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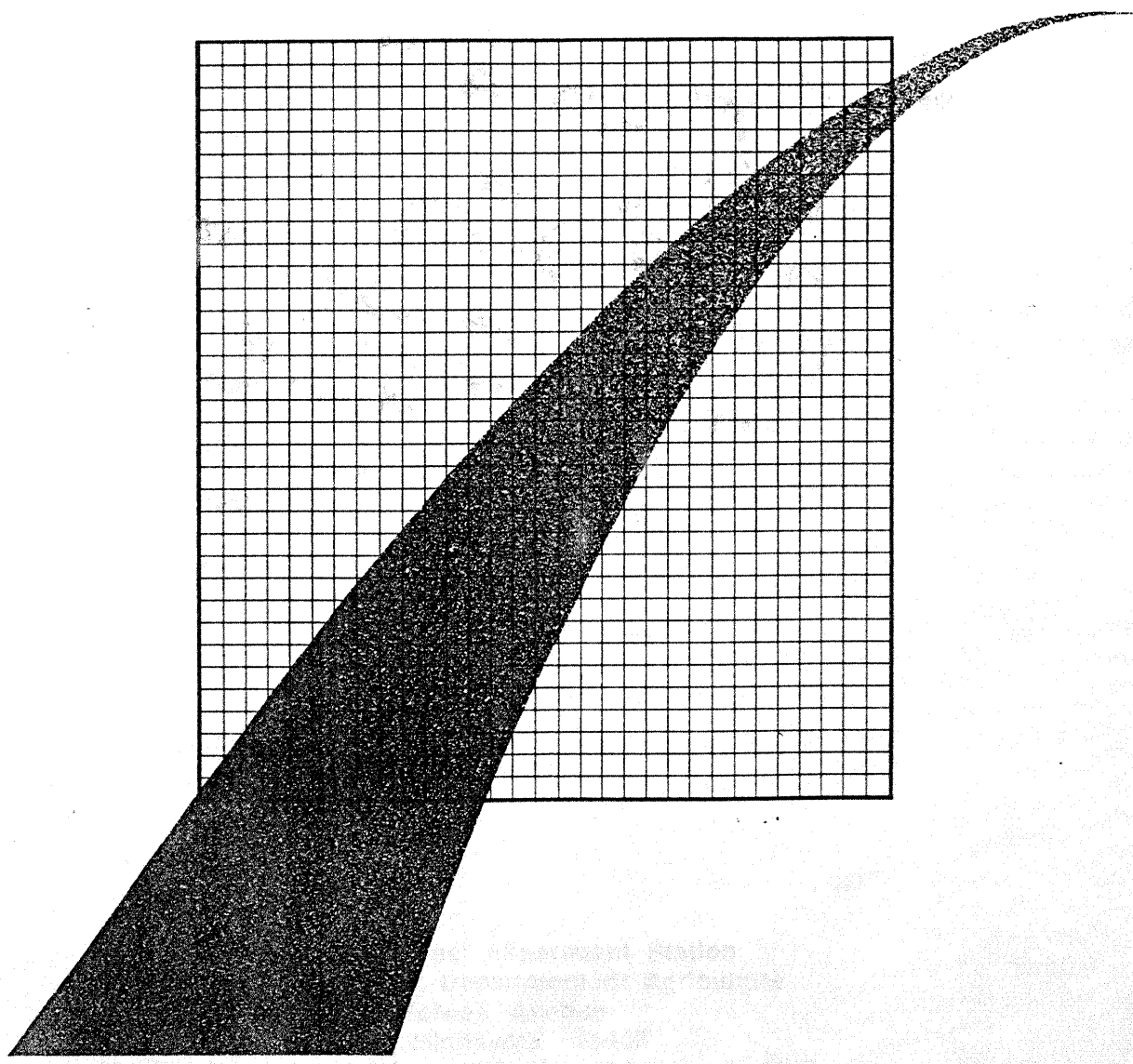
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Site Index Curves for Forest Tree Species in the Eastern United States

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Site Index Curves for Forest Tree Species in the Eastern United States

Willard H. Carmean, Jerold T. Hahn, and Rodney D. Jacobs

The goal of this paper is to inventory and summarize the site index curves available for forest tree species in the eastern United States. Hampf compiled a comprehensive list of site index curves in 1965, but many additional site index curves have been published in the more than two decades since this earlier summary. Accordingly, this paper is an updated summary that includes 127 site index curves presently considered to be useful for managing eastern hardwood and conifer forest species. Additional site index curves not included among the redrafted and formulated curves of our report are listed in Appendix I.

Forest site quality is an estimate of the capacity of forest land to grow trees, thus forest site quality corresponds to land capability for growing various agricultural crops. Productive forest land having good site quality usually should be managed most intensively, and less productive land having poor site quality usually should be managed less intensively. This same emphasis is followed in agriculture where intensive management is concentrated on the most productive cropland.

Many methods can be used to estimate forest site quality, but all methods have the common goal of classifying forest land's capability to grow trees (Carmean 1975). Directly estimating site index from forest trees is the most commonly used method for estimating site quality in North America. For most eastern forest species site index is defined as total height of dominant or total height of dominant and codominant trees at 50 years total age. However, age from breast height is sometimes used for species such as spruces, balsam fir, and red pine[1] that have slow and erratic height growth before reaching breast height. Younger index ages are sometimes used for plantations, short-lived species, or species managed on short rotations.

Tree height growth of dominant and codominant trees in pure, even-aged, fully stocked forest stands is closely related to volume growth. Accordingly, yield tables for pure natural stands and plantations list estimated yields at different ages for stands having different classes of site index. Growth and yield models also usually include site index as one of the major variables that is closely related to yield. Height growth is widely used as a measure of site quality because height in fully stocked stands is independent of stocking; height growth of dominant and codominant trees is reduced only at the extremes of overstocking or understocking (Carmean 1975, Lloyd and Jones 1983, Jones 1986, Lanner 1985.)

Accurate direct site index estimates depend upon two conditions: (1) availability of *suitable site trees* that are dependable indicators of site quality; and (2) availability of *suitable site index curves* that accurately portray tree height growth patterns for the area or for the soil and site conditions where site quality is estimated.

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[1] *See Appendix II for common and scientific names of tree species (Little 1979).*

Suitable site trees for site index estimates are free-growing, uninjured, dominant and codominant trees. Such trees occur in even-aged, fully stocked stands not disturbed by past cutting, severe fire, or heavy grazing. The best dominant and codominant trees in the stand should be carefully selected, and increment cores should be examined to see if annual rings in early years are wide and even. If early rings are narrow and suppressed, early height growth probably was suppressed and such trees should be rejected. Study the bole and look for forks or "dog legs". Trees with these defects probably have suffered from top breakage or die back and thus are not suitable as site trees.

Site trees should be selected from well-stocked even-aged stands having minimum age differences among dominant and codominant trees of no more than 10 years. Trees appreciably younger or older than the main stand may have different patterns of height growth and thus cause serious errors in site index estimation. For example, even-aged stands of upland oaks in the Missouri Ozarks may have occasional dominant and codominant trees appreciably younger or older than the main stand. McQuilkin (1975) found that appreciably younger trees had more rapid height growth, thus higher site index values, than trees in the main stand. Conversely, appreciably older trees had slower height growth, thus lower site index values, than trees in the main stand.

Site index measured from individual dominant and codominant trees may differ even on small plots that appear to have similar soil and microtopographic conditions. Thus, we are confronted with a sampling problem involving the number of site trees needed to obtain reliable site index estimates (Carmean 1975, Lloyd and Hafley 1977, Lloyd 1981). The number of site trees needed depends on many factors, including precision specified by the user, size of the area, and how much site quality differs within the defined stand. This sampling problem becomes more complex when we are dealing with large tracts of forest land that have variable soil, topographic, and site quality conditions. Such large land areas must be subdivided into smaller soil, topographic, or ecological units. Then site index sampling is done within each defined unit.

Suitable site index curves should be appropriate for the tree species, geographic region and the soil and/or topography of the stand. Even when suitable stands and site trees are available, large errors in site index estimation can occur when site index curves do not accurately express tree height growth patterns. In other words, initial or later height growth may be different from that expressed in existing site index curves. For many forest species, existing site index curves might be based on minimum data, mensurational methods using only total height and age values, and height growth models not suitable for expressing variable (polymorphic) tree height growth patterns.

Methods for collecting data and computing site index curves have evolved greatly since the first site index curves were published. The earliest curves were based on only a few plots and on total height and total age data from a few leading trees. These data were used to calculate an average guiding curve that would represent average height growth for a particular tree species. Graphical or proportional methods then were used to develop sets of anamorphic site index curves presumed to represent height growth throughout the range of the species. The unintentional assumption was that the pattern of tree height growth was similar for all levels of site quality, and for all climates, soils, and topographic conditions found throughout the range of the tree species (Carmean 1968).

The next development was the construction of proportional anamorphic site index curves that often accompanied normal yield tables for major forest types. Total height and age measurements from yield plots were used to calculate an average guiding curve; then harmonizing methods were used to develop a set of proportional curves for a range of good and poor sites. Some of the old curves included with yield studies were based on graphical methods, some on least squares regression, and some on harmonizing methods. Almost all of these methods resulted in a family of anamorphic site index curves that had the same shape regardless of site index level. They were proportional and differed only in rate of height growth for different levels of site quality.

A key point is that these older curves were not based on actual measurements of tree height growth but instead on total height and age measured from the yield study plots. These older anamorphic curves were often erroneous because plots representing good and poor sites might not be distributed through all age classes. For example, older-aged stands might be represented by mostly poor-site plots, and younger-aged stands might be represented by mostly good-site plots. The result would be a downwarping of the average guide curve for older ages and an upwarping of the guide curve for younger ages.

Unfortunately, these general anamorphic curves were often applied in far distant areas where climate, soils,

topography, site quality, and stand conditions differed greatly from the original study area. We now know that tree height growth is often polymorphic, and that many species covering wide ranges have different height growth patterns for areas differing greatly in climate, soil, topography, and site quality (Carmean 1968, 1975).

Stem analysis (or internode measurements) is now the most widely used method for collecting data, and nonlinear regression models are subsequently used for developing site index curves that express polymorphic tree height growth patterns. More precise site index curves based on stem analyses and nonlinear regression models are now replacing the older generalized curves that have been shown to be inaccurate. Additional discussion of methods for constructing site index curves is given by Burkhart *et al.* (1981), Clutter *et al.* (1983), Borders *et al.* (1984), and Biging (1985).

Inventory of Site Index Curves

The forestry literature includes a vast number of site index curves for the many eastern forest species; thus, the 127 site index curves in this summary represent only a small portion of the many curves found in our literature search to compile this summary. Many curves are not included because they are revisions or adaptations of earlier site index curves. For example, a large number of site index curves have been published for red pine (Carmean 1982). At first glance we might assume that this impressive wealth of curves is adequate for estimating site quality for red pine. However, such an assumption would be inaccurate because closer inspection reveals that many curves are merely a republishing or a revision of the original Brown and Gevorkiantz (1934) red pine data. Later site curves for red pine involved formulations for the earlier anamorphic curves (Lundgren and Dolid 1970, Hahn and Carmean 1982) or are metric expressions for these earlier curves (Laidly 1979).

Formulations for many eastern species have been published by Payandeh (1974a, 1974b), Farrar (1973, 1975, 1985), Monserud and Ek (1976), Guldin and Farrar (1983), and Scott and Voorhis (1986). Most of these formulations are based on older site index curves, thus the formulated curves may have the same data deficiency and computation problems associated with the original anamorphic curves. Formulations aid in making more rapid and consistent computations but cannot correct for data and computation deficiencies inherent in the original site index curves.

Many older site index curves were not included because they were based on minimum data from questionable stand or tree conditions. Many of the older curves contained no account of kinds of stands or trees measured, ranges of site index or age observed, or the graphical or computational methods used to develop the site index curves. Many of the older curves listed in Appendix I have been replaced by newer curves based on more data, stem analyses methods, and mathematical models capable of expressing polymorphic height growth patterns. These older curves are listed for historical purposes and for those interested in more complete site index curve coverage for certain tree species (Appendix I).

We made an effort to include curves for all forest species; thus, we included curves for certain minor species that are represented only by older and questionable site index curves. Also major forest species such as oaks and pines have wide ranges representing a wide range of climate, soil, topography, and site quality. A large number of curves are given for these wide-ranging species so that forest managers can select the set of curves most suited to local forest conditions. Several Canadian site index curves are included because they are considered applicable to the northern United States. Finally, species that are widely planted are represented by many site index curves based on data collected in older plantations located in different climatic, soil, and topographic regions.

Formulations

Many of the curves included in this report have already been formulated; thus, we used equations from these publications to generate values for our formulations. However, because some older curves were never formulated, we used values directly from the original curves as the basis for the formulations we give for these curves. Thus our formulations were accomplished using (1) height-age values generated either by the original equations or by more recent formulations, or (2) values from the original site index curves. All formulations listed for each of the 127 site index curves in this report are based on a single standard model. The model used for our formulations is a nonlinear height growth model capable of expressing polymorphic tree height growth patterns. This model is an expanded form of the Chapman-Richards nonlinear function developed by Ek (1971), Payandeh (1974a, 1974b), and Monserud and Ek (1976):

$$H = BH + b_1 S^{b_2}\left(1-e^{b_3 A}\right)^{b_4 S^{b_5}} \qquad (1)$$

where H = height, BH = 0 when A is total age and 4.5 when A is d.b.h. age, S = site index, A = age, e = base of the natural logarithms, and the b_i are regression parameters.

Most site index curves are a family of height growth curves with site index defined as tree height at a specified index age. These curves can be used to graphically estimate site index merely by relating measured tree height and age values to the curves and then interpolating between the curves. However, this graphical procedure is slow and inefficient when a large number of height and age values are available for estimating site index. Also this graphical procedure is subject to some personal bias and judgment when interpolating between the plotted site index curves. More rapid, more efficient, and less subjective site index estimates can be attained using a formulation for directly computing site index given tree height and age.

Site index cannot be computed using model (1), but an analogue suggested by Payandeh (1974b) provides a form for directly computing site index. Curves computed with this site index prediction model may not pass exactly through tree height specified at index age, but this problem can be solved by using a weighted regression with a weight of (index age - 2 abs[2] (age - index age)). This procedure ensures close agreement at index age with a somewhat poorer, yet acceptable, fit at the extremes of age and site index. The maximum difference from the data used is shown in the figure caption. Following is the model used to estimate site index, given age and height, for each of the curves included in this report:

$$S=BH+c_1 H^{c_2}\left(1-e^{c_3 A}\right)^{c_4 H^{c_5}} \qquad (2)$$

where H, BH, A, S, and e are as in equation (1) and c_i are regression parameters.

Both models were fit using the NONLINEAR subprogram of the Statistical Package for the Social Sciences (SPSS) (Nie *et al.* 1975) with weights as specified above.

[2] *Absolute value of...*

Preparing the Site Index Curves

The original site index curves usually consisted of curves for a series of 10-foot site index classes. These general curves were often ungridded, which made it difficult to interpolate between lines. Also, some of the very old curves only had a few individual height growth curves rather than a family of proportional site index curves. Our revisions for each of the 127 site index curves in this report include curves for 5-foot site index classes and a gridded background to assist in interpolating between site index lines.

The revised curves were plotted using values generated from the height formulations listed in the figure caption for each curve. These formulated and redrafted curves closely follow the range of site index and age included in the original curves. Extrapolations indicated in the original curves also are indicated by dashed lines in the redrafted curves. The 127 curves are grouped first by hardwood and conifer species and then alphabetically by scientific name.

Using the Site Index Curves

Each of the 127 site index curves can be directly used to graphically estimate site index when appropriate height and age values are available from suitable dominant, or dominant and codominant trees. To do this, relate height and age values to the site curves and then interpolate between curves.

Site index also can be estimated using a computer or programmable calculator together with the formulations for the site index equations listed in the caption for each figure. First, equation coefficients for each figure and a simple program for solving the equation are entered and stored in the computer. Then site index is estimated by manually entering the figure code together with measured height and age values. Computing site index using these formulations is rapid and efficient when a large number of height and age values are available for estimating site index. Computing site index also avoids errors and bias that might occur when interpolating between curves.

These revised, redrafted, and formulated site curves still contain the limitations that may be associated with the original site index curves. The original curves may be based on data representing a limited range of soils, topography, and site quality, and data may have been collected from stands and site trees not entirely suitable for constructing site index curves. Also the original curves may have been developed by graphical or anamorphic methods and may have used equation

models not capable of expressing polymorphic height growth. These original data or computation defects cannot be corrected by revisions or formulations. Accordingly, the caption for each of the 127 site index curves briefly states the study area, number of plots and trees measured, kind of data collected, and computation methods used to develop the original site curves. Such information will help the user decide which set of curves is most appropriate for use in a particular area and also will indicate the reliability of the site index curves presently available for use in that area.

What can be done when a particular area or tree species lacks published site index curves, or when all that exists are a few, older anamorphic curves of questionable accuracy? One alternative is to restrict site index estimates to stands close to index age. For example, if the site trees are exactly 50 years of age (index age), no error occurs because their present height is site index. Possibly, site index estimation could be restricted to stands ranging from 35 to 65 years. Thus, the maximum extrapolation would be 15 years forward or back to index age, and errors due to faulty site index curves would be minimal. Using stands at or close to index age will minimize errors in estimating site index—that is, tree height at index age. However, we should bear in mind that site index is tree height at only one point in time (index age). We also should be concerned about patterns of tree height and volume growth before and after index age. Thus, we need site index curves that accurately portray height growth throughout the life of the stand. This view uses a site index value only as a convenient label for an accurately defined height-age curve that passes through a specified height at index age.

A second alternative is to fell a few dominant and codominant trees, make a stem analysis, and construct individual tree height-age curves (Erdmann and Peterson 1982). These tree height-age curves then are used to observe (1) how tall trees were at the specified site index age and (2) early and later tree height growth patterns.

A third and more desirable alternative for species and areas lacking suitable site index curves is to encourage research needed for developing more precise site index curves. These more precise curves should be based upon stem analysis and equation models capable of expressing polymorphic height growth patterns.

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Appendix I

Additional Site Index Curves

References are given below for additional site index curves not included in the formulated and redrafted curves of this report. These additional references may be of historical interest, or they may be of value to those interested in more complete coverage for certain forest species.

Inventory of Site Index Curves

Species	Area	Reference
Hardwoods:		
Sugar maple	Vermont	Hawes and Chandler (1914)
Sugar maple, white ash	Vermont	Farrington and Howard (1958)
Sugar maple	New York	Farnsworth and Leaf (1963)
Sugar maple	N. lower Mich.	Shetron (1972)
Northern hardwood spp.	Lake States and NE States	Frothingham (1915b)
N. hardwood spp.	Lake States	Monserud and Ek (1976)
N. hardwood spp., paper birch, aspen	Ontario	Plonski (1960)
Red maple	NW Conn., W. Mass.	Foster (1959)
American beech	Northeast US.	Hampf (1965)
Sweetgum	C. Mississippi	Clatterbuck (1987)
Yellow-poplar	SE Ohio, Western Va.	McCarthy (1933)
Quaking and bigtooth aspens	Michigan	Graham *et al.* (1963)
Quaking aspen	N. Minnesota	Schlaegel (1971)
Black cherry	New York	Hampf (1965)
Black cherry	NW Pennsylvania	Ward *et al.* (1965)
Upland oaks	NW West. Va.	Lamson (1980)
Upland oaks	Central States	Hilt and Dale (1982)
Cherrybark oak	C. Mississippi	Clatterbuck (1987)
Conifers:		
Spruces and balsam fir	N. Michigan	Bowman (1944)
Spruces and balsam fir	Maine	Mount and Gore (1952)
Spruces and balsam fir	Northeast U.S.	Meyer (1929)
Black spruce	N. Minnesota	Averell and McGrew (1929)
Black spruce, jack pine, red pine, white pine, aspen, white birch, tolerent hwds	Ontario	Plonski (1974)
Black spruce	E. Canada	Heger and Lowry (1970)
Red spruce	N. Maine	McLintock and Bickford (1957)
Norway spruce	Central New York	Jokela *et al.* (1988)
Jack pine	Lake States	Sterrett (1920)
Slash, longleaf, loblolly, shortleaf and Virginia pines	Southeast U.S.	Cruikshank (1954)
Slash pine	Georgia	Bennett (1960)
Slash pine plantations	West Gulf	Bailey *et al.* (1973)
Slash pine plantations	Florida	Hebb and Burnes (1973)
Slash pine plantations	Georgia and N. Florida Coastal Plain	Newberry and Pienaar (1978)
Loblolly pine	Virginia, N. and S. Carolina	MacKinney (1936)
Loblolly and shortleaf pines	N. Carolina Piedmont	Coile and Schumacher (1953)
Loblolly pine stands & plantations	Va., N.C., Md., Del.	Devan and Burkhart (1982)
Loblolly pine plantation	N.C. to SW Ark.	Golden *et al.* (1981)
Loblolly pine plantations	NE Texas	Lenhart and Fields (1970)
Loblolly and slash pine plantations	E Texas	Lenhart, Hunt, and Blackard (1986)
Pitch pine	Pennsylvania	Illick and Aughanbaugh (1930)
Red pine	Central New England	Reed (1926)
Red pine	Northeast and Lake States	Spurr (1956)
Red pine	N. Minnesota	Alban (1976)
Red pine plantations	Connecticut	Bull (1931)
Red pine plantations	Pennsylvania	Kinsley and Bartoo (1967)
Red and white pine plantations	SE Ohio, S. Indiana	Gaiser and Merz (1953)
Red pine plantations	Michigan	Van Eck and Whiteside (1963)
Red pine plantations	S. Ontario	Beckwith *et al.* (1983)
White pine	Northeast U.S.	Frothingham (1914)
White pine	S. Appalachians	Barrett (1934)
White pine	S. Appalachians	Doolittle and Vimmerstedt (1960)
White pine	New Hampshire	Husch (1954)
White pine	Northeast U.S.	Leak *et al.* (1970)
White pine	Maine, Mass., New Hampshire	Barrett and Goldsmith (1973)
Northern white-cedar	Lake States	Gevorkiantz and Duerr (1939)

Appendix II

Common and Scientific Names of Tree Species (Little 1979)

Common name	Scientific name
Balsam fir	*Abies balsamea* (L.) Mill.
Red maple	*Acer rubrum* L.
Silver maple	*Acer saccharinum* L.
Sugar maple	*Acer saccharum* Marsh.
Yellow birch	*Betula alleghaniensis* Britton
Paper birch	*Betula papyrifera* Marsh.
Hickories	*Carya* spp. Nutt

Atlantic white-cedar ..... *Chamaecyparis thyoides* (L.) B.S.P.
American beech ..... *Fagus grandifolia* Ehrh.
White ash ..... *Fraxinus americana* L.
Black ash ..... *Fraxinus nigra* March.
Green ash ..... *Fraxinus pennsylvanica* Marsh.
Black walnut ..... *Juglans nigra* L.
Eastern redcedar ..... *Juniperus virginiana* L.
European larch ..... *Larix decidua* Mill.
Tamarack ..... *Larix laricina* (Du Roi) K. Koch
Japanese larch ..... *Larix leptolepis* (Sieb and Zucc.) Gard.
Sweetgum ..... *Liquidambar styraciflua* L.
Yellow-poplar ..... *Liriodendron tulipifera* L.
Water tupelo ..... *Nyssa aquatica* L.
Swamp tupelo ..... *Nyssa sylvatica* var. *biflora* (Walt.) Sarg.
Norway spruce ..... *Picea abies* (L.) Karst.
White spruce ..... *Picea glauca* (Moench) Voss
Black spruce ..... *Picea mariana* (Mill.) B.S.P.
Red spruce ..... *Picea rubens* Sarg.
Jack pine ..... *Pinus banksiana* Lamb.
Sand pine ..... *Pinus clausa* (Chapm.) Vasey
Shortleaf pine ..... *Pinus echinata* Mill.
Slash pine ..... *Pinus elliottii* Engelm.
Longleaf pine ..... *Pinus palustris* Mill.
Red pine ..... *Pinus resinosa* Ait.
Pitch pine ..... *Pinus rigida* Mill.
Pond pine ..... *Pinus serotina* Michx.
Eastern white pine ..... *Pinus strobus* L.
Scotch pine ..... *Pinus sylvestris* L.
Loblolly pine ..... *Pinus taeda* L.
Virginia pine ..... *Pinus virginiana* Mill.
Cottonwood ..... *Populus deltoides* Bartr.
Bigtooth aspen ..... *Populus grandidentata* Michx.
Quaking aspen ..... *Populus tremuloides* Michx.
Black cherry ..... *Prunus serotina* Ehrh.
White oak ..... *Quercus alba* L.
Scarlet oak ..... *Quercus coccinea* Muenchh.
Southern red oak ..... *Quercus falcata* Michx.
Cherrybark oak ..... *Quercus falcata* var. *pagodifolia* Ell.
Water oak ..... *Quercus nigra* L.
Nuttall oak ..... *Quercus nutallii* Palmer
Chestnut oak ..... *Quercus prinus* L.
Northern red oak ..... *Quercus rubra* L.
Black oak ..... *Quercus velutina* Lam.
Black locust ..... *Robinia pseudoacacia* L.
Northern white-cedar ..... *Thuja occidentalis* L.
American basswood ..... *Tilia americana* L.
Eastern hemlock ..... *Tsuga canadensis* (L.) Carr.
American elm ..... *Ulmus americana* L.

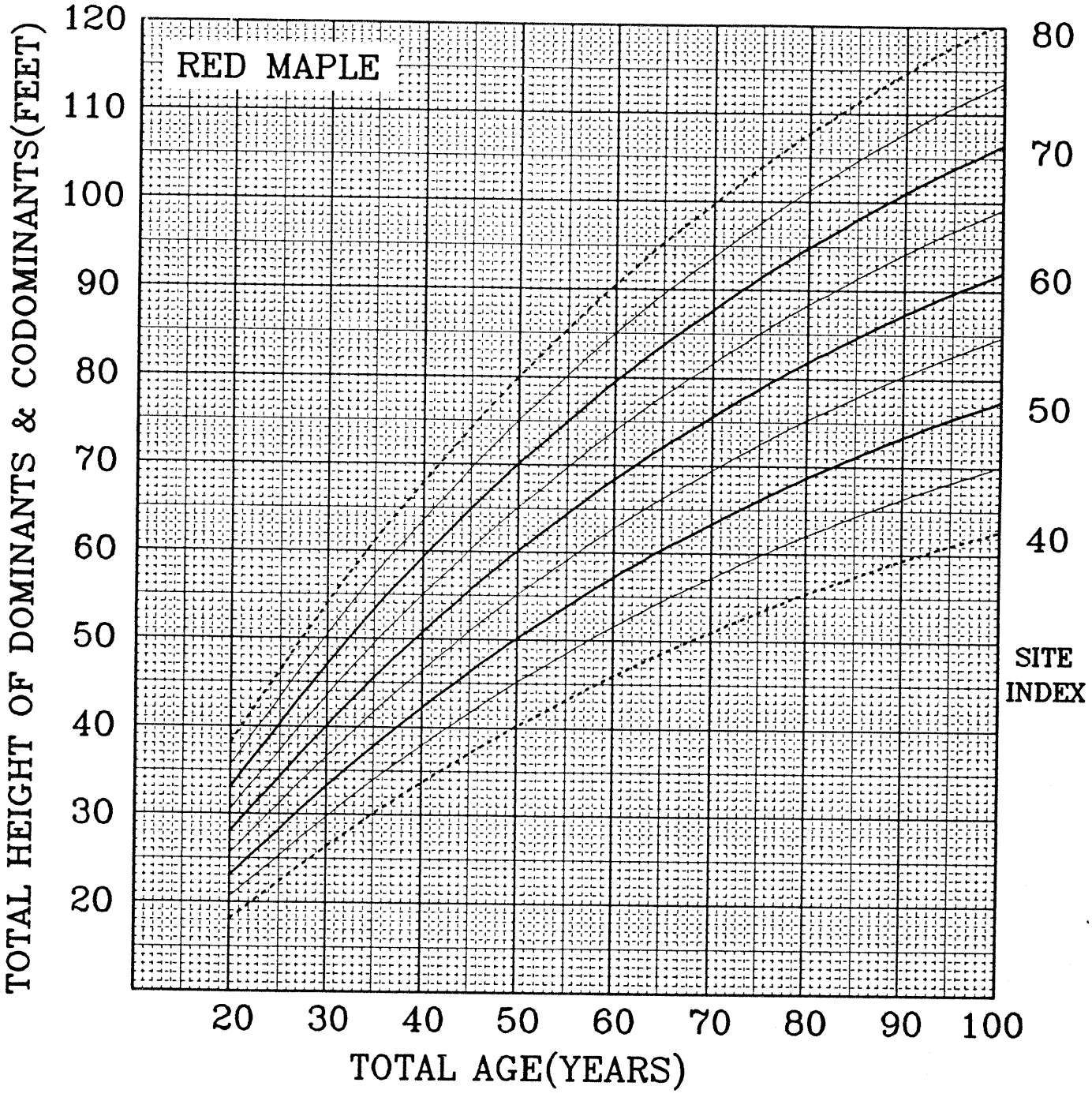


Figure 1.—Red maple (Carmean 1978)
Northern Wisconsin and Upper Michigan
114 plots having 438 dominant and codominant trees
Stem analysis, nonlinear regression, polymorphic
Add 4 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	2.9435	0.9132	-0.0141	1.6580	-0.1095	0.99	0.49	2.0
SI	0.3263	1.0634	-0.0106	-1.2573	-0.0646	0.99	0.51	2.2

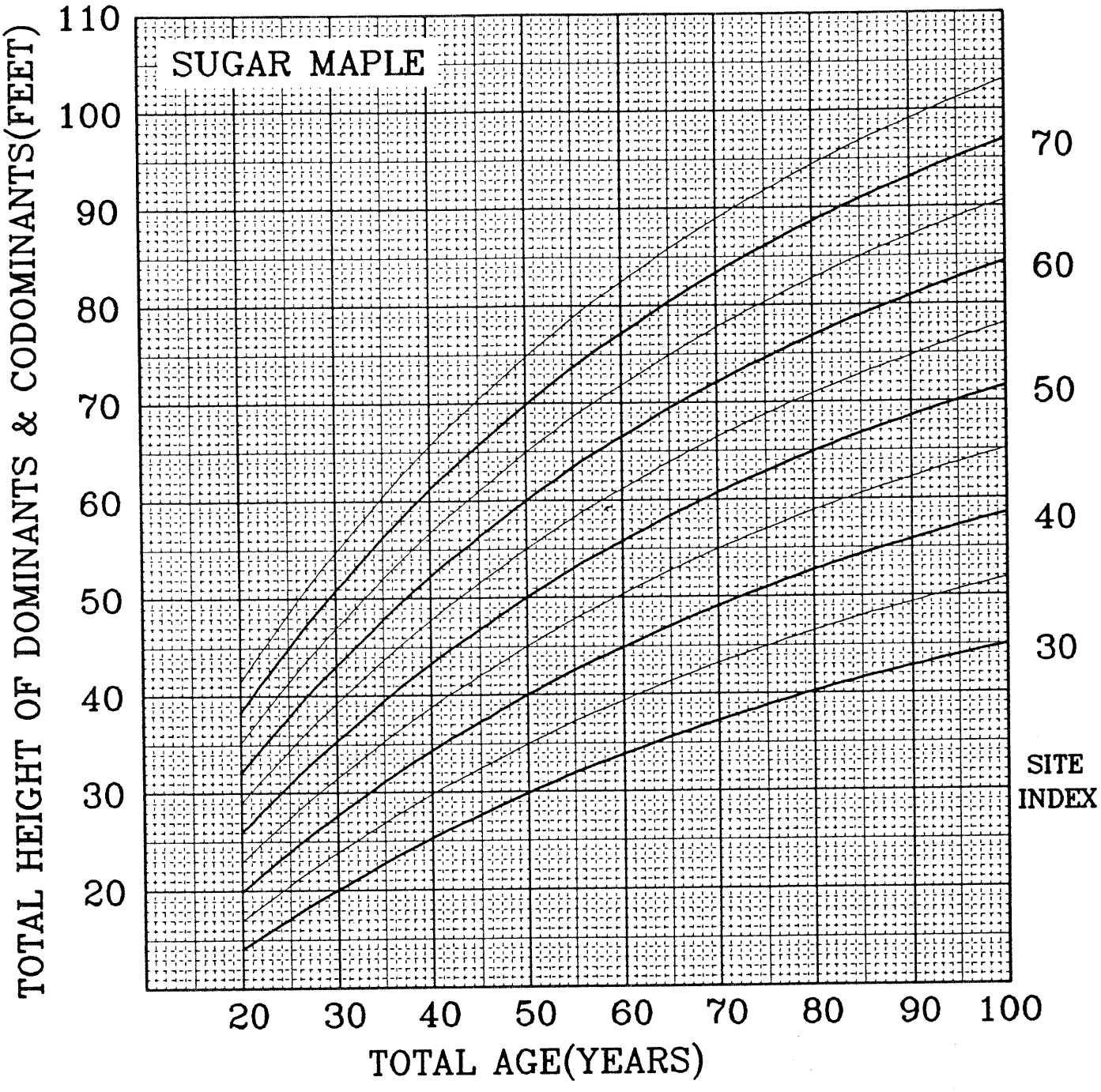


Figure 2.—Sugar maple (Curtis and Post 1962, Solomon 1968)
Vermont Green Mountains
67 plots having 136 dominant and codominant trees
Stem analysis, logarithm equation, anamorphic, original curves redrafted from d.b.h. age to total age and from SI age 75 to SI age of 50
Add 4 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	3.3721	0.8407	-0.0150	2.6208	-0.2661	0.99	0.88	0.3
SI	0.1771	1.2075	-0.0066	-1.7003	-0.2189	0.99	0.98	1.9

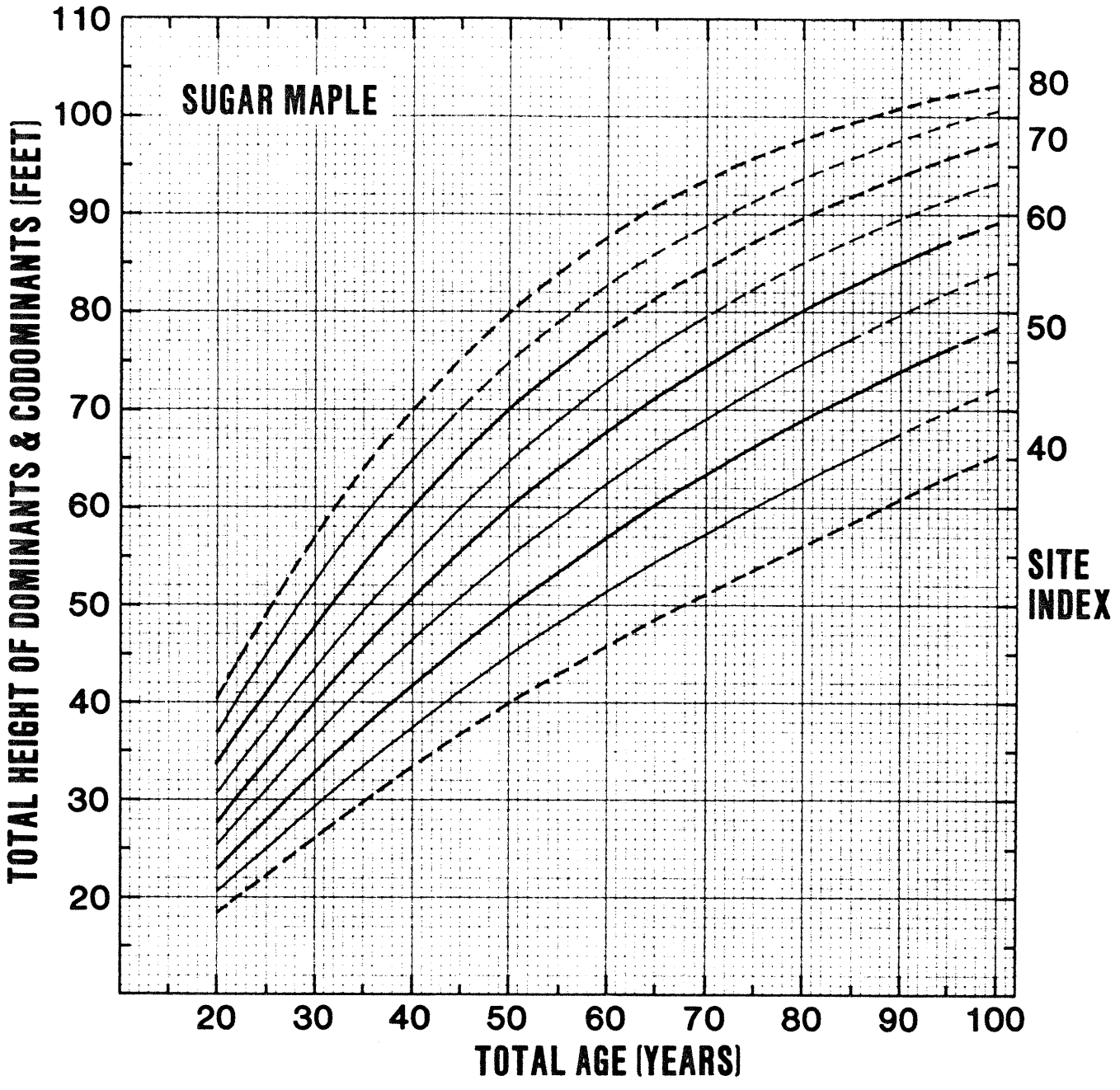


Figure 3.—Sugar maple (Carmean 1978)
Northern Wisconsin and Upper Michigan
177 plots having 721 dominant and codominant trees
Stem analysis, nonlinear regression, polymorphic
Add 4 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	6.1308	0.6904	-0.0195	10.1563	-0.5330	0.99	1.26	5.3
SI	0.1984	1.2089	-0.0110	-2.4917	-0.2542	0.98	1.90	6.7

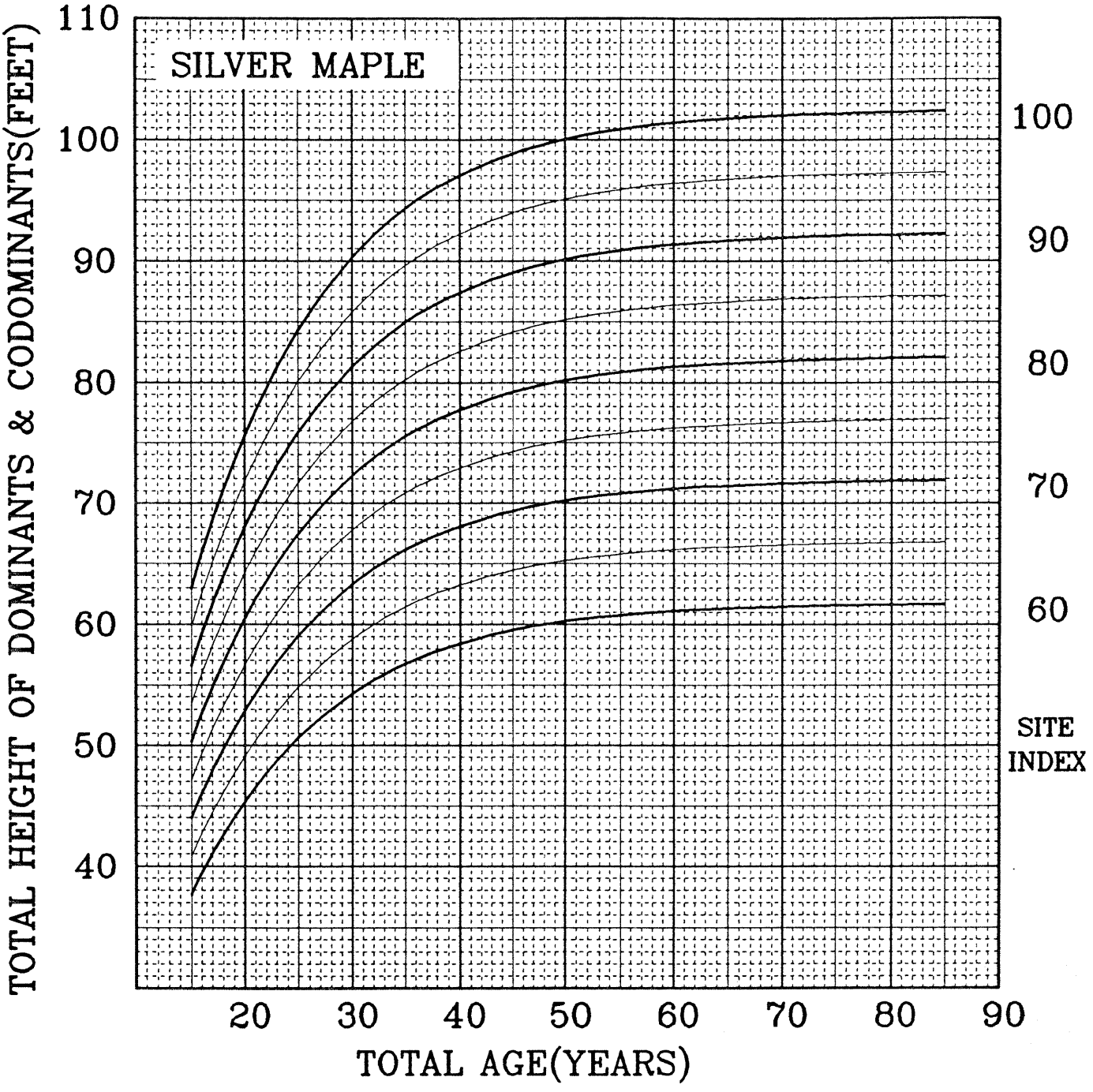


Figure 4.—Silver maple (Brendemuehl, McComb, and Thomson 1961b)
Southeastern Iowa
50 plots, number of dominant and codominant trees not given
Total height and age, anamorphic, equation not given
Add 3 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.0645	0.9918	-0.0812	1.5754	-0.0272	0.99	1.00	4.2
SI	0.8972	1.0183	-0.0769	-4.8154	-0.3162	0.99	0.95	6.0

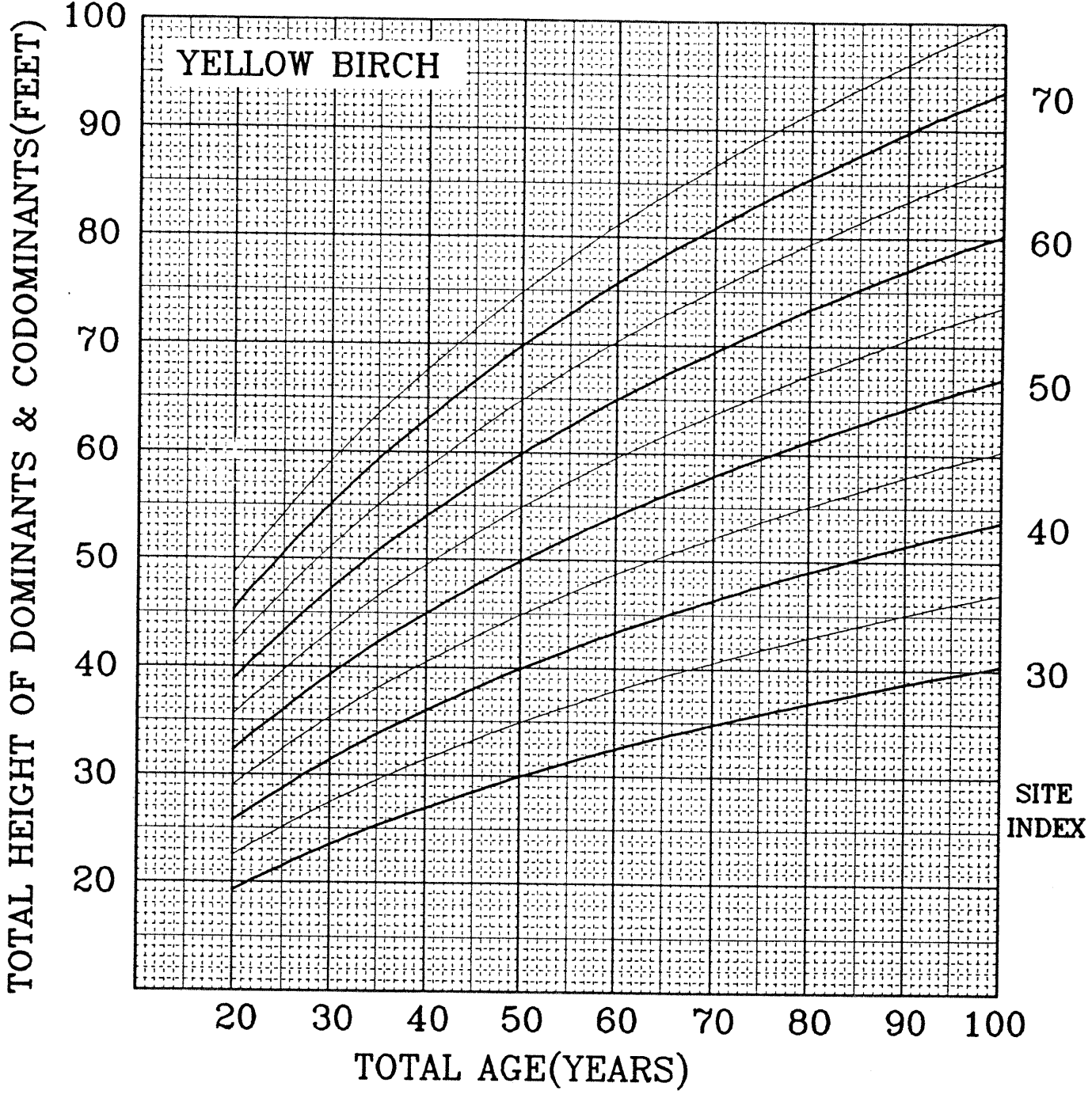


Figure 5.—Yellow birch (Curtis and Post 1962, Solomon 1968)
Vermont Green Mountains
38 plots having 68 dominant and codominant trees
Stem analysis, logarithm equation, anamorphic, original curves redrafted from d.b.h. age to total age and from SI age of 75 to SI age of 50
Add 4 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	2.2835	0.9794	-0.0054	0.5819	-0.0281	0.99	0.78	1.0
SI	0.5889	0.9922	-0.0096	-0.5473	0.0146	0.97	0.47	0.3

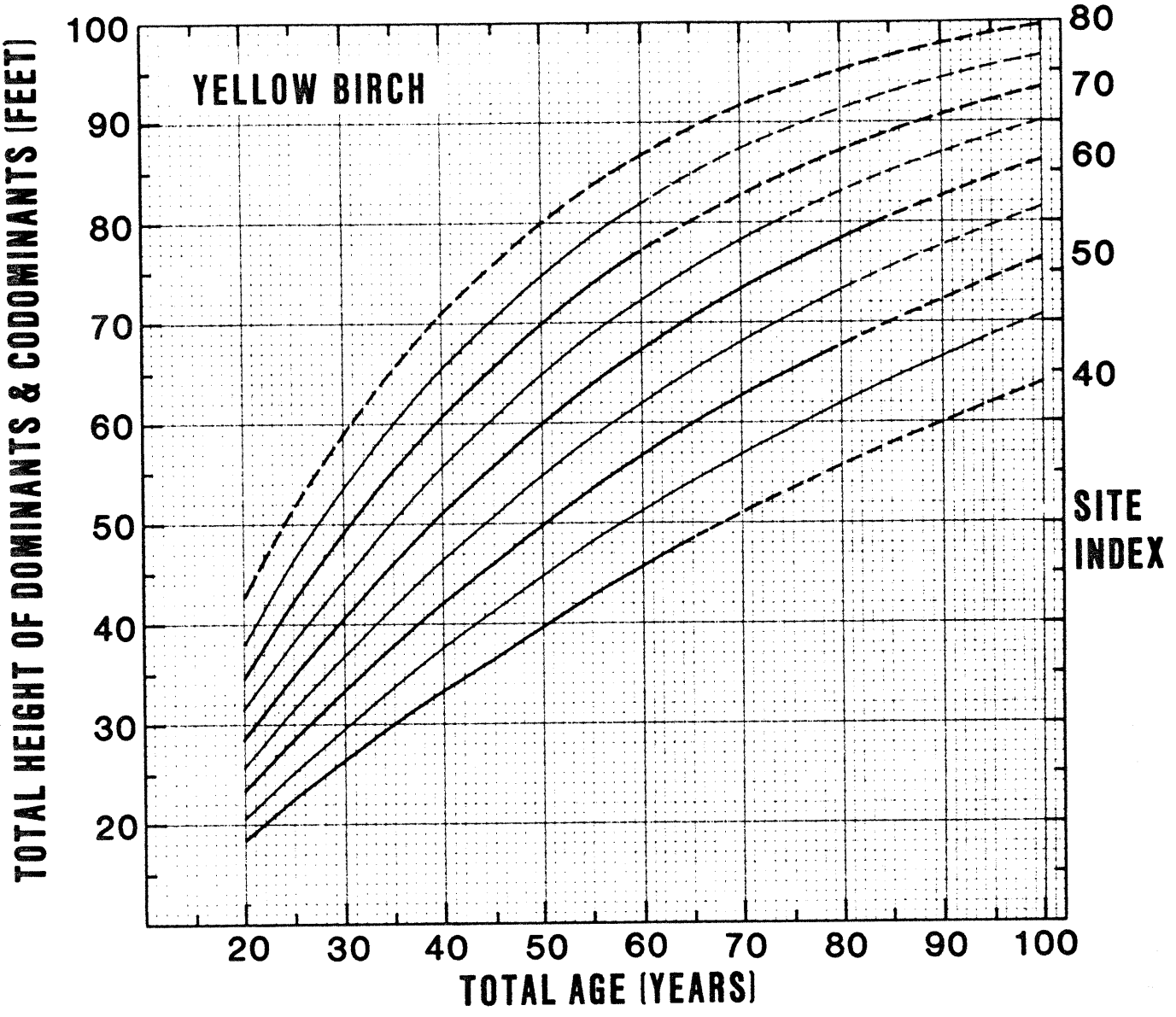


Figure 6.—Yellow birch (Carmean 1978)
Northern Wisconsin and Upper Michigan
119 plots having 459 dominant and codominant trees
Stem analysis, nonlinear regression, polymorphic
Add 4 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	6.0522	0.6768	-0.0217	15.4232	-0.6354	0.99	1.29	5.0
SI	0.1817	1.2430	-0.0110	-3.0184	-0.3180	0.98	2.05	7.7

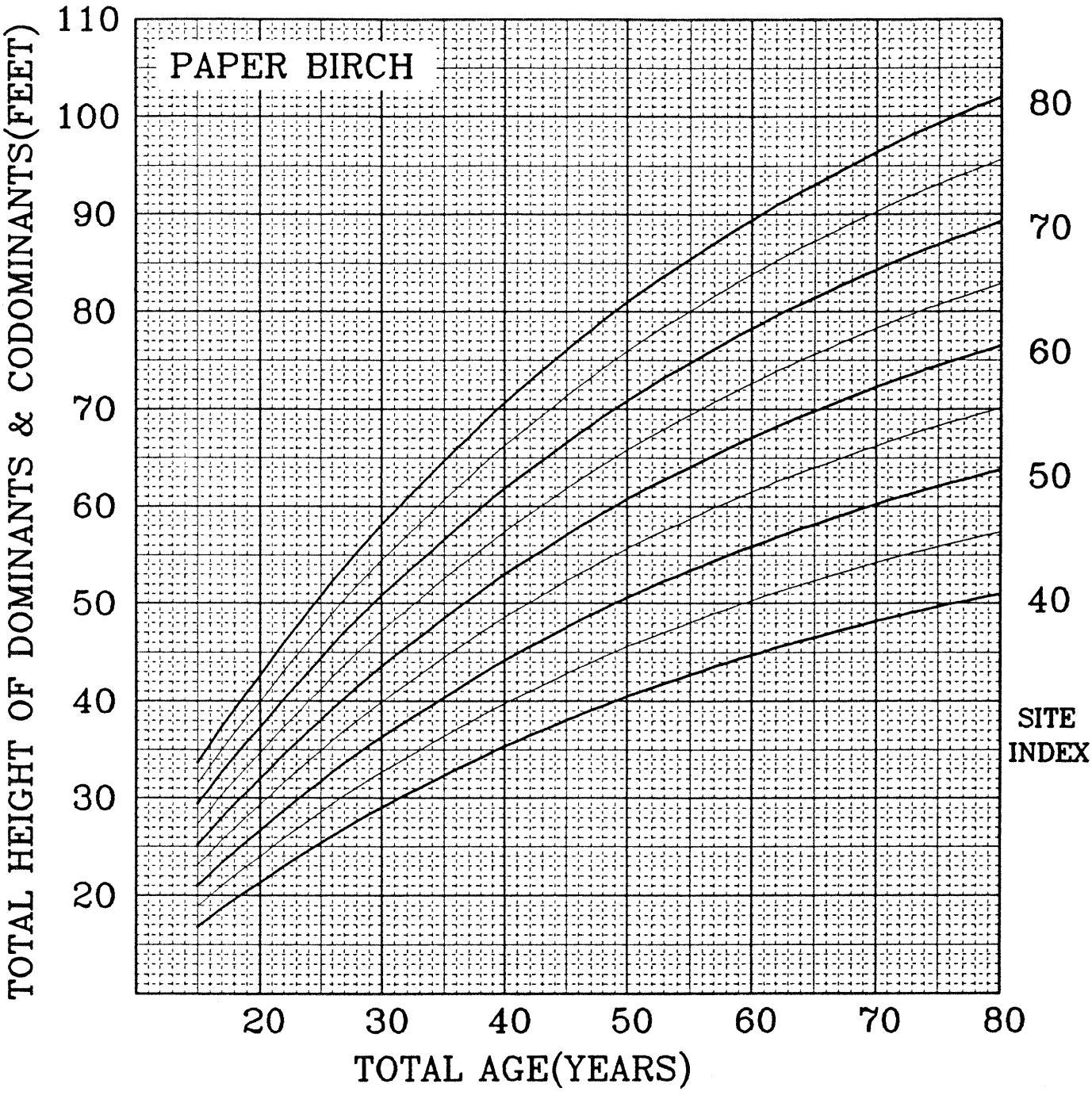


Figure 7.—Paper birch (Cooley 1958, 1962)
Northern Wisconsin (104 plots); Upper Michigan (4 plots)
108 plots, number of dominant and codominant trees not given
Total height and age, anamorphic, equation not given
Add 4 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.5980	1.0000	-0.0198	0.9824	0.0000	0.99	0.32	0.6
SI	0.6258	1.0000	-0.0198	-0.9824	0.0000	0.99	0.32	0.6

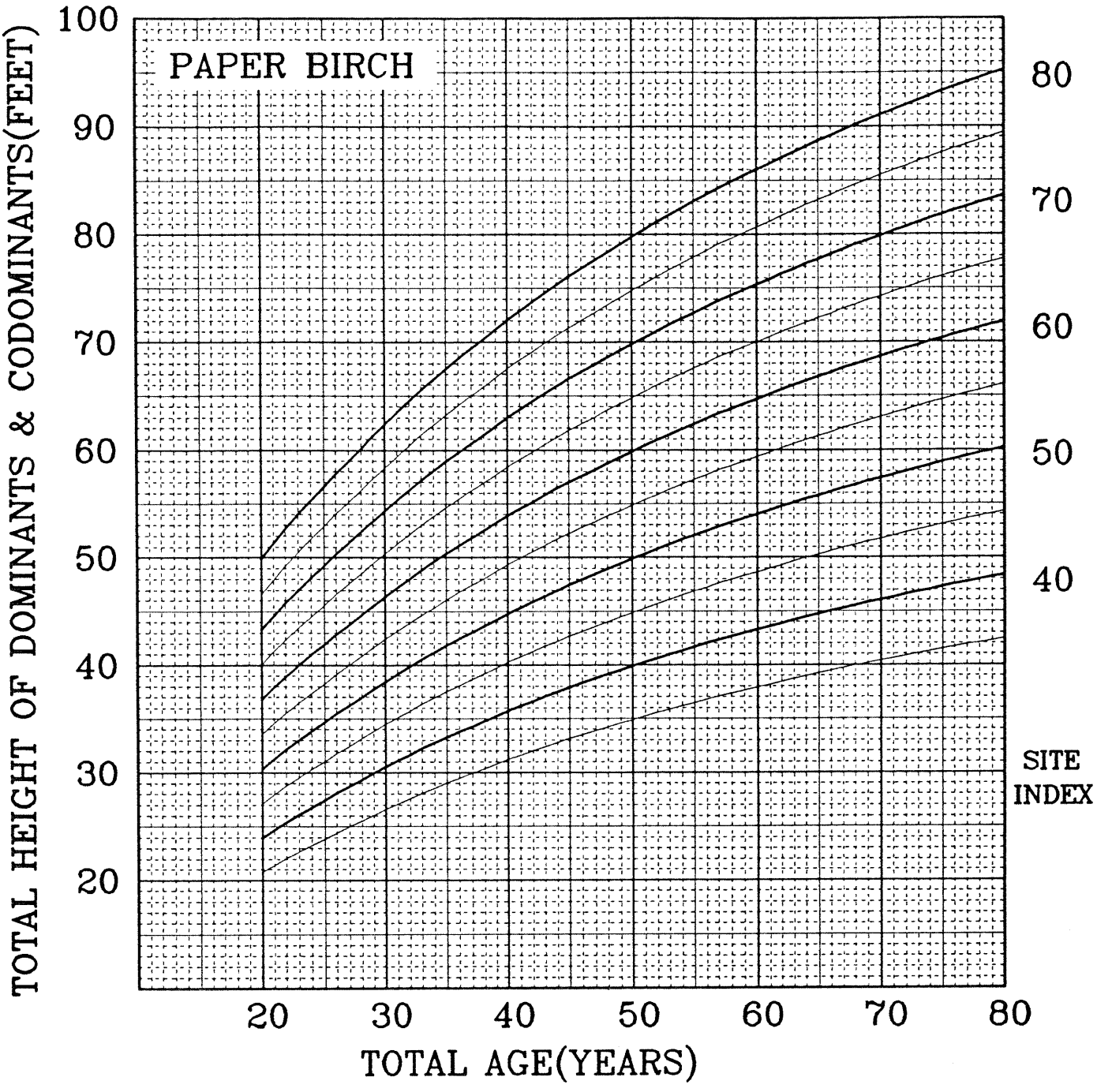


Figure 8.—Paper birch (Curtis and Post 1962, Solomon 1968)
Vermont Green Mountains
32 plots having 56 dominant and codominant trees
Stem analysis, logarithm equation, anamorphic, original curves redrafted from d.b.h. age to total age and from SI age 75 to SI age of 50
Add 4 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.7902	0.9522	-0.0173	1.1668	-0.1206	0.98	0.91	1.1
SI	0.5542	1.0540	-0.0184	-1.3053	-0.1435	0.96	0.49	0.6

