBH Merch. Trees (Inches)
20	1209.3	852.6	161.3	118.4	34.2	8.14
30	2151.9	536.1	232.8	149.3	36.1	8.98
40	3166.9	306.6	267.0	186.1	39.2	10.14
50	4254.3	164.0	263.9	228.7	43.5	11.61
60	5414.0	108.4	223.5	277.2	48.8	13.39

Table 38.--Yields in cubic feet per acre of the Branch Bottom working forest site type, as obtained from the equation:  
 $\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{UTRE} + b_3\text{MTRE} + b_4\text{BA} + b_5\text{AMH.}$

Age Class (Years)	Yield (Cu.Ft./ Acre)	Unmerch. Trees (Number/ Acre)	Merch. Trees (Number/ Acre)	Basal Area (Sq.Ft./ Acre)	Avg. Ht. Merch. Trees (Feet)	Avg. DBH Merch. Trees (Inches)
20	1498.0	629.1	223.5	110.7	32.5	7.99
30	1905.2	428.3	228.5	120.6	36.1	8.70
40	2279.6	298.3	231.6	134.5	38.5	9.39
50	2621.3	239.1	232.7	152.2	39.7	10.05
60	2930.4	250.6	231.8	173.8	39.8	10.69

Source: Kellison, Bob. 1972. Cubic volume yield tables of naturally regenerated, mixed hardwood stands of the southern United States. A report of the N.C. State Univ. - Industry Hardwood Research Program. 33p.



Table 39.--Yields in cubic feet per acre of the Atlantic Coastal Plain Bottomland working forest site type, as obtained from the equation:

$$\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{UTRE} + b_3\text{MTRE} + b_4\text{BA} + b_5\text{AMH.}$$

Age Class (Years)	Yield (Cu.Ft./ Acre)	Unmerch. Trees (Number/ Acre)	Merch. Trees (Number/ Acre)	Basal Area (Sq.Ft./ Acre)	Avg. Ht. Merch. Trees (Feet)	Avg. DBH Merch. Trees (Inches)
20	1089.9	749.5	194.0	105.9	33.9	7.92
30	2069.3	428.0	219.0	131.3	39.5	8.97
40	2831.3	231.1	228.3	151.9	43.7	9.96
50	3375.7	158.7	222.1	167.7	46.6	10.90
60	3702.7	210.8	200.2	178.7	48.0	11.77

Table 40.--Yields in cubic feet per acre of the Atlantic Piedmont Bottomland working forest site type, as obtained from the equation:

$$\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{UTRE} + b_3\text{MTRE} + b_4\text{BA} + b_5\text{AMH.}$$

Age Class (Years)	Yield (Cu.Ft./ Acre)	Unmerch. Trees (Number/ Acre)	Merch. Trees (Number/ Acre)	Basal Area (Sq.Ft./ Acre)	Avg. Ht. Merch. Trees (Feet)	Avg. DBH Merch. Trees (Inches)
20	1257.4	483.1	209.4	105.3	31.0	7.83
30	1813.7	356.1	216.9	120.0	35.7	8.75
40	2250.4	262.9	211.1	130.1	39.9	9.59
50	2567.6	203.5	192.0	135.6	43.6	10.36
60	2765.2	177.8	159.5	136.4	46.8	11.06

Source: Kellison, Bob. 1972. Cubic volume yield tables of naturally regenerated, mixed hardwood stands of the southern United States. A report of the N.C. State Univ. - Industry Hardwood Research Program. 33p.

Table 4L.--Yields in cubic feet per acre of the Gulf Coastal Plain and Piedmont Bottomland working forest site type, as obtained from the equation:

$$\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{UTRE} + b_3\text{MTRE} + b_4\text{BA} + b_5\text{AMH.}$$

Age Class (Years)	Yield (Cu.Ft./ Acre)	Unmerch. Trees (Number/ Acre)	Merch. Trees (Number/ Acre)	Basal Area (Sq.Ft./ Acre)	Avg. Ht. Merch. Trees (Feet)	Avg. DBH Merch. Trees (Inches)
20	1059.7	498.1	191.4	89.3	29.9	7.94
30	1714.0	347.1	218.8	111.4	34.1	8.55
40	2257.3	244.4	216.5	128.1	38.3	9.57
50	2689.8	190.2	184.7	139.4	42.6	11.01
60	3011.2	184.5	123.2	145.4	46.9	12.87

Table 42.--Yields in cubic feet per acre of the Atlantic and Gulf Piedmont Ridge working forest site type, as obtained from the equation:  
Vol. = Constant + b<sub>1</sub>AGE + b<sub>2</sub>UTRE + b<sub>3</sub>MTRE + b<sub>4</sub>BA + b<sub>5</sub>AMH.

Age Class (Years)	Yield (Cu.Ft./ Acre)	Unmerch. Trees (Number/ Acre)	Merch. Trees (Number/ Acre)	Basal Area (Sq.Ft./ Acre)	Avg. Ht. Merch. Trees (Feet)	Avg. DBH Merch. Trees (Inches)
20	754.8	628.9	191.6	91.2	30.8	7.27
30	927.9	469.7	184.9	93.3	30.0	7.70
40	1226.9	343.5	178.7	98.0	32.6	8.42
50	1651.6	250.4	172.9	105.0	38.7	9.43
60	2202.2	190.4	167.5	114.6	48.1	10.73

Source: Kellison, Bob. 1972. Cubic volume yield tables of naturally regenerated, mixed hardwood stands of the southern United States. A report of the N.C. State Univ. - Industry Hardwood Research Program. 33p.

Table 43.--Yields in cubic feet per acre of the Mountain Bottomland and Cove working forest site type, as obtained from the equation:  
 $Vol. = Constant + b_1AGE + b_2UTRE + b_3MTRE + b_4BA + b_5AMH.$

Age Class (Years)	Yield (Cu.Ft./Acre)	Unmerch. Trees (Number/Acre)	Merch. Trees (Number/Acre)	Basal Area (Sq.Ft./Acre)	Avg. Ht. Merch. Trees (Feet)	Avg. DBH Merch. Trees (Inches)
20	1104.7	356.3	159.7	86.6	35.5	7.79
30	1893.8	277.0	177.4	106.8	41.9	9.40
40	2332.2	208.8	173.2	115.3	45.9	10.42
50	2419.9	151.9	146.8	111.9	47.4	10.86
60	2156.9	106.2	98.5	96.9	46.4	10.71

Table 44.--Yields in cubic feet per acre of the Mountain Ridge working forest site type, as obtained from the equation:  
 $Vol. = Constant + b_1AGE + b_2UTRE + b_3MTRE + b_4BA + b_5AMH.$

Age Class (Years)	Yield (Cu.Ft./Acre)	Unmerch. Trees (Number/Acre)	Merch. Trees (Number/Acre)	Basal Area (Sq.Ft./Acre)	Avg. Ht. Merch. Trees (Feet)	Avg. DBH Merch. Trees (Inches)
20	873.0	322.0	212.9	76.0	29.8	7.23
30	1336.3	263.0	185.4	88.2	35.7	8.56
40	1495.7	223.0	172.1	91.6	37.9	9.12
50	1351.3	202.1	172.8	86.4	36.2	8.91
60	903.0	200.2	187.7	72.6	30.6	7.92

Source: Kellison, Bob. 1972. Cubic volume yield tables of naturally regenerated, mixed hardwood stands of the southern United States. A report of the N.C. State Univ. - Industry Hardwood Research Program. 33p.



Table 45.--Yields in cubic feet per acre of all working forest site types COMBINED, as obtained from the equation:  
 $\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{UTRE} + b_3\text{MTRE} + b_4\text{BA} + b_5\text{AMH}.$

Age Class (Years)	Yield (Cu.Ft./ Acre)	Unmerch. Trees (Number/ Acre)	Merch. Trees (Number/ Acre)	Basal Area (Sq.Ft./ Acre)	Avg. Ht. Merch. Trees (Feet)	Avg. DBH Merch. Trees (Inches)
20	1198.8	643.2	206.8	107.0	31.7	7.84
30	1762.9	437.3	218.1	120.6	35.4	8.64
40	2279.9	294.6	220.7	134.5	38.9	9.47
50	2749.8	214.9	214.5	148.7	42.2	10.33
60	3172.5	198.3	199.5	163.3	45.3	11.22

Table 46.--Yields in cubic feet per acre of the Muck Swamp working forest site type, as obtained from the equation:  
 $\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{MTRE} + b_3\text{BA} + b_4\text{AMH}.$

Age Class (Years)	Yield (Cu.Ft./ Acre)	Merch. Trees (Number/ Acre)	Basal Area (Sq.Ft./ Acre)	Avg. Ht. Merch. Trees (Feet)	Avg. DBH Merch. Trees (Inches)
20	1504.1	286.0	157.6	26.0	7.8
30	1909.8	294.6	149.7	32.1	8.6
40	2548.5	299.0	158.8	37.2	9.3
50	3420.3	299.2	184.8	41.2	10.1
60	4525.0	295.1	227.7	44.1	10.8

Source: Kellison, Bob. 1972. Cubic volume yield tables of naturally regenerated, mixed hardwood stands of the southern United States. A report of the N.C. State Univ. - Industry Hardwood Research Program. 33p.

Table 47.--Yields in cubic feet per acre of the Peat Swamp working forest site type, as obtained from the equation:  
 $\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{MTRE} + b_3\text{BA} + b_4\text{AMH}.$

Age Class (Years)	Yield (Cu.Ft./ Acre)	Merch. Trees (Number/ Acre)	Basal Area (Sq.Ft./ Acre)	Avg. Ht. Merch. Trees (Feet)	Avg. DBH Merch. Trees (Inches)
20	499.7	140.5	106.5	34.2	6.3
30	1206.0	203.6	138.8	33.3	7.5
40	1866.3	255.7	159.9	34.1	8.4
50	2480.6	296.9	170.0	36.7	8.9
60	3048.9	327.1	168.9	41.2	9.0

Table 48.--Yields in cubic feet per acre of the Black River Bottom working forest site type, as obtained from the equation:  
 $\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{MTRE} + b_3\text{BA} + b_4\text{AMH}.$

Age Class (Years)	Yield (Cu.Ft./ Acre)	Merch. Trees (Number/ Acre)	Basal Area (Sq.Ft./ Acre)	Avg. Ht. Merch. Trees (Feet)	Avg. DBH Merch. Trees (Inches)
20	1298.4	161.3	118.4	34.2	8.1
30	2145.0	232.8	149.3	36.1	9.0
40	3130.4	267.0	186.1	39.2	10.1
50	4254.7	263.9	228.7	43.5	11.6
60	5517.7	223.5	277.2	48.8	13.4

Source: Kellison, Bob. 1972. Cubic volume yield tables of naturally regenerated, mixed hardwood stands of the southern United States. A report of the N.C. State Univ. - Industry Hardwood Research Program. 33p.

Table 49.--Yields in cubic feet per acre of the Branch Bottom working forest site type, as obtained from the equation  
 $\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{MTRE} + b_3\text{BA} + b_4\text{AMH}.$

Age Class (Years)	Yield (Cu.Ft./ Acre)	Merch. Trees (Number/ Acre)	Basal Area (Sq.Ft./ Acre)	Avg. Ht. Merch. Trees (Feet)	Avg. DBH Merch. Trees (Inches)
20	1520.8	223.5	110.7	32.5	8.0
30	1898.5	228.5	120.6	36.1	8.7
40	2265.4	231.6	134.5	38.5	9.4
50	2621.4	232.7	152.2	39.7	10.1
60	2966.5	231.8	173.8	39.8	10.7

Table 50.--Yields in cubic feet per acre of the Atlantic Coastal Plain Bottomland working forest site type, as obtained from the equation:  
 $\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{MTRE} + b_3\text{BA} + b_4\text{AMH}.$

Age Class (Years)	Yield (Cu.Ft./ Acre)	Merch. Trees (Number/ Acre)	Basal Area (Sq.Ft./ Acre)	Avg. Ht. Merch. Trees (Feet)	Avg. DBH Merch. Trees (Inches)
20	1161.5	194.0	105.9	33.9	7.9
30	2051.4	219.0	131.3	39.5	9.0
40	2784.5	228.3	151.9	43.7	10.0
50	3360.9	222.1	167.7	46.6	10.9
60	3780.6	200.2	178.7	48.0	11.8

Source: Kellison, Bob. 1972. Cubic volume yield tables of natural regenerated, mixed hardwood stands of the southern United States. A report of the N.C. State Univ. - Industry Hardw Research Program. 33p.

Table 51.--Yields in cubic feet per acre of the Atlantic Piedmont Bottomland working forest site type, as obtained from the equation:

$$\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{MTRE} + b_3\text{BA} + b_4\text{AMH.}$$

Age Class (Years)	Yield (Cu.Ft./ Acre)	Merch. Trees (Number/ Acre)	Basal Area (Sq.Ft./ Acre)	Avg. Ht. Merch. Trees (Feet)	Avg. DBH Merch. Trees (Inches)
20	1269.9	209.4	105.3	31.0	7.8
30	1800.1	216.9	120.0	35.7	8.7
40	2236.2	211.1	130.1	39.9	9.6
50	2578.2	192.0	135.6	43.6	10.4
60	2826.1	159.5	136.4	46.8	11.1

Table 52.--Yields in cubic feet per acre of the Gulf Coastal Plain and Piedmont Bottomland working forest site type, as obtained from the equation:

$$\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{MTRE} + b_3\text{BA} + b_4\text{AMH.}$$

Age Class (Years)	Yield (Cu.Ft./ Acre)	Merch. Trees (Number/ Acre)	Basal Area (Sq.Ft./ Acre)	Avg. Ht. Merch. Trees (Feet)	Avg. DBH Merch. Trees (Inches)
20	1081.4	191.4	89.3	29.9	7.9
30	1709.8	218.8	111.4	34.1	8.5
40	2246.0	216.5	128.1	38.3	9.6
50	2689.7	184.7	139.4	42.6	11.0
60	3041.2	123.2	145.4	46.9	12.9

Source: Kellison, Bob. 1972. Cubic volume yield tables of naturally regenerated, mixed hardwood stands of the southern United States. A report of the N.C. State Univ. - Industry Hardwood Research Program. 33p.



Table 53.--Yields in cubic feet per acre of the Atlantic and Gulf Piedmont Ridge working forest site type, as obtained from the equation:

$$\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{MTRE} + b_3\text{BA} + b_4\text{AMH.}$$

Age Class (Years)	Yield (Cu.Ft./ Acre)	Merch. Trees (Number/ Acre)	Basal Area (Sq.Ft./ Acre)	Avg. Ht. Merch. Trees (Feet)	Avg. DBH Merch. Trees (Inches)
20	805.3	191.6	91.2	30.8	7.3
30	927.7	184.9	93.3	30.0	7.7
40	1205.8	178.7	98.0	32.6	8.4
50	1639.6	172.9	105.0	38.7	9.4
60	2229.0	167.5	114.6	48.1	10.7

Table 54.--Yields in cubic feet per acre of the Mountain Bottomland and Cove working forest site type, as obtained from the equation:

$$\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{MTRE} + b_3\text{BA} + b_4\text{AMH.}$$

Age Class (Years)	Yield (Cu.Ft./ Acre)	Merch. Trees (Number/ Acre)	Basal Area (Sq.Ft./ Acre)	Avg. Ht. Merch. Trees (Feet)	Avg. DBH Merch. Trees (Inches)
20	1100.5	159.7	86.6	35.5	7.8
30	1873.9	177.4	106.8	41.9	9.4
40	2318.4	173.2	115.3	45.9	10.4
50	2433.8	146.8	111.9	47.4	10.9
60	2220.2	98.5	96.9	46.4	10.7

Source: Kellison, Bob. 1972. Cubic volume yield tables of natural regenerated, mixed hardwood stands of the southern United States. A report of the N.C. State Univ. - Industry Hardwood Research Program. 33p.

Table 55.--Yields in cubic feet per acre of the Mountain Ridge working forest site type, as obtained from the equation:  
 $\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{MTRE} + b_3\text{BA} + b_4\text{AMH.}$

Age Class (Years)	Yield (Cu.Ft./ Acre)	Merch. Trees (Number/ Acre)	Basal Area (Sq.Ft./ Acre)	Avg. Ht. Merch. Trees (Feet)	Avg. DBH Merch. Trees (Inches)
20	870.7	212.9	76.0	29.8	7.2
30	1338.4	185.4	88.2	35.7	8.6
40	1497.9	172.1	91.6	37.9	9.1
50	1349.2	172.8	86.4	36.2	8.9
60	892.4	187.7	72.6	30.6	7.9

Table 56.--Yields in cubic feet per acre of the COMBINED working forest site types, as obtained from the equation:  
 $\text{Vol.} = \text{Constant} + b_1\text{AGE} + b_2\text{MTRE} + b_3\text{BA} + b_4\text{AMH.}$

Age Class (Years)	Yield (Cu.Ft./ Acre)	Merch. Trees (Number/ Acre)	Basal Area (Sq.Ft./ Acre)	Avg. Ht. Merch. Trees (Feet)	Avg. DBH Merch. Trees (Inches)
20	1238.3	206.8	107.0	31.7	7.8
30	1751.7	218.1	120.6	35.4	8.6
40	2254.1	220.7	134.5	38.9	9.5
50	2745.3	214.5	148.7	42.2	10.3
60	3225.4	199.5	163.3	45.3	11.2

Source: Kellison, Bob. 1972. Cubic volume yield tables of naturally regenerated, mixed hardwood stands of the southern United States. A report of the N.C. State Univ. - Industry Hardwood Research Program. 33p.

Table 57.--Yields per acre for upland oak; no thinning.

Age (years)	Basal area	Trees	Average tree diameter <sup>1</sup>	Yields		
	<i>Square feet</i>	<i>No.</i>	<i>Inches</i>	<i>Cubic feet</i>	<i>Cords</i>	<i>Board feet</i>
SITE INDEX 55						
20	55	2,500	2.0	60	0.6	—
30	75	1,260	3.3	583	5.3	—
40	87	790	4.5	1,320	12.1	—
50	97	480	6.1	2,150	19.7	400
60	104	357	7.3	2,520	22.9	900
70	108	295	8.2	2,730	24.4	2,800
80	112	242	9.2	2,880	25.6	5,400
SITE INDEX 65						
20	59	1,880	2.4	178	1.6	—
30	81	930	4.0	1,200	10.6	—
40	96	505	5.9	1,840	18.2	440
50	105	342	7.5	2,800	26.9	2,150
60	111	262	8.8	3,300	30.8	5,160
70	115	215	9.9	3,700	33.3	7,200
80	117	187	10.7	3,950	35.6	8,200
SITE INDEX 75						
20	70	1,425	3.0	694	6.4	—
30	89	680	4.9	1,670	16.7	—
40	101	400	6.8	2,440	23.7	1,380
50	110	279	8.5	3,315	30.1	4,100
60	114	222	9.7	4,140	37.7	9,288
70	117	187	10.7	4,760	43.0	11,200
80	120	166	11.5	5,160	46.5	12,500

<sup>1</sup>The diameter of the tree of average basal area.

Source: Gingrich, S. F. 1971. Management of young and intermediate stands of upland hardwoods. U.S.F.S. Northeastern Forest Exp. Sta., Res. Paper NE-195. 26p.

Table 58.--Yields per acre for upland oak. First thinning at age 10.

Age (years)	Residual stand					Cut stand					Cumulative total yields (cut stand plus residual stand)	
	Basal area	Average tree diameter	Yield			Basal area	Yield					
	Square feet	Inches	Cubic feet	Cords	Board feet	Square feet	Cubic feet	Cords	Board feet	Cubic feet	Cords	Board feet
SITE INDEX 55												
10	20	1.9	—	—	—	—	—	—	—	—	—	—
20	48	4.1	515	5.0	—	7	25	—	—	—	—	—
30	58	5.9	1,190	9.9	240	20	345	4.2	—	540	5.0	—
40	64	8.0	1,640	15.0	1,560	19	350	3.6	160	1,560	14.1	240
50	71	10.6	1,990	18.3	3,800	16	415	4.4	590	2,360	22.8	1,720
60	75	13.0	2,280	20.7	6,540	16	485	4.9	1,050	3,125	30.5	4,550
SITE INDEX 65												
10	23	2.1	—	—	—	—	—	—	—	—	—	—
20	51	4.5	775	6.8	—	8	125	1.2	—	900	8.0	—
30	59	6.4	1,445	13.1	540	25	370	3.8	—	1,940	18.1	540
40	66	8.6	1,920	18.0	2,280	21	465	3.8	280	2,880	26.8	2,560
50	72	11.0	2,340	21.8	5,250	19	575	5.2	970	3,875	35.8	6,500
60	76	13.7	2,655	24.3	8,940	18	670	5.8	1,810	4,860	44.1	12,000
SITE INDEX 75												
10	25	2.5	—	—	—	—	—	—	—	—	—	—
20	55	5.4	1,060	9.6	—	12	200	1.6	—	—	—	—
30	62	7.4	1,920	17.5	1,380	30	520	5.2	60	1,260	11.2	—
40	71	10.5	2,550	23.0	4,840	22	610	5.6	500	2,640	24.3	1,440
50	75	13.2	3,025	26.8	10,300	22	745	6.8	1,540	3,880	35.4	5,400
60	78	15.5	3,360	29.7	13,200	21	925	7.8	3,540	5,100	46.0	12,400
											56.7	18,840

Source: Gingrich, S. F. 1971. Management of young and intermediate stands of upland hardwoods. U.S.F.S. Northeastern Forest Exp. Sta., Res. Paper NE-195. 26p.

Table 59.--Yields per acre for upland oak.. First thinning at age 20.

Age (years)	Residual stand					Cut stand					Cumulative total yields (cut stand plus residual stand)		
	Basal area	Average tree diameter	Yield			Basal area	Yield						
	Square feet	Inches	Cubic feet	Cords	Board feet	Square feet	Cubic feet	Cords	Board feet	Cubic feet	Cords	Board feet	
SITE INDEX 55													
20	34	2.3	60	0.6	—	—	—	—	—	60	0.6	—	
30	49	4.2	600	5.1	—	15	—	0.9	—	600	6.0	—	
40	58	6.1	1,220	12.2	880	16	300	2.9	—	1,520	16.0	880	
50	66	8.6	1,750	16.0	2,350	15	300	3.2	150	2,350	23.0	2,500	
60	71	10.6	1,980	18.6	3,960	15	360	3.2	570	2,940	28.8	4,680	
70	74	12.1	2,170	20.0	5,810	14	370	3.8	820	3,500	34.0	7,350	
SITE INDEX 65													
20	37	2.8	160	1.6	—	—	18	—	—	178	1.6	—	
30	50	4.6	750	7.4	—	20	132	1.2	—	900	8.6	—	
40	63	7.7	1,760	16.0	1,320	15	290	3.2	—	2,200	20.4	1,320	
50	69	9.8	2,150	19.7	3,500	19	625	4.1	400	3,215	28.2	3,900	
60	73	12.0	2,460	22.5	6,120	18	515	4.4	1,160	4,040	35.4	7,680	
70	77	14.6	2,730	24.2	9,030	16	520	4.9	2,010	4,830	42.0	12,600	
SITE INDEX 75													
20	46	3.6	476	4.4	—	—	218	2.0	—	694	6.4	—	
30	57	5.6	1,275	13.0	—	26	307	3.6	—	1,800	18.6	—	
40	66	8.4	2,140	19.8	2,160	21	535	4.8	240	3,200	30.2	2,400	
50	71	10.8	2,600	24.7	6,450	21	665	5.4	1,160	4,325	40.5	7,850	
60	76	13.4	3,060	28.5	10,680	19	615	4.9	2,020	5,400	49.2	14,100	
70	79	16.3	3,465	31.5	13,720	19	635	5.2	2,740	6,440	57.4	19,850	

Source: Gingrich, S. F. 1971. Management of young and intermediate stands of upland hardwoods. U.S.F.S. Northeastern Forest Exp. Sta., Res. Paper NE-195. 26p.

Table 60.--Yields per acre for upland oak. First thinning at age 30.

Age (years)	Residual stand				Cut stand				Cumulative total yields (cut stand plus residual stand)			
	Basal area	Average tree diameter	Yield		Basal area	Yield						
	Square feet	Inches	Cubic feet	Cords	Square feet	Cubic feet	Cords	Board feet	Cubic feet	Cords	Board feet	
	SITE INDEX 55											
30	58	4.3	528	4.8	—	17	55	0.5	—	—	—	—
40	55	5.7	1,120	9.4	—	27	265	3.1	—	583	5.3	—
50	62	7.8	1,600	14.2	200	27	265	3.1	—	1,440	13.0	200
60	67	10.2	1,950	17.4	1,500	15	330	3.4	—	2,250	21.2	1,500
70	72	11.7	2,135	19.6	3,000	15	310	3.2	360	2,910	27.6	3,360
80	75	13.0	2,280	20.6	5,040	12	335	3.1	550	3,430	32.9	5,950
					8,000	12	345	3.7	1,010	3,920	37.6	9,920
	SITE INDEX 65											
30	62	4.9	1,120	9.6	—	20	80	1.0	—	—	—	—
40	60	6.6	1,520	13.6	—	29	400	3.8	—	1,200	10.6	—
50	67	9.0	2,000	18.5	640	29	400	3.8	—	2,000	18.4	640
60	72	11.2	2,370	21.5	2,450	18	470	4.2	—	2,950	27.5	2,450
70	76	13.7	2,660	23.8	4,620	17	430	3.9	600	3,750	34.5	5,220
80	78	16.1	2,880	24.8	8,320	16	440	3.9	1,510	4,480	40.6	10,430
					10,900	16	460	4.0	2,510	5,160	45.6	15,520
	SITE INDEX 75											
30	66	5.5	1,450	14.0	—	23	220	2.7	—	—	—	—
40	62	7.1	1,840	17.0	—	34	600	5.5	—	1,670	16.7	—
50	68	9.7	2,400	22.8	1,400	34	600	5.5	—	2,660	25.2	1,400
60	73	12.4	2,880	26.7	4,200	20	555	5.0	650	3,775	36.0	4,850
70	77	15.2	3,325	29.8	7,980	19	515	4.8	1,450	4,770	44.7	10,080
80	80	17.7	3,760	31.6	13,020	17	490	4.4	2,100	5,705	52.2	17,220
					15,440	16	500	4.8	3,400	6,640	58.8	23,040

Source: Gingrich, S. F. 1971. Management of young and intermediate stands of upland hardwoods. U.S.F.S. Northeastern Forest Exp. Sta., Res. Paper NE-195. 26p.