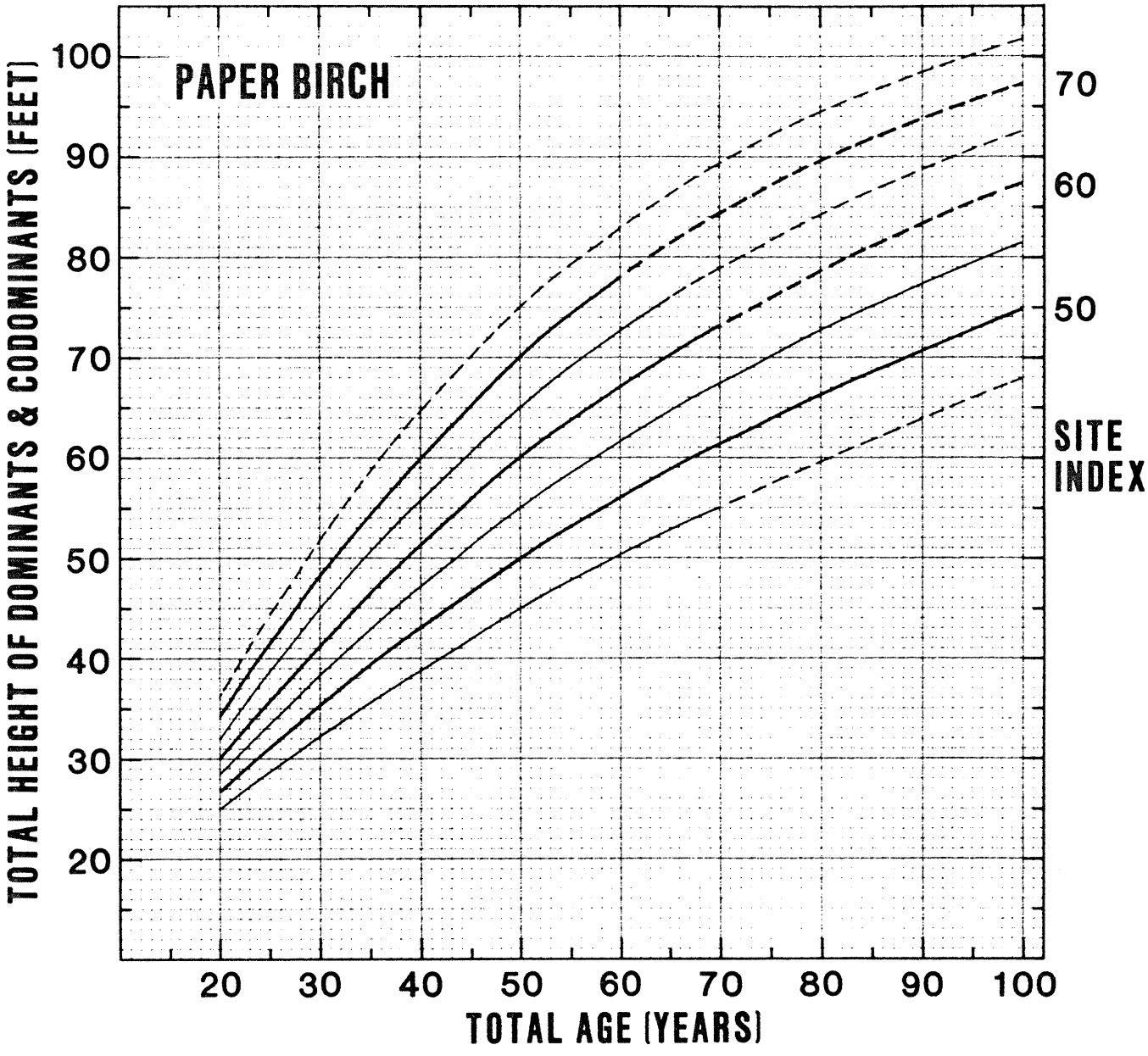


Figure 9.—Paper birch (Carmean 1978)
Northern Wisconsin and Upper Michigan
30 plots having 93 dominant and codominant trees
Stem analysis, nonlinear regression, polymorphic
Add 4 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	2.4321	0.9207	-0.0168	1.5247	-0.1042	0.99	1.06	4.2
SI	0.5119	1.0229	-0.0167	-1.0284	-0.0049	0.98	1.07	4.3

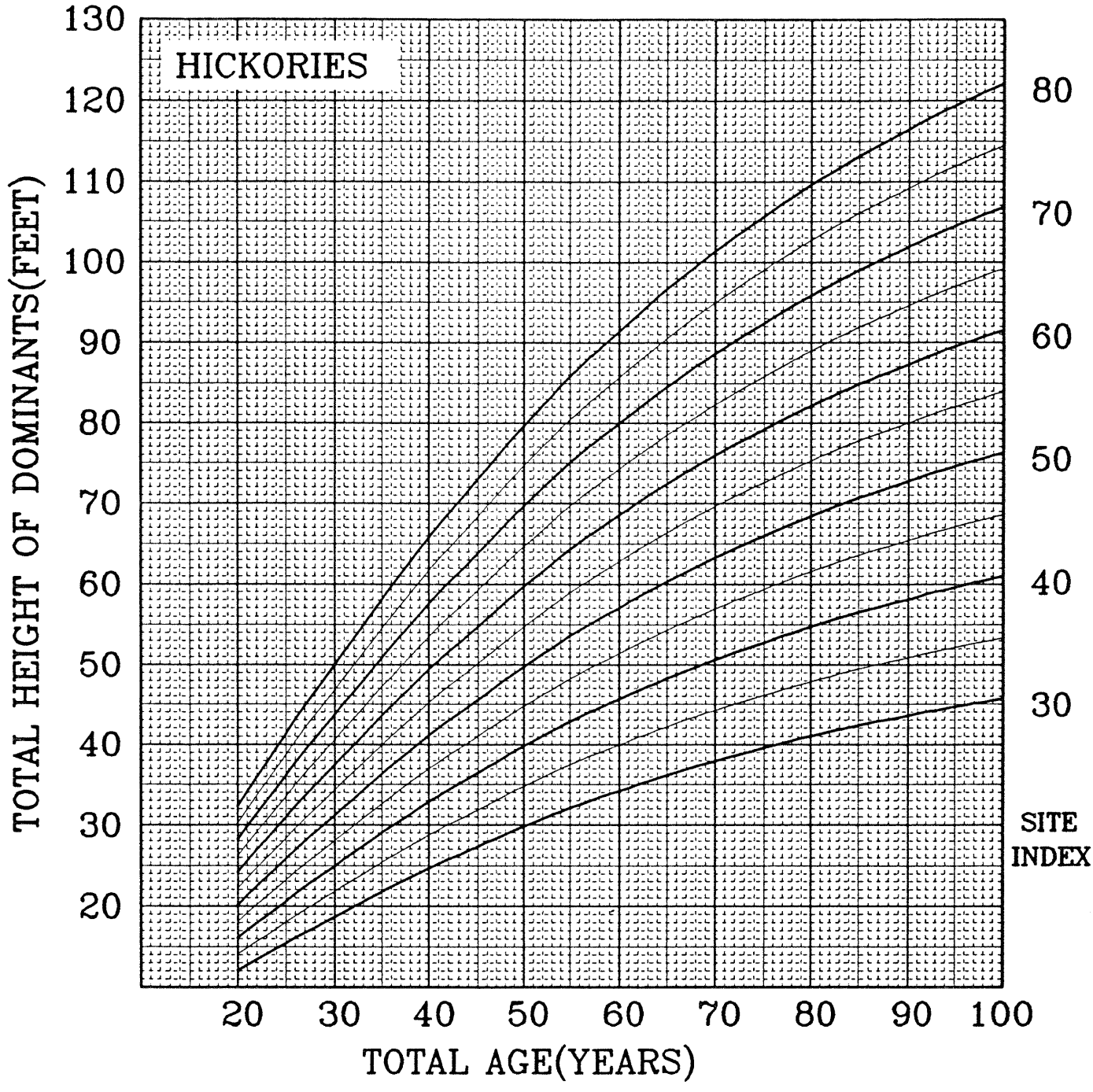


Figure 10.—Hickories (Boisen and Newlin 1910, Hampf 1965)
Central States, Cumberland Mountains of Kentucky
30 plots, number of dominant trees not given
Total height and age, anamorphic, equation not given
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	30	40	50	60	70	80
Years:	10	8	7	6	5	4

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.8326	1.0015	-0.0207	1.4080	-0.0005	0.99	0.60	2.1
SI	0.5243	1.0126	-0.0216	-1.5897	-0.0239	0.99	0.62	2.3

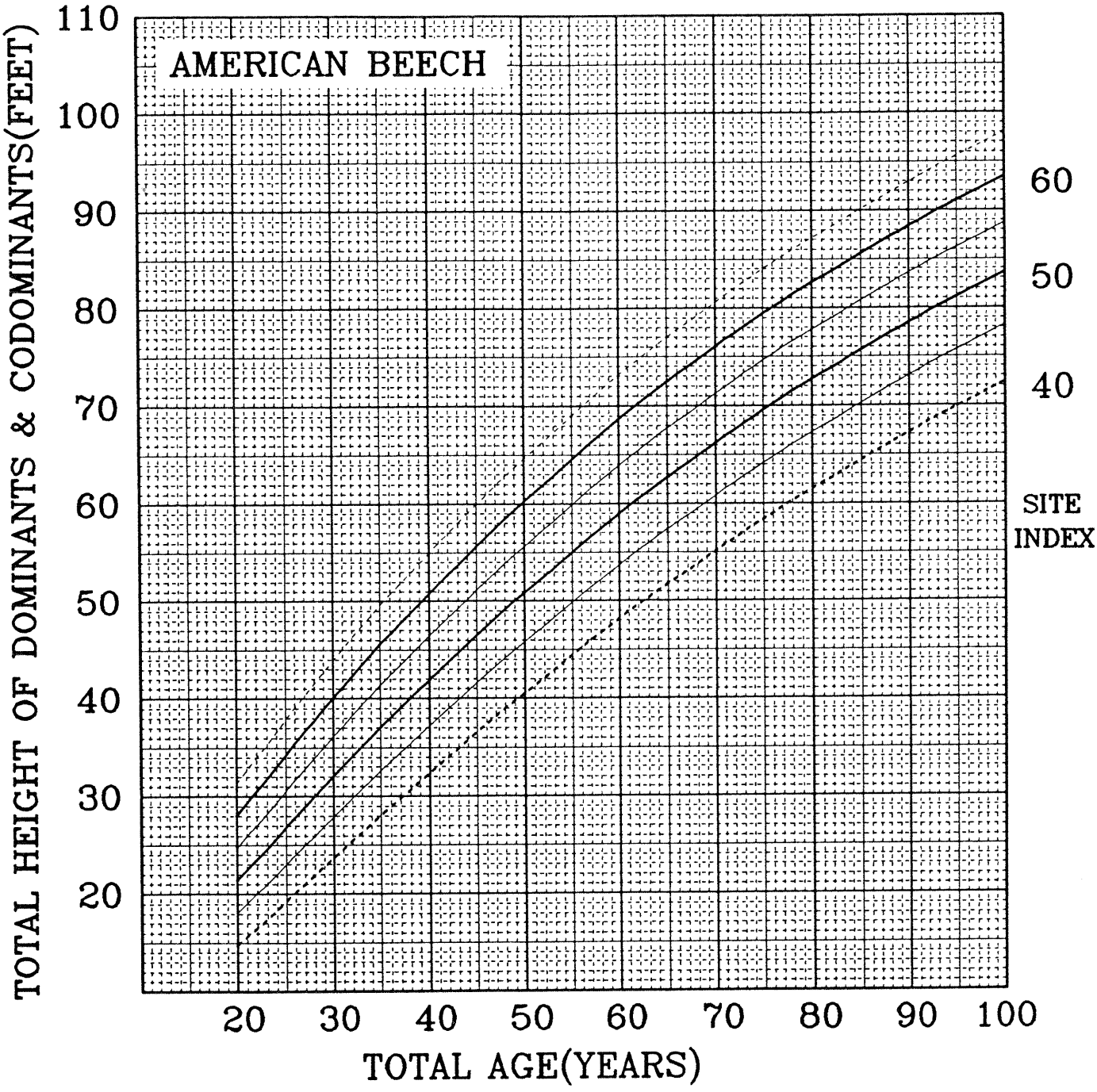


Figure 11.—American beech (Carmean 1978)
Northern Wisconsin and Upper Michigan
19 plots having 70 dominant and codominant trees
Stem analysis, nonlinear regression, polymorphic
Add 4 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	29.7300	0.3631	-0.0127	16.7616	-0.6804	0.99	0.44	1.3
SI	0.2376	1.1312	-0.0109	-1.8550	-0.1430	0.96	1.99	6.5

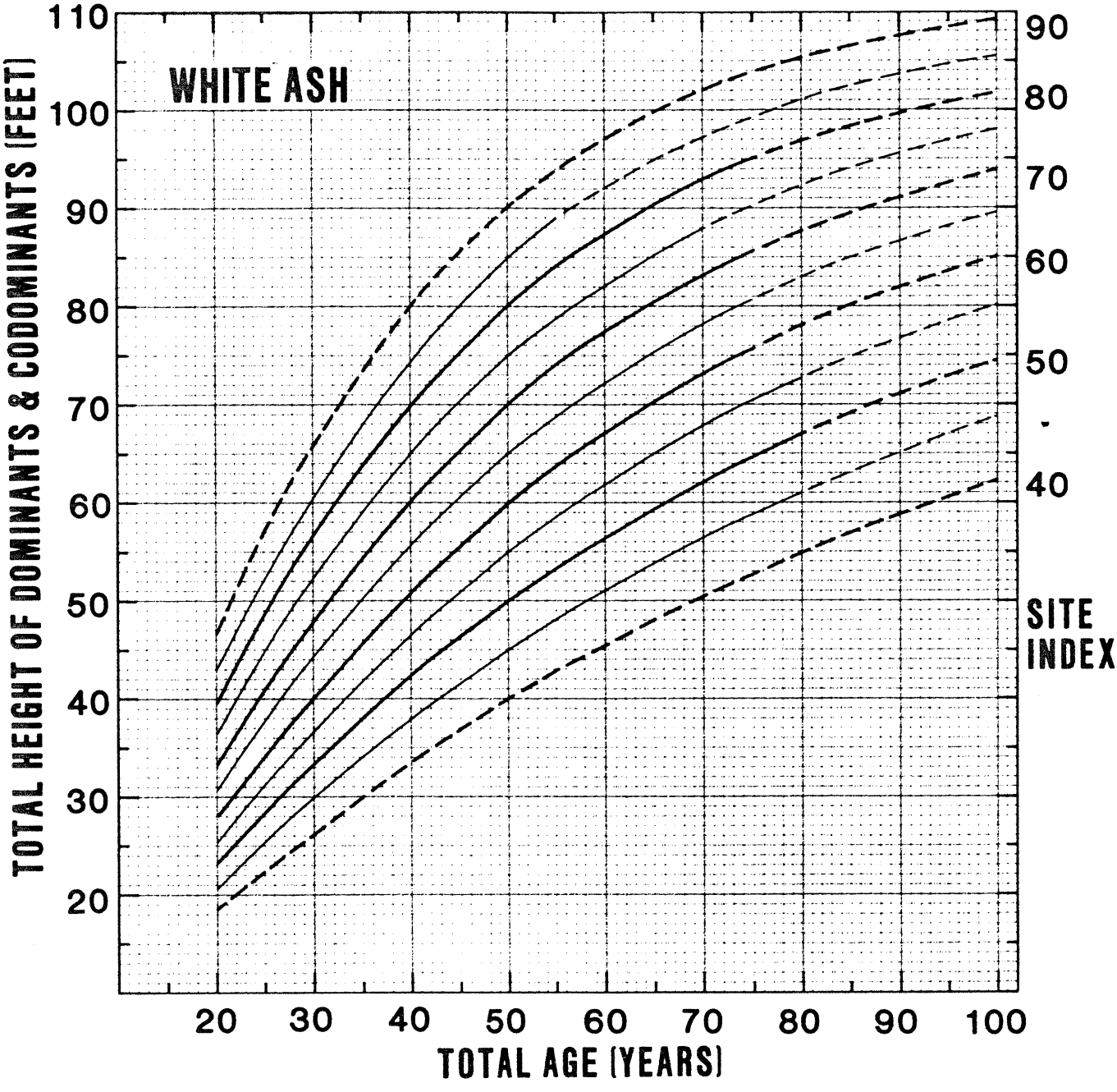


Figure 12.—White ash (Curtis and Post 1962, Solomon 1968)
Vermont Green Mountains
44 plots having 83 dominant and codominant trees
Stem analysis, logarithm equation, anamorphic, original curves redrafted from d.b.h. age to total age and from SI age 75 to SI age of 50
Add 4 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.5768	0.9978	-0.0156	0.6705	0.0182	0.99	1.77	2.5
SI	0.6835	0.9882	-0.0167	-0.6218	0.0462	0.99	1.70	2.0

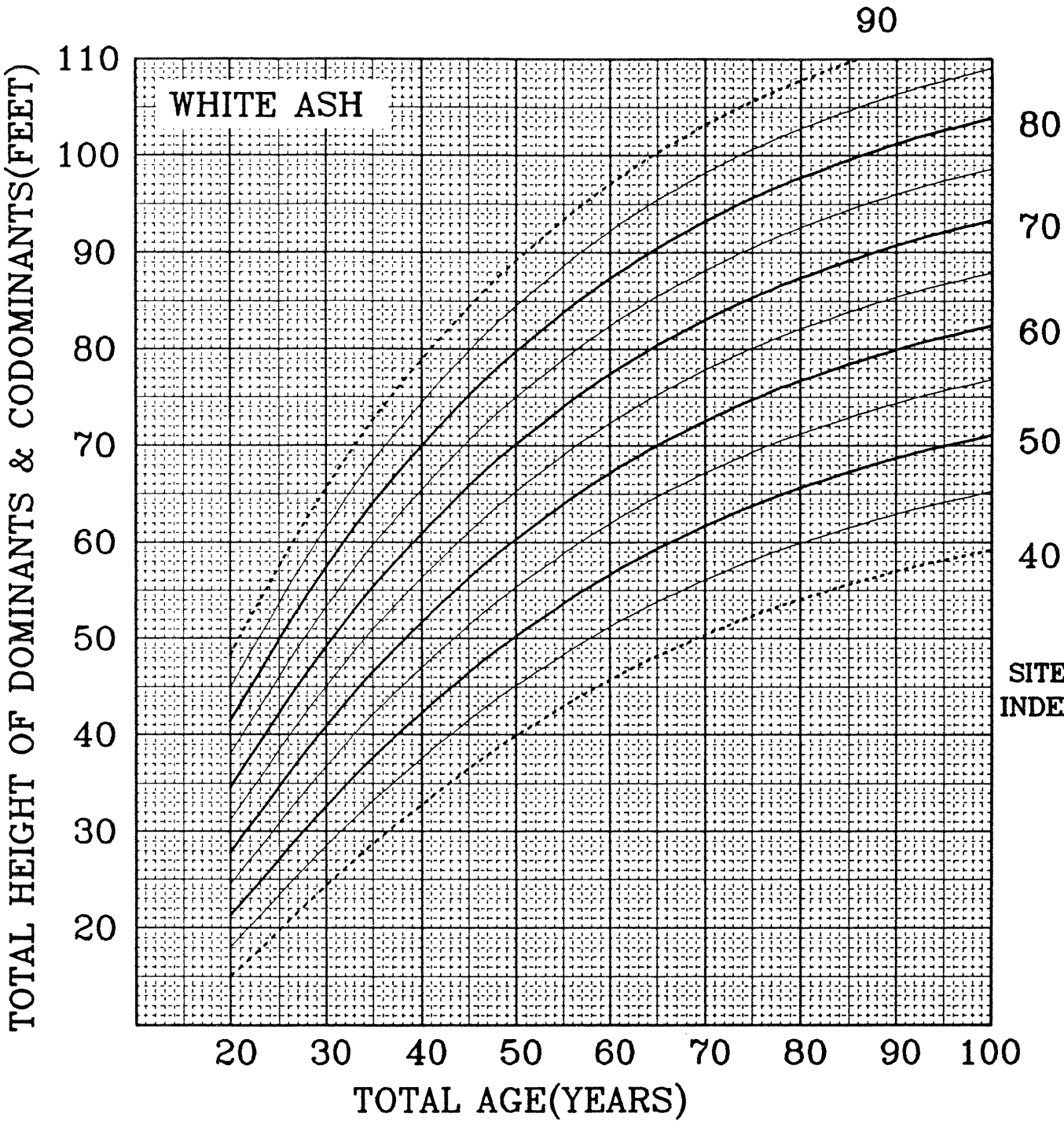


Figure 13.—White ash (Carmean 1978)
Northern Wisconsin and Upper Michigan
73 plots having 275 dominant and codominant trees
Stem analysis, nonlinear regression, polymorphic
Add 4 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	4.1492	0.7531	-0.0269	14.5384	-0.5811	0.99	1.37	5.1
SI	0.1728	1.2560	-0.0110	-3.3605	-0.3452	0.99	1.99	9.5

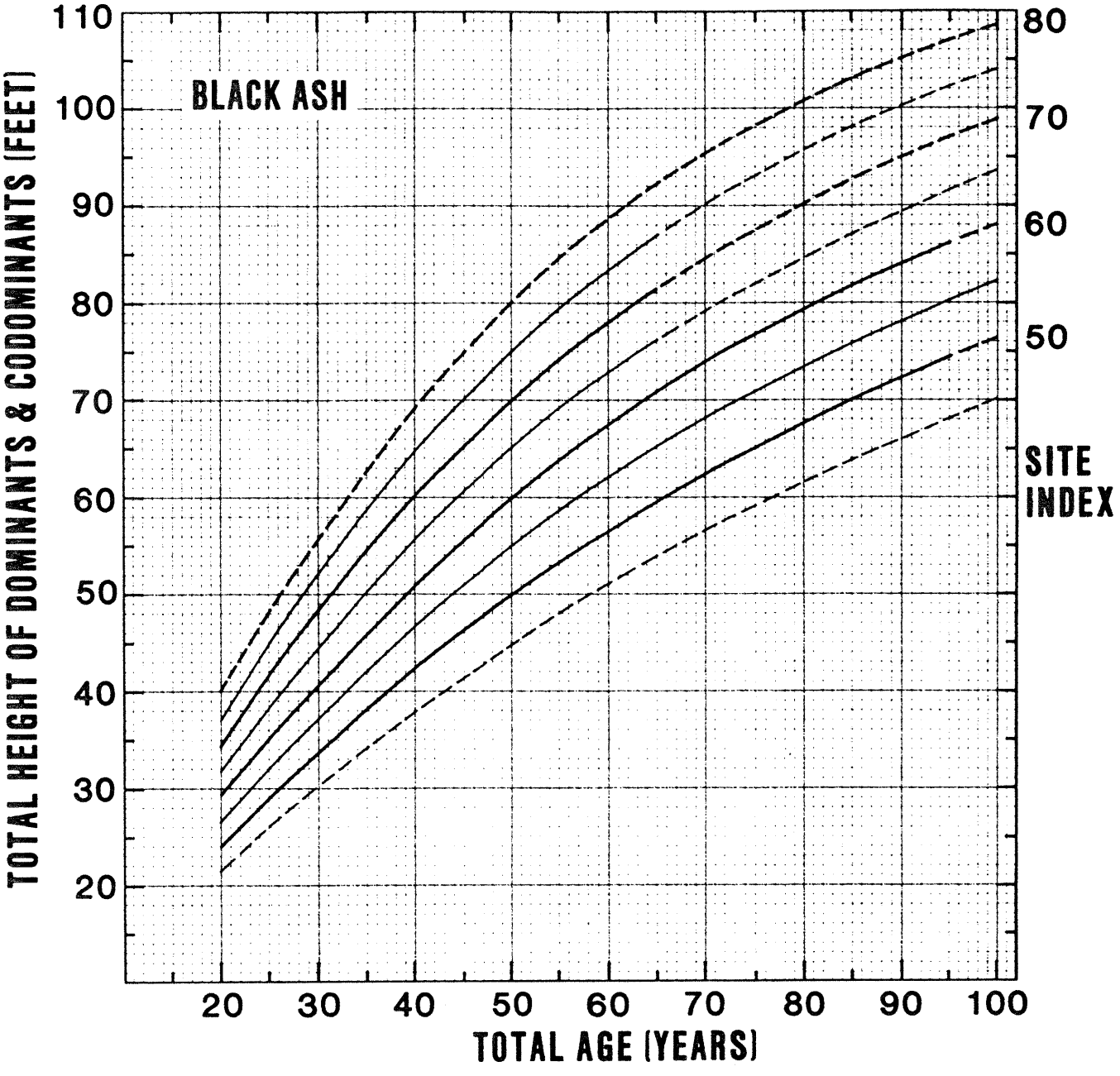


Figure 14.—Black ash (Carmean 1978)
Northern Wisconsin and Upper Michigan
39 plots having 143 dominant and codominant trees
Stem analysis, nonlinear regression, polymorphic
Add 4 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	4.2286	0.7857	-0.0178	4.6219	-0.3591	0.99	0.70	2.4
SI	0.2388	1.1583	-0.0102	-1.8455	-0.1883	0.99	0.99	3.4

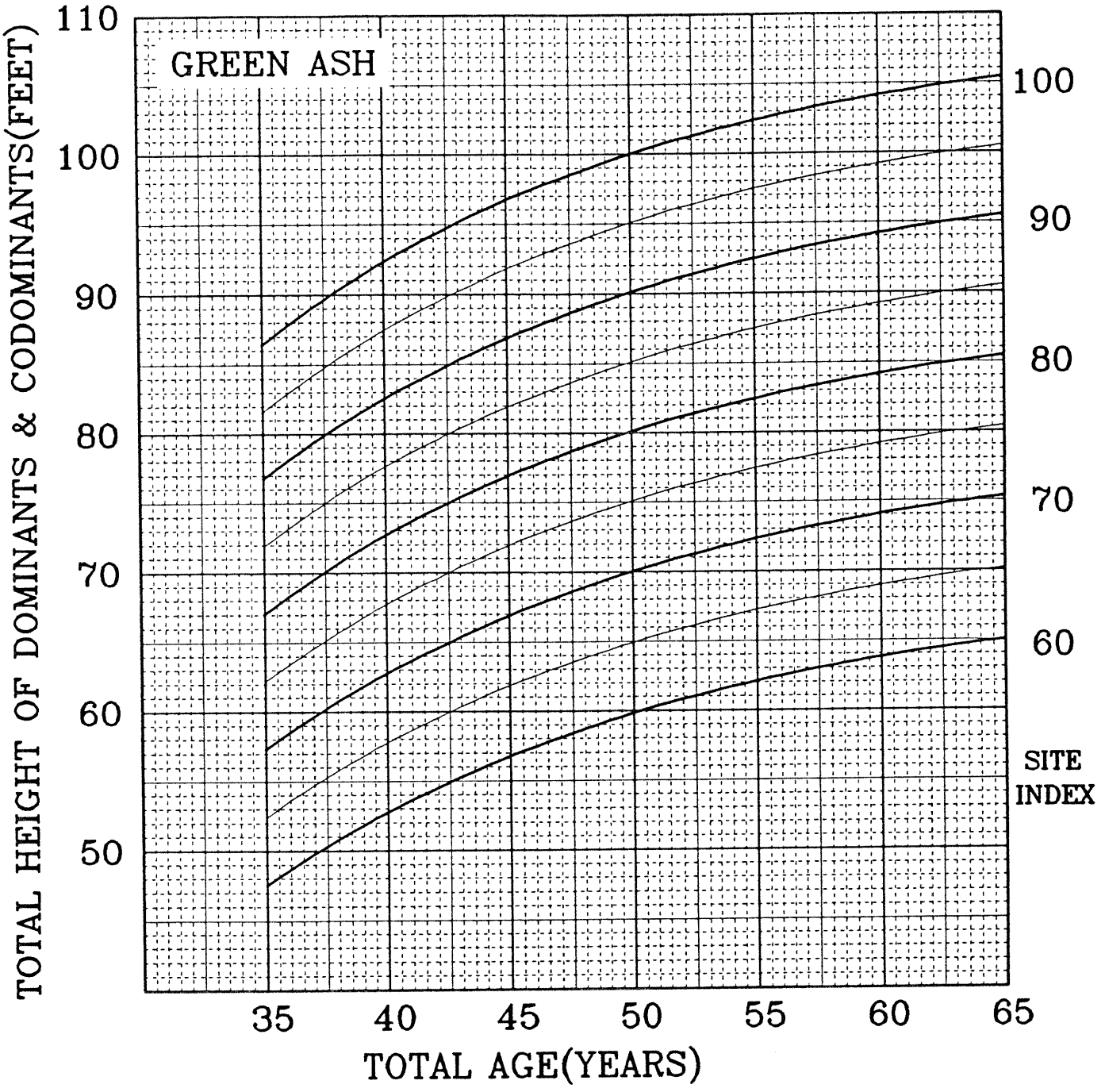


Figure 15.—Green ash (Broadfoot 1969)
Mississippi Valley alluvium—Louisiana, Mississippi, Arkansas, Tennessee
Number of plots and number of dominant and codominant trees not given
Stem analysis, graphically constructed anamorphic curves
Add 2 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.6505	0.9096	-0.0644	125.7045	-0.8908	0.99	1.20	0.8
SI	0.5672	1.0990	-0.0482	-38.2659	-0.7549	0.99	1.25	0.8

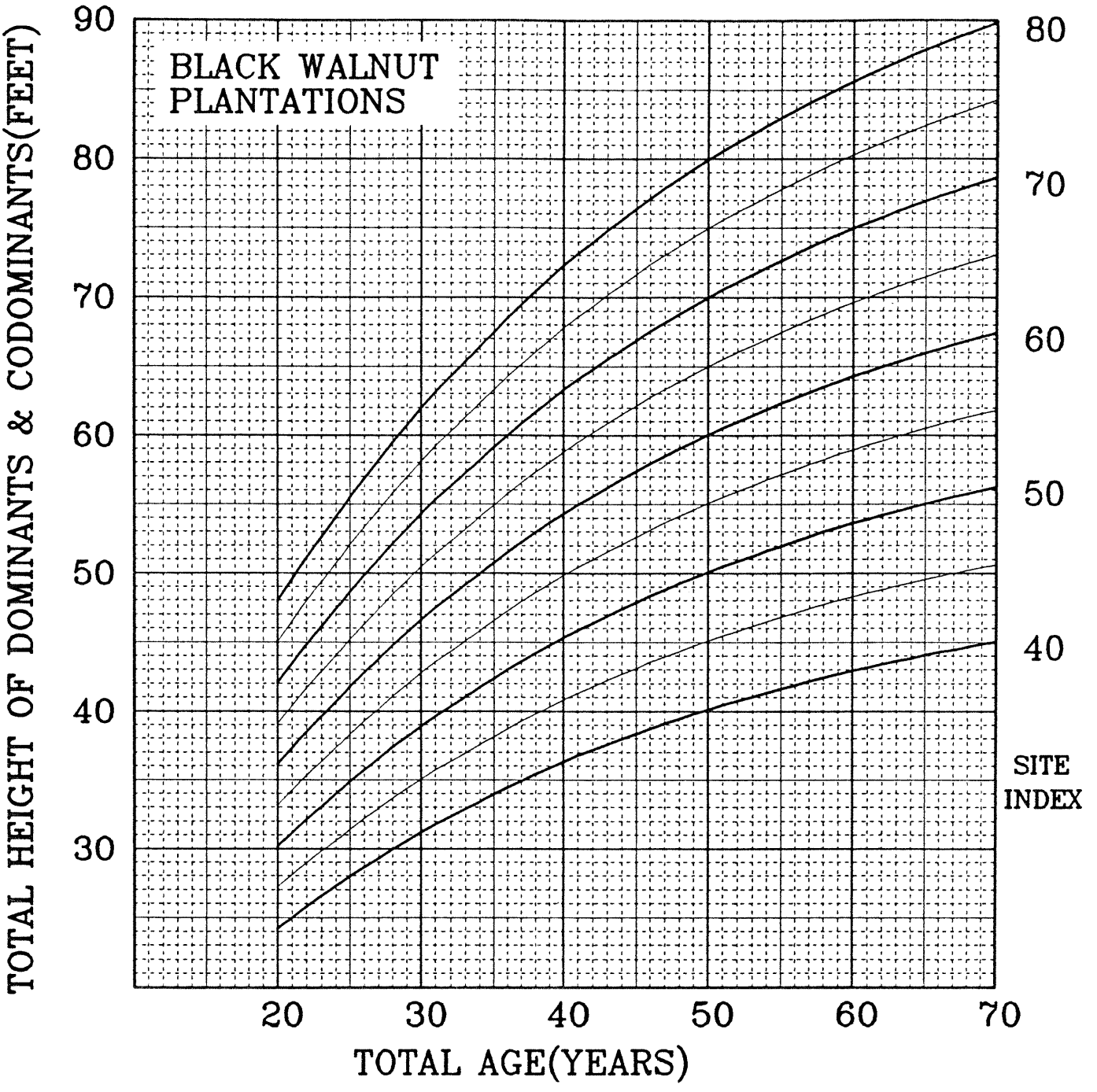


Figure 16.—Black walnut plantations (Kellogg 1939b)
Central States
188 plots, number of dominant trees not given
Total height and total age, anamorphic, equation not given
Determine total age from stumps or planting records (do not damage trees by using an increment borer) (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.2898	0.9982	-0.0289	0.8546	0.0171	0.99	0.44	1.7
SI	0.7875	0.9963	-0.0281	-0.7823	0.0353	0.99	0.49	2.1

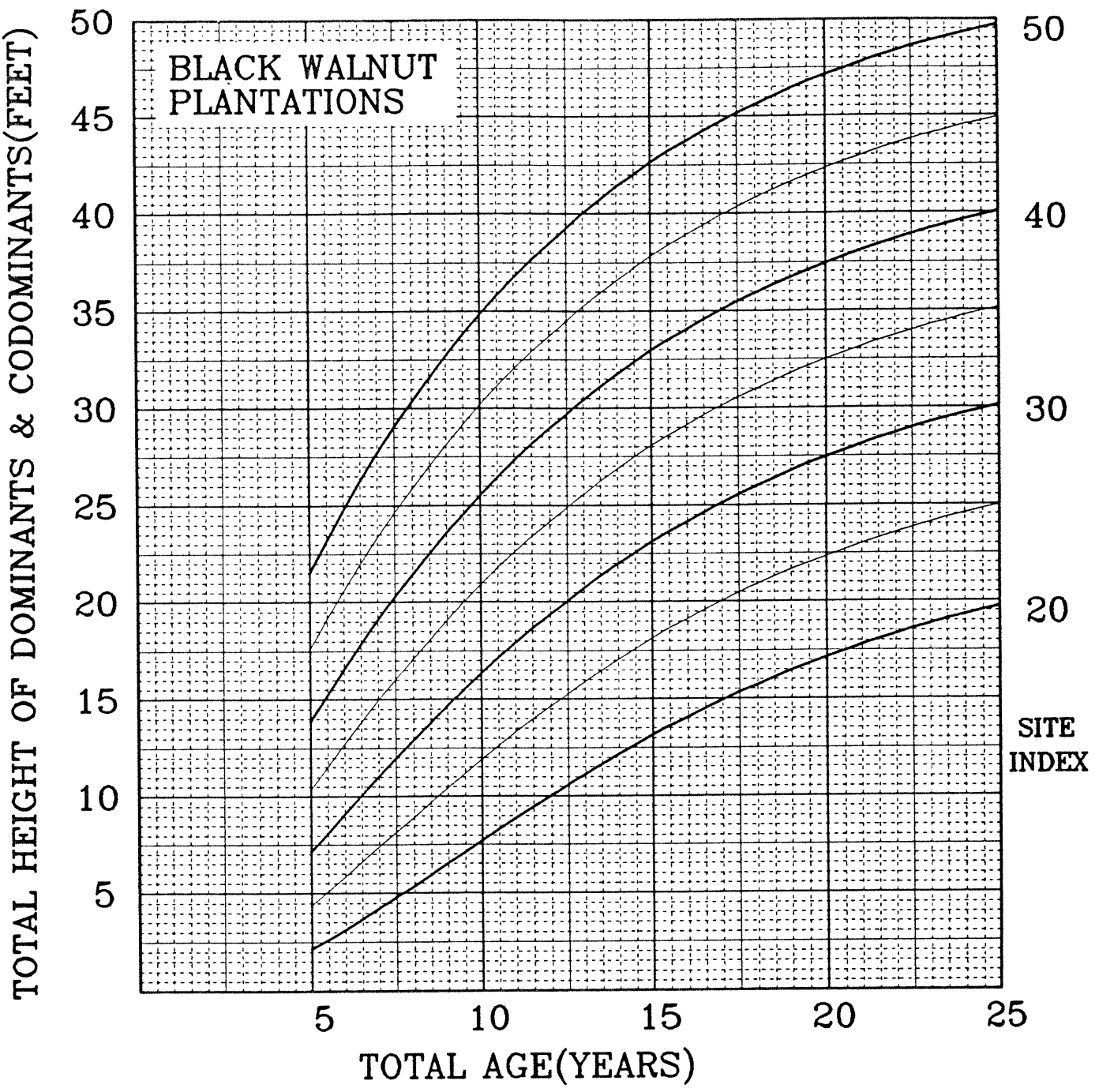


Figure 17.—Black walnut plantations—shallow flood plains (Losche and Schlesinger 1975)

Southern Illinois

19 plots having 85 dominant and codominant trees

Stem analysis, site index prediction equations based on linear regressions using Hegar (1968) model. Site index is height at 25 years total age (BH = 0.0)

Determine total age from stumps or planting records (do not damage trees by using an increment borer)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.6622	0.8860	-0.1113	66.8363	-1.0584	0.99	0.57	1.9
SI	0.6204	1.0542	-0.0373	-1.9626	-0.3491	0.98	1.62	5.4

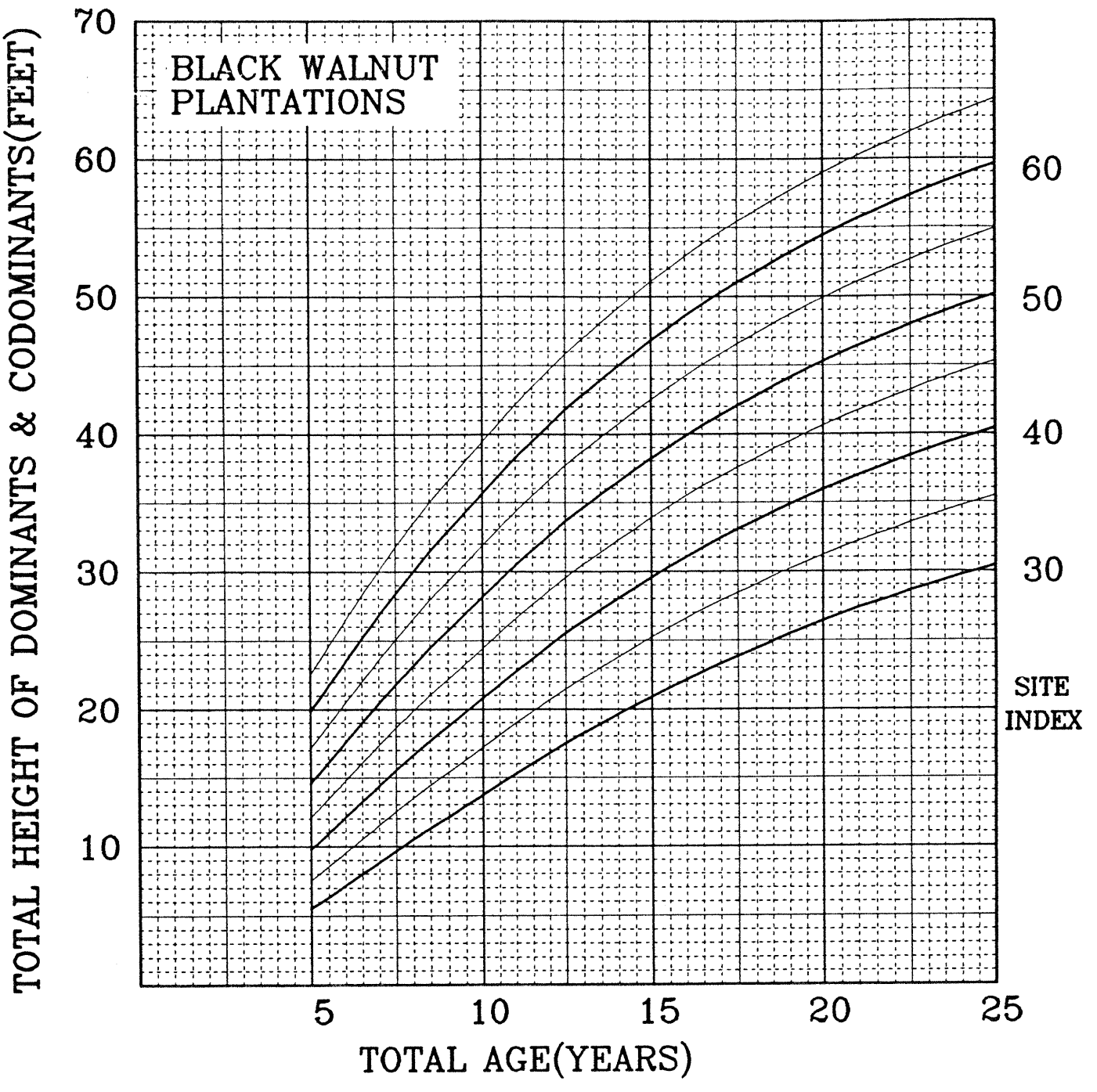


Figure 18.—Black walnut plantations—deep flood plains (Losche and Schlesinger 1975)

Southern Illinois

26 plots having 108 dominant and codominant trees

Stem analysis, site index prediction equations based on linear regressions using Hegar (1968) model. Site index is height at 25 years total age (BH = 0.0)

Determine total age from stumps or planting records (do not damage trees by using an increment borer)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	2.2349	0.8420	-0.0808	15.0884	-0.6292	0.99	1.10	3.0
SI	0.1758	1.2568	-0.0124	-1.9426	-0.3231	0.98	1.91	5.8

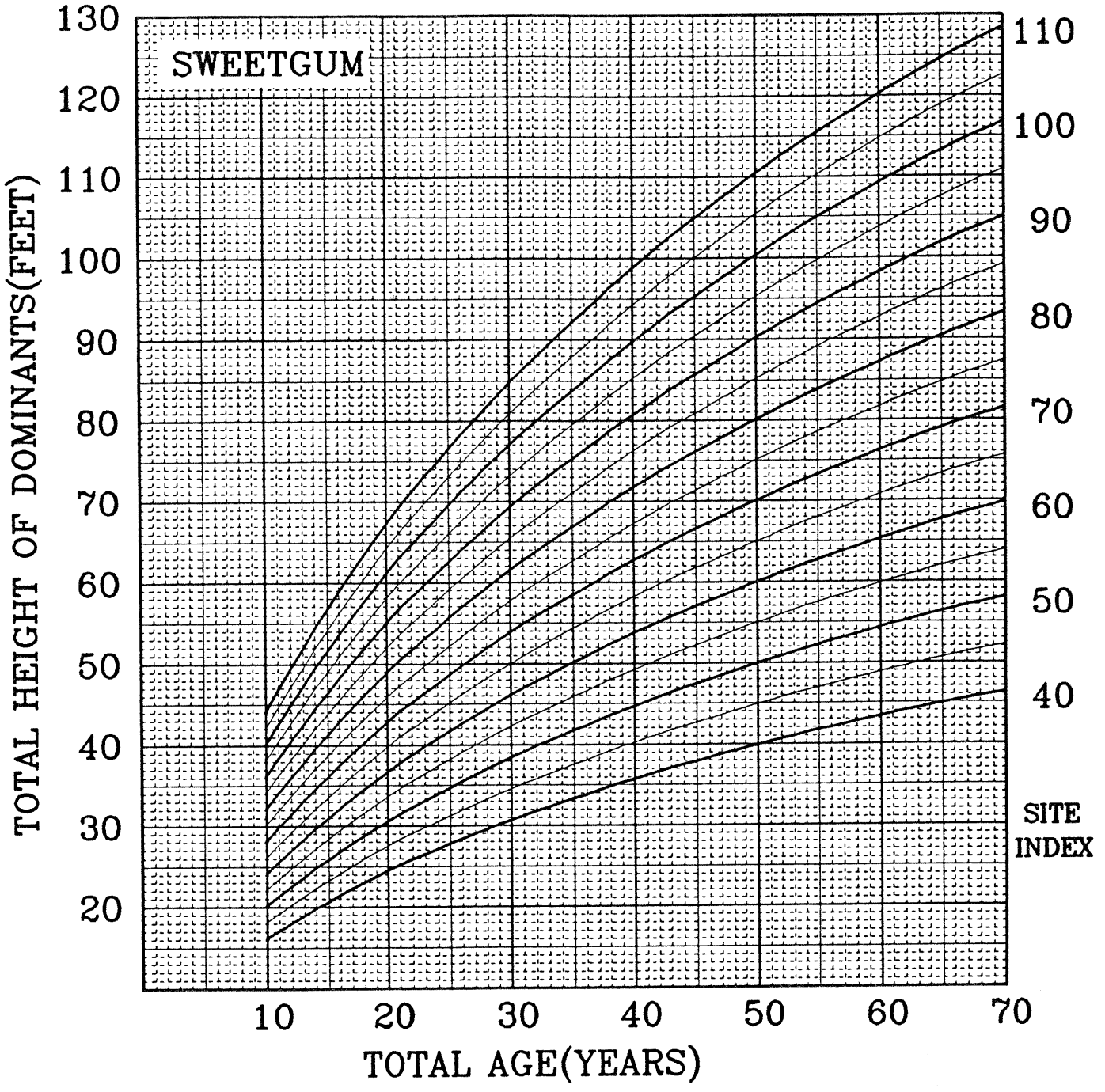


Figure 19.—Sweetgum (Trenk 1929)
Maryland
Number of plots and number of dominant trees not given
Total height and total age, anamorphic, equation not given
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	40-55	56-75	76+	
Years:	5	4	3	(seedlings)
	2	1	1	(sprouts)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.5932	1.0124	-0.0122	0.6245	0.0130	0.99	0.75	3.3
SI	0.6092	0.9895	-0.0113	-0.6219	0.0078	0.99	1.12	5.5

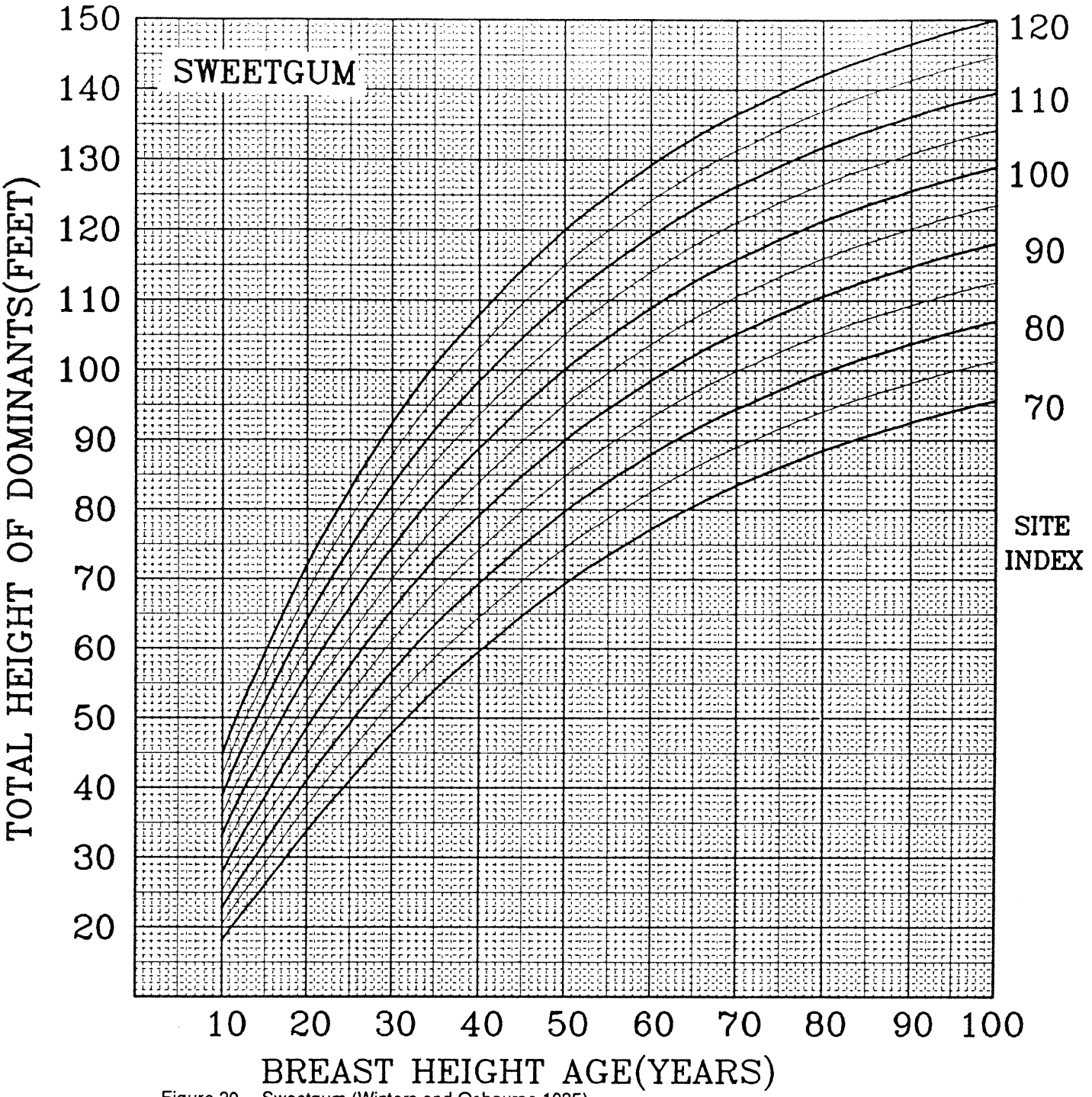


Figure 20.—Sweetgum (Winters and Osbourne 1935)
Mississippi Valley alluvium plus a few locations on alluvial soils of South Carolina, Alabama, and northern Florida
25 locations having 99 plots, number of dominant trees not given (BH = 4.5)
Total height and d.b.h. age, anamorphic, equation not given

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	3.5384	0.7932	-0.0244	29.2355	-0.7291	0.99	1.46	5.2
SI	0.0055	1.6414	-0.0026	-1.7678	-0.2712	0.99	1.86	8.8

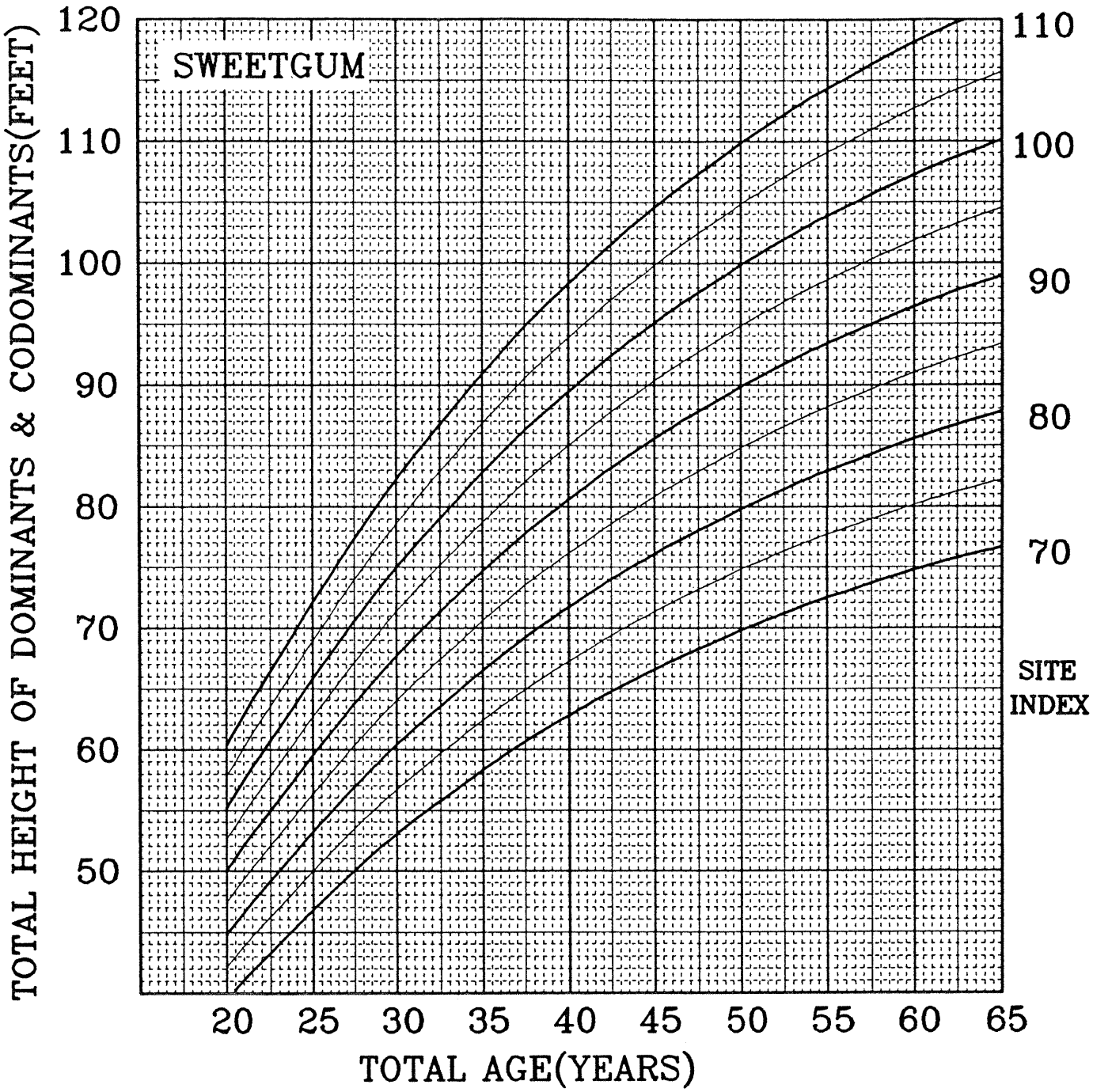


Figure 21.—Sweetgum (Broadfoot and Krinard 1959)
Mississippi Valley alluvium—Louisiana, Mississippi, Arkansas, Tennessee
Number of plots and number of dominant and codominant trees not given
Stem analysis, graphically constructed anamorphic curves
Add 2 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.0902	1.0298	-0.0354	0.7011	0.1178	0.99	0.86	3.9
SI	0.9550	0.9639	-0.0380	-0.6685	0.1478	0.99	0.99	5.1

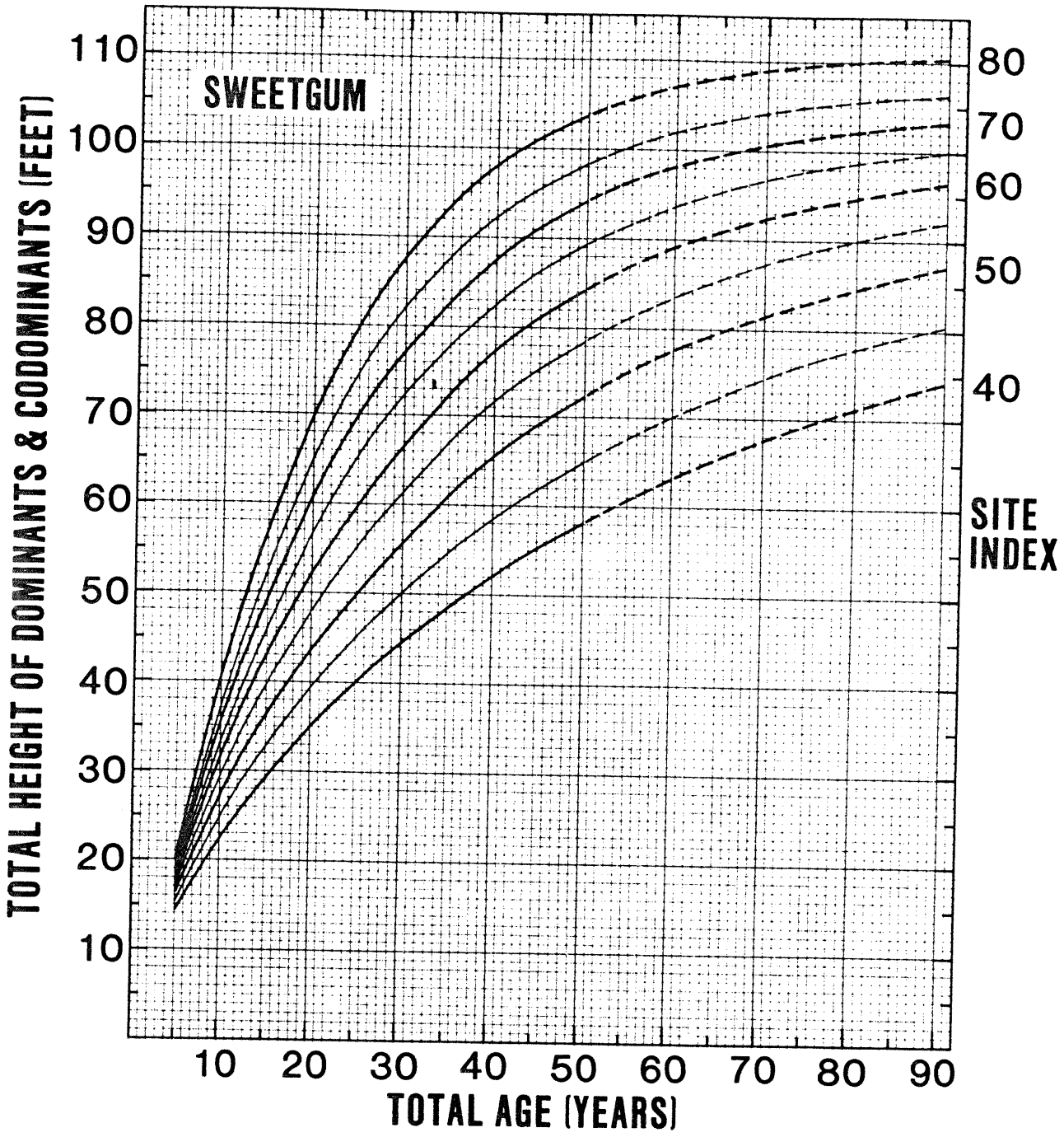


Figure 22.—Sweetgum (Lyle *et al.* 1975)
Alabama
50 stands each having two dominant trees
Stem analysis, nonlinear regression, polymorphic, site index is height at 25 years total age
Add 2 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	6.0673	0.6774	-0.0391	9.6135	-0.5504	0.99	2.15	6.7
SI	0.2520	1.1879	-0.0276	-2.0900	-0.2154	0.97	2.61	8.0