Table 61.--Yields per acre for upland oak. First thinning at age 40.

Age (years)	Residual stand				Cut stand				Cumulative total yields (cut stand plus residual stand)			
	Basal area	Average tree diameter	Yield		Basal area	Yield						
	Square feet	Inches	Cubic feet	Cords	Board feet	Square feet	Cubic feet	Cords	Board feet	Cubic feet	Cords	Board feet
SITE INDEX 55												
40	63	5.0	1,140	10.5	—	24	180	1.6	—	1,320	12.1	—
50	62	7.4	1,538	13.0	900	23	282	3.4	—	2,000	18.0	900
60	67	9.1	1,830	15.6	2,430	15	288	3.1	270	2,580	23.7	2,700
70	72	11.0	2,065	18.6	4,445	12	300	2.7	465	3,115	29.4	5,180
80	74	12.7	2,240	21.6	6,880	12	350	2.8	865	3,640	35.2	8,480
90	76	13.8	2,430	24.8	9,180	9	355	3.0	1,100	4,185	41.4	11,880
SITE INDEX 65												
40	69	6.5	1,600	15.9	440	27	240	2.3	—	1,840	18.2	440
50	66	8.5	1,910	17.7	1,800	28	410	4.0	200	2,560	24.0	2,000
60	70	10.4	2,200	20.7	4,200	18	400	3.6	280	3,270	30.6	4,680
70	74	12.4	2,485	23.1	7,210	16	420	3.7	710	3,955	36.7	8,400
80	77	14.5	2,720	24.8	8,960	15	410	4.0	1,050	4,600	42.4	11,200
90	79	16.5	2,925	26.6	10,710	13	460	4.0	1,630	5,265	48.2	14,580
SITE INDEX 75												
40	73	7.4	2,130	20.2	1,380	28	300	3.0	—	2,440	23.2	1,380
50	68	9.6	2,390	21.8	3,450	31	635	6.2	300	3,325	31.0	3,750
60	73	11.6	2,730	24.9	7,680	19	625	5.2	1,020	4,290	39.3	9,000
70	76	13.8	3,115	28.0	11,200	19	610	4.8	1,620	5,285	47.2	14,140
80	79	16.5	3,480	30.8	14,080	17	590	5.2	2,340	6,240	55.2	19,360
90	81	18.7	3,735	33.7	15,840	15	660	5.3	3,000	7,155	63.4	24,120

Source: Gingrich, S. F. 1971. Management of young and intermediate stands of upland hardwoods. U.S.F.S. Northeastern Forest Exp. Sta., Res. Paper NE-195. 26p.

Table 62.--Yields per acre for upland oak. First thinning at age 50.

Age (years)	Residual stand					Cut stand					Cumulative total yields (cut stand plus residual stand)	
	Basal area	Average tree diameter	Yield		Basal area	Yield						
	Square feet	Inches	Cubic feet	Cords	Board feet	Square feet	Cubic feet	Cords	Board feet	Cubic feet	Cords	Board feet
SITE INDEX 55												
50	69	6.5	1,627	14.9	400	28	523	4.8	—	2,150	19.7	400
60	66	8.4	1,710	14.7	1,350	23	317	3.9	150	2,550	23.4	1,500
70	68	9.3	1,855	15.4	3,585	15	280	3.2	165	2,975	27.3	3,900
80	71	10.5	1,960	18.0	6,160	12	280	2.1	325	3,360	32.0	6,800
90	73	11.5	2,115	20.0	8,240	10	220	2.2	620	3,735	36.2	9,500
100	74	12.7	2,250	22.8	8,900	9	230	1.5	1,240	4,100	40.5	11,400
SITE INDEX 65												
50	75	8.0	2,130	19.6	1,850	30	670	7.3	300	2,800	26.9	2,150
60	68	9.6	2,130	19.5	4,090	29	470	4.4	210	3,270	31.2	4,600
70	70	10.4	2,240	20.6	6,160	18	400	3.7	330	3,780	36.0	7,000
80	74	12.2	2,480	22.8	8,240	14	300	2.6	520	4,320	40.8	9,600
90	77	14.8	2,745	25.2	10,305	12	275	2.7	935	4,860	45.9	12,600
100	79	17.0	3,000	28.5	10,700	10	235	1.8	1,905	5,350	51.0	14,900
SITE INDEX 75												
50	78	9.0	2,590	24.4	3,650	32	725	5.7	450	3,315	30.1	4,100
60	72	11.3	2,700	25.2	6,300	30	655	6.8	1,050	4,080	37.7	7,800
70	75	12.8	2,965	26.8	9,200	19	475	5.2	1,100	4,820	44.5	11,800
80	77	14.1	3,180	29.0	11,500	18	425	4.8	1,500	5,460	51.5	15,600
90	79	16.5	3,620	31.4	13,000	16	420	4.6	1,900	6,320	58.5	19,000
100	81	18.4	3,880	33.0	14,450	14	500	4.2	2,750	7,080	65.0	23,200

Source: Gingrich, S. F. 1971. Management of young and intermediate stands of upland hardwoods. U.S.F.S. Northeastern Forest Exp. Sta., Res. Paper NE-195. 26p.



Table 63.--Yields per acre for upland oak. First thinning at age 60.

Age (years)	Residual stand					Cut stand			Cumulative total yields (cut stand plus residual stand)			
	Basal area	Average tree diameter	Yield			Basal area	Yield					
	<i>Square feet</i>	<i>Inches</i>	<i>Cubic feet</i>	<i>Cords</i>	<i>Board feet</i>	<i>Square feet</i>	<i>Cubic feet</i>	<i>Cords</i>	<i>Board feet</i>	<i>Cubic feet</i>	<i>Cords</i>	<i>Board feet</i>
SITE INDEX 55												
60	76	8.2	1,860	17.1	780	28	660	5.8	120	2,520	22.9	900
70	73	9.3	1,960	17.5	2,345	19	285	4.0	685	2,905	27.3	3,150
80	70	10.3	2,000	18.4	4,320	16	335	3.0	555	3,280	31.2	5,680
90	72	11.3	2,115	19.3	5,850	10	250	2.5	530	3,645	34.6	7,740
100	74	12.3	2,200	20.8	7,300	8	270	1.9	510	4,000	38.0	9,700
110	75	13.2	2,310	22.6	8,580	7	235	2.0	570	4,345	41.8	11,550
SITE INDEX 65												
60	78	9.4	2,400	22.2	3,900	33	900	8.6	1,260	3,300	30.8	5,160
70	75	10.2	2,450	22.1	4,550	23	360	3.6	770	3,710	34.3	6,580
80	73	12.0	2,520	23.0	5,920	20	400	3.6	810	4,180	38.8	8,760
90	77	14.1	2,610	23.8	7,785	13	365	3.6	895	4,635	43.2	11,520
100	78	15.5	2,650	25.5	9,850	12	325	3.1	915	5,000	48.0	14,500
110	80	17.2	2,750	26.6	11,770	9	345	3.1	960	5,445	52.2	17,380
SITE INDEX 75												
60	82	10.2	3,060	27.0	7,848	32	1,080	10.7	1,440	4,140	37.7	9,288
70	78	11.5	3,150	27.3	8,540	21	460	4.7	870	4,690	42.7	10,850
80	76	13.5	3,320	28.4	9,760	21	420	4.2	1,290	5,280	48.0	13,360
90	78	15.6	3,510	29.9	10,935	16	425	3.6	1,665	5,895	53.1	16,200
100	80	17.2	3,725	31.5	12,200	13	415	3.3	1,835	6,525	58.0	19,300
110	82	19.1	3,795	33.0	13,530	9	445	3.2	1,920	7,040	62.7	22,550

Source: Gingrich, S. F. 1971. Management of young and intermediate stands of upland hardwoods. U.S.F.S. Northeastern Forest Exp. Sta., Res. Paper NE-195. 26p.

Table 64.--A comparison of yields per acre for even-aged upland hardwoods.  
 Management period: 50 years, Cutting interval: 10 years.

Stand age at first thinning (years)	Site 55			Site 65			Site 75		
	Volume at beginning of period	Cumulative yields 50 years later	Increase in yield	Volume at beginning of period	Cumulative yields 50 years later	Increase in yield	Volume at beginning of period	Cumulative yields 50 years later	Increase in yield
CUBIC FEET									
10	—	3,900	3,900	—	4,860	4,860	—	6,390	6,390
20	60	3,500	3,440	178	4,830	4,652	694	6,440	5,746
30	583	3,920	3,337	1,200	5,160	3,960	1,670	6,640	4,970
40	1,320	4,185	2,865	1,840	5,265	3,425	2,440	7,155	4,715
50	2,150	4,100	1,950	2,800	5,350	2,550	3,315	7,080	3,765
60	2,520	4,345	1,825	3,300	5,445	2,145	4,140	7,040	2,900
CORDS									
10	—	37.8	37.8	—	44.1	44.1	—	56.7	56.7
20	0.6	34.0	33.4	1.6	42.0	40.4	6.4	57.4	51.0
30	5.3	37.6	32.3	10.6	45.6	35.0	16.7	58.8	42.1
40	12.1	41.4	29.3	18.2	48.2	30.0	23.2	63.4	40.2
50	19.7	40.5	20.8	26.9	51.0	24.1	30.1	65.0	34.9
60	22.9	41.8	18.9	30.8	52.2	21.4	37.7	62.7	25.0
BOARD FEET									
10	—	8,340	8,340	—	12,000	12,000	—	18,840	18,840
20	—	7,350	7,350	—	12,600	12,600	—	19,880	19,880
30	—	9,920	9,920	—	15,520	15,520	—	23,040	23,040
40	—	11,880	11,880	440	14,580	14,140	1,380	24,120	22,740
50	400	11,400	11,000	2,150	14,900	12,750	4,100	23,200	19,100
60	900	11,550	10,650	5,160	17,380	12,220	9,238	22,550	13,312

Source: Gingrich, S. F. 1971. Management of young and intermediate stands of upland hardwoods. U.S.F.S. Northeastern Forest Exp. Sta., Res. Paper NE-195. 26p.

Table 65.--A comparison of yields per acre at age 60 when thinning is begun at different ages (Source: tables 58 to 63). Thinning interval - 10 years.

Yields at age 60	Age of stand at time of first thinning (years)					
	10	20	30	40	50	60
SITE 55						
Cubic feet	3,900	2,940	2,910	2,580	2,550	2,520
Cords	37.8	28.8	27.6	23.7	23.4	22.9
Board feet	8,340	4,680	3,360	2,700	1,500	900
SITE 65						
Cubic feet	4,860	4,040	3,750	3,270	3,270	3,300
Cords	44.1	35.4	34.5	30.6	31.2	30.8
Board Feet	12,000	7,680	5,220	4,680	4,600	5,160
					(7,000)*	(6,580)*
SITE 75						
Cubic feet	6,360	5,400	4,770	4,290	4,080	4,140
Cords	56.7	49.2	44.7	39.3	37.7	37.7
Board feet	18,840	14,100	10,080	9,000	7,800	9,288
					(11,800)*	(10,850)*

\*Board-foot yields at age 70

Source: Gingrich, S. F. 1971. Management of young and intermediate stands of upland hardwoods. U.S.F.S. Northeastern Forest Exp. Sta., Res. Paper NE-195. 26p.

Table 66.--Current annual basal-area increment per acre of upland oak for given age and basal area.  
[In square feet]

Basal area	Average stand age — years									
	20	30	40	50	60	70	80	90	100	110
SITE INDEX 55										
20	2.88	2.16	1.76	1.51	1.32	1.10	1.08	1.00	0.93	0.87
30	3.21	2.44	2.01	1.73	1.53	1.38	1.26	1.16	1.08	1.02
40	3.23	2.49	2.07	1.80	1.60	1.45	1.33	1.23	1.15	1.09
50	3.03	2.38	2.01	1.76	1.58	1.44	1.33	1.24	1.16	1.10
60	2.63	2.14	1.84	1.63	1.48	1.36	1.27	1.19	1.12	1.06
70	2.09	1.78	1.58	1.43	1.32	1.23	1.15	1.09	1.04	.99
80	—	1.34	1.25	1.17	1.10	1.05	1.00	.95	.92	.88
90	—	—	.85	.85	.84	.82	.80	.78	.76	.74
100	—	—	—	—	.54	.56	.58	.58	.58	.58
110	—	—	—	—	—	—	.32	.35	.38	.40
120	—	—	—	—	—	—	—	—	—	.19
SITE INDEX 65										
20	2.99	2.22	1.81	1.54	1.36	1.21	1.10	1.02	0.94	0.88
30	3.36	2.53	2.08	1.78	1.57	1.41	1.29	1.19	1.11	1.04
40	3.45	2.62	2.17	1.87	1.66	1.50	1.38	1.27	1.19	1.12
50	3.27	2.54	2.13	1.85	1.63	1.51	1.39	1.29	1.21	1.14
60	2.93	2.33	1.98	1.75	1.57	1.41	1.34	1.25	1.17	1.11
70	2.45	2.01	1.75	1.56	1.43	1.32	1.23	1.16	1.10	1.05
80	—	1.59	1.44	1.32	1.23	1.15	1.09	1.03	.99	.95
90	—	—	1.06	1.02	.98	.94	.91	.87	.84	.82
100	—	—	—	.68	.69	.70	.69	.68	.67	.66
110	—	—	—	—	—	.41	.45	.47	.48	.49
120	—	—	—	—	—	—	—	.22	.26	.29
130	—	—	—	—	—	—	—	—	—	.07
SITE INDEX 75										
20	3.07	2.29	1.86	1.58	1.39	1.24	1.13	1.04	0.96	0.90
30	3.50	2.63	2.15	1.84	1.62	1.45	1.33	1.22	1.14	1.06
40	3.62	2.75	2.26	1.95	1.72	1.56	1.42	1.32	1.23	1.15
50	3.52	2.70	2.25	1.95	1.73	1.57	1.44	1.34	1.25	1.18
60	3.22	2.52	2.12	1.86	1.67	1.52	1.40	1.31	1.23	1.16
70	2.78	2.23	1.91	1.70	1.54	1.41	1.31	1.23	1.16	1.10
80	2.20	1.85	1.63	1.47	1.35	1.26	1.18	1.12	1.06	1.01
90	—	1.38	1.28	1.19	1.12	1.06	1.01	.97	.93	.89
100	—	—	.87	.86	.85	.82	.81	.78	.76	.74
110	—	—	—	—	.53	.56	.57	.58	.58	.58
120	—	—	—	—	—	—	.31	.34	.37	.38
130	—	—	—	—	—	—	—	—	.14	.17
SITE INDEX 85										
20	3.17	2.35	1.90	1.62	1.42	1.27	1.15	1.06	0.98	0.91
30	3.65	2.73	2.22	1.89	1.67	1.49	1.36	1.25	1.16	1.09
40	3.82	2.88	2.36	2.02	1.79	1.61	1.47	1.36	1.26	1.18
50	3.76	2.86	2.36	2.04	1.81	1.64	1.50	1.39	1.30	1.22
60	3.52	2.71	2.26	1.97	1.76	1.63	1.47	1.37	1.28	1.21
70	3.12	2.46	2.08	1.83	1.61	1.50	1.39	1.30	1.23	1.16
80	2.59	2.10	1.82	1.62	1.48	1.35	1.27	1.20	1.13	1.08
90	—	1.67	1.49	1.36	1.25	1.18	1.11	1.06	1.01	.96
100	—	—	1.10	1.05	1.00	.96	.92	.89	.85	.83
110	—	—	—	.70	.71	.70	.70	.69	.68	.67
120	—	—	—	—	—	.42	.45	.46	.48	.48
130	—	—	—	—	—	—	—	.22	.25	.28

Source: Dore, Martin E. 1972. Growth and yield predictions for upland oak stands 10 years after initial thinning. U.S.F.S. Northeastern Forest Exp. Sta., Res. Paper NE-241. 21p.

Table 67.--Net basal-area growth of upland oak in 10 years, by initial age and basal area.

[In square feet per acre]

Initial basal area	Initial stand age — years									
	20	30	40	50	60	70	80	90	100	110
SITE INDEX 55										
20	27.76	21.82	18.16	15.67	13.85	12.46	11.35	10.46	9.71	9.08
30	27.84	22.61	19.23	16.85	15.08	13.70	12.59	11.68	10.91	10.26
40	26.12	21.81	18.91	16.81	15.21	13.94	12.91	12.05	11.32	10.69
50	23.27	19.99	17.67	15.93	14.58	13.48	12.58	11.82	11.16	10.59
60	19.62	17.42	15.75	14.44	13.38	12.50	11.76	11.13	10.58	10.10
70	15.37	14.29	13.31	12.46	11.74	11.11	10.57	10.09	9.66	9.28
80	—	10.70	10.44	10.09	9.73	9.38	9.05	8.74	8.46	8.20
90	—	—	7.21	7.39	7.41	7.35	7.26	7.14	7.02	6.89
100	—	—	—	—	4.83	5.08	5.24	5.32	5.36	5.37
110	—	—	—	—	—	—	3.01	3.31	3.53	3.69
120	—	—	—	—	—	—	—	—	—	1.85
SITE INDEX 65										
20	29.06	22.68	18.79	16.16	14.25	12.79	11.64	10.71	9.93	9.28
30	29.43	23.70	20.05	17.50	15.62	14.16	12.99	12.03	11.22	10.54
40	27.96	23.11	19.90	17.60	15.87	14.50	13.40	12.48	11.71	11.04
50	25.33	21.46	18.81	16.86	15.35	14.15	13.16	12.34	11.63	11.02
60	21.87	19.07	17.04	15.49	14.27	13.27	12.44	11.73	11.12	10.59
70	17.79	16.08	14.73	13.63	12.73	11.97	11.32	10.76	10.27	9.84
80	—	12.64	11.99	11.37	10.82	10.33	9.89	9.49	9.14	8.82
90	—	—	8.88	8.70	8.60	8.39	8.18	7.97	7.76	7.57
100	—	—	—	5.90	6.11	6.21	6.24	6.22	6.18	6.12
110	—	—	—	—	—	3.81	4.09	4.28	4.41	4.50
120	—	—	—	—	—	—	—	2.16	2.47	2.71
130	—	—	—	—	—	—	—	—	—	.79
SITE INDEX 75										
20	30.38	23.55	19.43	16.65	14.65	13.13	11.93	10.96	10.16	9.48
30	31.06	24.81	20.88	18.16	16.16	14.62	13.38	12.38	11.53	10.82
40	29.85	24.42	20.90	18.41	16.54	15.08	13.90	12.92	12.10	11.40
50	27.43	22.97	19.97	17.80	16.14	14.83	13.75	12.86	12.10	11.44
60	24.18	20.74	18.34	16.56	15.17	14.04	13.12	12.34	11.67	11.09
70	20.28	17.92	16.17	14.82	13.73	12.84	12.09	11.45	10.89	10.40
80	15.89	14.62	13.56	12.67	11.93	11.29	10.74	10.25	9.83	9.45
90	—	10.93	10.58	10.19	9.80	9.44	9.11	8.80	8.52	8.26
100	—	—	7.30	7.42	7.41	7.35	7.24	7.13	7.00	6.87
110	—	—	—	—	4.79	5.03	5.17	5.25	5.29	5.31
120	—	—	—	—	—	—	2.91	3.21	3.42	3.59
130	—	—	—	—	—	—	—	—	1.40	1.72
SITE INDEX 85										
20	31.74	24.44	20.07	17.15	15.06	13.47	12.22	11.22	10.38	9.68
30	32.74	25.94	21.72	18.83	16.71	15.08	13.78	12.73	11.85	11.10
40	31.78	25.77	21.92	19.22	17.21	15.65	14.40	13.36	12.49	11.75
50	29.60	24.50	21.15	18.75	16.94	15.51	14.35	13.39	12.57	11.87
60	26.55	22.45	19.67	17.64	16.07	14.83	13.80	12.95	12.22	11.58
70	22.84	19.79	17.63	16.02	14.75	13.72	12.86	12.14	11.51	10.97
80	18.62	16.64	15.16	13.99	13.04	12.26	11.59	11.02	10.52	10.08
90	—	13.10	12.31	11.62	11.02	10.50	10.05	9.64	9.28	8.95
100	—	—	9.14	8.95	8.73	8.49	8.26	8.04	7.83	7.63
110	—	—	—	6.03	6.19	6.26	6.27	6.24	6.19	6.13
120	—	—	—	—	—	3.83	4.08	4.26	4.38	4.46
130	—	—	—	—	—	—	—	2.12	2.42	2.66

Source: Dale, Martin E. 1972. Growth and yield predictions for upland oak stands 10 years after initial thinning. U.S.F.S. Northeastern Forest Exp. Sta., Res. Paper NE-241. 21p.

Table 68.—Total cubic-foot volume of upland oak for all trees over 2.5 inches d.b.h. by age and basal area.  
[In cubic feet]

Basal area	Average stand age — years									
	20	30	40	50	60	70	80	90	100	110
SITE INDEX 55										
20	302	422	499	552	590	619	642	660	675	687
30	460	643	760	841	899	943	978	1,005	1,028	1,047
40	620	867	1,025	1,134	1,213	1,272	1,318	1,356	1,386	1,412
50	782	1,093	1,293	1,430	1,529	1,604	1,663	1,710	1,748	1,781
60	945	1,322	1,563	1,728	1,848	1,938	2,009	2,066	2,113	2,152
70	1,109	1,551	1,834	2,028	2,169	2,275	2,358	2,425	2,480	2,526
80	—	1,782	2,107	2,330	2,492	2,614	2,709	2,786	2,849	2,902
90	—	—	2,381	2,633	2,816	2,954	3,062	3,149	3,220	3,279
100	—	—	—	—	3,142	3,296	3,416	3,513	3,593	3,659
110	—	—	—	—	—	—	3,772	3,879	3,967	4,040
120	—	—	—	—	—	—	—	—	—	4,422
SITE INDEX 65										
20	331	463	548	606	648	679	704	724	740	754
30	505	706	835	923	987	1,035	1,073	1,104	1,128	1,149
40	681	952	1,125	1,244	1,331	1,396	1,447	1,488	1,522	1,550
50	858	1,200	1,419	1,569	1,678	1,760	1,825	1,876	1,919	1,954
60	1,037	1,450	1,715	1,896	2,028	2,127	2,205	2,268	2,319	2,362
70	1,218	1,702	2,013	2,226	2,380	2,497	2,588	2,662	2,722	2,772
80	—	1,956	2,313	2,557	2,734	2,869	2,973	3,058	3,127	3,185
90	—	—	2,614	2,890	3,091	3,242	3,361	3,456	3,534	3,599
100	—	—	—	3,225	3,448	3,617	3,749	3,856	3,943	4,016
110	—	—	—	—	—	3,994	4,140	4,257	4,353	4,434
120	—	—	—	—	—	—	—	4,660	4,765	4,853
130	—	—	—	—	—	—	—	—	—	5,274
SITE INDEX 75										
20	364	508	601	665	711	746	773	795	813	828
30	554	775	916	1,013	1,083	1,136	1,178	1,211	1,238	1,261
40	747	1,045	1,235	1,366	1,460	1,532	1,588	1,633	1,670	1,701
50	942	1,317	1,557	1,722	1,842	1,932	2,002	2,059	2,106	2,145
60	1,138	1,592	1,882	2,081	2,226	2,335	2,420	2,489	2,545	2,592
70	1,336	1,868	2,209	2,443	2,612	2,740	2,841	2,921	2,987	3,042
80	1,535	2,146	2,538	2,806	3,001	3,148	3,263	3,356	3,432	3,495
90	—	2,426	2,868	3,172	3,392	3,558	3,688	3,793	3,878	3,950
100	—	—	3,200	3,539	3,784	3,970	4,115	4,231	4,327	4,407
110	—	—	—	—	4,178	4,383	4,543	4,672	4,778	4,866
120	—	—	—	—	—	—	4,973	5,114	5,230	5,326
130	—	—	—	—	—	—	—	—	5,683	5,788
SITE INDEX 85										
20	399	558	660	729	780	818	848	872	892	908
30	608	850	1,005	1,112	1,189	1,247	1,293	1,329	1,359	1,384
40	820	1,146	1,355	1,499	1,603	1,681	1,743	1,792	1,833	1,867
50	1,034	1,445	1,709	1,890	2,021	2,120	2,198	2,260	2,311	2,354
60	1,249	1,747	2,066	2,284	2,443	2,562	2,656	2,731	2,793	2,845
70	1,467	2,050	2,425	2,681	2,867	3,008	3,117	3,206	3,278	3,339
80	1,685	2,356	2,785	3,080	3,294	3,455	3,581	3,683	3,766	3,836
90	—	2,662	3,148	3,481	3,722	3,905	4,048	4,162	4,256	4,335
100	—	—	3,512	3,884	4,153	4,357	4,516	4,644	4,749	4,837
110	—	—	—	4,288	4,585	4,810	4,986	5,127	5,243	5,340
120	—	—	—	—	—	5,266	5,458	5,613	5,739	5,845
130	—	—	—	—	—	—	—	6,099	6,237	6,352

Source: Dale, Martin E. 1972. Growth and yield predictions for upland oak stands 10 years after initial thinning. U.S.F.S. Northeastern Forest Exp. Sta., Res. Paper NE-241. 21p.

Table 69.--Net cubic-volume growth per acre of upland oak in 10 years, by initial age and basal area.

[In cubic feet per acre]

Initial basal area	Initial stand age — years									
	20	30	40	50	60	70	80	90	100	110
SITE INDEX 55										
20	741	652	581	525	479	442	411	385	362	342
30	812	720	646	588	541	502	469	441	417	396
40	842	745	670	612	565	527	495	467	443	422
50	844	740	665	608	563	527	496	470	447	427
60	828	715	639	584	542	508	479	455	435	416
70	797	673	596	543	504	473	448	427	409	393
80	—	619	540	489	453	426	405	387	372	359
90	—	—	472	423	391	368	351	337	325	315
100	—	—	—	—	320	301	288	278	270	264
110	—	—	—	—	—	—	217	212	208	205
120	—	—	—	—	—	—	—	—	—	140
SITE INDEX 65										
20	845	741	658	593	540	498	462	432	406	384
30	931	822	736	668	613	568	530	498	470	446
40	970	856	768	699	645	600	562	530	502	477
50	979	857	768	700	647	604	567	536	510	486
60	966	834	744	678	627	587	553	524	499	477
70	937	793	701	638	590	553	522	496	474	455
80	—	738	644	582	538	505	478	456	437	420
90	—	—	573	514	474	445	422	404	388	375
100	—	—	—	435	399	374	356	342	331	321
110	—	—	—	—	—	295	282	272	265	259
120	—	—	—	—	—	—	—	194	192	190
130	—	—	—	—	—	—	—	—	—	115
SITE INDEX 75										
20	964	841	744	669	609	560	519	485	456	430
30	1,067	939	838	758	695	643	599	562	530	502
40	1,117	982	879	799	735	682	638	601	568	540
50	1,133	990	884	805	742	691	648	612	580	553
60	1,124	971	864	786	725	677	636	602	573	547
70	1,098	931	822	746	689	643	606	575	548	525
80	1,056	875	764	690	636	595	562	534	510	490
90	—	806	692	620	570	533	504	481	461	444
100	—	—	607	537	492	460	436	416	401	388
110	—	—	—	—	403	376	357	343	332	323
120	—	—	—	—	—	—	270	261	254	250
130	—	—	—	—	—	—	—	—	170	170
SITE INDEX 85										
20	1,099	954	842	755	686	630	583	544	511	482
30	1,222	1,070	952	860	787	726	676	634	597	565
40	1,285	1,126	1,005	911	836	775	724	680	643	610
50	1,310	1,141	1,018	924	850	790	740	697	660	628
60	1,307	1,127	1,001	908	837	779	731	690	656	625
70	1,283	1,090	961	870	802	747	702	665	633	605
80	1,243	1,034	903	814	749	698	658	624	595	570
90	—	963	829	742	681	635	599	569	544	522
100	—	—	741	656	599	558	527	502	482	464
110	—	—	—	559	507	471	445	425	409	396
120	—	—	—	—	—	373	353	339	328	319
130	—	—	—	—	—	—	—	244	238	235

Source: Dale, Martin E. 1972. Growth and yield predictions for upland oak stands 10 years after initial thinning. U.S.F.S. Northeastern Forest Exp. Sta., Res. Paper NE-241. 21p.

Table 70.--Total cordwood volume per acre of upland oak for all trees over 4.5 inches d.b.h., by age and basal area.  
[In cords per acre]

Basal area	Average stand age -- years									
	20	30	40	50	60	70	80	90	100	110
SITE INDEX 55										
20	0.8	2.6	4.0	4.9	5.4	5.7	5.9	6.1	6.2	6.3
30	1.3	3.9	6.1	7.4	8.2	8.7	9.0	9.2	9.4	9.6
40	1.5	5.0	8.1	9.9	11.0	11.7	12.1	12.5	12.7	13.0
50	1.7	5.9	9.9	12.4	13.8	14.7	15.3	15.7	16.1	16.4
60	1.8	6.7	11.6	14.8	16.6	17.7	18.4	19.0	19.4	19.8
70	1.8	7.3	13.0	17.0	19.4	20.7	21.6	22.3	22.8	23.2
80	—	7.7	14.4	19.2	22.1	23.8	24.8	25.6	26.2	26.7
90	—	—	15.6	21.3	24.7	26.8	28.0	28.9	29.6	30.1
100	—	—	—	—	27.4	29.8	31.2	32.2	33.0	33.6
110	—	—	—	—	—	—	34.4	35.6	36.4	37.1
120	—	—	—	—	—	—	—	—	—	40.6
SITE INDEX 65										
20	1.4	3.4	4.8	5.5	5.9	6.2	6.5	6.7	6.8	6.9
30	2.0	5.1	7.2	8.4	9.1	9.5	9.9	10.1	10.4	10.6
40	2.5	6.7	9.7	11.3	12.2	12.8	13.3	13.7	14.0	14.2
50	2.9	8.1	12.0	14.2	15.4	16.2	16.8	17.2	17.6	18.0
60	3.2	9.4	14.3	17.0	18.5	19.5	20.3	20.8	21.3	21.7
70	3.3	10.5	16.4	19.8	21.7	22.9	23.8	24.5	25.0	25.5
80	—	11.4	18.4	22.6	24.9	26.3	27.3	28.1	28.7	29.3
90	—	—	20.3	25.3	28.0	29.7	30.9	31.7	32.5	33.1
100	—	—	—	27.9	31.2	33.1	34.4	35.4	36.2	36.9
110	—	—	—	—	—	36.5	38.0	39.1	40.0	40.7
120	—	—	—	—	—	—	—	42.8	43.8	44.6
130	—	—	—	—	—	—	—	—	—	48.4
SITE INDEX 75										
20	1.9	4.1	5.4	6.1	6.5	6.8	7.1	7.3	7.5	7.6
30	2.9	6.3	8.2	9.3	9.9	10.4	10.8	11.1	11.4	11.6
40	3.7	8.3	11.1	12.5	13.4	14.1	14.6	15.0	15.3	15.6
50	4.3	10.2	13.8	15.7	16.9	17.7	18.4	18.9	19.3	19.7
60	4.8	12.0	16.6	19.0	20.4	21.4	22.2	22.9	23.4	23.8
70	5.2	13.6	19.2	22.2	24.0	25.2	26.1	26.8	27.4	27.9
80	5.4	15.0	21.8	25.4	27.5	28.9	30.0	30.8	31.5	32.1
90	—	16.3	24.3	28.6	31.1	32.7	33.9	34.8	35.6	36.3
100	—	—	26.8	31.8	34.6	36.5	37.8	38.9	39.8	40.5
110	—	—	—	—	38.2	40.2	41.7	42.9	43.9	44.7
120	—	—	—	—	—	—	45.7	47.0	48.0	48.9
130	—	—	—	—	—	—	—	—	52.2	53.2
SITE INDEX 85										
20	2.5	4.8	6.0	6.7	7.2	7.5	7.8	8.0	8.2	8.3
30	3.8	7.3	9.2	10.2	10.9	11.5	11.9	12.2	12.5	12.7
40	4.9	9.8	12.3	13.8	14.7	15.4	16.0	16.5	16.8	17.1
50	5.9	12.1	15.5	17.3	18.6	19.5	20.2	20.8	21.2	21.6
60	6.7	14.4	18.7	21.0	22.4	23.5	24.4	25.1	25.7	26.1
70	7.3	16.5	21.8	24.6	26.3	27.6	28.6	29.5	30.1	30.7
80	7.8	18.5	24.9	28.2	30.2	31.7	32.9	33.8	34.6	35.2
90	—	20.3	27.9	31.8	34.2	35.9	37.2	38.2	39.1	39.8
100	—	—	30.9	35.4	38.1	40.0	41.5	42.7	43.6	44.4
110	—	—	—	39.1	42.1	44.2	45.8	47.1	48.2	49.1
120	—	—	—	—	—	48.4	50.1	51.6	52.7	53.7
130	—	—	—	—	—	—	—	56.0	57.3	58.4

Source: Dale, Martin E. 1972. Growth and yield predictions for upland oak stands 10 years after initial thinning. U.S.F.S. Northeastern Forest Exp. Sta., Res. Paper NE-241. 21p.



Table 71.--Net cordwood growth per acre of upland oak in 10 years, by initial age and basal area.  
[In cords per acre]

Initial basal area	Initial stand age — years									
	20	30	40	50	60	70	80	90	100	110
SITE INDEX 55										
20	5.9	6.4	5.7	5.0	4.4	4.1	3.8	3.5	3.3	3.1
30	5.4	7.1	6.4	5.6	5.0	4.6	4.3	4.1	3.8	3.6
40	4.3	7.2	6.8	5.9	5.3	4.9	4.5	4.3	4.1	3.9
50	2.9	6.9	6.9	6.0	5.3	4.9	4.6	4.3	4.1	3.9
60	1.5	6.4	6.8	5.9	5.2	4.7	4.4	4.2	4.0	3.8
70	.2	5.6	6.5	5.7	4.9	4.4	4.1	3.9	3.8	3.6
80	—	4.7	6.2	5.4	4.6	4.1	3.8	3.6	3.4	3.3
90	—	—	5.7	5.0	4.2	3.6	3.3	3.1	3.0	2.9
100	—	—	—	—	3.7	3.0	2.7	2.6	2.5	2.4
110	—	—	—	—	—	—	2.1	2.0	1.9	1.9
120	—	—	—	—	—	—	—	—	—	1.3
SITE INDEX 65										
20	8.0	7.4	6.3	5.5	5.0	4.6	4.2	4.0	3.7	3.5
30	8.2	8.3	7.1	6.2	5.6	5.2	4.9	4.6	4.3	4.1
40	7.6	8.8	7.5	6.6	5.9	5.5	5.2	4.9	4.6	4.4
50	6.6	9.0	7.7	6.6	6.0	5.6	5.2	4.9	4.7	4.5
60	5.2	8.8	7.7	6.5	5.8	5.4	5.1	4.8	4.6	4.4
70	3.7	8.5	7.6	6.3	5.5	5.1	4.8	4.6	4.4	4.2
80	—	8.0	7.4	6.0	5.1	4.7	4.4	4.2	4.0	3.9
90	—	—	7.0	5.5	4.6	4.1	3.9	3.7	3.6	3.4
100	—	—	—	5.0	4.0	3.5	3.3	3.1	3.0	3.0
110	—	—	—	—	—	2.8	2.6	2.5	2.4	2.4
120	—	—	—	—	—	—	—	1.8	1.8	1.7
130	—	—	—	—	—	—	—	—	—	1.1
SITE INDEX 75										
20	9.6	8.2	6.9	6.2	5.6	5.1	4.8	4.5	4.2	4.0
30	10.5	9.3	7.9	7.0	6.4	5.9	5.5	5.2	4.9	4.6
40	10.6	9.9	8.3	7.4	6.8	6.3	5.9	5.5	5.2	5.0
50	10.2	10.3	8.5	7.5	6.8	6.3	6.0	5.6	5.3	5.1
60	9.3	10.4	8.5	7.3	6.7	6.2	5.8	5.5	5.3	5.0
70	8.1	10.3	8.3	7.0	6.4	5.9	5.6	5.3	5.0	4.8
80	6.7	10.0	8.0	6.6	5.9	5.5	5.2	4.9	4.7	4.5
90	—	9.6	7.6	6.1	5.3	4.9	4.6	4.4	4.2	4.1
100	—	—	7.0	5.4	4.6	4.2	4.0	3.8	3.7	3.6
110	—	—	—	—	3.8	3.5	3.3	3.1	3.0	3.0
120	—	—	—	—	—	—	2.5	2.4	2.3	2.3
130	—	—	—	—	—	—	—	—	1.6	1.6
SITE INDEX 85										
20	11.0	9.1	7.8	6.9	6.3	5.8	5.4	5.0	4.7	4.4
30	12.3	10.3	8.8	7.9	7.2	6.7	6.2	5.8	5.5	5.2
40	12.9	11.0	9.3	8.4	7.7	7.1	6.7	6.3	5.9	5.6
50	13.1	11.4	9.5	8.5	7.8	7.3	6.8	6.4	6.1	5.8
60	12.8	11.5	9.5	8.4	7.7	7.2	6.7	6.3	6.0	5.7
70	12.2	11.5	9.2	8.1	7.4	6.9	6.5	6.1	5.8	5.6
80	11.3	11.2	8.9	7.6	6.9	6.4	6.0	5.7	5.5	5.2
90	—	10.9	8.4	7.0	6.3	5.8	5.5	5.2	5.0	4.8
100	—	—	7.7	6.2	5.5	5.1	4.8	4.6	4.4	4.3
110	—	—	—	5.4	4.7	4.3	4.1	3.9	3.8	3.6
120	—	—	—	—	—	3.4	3.2	3.1	3.0	2.9
130	—	—	—	—	—	—	—	2.2	2.2	2.2

Source: Dale, Martin E. 1972. Growth and yield predictions for upland oak stands 10 years after initial thinning. U.S.F.S. Northeastern Forest Exp. Sta., Res. Paper NE-241. 21p.

Table 72.--Total board-foot volume per acre of upland oak for all trees over 8.5 inches d.b.h., by age and basal area.  
[In board feet per acre]

Basal area	Average stand age — years									
	20	30	40	50	60	70	80	90	100	110
SITE INDEX 55										
20	0	0	118	411	898	1,431	1,870	2,178	2,359	2,434
30	0	0	168	619	1,335	2,134	2,850	3,320	3,587	3,709
40	0	0	186	727	1,651	2,708	3,696	4,401	4,789	4,988
50	0	0	175	770	1,834	3,156	4,397	5,361	5,968	6,263
60	0	0	156	777	1,936	3,490	4,997	6,267	7,019	7,507
70	0	0	119	743	1,954	3,646	5,451	6,966	8,071	8,718
80	—	0	83	690	1,929	3,728	5,767	7,601	8,989	9,858
90	—	—	43	630	1,858	3,749	6,008	8,125	9,791	10,940
100	—	—	—	—	1,824	3,808	6,225	8,595	10,574	12,001
110	—	—	—	—	—	—	6,462	9,123	11,348	13,007
120	—	—	—	—	—	—	—	—	—	14,045
SITE INDEX 65										
20	0	42	325	888	1,545	2,076	2,420	2,558	2,628	2,677
30	0	61	465	1,304	2,330	3,164	3,646	3,893	4,005	4,080
40	0	59	553	1,602	2,929	4,119	4,851	5,234	5,400	5,501
50	0	43	572	1,772	3,394	4,922	5,985	6,552	6,801	6,937
60	0	22	568	1,866	3,783	5,669	7,027	7,820	8,200	8,383
70	0	0	523	1,859	3,976	6,201	7,960	9,042	9,587	9,836
80	0	0	475	1,836	4,084	6,630	8,774	10,175	10,934	11,289
90	—	—	419	1,768	4,122	6,914	9,463	11,241	12,238	12,727
100	—	—	—	1,736	4,167	7,267	10,144	12,238	13,521	14,163
110	—	—	—	—	—	7,538	10,764	13,218	14,789	15,580
120	—	—	—	—	—	—	—	14,293	16,048	17,007
130	—	—	—	—	—	—	—	—	—	18,451
SITE INDEX 75										
20	0	135	654	1,439	2,172	2,562	2,737	2,821	2,885	2,938
30	0	195	960	2,192	3,260	3,891	4,171	4,299	4,396	4,478
40	0	219	1,155	2,716	4,256	5,171	5,610	5,797	5,928	6,038
50	0	215	1,262	3,160	5,093	6,378	7,028	7,308	7,475	7,613
60	0	195	1,318	3,447	5,818	7,534	8,421	8,825	9,034	9,201
70	0	156	1,277	3,563	6,318	8,532	9,776	10,332	10,603	10,800
80	0	117	1,224	3,648	6,770	9,402	11,052	11,831	12,179	12,407
90	—	76	1,161	3,643	7,073	10,137	12,221	13,291	13,756	14,022
100	—	—	1,116	3,680	7,345	10,920	13,358	14,731	15,332	15,644
110	—	—	—	—	7,637	11,640	14,528	16,130	16,900	17,272
120	—	—	—	—	—	—	15,691	17,575	18,483	18,905
130	—	—	—	—	—	—	—	—	20,058	20,544
SITE INDEX 85										
20	2	296	1,119	2,072	2,650	2,898	3,011	3,096	3,166	3,225
30	0	429	1,645	3,075	4,003	4,409	4,588	4,718	4,825	4,914
40	0	503	2,024	3,975	5,333	5,928	6,187	6,362	6,506	6,626
50	0	524	2,276	4,710	6,537	7,423	7,800	8,023	8,204	8,355
60	0	515	2,423	5,280	7,628	8,916	9,422	9,696	9,915	10,098
70	0	471	2,459	5,693	8,590	10,287	11,035	11,380	11,638	11,852
80	0	423	2,439	5,968	9,418	11,623	12,640	13,073	13,370	13,616
90	—	367	2,397	6,169	10,171	12,847	14,204	14,771	15,110	15,389
100	—	—	2,373	6,354	10,793	14,041	15,746	16,470	16,859	17,170
110	—	—	—	6,566	11,478	15,219	17,273	18,168	18,613	18,957
120	—	—	—	—	—	16,444	18,821	19,873	20,374	20,751
130	—	—	—	—	—	—	—	21,580	22,141	22,551

Source: Dale, Martin E. 1972. Growth and yield predictions for upland oak stands 10 years after initial thinning. U.S.F.S. Northeastern Forest Exp. Sta., Res. Paper NE-241. 21p.

Table 73.--Net board-foot growth per acre of upland oak in 10 years, by initial age and basal area.  
[In board feet per acre]

Initial basal area	Initial stand age — years									
	20	30	40	50	60	70	80	90	100	110
SITE INDEX 55										
20	0	388	962	1,458	1,744	1,742	1,596	1,434	1,304	1,218
30	0	306	947	1,596	1,939	1,955	1,819	1,643	1,502	1,408
40	0	201	838	1,558	2,028	2,096	1,938	1,733	1,587	1,493
50	0	102	690	1,442	2,007	2,160	2,014	1,783	1,602	1,499
60	0	21	564	1,305	1,933	2,160	2,046	1,793	1,578	1,453
70	0	0	441	1,151	1,822	2,130	2,049	1,780	1,523	1,369
80	—	0	347	1,006	1,704	2,075	2,036	1,754	1,452	1,256
90	—	—	270	881	1,581	2,012	2,017	1,726	1,378	1,127
100	—	—	—	—	1,487	1,962	1,998	1,698	1,300	990
110	—	—	—	—	—	—	1,981	1,664	1,218	849
120	—	—	—	—	—	—	—	—	—	701
SITE INDEX 65										
20	234	1,086	2,023	2,431	2,320	2,008	1,713	1,546	1,442	1,362
30	90	1,000	2,150	2,796	2,730	2,346	2,009	1,791	1,671	1,584
40	0	815	2,095	2,959	3,014	2,612	2,196	1,921	1,783	1,694
50	0	625	1,904	2,969	3,193	2,820	2,329	1,988	1,818	1,726
60	0	473	1,700	2,896	3,299	2,965	2,429	2,018	1,798	1,696
70	0	329	1,462	2,743	3,336	3,092	2,511	2,017	1,738	1,618
80	—	205	1,243	2,528	3,323	3,188	2,585	2,012	1,659	1,503
90	—	—	1,039	2,244	3,157	3,268	2,659	1,997	1,566	1,365
100	—	—	—	1,994	2,948	3,183	2,708	1,979	1,453	1,198
110	—	—	—	—	—	3,051	2,682	1,944	1,322	1,017
120	—	—	—	—	—	—	—	1,840	1,175	810
130	—	—	—	—	—	—	—	—	—	575
SITE INDEX 75										
20	742	2,227	3,126	3,012	2,480	2,072	1,850	1,722	1,617	1,527
30	483	2,209	3,562	3,598	2,966	2,421	2,136	1,995	1,882	1,783
40	270	1,966	3,673	4,012	3,345	2,671	2,293	2,133	2,017	1,917
50	111	1,653	3,556	4,248	3,674	2,876	2,380	2,175	2,061	1,963
60	1	1,345	3,300	4,375	3,914	3,030	2,421	2,148	2,033	1,941
70	0	1,055	2,915	4,196	4,076	3,193	2,434	2,079	1,947	1,864
80	0	828	2,540	3,998	4,118	3,315	2,452	1,975	1,815	1,740
90	—	645	2,194	3,735	4,093	3,402	2,475	1,869	1,648	1,575
100	—	—	1,900	3,459	3,992	3,380	2,448	1,739	1,451	1,377
110	—	—	—	—	3,832	3,314	2,344	1,600	1,236	1,147
120	—	—	—	—	—	—	2,194	1,389	982	889
130	—	—	—	—	—	—	—	—	711	606
SITE INDEX 85										
20	1,641	3,542	3,900	3,178	2,554	2,243	2,071	1,932	1,813	1,710
30	1,239	3,704	4,594	3,848	3,008	2,596	2,401	2,249	2,119	2,006
40	876	3,496	4,954	4,356	3,319	2,792	2,570	2,416	2,283	2,167
50	570	3,085	5,020	4,743	3,615	2,906	2,627	2,475	2,344	2,231
60	349	2,626	4,875	5,000	3,872	2,944	2,602	2,451	2,327	2,219
70	173	2,159	4,579	5,127	4,089	3,024	2,526	2,361	2,246	2,147
80	48	1,766	4,202	5,133	4,257	3,058	2,408	2,215	2,112	2,023
90	—	1,429	3,800	5,031	4,343	3,102	2,287	2,025	1,931	1,855
100	—	—	3,418	4,847	4,379	3,089	2,143	1,799	1,710	1,647
110	—	—	—	4,608	4,304	3,016	1,969	1,543	1,454	1,406
120	—	—	—	—	—	2,857	1,738	1,254	1,165	1,133
130	—	—	—	—	—	—	—	936	847	833

Source: Dale, Martin E. 1972. Growth and yield predictions for upland oaks stands 10 years after initial thinning. U.S.F.S. Northeastern Forest Exp. Sta., Res. Paper NE-241. 21p.

Table 74.--Regression equations used for growth and yield estimates of upland oak.

Equation number	Equation form	Mean of dependent variable	Coefficient of determination (R <sup>2</sup> )	Root mean square residual (S <sub>y.x</sub> )
(1)	$Y_1 = -BA^{-.5} \ln(B) + 3.68521BA^{.75} + .011383BSA^{-1.05}$	1.80	0.518	0.733
(2)	$Y_2 = 3.09094 + .00930176S + 1.03909 \ln(B) - 20.11035A^{-1}$	7.463	.984	.064
(3)	$Y_3 = 1.1341 + .0019876AS$	7.9	.867	1.147
(4)	$Y_4 = -.052676 + .7876045 \cdot \exp [-(1.2987 - .08117D)^{10}]$	.632	.985	.016
(5)	$Y_5 = -.088414 + 3.63827 \cdot \exp [-(2.00 - .125D)^4]$	1.277	.969	.235

where

$Y_1$  = net annual basal area increment per acre including ingrowth for all trees 2.6 inches d.b.h. or larger.

$Y_2$  = natural logarithm of total cubic foot volume per acre for all trees 2.6 inches d.b.h. or larger, including bark, stump, tip, but no branchwood.

$Y_3$  = quadratic mean stand diameter of trees 2.6 inches d.b.h. or larger.

$Y_4$  = ratio of merchantable cubic-foot volume to total cubic-foot volume. Merchantable volume is for all trees 4.6 inches d.b.h. or larger and the volume excludes stump, bark, branches, and tip above 4.5 inch top d.o.b.  $Y_4 = 0.0$  if  $D < 2.3$  and  $Y_4 = 0.735$  if  $D > 16$  inches.

$Y_5$  = ratio of board-foot volume to total cubic-foot volume. Board-foot volume based on International 1/4-inch rule for trees 8.6 inches d.b.h. or larger to a top d.o.b. of 8.5 inches.  $Y_5 = 0.0$  if  $D < 4.8$  inches, and  $Y_5 = 3.55$  if  $D > 16$  inches.

$B$  = basal area in square feet per acre of all living trees 2.6 inches or larger d.b.h.

$S$  = site index in feet at reference age 50.

$A$  = average stand age in years.

$D$  = quadratic mean stand diameter of trees 2.6 inches d.b.h. or larger.

Source: Dale, Martin E. 1972. Growth and yield predictions for upland oak stands 10 years after initial thinning. U.S.F.S. Northeastern Forest Exp. Sta., Res. Paper NE-241. 21p.

Table 75.--Total cubic-foot yield for thinned stands of yellow-poplar<sup>1</sup>.

SITE INDEX 90													
Age (years)	Basal area (sq. ft./acre)												
	40	50	60	70	80	90	100	110	120	130	140	150	160
	----- Cu. ft./acre -----												
20	831	1,032	1,232	1,431									
25	1,036	1,286	1,538	1,783	2,030								
30	1,199	1,490	1,778	2,065	2,351	2,636	2,920						
35	1,332	1,654	1,974	2,293	2,611	2,927	3,242	3,557					
40	1,441	1,789	2,136	2,481	2,824	3,166	3,508	3,848	4,187				
45	1,531	1,902	2,270	2,637	3,002	3,366	3,729	4,090	4,451				
50	1,608	1,997	2,384	2,769	3,153	3,535	3,915	4,295	4,674	5,052			
55	1,674	2,079	2,481	2,882	3,281	3,679	4,075	4,470	4,865	5,258			
60	1,731	2,149	2,566	2,980	3,393	3,804	4,213	4,622	5,030	5,436	5,842		
65	1,780	2,211	2,639	3,065	3,490	3,912	4,334	4,754	5,173	5,592	6,009		
70	1,824	2,265	2,704	3,140	3,575	4,008	4,440	4,870	5,300	5,728	6,156	6,582	
75	1,862	2,313	2,761	3,207	3,651	4,093	4,534	4,974	5,412	5,850	6,286	6,722	
80	1,897	2,356	2,812	3,266	3,718	4,169	4,618	5,066	5,512	5,958	6,403	6,846	7,289

SITE INDEX 100													
20	930	1,155	1,379	1,602	1,823								
25	1,159	1,439	1,718	1,996	2,272	2,547							
30	1,342	1,667	1,990	2,311	2,631	2,950	3,267	3,584					
35	1,490	1,851	2,209	2,566	2,921	3,275	3,628	3,980	4,331				
40	1,612	2,002	2,390	2,776	3,160	3,543	3,925	4,306	4,685	5,064	5,442		
45	1,714	2,128	2,541	2,951	3,359	3,766	4,172	4,577	4,980	5,383	5,785		
50	1,799	2,235	2,668	3,099	3,528	3,955	4,381	4,806	5,230	5,653	6,074	6,496	6,916
55	1,873	2,326	2,777	3,225	3,672	4,116	4,560	5,002	5,443	5,883	6,322	6,760	7,198
60	1,936	2,405	2,871	3,334	3,796	4,256	4,715	5,172	5,628	6,083	6,537	6,990	7,442
65	1,992	2,474	2,953	3,430	3,905	4,378	4,850	5,320	5,789	6,257	6,724	7,190	7,655
70	2,040	2,534	3,025	3,514	4,000	4,485	4,968	5,450	5,930	6,410	6,888	7,366	7,842
75	2,084	2,588	3,089	3,588	4,085	4,580	5,073	5,565	6,056	6,546	7,034	7,522	8,008
80	2,122	2,636	3,146	3,655	4,160	4,665	5,167	5,668	6,168	6,667	7,164	7,661	8,156

<sup>1</sup>Only bole wood and bark of trees 4.5 inches d.b.h. and larger are included.