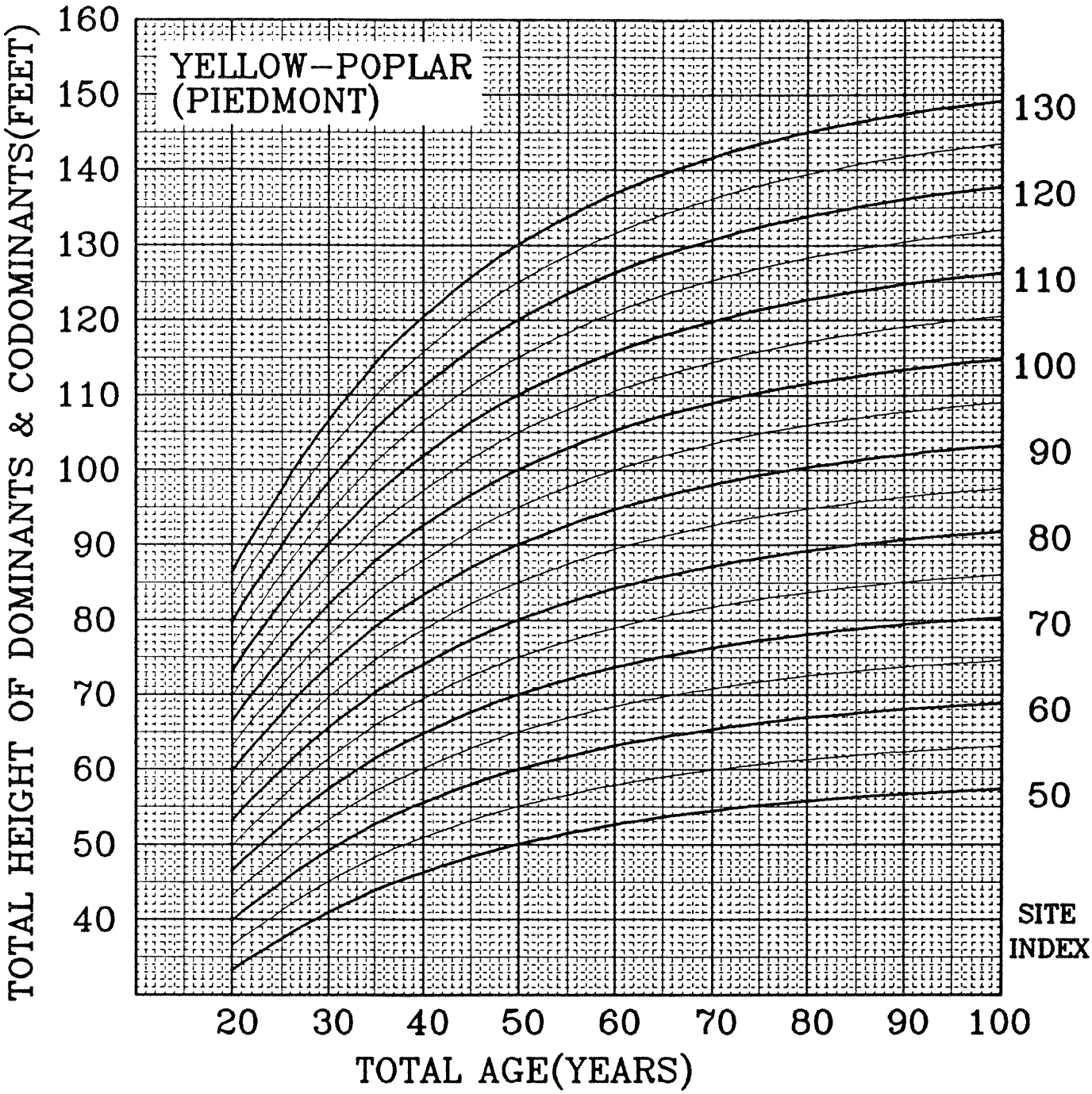


Figure 23.—Yellow-poplar—Piedmont (Beck 1962)
Piedmont of Carolinas and Virginia
117 plots having 4 to 6 dominant and codominant trees on each plot
Total height and total age, anamorphic, logarithm equation
Add 3 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.1798	1.0000	-0.0339	0.8117	-0.0001	0.99	0.78	3.3
SI	0.8323	1.0051	-0.0352	-0.9706	-0.0303	0.99	0.86	4.0

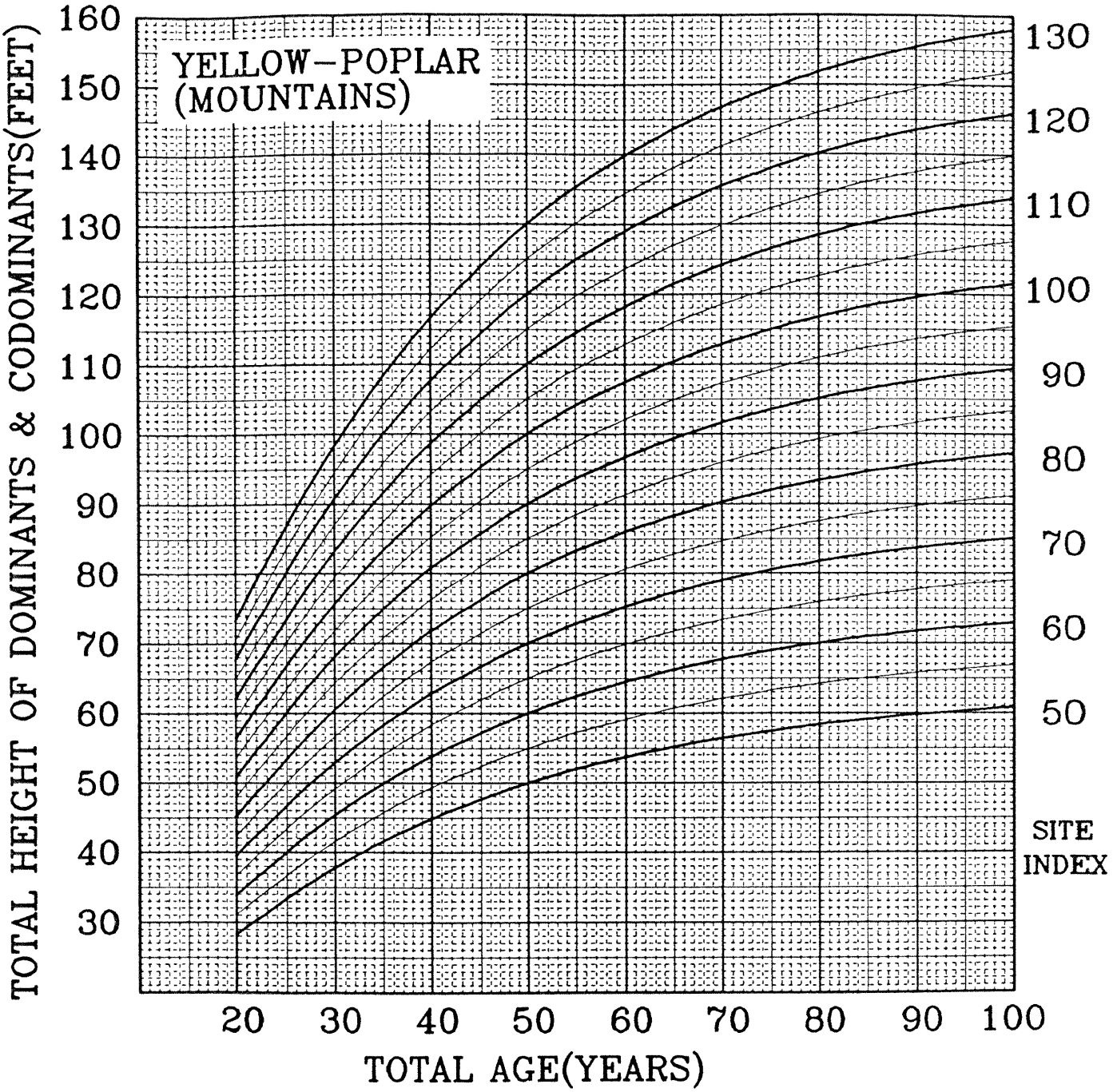


Figure 24.—Yellow-poplar—Mountains (Beck 1962)
Southern Appalachians of western North Carolina and northern Georgia
267 plots having 4 to 6 dominant and codominant trees on each plot
Total height and total age, anamorphic, logarithm equation
Add 3 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.2673	1.0000	-0.0331	1.1149	0.0001	0.99	1.02	4.3
SI	0.7609	1.0097	-0.0346	-1.4002	-0.0402	0.99	1.18	5.6

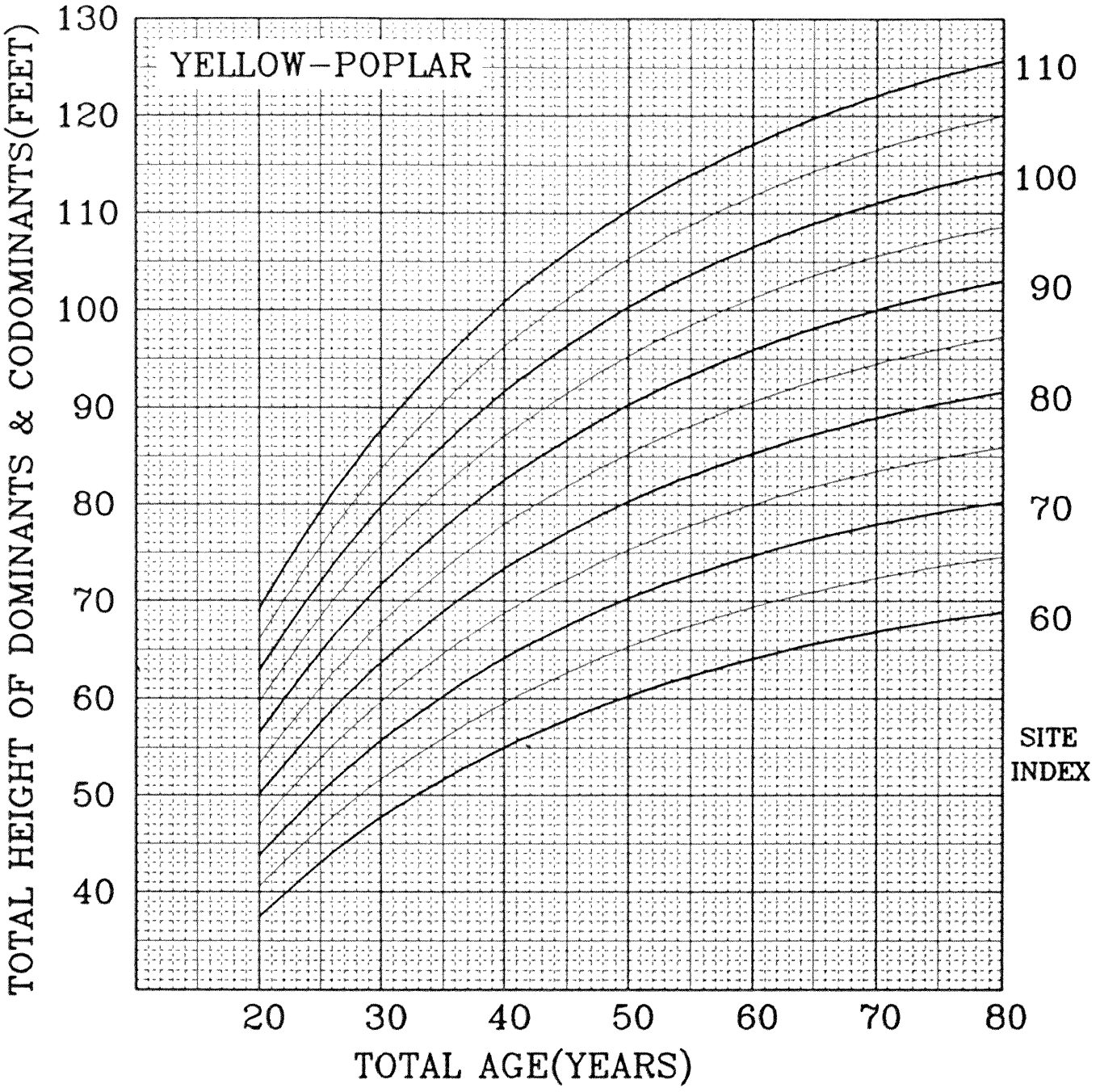


Figure 25.—Yellow-poplar (Schlaegel, Kulow, and Baughman 1969)
West Virginia Appalachians
123 plots, number of dominant and codominant trees not given
Total height and total age, anamorphic, logarithm equation
Add 3 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.2941	0.9892	-0.0315	-1.0471	-0.0368	0.99	1.18	2.1
SI	0.7459	1.0184	-0.0313	-1.2121	-0.0717	0.99	1.21	2.4

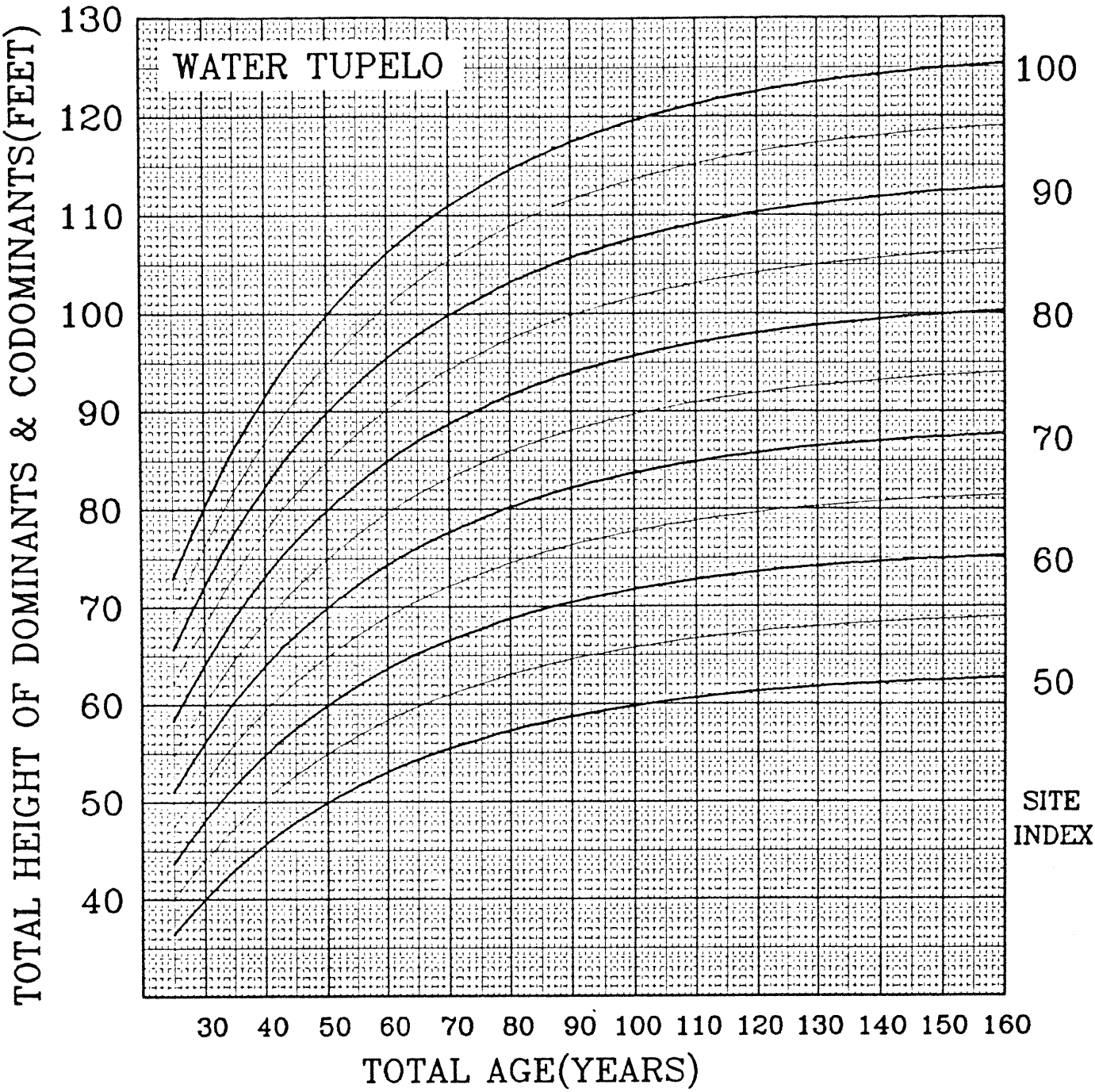


Figure 26.—Water tupelo (Applequist 1959)
Lower coastal plain of southeastern Georgia
17 plots having 6 to 8 dominant and codominant trees on each plot
Total height and total age, anamorphic, logarithm equation
Add 2 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.2721	0.9995	-0.0256	0.7447	-0.0019	0.99	0.59	4.4
SI	0.7505	1.0112	-0.0259	-0.9213	-0.0475	0.99	0.60	3.0

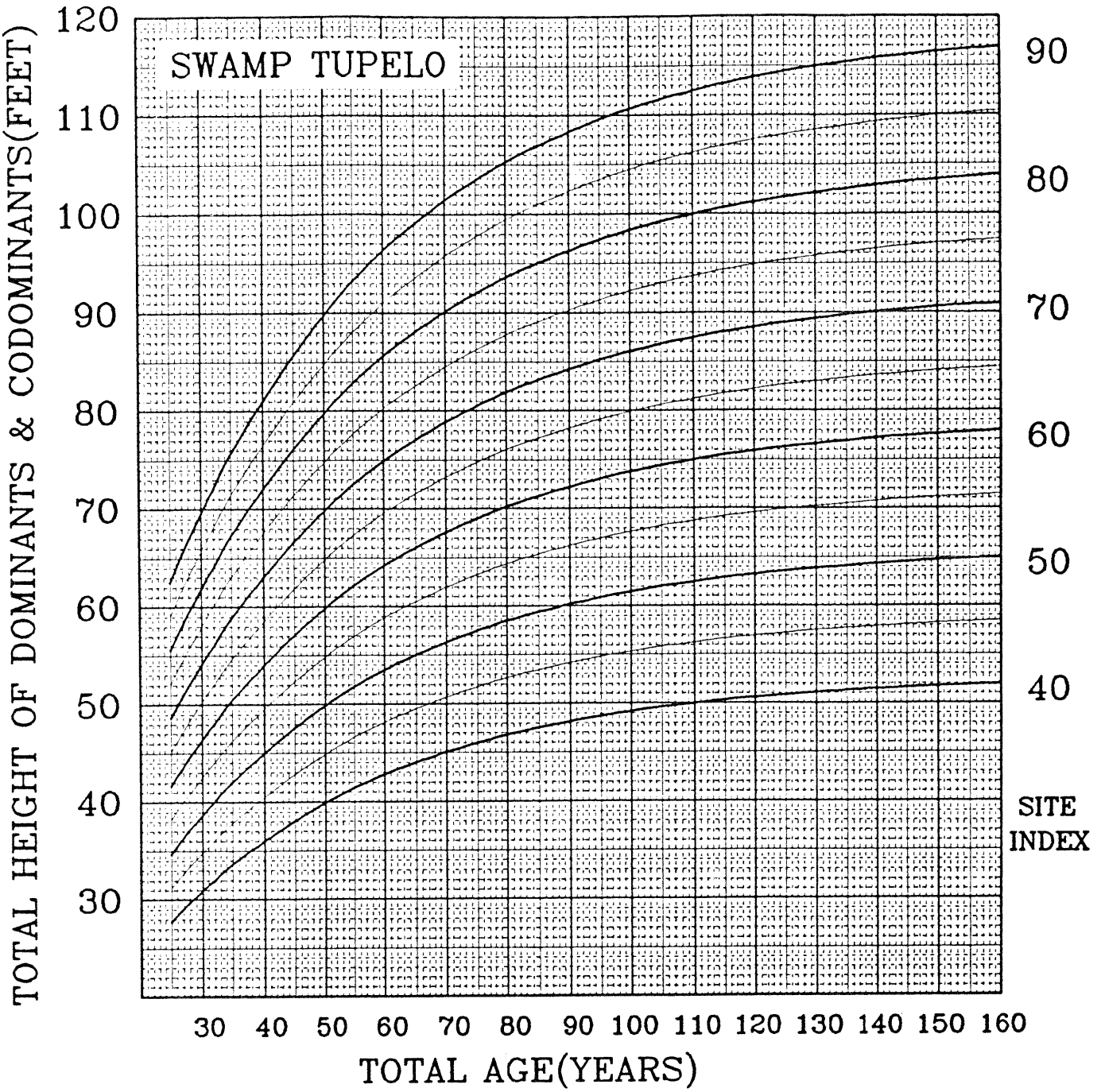


Figure 27.—Swamp tupelo (Applequist 1959)
Lower coastal plain of southeastern Georgia
81 plots having 6 to 8 dominant and codominant trees on each plot
Total height and total age, anamorphic, logarithm equation
Add 2 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.3213	0.9995	-0.0254	0.8549	-0.0016	0.99	0.59	2.4
SI	0.7224	1.0117	-0.0259	-1.0375	-0.0428	0.99	0.61	3.0

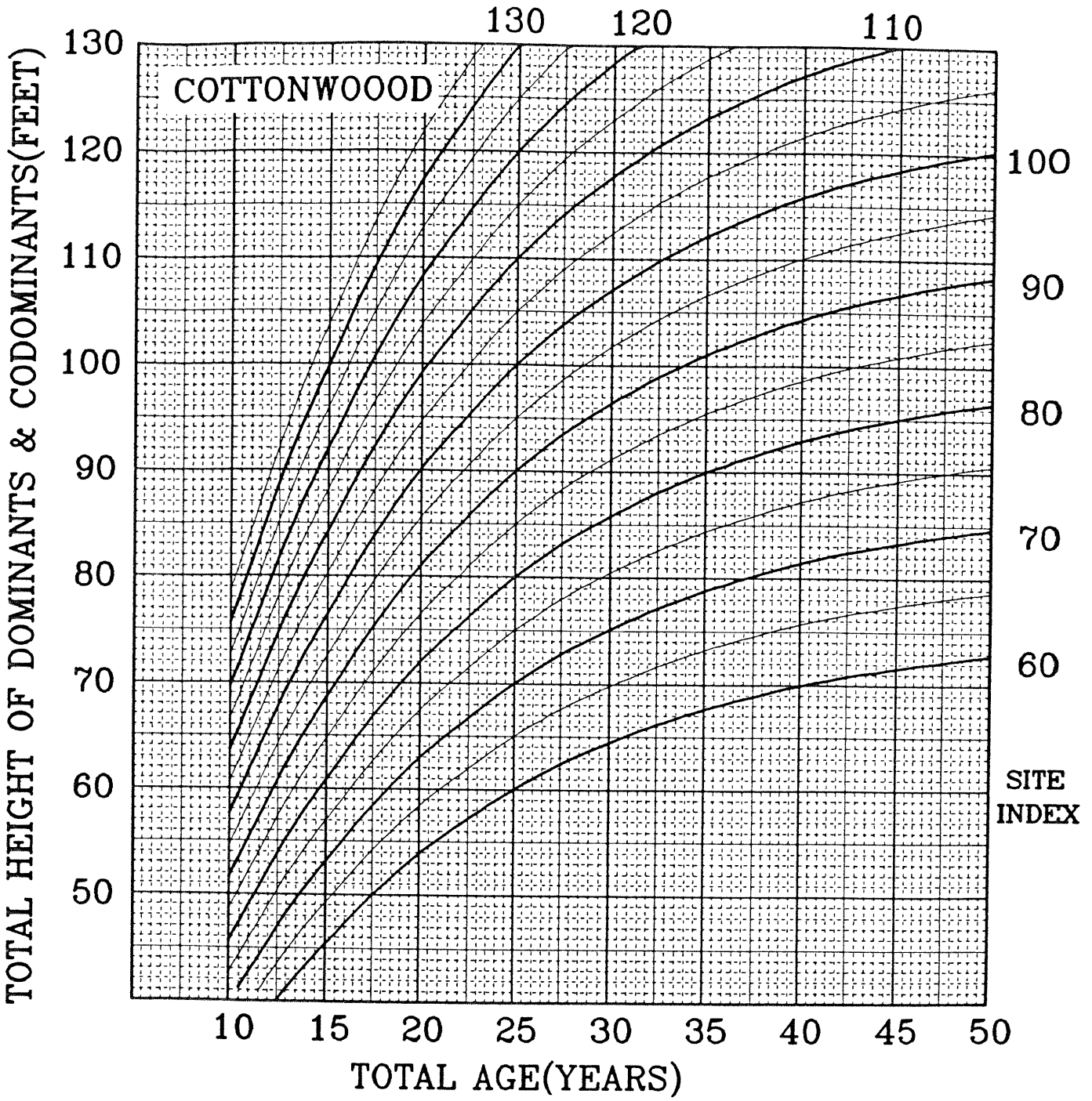


Figure 28.—Cottonwood (Neebe and Boyce 1959)
Southern Illinois bottomlands and a few uplands
65 areas having 172 dominant and codominant trees
Total height and total age, anamorphic, site index prediction using straight line "curves," equation not given
Site index is total height at 25 years total age
Add 2 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.3615	0.9813	-0.0675	1.5494	-0.0767	0.99	1.06	3.1
SI	0.6901	1.0316	-0.0655	-1.8288	-0.1226	0.99	1.05	3.3

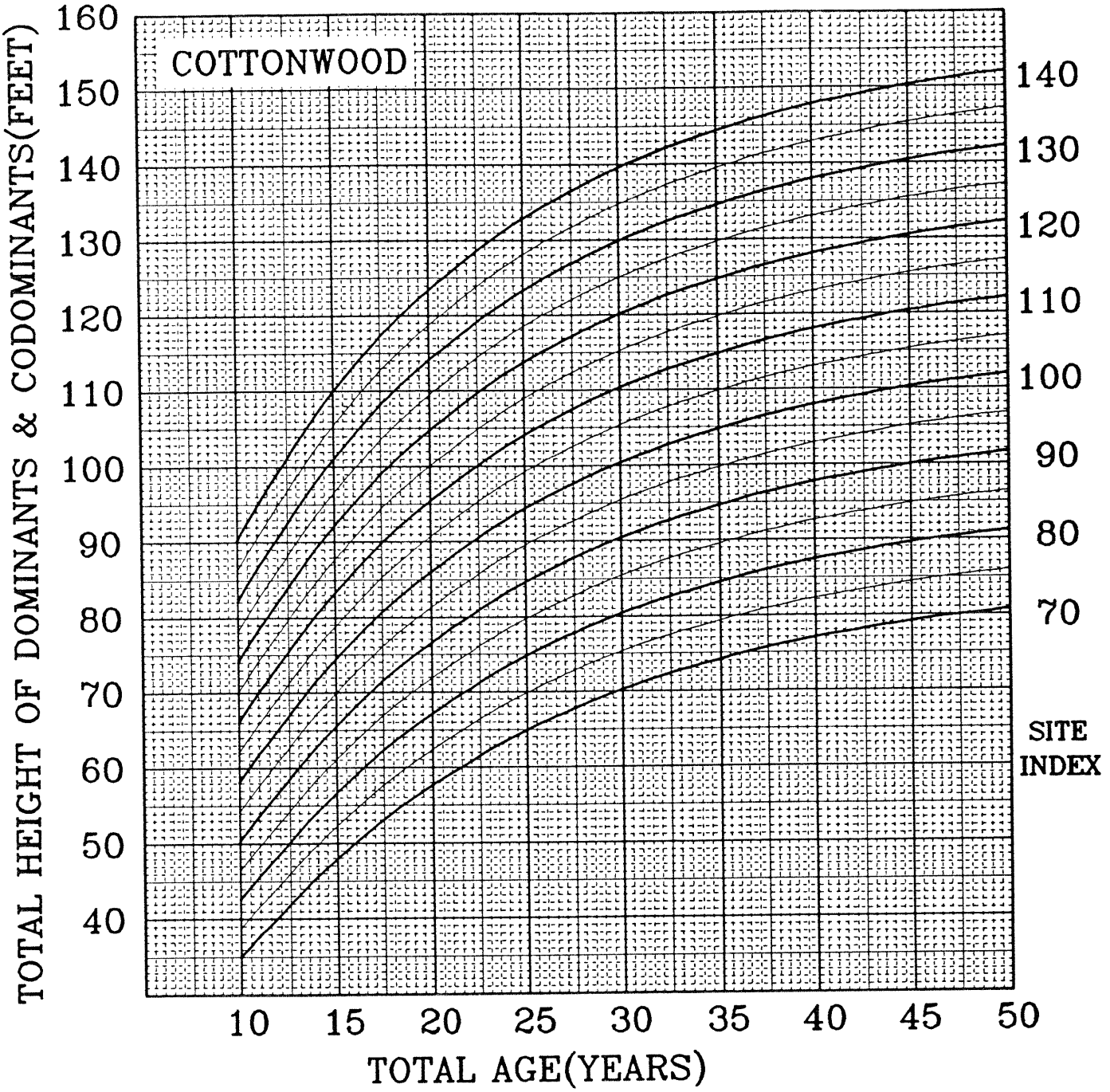


Figure 29.—Cottonwood (Broadfoot 1960)

Mississippi Valley alluvium—Louisiana, Mississippi, Arkansas, Tennessee, Missouri, Kentucky

Number of plots and number of dominant and codominant trees not given

Stem analysis, graphically constructed anamorphic curves, site index is height at 30 years total age

Add 2 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.9426	0.8886	-0.0640	21.0753	-0.6786	0.99	0.90	3.4
SI	0.4754	1.1190	-0.0429	-5.6452	-0.4912	0.99	1.64	4.8

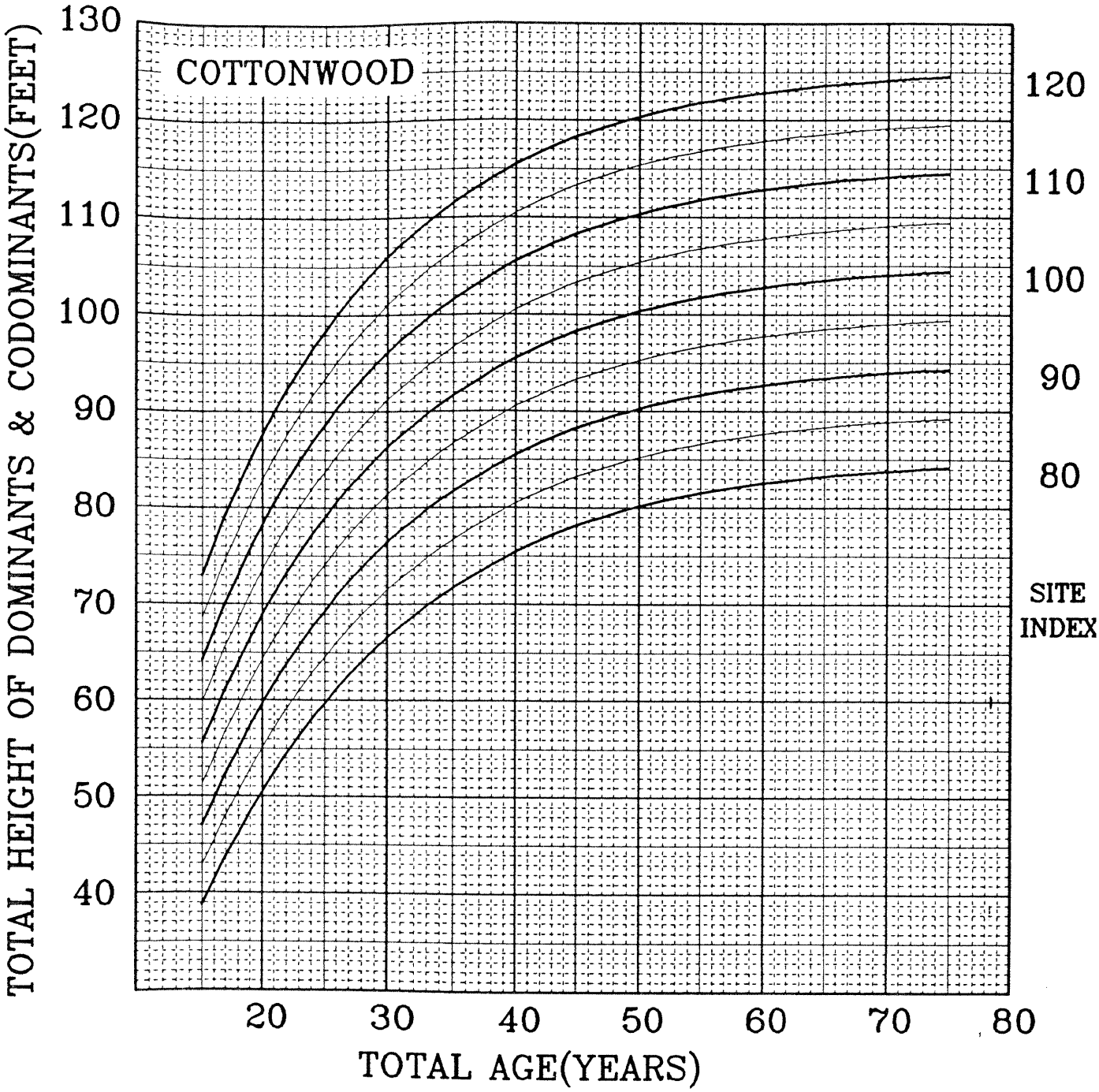


Figure 30.—Cottonwood (Brendemuehl 1965)
Iowa bottomlands
66 plots, number of dominant and codominant trees not given
Total height and total age, anamorphic, equation not given
Add 2 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.2834	0.9571	-0.0680	100.0000	-0.9223	0.99	0.96	3.3
SI	0.7688	1.0412	-0.0462	-14.4222	-0.6595	0.99	1.56	4.4

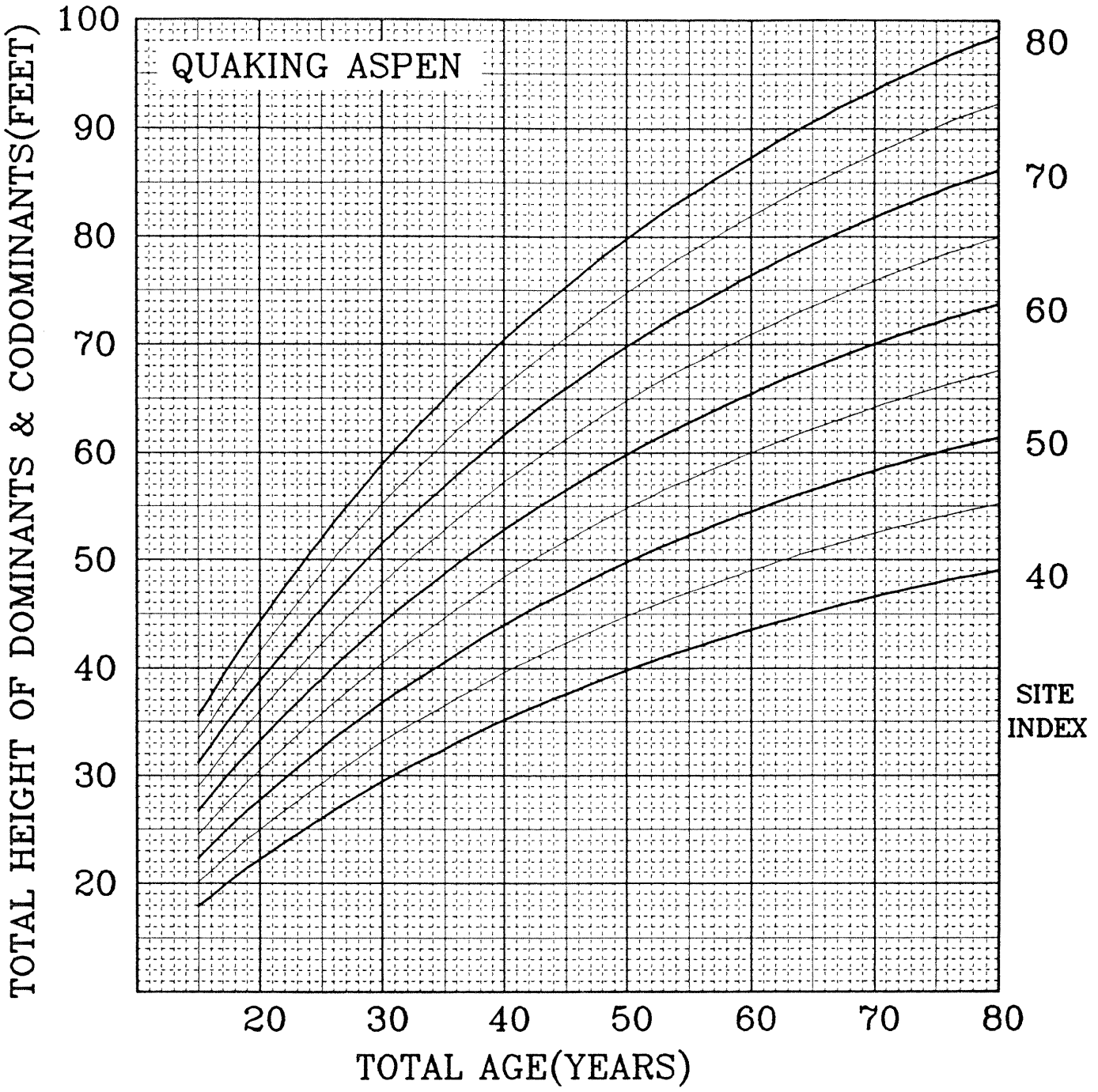


Figure 31.—Quaking aspen (Gevorkiantz 1956a, from Kittredge and Gevorkiantz 1929)

Number of plots and number of dominant and codominant trees not given

Total height and total age, anamorphic, equation not given

Add 4 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.4475	1.0098	-0.0200	0.8489	0.0146	0.99	0.15	0.4
SI	0.6755	1.0000	-0.0213	-0.9367	-0.0002	0.99	0.04	0.1

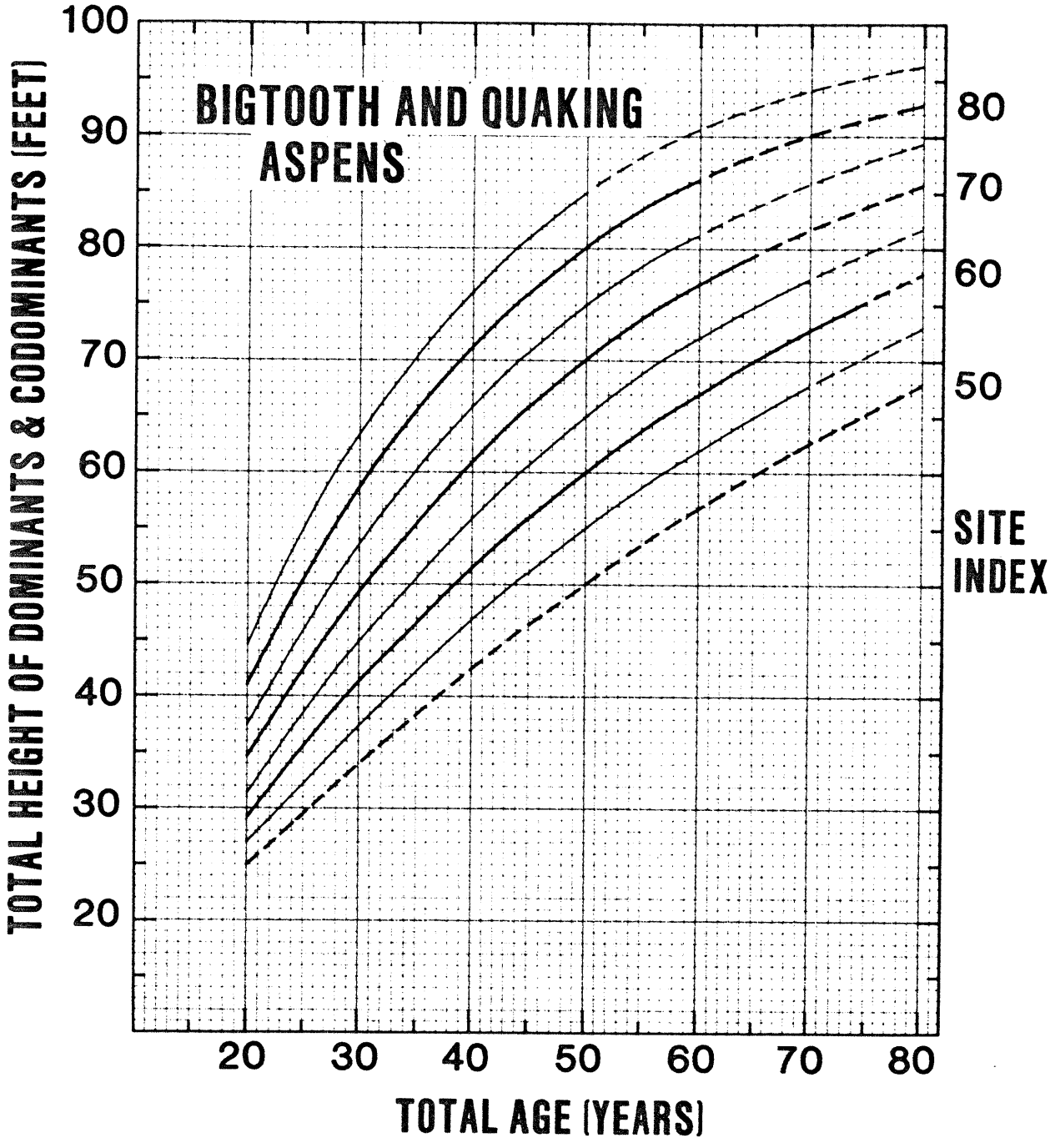


Figure 32.—Bigtooth and quaking aspens (Carmean 1978)
Northern Wisconsin and Upper Michigan
13 plots having 42 dominant and codominant trees
Stem analysis, nonlinear regression, polymorphic
Add 4 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	5.2188	0.6855	-0.0301	50.0071	-0.8695	0.99	1.58	4.5
SI	0.0612	1.4390	-0.0050	-3.9080	-0.4350	0.99	1.90	10.4

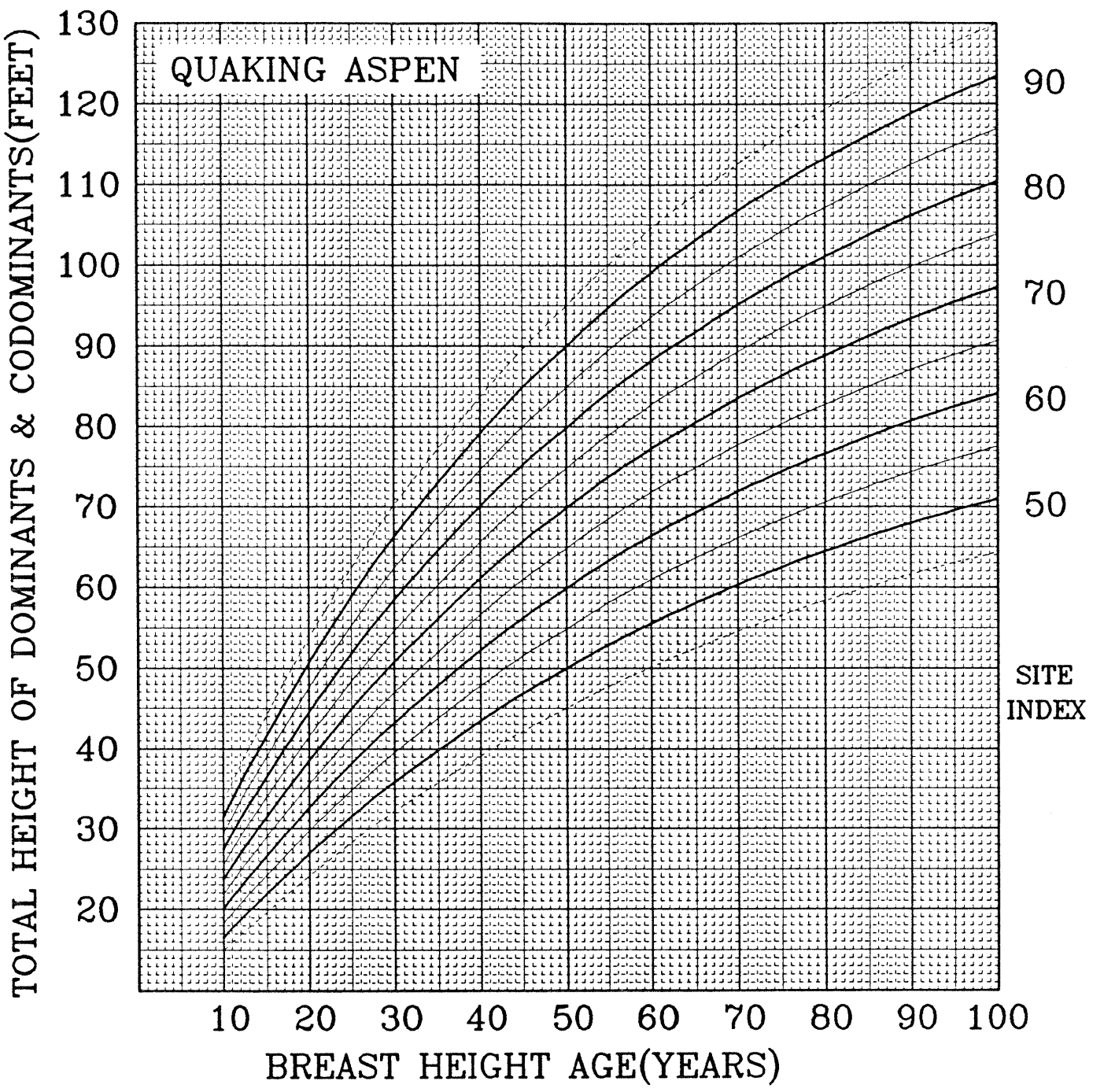


Figure 33.—Quaking aspen (Deschamps 1989)
North central Ontario
99 plots having 3 dominant and codominant trees per plot
Stem analysis, nonlinear regression, polymorphic
Site index is total height at 50 years breast height age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	2.1567	0.9374	-0.0155	2.4997	-0.2338	0.98	0.51	0.3
SI	0.2356	1.1332	-0.0082	-1.0342	-1.0772	0.99	1.01	2.7

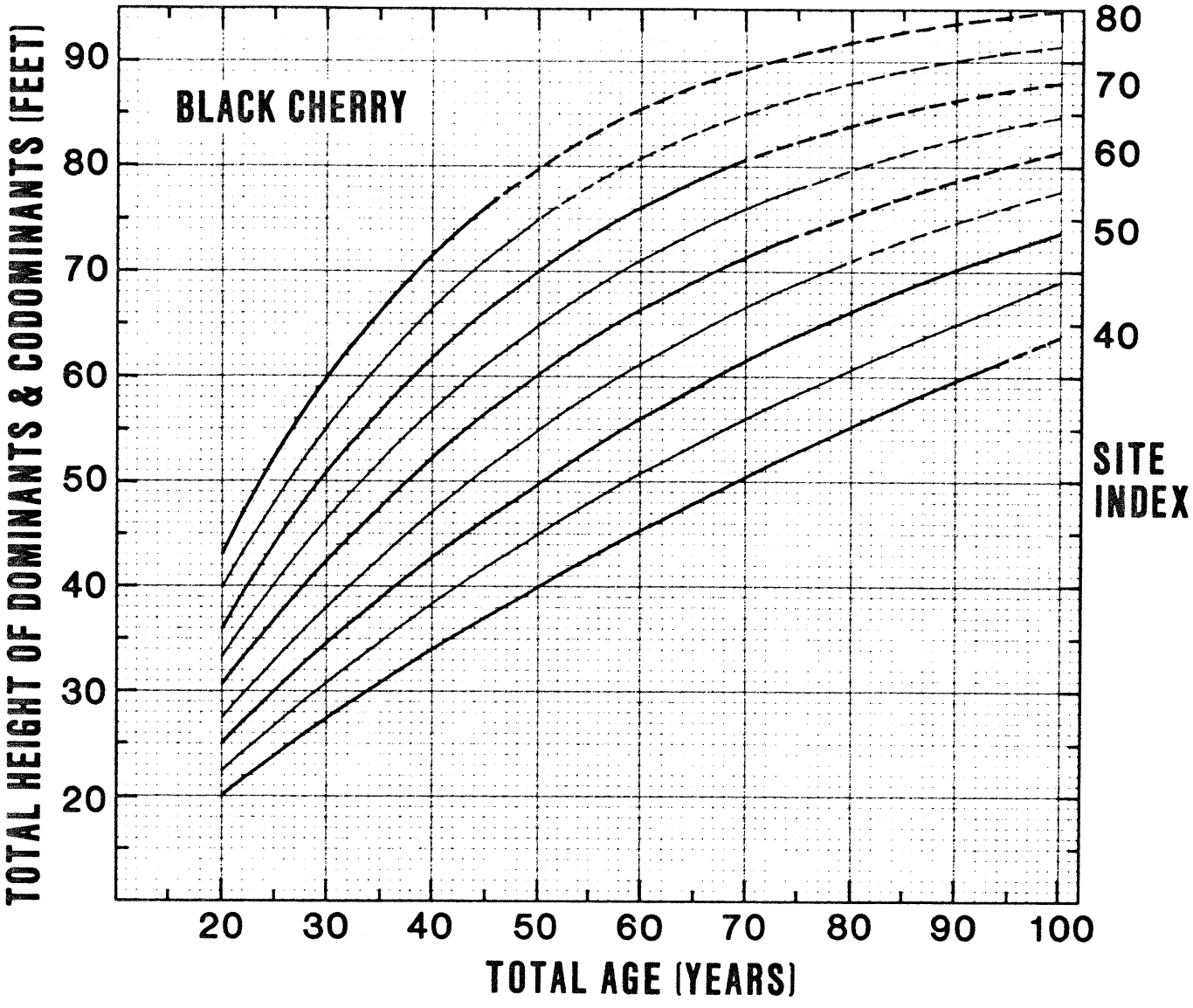


Figure 34.—Black cherry (Carmean 1978)
Northern Wisconsin and Upper Michigan
42 plots having 126 dominant and codominant trees
Stem analysis, nonlinear regression, polymorphic
Add 4 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	5.1493	0.6948	-0.0248	20.9210	-0.7143	0.99	1.55	5.4
SI	0.1073	1.3455	-0.0070	-3.3034	-0.3899	0.99	1.77	9.1

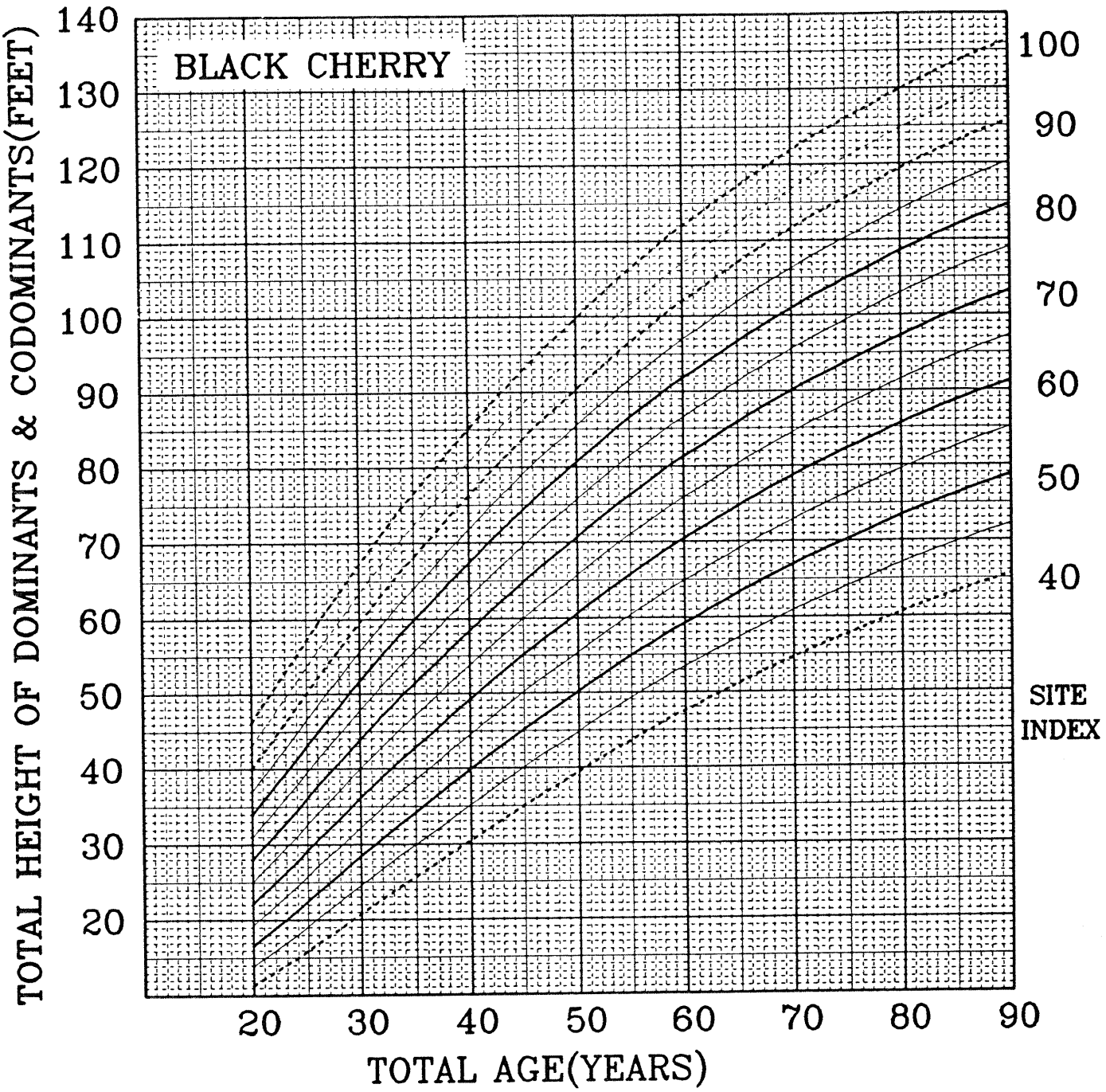


Figure 35.—Black cherry (Auchmoody and Rexrode 1984)
Northwestern Pennsylvania Allegheny Plateau
6 stands having 39 dominant and codominant trees
Stem analysis, site index prediction equations based on second degree quadratic regressions
Add 4 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	7.1846	0.6781	-0.0222	13.9186	-0.5268	0.99	1.54	4.4
SI	0.0063	1.6337	-0.0010	-2.4168	-0.2635	0.99	2.39	6.9

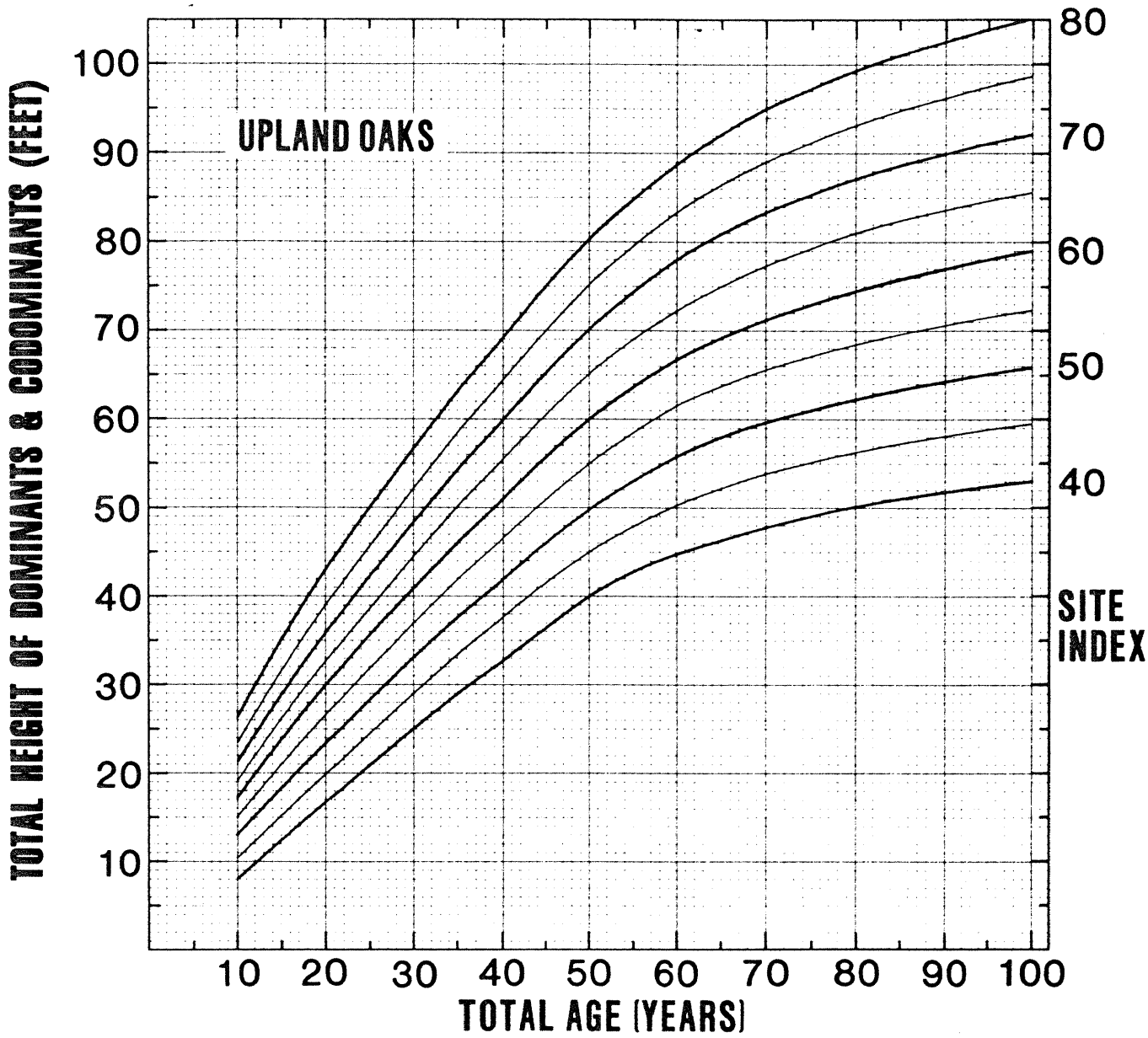


Figure 36.—Upland oaks (Schnur 1937)