Source: Beck, D. E. and L. Della-Bianca. 1972. Growth and yield of thinned yellow-poplar. U.S.F.S. Southeastern Forest Exp. Sta., Res. Paper SE-101. 20p.

Table 75.--Total cubic-foot yield for thinned stands of yellow-poplar<sup>1</sup>  
(continued).

SITE INDEX 110													
20	1,020	1,266	1,512	1,756	1,999								
25	1,370	1,578	1,884	2,188	2,491	2,793	3,094	3,394					
30	1,471	1,827	2,181	2,533	2,884	3,234	3,582	3,930	4,276	4,622			
35	1,634	2,029	2,422	2,813	3,203	3,591	3,978	4,364	4,748	5,132			
40	1,767	2,195	2,620	3,043	3,465	3,884	4,303	4,720	5,136	5,552	5,966	6,379	
45	1,879	2,333	2,785	3,235	3,683	4,129	4,574	5,018	5,460	5,902	6,342	6,781	7,220
50	1,973	2,450	2,925	3,397	3,867	4,336	4,803	5,269	5,734	6,197	6,660	7,121	7,582
55	2,053	2,550	3,044	3,536	4,025	4,513	4,999	5,484	5,968	6,450	6,931	7,412	7,891
60	2,123	2,637	3,147	3,656	4,162	4,666	5,169	5,670	6,170	6,669	7,166	7,663	8,159
65	2,184	2,712	3,237	3,760	4,281	4,800	5,317	5,832	6,346	6,860	7,371	7,882	8,392
70	2,237	2,778	3,316	3,852	4,386	4,917	5,447	5,975	6,502	7,027	7,552	8,075	8,597
75	2,284	2,837	3,387	3,934	4,478	5,021	5,562	6,102	6,640	7,176	7,712	8,246	8,780
80	2,327	2,890	3,449	4,006	4,561	5,114	5,665	6,214	6,762	7,309	7,854	8,399	8,942

SITE INDEX 120													
20	1,101	1,367	1,632	1,896	2,158	2,420							
25	1,372	1,704	2,034	2,362	2,689	3,015	3,340	3,664	3,987				
30	1,588	1,973	2,355	2,735	3,114	3,491	3,868	4,242	4,617	4,990	5,362		
35	1,764	2,191	2,615	3,037	3,458	3,877	4,295	4,711	5,126	5,541	5,954	6,367	6,779
40	1,908	2,370	2,829	3,286	3,740	4,194	4,646	5,096	5,546	5,994	6,441	6,888	7,333
45	2,028	2,519	3,007	3,493	3,976	4,458	4,938	5,417	5,895	6,372	6,847	7,322	7,795
50	2,130	2,645	3,158	3,668	4,176	4,682	5,186	5,689	6,190	6,691	7,190	7,688	8,186
55	2,217	2,753	3,287	3,817	4,346	4,872	5,398	5,921	6,443	6,964	7,484	8,002	8,520
60	2,292	2,847	3,398	3,947	4,493	5,038	5,580	6,122	6,651	7,200	7,737	8,273	8,808
65	2,358	2,928	3,495	4,060	4,622	5,182	5,740	6,297	6,852	7,406	7,959	8,510	9,060
70	2,415	3,000	3,581	4,159	4,735	5,309	5,881	6,451	7,020	7,587	8,153	8,718	9,282
75	2,466	3,063	3,656	4,247	4,835	5,421	6,005	6,588	7,168	7,748	8,326	8,903	9,479
80	2,512	3,120	3,724	4,326	4,924	5,521	6,116	6,709	7,301	7,891	8,480	9,068	9,654

<sup>1</sup>Only bole wood and bark of trees 4.5 inches d.b.h. and larger are included.

Source: Beck, D. E. and L. Della-Bianca. 1972. Growth and yield of thinned yellow-poplar. U.S.F.S. Southeastern Forest Exp. Sta., Res. Paper SE-101. 20p.

Table 75.--Total cubic-foot yield for thinned stands of yellow-poplar<sup>1</sup>  
(continued).

SITE INDEX 130													
Age (years)	Basal area (sq. ft./acre)												
	40	50	60	70	80	90	100	110	120	130	140	150	160
----- Cu. ft./acre -----													
20	1,175	1,459	1,741	2,023	2,303	2,582	2,860						
25	1,464	1,818	2,170	2,520	2,869	3,217	3,564	3,909	4,254	4,598			
30	1,695	2,105	2,513	2,918	3,323	3,725	4,127	4,527	4,926	5,324	5,721	6,118	6,514
35	1,882	2,337	2,790	3,241	3,690	4,137	4,582	5,027	5,470	5,912	6,353	6,794	7,233
40	2,036	2,529	3,018	3,506	3,991	4,475	4,957	5,438	5,917	6,395	6,873	7,349	7,824
45	2,164	2,688	3,208	3,727	4,243	4,757	5,269	5,780	6,290	6,798	7,306	7,812	8,317
50	2,273	2,822	3,369	3,913	4,455	4,995	5,533	6,070	6,605	7,139	7,672	8,204	8,734
55	2,365	2,938	3,507	4,073	4,637	5,199	5,759	6,318	6,875	7,430	7,985	8,538	9,090
60	2,446	3,037	3,625	4,211	4,794	5,375	5,954	6,532	7,108	7,682	8,256	8,828	9,399
65	2,516	3,124	3,729	4,332	4,931	5,529	6,125	6,719	7,311	7,902	8,492	9,080	9,668
70	2,577	3,201	3,821	4,438	5,052	5,664	6,274	6,883	7,490	8,095	8,700	9,302	9,904
75	2,632	3,268	3,902	4,532	5,159	5,784	6,407	7,029	7,649	8,267	8,884	9,499	10,114
80	2,680	3,329	3,974	4,615	5,254	5,891	6,526	7,159	7,790	8,420	9,048	9,675	10,301

<sup>1</sup>Only bole wood and bark of trees 4.5 inches d.b.h. and larger are included.

Source: Beck, D. E. and L. Della-Bianca. 1972. Growth and yield of thinned yellow-poplar. U.S.F.S. Southeastern Forest Exp. Sta., Res. Paper SE-101. 20p.

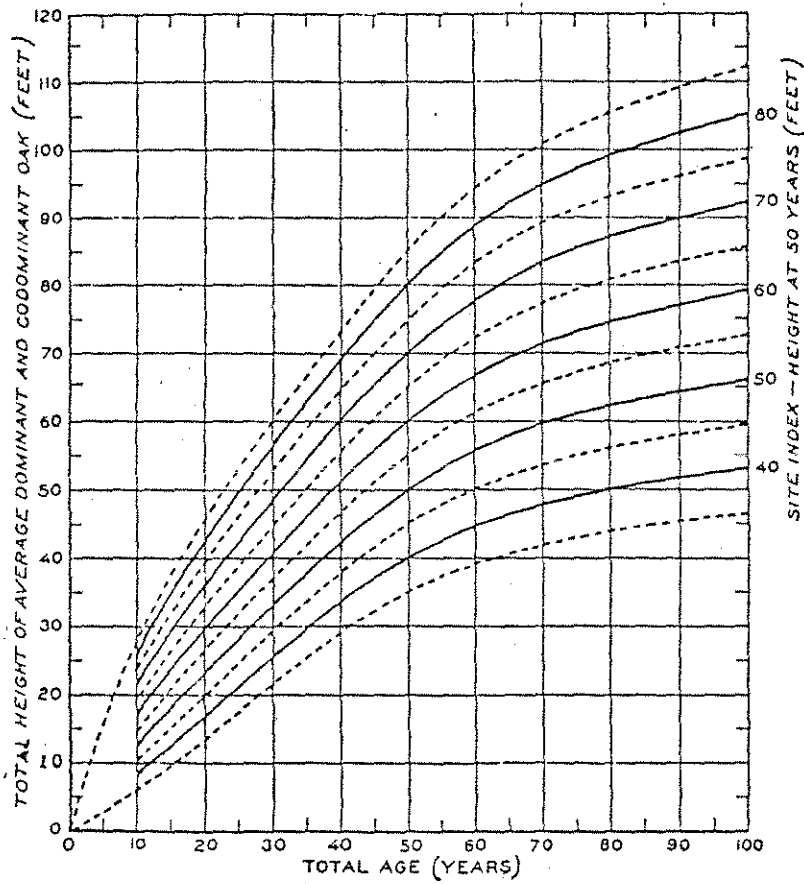


Figure 1. Height curves used for upland oak site classification.

Source: Schnur, G. L. 1937. Yield, stand, and volume tables for even-aged upland oak forests. U.S.D.A. Tech. Bull. 560. 87p.



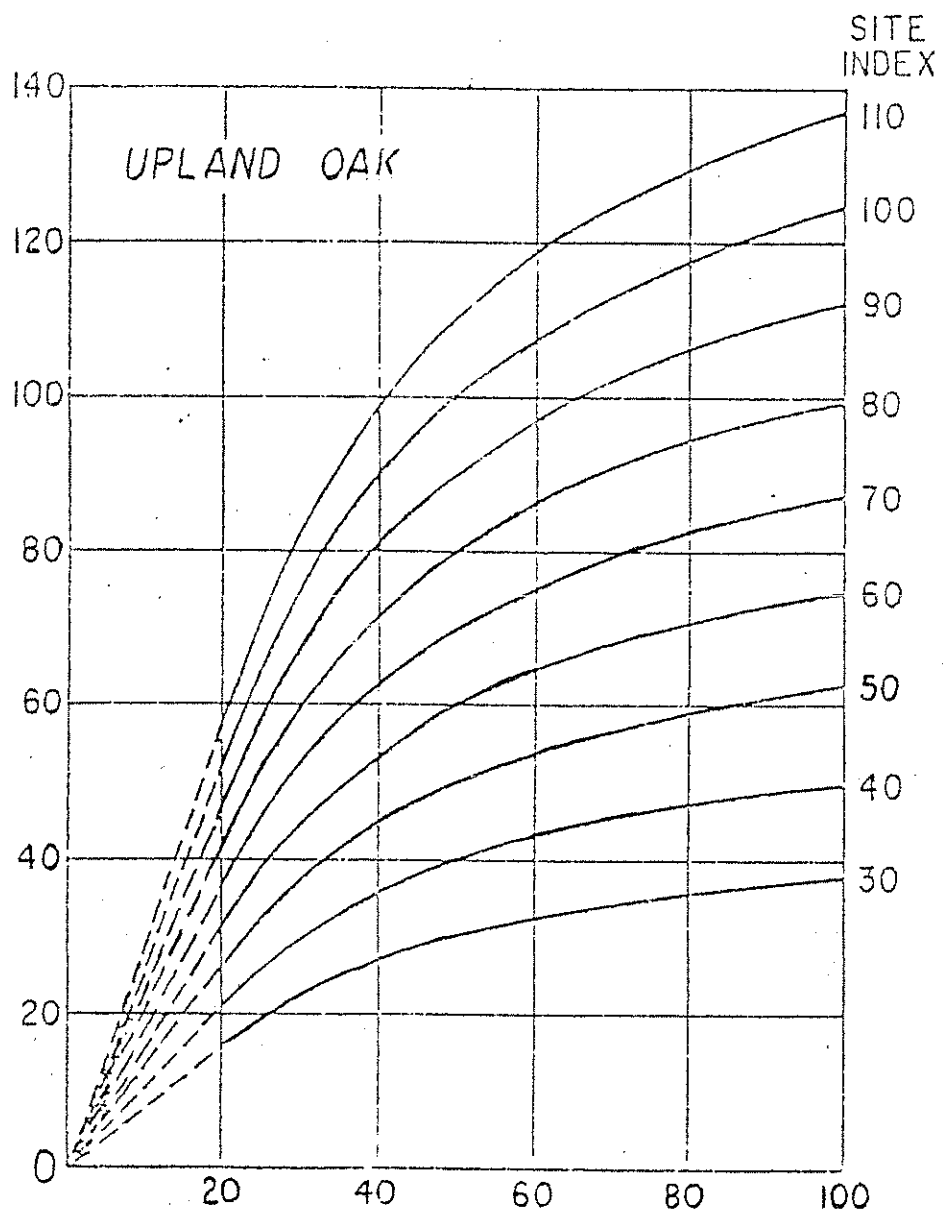


Figure 2. Site index curves for upland oak in the Southeast.

Source: Olson, D. F., Jr. 1959. Site index curves for upland oak in the Southeast. U.S.F.S. Southeastern Forest Exp. Sta., Res. Note 125. 2p.

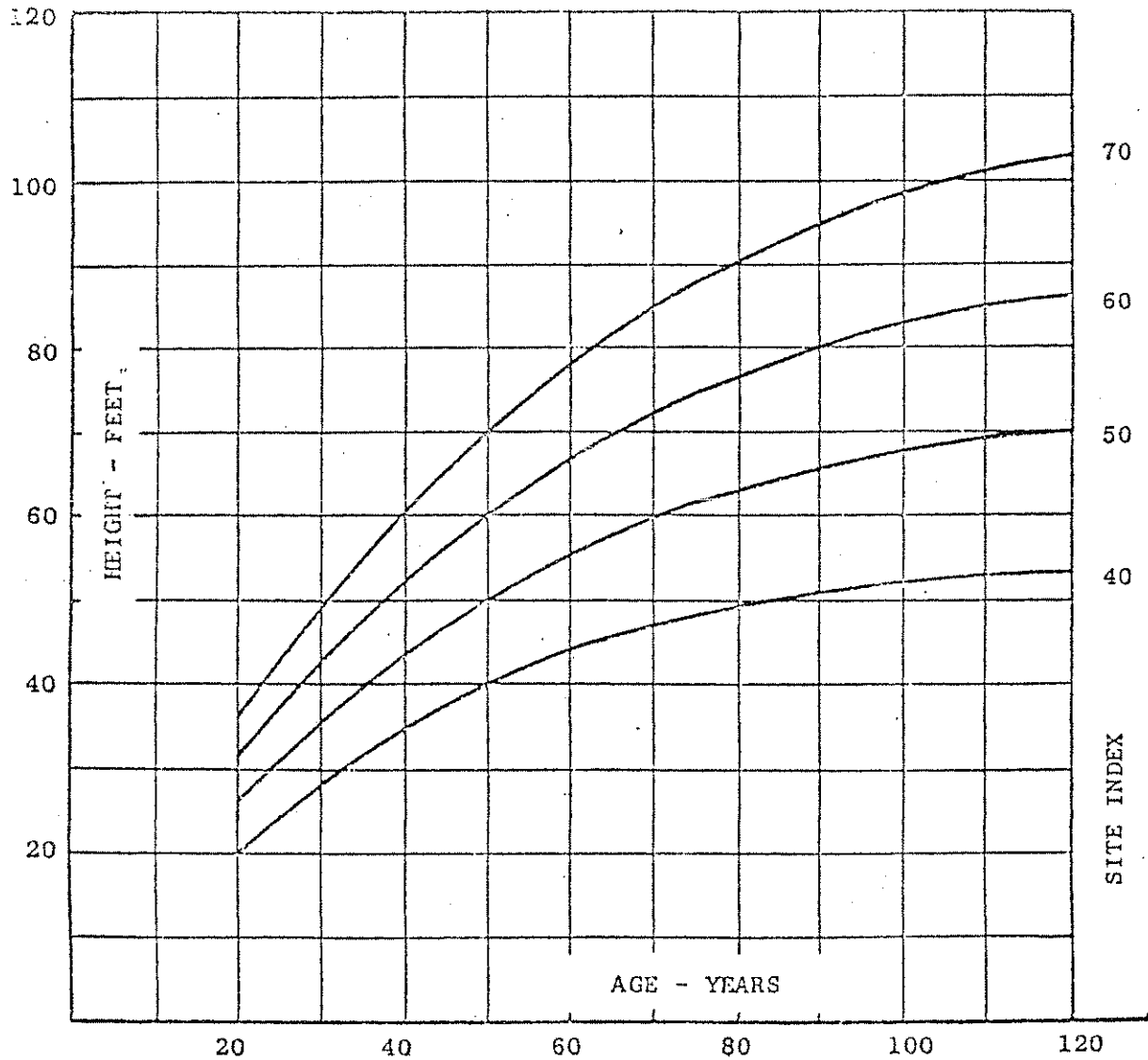


Figure 3. Site index curves for red oak in the Lake States.

Source: Gavorkiantz, S. R. 1957. Site index curves for red oak in the Lake States. U.S.F.S. Lake States Forest Exp. Sta., Tech. Note 485. 2p.

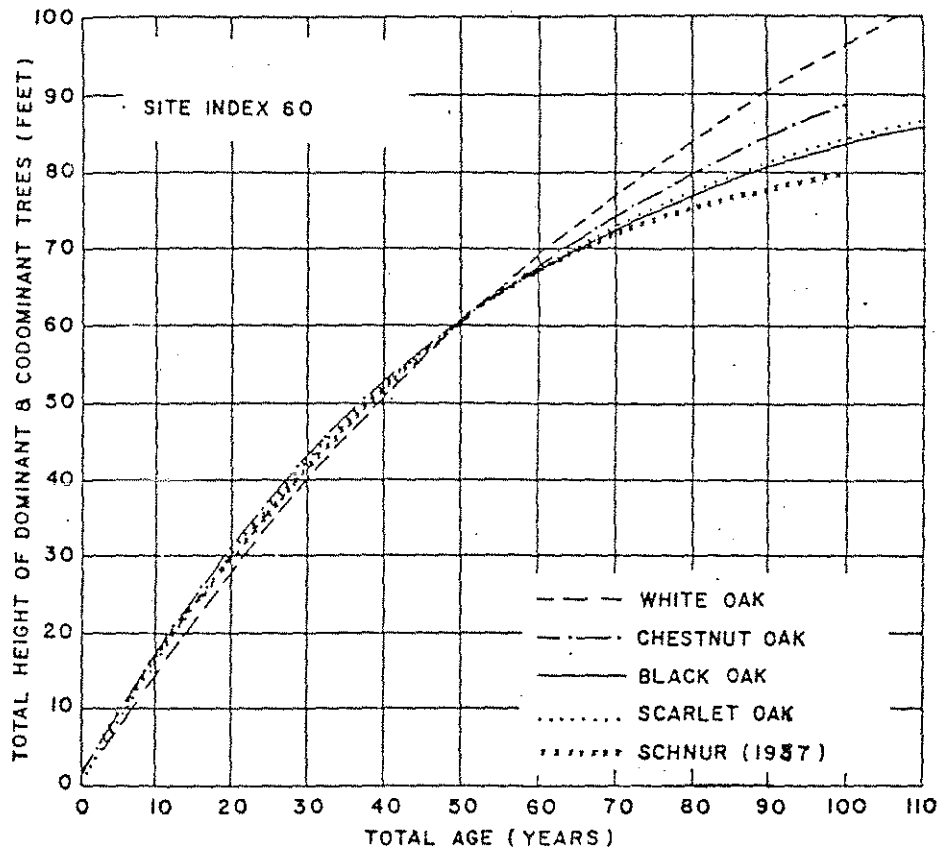


Figure 4. Tree height-growth patterns for four species of upland oaks reveal decided differences in growth for older ages. Also shown is the Schnur (1937) site-index curve for upland oaks.

Source: Carmean, W. H. 1971a. Soil-site relationships of the upland oaks. In: Oak symposium proceedings. U.S.F.S. Northeastern Forest Exp. Sta., Upper Darby, Pa. p. 23-29.

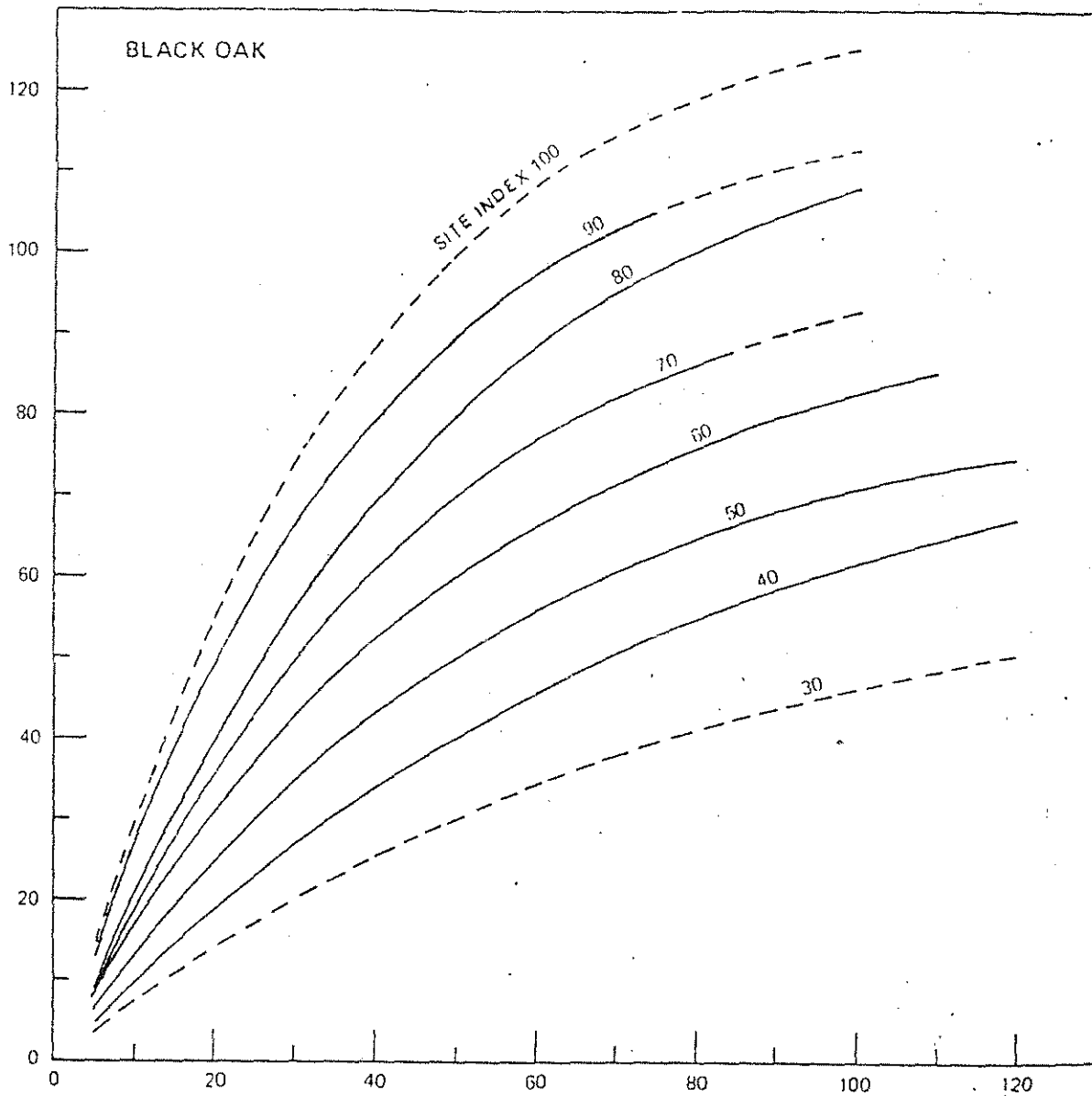


Figure 5. Site index curves for black oak in the Central States. These curves are based on stem analyses of 300 dominant and codominant black oaks growing on 120 plots located in the unglaciated portions of southeastern Ohio, eastern Kentucky, southern Indiana, southern Illinois, and southern Missouri.

Source: Carmean, W. H. 1971b. Site index curves for black, white, scarlet, and chestnut oaks in the Central States. U.S.F.S. North Central Forest Exp. Sta. Res., Paper NC-62. 8p.