Michigan south to Georgia, Missouri east to Pennsylvania and Maryland

404 plots, combined data for white, black, scarlet, chestnut, and red oaks; number of dominant and codominant trees not given

Total height and total age, anamorphic, equation not given

Add 3 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	2.1037	0.9140	-0.0275	3.7962	-0.2530	0.99	1.67	6.6
SI	0.1890	1.2031	-0.0081	-2.1975	-0.2582	0.98	2.23	4.9

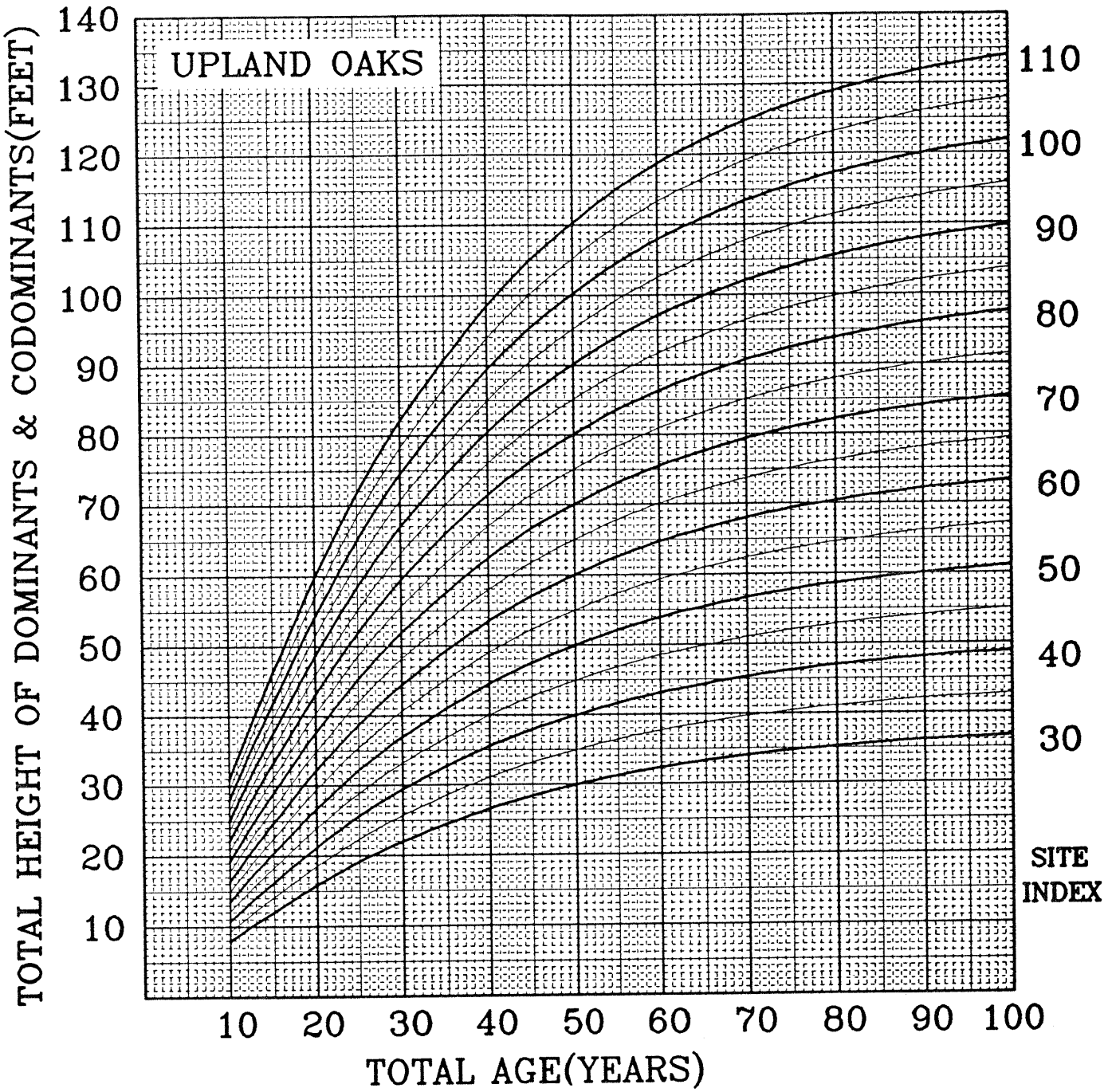


Figure 37.—Upland oaks (Olson 1959)
Virginia-Carolina Piedmont and northern Appalachian Mountains
269 plots in Piedmont, 428 plots in Appalachians, combined data for white, northern red, southern red, scarlet, black, and chestnut oaks; number of dominant and codominant trees not given
Total height and total age, logarithm equation, anamorphic
Add 3 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.2866	0.9962	-0.0355	1.4485	-0.0316	0.99	1.22	3.0
SI	0.7709	1.0063	-0.0356	-1.5038	-0.0419	0.99	1.29	4.4

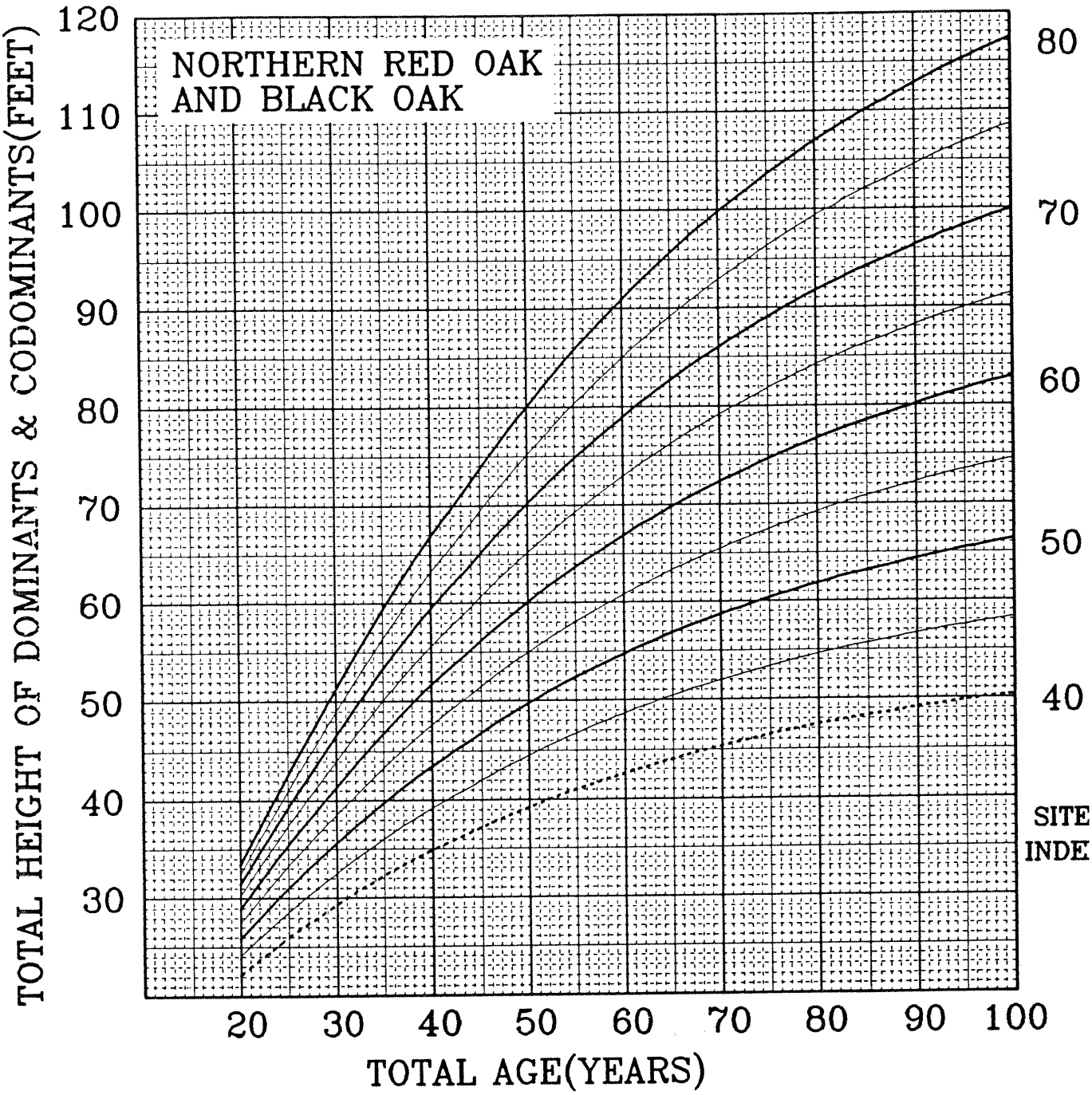


Figure 38.—Northern red oak and black oak (Graney and Bower 1971)
Boston Mountains of Arkansas
Number of plots not given, 142 dominant and codominant trees
Stem analysis, polynomial equation, anamorphic
Add 3 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	0.4737	1.2905	-0.0236	0.0979	0.6121	0.99	2.01	10.3
SI	1.6229	0.8134	-0.0439	-0.1886	0.6157	0.99	1.46	6.5

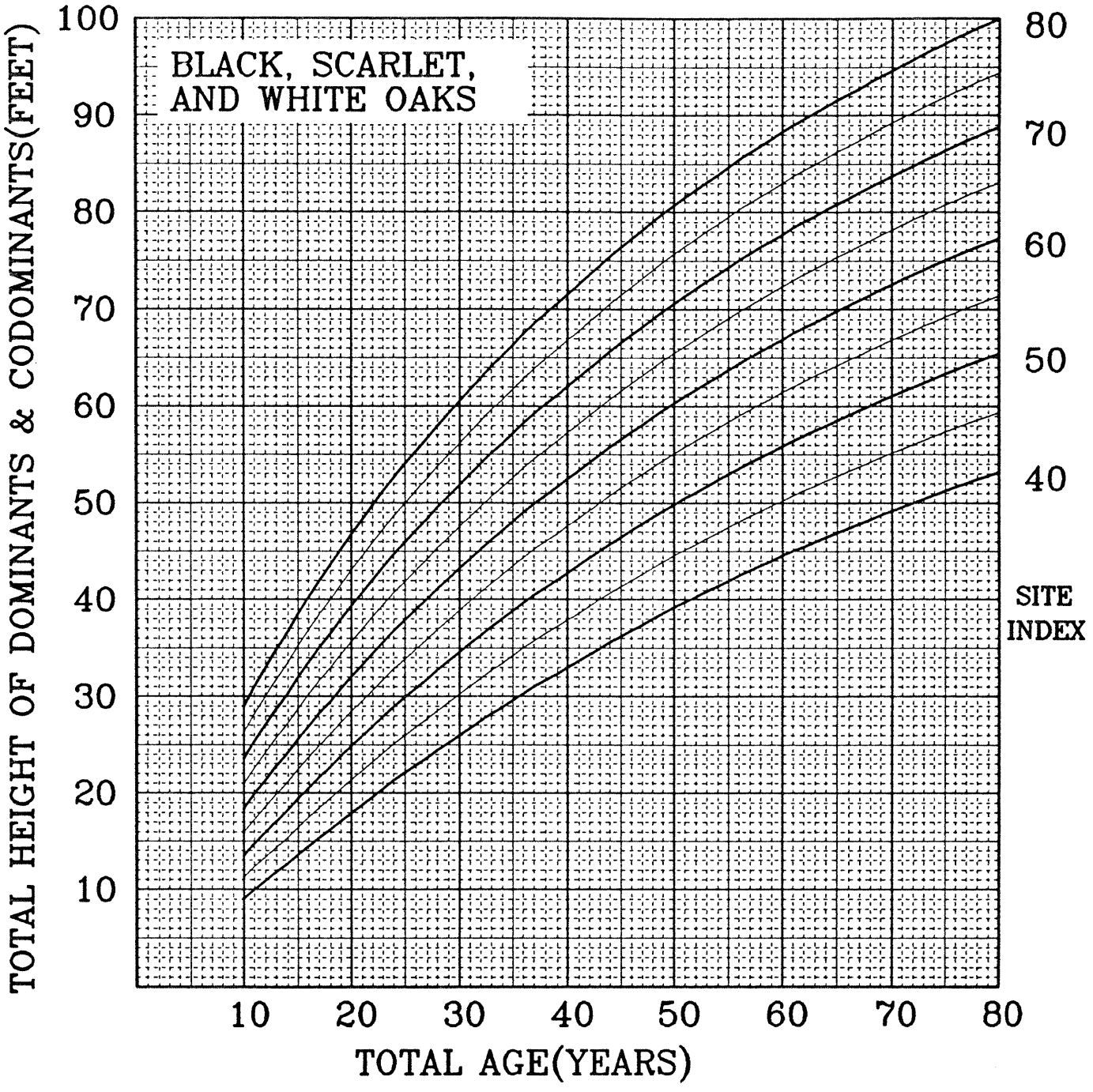


Figure 39.—Black, scarlet, and white oaks (McQuilkin 1974, 1978)
Missouri Ozarks—Clark and Mark Twain National Forests
Number of plots not given; combined data for 399 black oak, 276 white oak, and 66 scarlet oak dominant and codominant trees
Stem analysis, anamorphic, site index prediction equations using Hegar (1968) model, separate equations for black and scarlet oak, and for white oak (McQuilkin 1974)
Add 2 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	4.9676	-0.7459	-0.0154	7.3640	-0.5144	0.99	1.92	3.5
SI	0.0064	1.6595	-0.0003	-1.8660	-0.2916	0.99	1.82	2.7

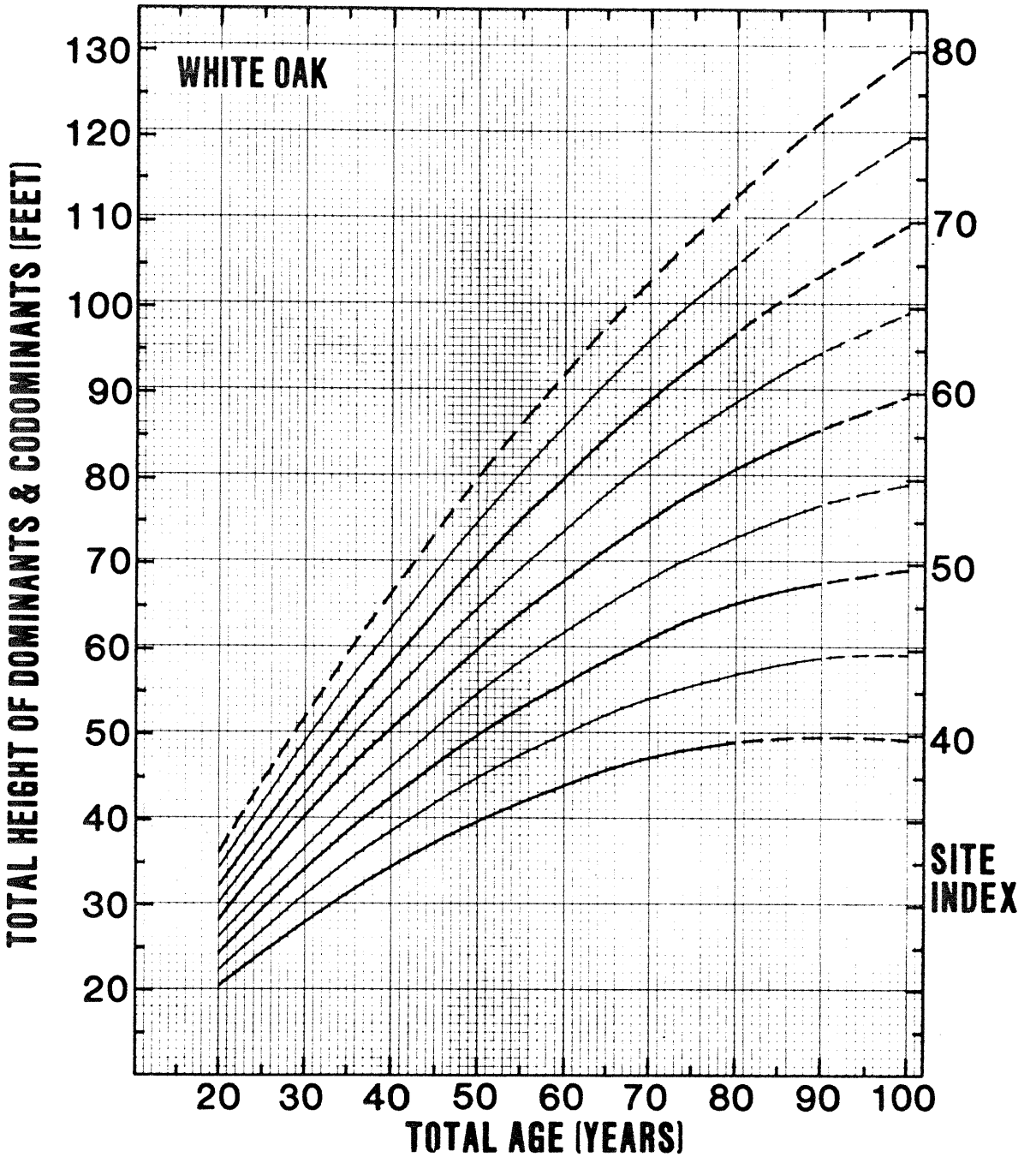


Figure 40.—White oak (Graney and Bower 1971)
Boston Mountains of Arkansas
Number of plots not given, 136 dominant and codominant trees
Stem analysis, polynomial equation, anamorphic
Add 3 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	0.5605	1.3105	-0.0145	0.1779	0.4323	0.99	1.17	6.2
SI	1.4040	0.8163	-0.0314	-0.3078	0.4260	0.99	0.98	3.4

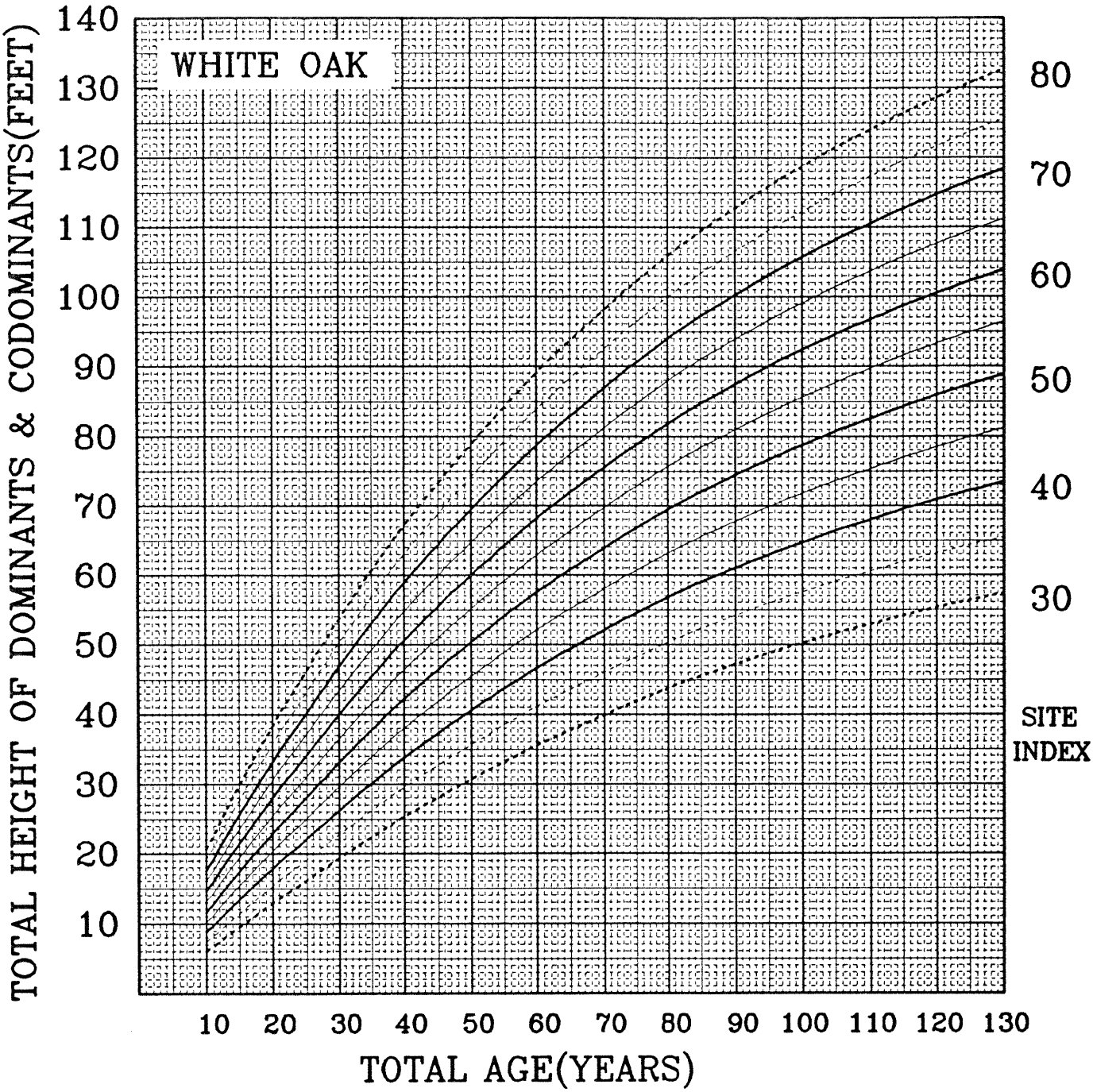


Figure 41.—White oak (Carmean 1971, 1972)
Unglaciated uplands of southeastern Ohio, eastern Kentucky, southern Indiana, southern Illinois, and southern Missouri
41 plots having 112 dominant and codominant trees
Stem analysis, nonlinear regression, polymorphic
Add 3 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	4.5598	0.8136	-0.0132	2.2410	-0.1880	0.99	2.69	(1)
SI	0.3387	1.0135	-0.0076	-0.9644	-0.0176	0.99	2.90	(1)

(1) Value not calculated because model was fitted to original data rather than to site index curves.

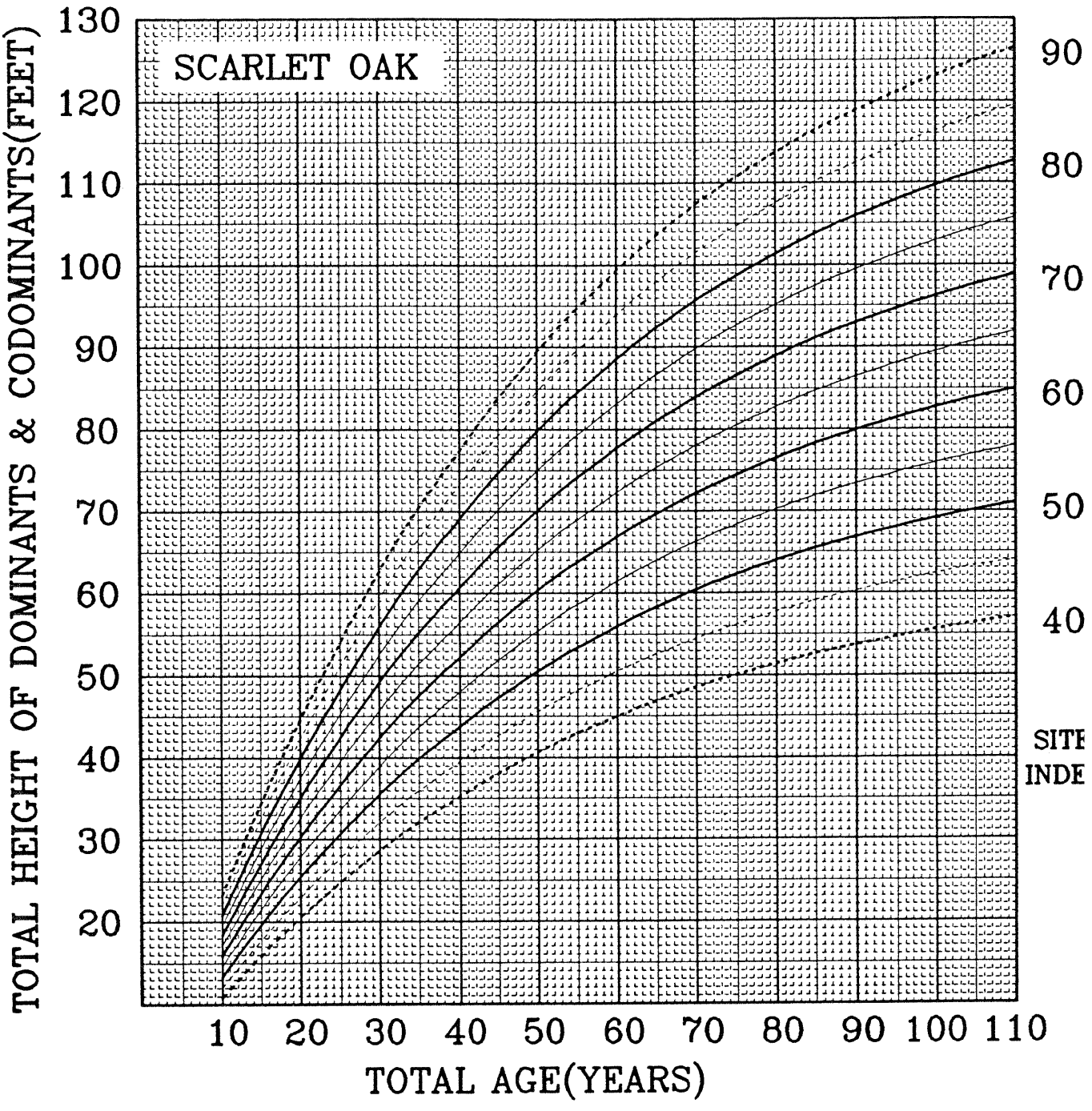


Figure 42.—Scarlet oak (Carmean 1971, 1972)
Unglaciated uplands of southeastern Ohio, eastern Kentucky, southern Illinois, and southern Missouri
25 plots having 88 dominant and codominant trees
Stem analysis, nonlinear regression, polymorphic
Add 3 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.6763	0.9837	-0.0220	0.9949	0.0240	0.99	2.77	(1)
SI	0.7423	0.9677	-0.0223	-1.0260	-0.0137	0.99	5.29	(1)

(1) Value not calculated because model was fitted to original data rather than to site index curves.

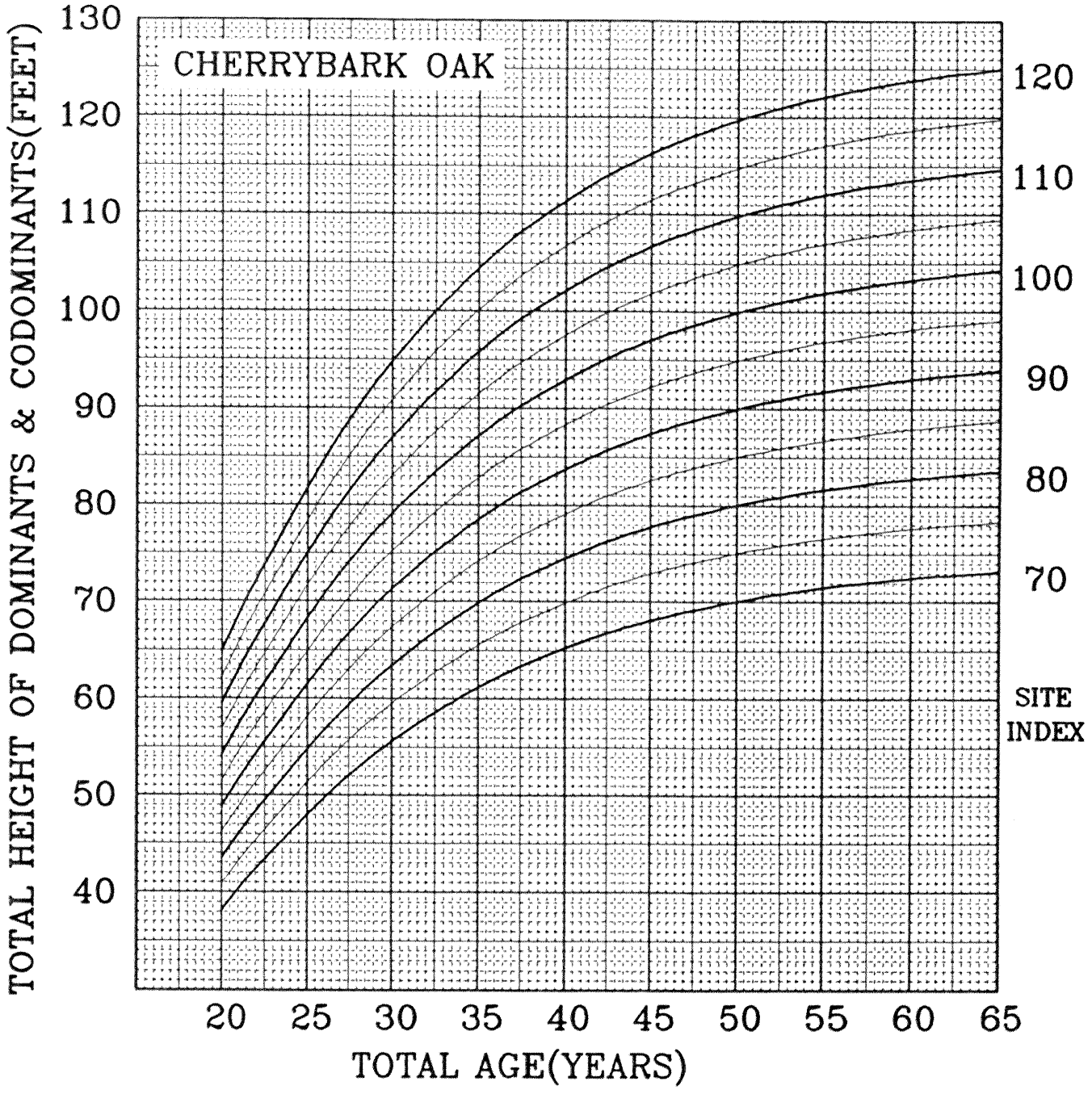


Figure 43.—Cherrybark oak (Broadfoot 1961)
Mississippi Valley alluvium—Louisiana, Mississippi, Arkansas, Tennessee
Number of plots and number of dominant and codominant trees not given
Stem analysis, graphically constructed anamorphic curves
Add 2 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.0945	0.9938	-0.0755	2.5601	0.0114	0.99	1.03	4.2
SI	0.9452	0.9987	-0.0762	-1.8868	0.0861	0.99	1.37	5.7

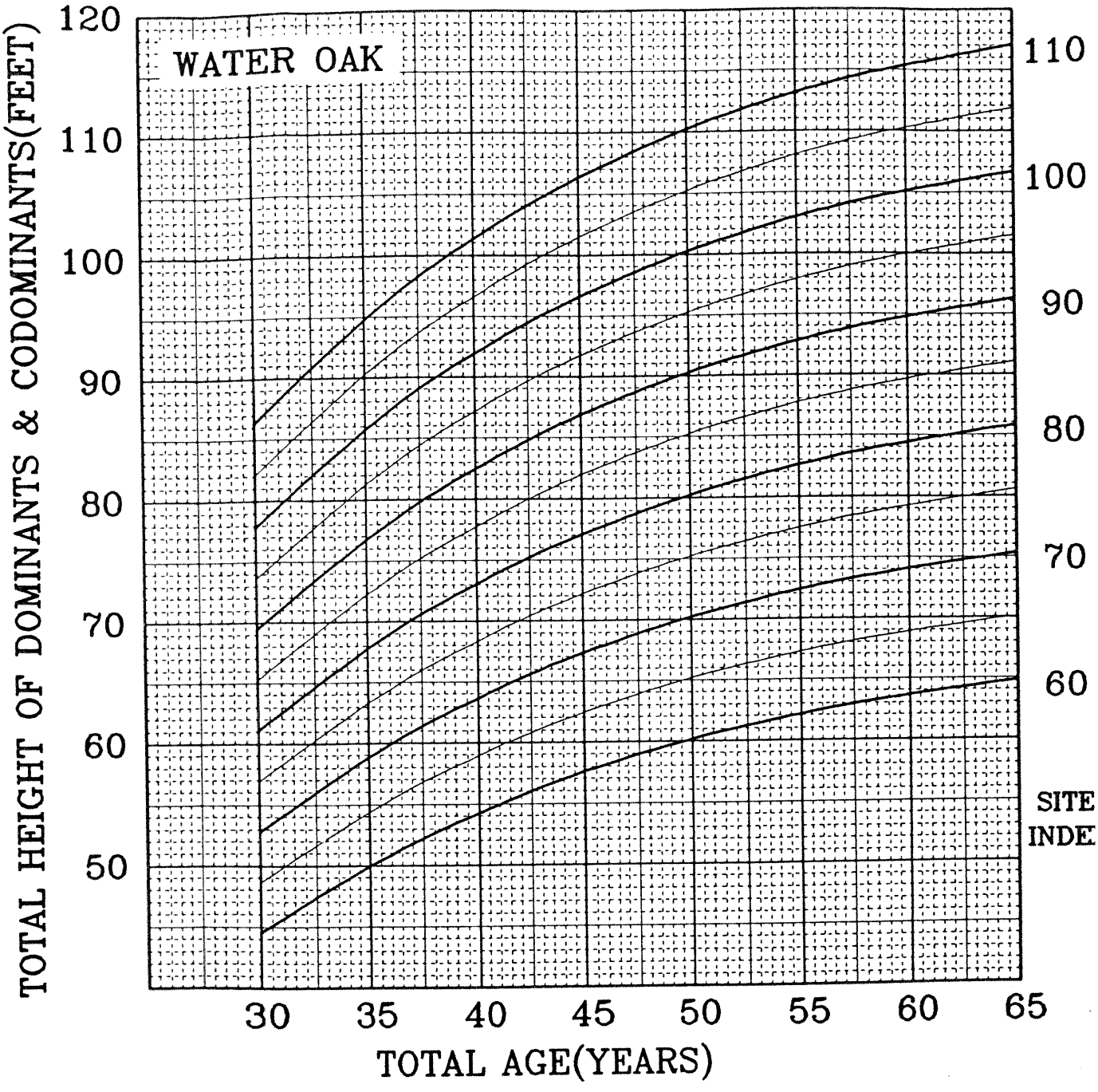


Figure 44.—Water oak (Broadfoot 1963)
Mississippi Valley alluvium—Louisiana, Mississippi, Arkansas, Tennessee
Number of plots and number of dominant and codominant trees not given
Stem analysis, graphically constructed anamorphic curves
Add 2 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.3466	0.9590	-0.0574	8.9538	-0.3454	0.99	0.62	2.2
SI	0.7317	1.0415	-0.0504	-6.1926	-0.3191	0.99	0.69	2.4

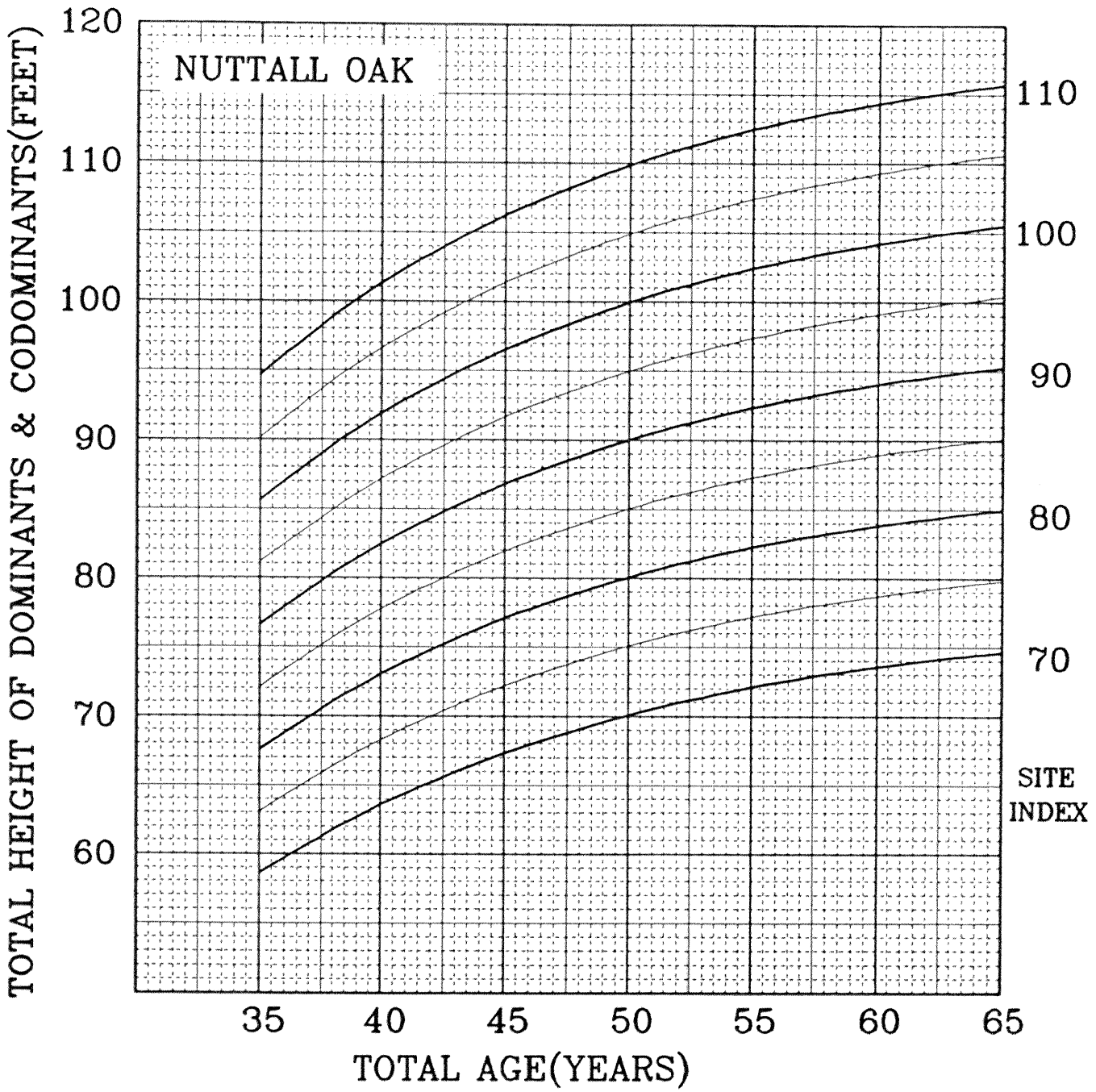


Figure 45.—Nuttall oak (Broadfoot 1969)
Mississippi Valley alluvium—Louisiana, Mississippi, Arkansas, Tennessee
Number of dominant and codominant trees not given
Stem analysis, graphically constructed anamorphic curves
Add 2 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.3295	0.9565	-0.0668	16.0085	-0.4157	0.99	0.38	1.9
SI	0.7488	1.0424	-0.0597	-10.0941	-0.3709	0.99	0.42	2.1

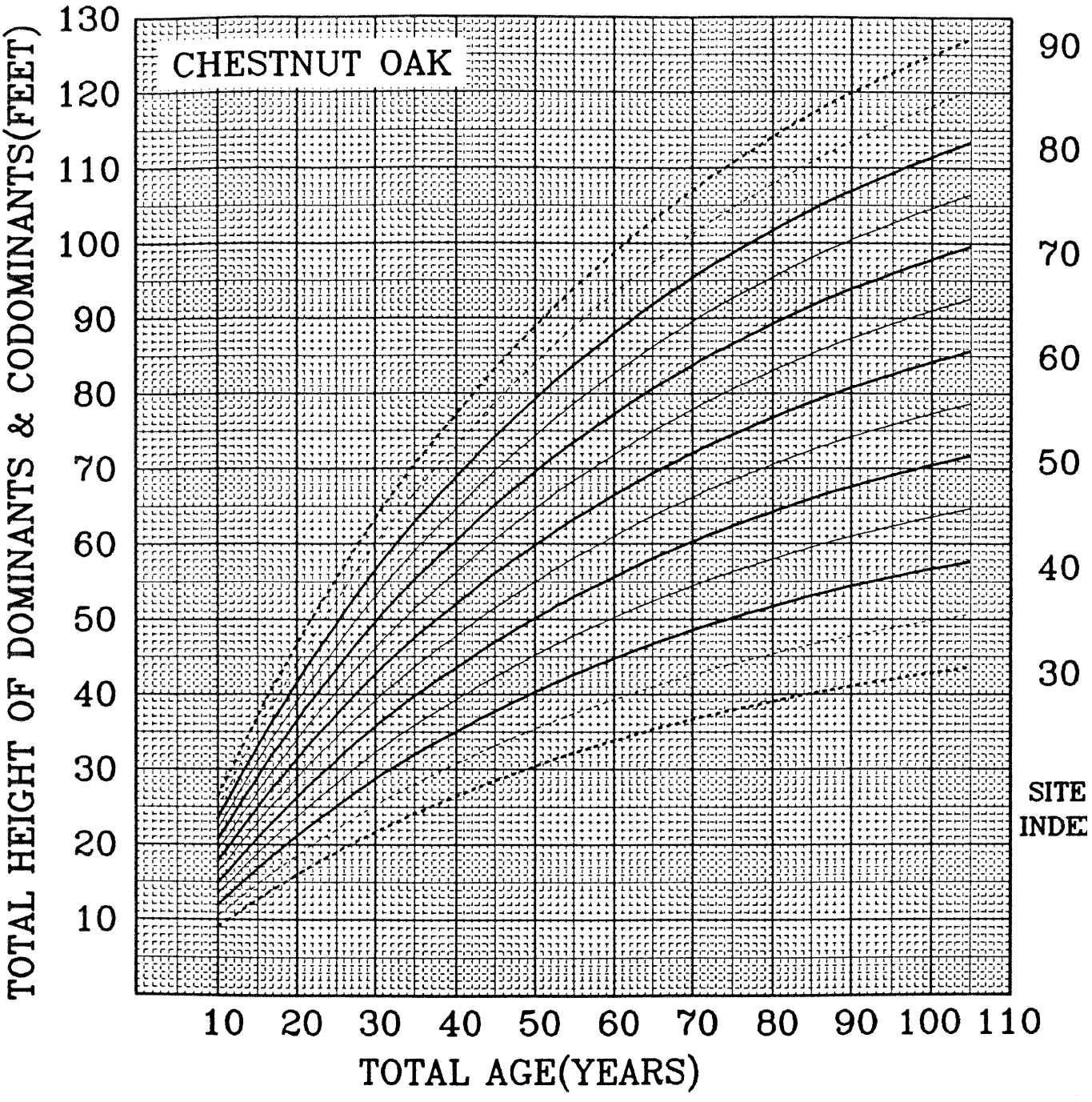


Figure 46.—Chestnut oak (Carmean 1971, 1972)
Unglaciated uplands of southeastern Ohio, eastern Kentucky, and southern Indiana
18 plots having 59 dominant and codominant trees
Stem analysis, nonlinear regression, polymorphic
Add 3 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.9044	0.9752	-0.0162	0.9262	0.0000	0.99	3.28	(1)
SI	0.4124	1.0394	-0.0100	-0.9980	-0.0583	0.99	6.85	(1)

(1) Value not calculated because model was fitted to original data rather than to site index curves.

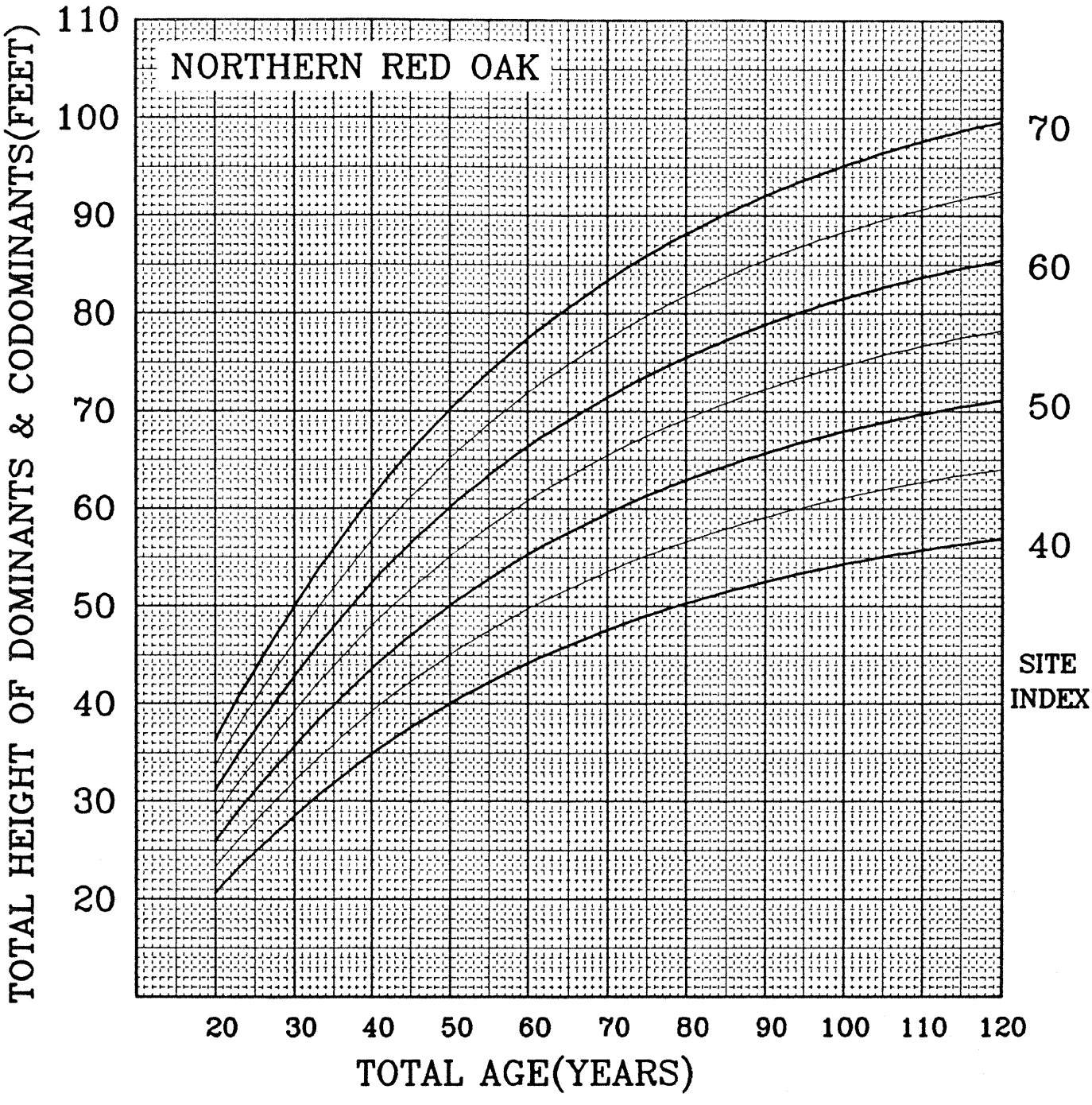


Figure 47.—Northern red oak (Gevorkiantz 1957b)
Southwestern Wisconsin
Number of plots and number of dominant and codominant trees not given
Total height and total age, anamorphic, equation not given
Add 4 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.5403	1.0006	-0.0216	1.0616	-0.0044	0.99	0.86	0.7
SI	1.0000	0.9058	-0.0269	-0.5382	0.2108	0.98	1.19	3.4

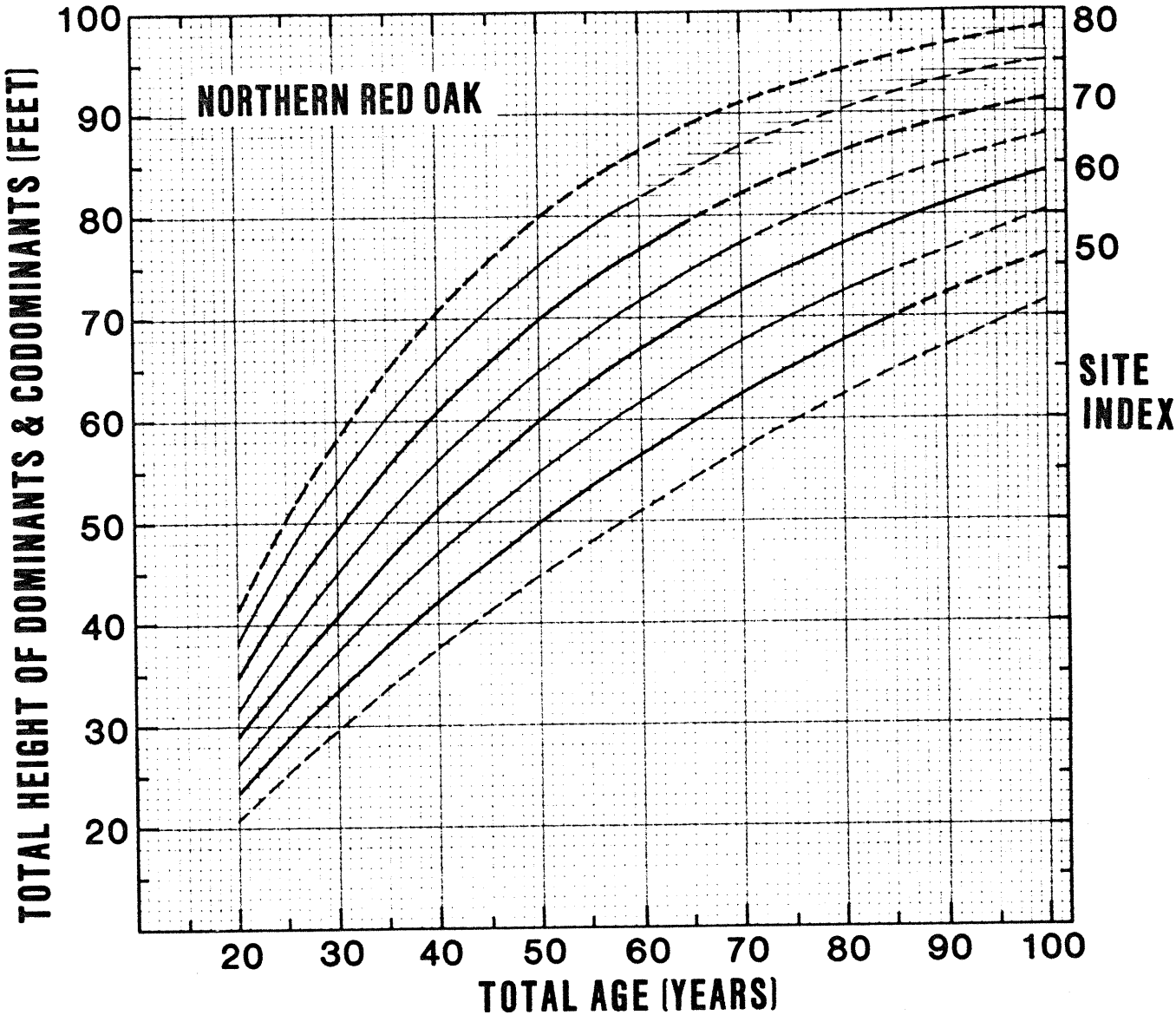


Figure 48.—Northern red oak (Carmean 1978)
Northern Wisconsin and Upper Michigan
37 plots having 136 dominant and codominant trees
Stem analysis, nonlinear regression, polymorphic
Add 4 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	6.1785	0.6619	-0.0241	25.0185	-0.7400	0.99	1.32	4.9
SI	0.1692	1.2648	-0.0110	-3.4334	-0.3557	0.97	2.09	7.8

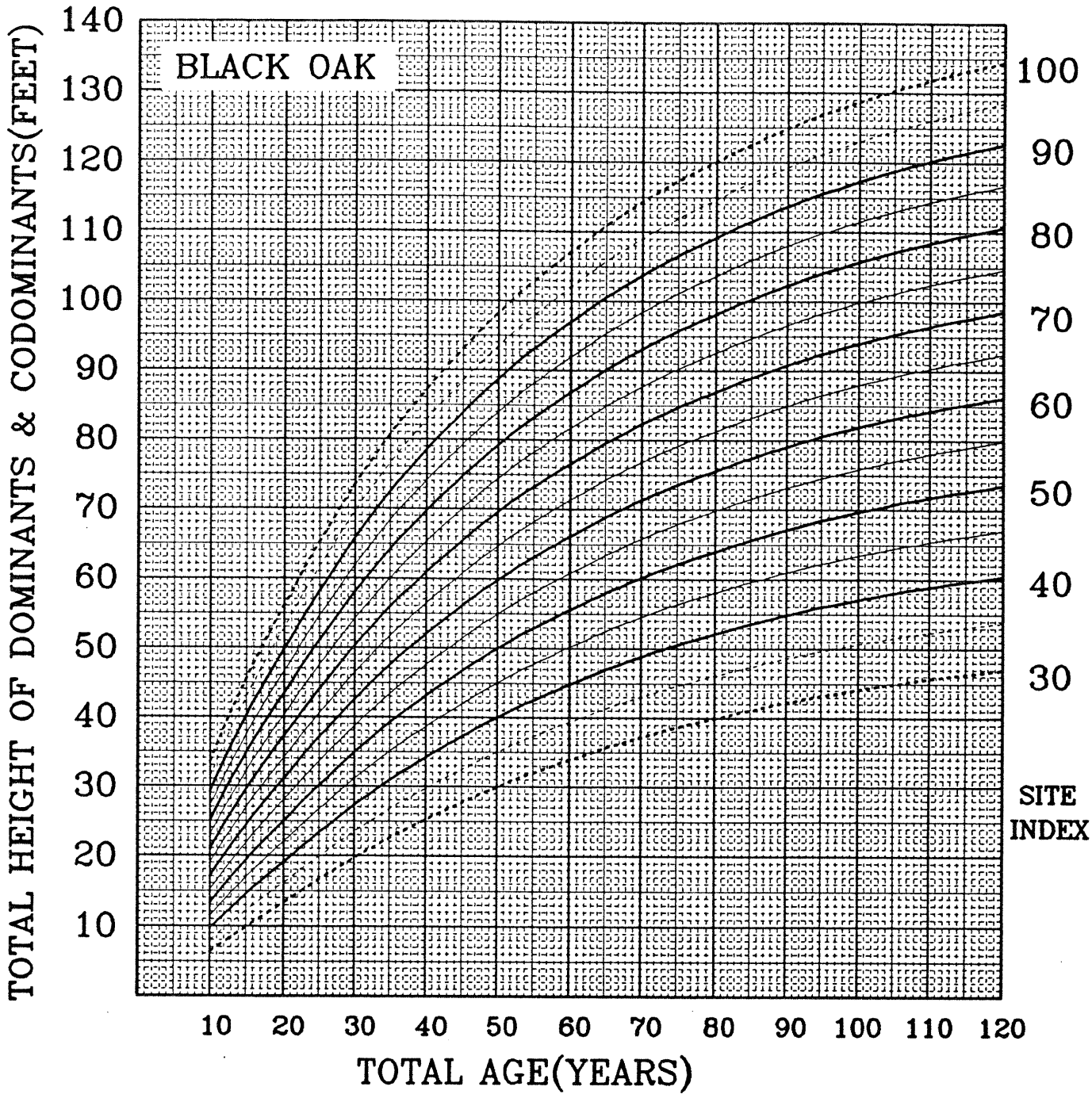


Figure 49.—Black oak (Carmean 1971, 1972)
Unglaciated uplands of southeastern Ohio, eastern Kentucky, southern Indiana, and southern Missouri
120 plots having 300 dominant and codominant trees
Stem analysis, nonlinear regression, polymorphic
Add 3 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	2.9989	0.8435	-0.0200	3.4635	-0.3020	0.99	4.09	(1)
SI	0.2598	1.1721	-0.0107	-2.3272	-0.2825	0.99	4.42	(1)

(1) Value not calculated because model was fitted to original data rather than to site index curves.

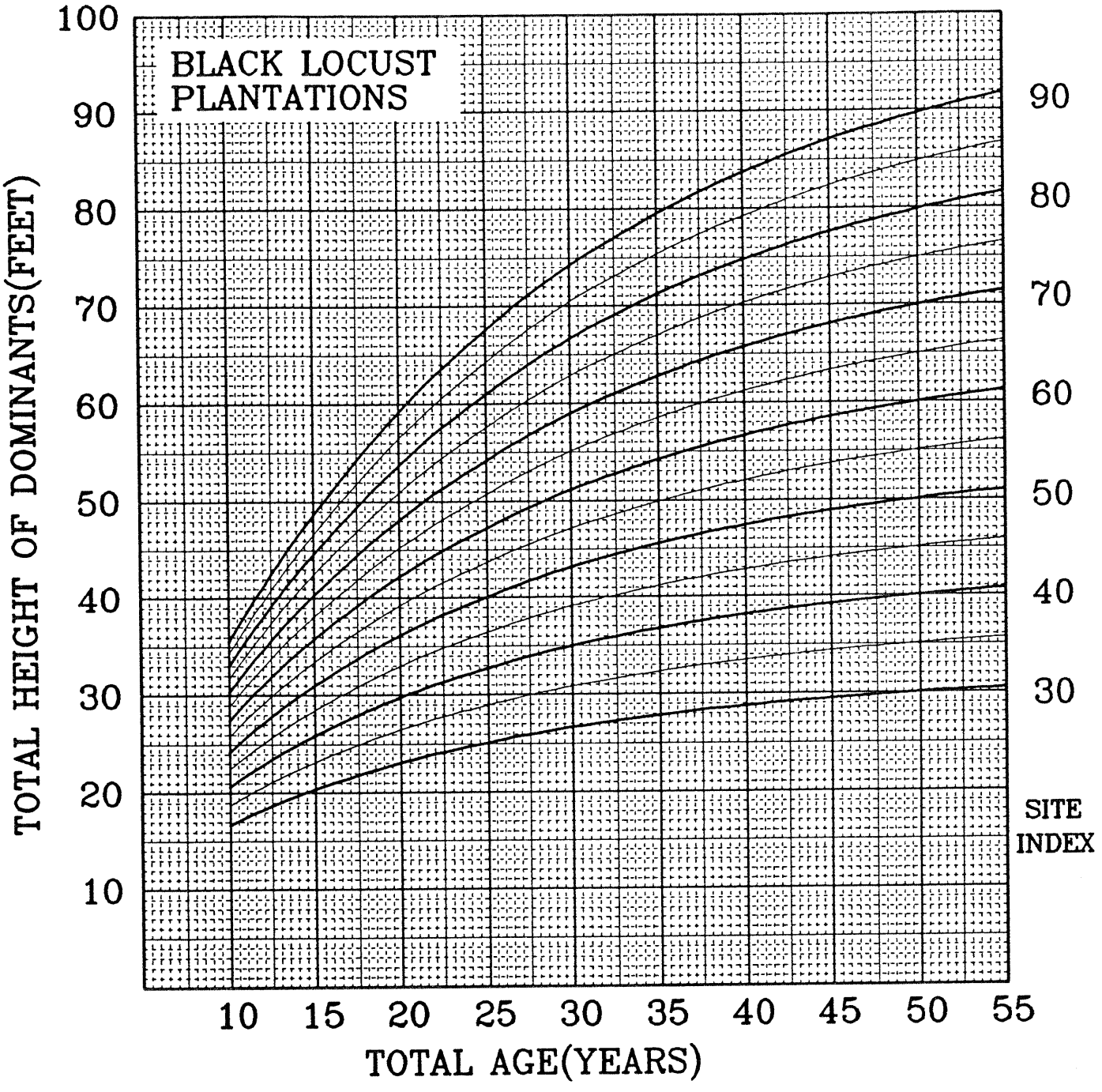


Figure 50.—Black locust plantations (Kellogg 1939a)
Central States
170 plots, number of dominant trees not given
Total height and total age, anamorphic, equation not given
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	30-45	46-65	66+
Years:	3	2	1

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	0.9680	1.0301	-0.0468	0.1639	0.4127	0.99	1.42	6.0
SI	0.9411	0.9941	-0.0535	-0.4600	0.2242	0.99	1.85	8.7

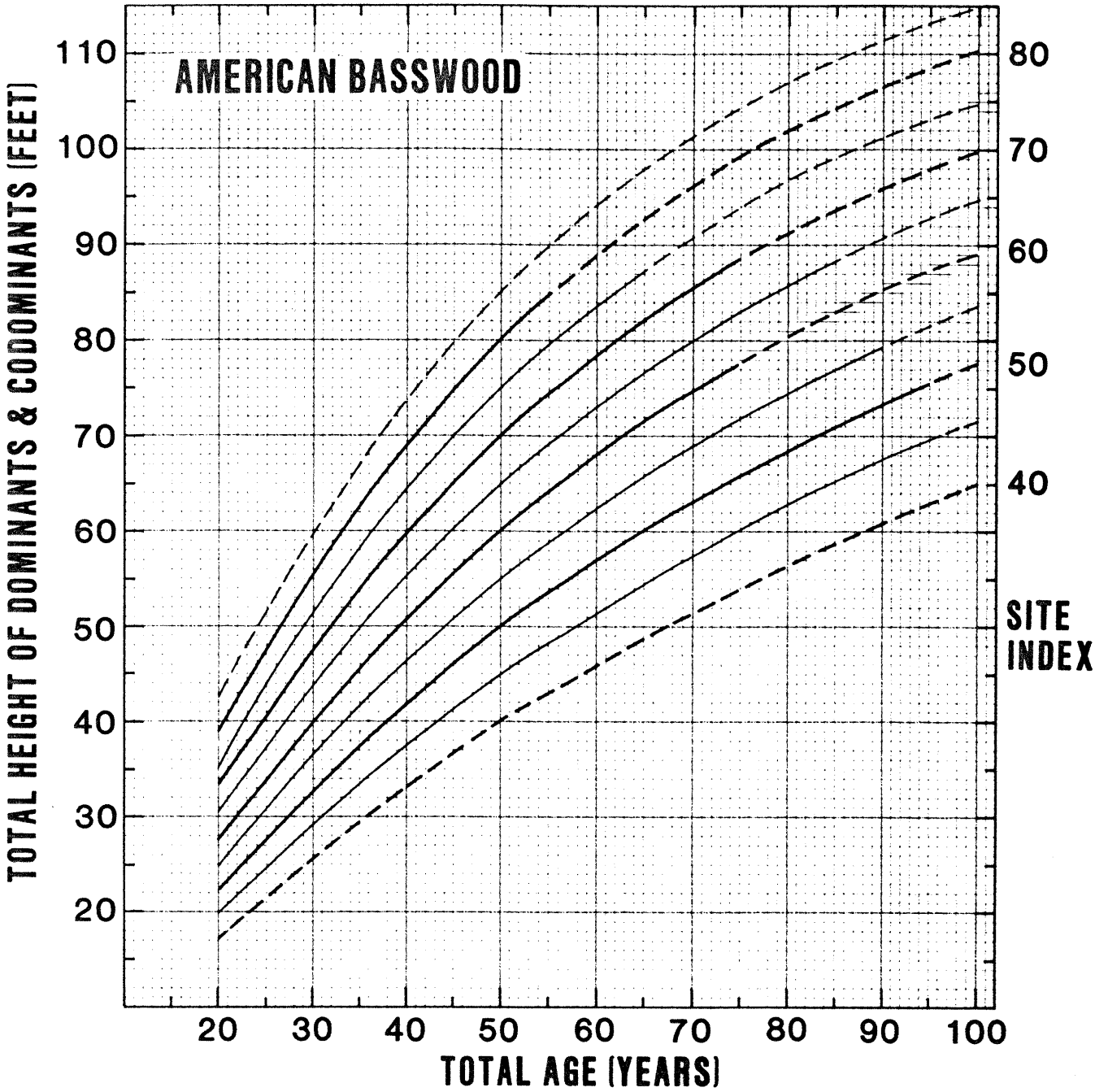


Figure 51.—American basswood (Carmean 1978)
Northern Wisconsin and Upper Michigan
122 plots having 483 dominant and codominant trees
Stem analysis, nonlinear regression, polymorphic
Add 4 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	4.7633	0.7576	-0.0194	6.5110	-0.4156	0.99	0.70	2.7
SI	0.1921	1.2010	-0.0100	-2.3009	-0.2331	0.99	1.24	4.5

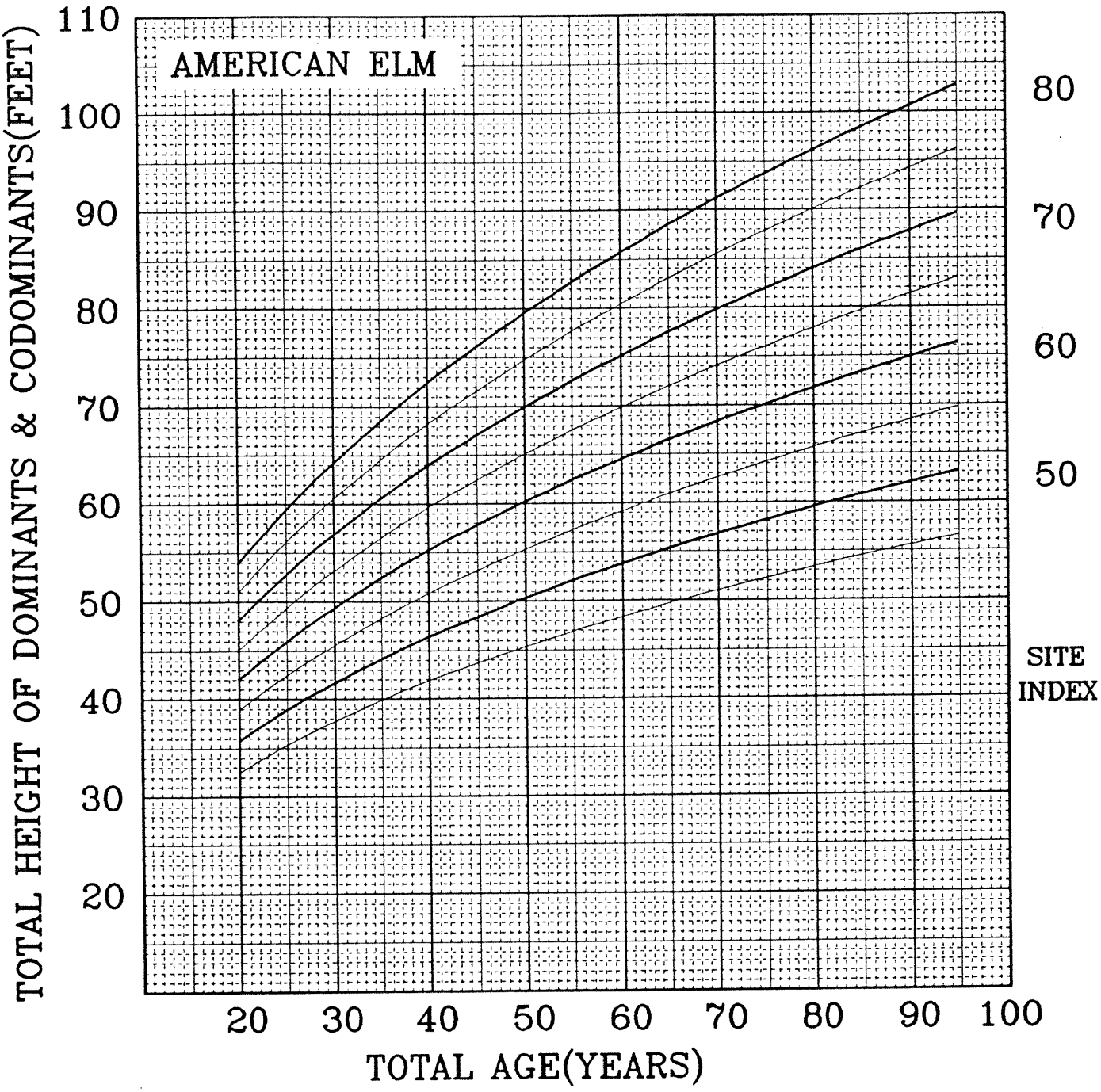


Figure 52.—American elm (Brendemuehl, McComb, and Thomson 1961a)
Southern Iowa
Number of plots and number of dominant and codominant trees not given
Total height and total age, anamorphic, equation not given
Add 3 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.0370	1.1906	-0.0030	0.1391	0.2655	0.99	0.92	2.5
SI	1.1330	0.8807	-0.0160	-0.1140	-0.4054	0.99	1.22	4.1

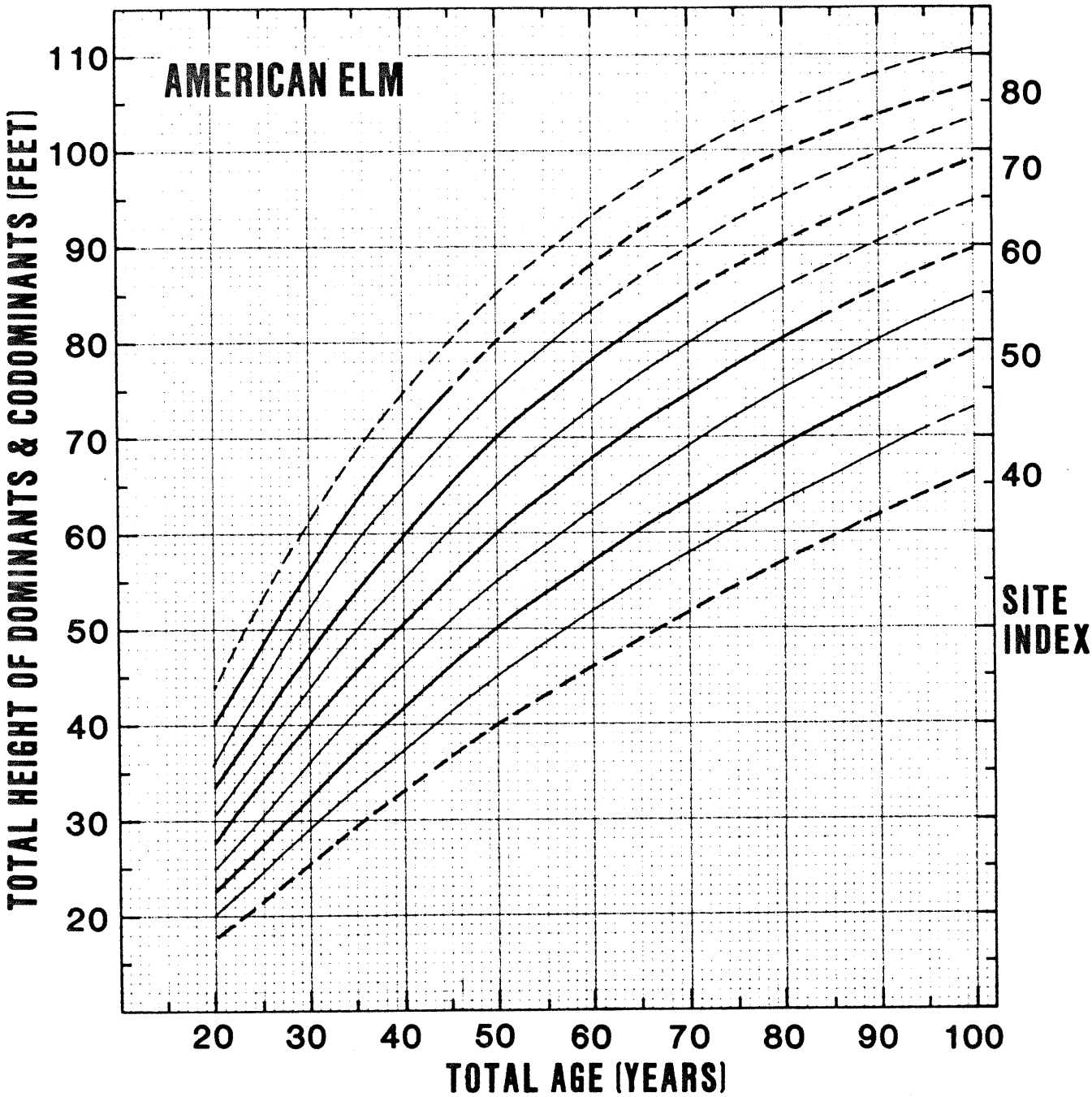


Figure 53.—American elm (Carmean 1978)
Northern Wisconsin and Upper Michigan
109 plots having 416 dominant and codominant trees
Stem analysis, nonlinear regression, polymorphic
Add 4 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	6.4362	0.6827	-0.0194	10.9767	-0.5477	0.99	1.12	4.4
SI	0.1898	1.2186	-0.0110	-2.6865	-0.2717	0.99	1.99	6.6

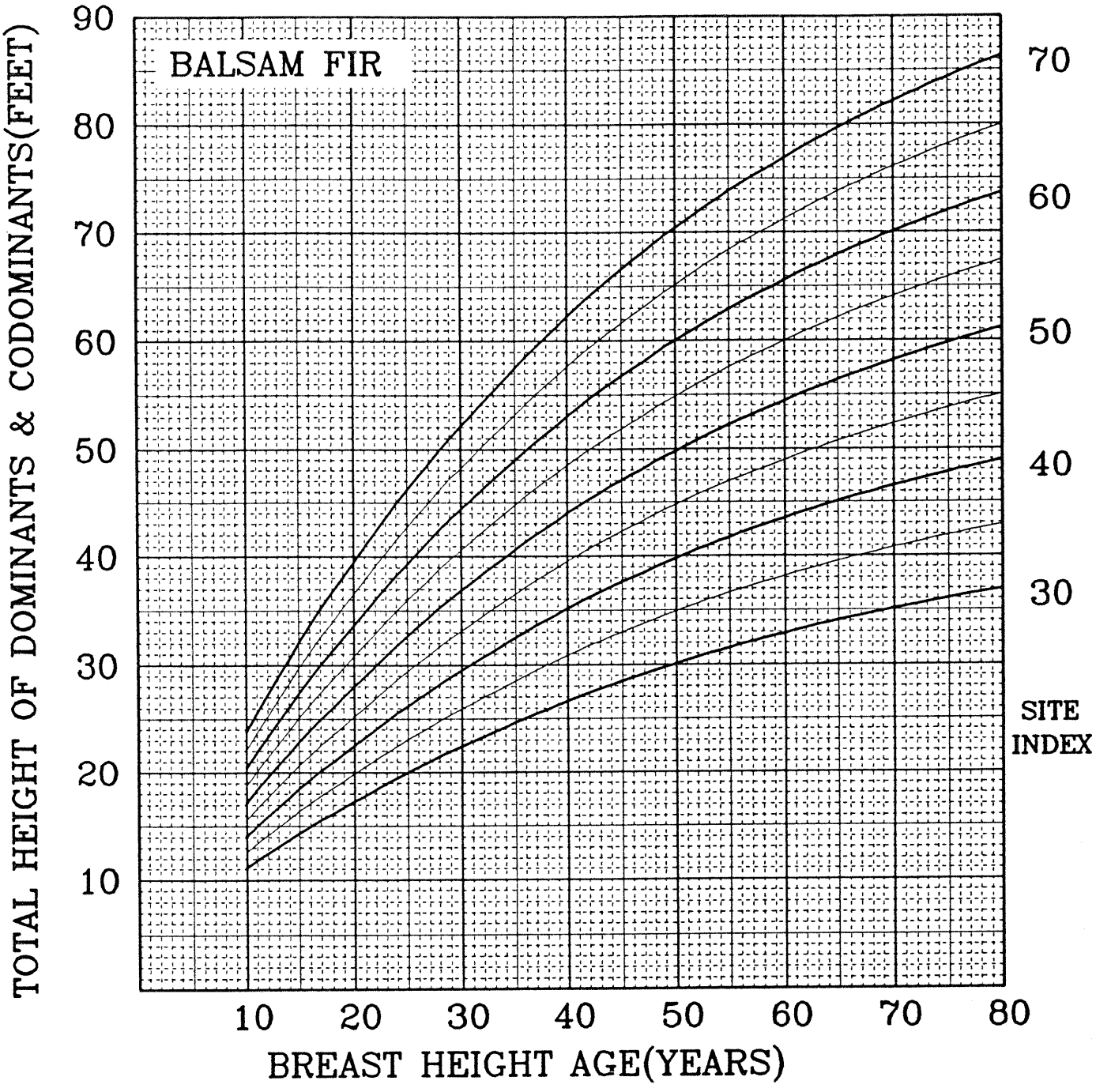


Figure 54.—Balsam fir (Gevorkiantz 1956b)

Lake States

Number of plots and number of dominant and codominant trees not given

Total height and breast height age, anamorphic, equation not given

Site index is total height of dominant and codominant trees at 50 years breast height age (BH = 4.5)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.0438	1.0708	-0.0222	1.5915	-0.1068	0.99	1.08	1.6
SI	0.4358	1.0650	-0.0179	-0.7497	0.0251	0.99	1.18	2.1

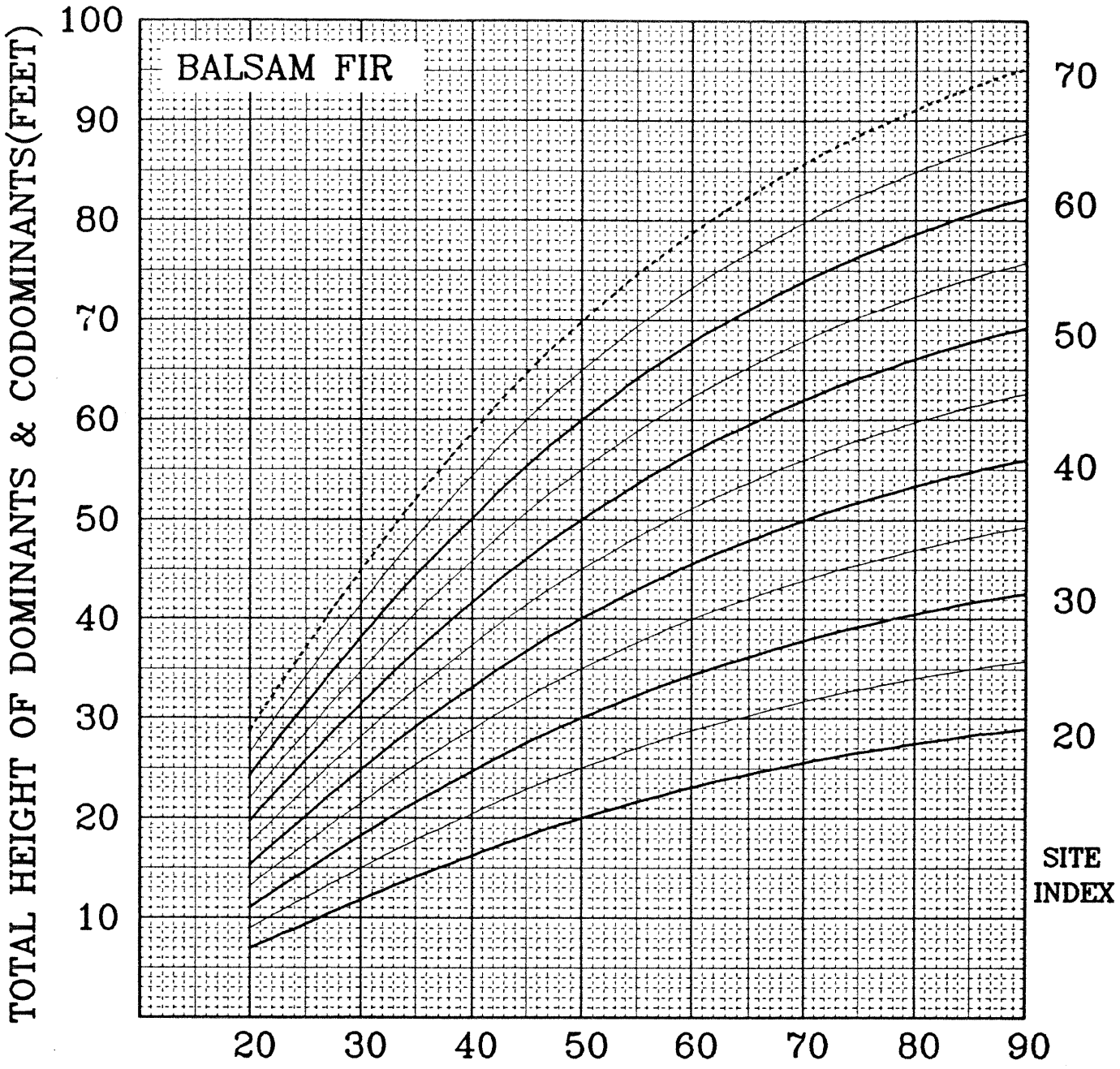


Figure 55.—Balsam fir (Carmean and Hahn 1981, revision of Gevorkiantz 1956b)

Lake States

Number of plots and number of dominant and codominant trees not given

Total height and total age, anamorphic, Gevorkiantz (1956b) equation not given

Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	20	30	40	50	60	70
Years:	15	13	11	10	9	8

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	2.0770	0.9303	-0.0285	2.8937	-0.1414	0.97	0.95	1.7
SI	0.4100	1.0799	-0.0205	-2.1577	-0.1295	0.98	1.07	2.5

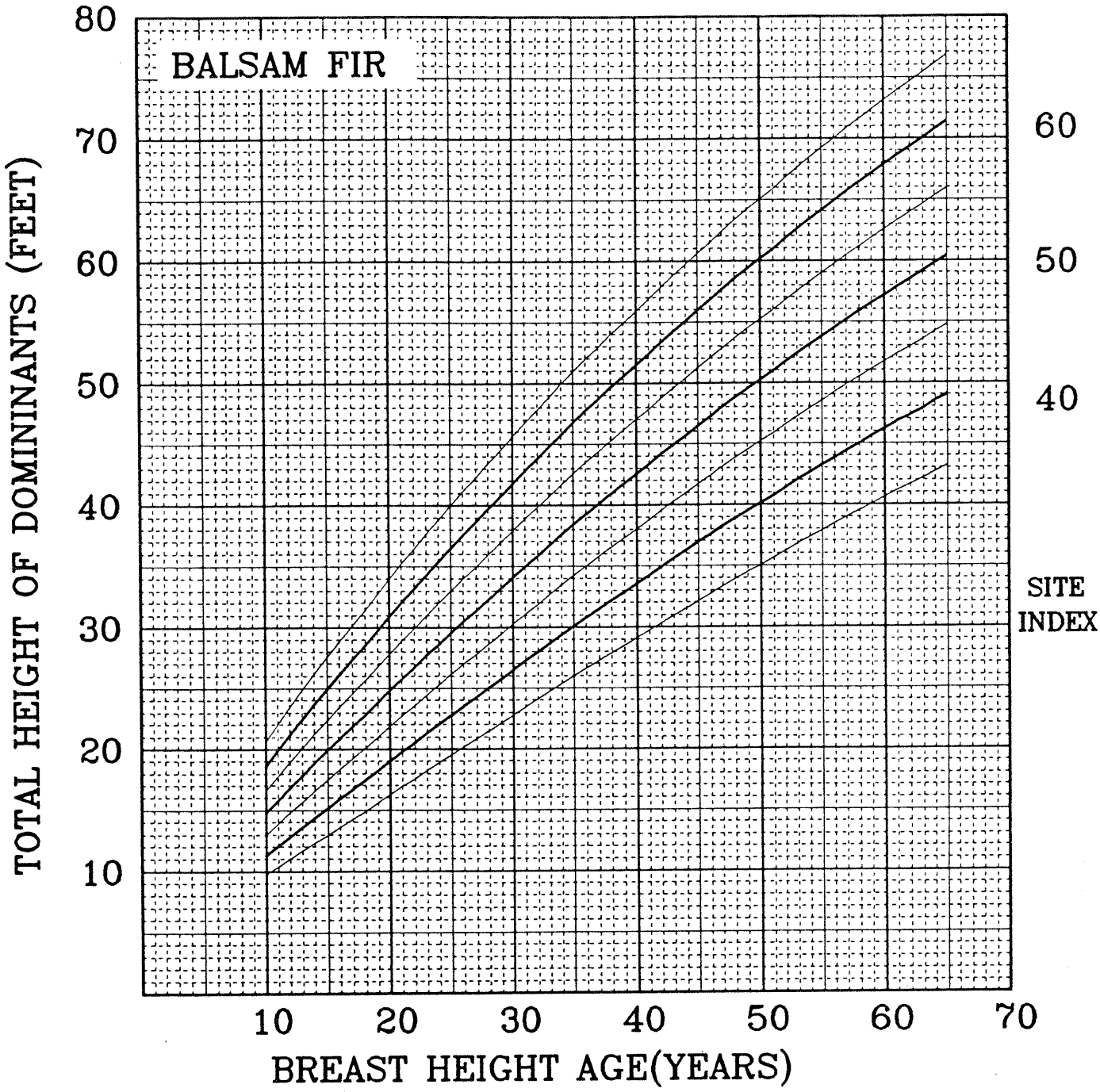


Figure 56.—Balsam fir (Griffin and Johnson 1980)
Northern Maine (Aroostock and Piscataquis Counties)
42 plots using stem analysis of "six tallest trees" (dominants) on each plot; trees older than 45 years breast height age
Stem analysis, quadratic regression, polymorphic
Site index is height of dominant trees at 50 years breast height age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	8.1200	0.6748	-0.0111	6.4229	-0.4586	0.99	0.95	1.1
SI	0.0061	1.3539	-0.00019	-1.0286	-0.0723	0.99	1.61	8.2

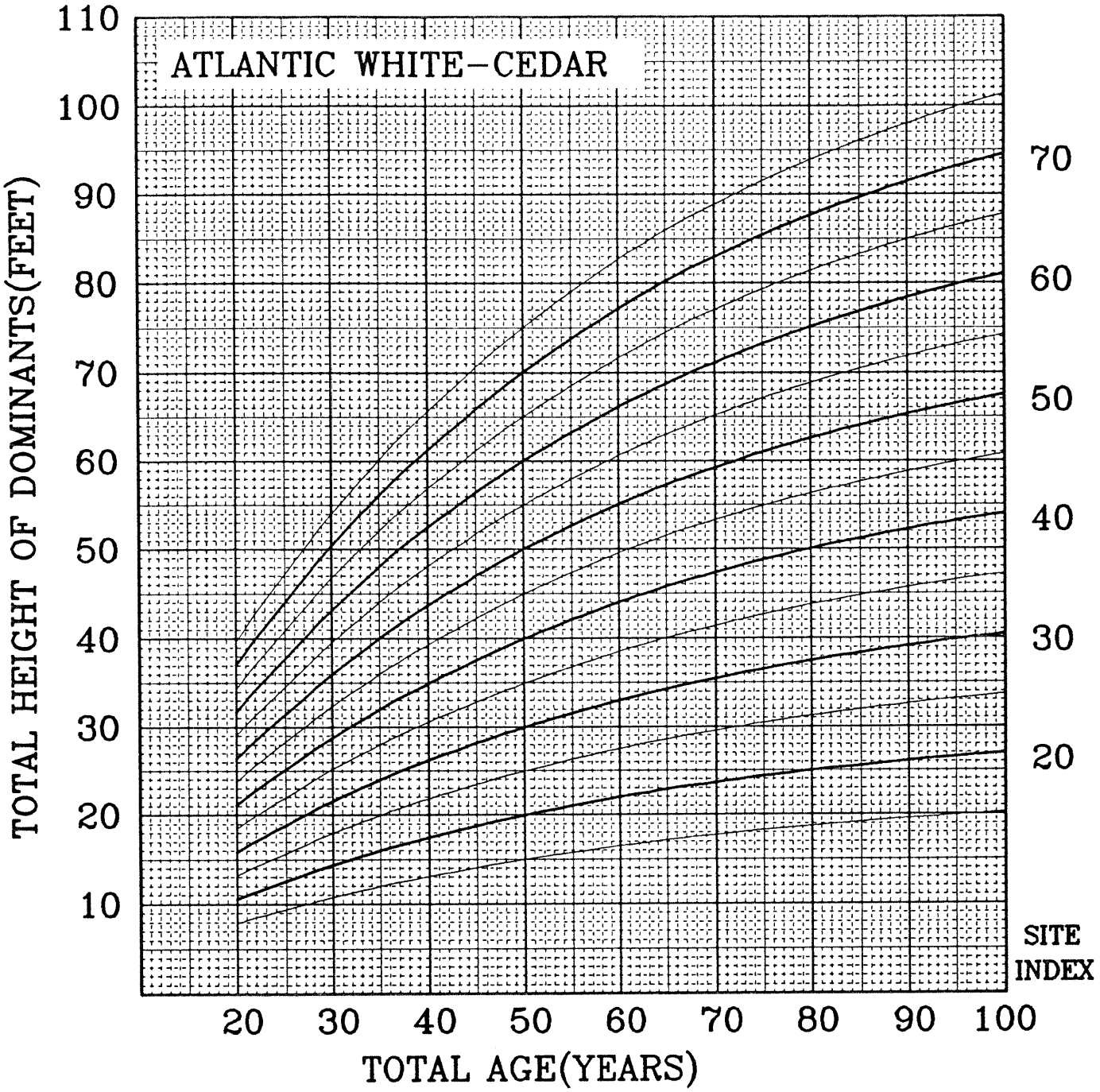


Figure 57.—Atlantic white-cedar (Korstian and Brush 1931)
Florida to Massachusetts
63 plots, number of dominant trees not given
Total height and total age, anamorphic, equation not given
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	20	30	40	50	60	70	80
Years:	11	10	9	8	7	6	5

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.5341	1.0013	-0.0208	0.9986	-0.0012	0.99	0.18	1.0
SI	0.6528	1.0000	-0.0213	-1.0243	-0.0046	0.99	0.23	1.1

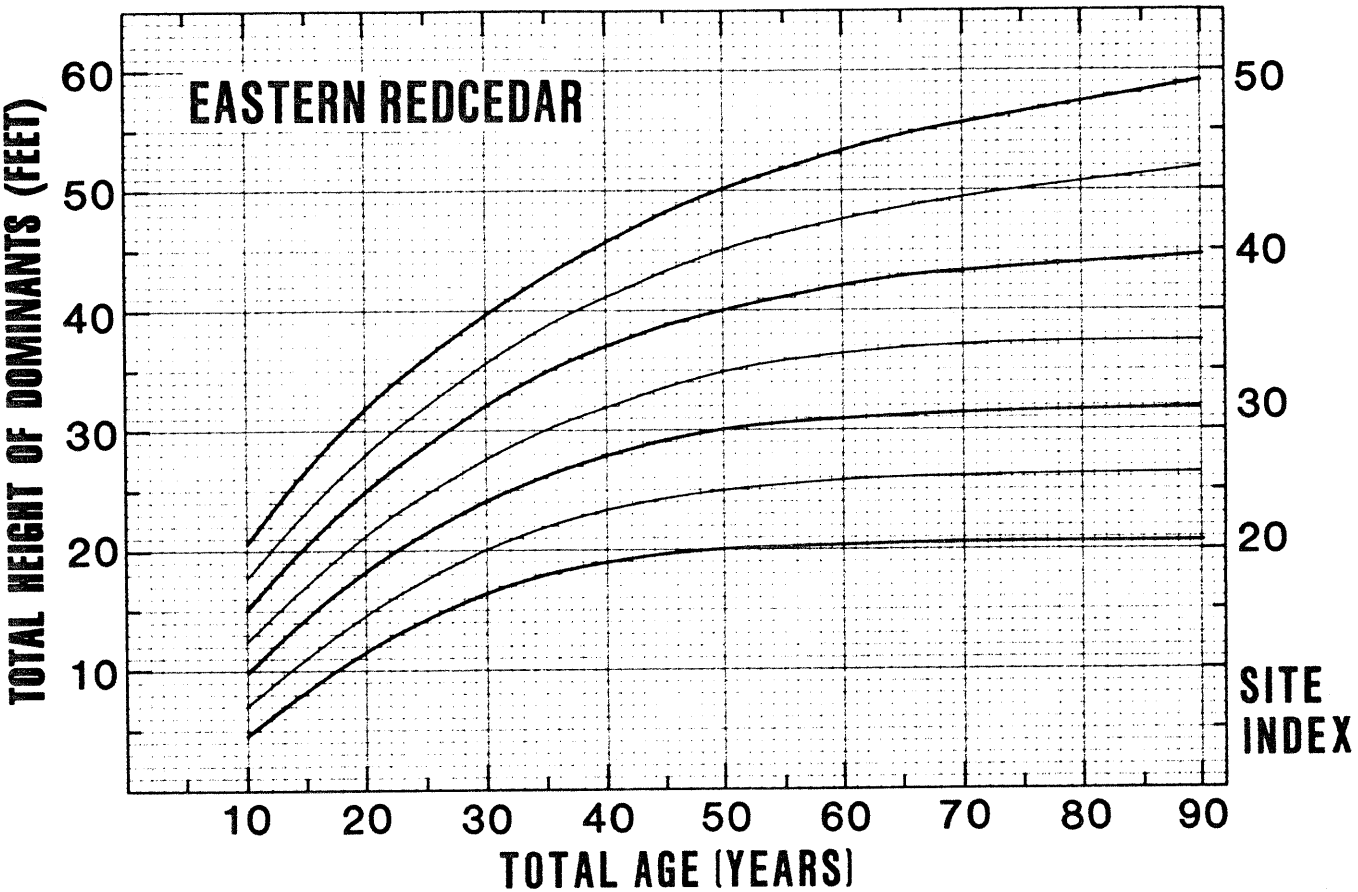


Figure 58.—Eastern redcedar (Hampf 1965)
Tennessee Valley
"Based on 271 observations"
Total height and total age of dominants, anamorphic, equation not given
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	20	30	40	50	60
Years:	14	12	11	10	9

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	0.9276	1.0591	-0.0424	0.3529	0.3114	0.99	1.10	4.1
SI	0.8965	0.9895	-0.0397	-1.0981	-0.0242	0.99	1.41	7.0

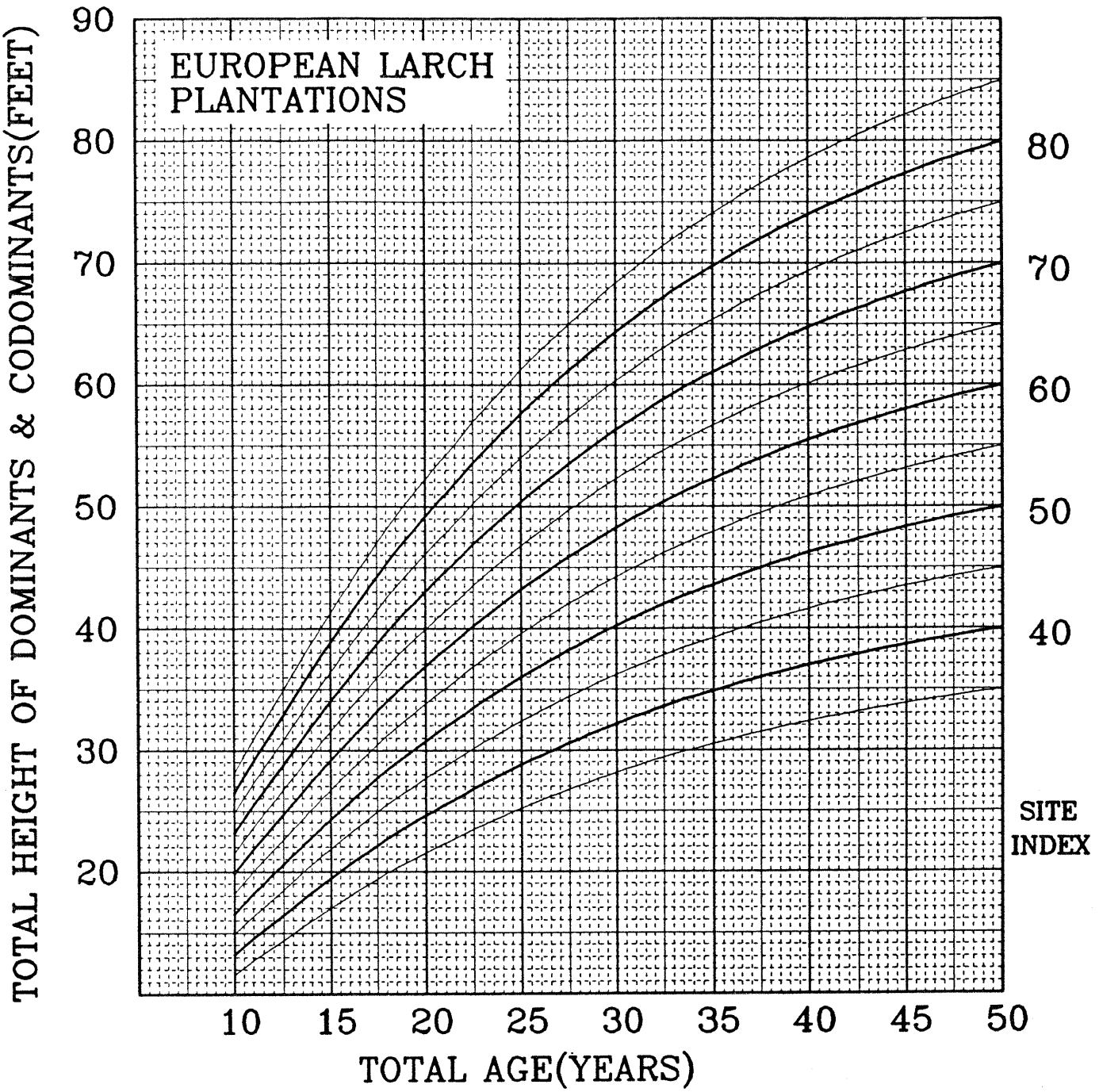


Figure 59.—European larch plantations (Aird and Stone 1955, Stone 1957)
New York and southern New England
147 plots, number of dominants and codominants not given
Total height and total age, anamorphic, logarithm equation
Add 3 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.1151	1.0000	-0.0504	1.3076	0.0009	0.98	0.72	4.2
SI	0.8821	1.0047	-0.0511	-1.4863	-0.0271	0.98	0.82	1.4

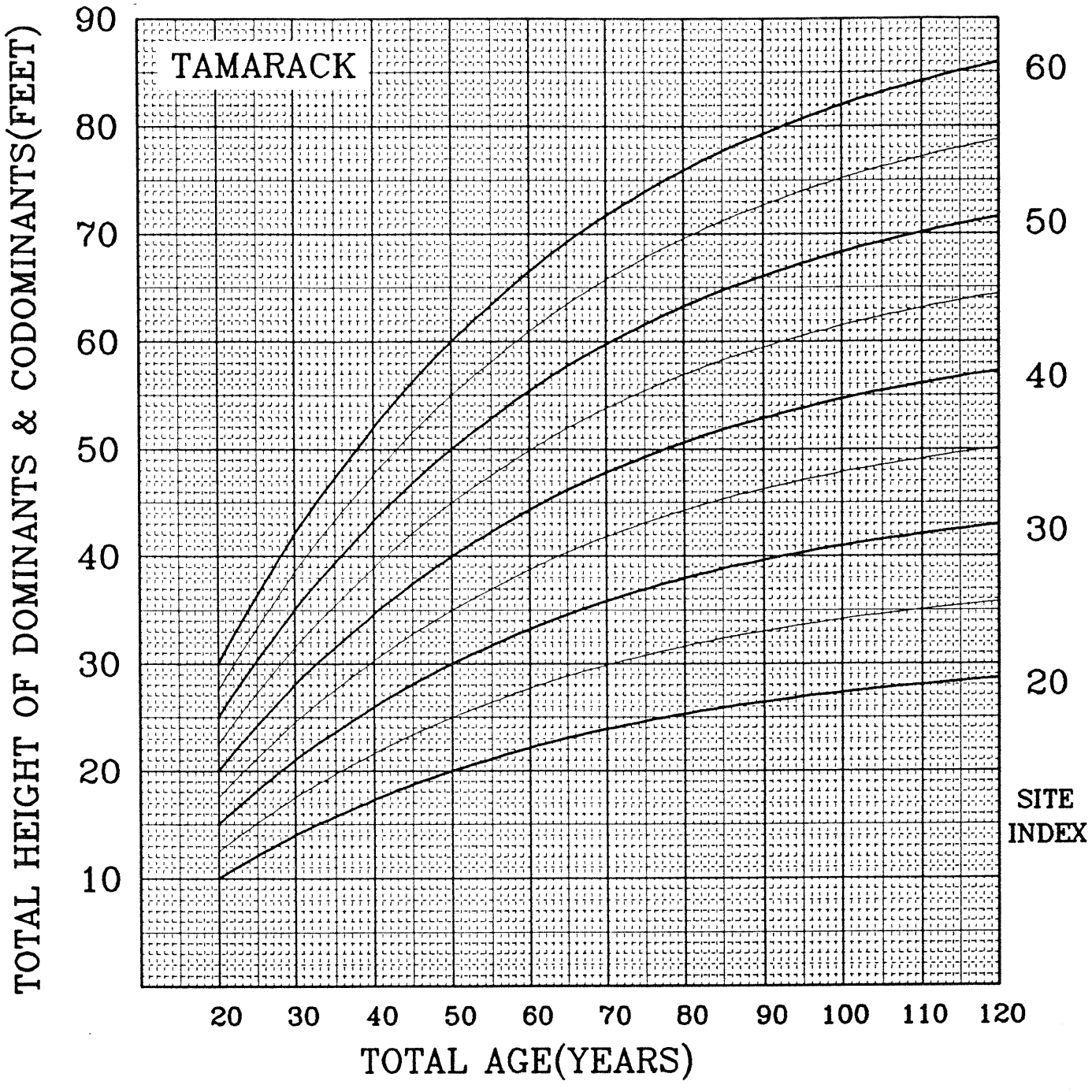


Figure 60.—Tamarack (Gevorkiantz 1957d)

Minnesota

Number of plots and number of dominant and codominant trees not given

Total height and total age, anamorphic, equation not given

Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	20	30	40	50-90
Years:	12	10	7	5

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.5470	1.0000	-0.0225	1.1129	0.0000	0.99	0.52	1.4
SI	0.6464	1.0000	-0.0225	-1.1129	0.0000	0.99	0.52	1.4

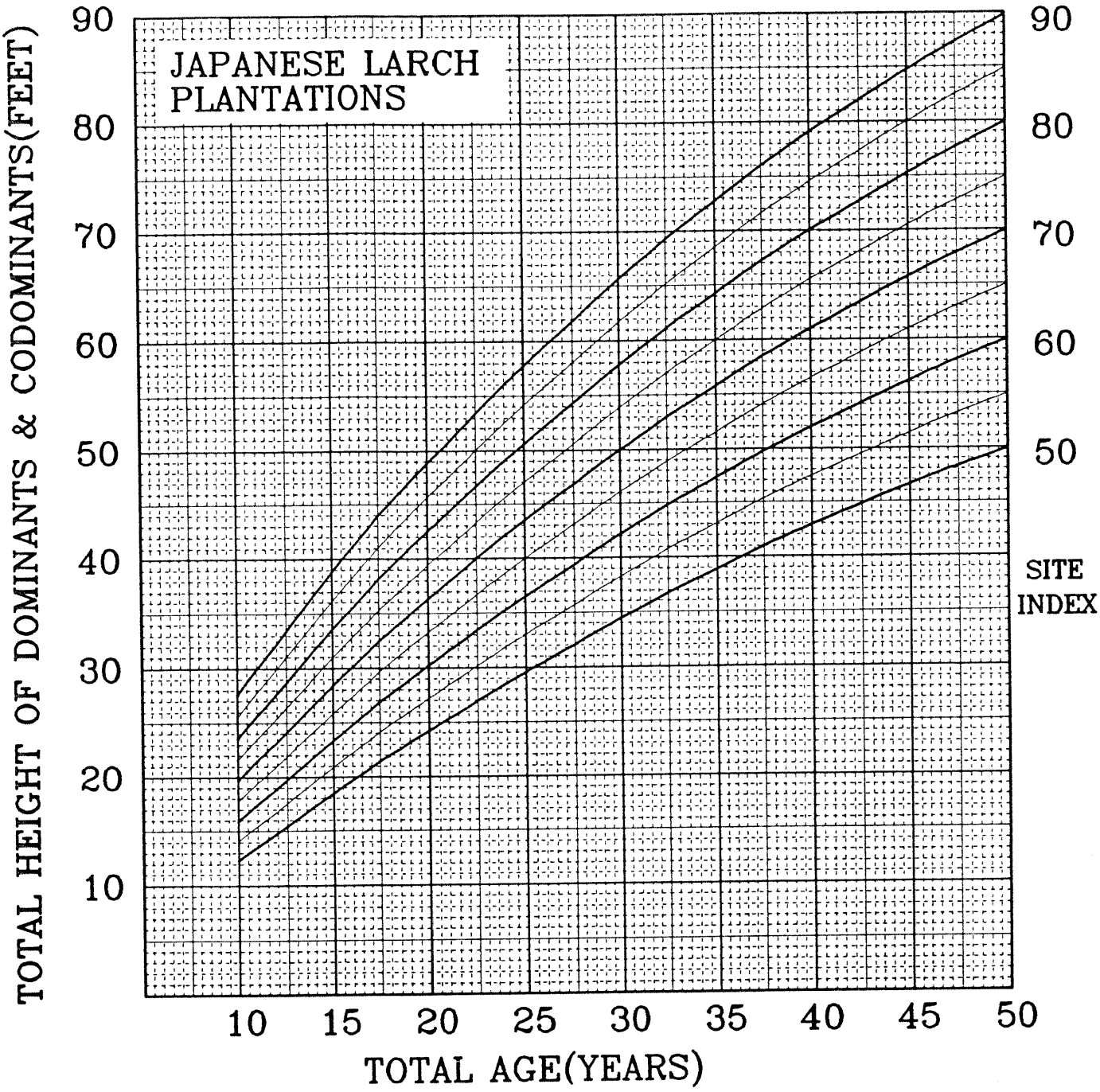


Figure 61.—Japanese larch plantations (Aird and Stone 1955, Stone 1957)
Southern portion of upper New York
25 plots, number of dominants and codominants not given
Total height and total age, anamorphic, logarithm equation not given
Add 3 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	2.5878	0.8755	-0.0220	3.5505	-0.2882	0.99	0.36	1.5
SI	0.1684	1.1840	-0.0051	-1.4894	-0.1879	0.99	0.83	3.7

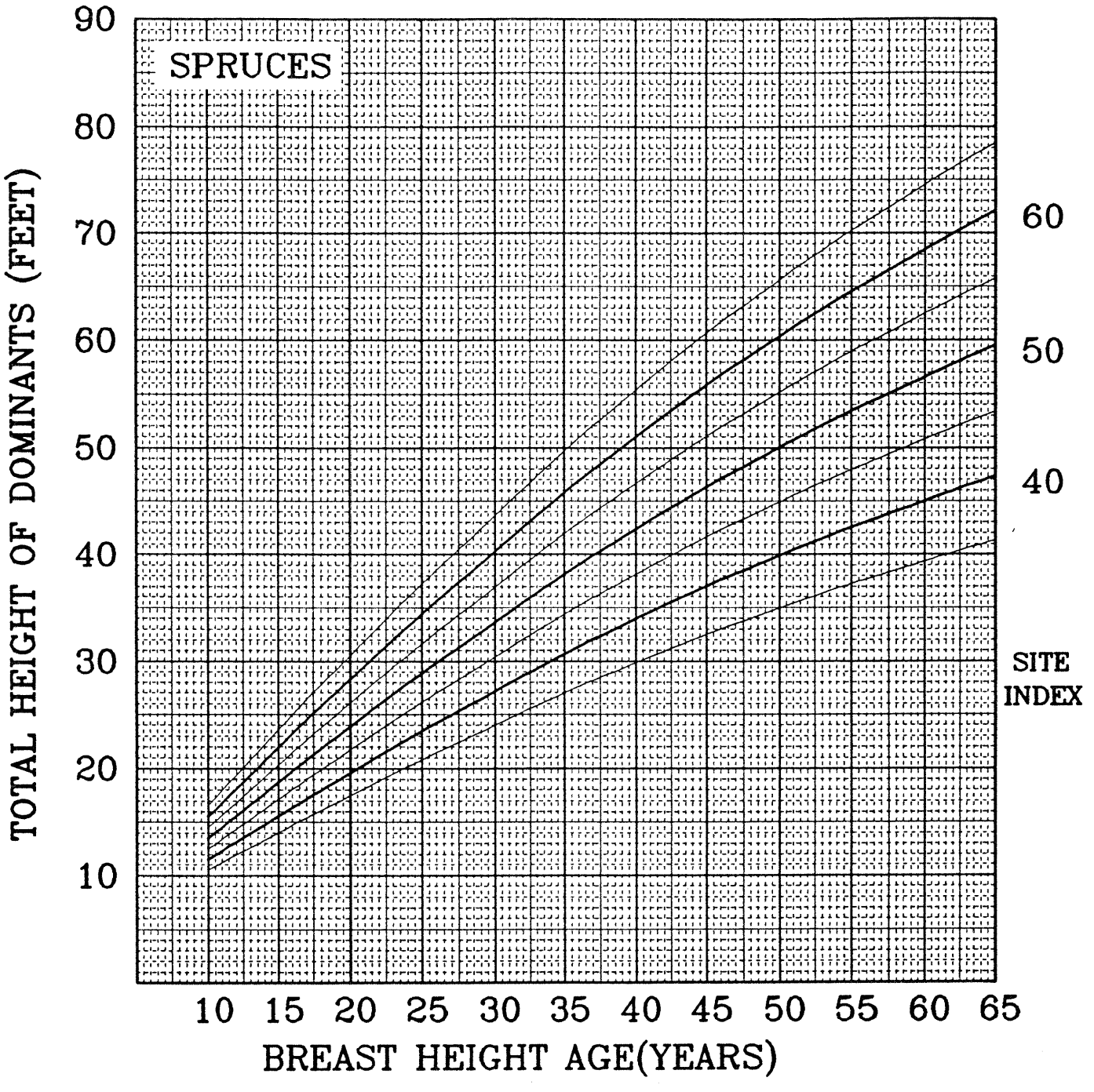


Figure 62.—Spruces (Griffin and Johnson 1980)
Northern Maine (Aroostock and Piscataquis Counties)
40 plots combining data for red, white, and black spruces; "six tallest trees" (dominants) on each plot; trees older than 45 years breast height age
Stem analysis, quadratic regression, polymorphic
Site index is height of dominant trees at 50 years breast height age (BH = 4.5)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.0716	1.1276	-0.0018	1.2495	-0.0029	0.99	1.83	3.2
SI	0.0063	1.3985	-0.00024	-1.1102	-0.0944	0.99	2.11	4.0

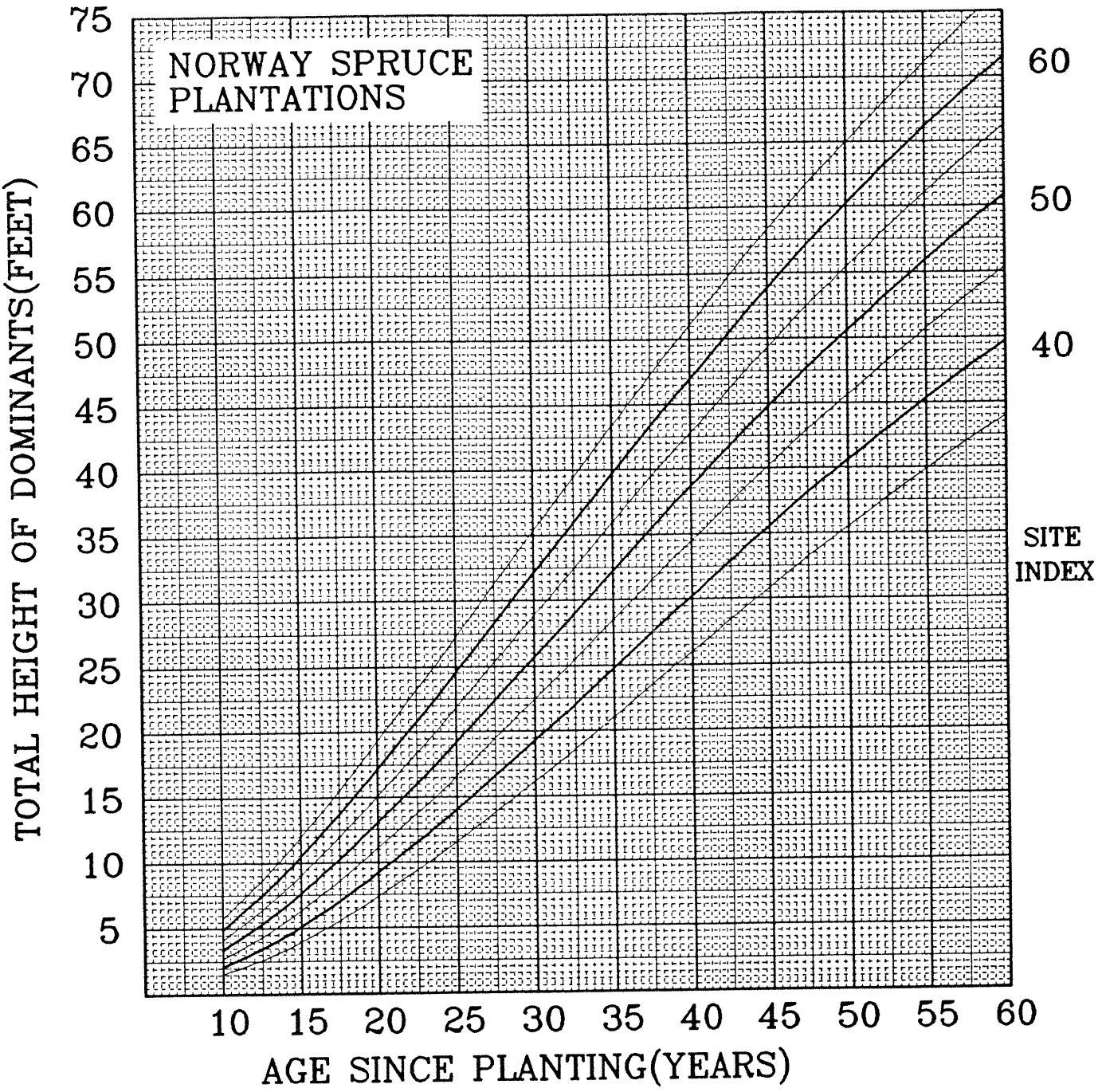


Figure 63.—Norway spruce plantations (Wilde *et al.* 1965)
Wisconsin
Number of plots and number of dominant trees not given
Total height and total age, anamorphic curves based on average of Wilde's two height growth curves
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	40	50	60
Years:	17	15	13

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	6.7791	0.6876	-0.0280	12.1447	-0.4142	0.99	0.94	2.2
SI	0.0259	1.2496	-0.0021	-1.7841	-0.1088	0.97	1.81	3.8