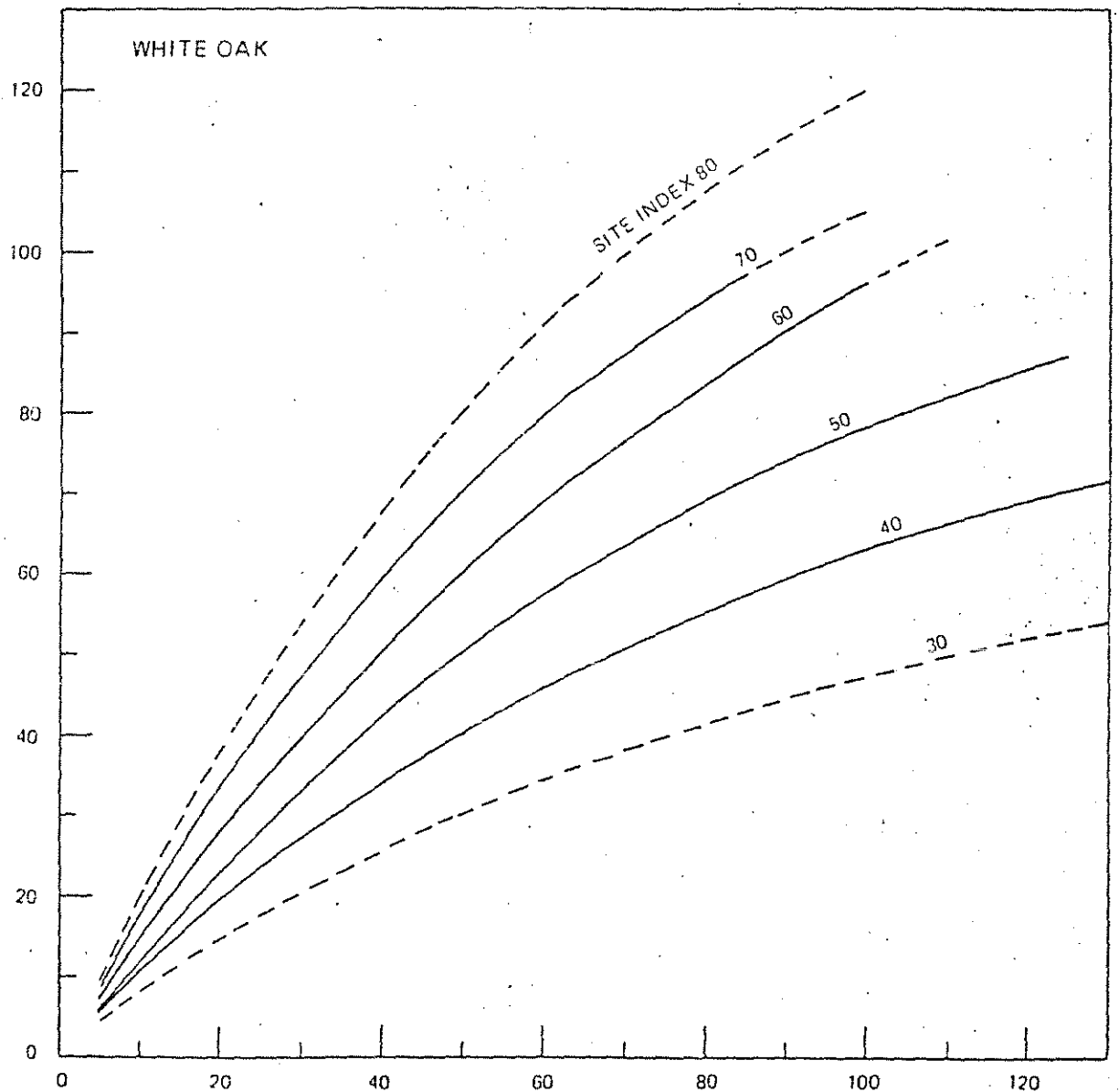


Figure 6. Site index curves for white oak in the Central States. These curves are based on stem analyses of 112 dominant and codominant white oaks growing on 41 plots located in the unglaciated portions of southeastern Ohio, eastern Kentucky, southern Indiana, southern Illinois, and southern Missouri.

Source: Carmean, W. H. 1971b. Site index curves for black, white, scarlet, and chestnut oaks in the Central States. U.S.F.S. North Central Forest Exp. Sta., Res. Paper NC-62. 8p.

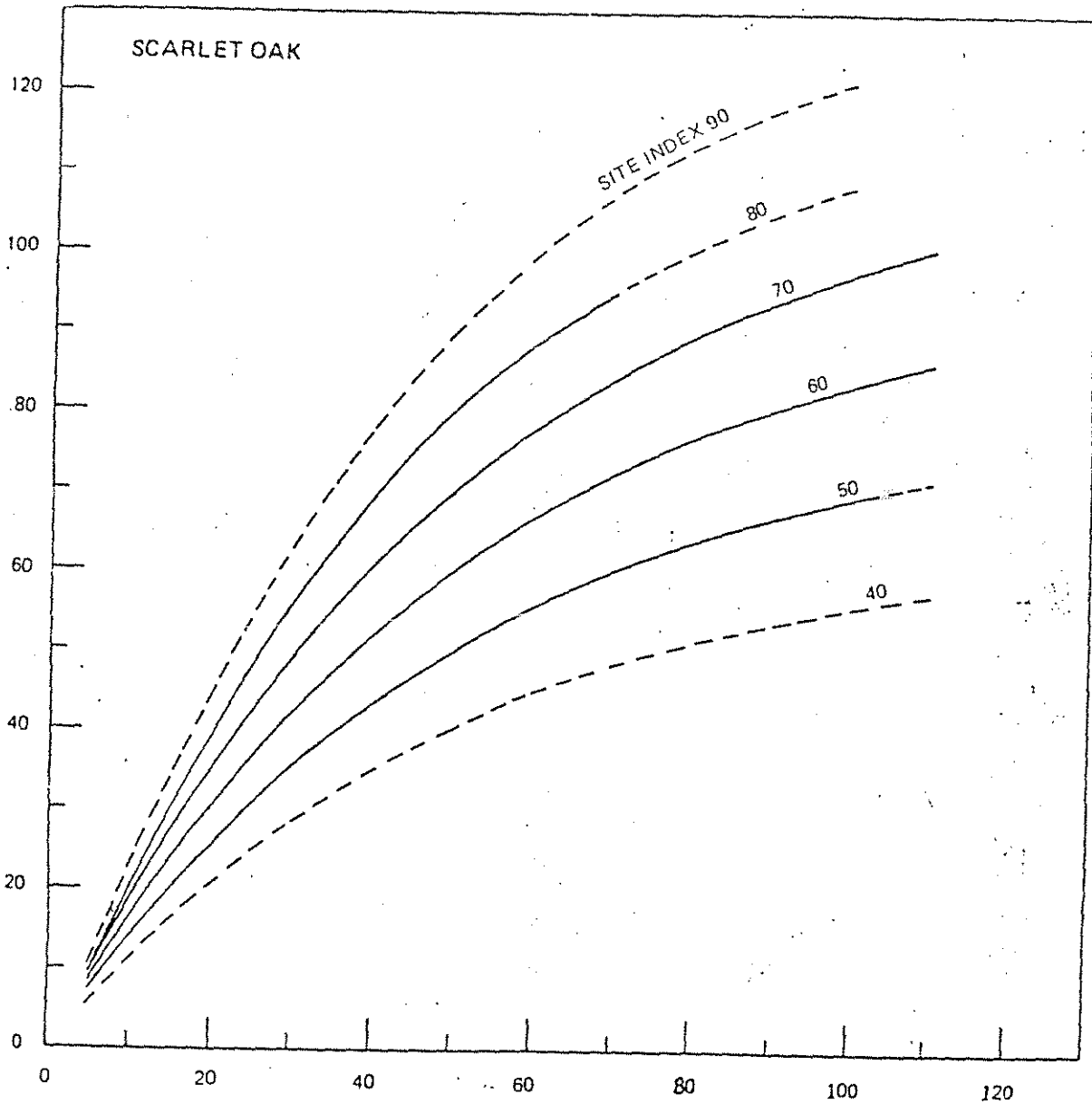


Figure 7. Site index curves for scarlet oak in the Central States. These curves are based on stem analyses of 88 dominant and codominant scarlet oaks growing on 25 plots located in the unglaciated portions of southeastern Ohio, eastern Kentucky, southern Illinois, and southern Missouri.

Source: Carmean, W. H. 1971b. Site index curves for black, white, scarlet, and chestnut oaks in the Central States. U.S.F.S. North Central Forest Exp. Sta., Res. Paper NC-62. 8p.

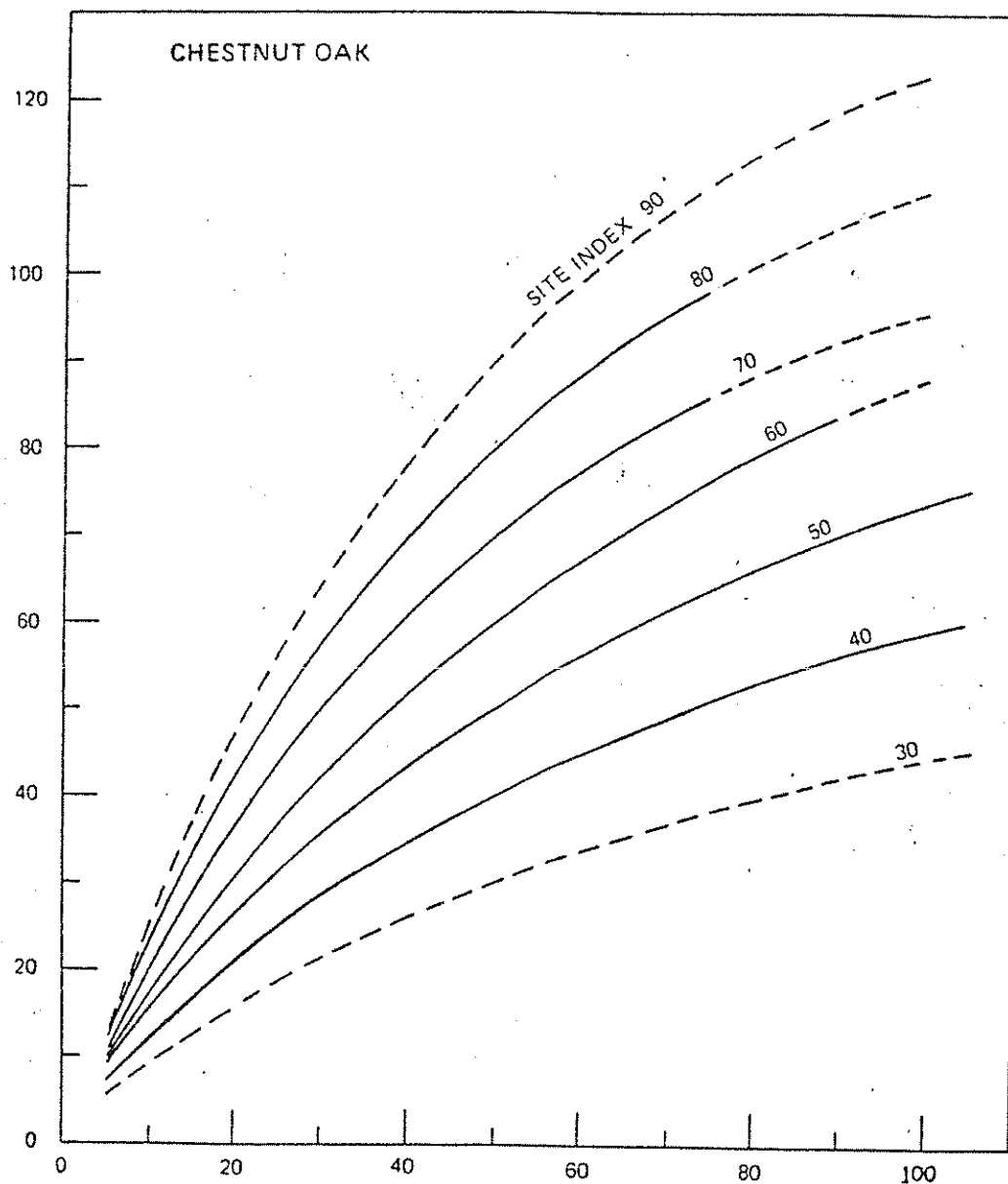


Figure 8. Site index curves for chestnut oak in the Central States. These curves are based on stem analyses of 59 dominant and codominant chestnut oaks growing on 18 plots located in the unglaciated portions of southeastern Ohio, eastern Kentucky, and southern Indiana.

Source: Carmean, W. H. 1971b. Site index curves for black, white, scarlet, and chestnut oaks in the Central States. U.S.F.S. North Central Forest Exp. Sta., Res. Paper NC-62. 8p.

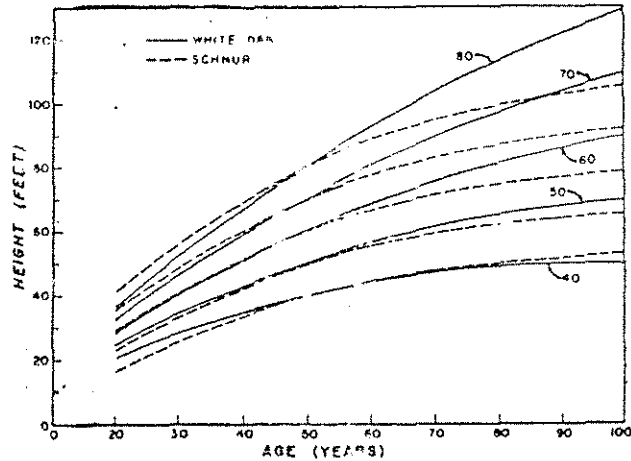


Figure 9. White oak curves for Boston Mountains compared with Schnur's curves.

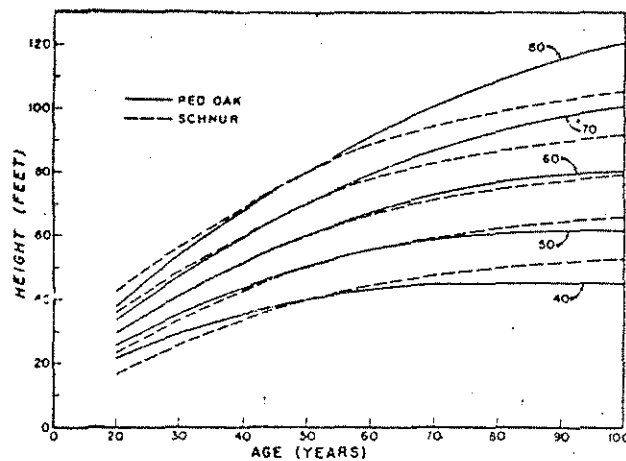
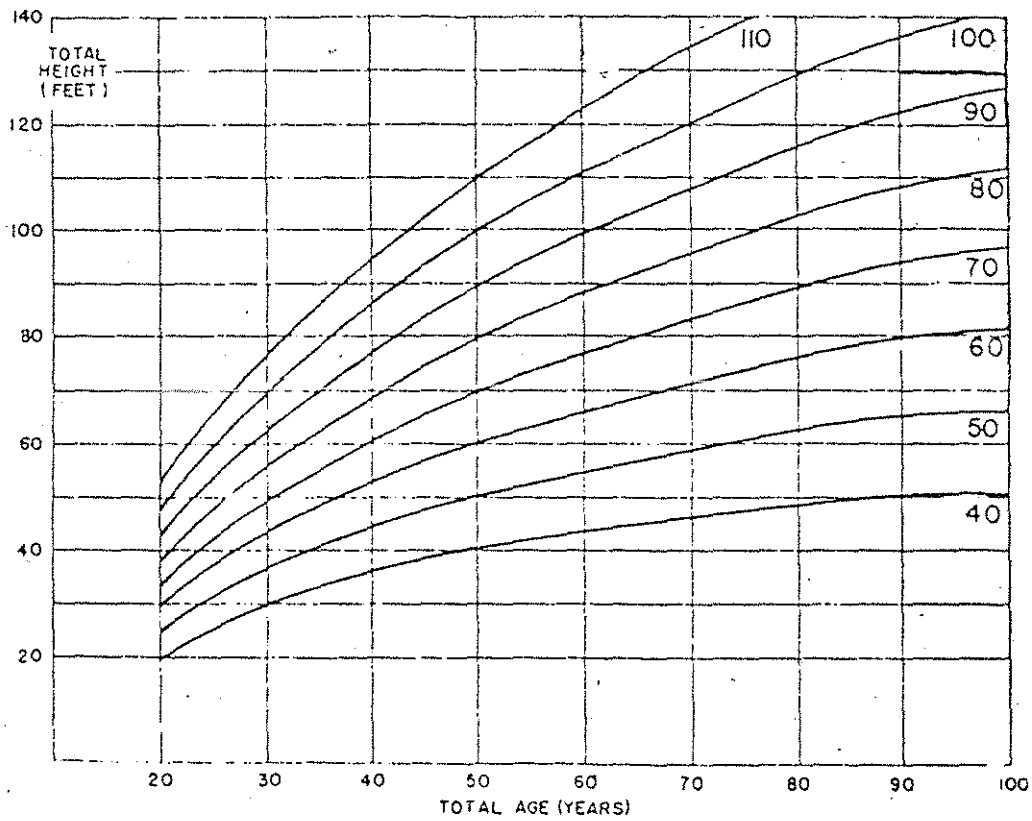


Figure 10. Red oak curves for the Boston Mountains compared with Schnur's curves.

Source: Graney, D. L. and D. R. Bower. 1971. Site index curves for red and white oaks in the Boston Mountains of Arkansas. U.S.F.S. Southern Forest Exp. Sta. Res. Note SO-121. 4p.

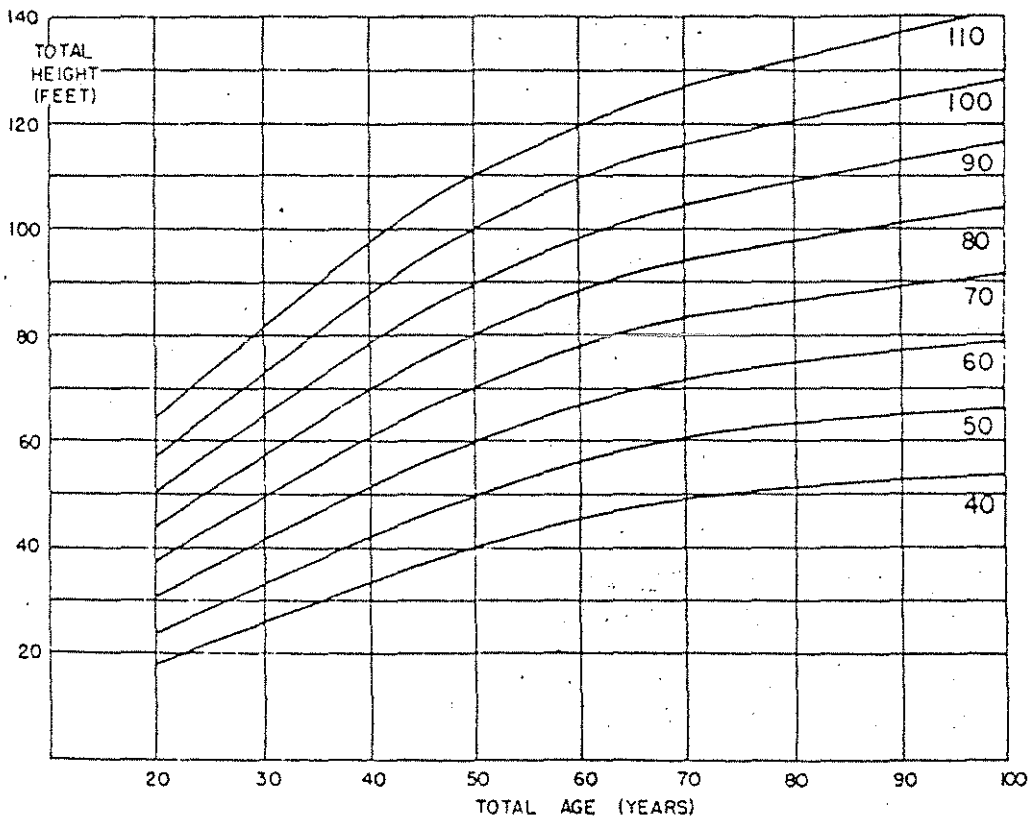




Height in feet of average dominant & codominant trees, by site index at 50 years, in eastern U. S.

Figure 11. White oak site index curves.

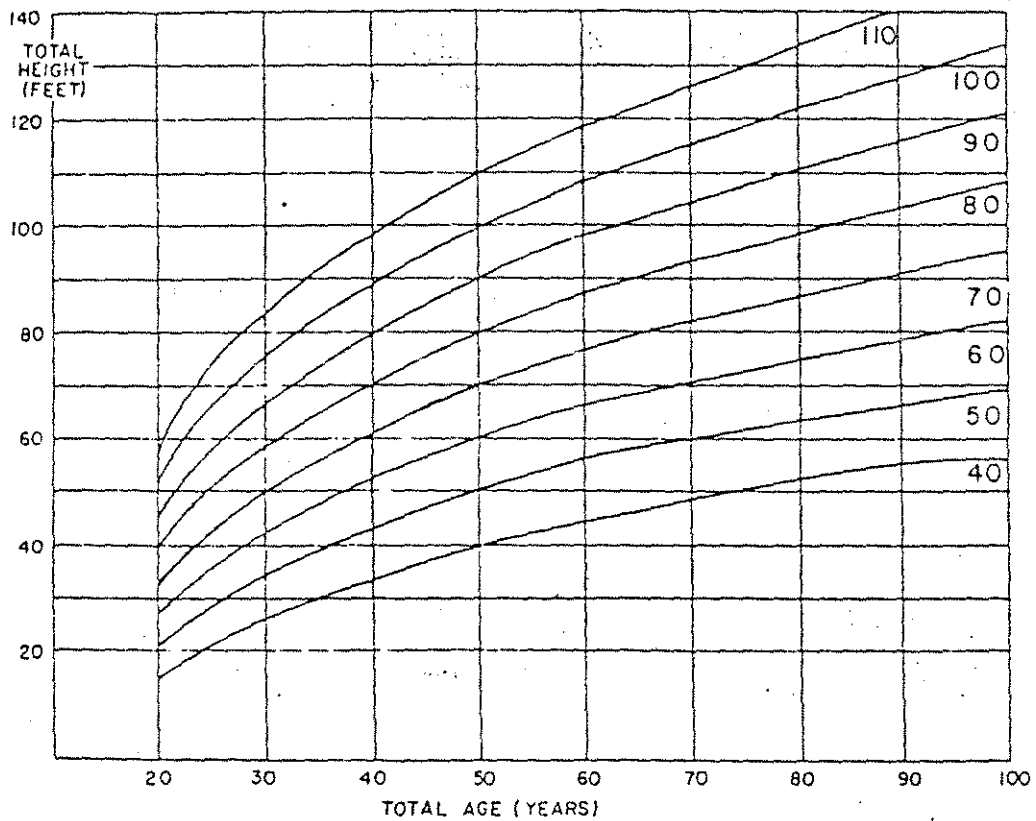
Source: Hampf, F. E. 1964. Site index curves for some forest species in the eastern United States. U.S.F.S. Northeastern Forest Exp. Sta., Upper Darby, Pa. 43p.



Height in feet of average dominant & codominant trees by site index at 50 years, in oak-hickory forests.

Figure 12. Upland oak site index curves.

Source: Hampf, F. E. 1964. Site index curves for some forest species in the eastern United States. U.S.F.S. Northeastern Forest Exp. Sta., Upper Darby, Pa. 43p.



Height in feet of average dominant & codominant trees, by site index at 50 years, in eastern United States.

Figure 13. Red oak site index curves.

Source: Hampf, F. E. 1964. Site index curves for some forest species in the eastern United States. U.S.F.S. Northeastern Forest Exp. Sta., Upper Darby, Pa. 43p.

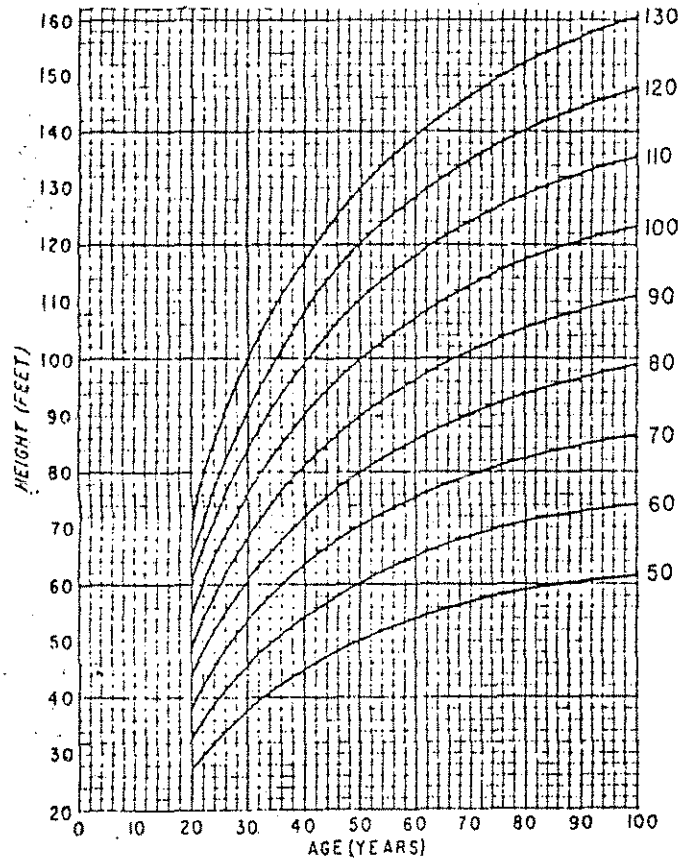


Figure 14. Site index curves at an index age of 50 years for yellow-poplar in the southern Appalachian Mountains.

Source: Beck, D. E. 1962. Yellow-poplar site index curves. U.S.F.S. Southeastern Forest Exp. Sta., Res. Note 180. 2p.