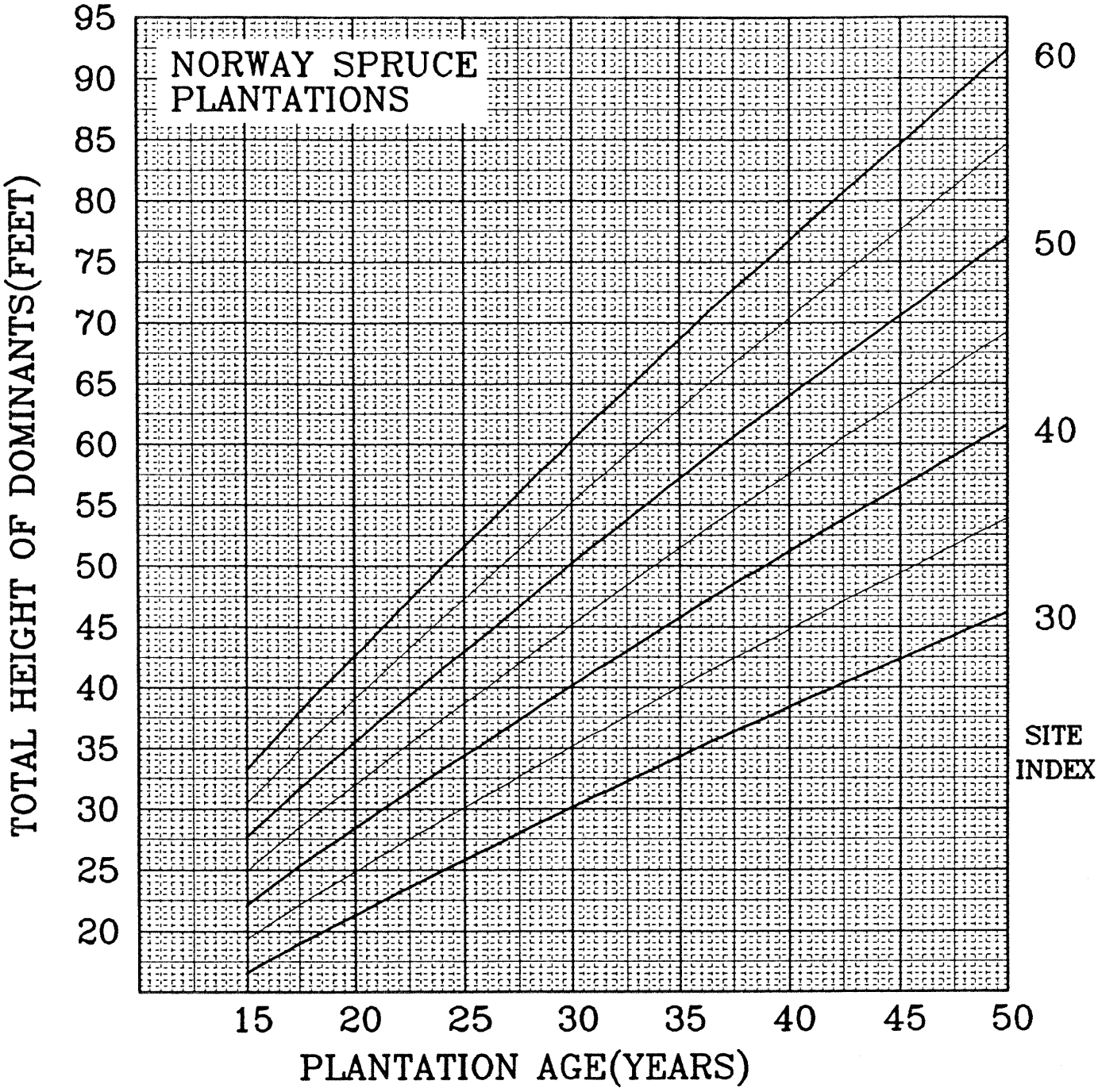


Figure 64.—Norway spruce plantations (Hannah 1972)
Vermont
99 plantations, number of dominant trees not given
Total height and plantation age, anamorphic, quadratic equation
Site index is total height at 30 years plantation age
Convert d.b.h. age to plantation age by adding years according to site index (BH = 0.0):

SI:	30	40	50	60
Years:	13	11	9	7

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	8.6744	0.9986	-0.0031	0.8904	-0.0006	0.99	1.04	2.8
SI	0.1149	0.6638	-0.0005	-0.5680	0.0958	0.99	0.55	2.3

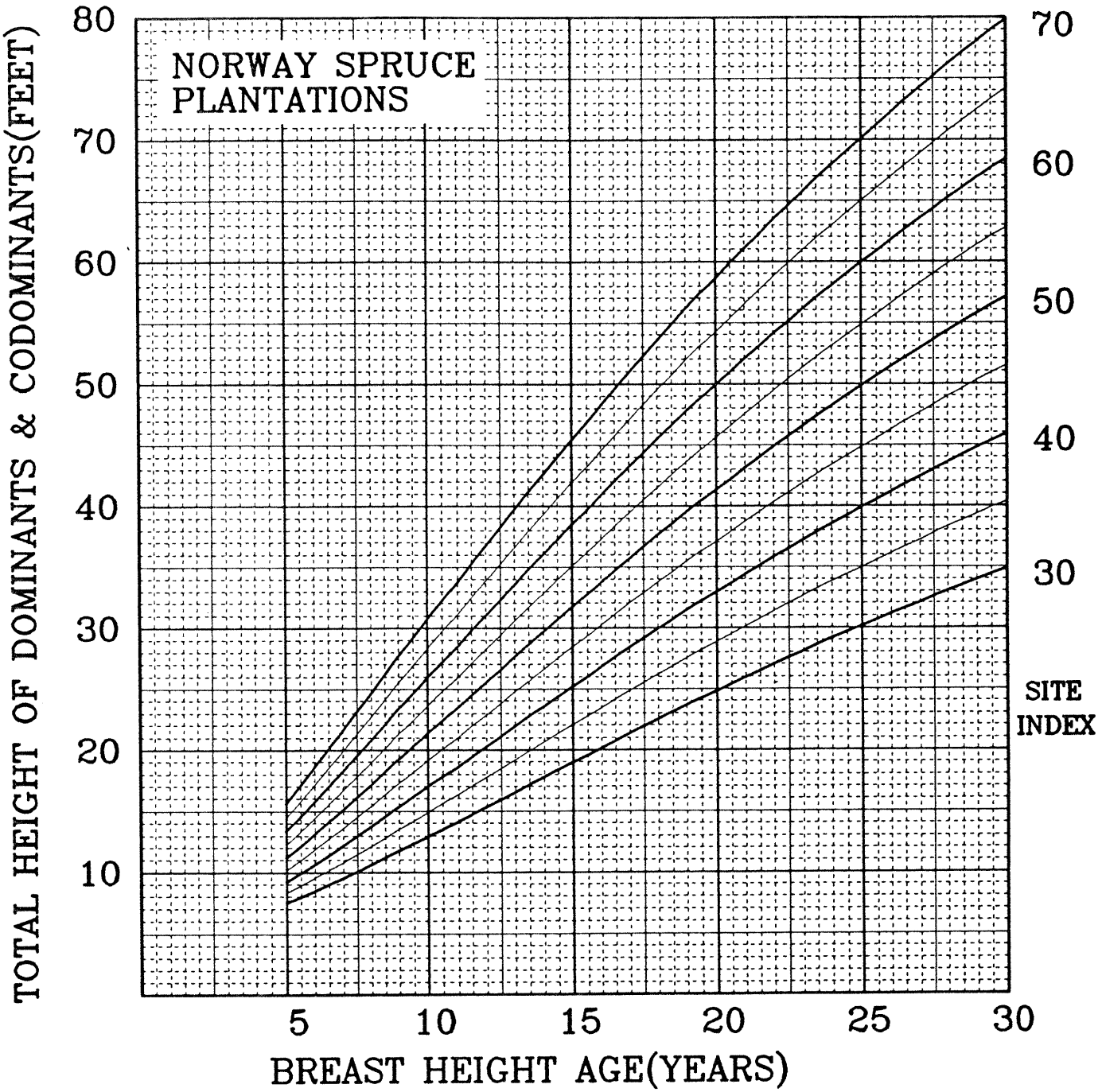


Figure 65.—Norway spruce plantations (Gordon, Williams, and Taylor 1989)
Southern Ontario
55 plots having 220 dominant and codominant trees
Stem analysis, site index prediction equations using Hegar (1968) model
Site index is total height of dominant and codominant trees at 25 years breast height age (BH = 4.5)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	2.0854	0.9547	-0.0427	3.8109	-0.2288	0.98	1.22	1.4
SI	0.7847	0.9416	-0.0680	-0.8085	0.2206	0.99	2.14	5.3

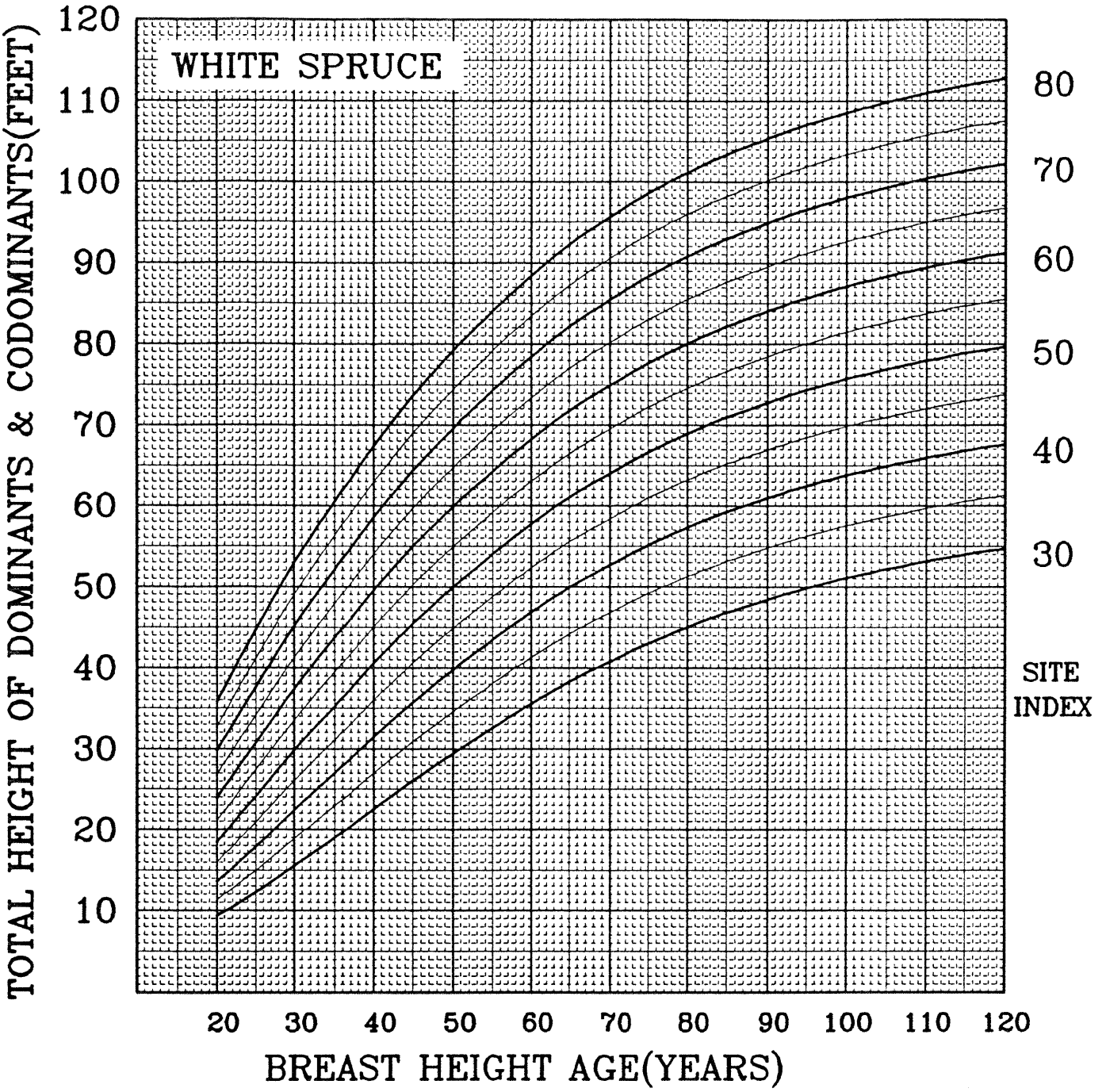


Figure 66.—White spruce (Gevorkiantz 1957g)
Minnesota
Number of plots and number of dominant and codominant trees not given
Total height and breast height age, anamorphic, equation not given
Site index is total height of dominant and codominant trees at 50 years breast height age (BH = 4.5)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	4.4803	0.7382	-0.0289	26.6132	-0.6461	0.99	1.60	3.0
SI	0.0816	1.3801	-0.0119	-3.5684	-0.2906	0.99	2.05	3.4

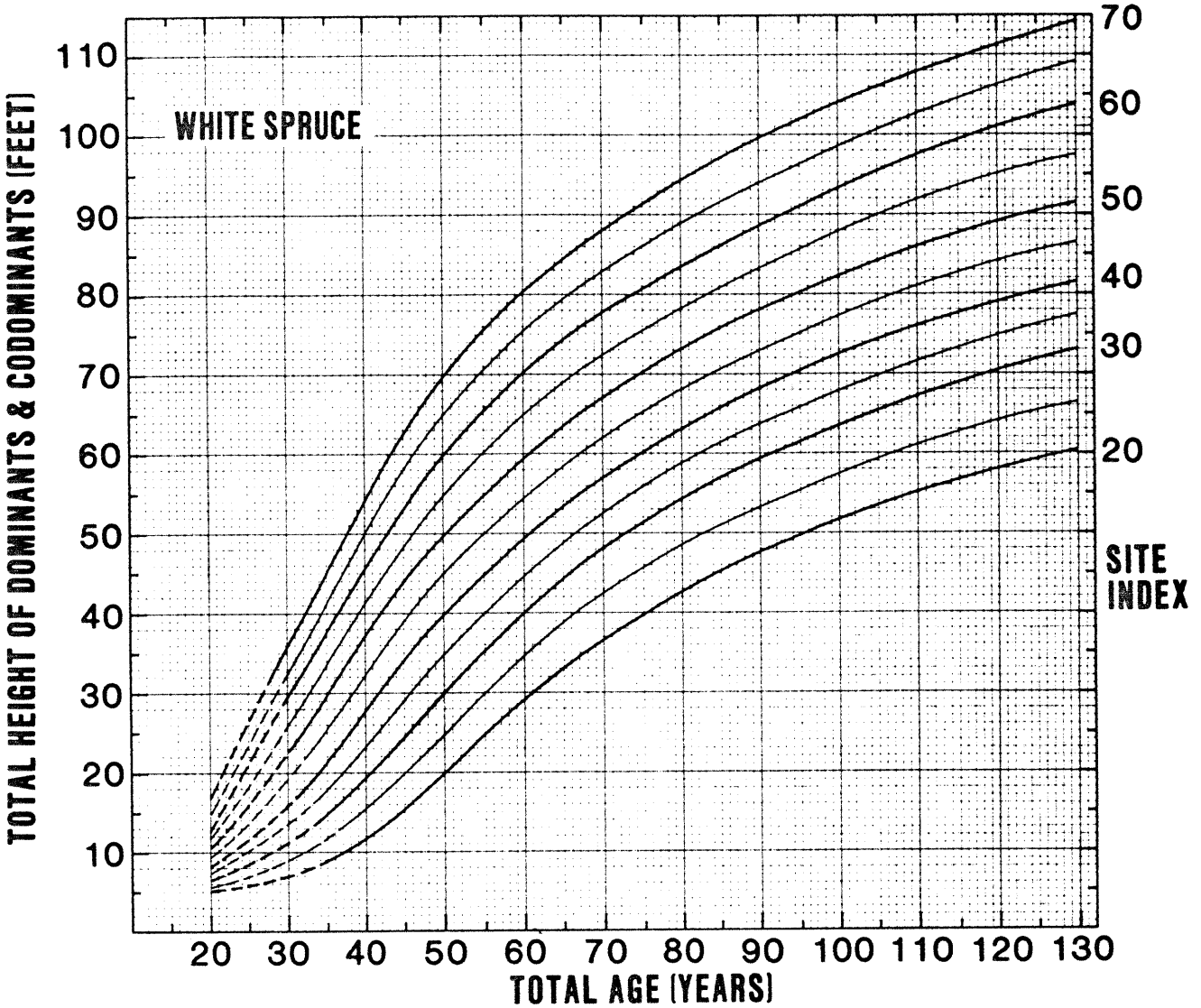


Figure 67.—White spruce (Carmean and Hahn 1981, revision of Gevorkiantz 1957g)
Minnesota
Number of plots and number of dominant and codominant trees not given
Total height and breast height age, anamorphic, Gevorkiantz (1957g) equation not given
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	20	30	40	50	60	70
Years:	15	13	11	10	9	8

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	11.3079	0.5419	-0.0345	34.1568	-0.6078	0.99	2.18	6.4
SI	0.0380	1.5142	-0.0124	-6.4840	-0.3550	0.99	2.29	6.4

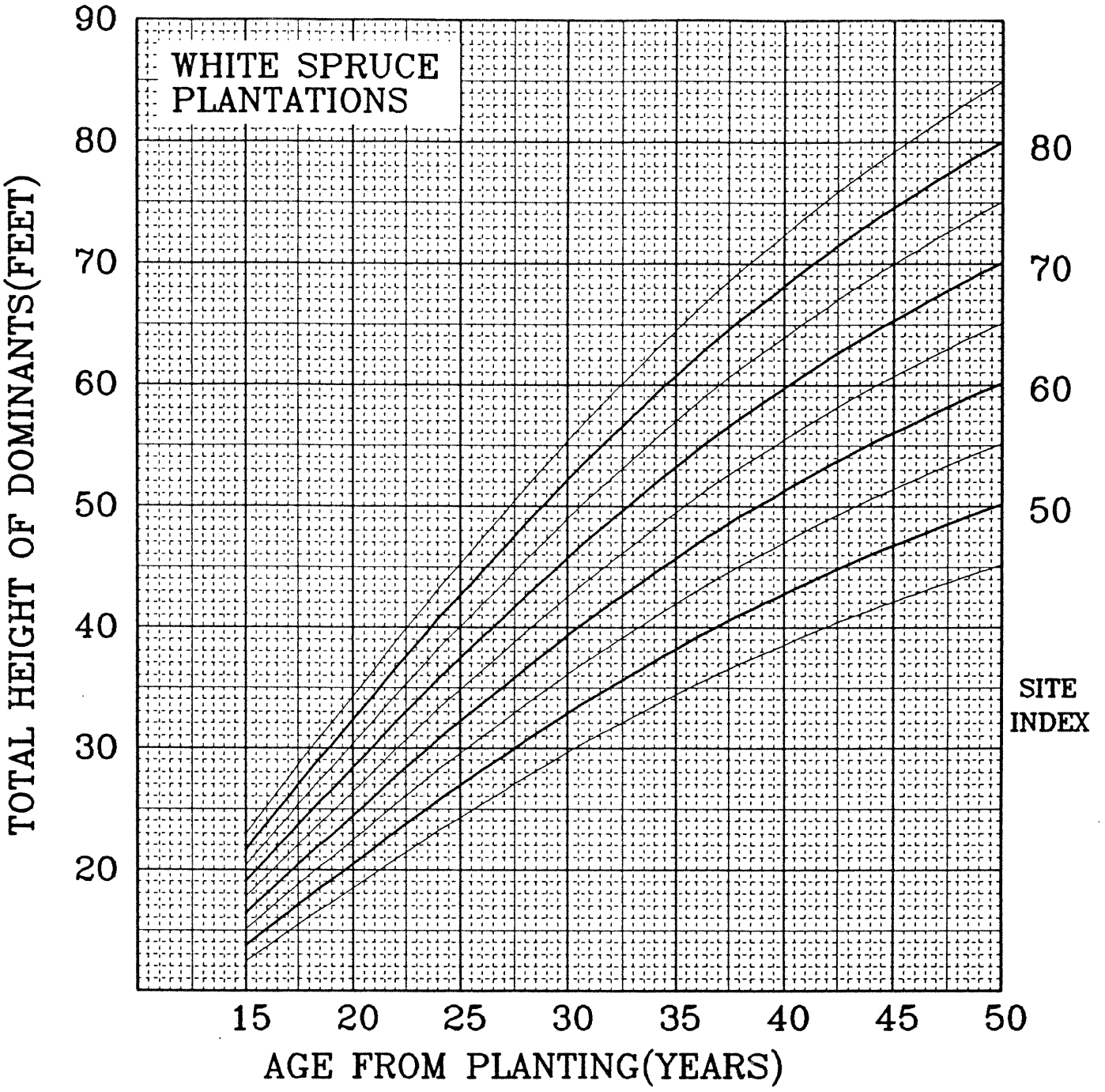


Figure 68.—White spruce plantations (Stiell and Berry 1973a, Berry 1978)
Ontario—Petawawa
46 permanent growth study plots, number of dominant trees not given
Plot remeasurements, quadratic equation not given, anamorphic
Site index is total height at 50 years from planting
Add 5 years to d.b.h. age to obtain age from planting (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.3342	1.0008	-0.0401	1.8068	0.0248	0.97	1.07	2.1
SI	0.7485	0.9939	-0.0383	-1.7116	0.0320	0.99	1.38	4.2

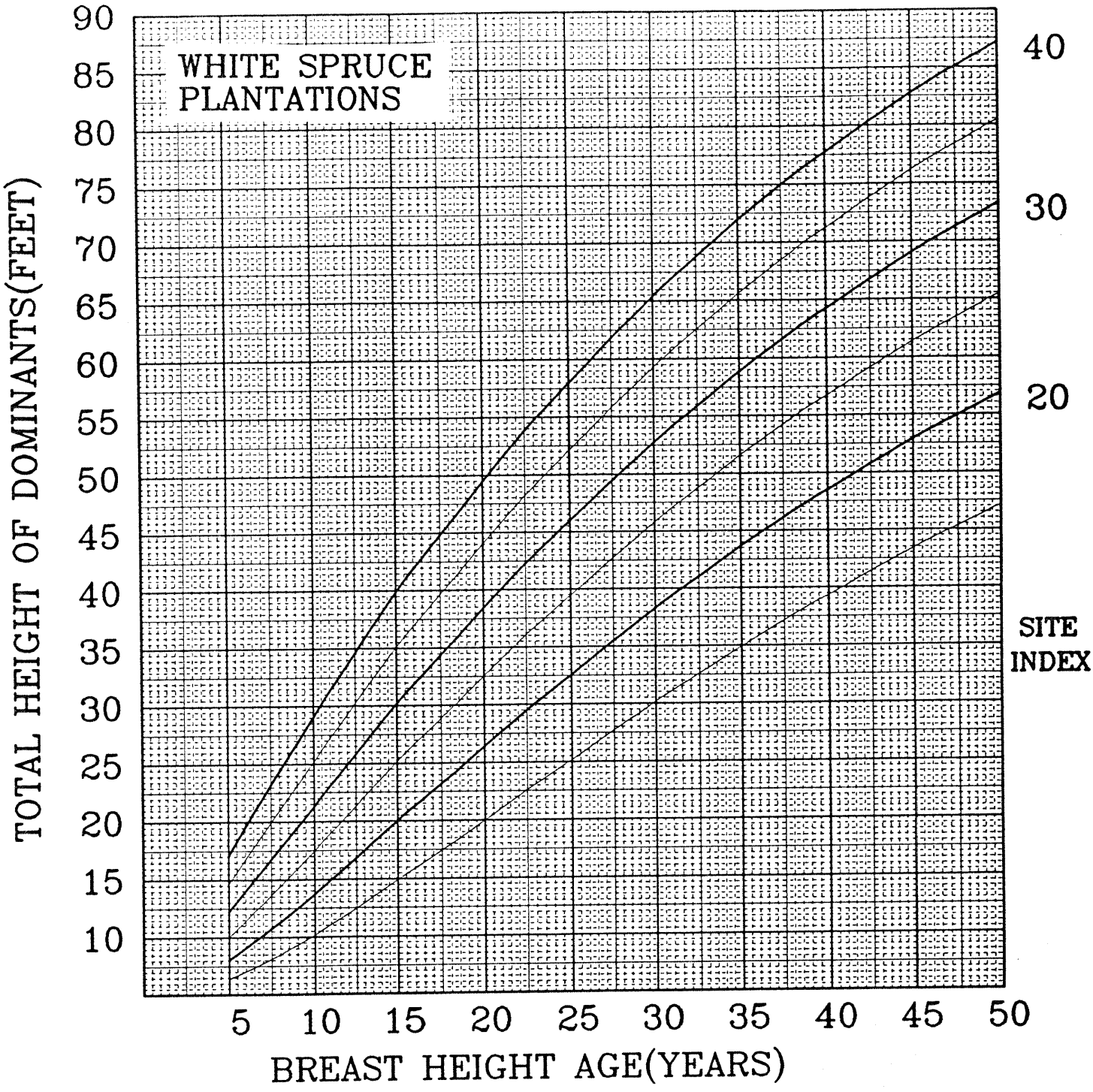


Figure 69.—White spruce plantations (Thrower 1986b)
North central Ontario
46 plots having 3 dominant trees per plot
Internode measurements and stem analysis, nonlinear regression, polymorphic
Site index is total height at 15 years breast height age (BH = 4.5)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	20.3317	0.4049	-0.0275	7.2043	-0.5166	0.94	0.54	0.7
SI	0.00033	1.6606	-0.00025	-1.2755	-0.0715	0.99	1.35	3.6

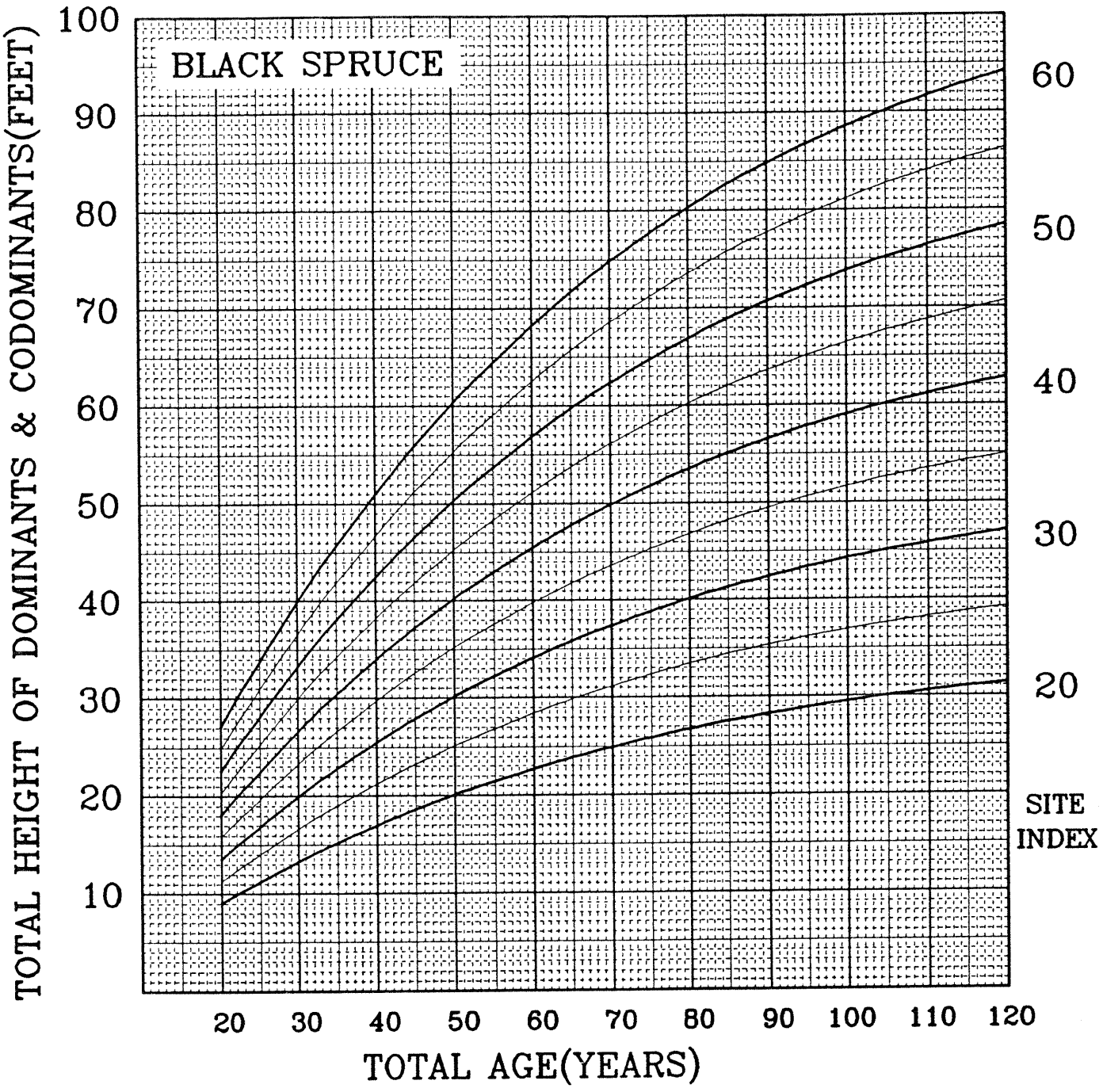


Figure 70.—Black spruce (Gevorkiantz 1957a, derived from Fox and Kruse 1939)
Northeastern Minnesota—Superior National Forest
Number of plots and number of dominant and codominant trees not given
Total height and total age, anamorphic, equation not given
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	20	30	40	50	60	70	80	90
Years:	15	13	11	10	9	8	7	6

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.7620	1.0000	-0.0201	1.2307	0.0000	0.99	0.72	1.9
SI	0.5675	1.0000	-0.0201	-1.2307	0.0000	0.99	0.72	1.9

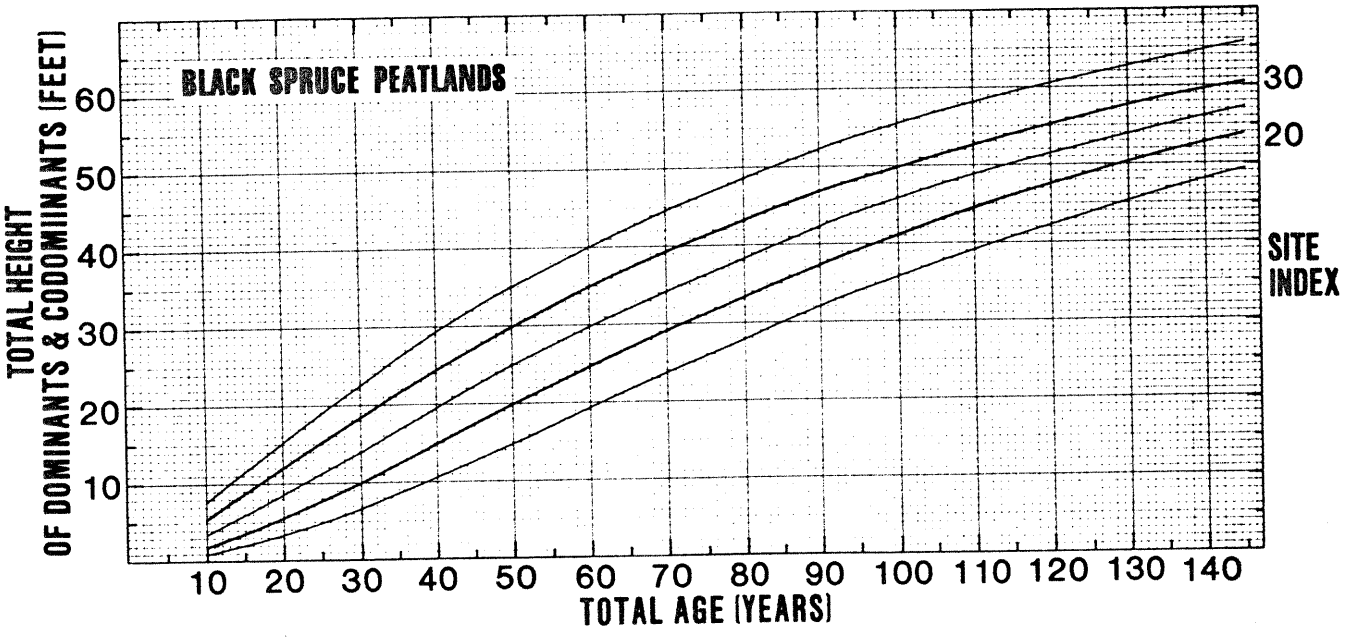


Figure 71.—Black spruce peatlands (Payandeh 1978)
Ontario Clay Belt
Number of plots not given, 60 dominant and codominant trees
Stem analysis, polymorphic, nonlinear regression
Add 15 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	16.2120	0.4580	-0.0135	8.0105	-0.5321	0.99	1.22	2.9
SI	0.0008	1.8529	-0.00016	-1.7043	-0.1933	0.99	1.66	7.4

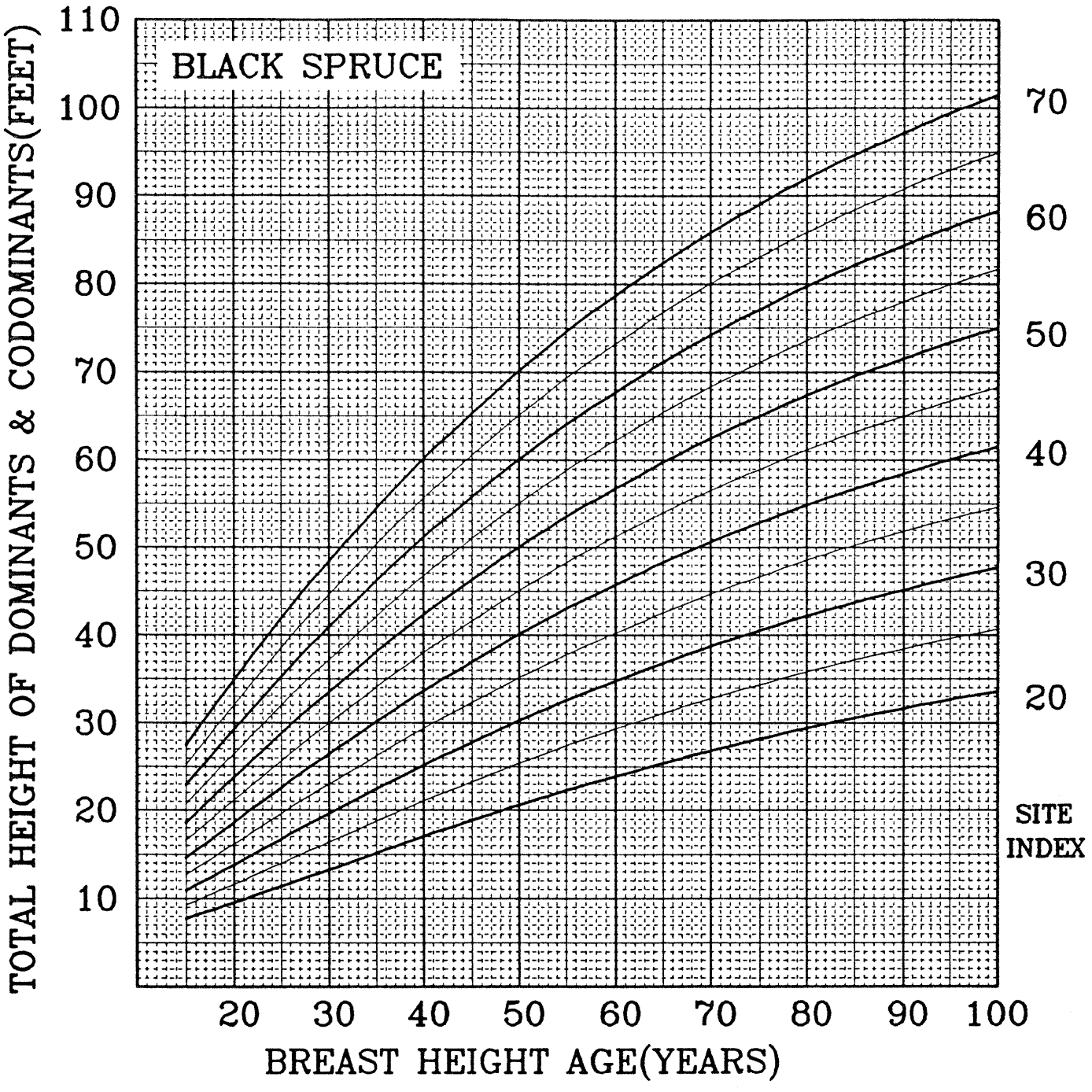


Figure 72.—Black spruce (Thrower 1986a)
North central Ontario, mineral soils
44 plots having 2 to 5 dominant and codominant trees per plot
Stem analysis, nonlinear regression, polymorphic
Site index is total height at 50 years breast height age (BH = 4.5)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	2.9232	0.8737	-0.0178	4.6529	-0.3319	0.97	0.40	0.2
SI	0.1324	1.1955	-0.0061	-1.2545	-0.0943	0.99	1.31	4.1

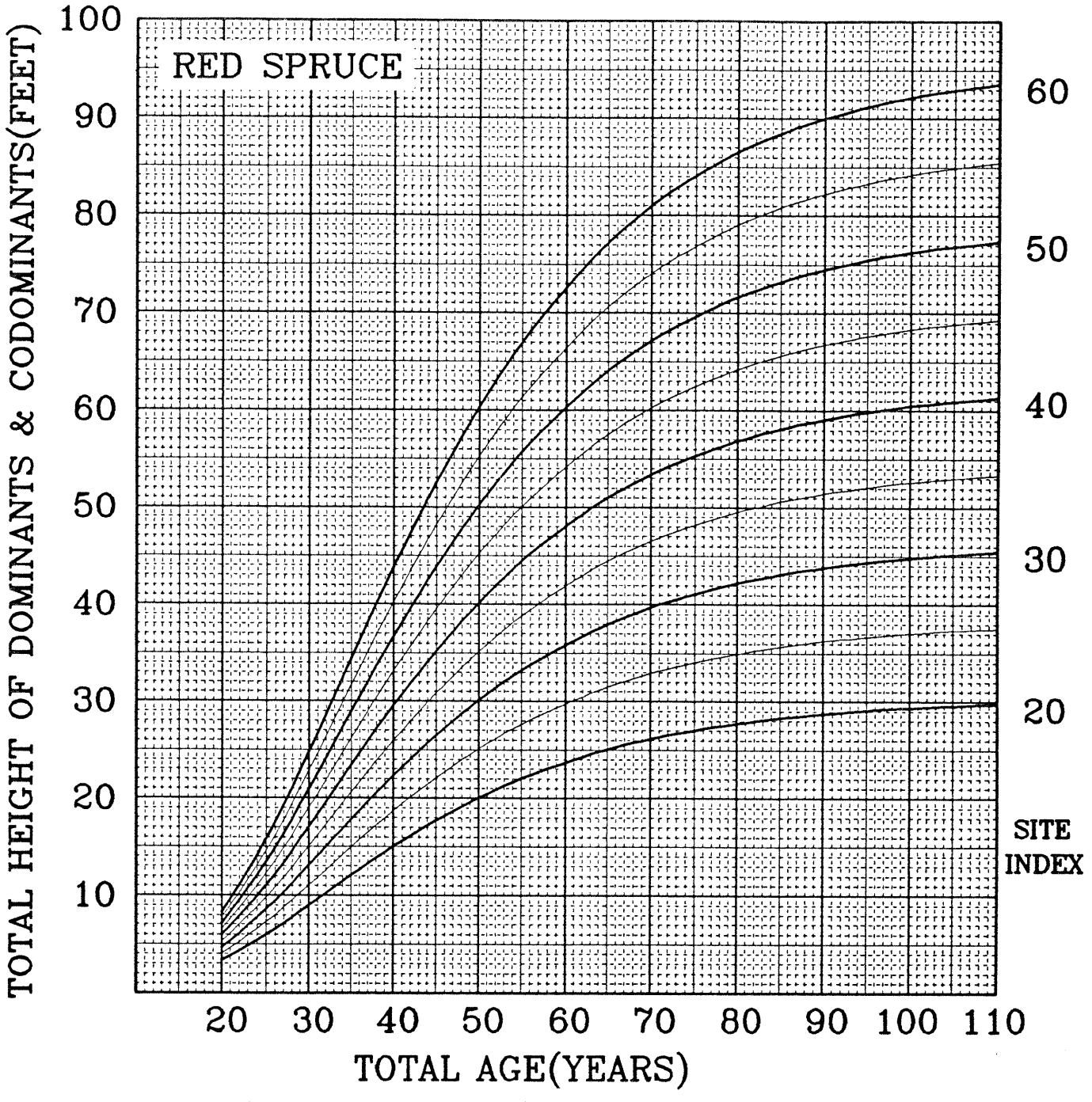


Figure 73.—Red spruce (Meyer 1929)
Maine, New Hampshire, and Vermont
201 plots, number of dominant and codominant trees not given
Total height and total age, anamorphic, equation not given,
original curves revised from SI age 65 to SI age 50 years
Add 15 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.3307	1.0442	-0.0496	3.5829	0.0945	0.99	1.19	4.0
SI	0.9333	0.9124	-0.0585	-3.1832	0.2184	0.99	0.91	3.7

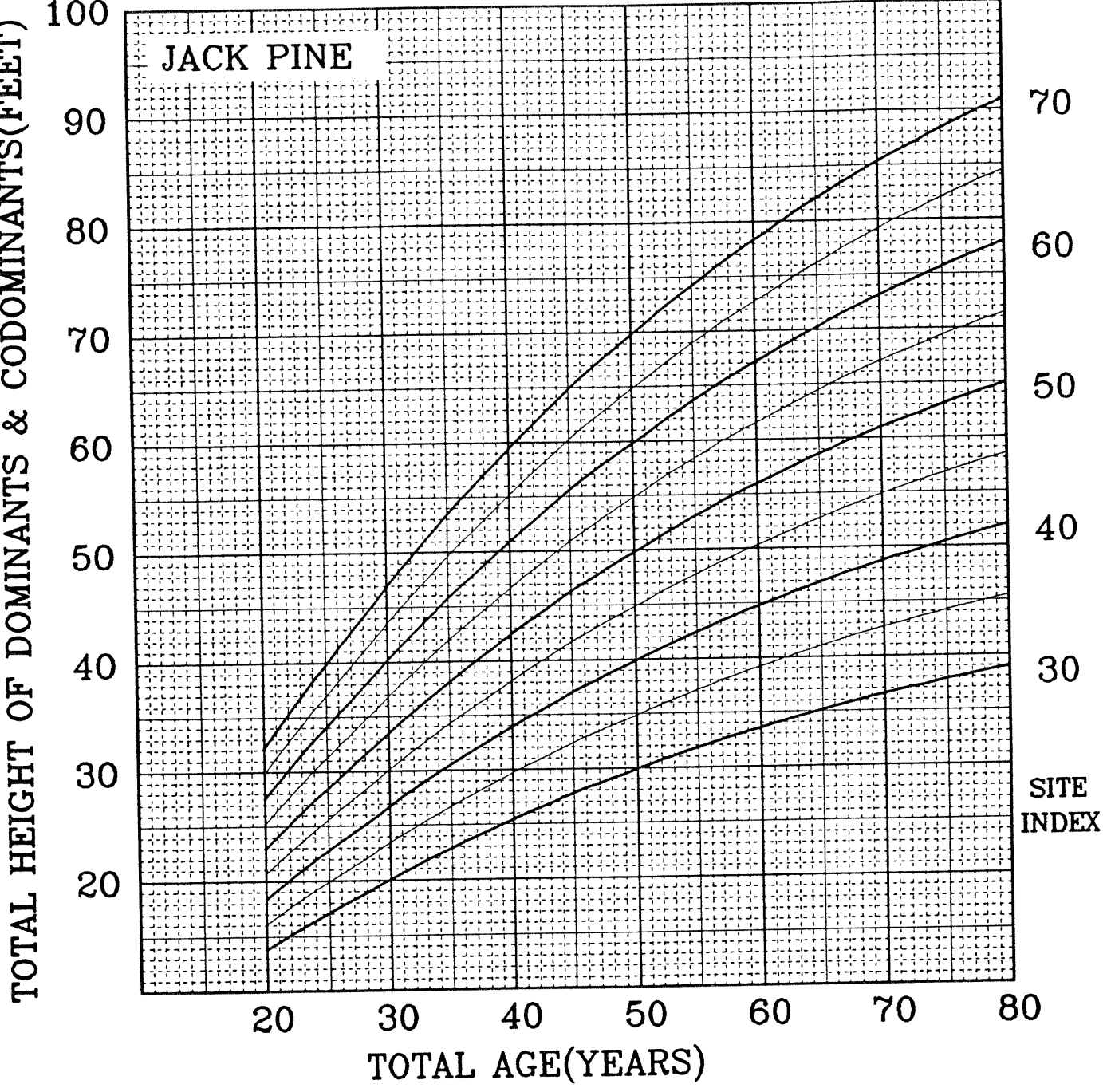


Figure 74.—Jack pine (Gevorkiantz 1956c, derived from Wackerman *et al.* 1929, and from Eyre and LeBarron 1944)

Lake States

Number of plots and number of dominant and codominant trees not given

Total height and total age, anamorphic, equation not given

Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	30	40	50	60	70	80	90
Years:	9	8	7	6	5	4	4

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.6330	1.0000	-0.0223	1.2419	0.0000	0.99	0.50	1.1
SI	0.6124	1.0000	-0.0223	-1.2419	0.0000	0.99	0.50	1.1

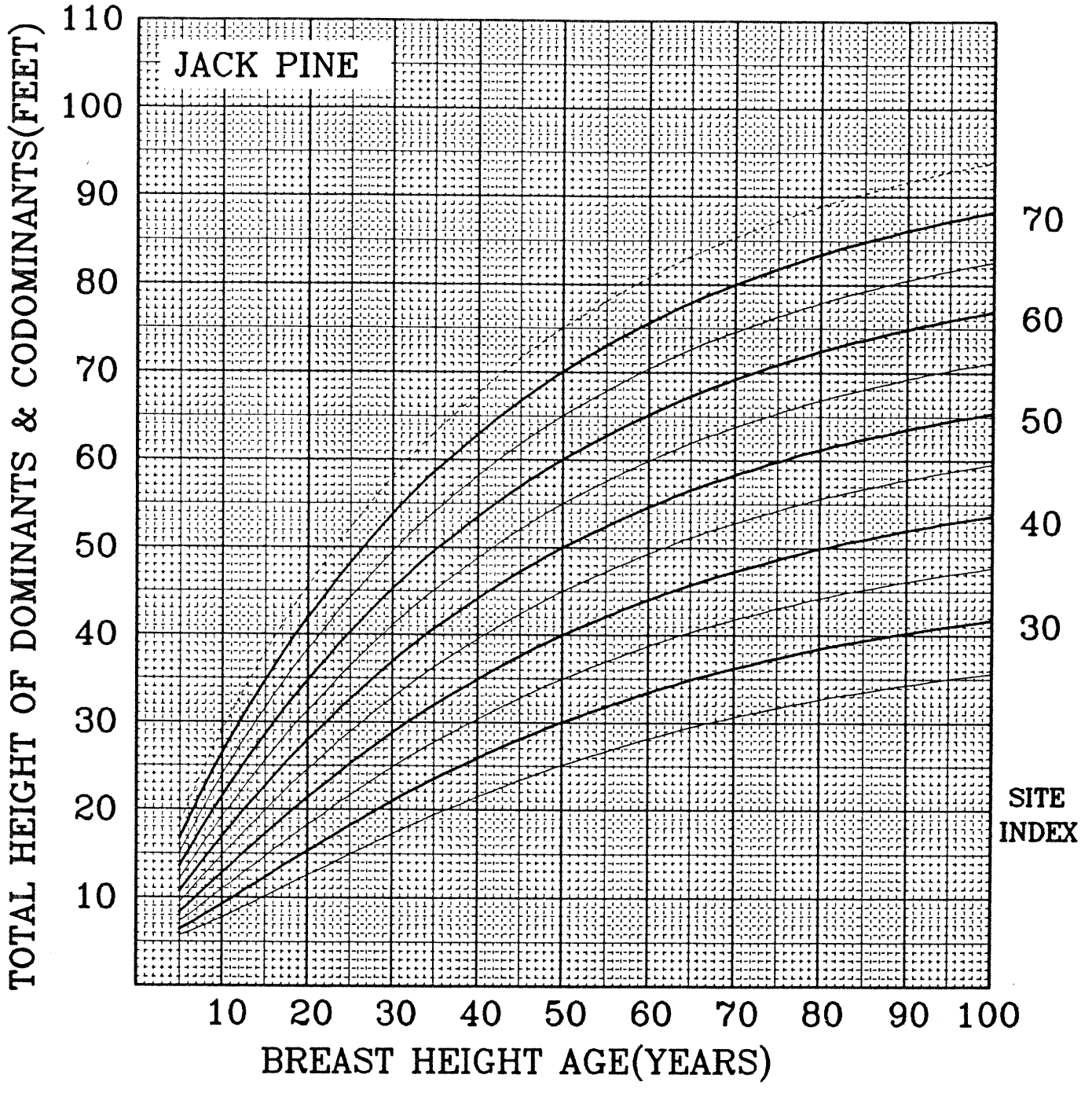


Figure 75.—Jack pine (Lenthall 1986, Carmean and Lenthall 1989)
North central Ontario
141 plots having 3 to 5 dominant and codominant trees per plot
Stem analysis, nonlinear regression, polymorphic
Site index is total height at 50 years breast height age (BH = 4.5)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	2.0141	0.8989	-0.0236	7.9469	-0.5084	0.98	0.54	0.8
SI	0.1917	1.2234	-0.0092	-1.3627	-0.1764	0.99	1.54	3.2

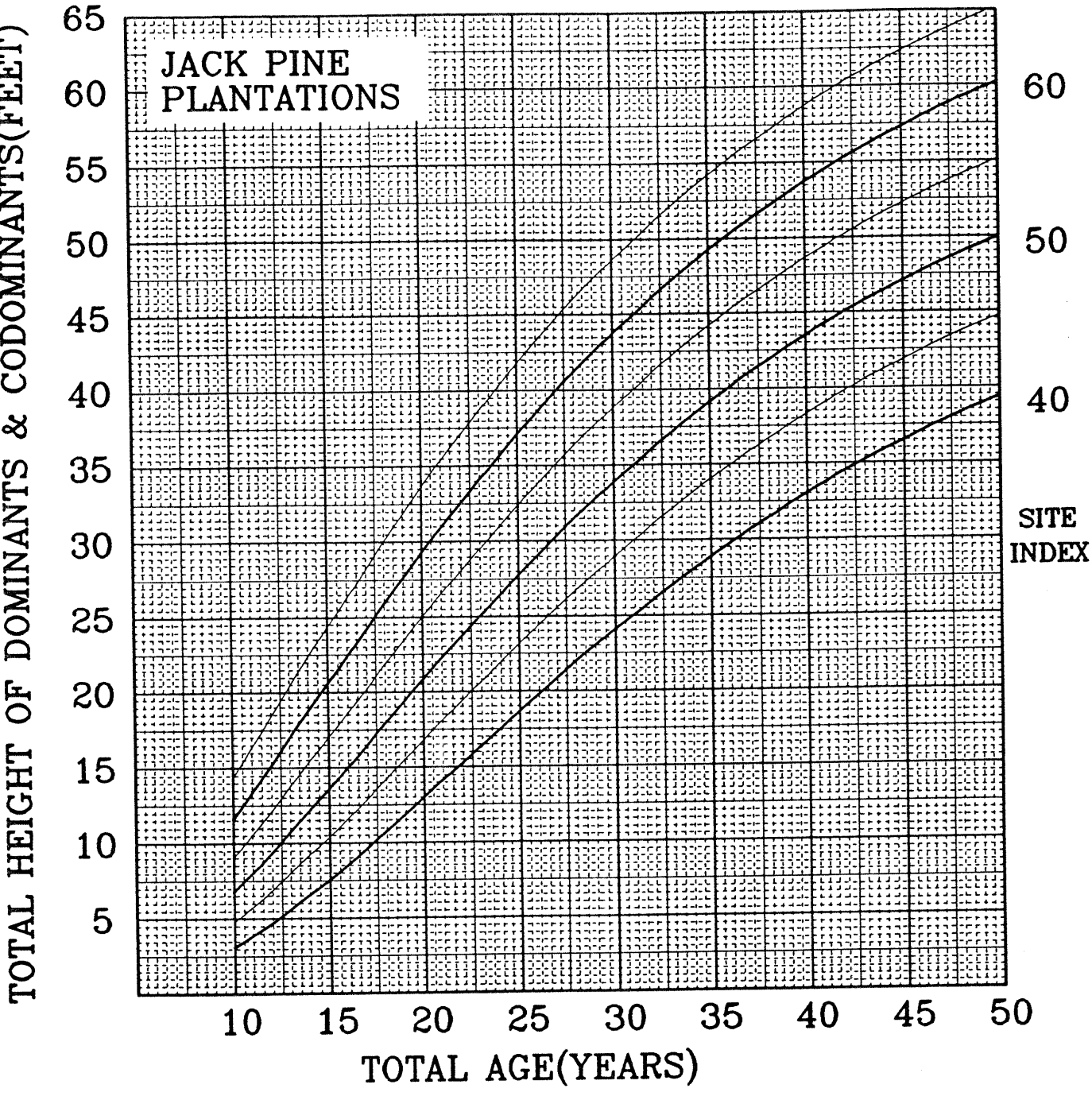


Figure 76.—Jack pine plantations (Wilde *et al.* 1965)
Wisconsin
44 plots, number of dominant and codominant trees not given
Total height and total age, anamorphic, equation not given
Add 4 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	2.3102	0.8350	-0.0512	152.9926	-1.0625	0.97	1.44	2.6
SI	0.8618	0.9312	-0.0190	-1.8004	0.1877	0.98	2.42	3.7

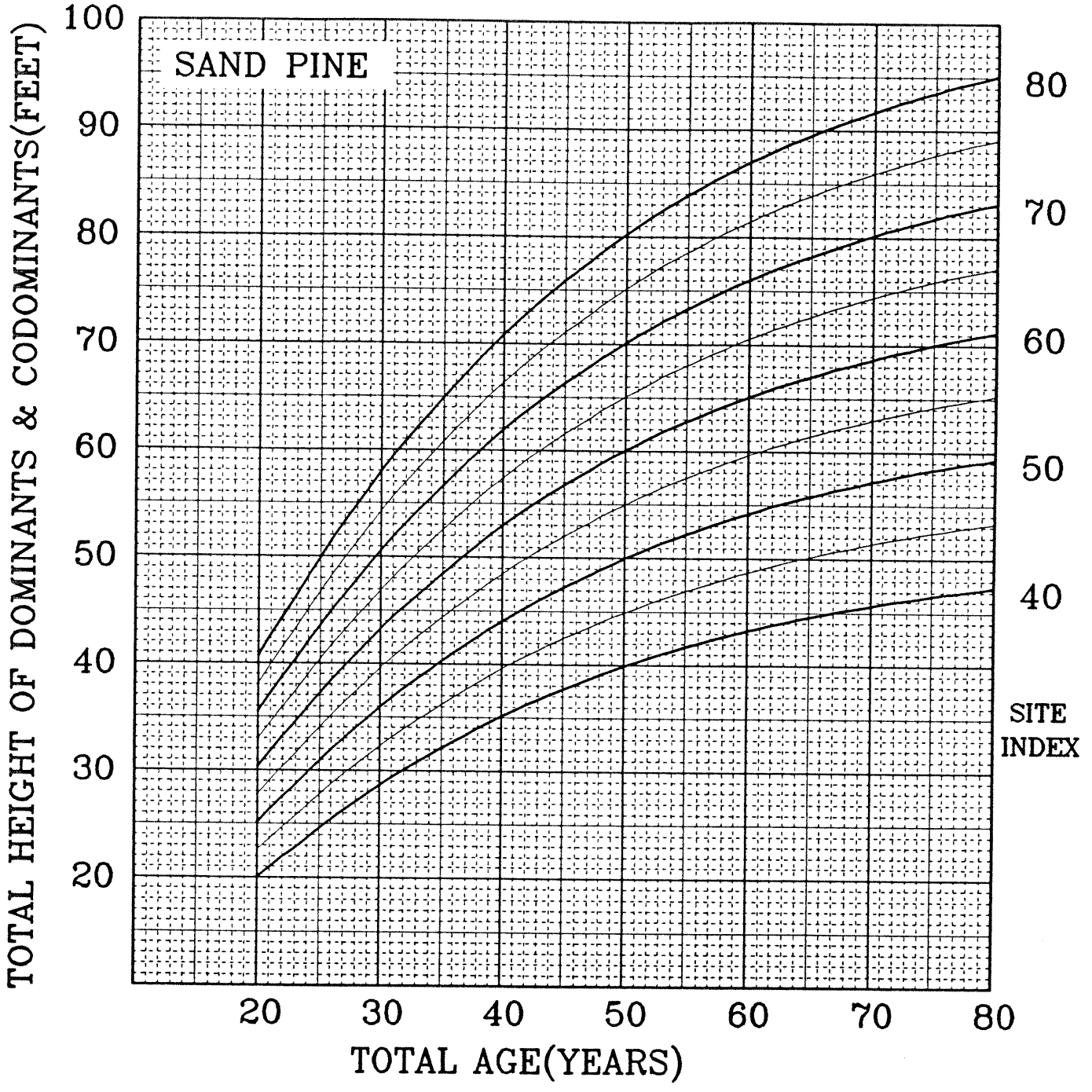


Figure 77.—Sand pine (Schumacher and Coile 1970)
Florida—Ocala National Forest
54 plots having 8 dominant and codominant trees on each plot
Total height and total age, anamorphic, logarithm equation
Add 5 years to d.b.h. age to obtain total age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.2660	1.0034	-0.0365	1.5515	-0.0221	0.99	0.63	1.7
SI	0.7523	1.0085	-0.0360	-1.7997	-0.0657	0.99	0.67	2.2

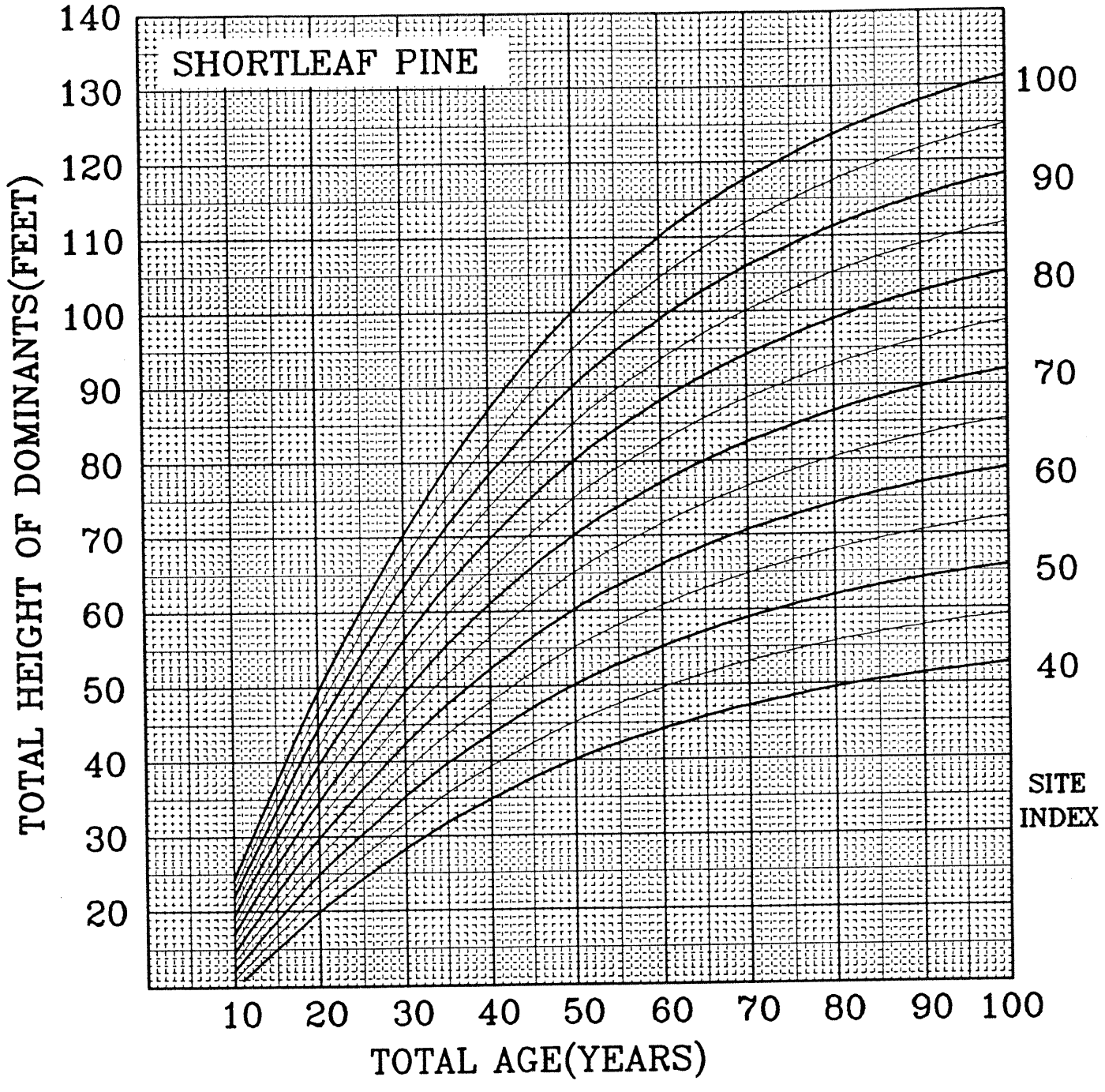


Figure 78.—Shortleaf pine (USDA 1929)
Southern States
188 plots, number of dominant trees not given
Total height and total age, anamorphic, equation not given
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	40-55	56-75	76+
Years:	6	5	4

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.4232	0.9989	-0.0285	1.2156	0.0088	0.99	0.37	1.7
SI	0.7286	0.9946	-0.0296	-1.1733	0.0266	0.99	0.51	2.4

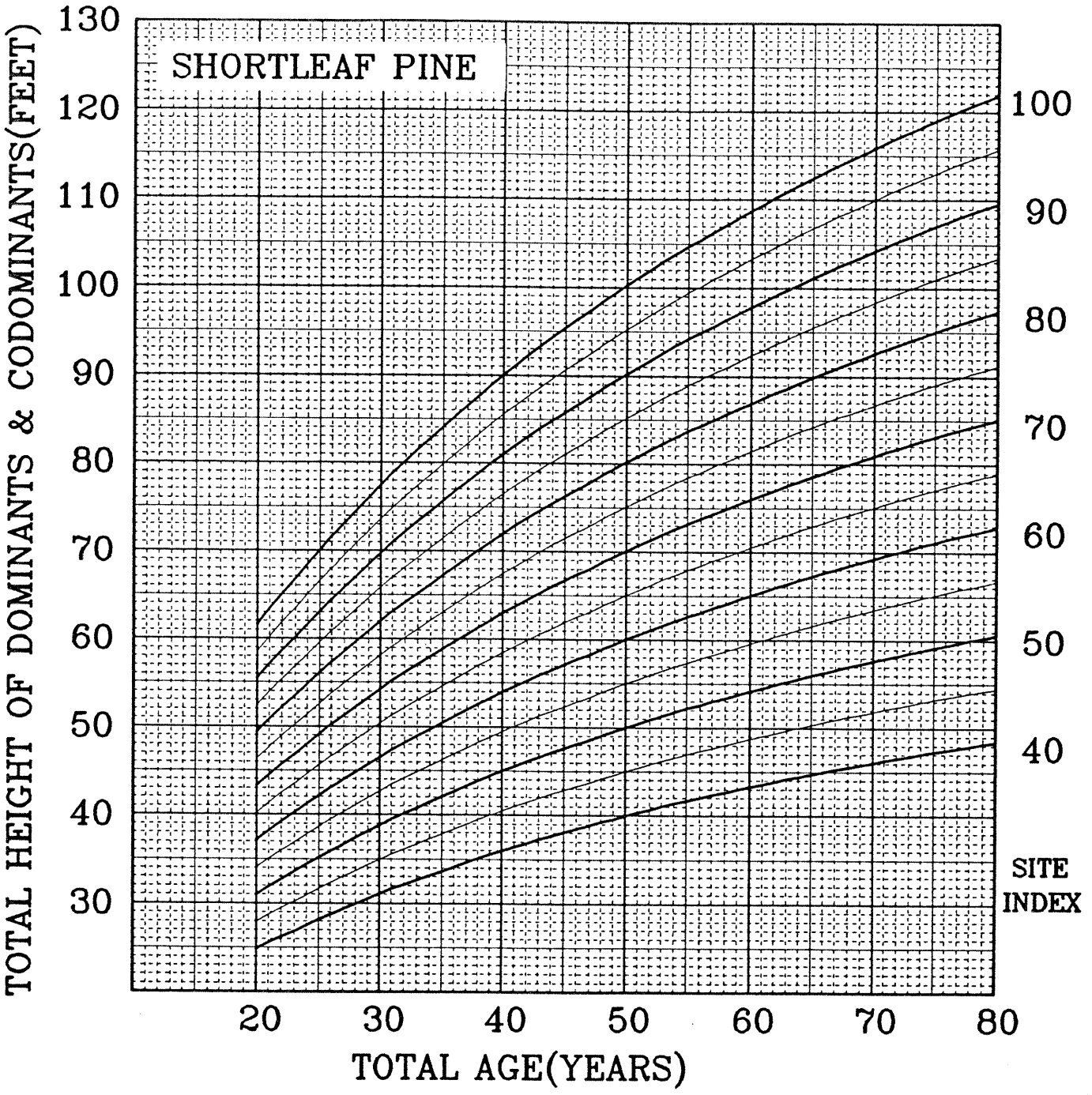


Figure 79.—Shortleaf pine (Schumacher and Coile 1960)
North Carolina Piedmont
74 plots having 8 dominant and codominant trees on each plot
Total height and total age, anamorphic, logarithm equation
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	30-55	56-75	76+
Years:	6	5	4

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.4809	1.0145	-0.0142	0.6040	0.0242	0.99	0.50	1.5
SI	0.6161	0.9871	-0.0106	-0.5655	0.0174	0.99	0.26	0.8

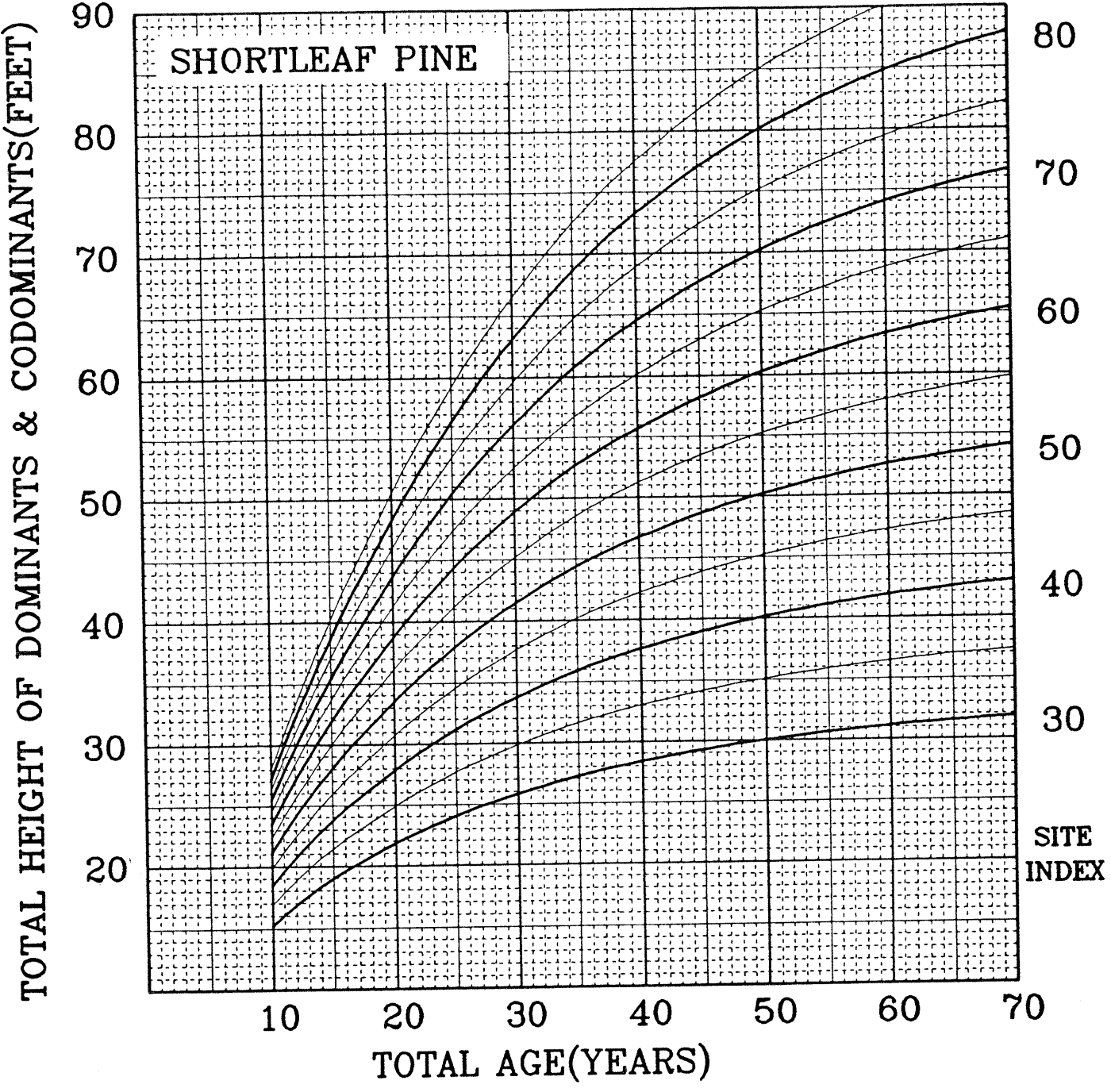


Figure 80.—Shortleaf pine (Nash 1963)
Southeastern Missouri—three areas averaged
309 plots having 7 dominant and codominant trees on each plot
Total height and total age, anamorphic, equation not given
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	30-55	56-75	76+
Years:	6	5	4

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	0.8977	1.0624	-0.0398	0.1419	0.4709	0.99	1.00	3.2
SI	0.9506	0.9859	-0.0562	-0.6048	0.2444	0.99	1.55	4.9

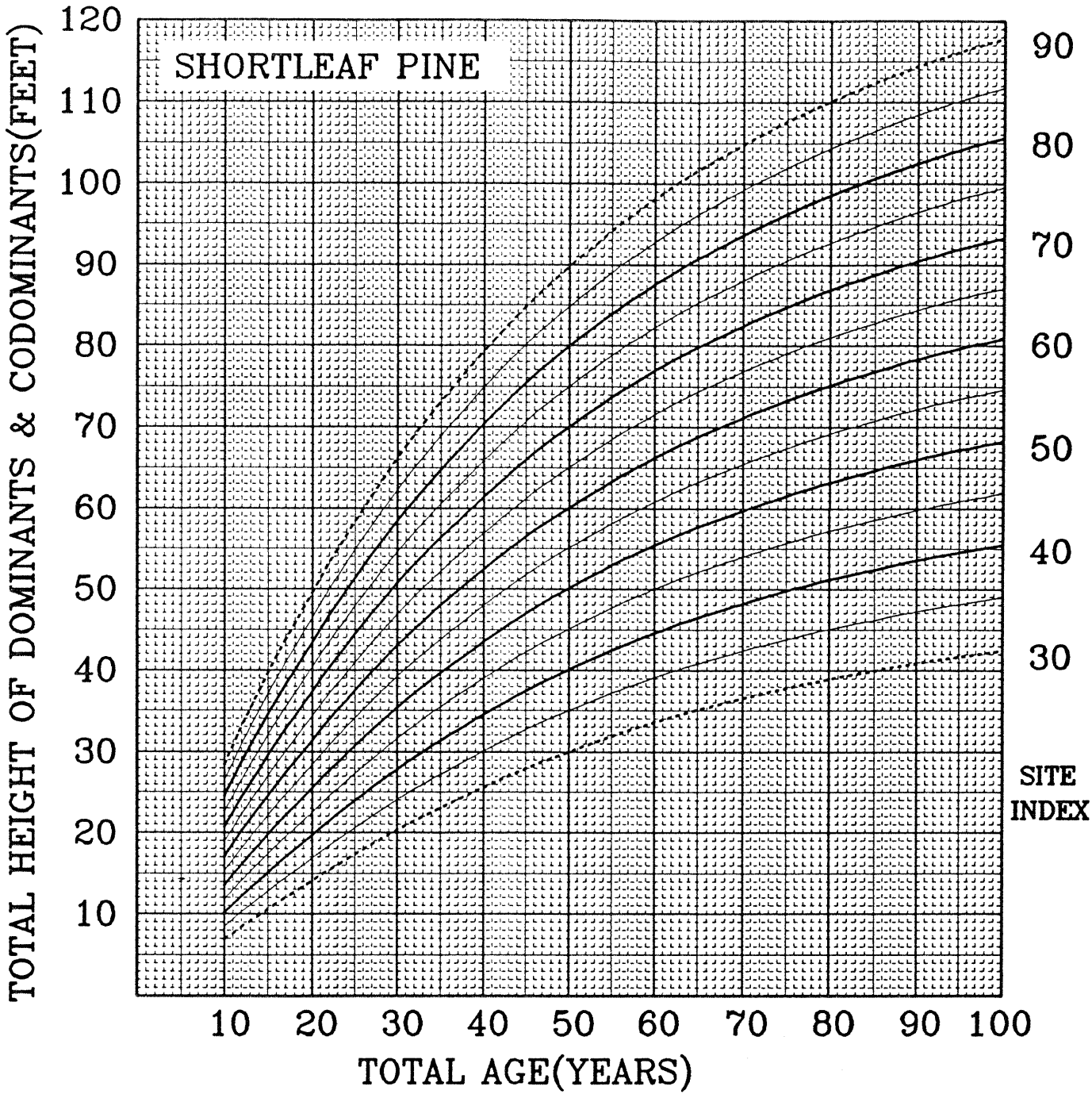


Figure 81.—Shortleaf pine (Graney and Burkhart 1973)
Ouachita Mountains of west-central Arkansas and southeastern Oklahoma
216 plots having 2 dominant and codominant trees on each plot
Stem analysis, nonlinear regression, polymorphic
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	30-55	56-75	76+
Years:	6	5	4

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	2.2746	0.9019	-0.0220	2.1554	-0.2208	0.99	0.82	1.8
SI	0.4280	1.0711	-0.0139	-1.3230	-0.12069	0.99	1.13	3.6

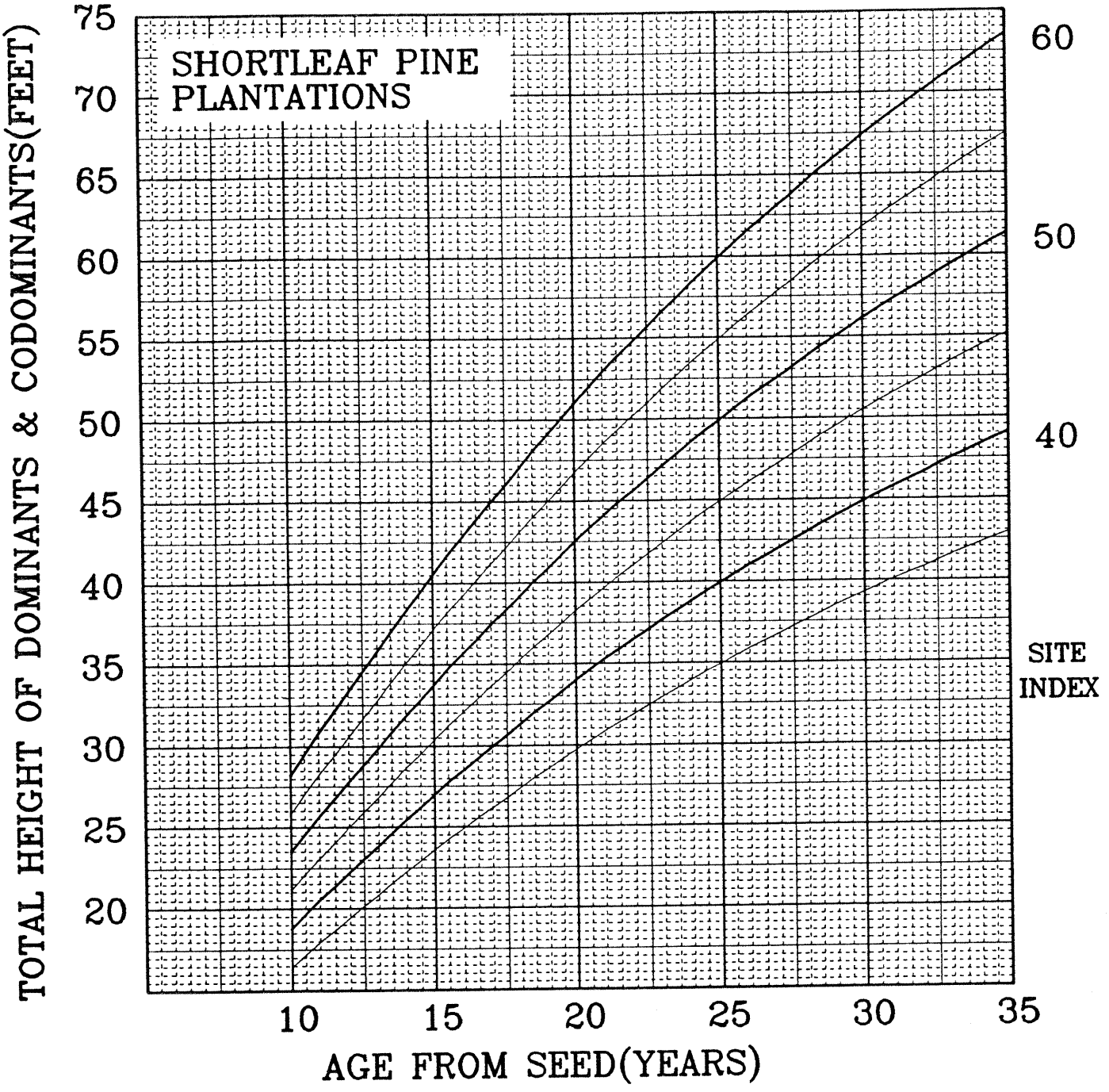


Figure 82.—Shortleaf pine plantations (Smalley and Bower 1971)
Central Tennessee, Northern Alabama, and Northwest Georgia
104 plantations, number of dominant trees not given
Total height and age from seed, anamorphic, logarithm equation
Site index is total height at 25 years age from seed
Convert d.b.h. age to age from seed by adding years according to site index (BH = 0.0):

SI:	<40	40-55	>55
Years:	6	5	4

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.7327	0.9998	-0.0384	1.1430	-0.0004	0.99	0.28	0.6
SI	0.5383	1.0180	-0.0383	-1.2795	-0.0315	0.99	0.30	0.9

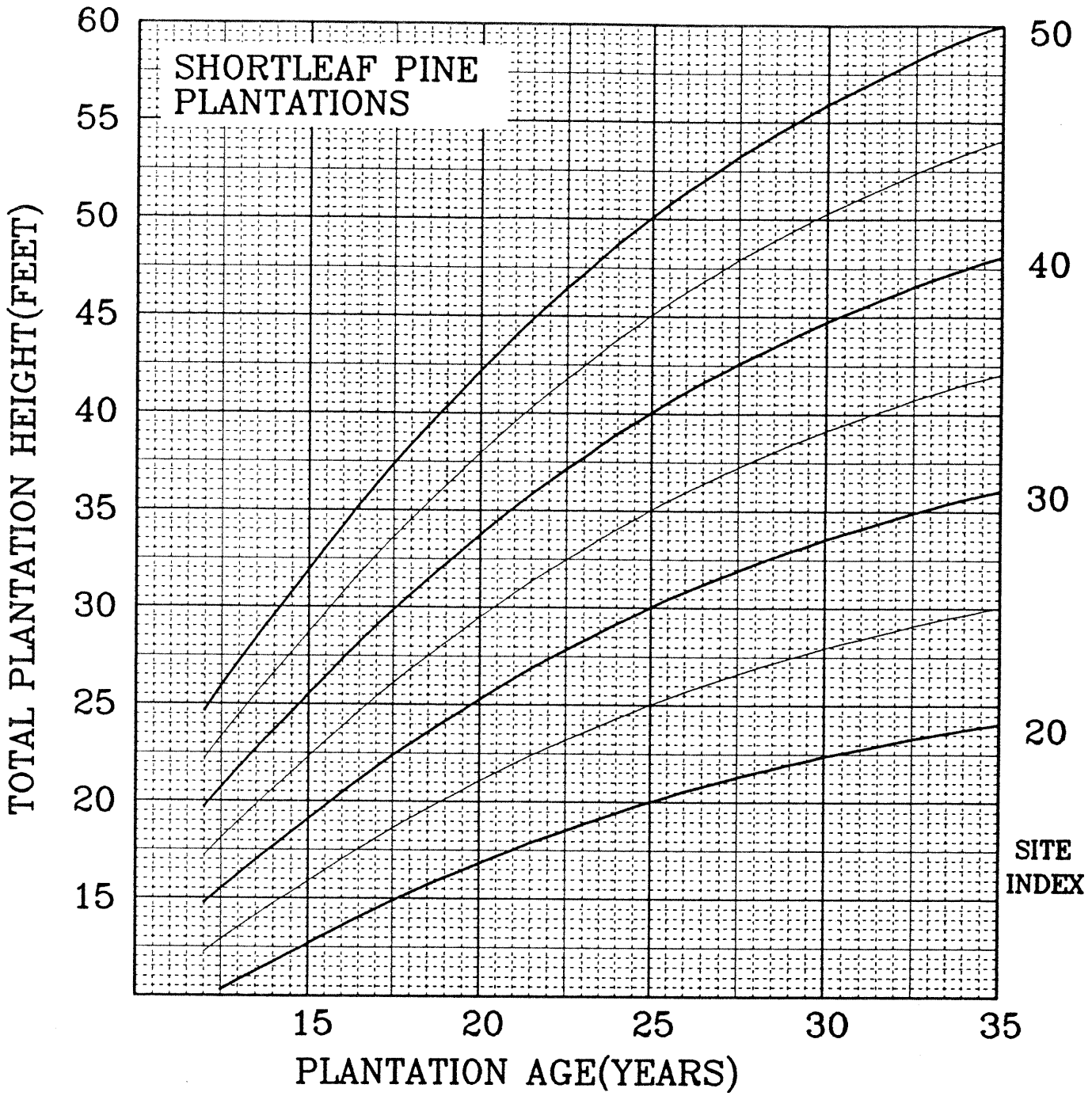


Figure 83.—Shortleaf pine plantations (Gilmore and Metcalf 1961b)
Southern Illinois
61 plantations, number of dominant and codominant trees not given
Total height and plantation age, anamorphic, logarithm equation
Site index is total height at plantation age of 25 years
Convert d.b.h. age to plantation age by adding years according to site index (BH = 0.0):

SI:	<25	25-40	>40
Years:	7	6	5

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.4105	0.9977	-0.0747	2.0668	-0.0104	0.95	0.73	0.6
SI	0.6996	1.0078	-0.0761	-2.2217	-0.0262	0.95	0.71	0.8

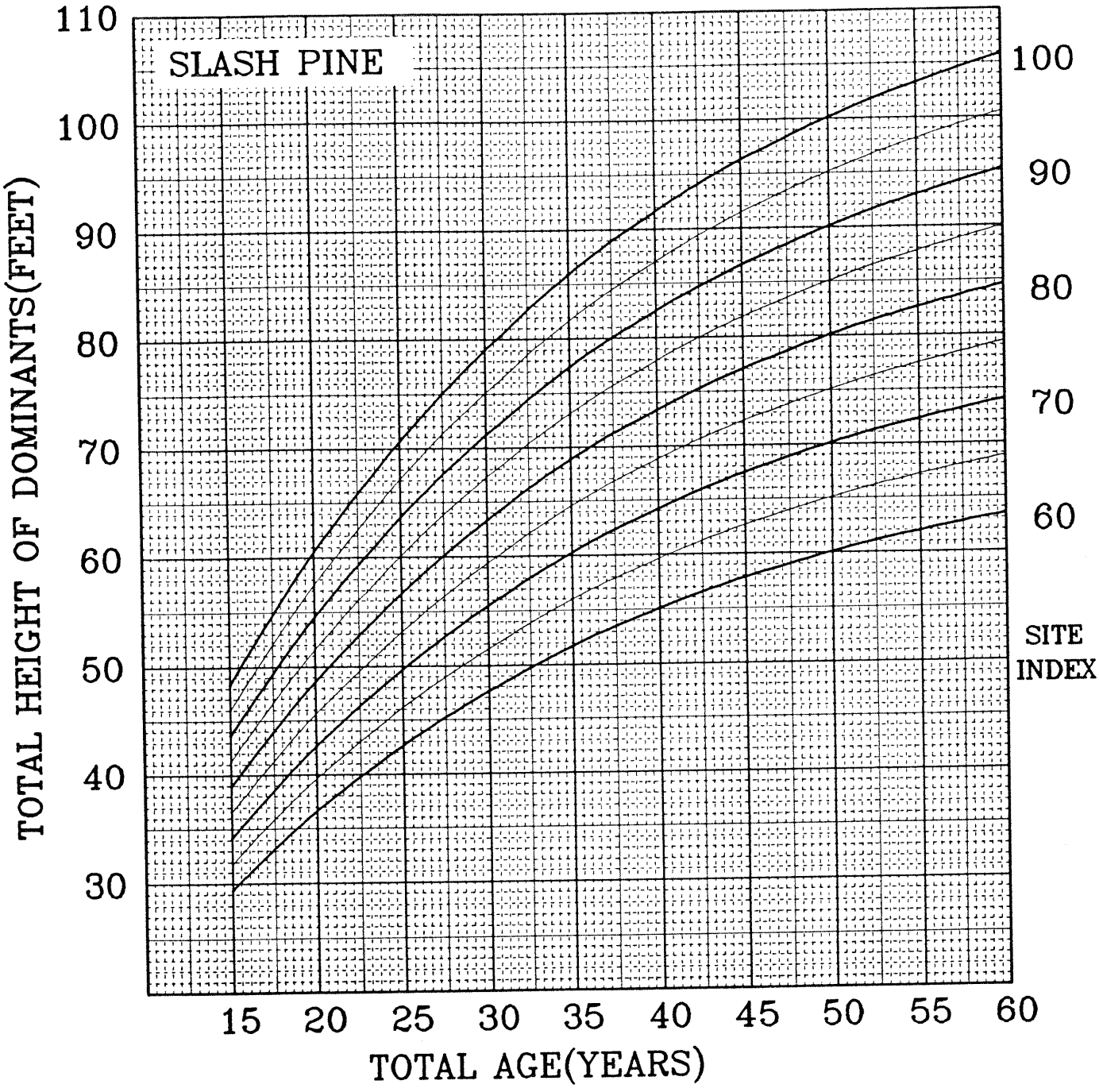


Figure 84.—Slash pine (USDA 1929)
Southern States
124 plots, number of dominant trees not given
Total height and total age, anamorphic, equation not given
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	60-75	75+
Years:	3	2

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.1557	1.0031	-0.0408	0.9807	0.0314	0.99	0.37	0.7
SI	0.8565	1.0002	-0.0421	-1.1093	0.0124	0.99	0.45	1.0

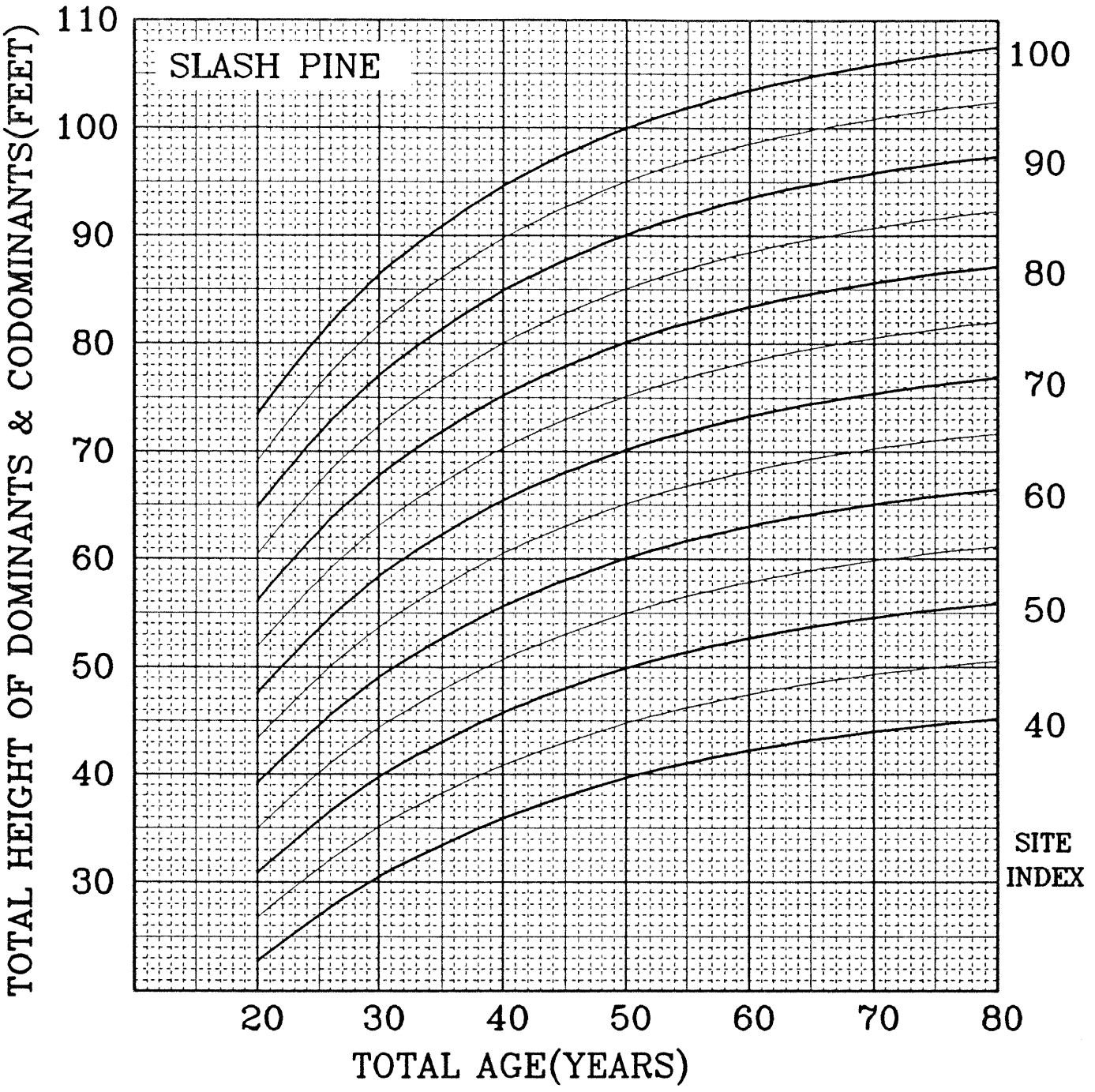


Figure 85.—Slash pine (Schumacher and Coile 1960, Coile and Schumacher 1964)
Southeastern and southern States
231 plots having 8 dominant and codominant trees on each plot
Total height and total age, anamorphic, logarithm equation
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	50-75	76+
Years:	3	2

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.6072	0.9192	-0.0390	12.9271	-0.6427	0.99	0.58	1.6
SI	0.5764	1.0893	-0.0268	-5.4782	-0.5358	0.99	0.37	1.0

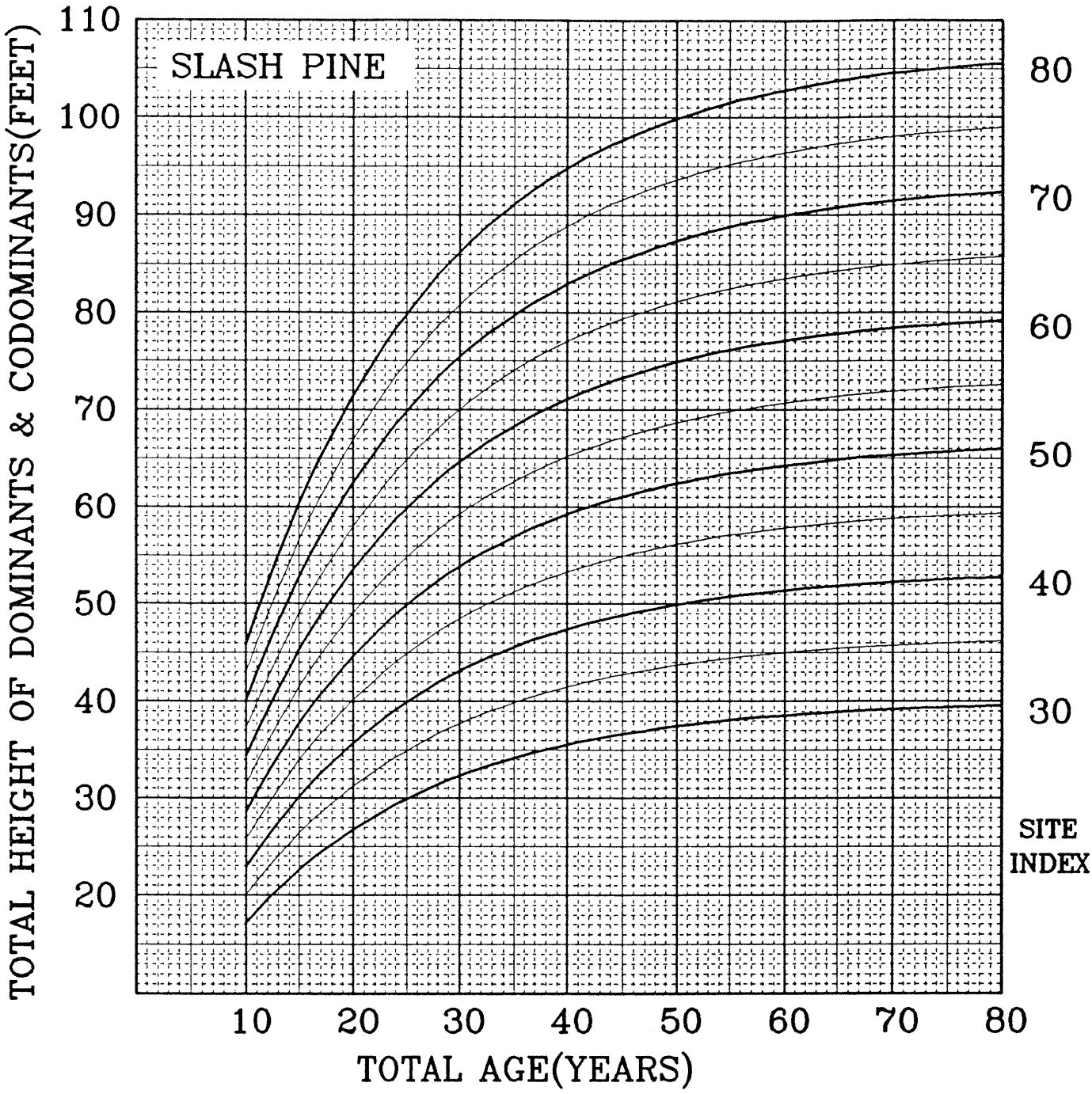


Figure 86.—Slash pine (Langdon 1959)
Florida
90 permanent growth study plots, number of dominant and codominant trees not given
Total height and total age, anamorphic, logarithm equation
Site index is total height at 25 years total age
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	<40	40-60	>60
Years:	4	3	2

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.3379	0.9999	-0.0534	0.9608	-0.0001	0.99	0.88	3.6
SI	0.6874	1.0212	-0.0555	-1.3771	-0.0775	0.99	0.92	4.3

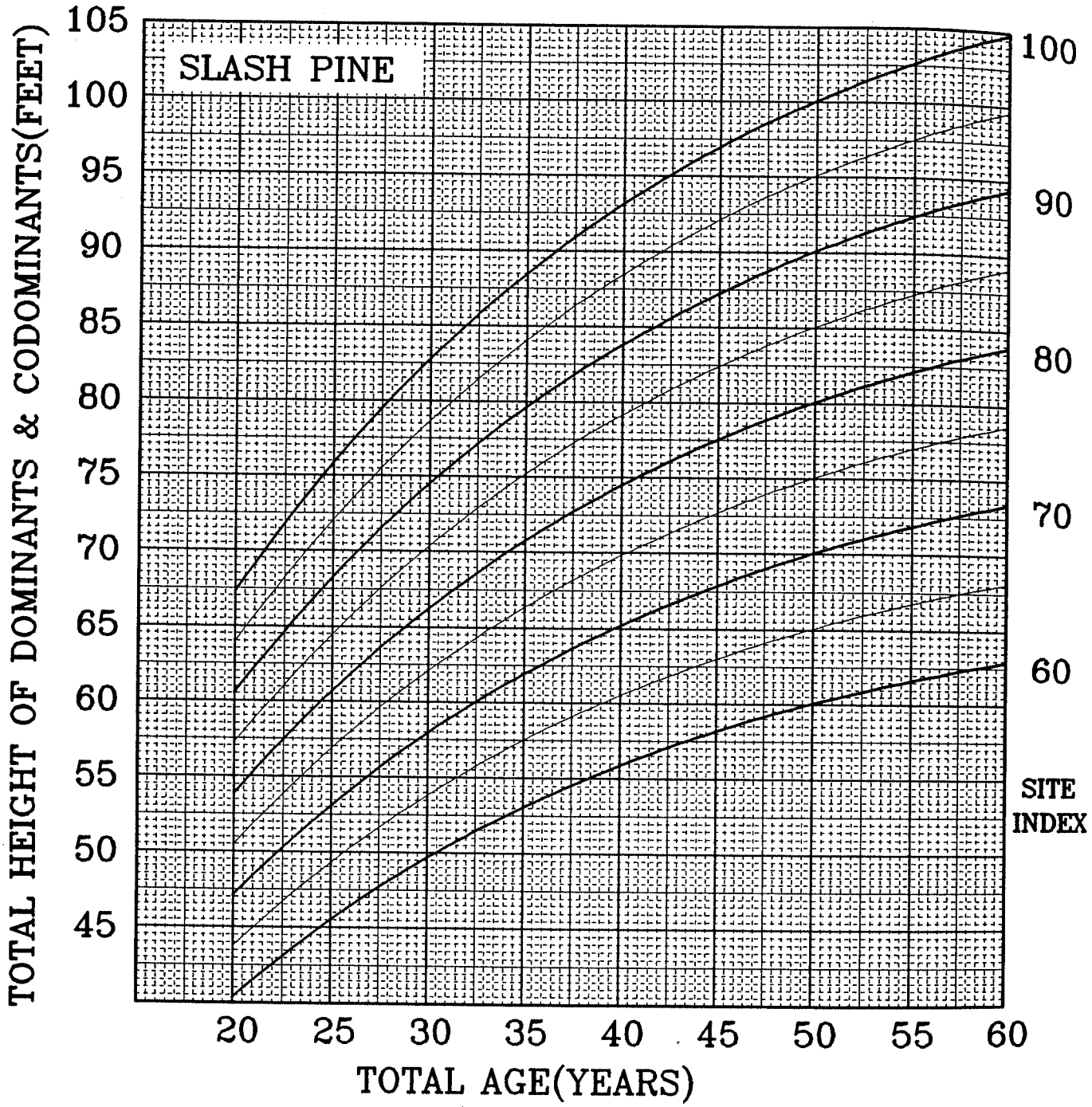


Figure 87.—Slash pine (Bennett 1970)
Florida and southern Georgia
176 permanent growth study plots, number of dominant and codominant trees not given
Total height and total age, anamorphic, logarithm equation
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	60-75	76+
Years:	3	2

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.1510	1.0000	-0.0375	0.8394	0.0000	0.99	0.45	1.7
SI	0.8470	1.0062	-0.0380	-1.0187	-0.0411	0.99	0.48	2.1

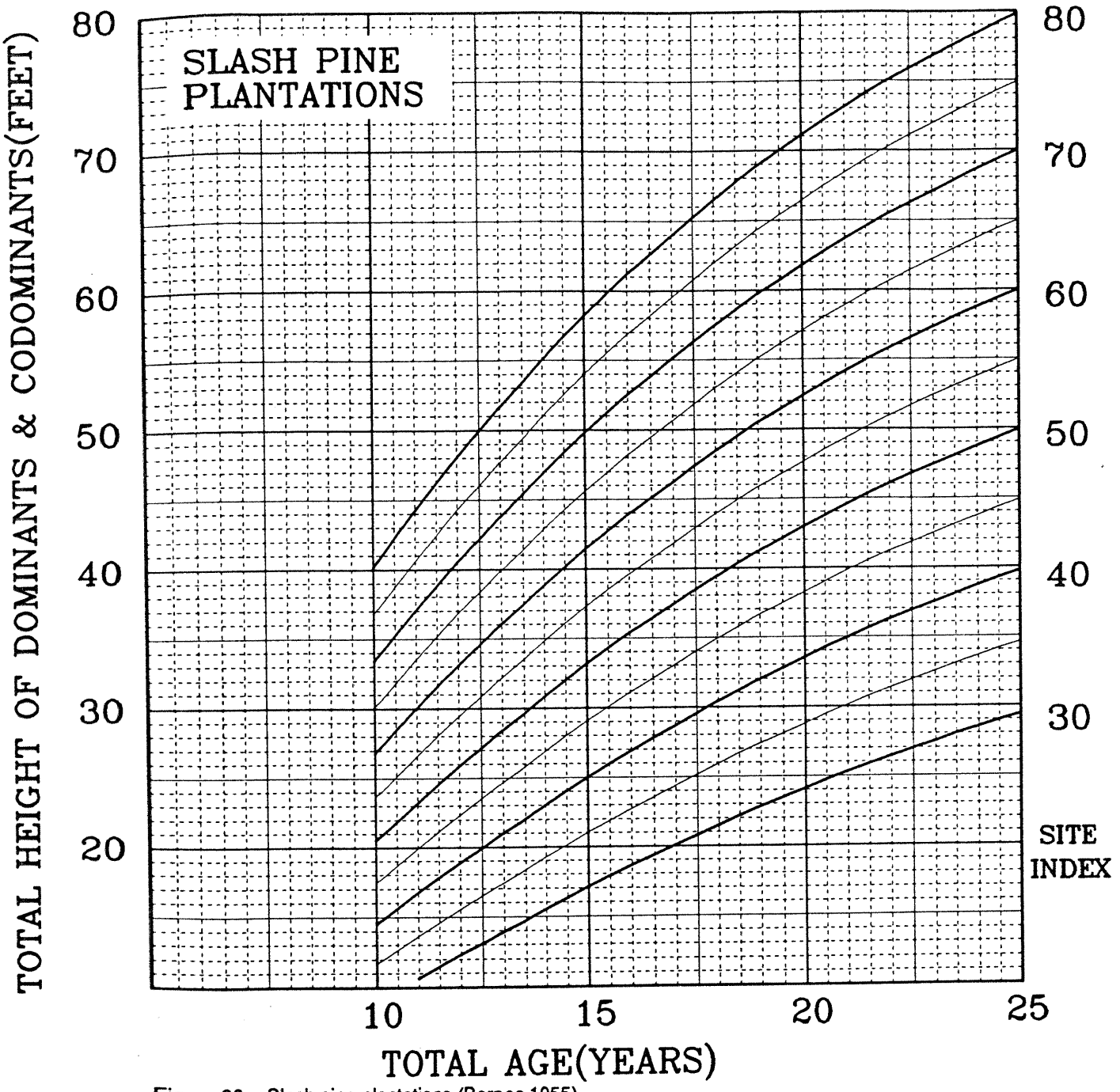


Figure 88.—Slash pine plantations (Barnes 1955)
Florida
328 plots, number of dominant trees not given
Total height and total age, anamorphic, equation not given
Site index is total height at 25 years total age
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	<40	40-60	>60
Years:	4	3	2

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	2.0185	0.8815	-0.0902	18.8088	-0.5520	0.99	0.91	2.0
SI	0.3372	1.1467	-0.0342	-3.4365	-0.3336	0.99	1.08	3.2

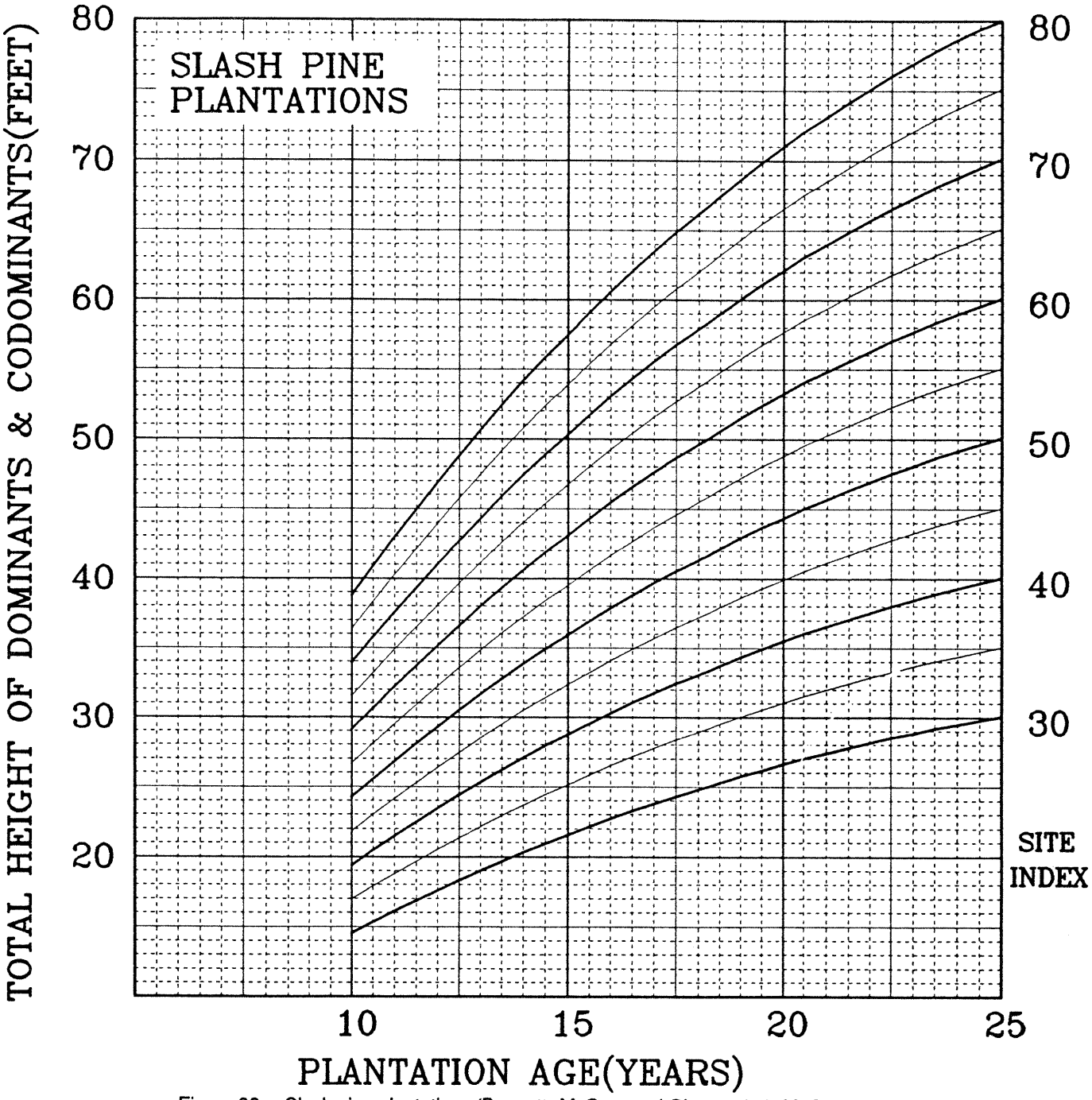


Figure 89.—Slash pine plantations (Bennett, McGee, and Clutter 1959; McGee and Bennett 1959)

Georgia middle coastal plain and Carolina sandhills
310 plots, number of dominant and codominant trees not given
Total height and total age, anamorphic, logarithm equation
Site index is total height at 25 years total age
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	<40	40-60	>60
Years:	4	3	2

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.2144	0.9999	-0.0916	1.7968	-0.0002	0.99	0.38	0.9
SI	0.8474	0.9983	-0.1000	-1.9954	0.0020	0.99	0.20	0.4

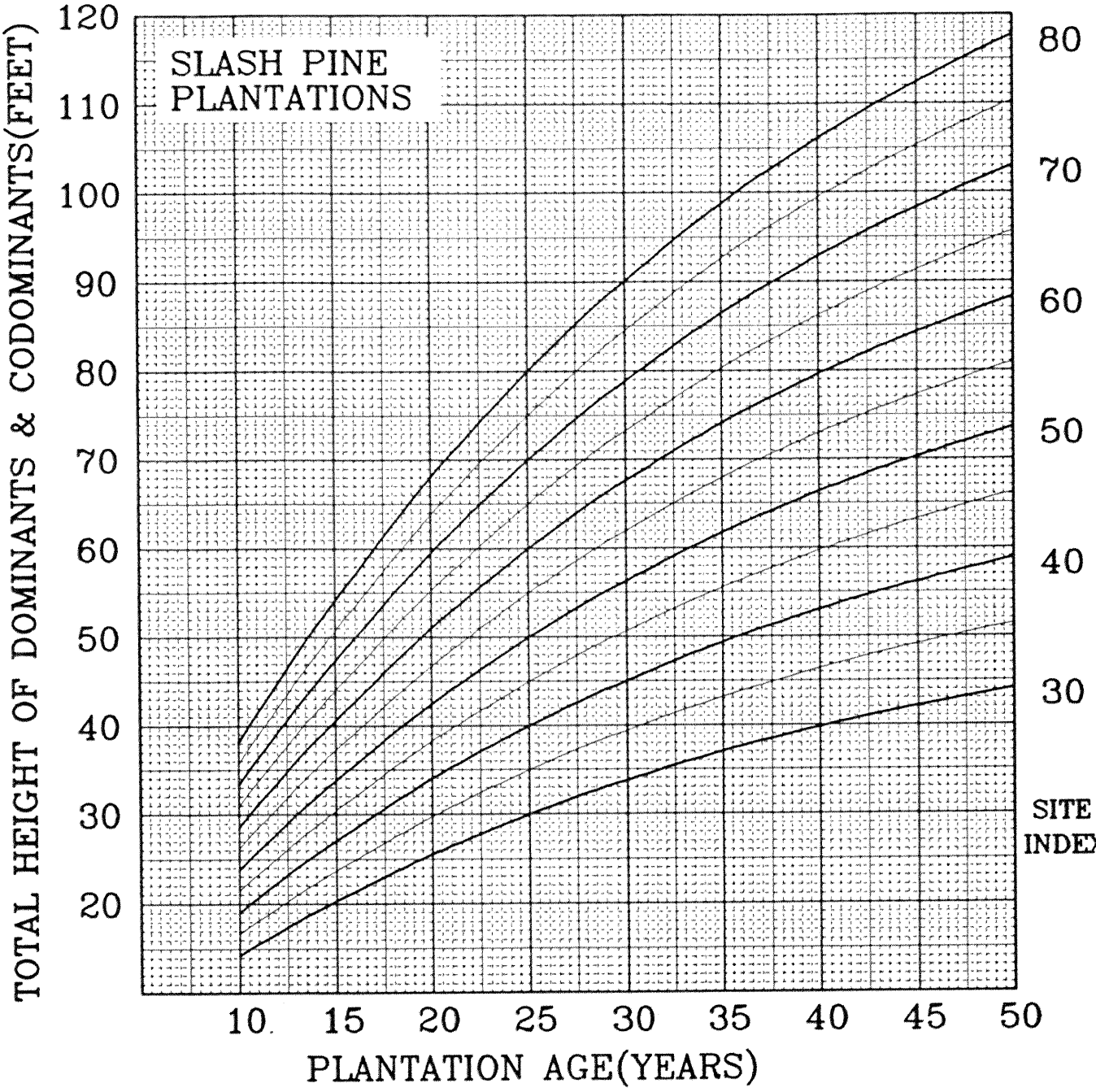


Figure 90.—Slash pine plantations (Zarnoch and Feduccia 1984)

West Gulf

247 plots, some plots remeasured, plantations mostly outside natural range of slash pine

Total height and plantation age, anamorphic, nonlinear regression

Site index is total height at plantation age of 25 years

Convert d.b.h. age to plantation age by adding years according to site index (BH = 0.0):

SI:	<55	>55
Years:	2	1

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.8395	1.0001	-0.0335	1.0774	0.0001	0.98	0.72	1.4
SI	0.5135	1.0169	-0.0348	-1.2309	-0.0278	0.98	0.79	1.9

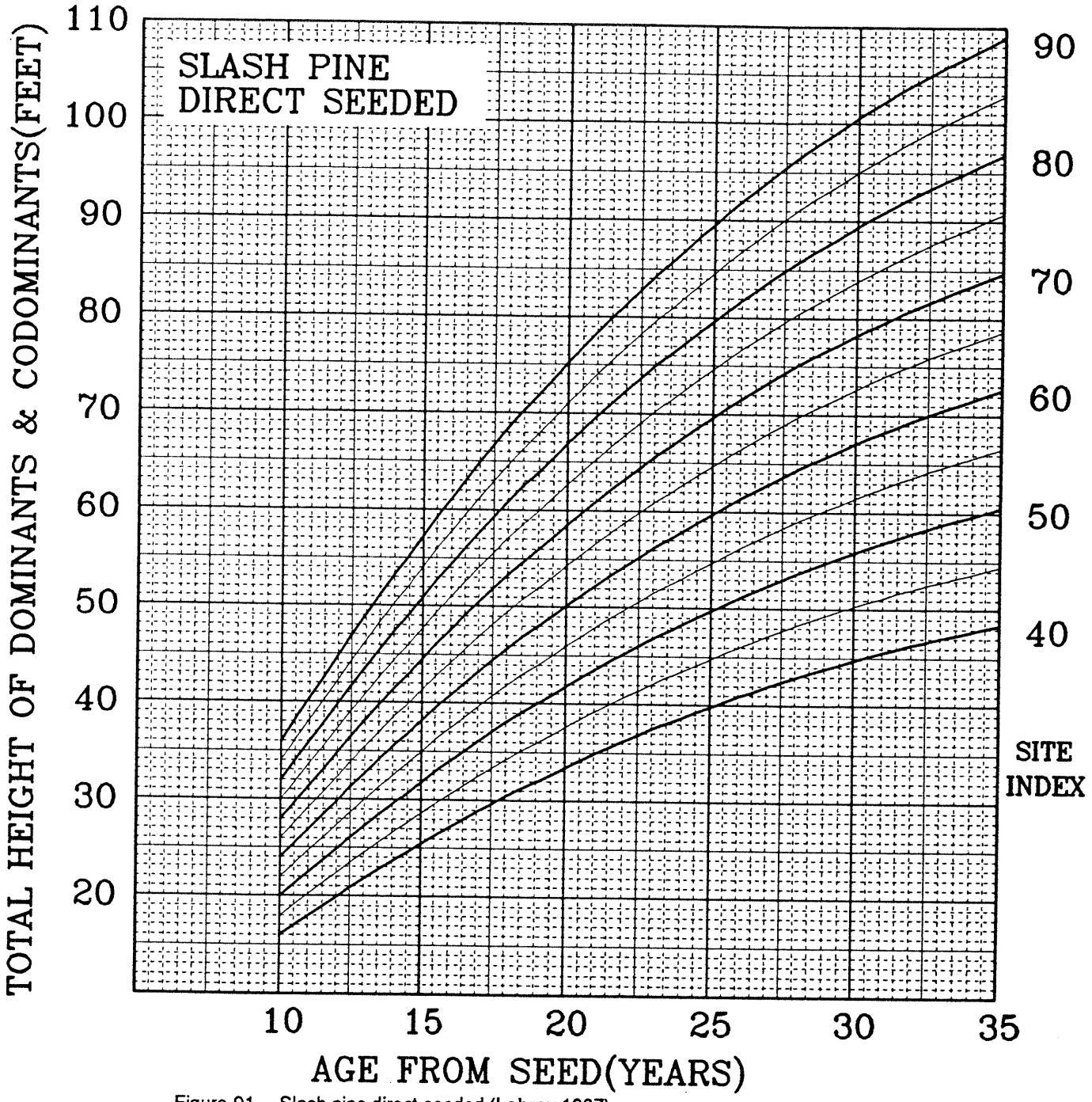


Figure 91.—Slash pine direct-seeded (Lohrey 1987)

Louisiana

218 plots in cutover forest sites that were site prepared and direct seeded; remeasurements from most plots

Total height and age from seed from 10 or more dominant and codominant trees on each plot, anamorphic, logarithm equation

Site index is total height at 25 years age from seed

Convert d.b.h. age to plantation age by adding years according to site index (BH = 0.0):

SI:	<55	>55
Years:	2	1

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.4698	0.9998	-0.0645	1.7575	0.0009	0.99	1.17	1.3
SI	0.6687	1.0058	-0.0655	-2.0012	-0.0294	0.99	1.10	1.6