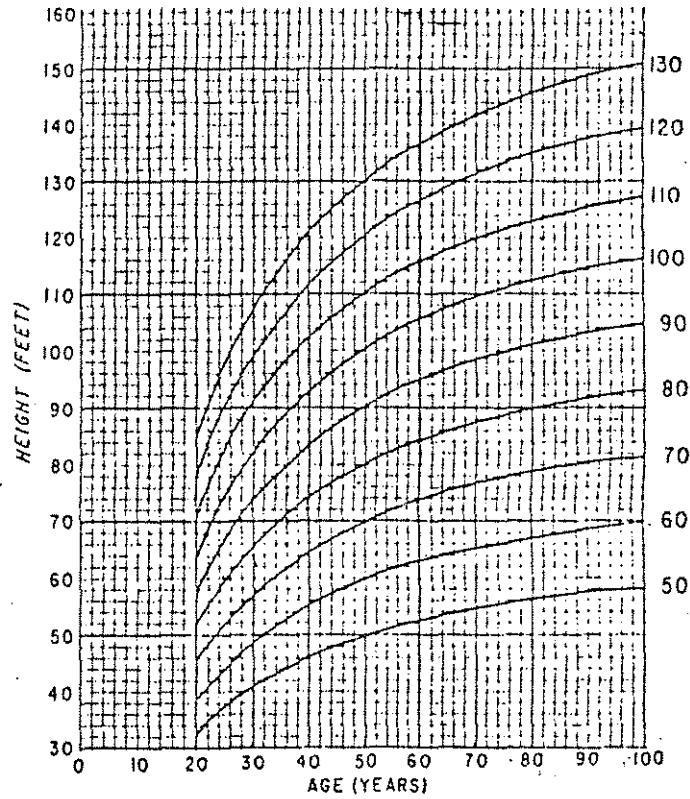


Figure 15. Site index curves at index age of 50 years for yellow-poplar in the Piedmont of Virginia and the Carolinas.

Source: Beck, D. E. 1962. Yellow-poplar site index curves. U.S.F.S. Southeastern Forest Exp. Sta., Res. Note 180. 2p.

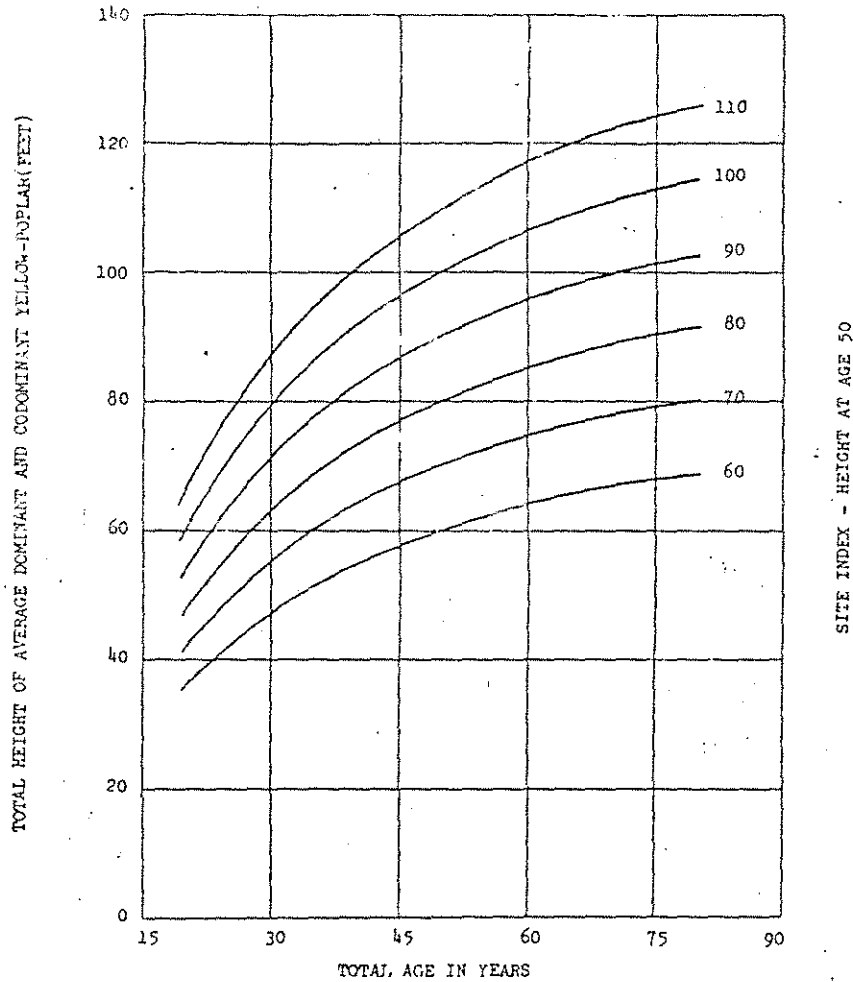


Figure 16. Site index curves for West Virginia yellow-poplar.

Source: Schlaegel, B. E., D. L. Kulow, and R. N. Baughman. 1969. Empirical yield tables for West Virginia yellow-poplar. W. Va. Univ. Agric. Exp. Sta. Bull. 574T. 24p.

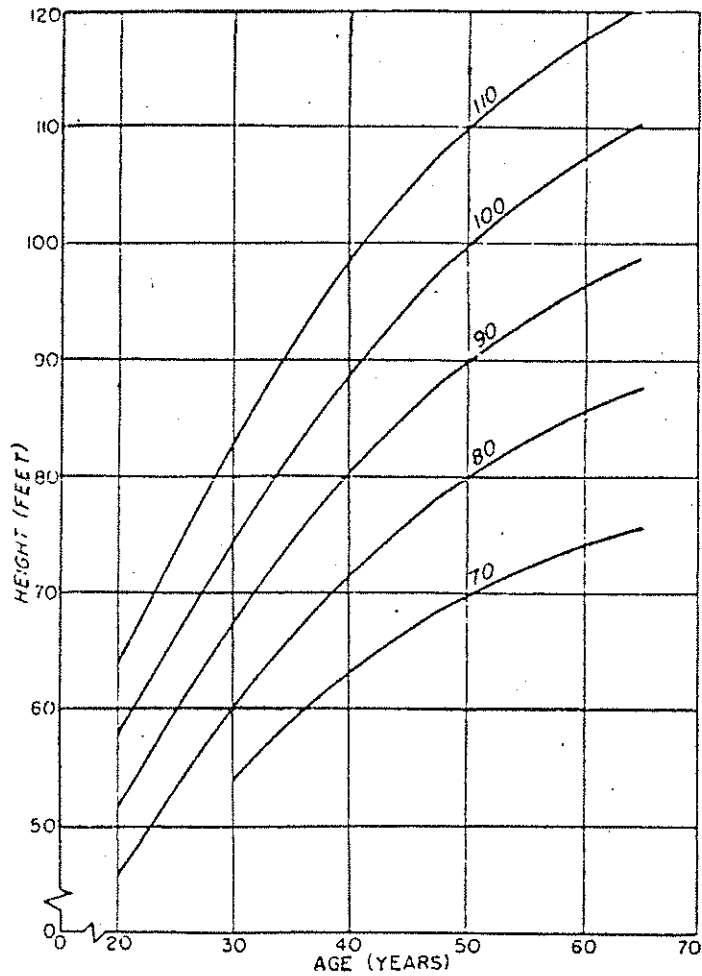
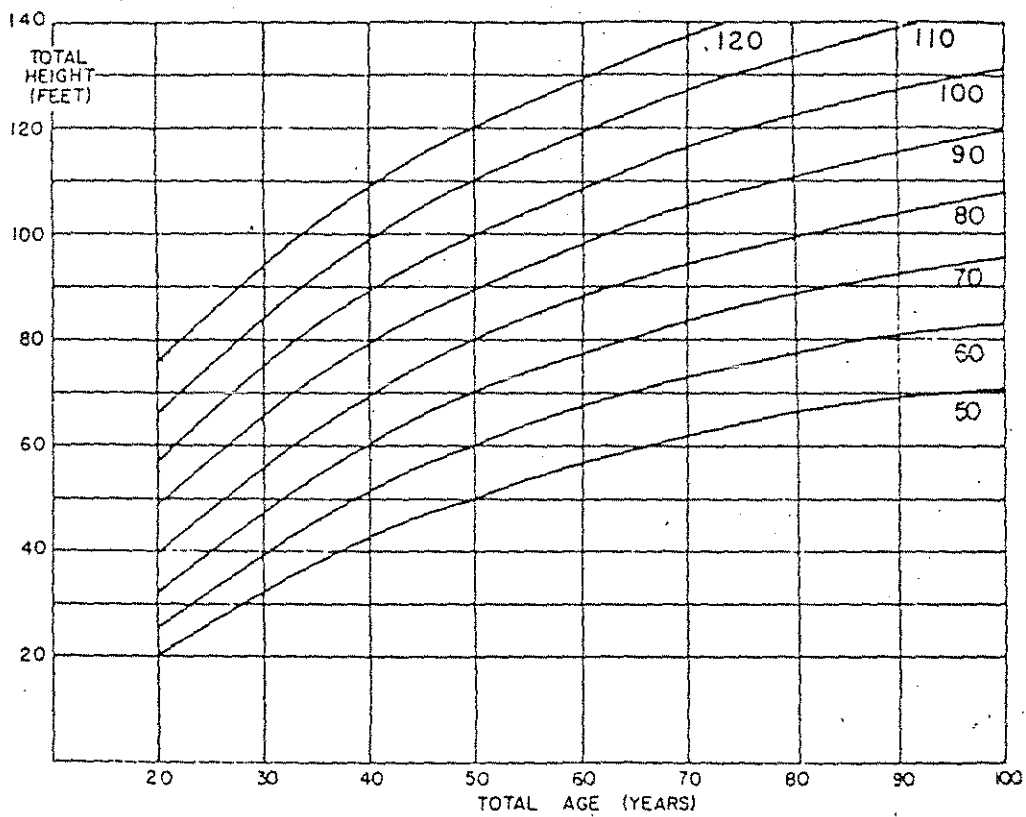


Figure 17. Sweetgum site index curves for Midsouth soils.

Source: Broadfoot, W. M. and R. M. Krinard. 1959. Guide for evaluating sweetgum sites. U.S.F.S. Southern Forest Exp. Sta., Occas. Paper 176. 8p.



Height in feet of average dominant trees,  
by site index at 50 years, in southeastern  
U.S.

Figure 18. Site index curves for sweetgum in fully stocked stands.

Source: Hampf, F. E. 1964. Site index curves for some forest species in the eastern United States. U.S.F.S. Northeastern Forest Exp. Sta., Upper Darby, Pa. 43p.



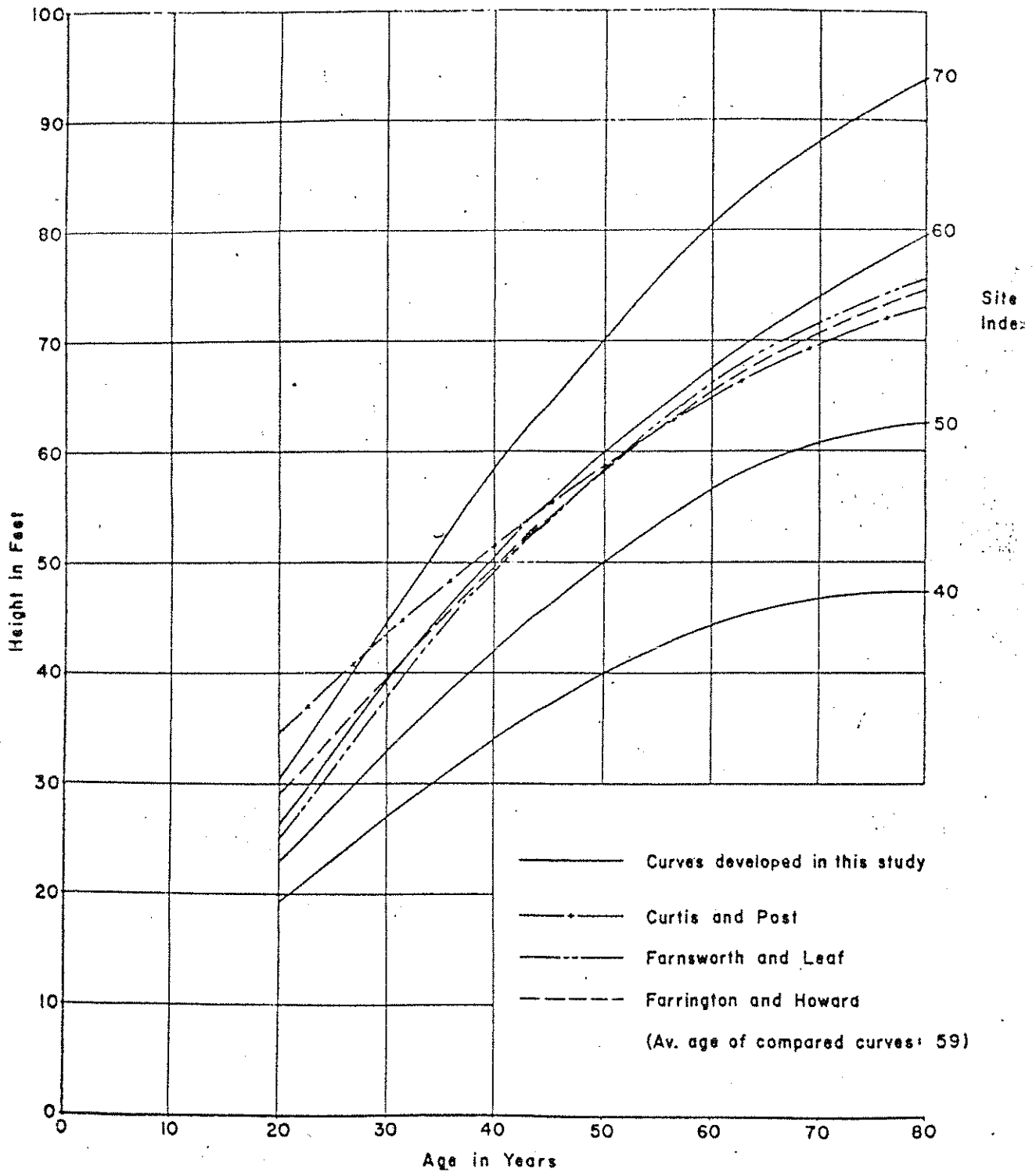
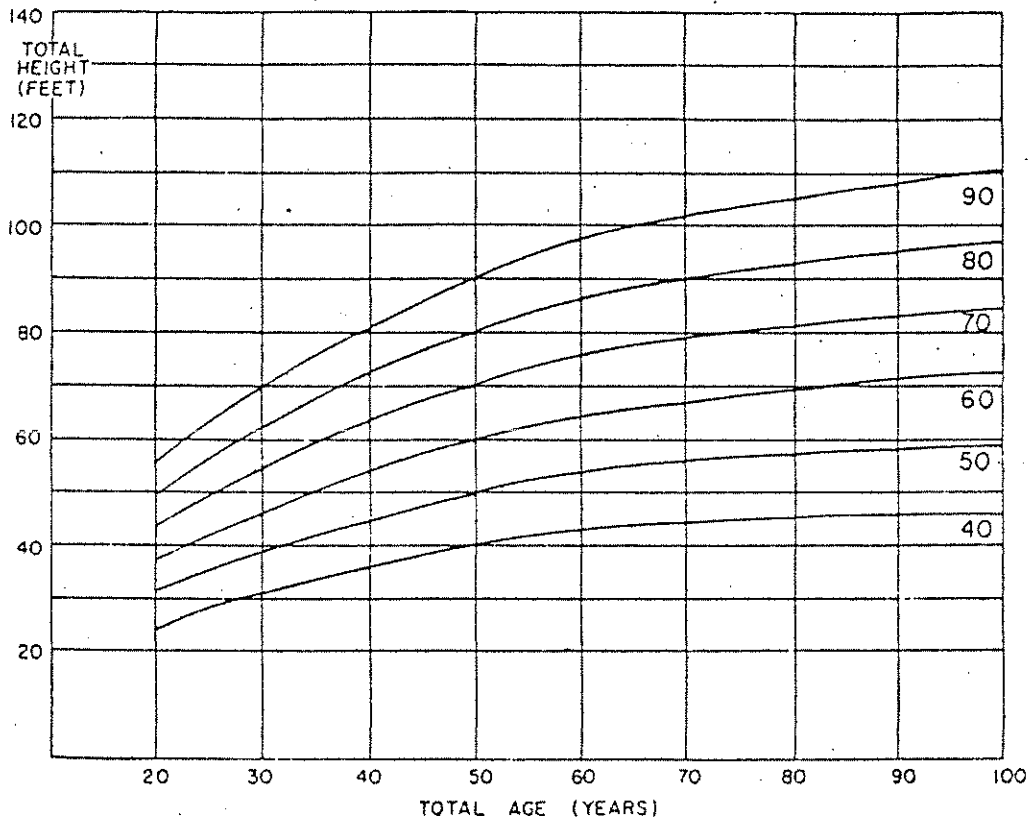


Figure 19. Site index curves (Age Base 50) developed for sugar maple from individual stem analysis. Correction of 5 years should be added to age for adjusting D.B.H. age to stump height age.

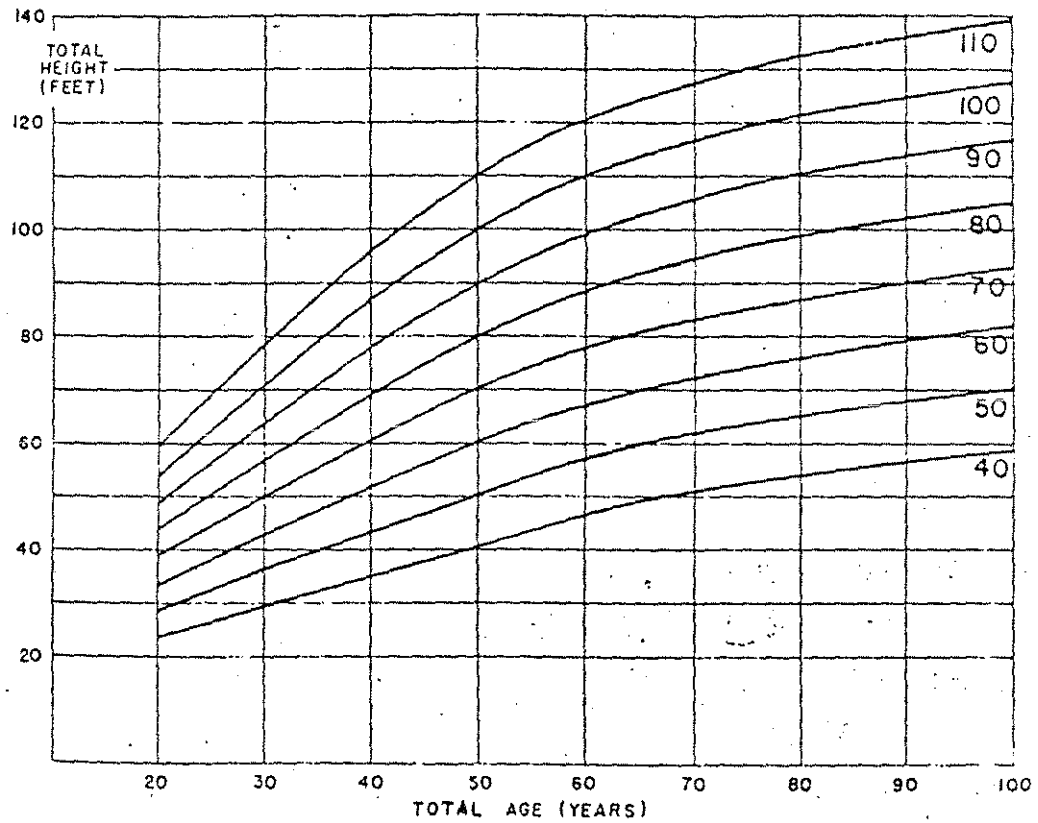
Source: Shetron, S. G. 1969. Site index curves for sugar maple in northern lower Michigan. Mich. Tech. Univ. Res. Note No. 6. 8p.



Height in feet of average dominant trees, by site index at 50 years, in Central States Region.

Figure 20. Site index curves for black walnut.

Source: Hampf, F. E. 1964. Site index curves for some forest species in the eastern United States. U.S.F.S. Northeastern Forest Exp. Sta., Upper Darby, Pa. 43p.



Height in feet of average dominant & codominant trees, by site index at 50 years, in New England & New York.

Figure 21. Site index curves for red maple.

Source: Hampf, F. E. 1964. Site index curves for some forest species in the eastern United States. U.S.F.S. Northeastern Forest Exp. Sta., Upper Darby, Pa. 43p.

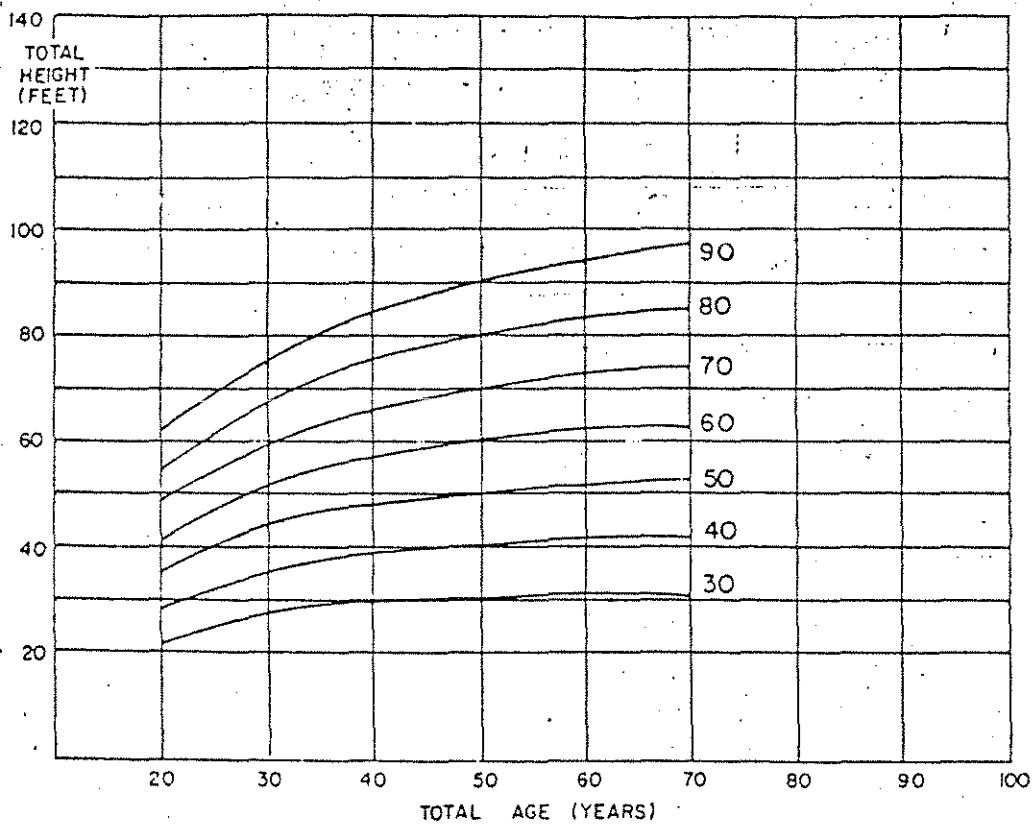
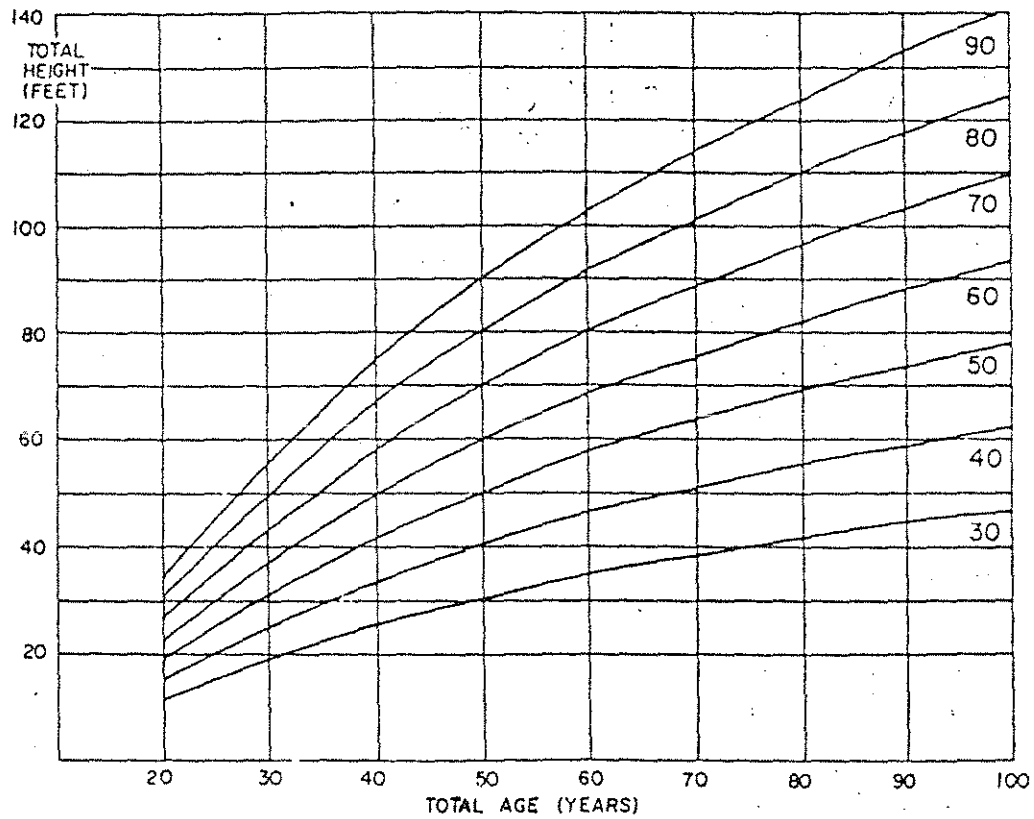


Figure 22. Site index curves for black locust.

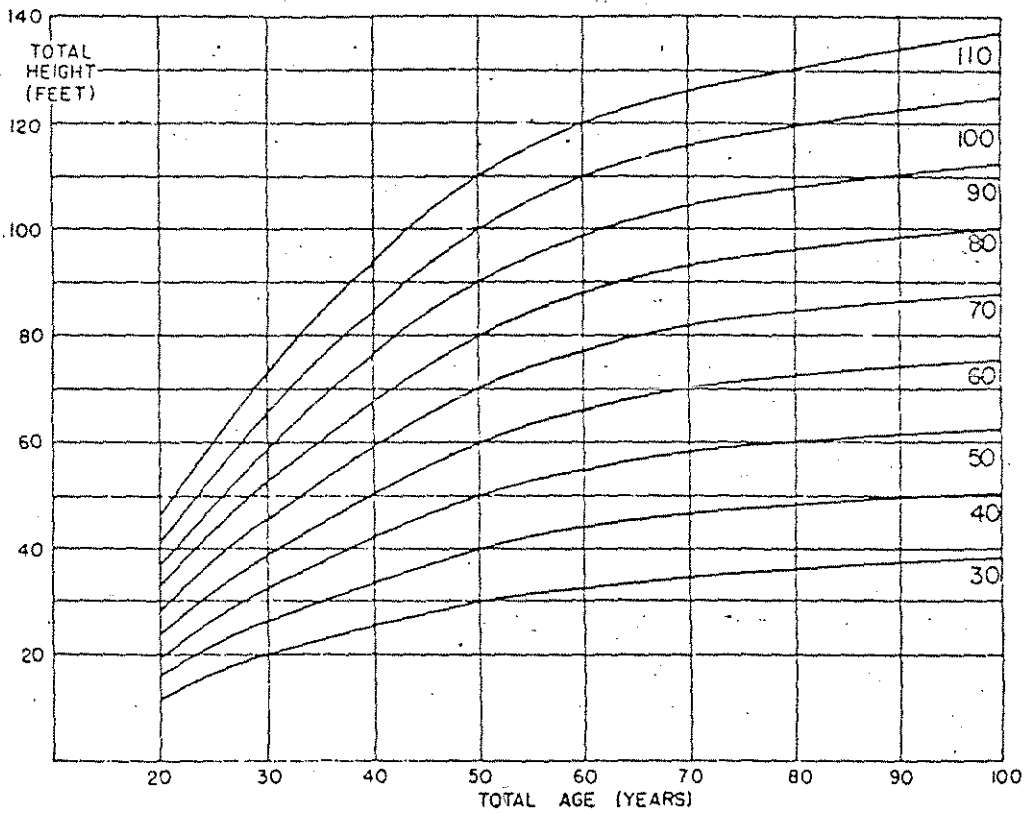
Source: Hampf, F. E. 1964. Site index curves for some forest species in the eastern United States. U.S.F.S. Northeastern Forest Exp. Sta., Upper Darby, Pa. 43p.



Height in feet of average dominant trees, by site index at 50 years, in eastern United States.

Figure 23. Site index curves for hickory.

Source: Hampf, F. E. 1964. Site index curves for some forest species in the eastern United States. U.S.F.S. Northeastern Forest Exp. Sta., Upper Darby, Pa. 43p.



Height in feet of average dominant & codominant trees, by site index at 50 years, in the Northeast.

Figure 24. Site index curves for beech.

Source: Hampf, F. E. 1964. Site index curves for some forest species in the eastern United States. U.S.F.S. Northeastern Forest Exp. Sta., Upper Darby, Pa. 43p.

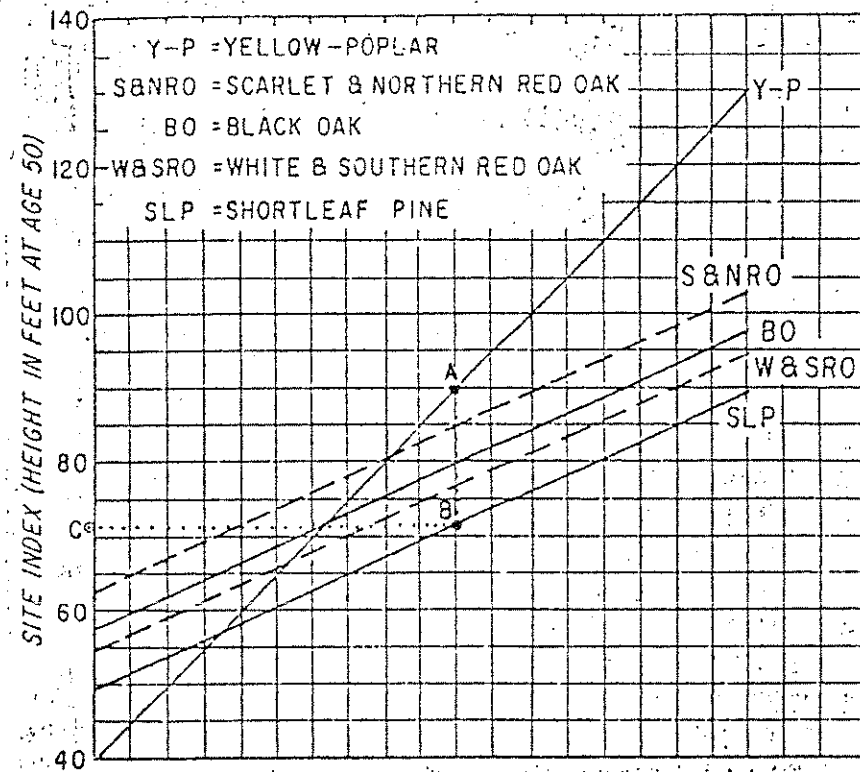


Figure 25. A site index comparison study for important timber species in the Virginia-Carolina Piedmont. For example on land that is site index 90 (A), for yellow-poplar, read down (B) and across (C) to find that this same land averages about 72 feet for shortleaf pine.

Source: Olson, D. F., Jr. and L. Della-Bianca. 1959. Site index comparisons for several tree species in the Virginia-Carolina Piedmont. U.S.F.S. Southeastern Forest Exp. Sta., Sta. Paper 104. 9p.

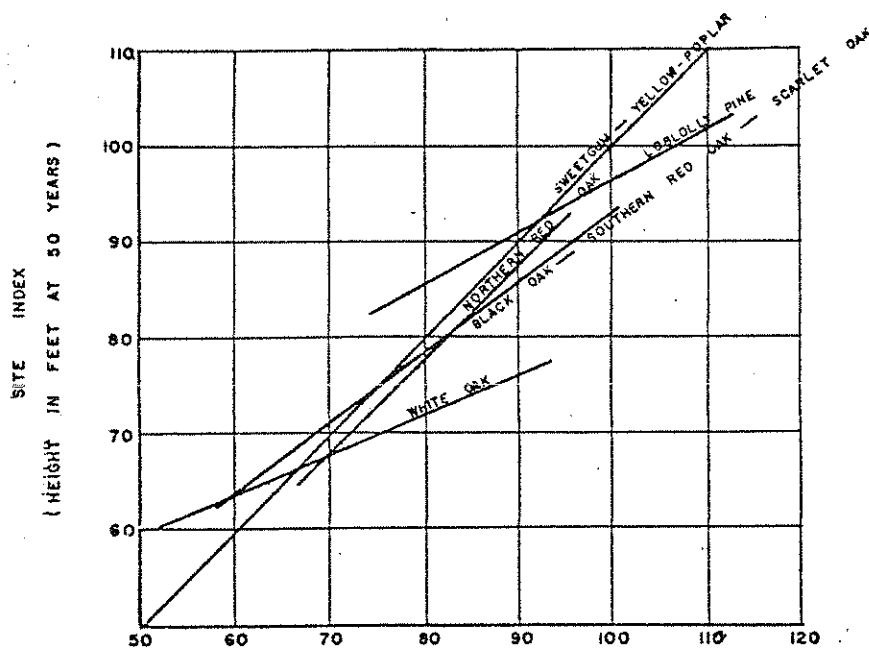


Figure 26. Preliminary comparison of site indices for several different species on the same land in the Georgia Piedmont.

Source: Nelson, T.C. and W.R. Beaufait. 1956. Studies in site evaluation for southern hardwoods. Soc. Amer. Foresters Ann. Meeting Proc.:67-70.



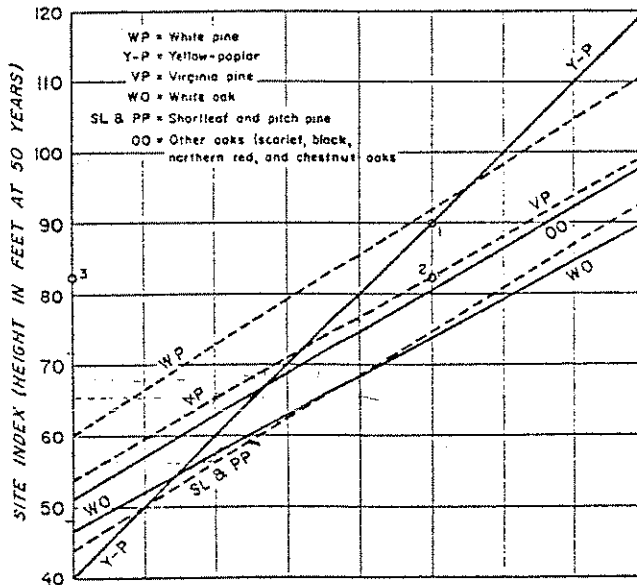


Figure 27. A comparison of site indices for 10 species on the same land in the Southern Appalachians. For example, on land that is site index 90 (1) for yellow-poplar, read down (2) and across (3) to find that this same land averages about site index 82 for Virginia pine.

Source: Doolittle, Warren T. Site index comparisons for several forest species in the southern Appalachians. *Soil Sci. Soc. Amer. Proc.* 22:455-458.

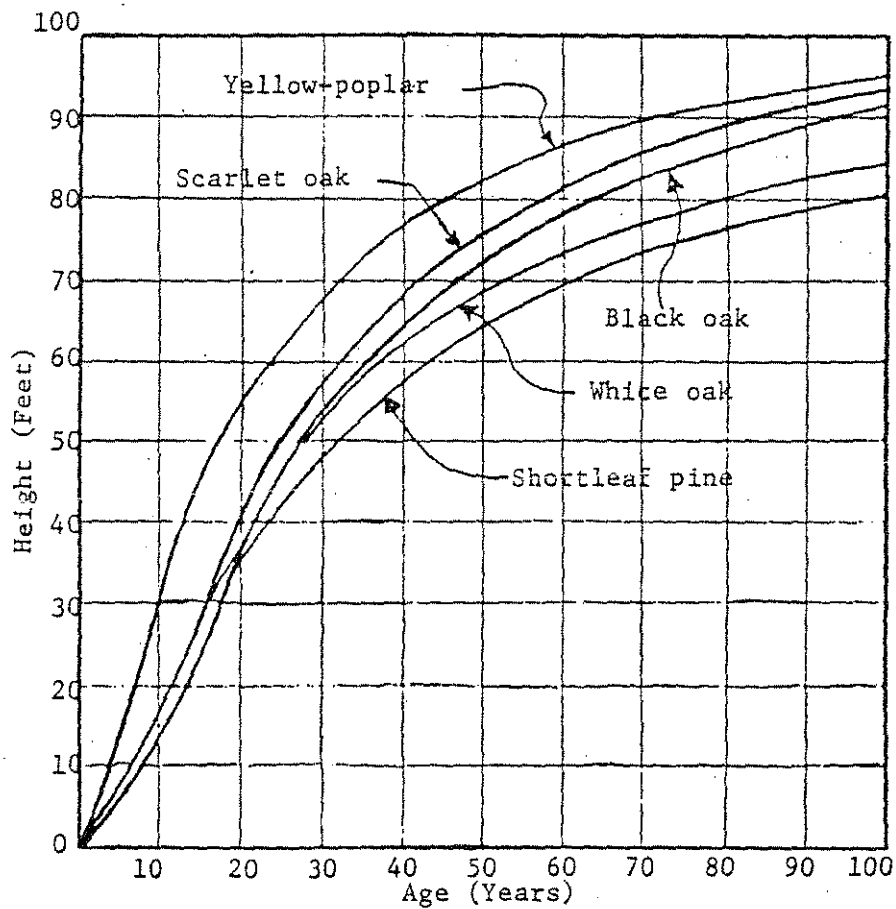


Figure 28. Mean height-age curves based on soil-site equations for Piedmont upland species in mixed timber stands.

Adapted from: Della-Bianca, L. and D. F. Olson, Jr. 1961.  
Soil-site studies in Piedmont hardwood and  
pine-hardwood upland forests. For. Sci. 7:320-329.

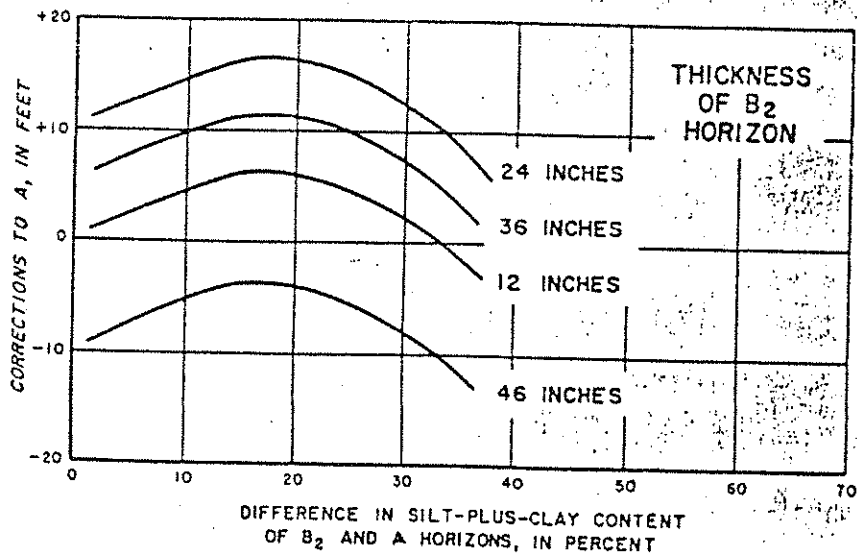
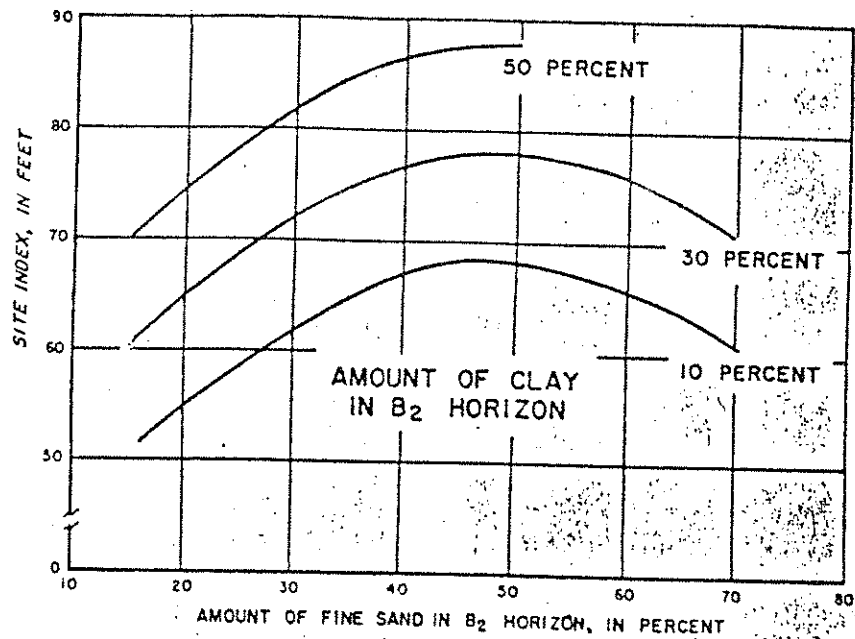


Figure 29. Effect of certain soil factors on the site index for sweetgum.

Source: Phillips, J. J. and M. L. Markley. 1963. Site index of New Jersey sweetgum stands related to soil and water-table characteristics. U.S.F.S. Northeastern Forest Exp. Sta., Res. Paper NE-6. 25p.

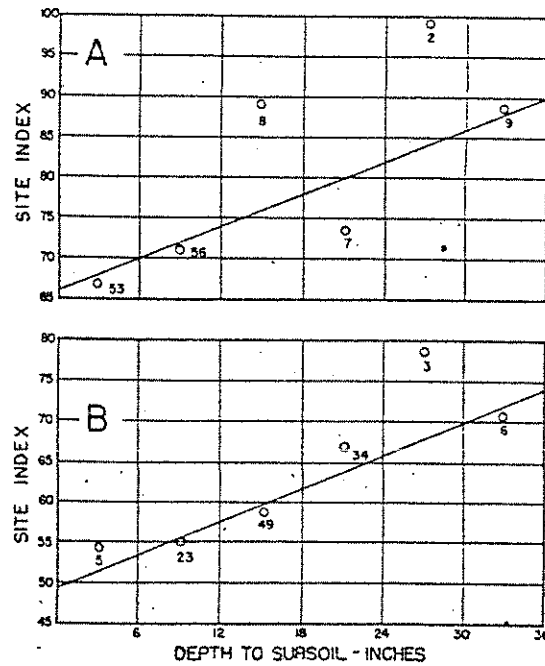


Figure 30. Average relation between site index and depth to subsoil. A - black locust; B - black walnut. Each plotted point is the average of site-index residuals accumulated by 6-inch intervals of the surface horizon depth from 0 to 36 inches.

Source: Auten, J.T. 1945b. Some soil factors associated with site quality for planted black locust and black walnut. J. For. 43:592-598.

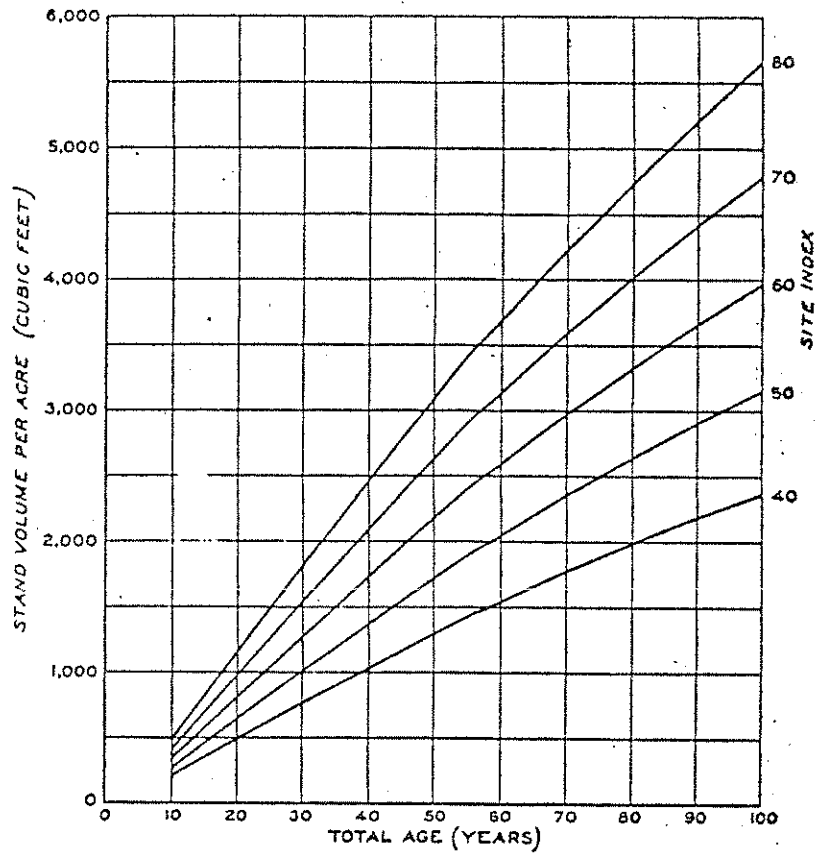


Figure 31. Yields per acre of upland oak in cubic feet, excluding bark showing trends with age by site index.

Source: Schnur, G. L. 1937. Yield, stand, and volume tables for even-aged upland oak forests. U.S.D.A. Tech. Bull. 560. 87p.

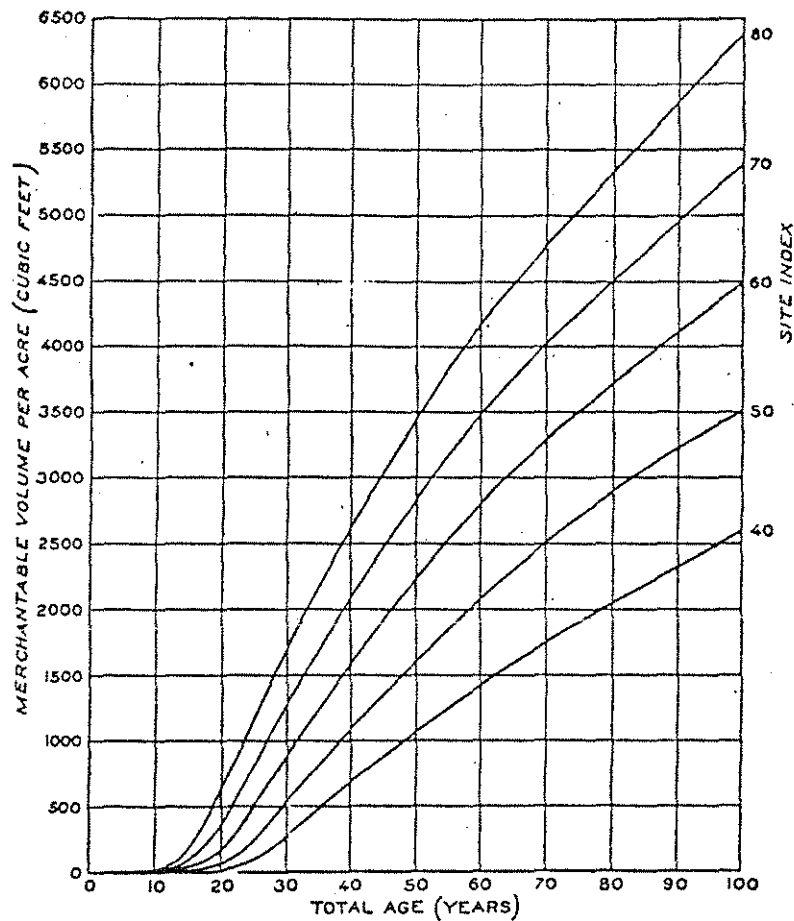


Figure 32. Yield per acre of upland oak in cubic feet of merchantable stem, including bark (to a 4-inch top outside bark), showing trends with age by site index.

Source: Schnur, G. L. 1937. Yield, stand, and volume tables for even-aged upland oak forests. U.S.D.A. Tech. Bull. 560. 87p.

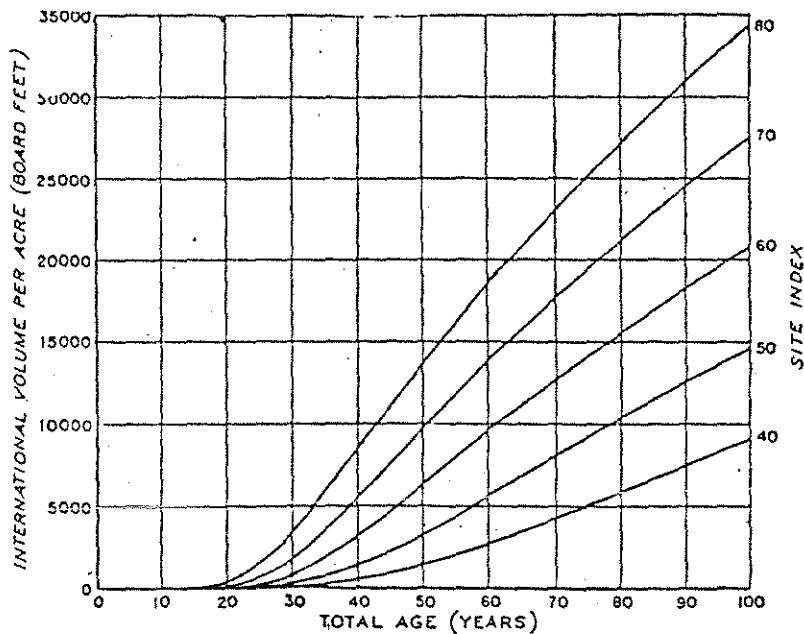


Figure 33. Yield per acre of upland oak in board feet, International rule (1/8-inch kerf) (to a 5-inch top inside bark), showing trends with age by site index.

Source: Schnur, G. L. 1937. Yield, stand, and volume tables for even-aged upland oak forests. U.S.D.A. Tech. Bull. 560. 87p.

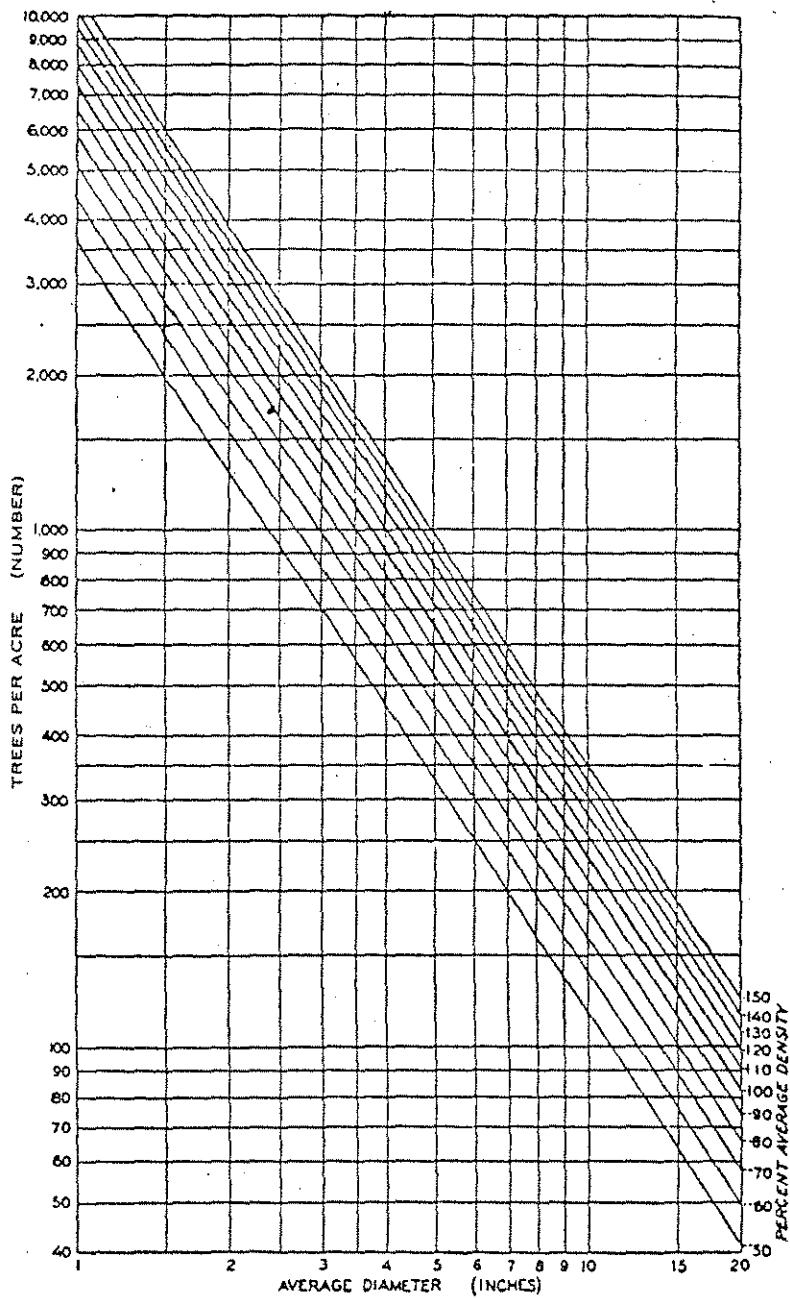


Figure 34. Stand density chart for upland oak.

Source: Schnur, G. L. 1937. Yield, stand, and volume tables for even-aged upland oak forests. U.S.D.A. Tech. Bull. 560. 87p.



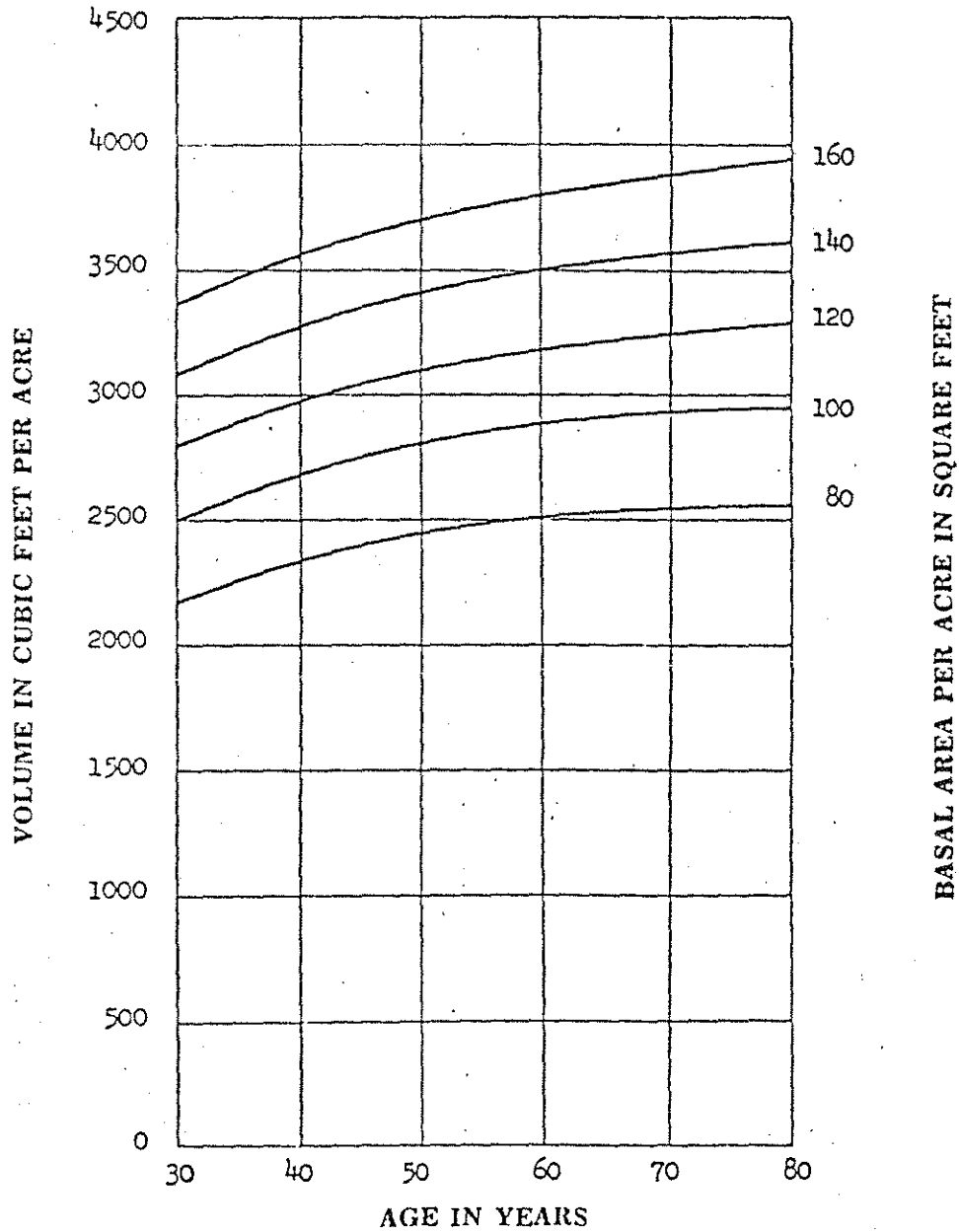


Figure 35. Yellow-poplar yield in cubic feet per acre, site index 75.

Source: Schlaegel, B. E. and D. L. Kulow. 1969. Compatible growth and yield equations for West Virginia yellow-poplar. W. Va. Univ. Agric. Exp. Sta. Bull. 573T. 20p.

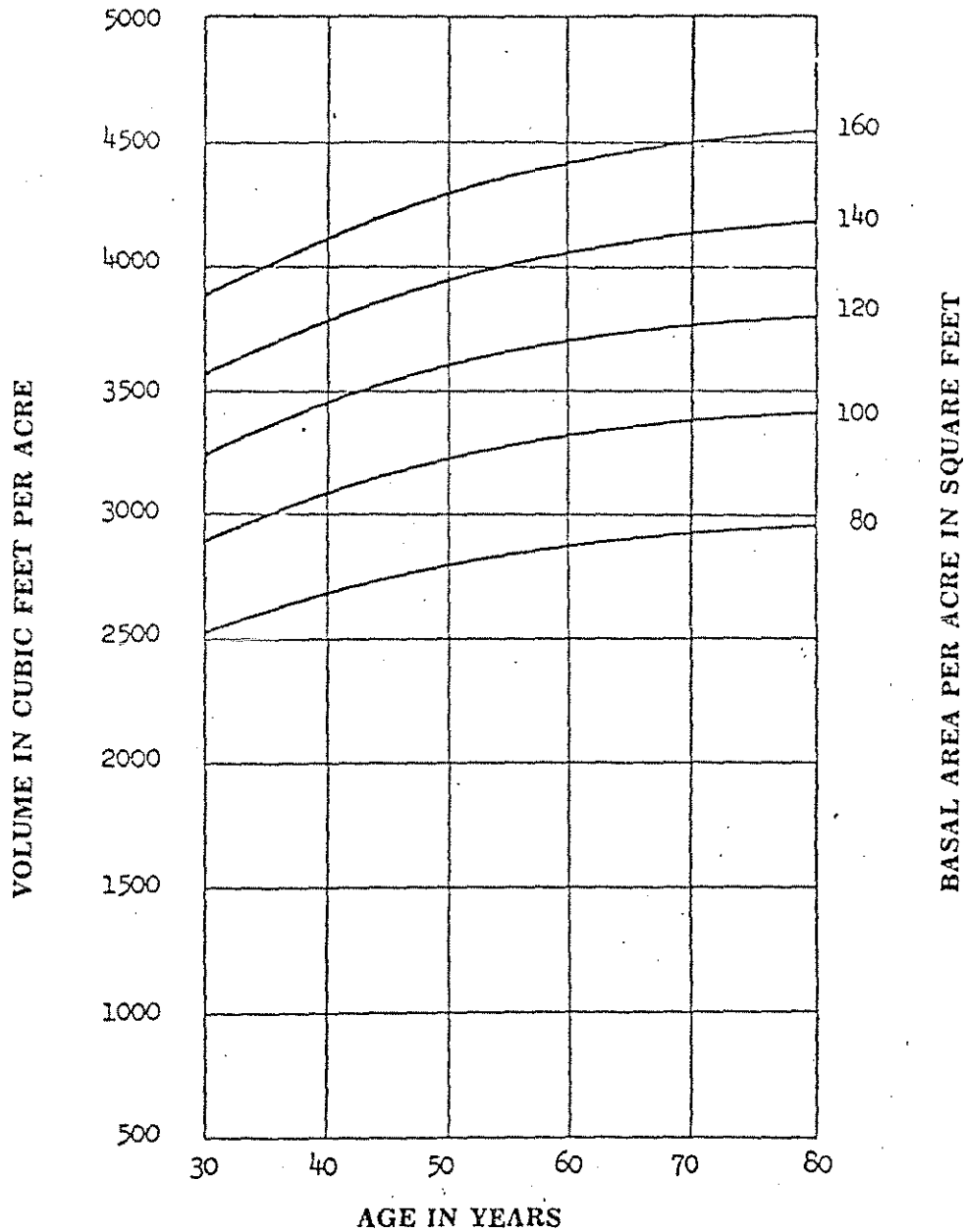


Figure 36. Yellow-poplar yield in cubic feet per acre, site index 95.

Source: Schlaegel, B. E. and D. L. Kulow. 1969. Compatible growth and yield equations for West Virginia yellow-poplar. W. Va. Univ. Agric. Exp. Sta. Bull. 573T. 20p.

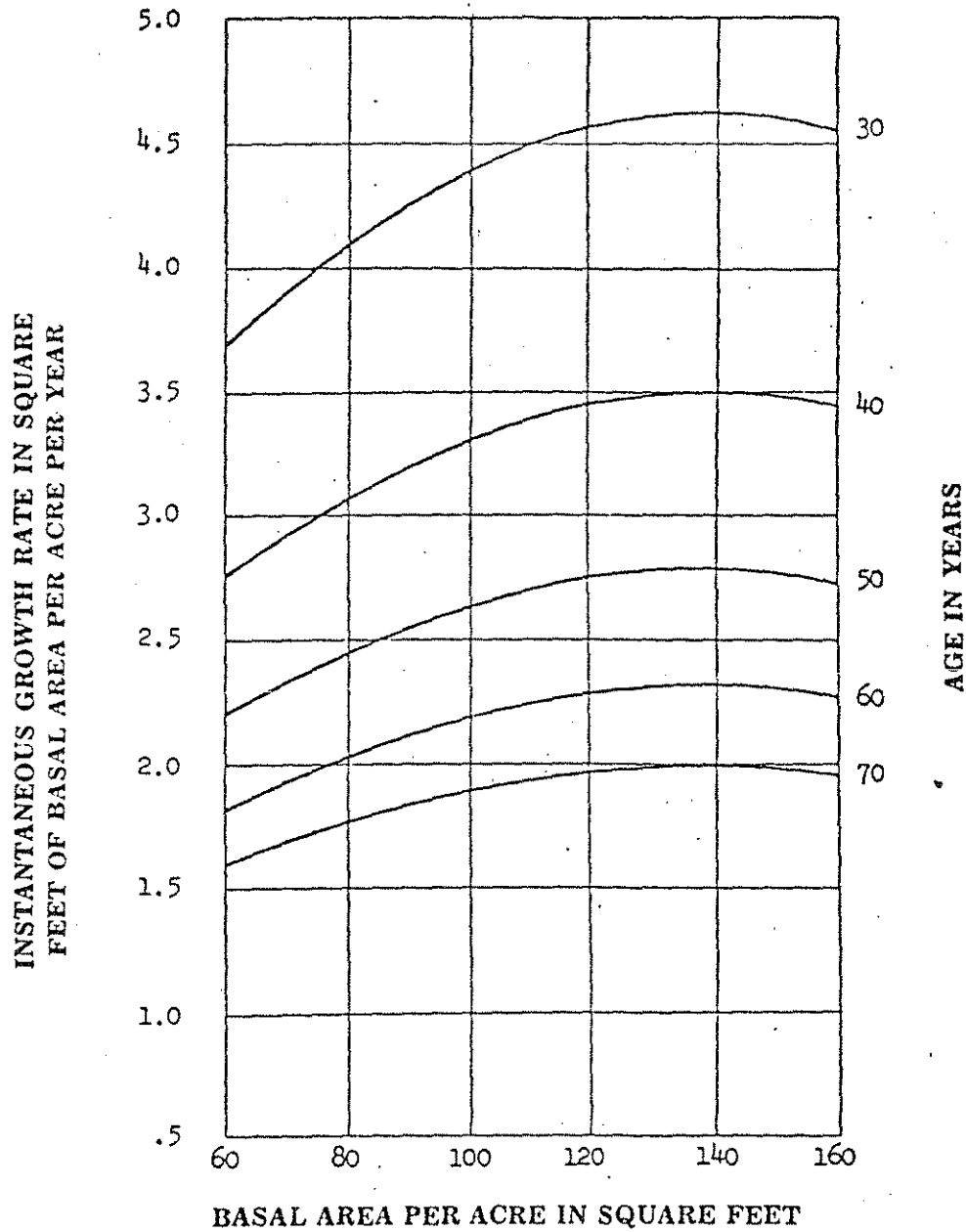


Figure 37. Basal area growth of yellow-poplar in square feet per acre per year.

Source: Schlaegel, B. E. and D. L. Kulow. 1969. Compatible growth and yield equations for West Virginia yellow-poplar. W. Va. Univ. Agric. Exp. Sta. Bull. 573T. 20p.

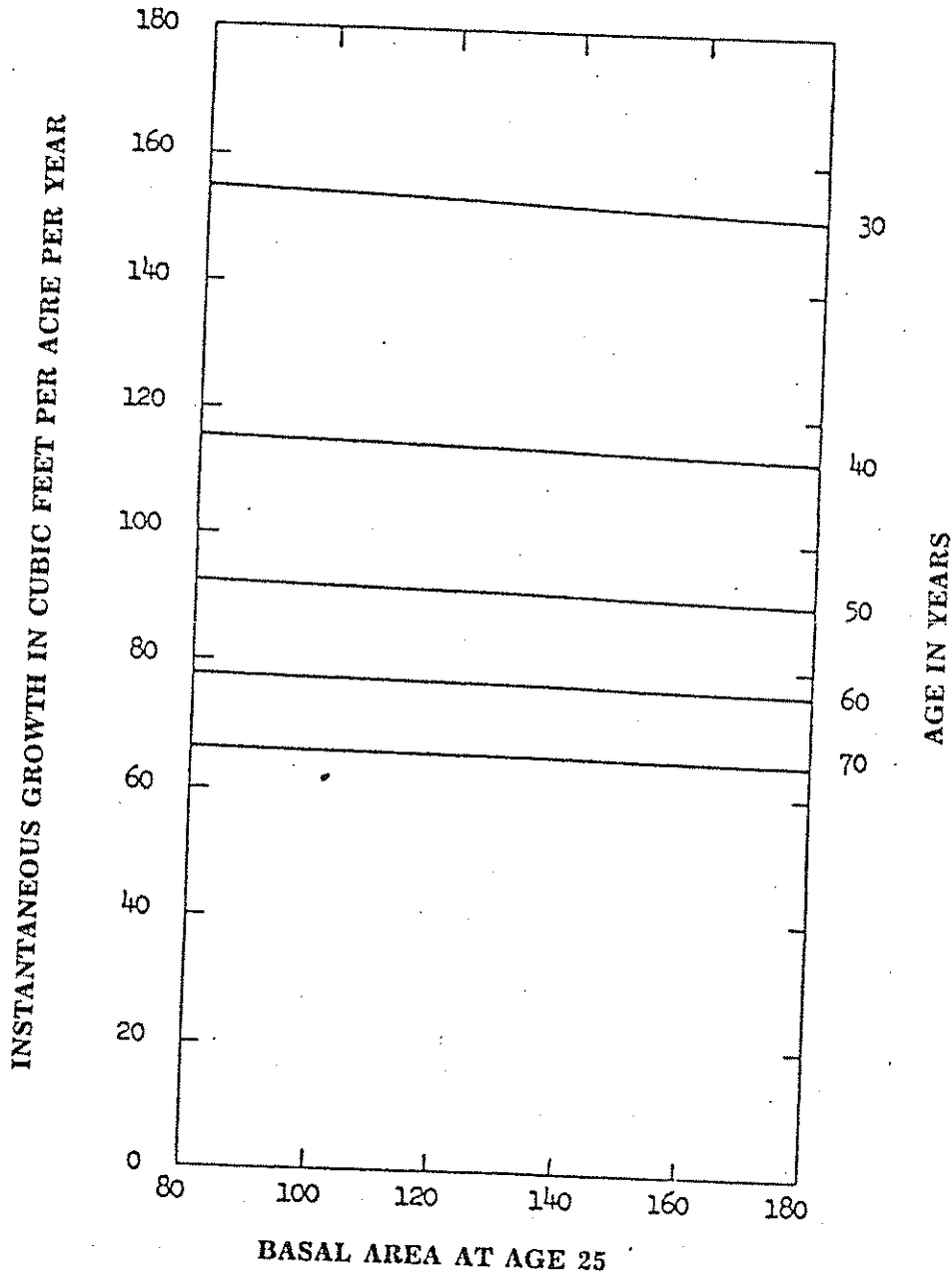


Figure 38. Cubic-foot growth of yellow-poplar per acre per year, initial volume 3400 cubic feet.

Source: Schlaegel, B. E. and D. L. Kulow. 1969. Compatible growth and yield equations for West Virginia yellow-poplar. W. Va. Univ. Agric. Exp. Sta. Bull. 573T. 20p.

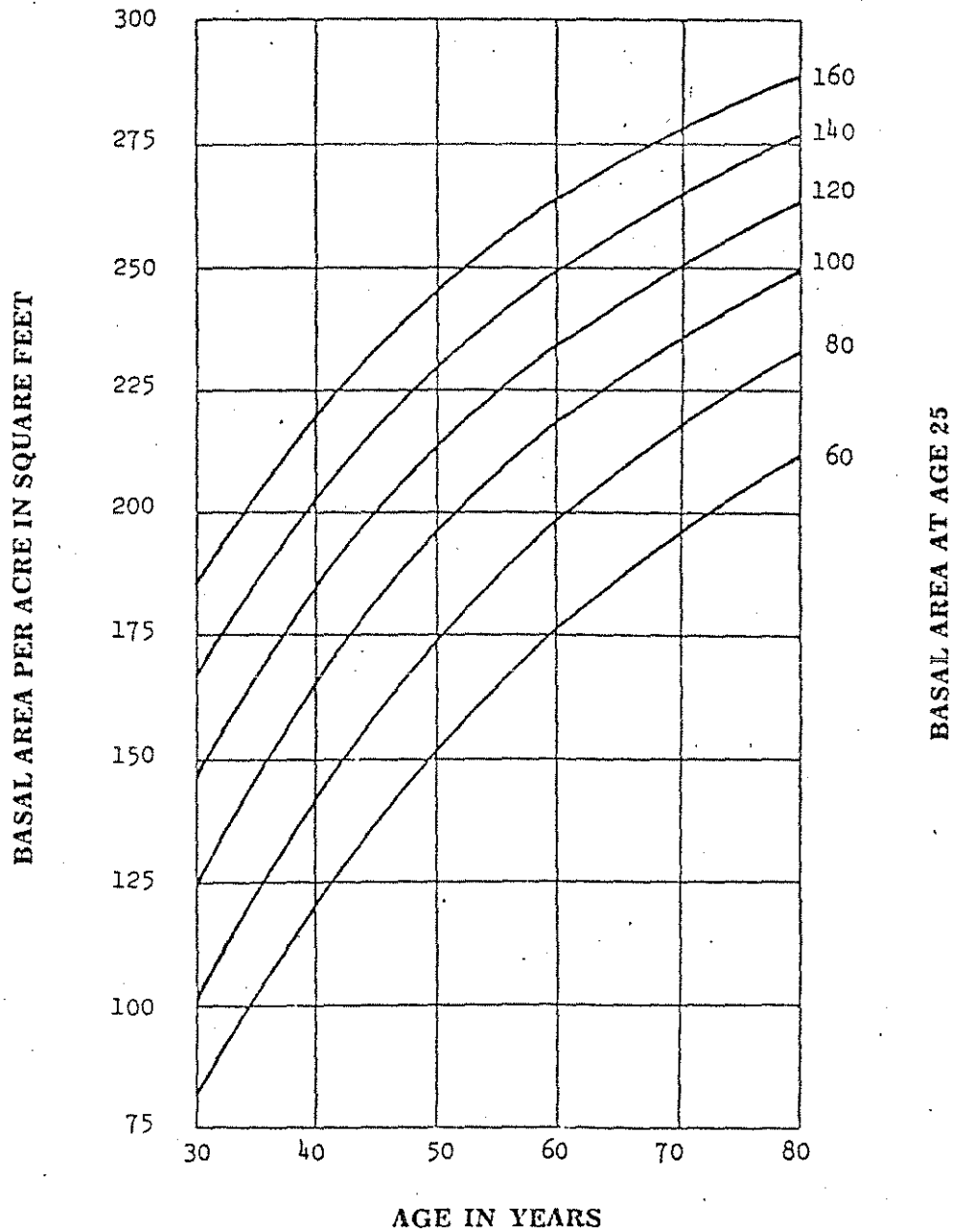


Figure 39. Projected basal area of yellow-poplar in square feet per acre.

Source: Schlaegel, B. E. and D. L. Kulow. 1969. Compatible growth and yield equations for West Virginia yellow-poplar. W. Va. Univ. Agric. Exp. Sta. Bull. 573T. 20p.

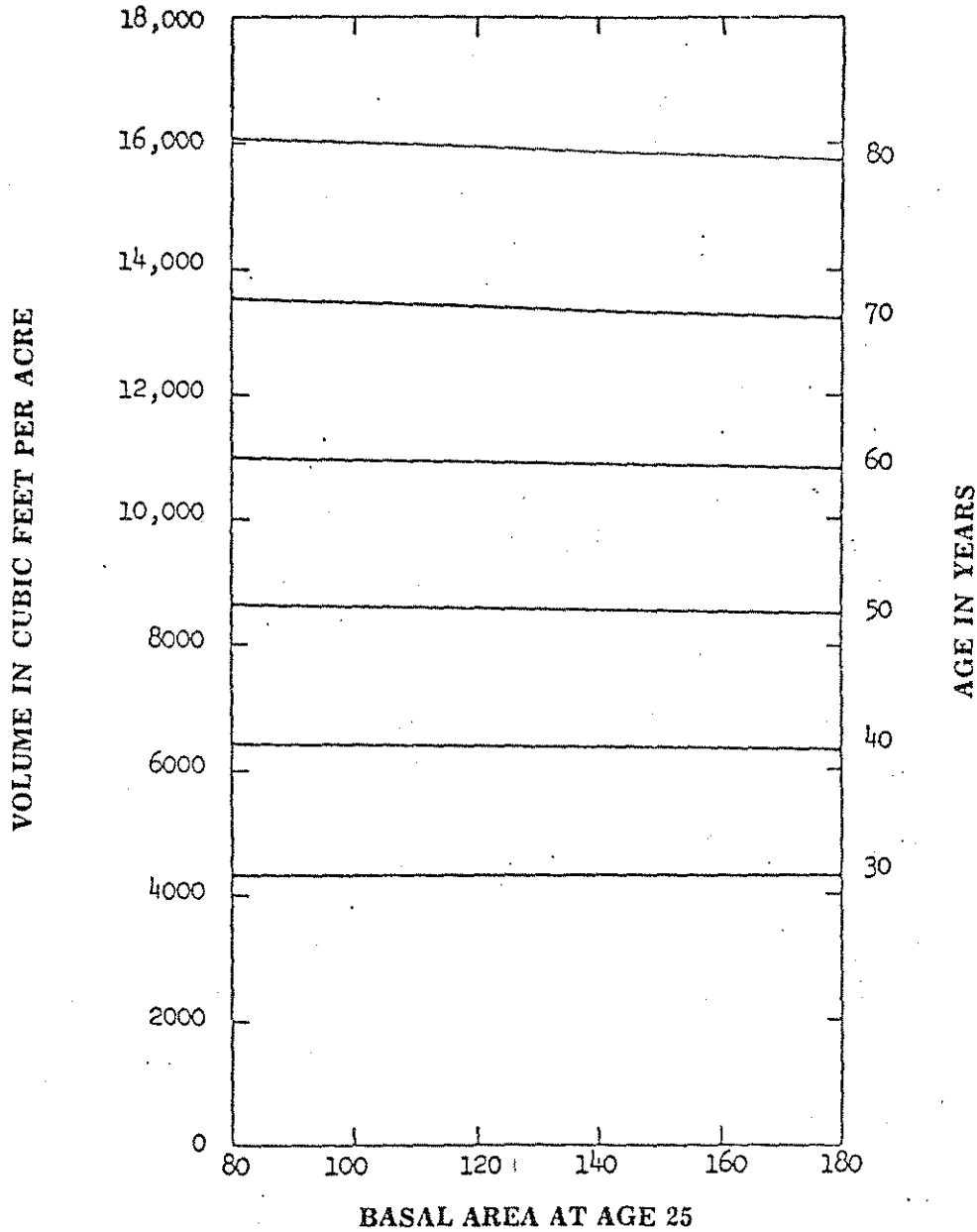


Figure 40. Projected yield of yellow-poplar in cubic feet per acre, initial volume 3400 cubic feet.

Source: Schlaegel, B. E. and D. L. Kulow. 1969. Compatible growth and yield equations for West Virginia yellow-poplar. W. Va. Univ. Agric. Exp. Sta. Bull. 573T. 20p.