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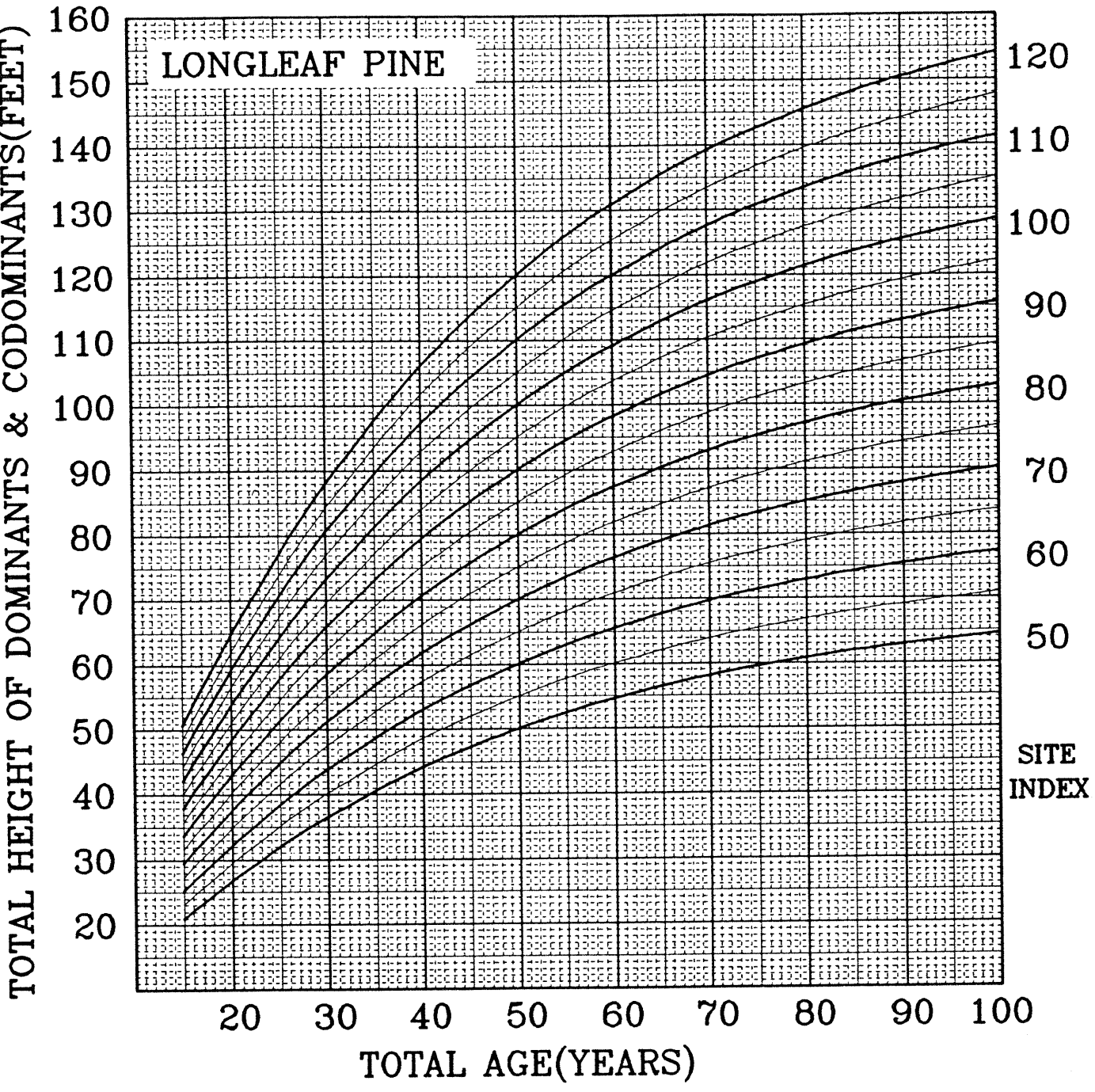


Figure 92.—Longleaf pine (USDA 1929)
Southern States
244 plots, number of dominant trees not given
Total height and total age, anamorphic, equation not given
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	40	50	60	65-95	96+
Years:	10	8	6	5	4

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.4210	0.9947	-0.0269	1.1344	-0.0109	0.99	1.19	5.5
SI	0.6333	1.0310	-0.0278	-1.6207	-0.0878	0.99	1.36	7.3

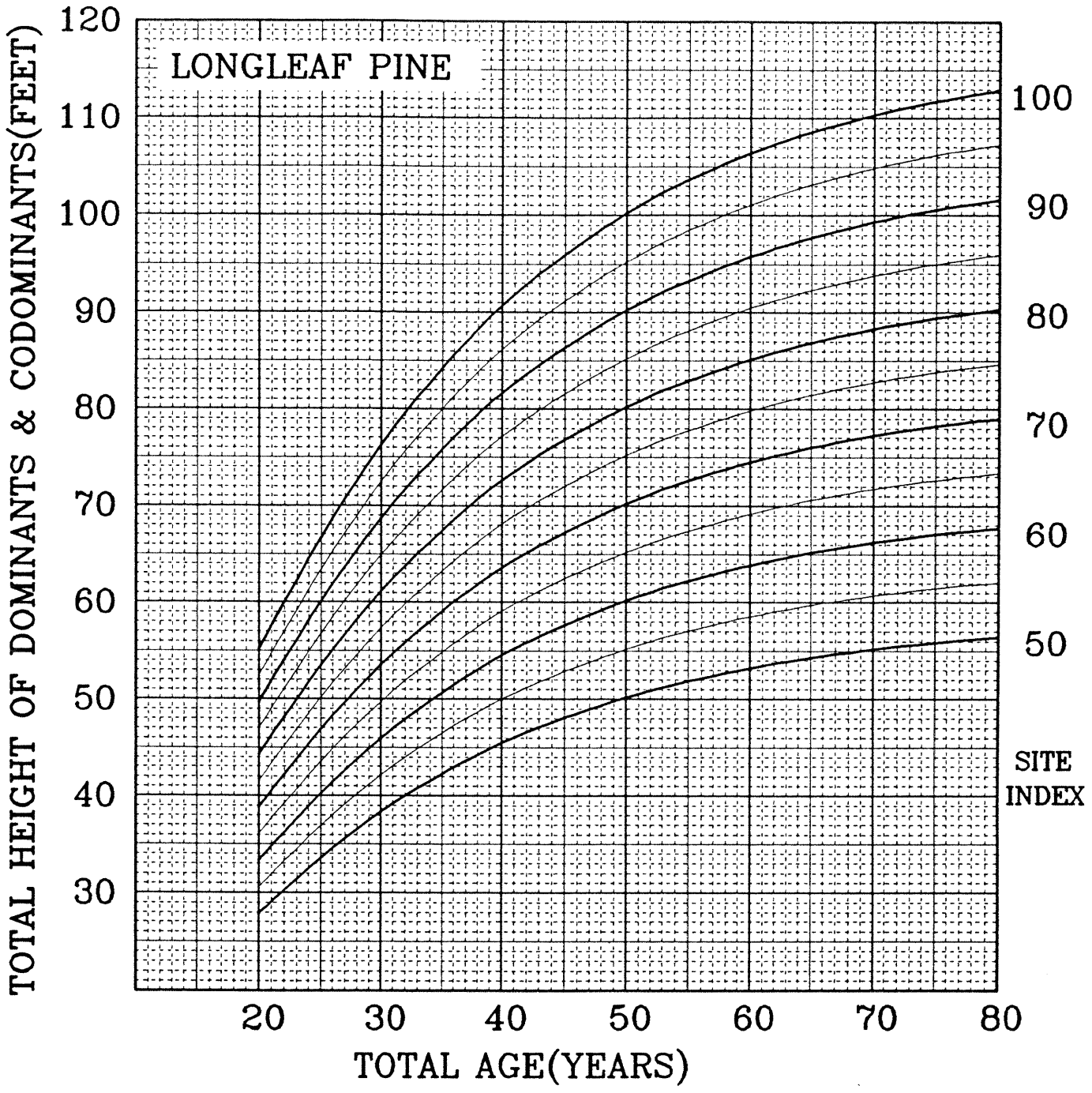


Figure 93.—Longleaf pine (Schumacher and Coile 1960)
Atlantic Coastal Plain
368 plots having 8 dominant and codominant trees on each plot
Total height and total age, anamorphic, logarithm equation
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	50	60	65-95	96+
Years:	8	6	5	4

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.1672	1.0010	-0.0459	1.3460	0.0204	0.99	1.15	3.2
SI	0.7948	1.0171	-0.0470	-2.1964	-0.0864	0.99	1.15	4.2

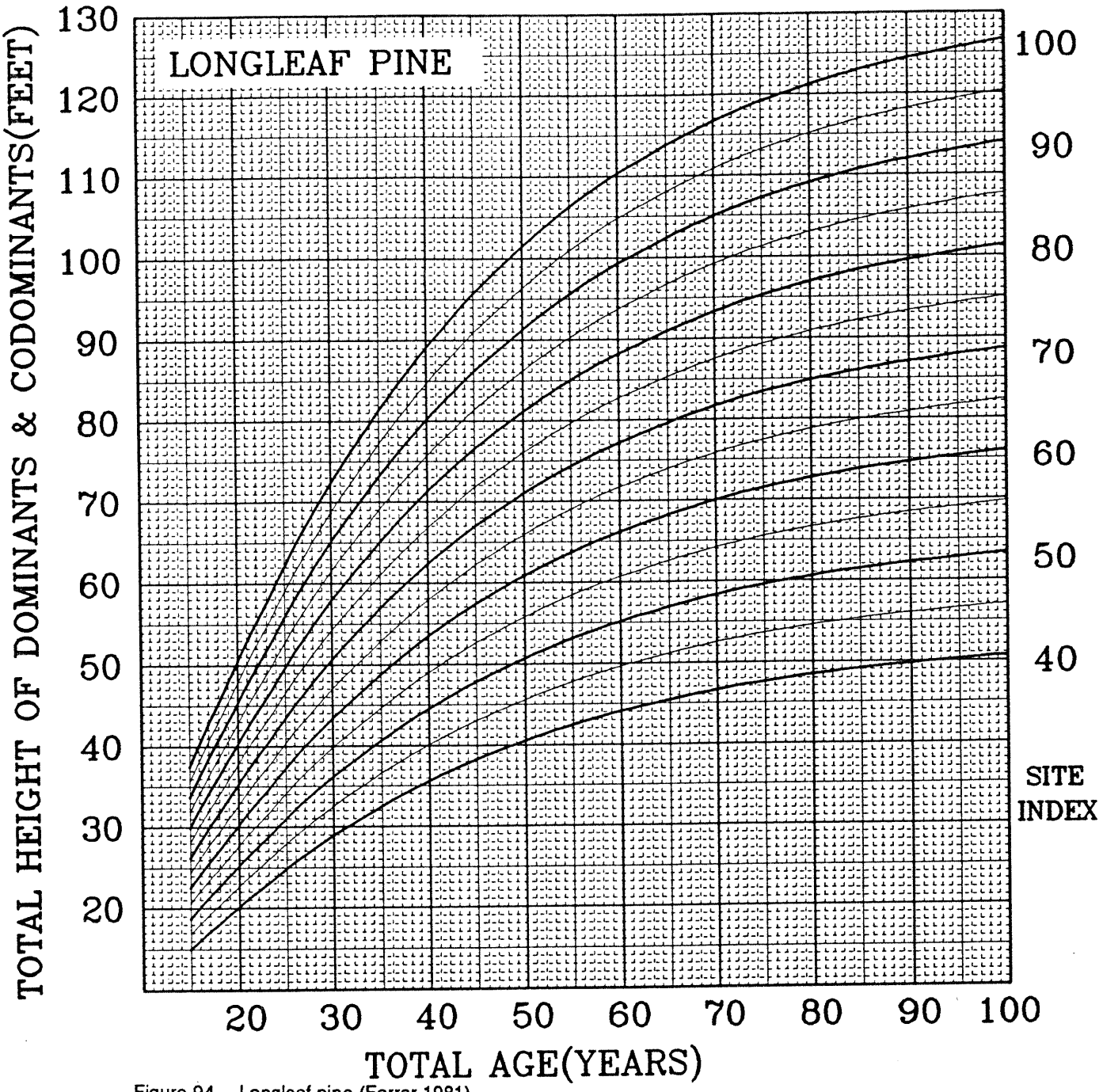


Figure 94.—Longleaf pine (Farrar 1981)

Coastal plain of Northwest Florida, Southwest Georgia, South and Central Alabama, and South Mississippi

182 permanent growth study plots on naturally regenerated lands, remeasurements of total height and age from dominant and codominant trees

Weighted multiple linear regression, anamorphic

Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	40	50	60	65-95	96+
Years:	10	8	6	5	4

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.3196	1.0000	-0.0356	1.4271	0.000017	0.99	3.43	8.6
SI	0.6398	1.0401	-0.0345	-2.6970	-0.1749	0.99	3.78	8.3

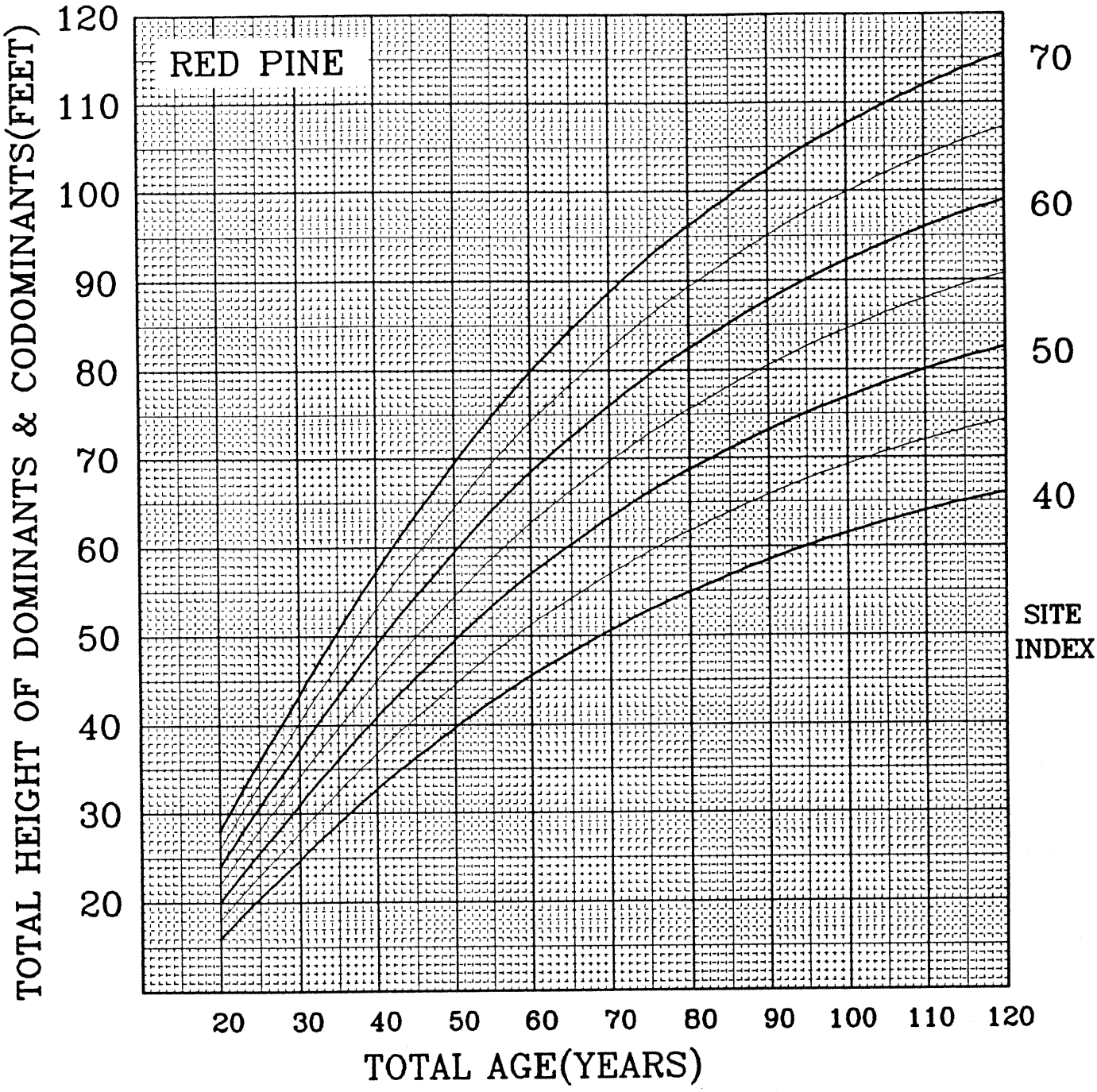


Figure 95.—Red pine (Gevorkiantz 1957c, derived from Eyre and Zehngraff 1948, and Brown and Gevorkiantz 1934)

Minnesota

Number of plots and number of dominant and codominant trees not given

Total height and total age, anamorphic, equation not given

Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	40	50	60	70+
Years:	8	6	5	4

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.8900	1.0000	-0.0198	1.3892	0.0000	0.99	0.64	1.4
SI	0.5291	1.0000	-0.0198	-1.3892	0.0000	0.99	0.64	1.4

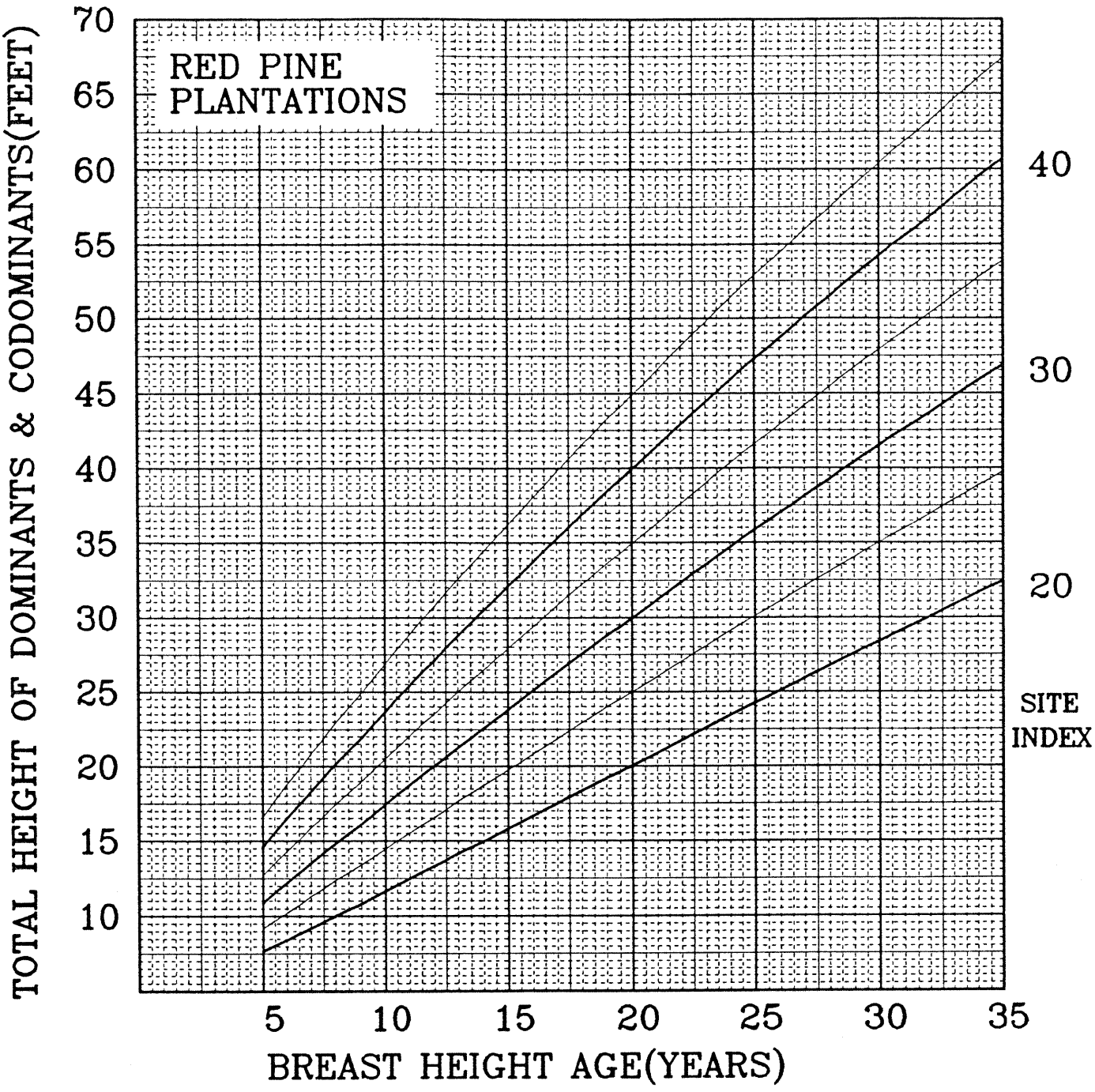


Figure 96.—Red pine plantations (Richards, Morrow, and Stone 1962)
New York
96 plots having 6 to 10 dominant and codominant trees on each plot
Total height and breast height age, polymorphic, independent curves plotted for each site class
Site index is height at 20 years breast height age (BH = 4.5)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	19.0635	0.5885	-0.0111	3.3922	-0.3418	0.95	0.76	1.1
SI	0.0199	1.0192	-0.0081	-0.7730	0.0424	0.97	1.09	1.9

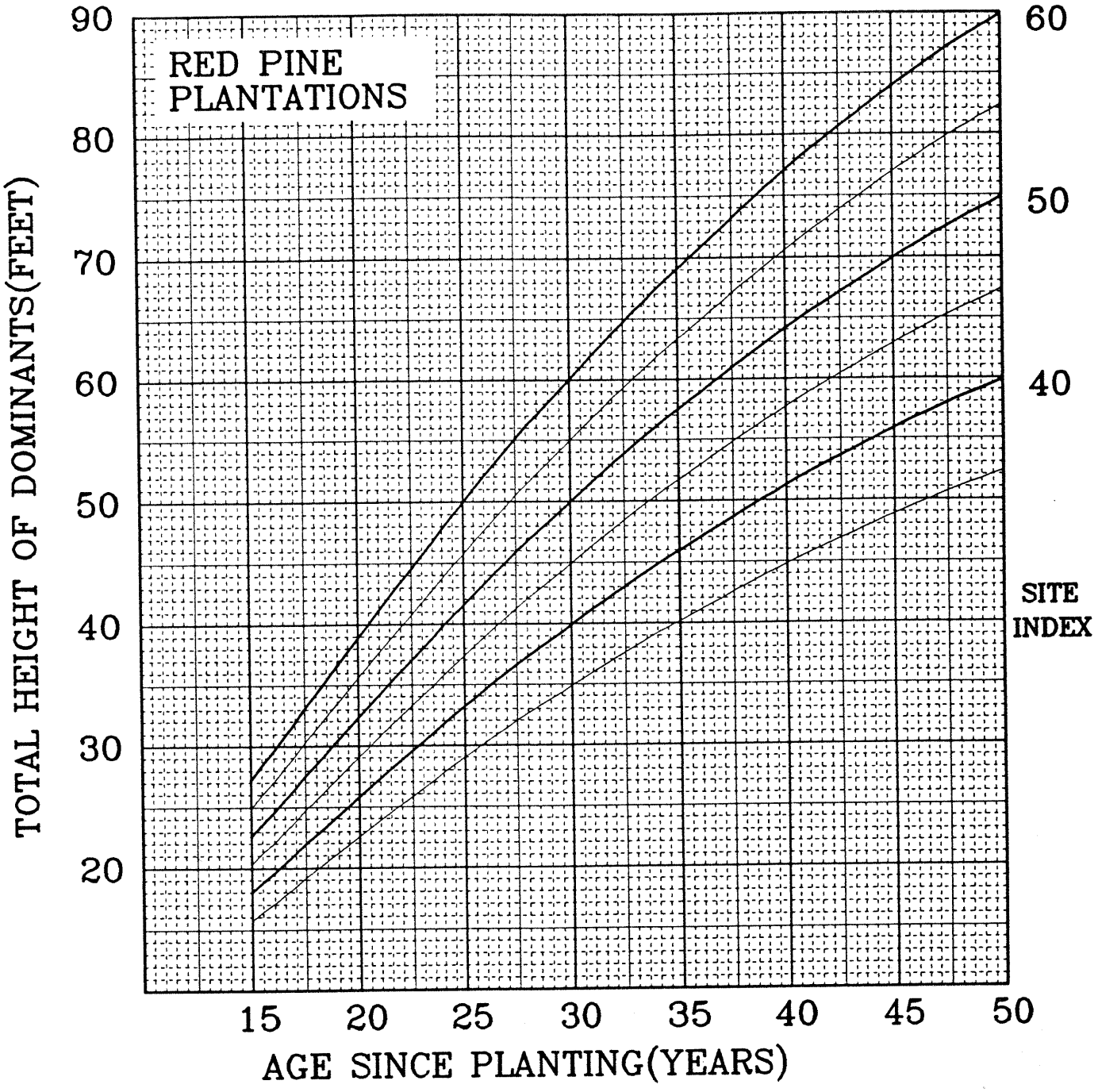


Figure 97.—Red pine plantations (Hannah 1971)
Vermont
92 plots having 2 to 4 dominant trees on each plot
Total height and plantation age, anamorphic, logarithm equation
Site index is total height at 30 years plantation age
Add 7 years to d.b.h. age to obtain plantation age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	2.0401	1.0003	-0.0361	1.7914	-0.0090	0.94	0.62	0.4
SI	0.4935	0.9966	-0.0353	-1.7278	-0.0051	0.95	0.65	0.6

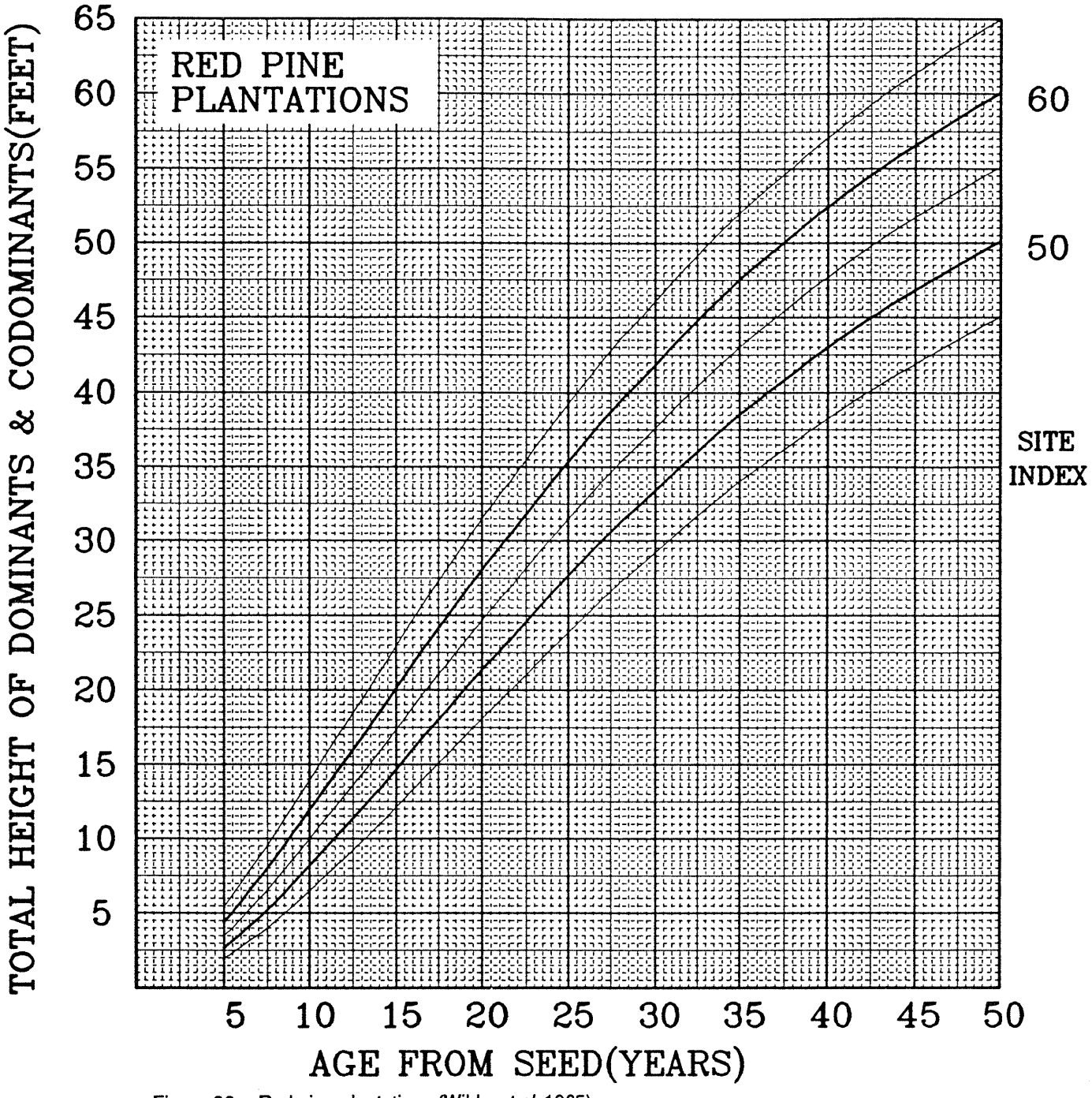


Figure 98.—Red pine plantations (Wilde *et al.* 1965)
Wisconsin
69 plantations, number of dominant and codominant trees not given
Total height and age from seed, anamorphic, equation not given
Add 7 years to d.b.h. age to obtain age from seed (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	2.6359	0.8259	-0.0389	21.5578	-0.6271	0.98	1.05	1.6
SI	0.0102	1.4990	-0.0004	-1.4930	-0.2058	0.99	1.62	4.0

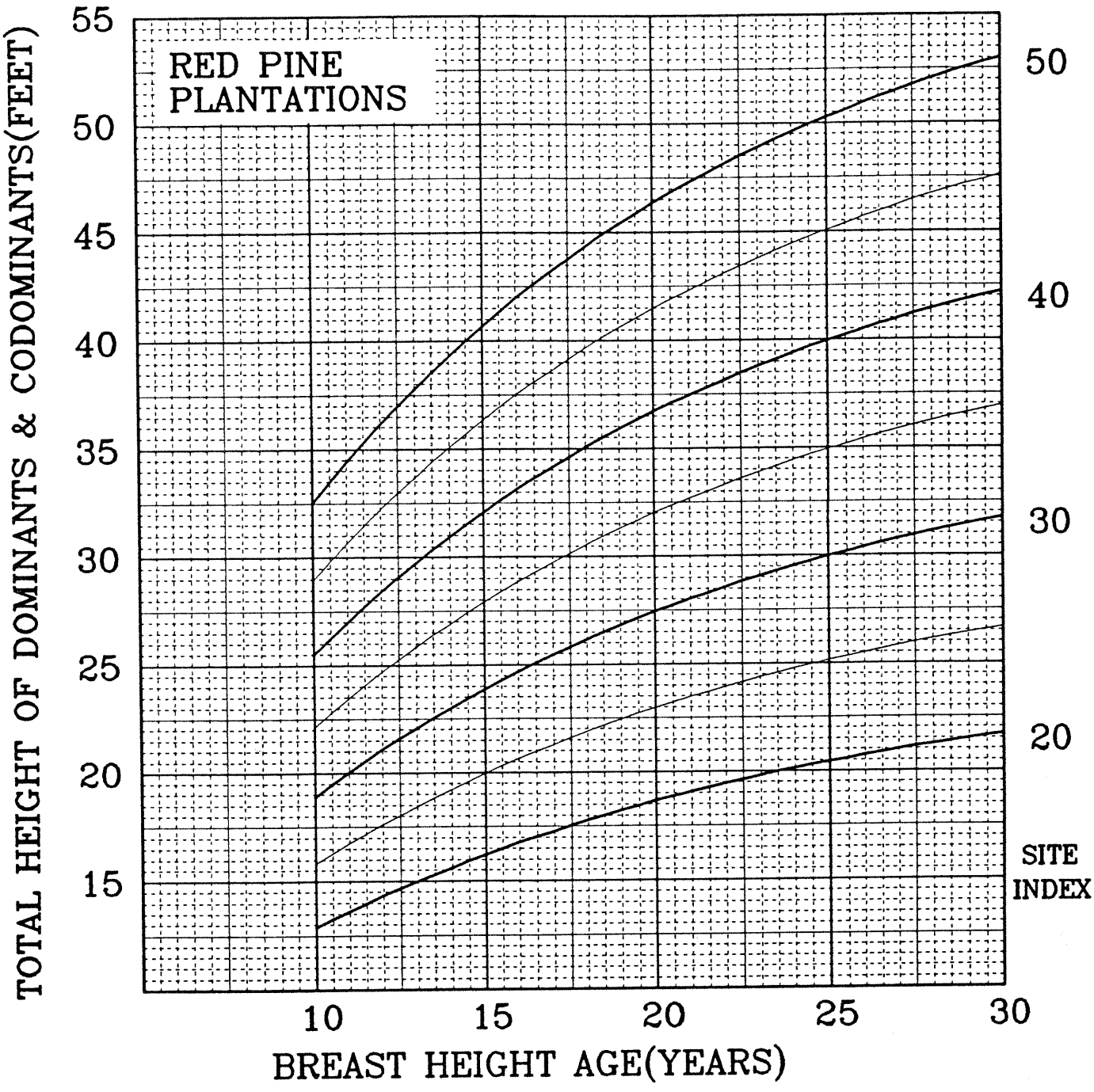


Figure 99.—Red pine plantations (Gilmore 1967)
Illinois
60 plantations, number of dominant trees not given
Total height and breast height age, anamorphic, logarithm equation
Site index is total height at 25 years breast height age (BH = 4.5)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	0.7666	1.0909	-0.0733	3.2335	-0.2947	0.98	1.17	1.2
SI	0.3862	1.1649	-0.0646	-1.0878	-0.0287	0.97	1.08	1.0

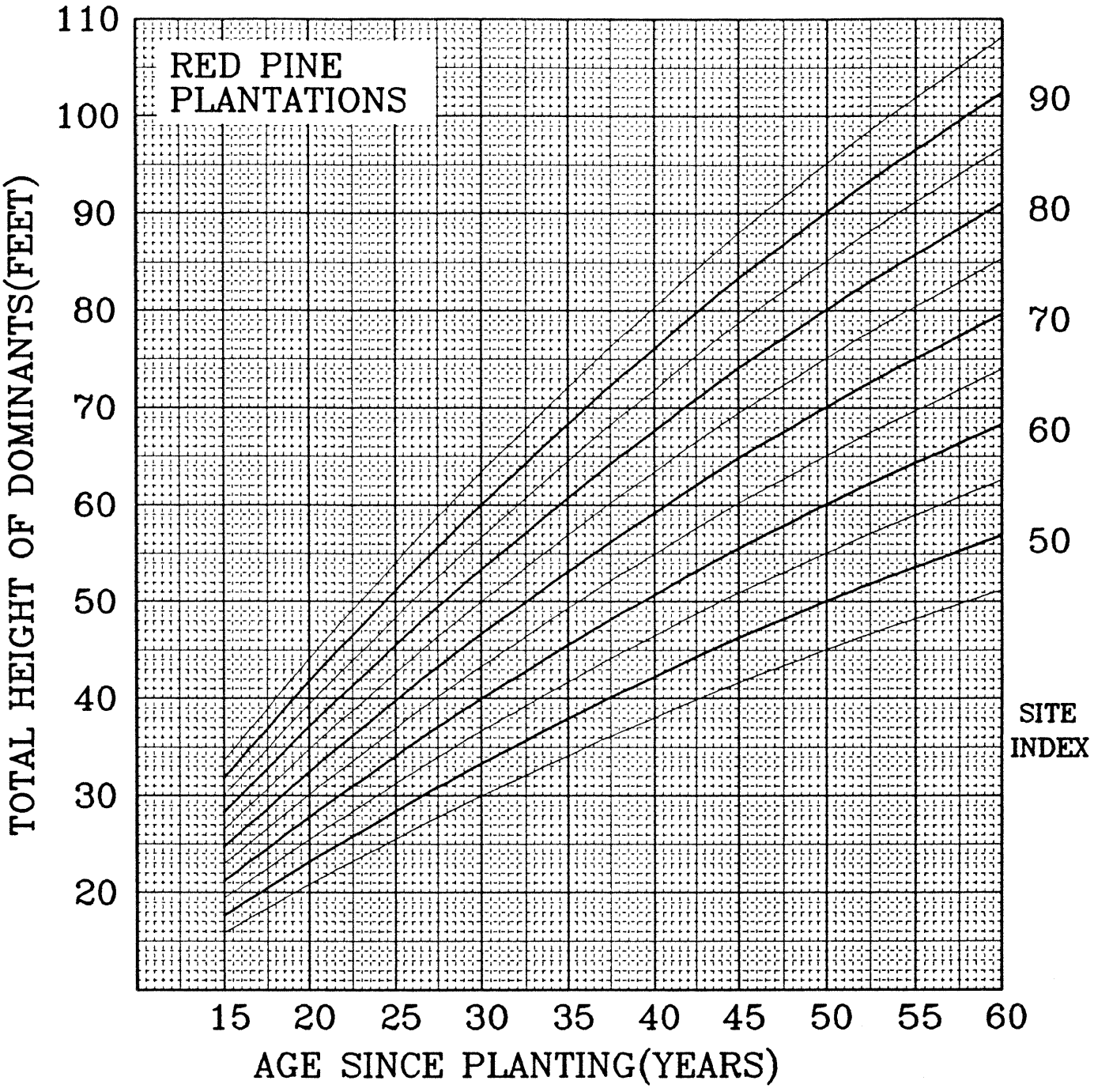


Figure 100.—Red pine plantations (Stiell and Berry 1973b, Berry 1984)
Eastern Ontario—Petawawa
31 plantations having 56 permanent growth study plots
Periodic height measurements, anamorphic, quadratic equation not given
Site index is total height at 50 years since planting
Add 5 years to d.b.h. age to obtain years since planting (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	2.0434	0.9978	-0.0147	1.0937	-0.0035	0.89	0.44	0.4
SI	0.4950	0.9965	-0.0143	-1.0491	0.0039	0.92	0.51	0.5

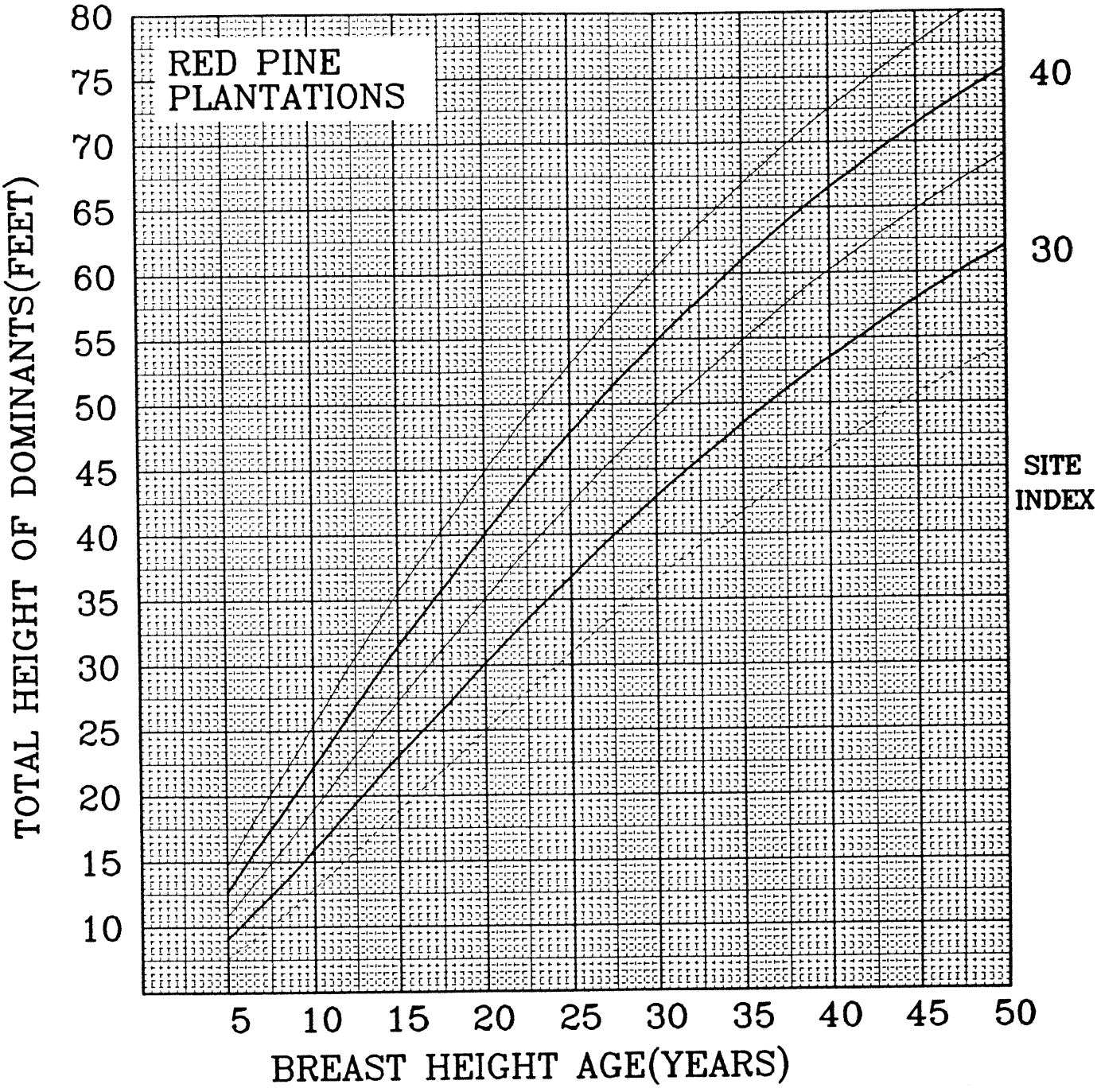


Figure 101.—Red pine plantations (Thrower 1986b)
North central Ontario
25 plots having 3 dominant trees per plot
Internode measurements and stem analysis, nonlinear regression, polymorphic
Site index is total height at 20 years breast height age (BH = 4.5)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	13.6713	0.5404	-0.0283	8.7720	-0.5308	0.94	0.55	0.5
SI	0.00098	1.4784	-0.00023	-1.1602	-0.0574	0.99	1.35	3.7

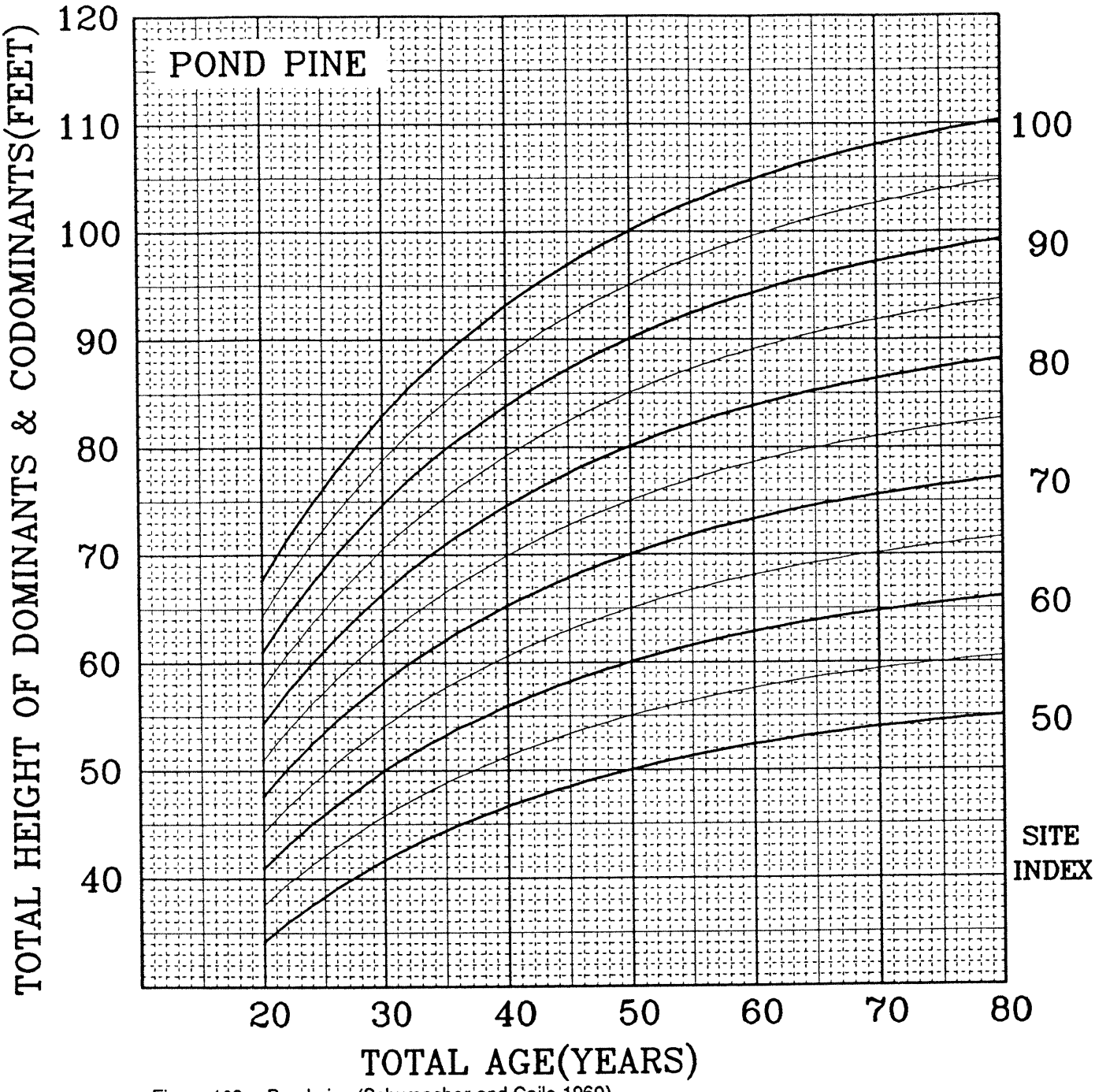


Figure 102.—Pond pine (Schumacher and Coile 1960)
Coastal Plain of North Carolina, South Carolina, and Georgia
130 plots having 8 dominant and codominant trees on each plot
Total height and age, anamorphic, logarithm equation
Convert d.b.h. age to total age by adding years according to
site index (BH = 0.0):

SI:	50-75	75-100
Years:	5	4

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.1266	1.0051	-0.0367	0.6780	0.0404	0.99	0.61	1.6
SI	0.8682	1.0012	-0.0384	-0.8561	-0.0016	0.99	0.68	2.1

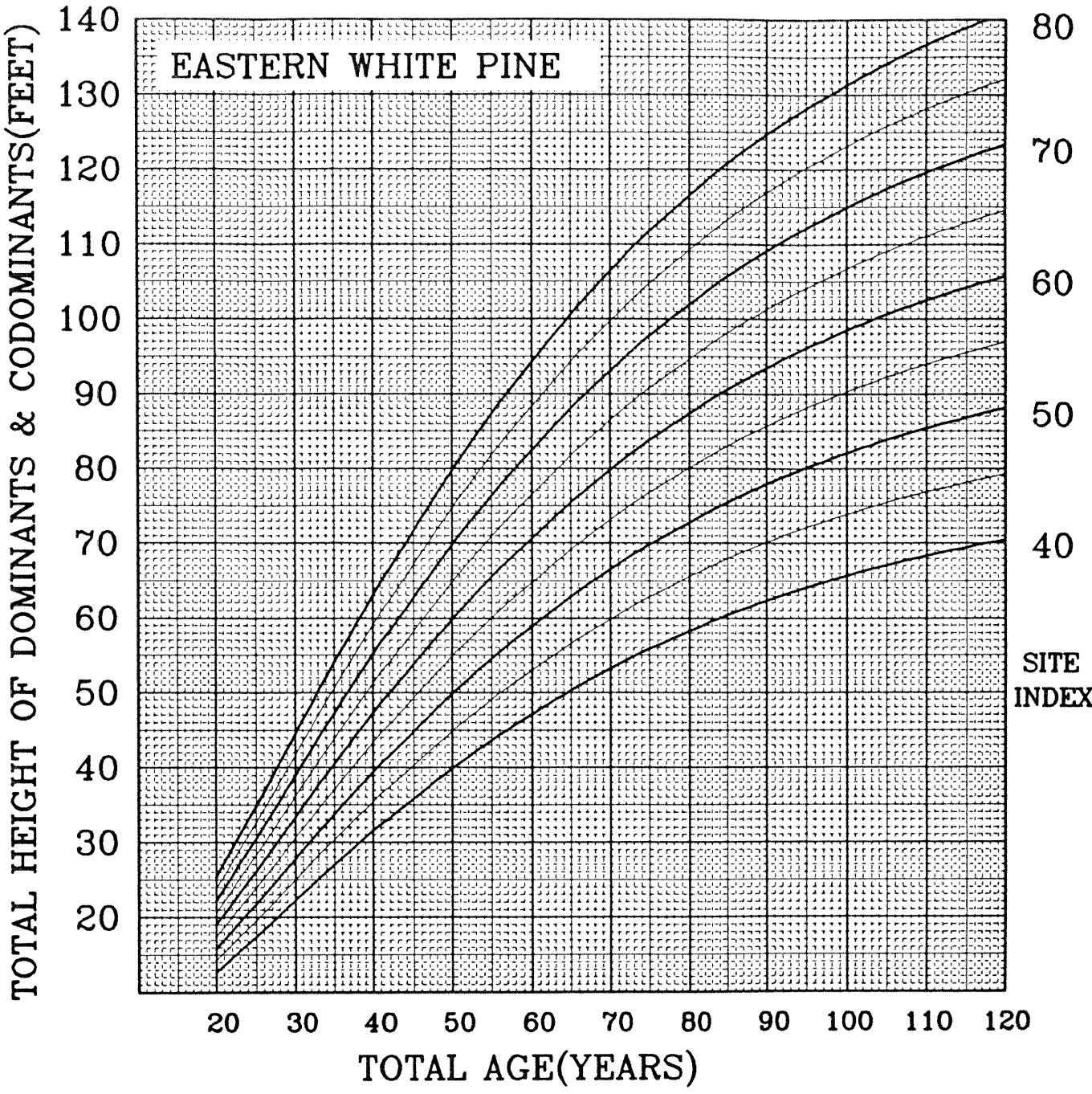


Figure 103.—Eastern white pine (Gevorkiantz 1957f, derived from Gevorkiantz and Zon 1930)
Northern Wisconsin
92 plots, number of dominant and codominant trees not given
Total height and total age, anamorphic, equation not given
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	40	50	60	70	80
Years:	12	12	10	8	6

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.9660	1.0000	-0.0240	1.8942	0.0000	0.99	0.66	1.7
SI	0.5086	1.0000	-0.0240	-1.8942	0.0000	0.99	0.66	1.7

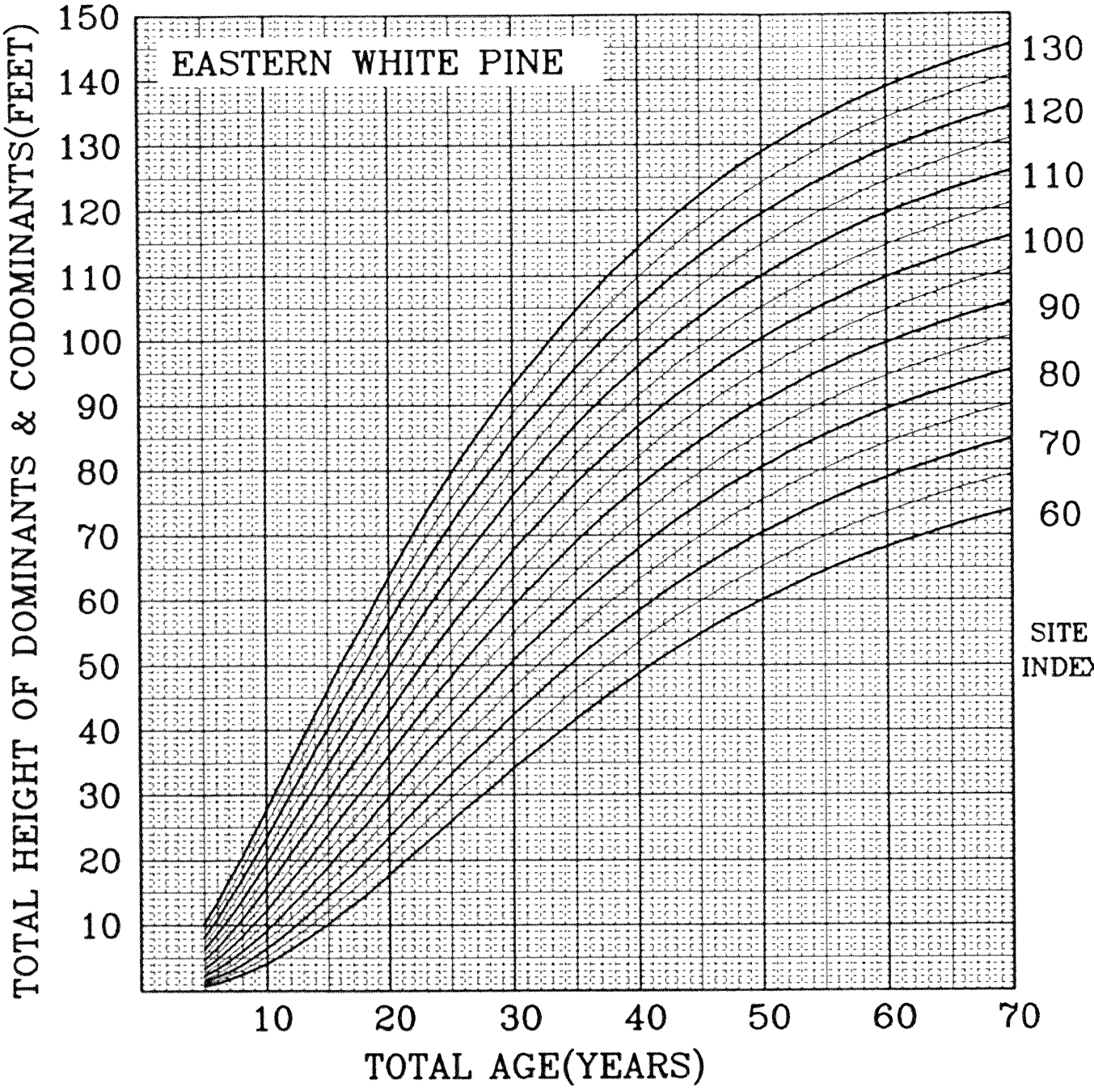


Figure 104.—Eastern white pine (Beck 1971a, 1971b)
Appalachian Mountains of Virginia, Tennessee, North Carolina, and Georgia
42 plots having 3 dominant and codominant trees on each plot
Stem analysis, polymorphic, nonlinear regression
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	50-65	66-80	81-95	96-110	111+
Years:	7	6	5	4	3

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	3.2425	0.7980	-0.0435	52.0549	-0.7064	0.99	2.24	2.8
SI	0.4732	1.0520	-0.0168	-2.2944	-0.1984	0.99	3.95	9.6

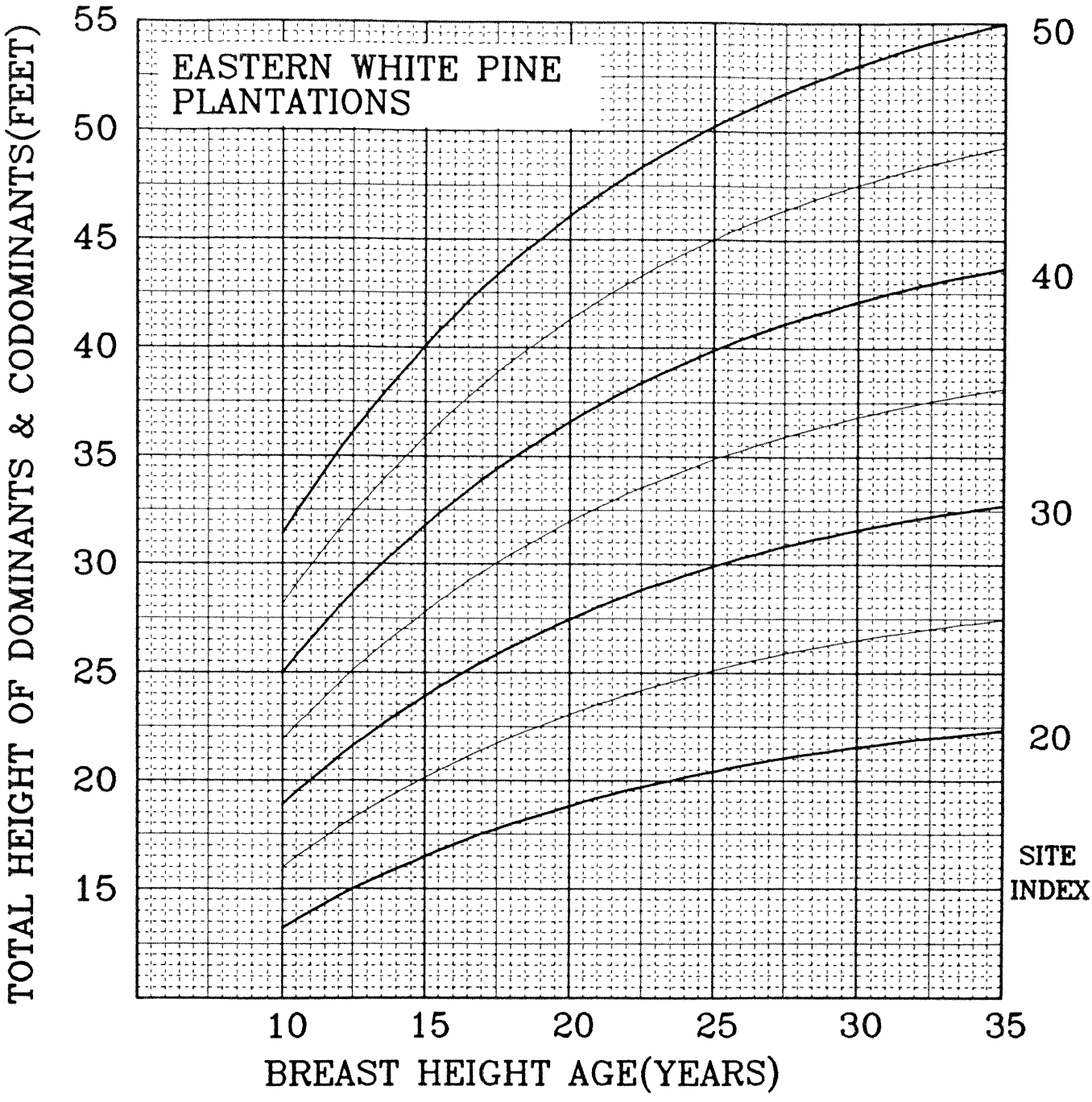


Figure 105.—Eastern white pine plantations (Gilmore 1968)
Illinois
48 plantations, number of dominant trees not given
Total height and breast height age, anamorphic, logarithm equation
Site index is height at 25 years breast height age (BH = 4.5)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	0.6689	1.1249	-0.0785	1.9792	-0.1365	0.97	0.97	1.0
SI	0.4143	1.1539	-0.0771	-1.0397	0.0379	0.97	0.96	1.2

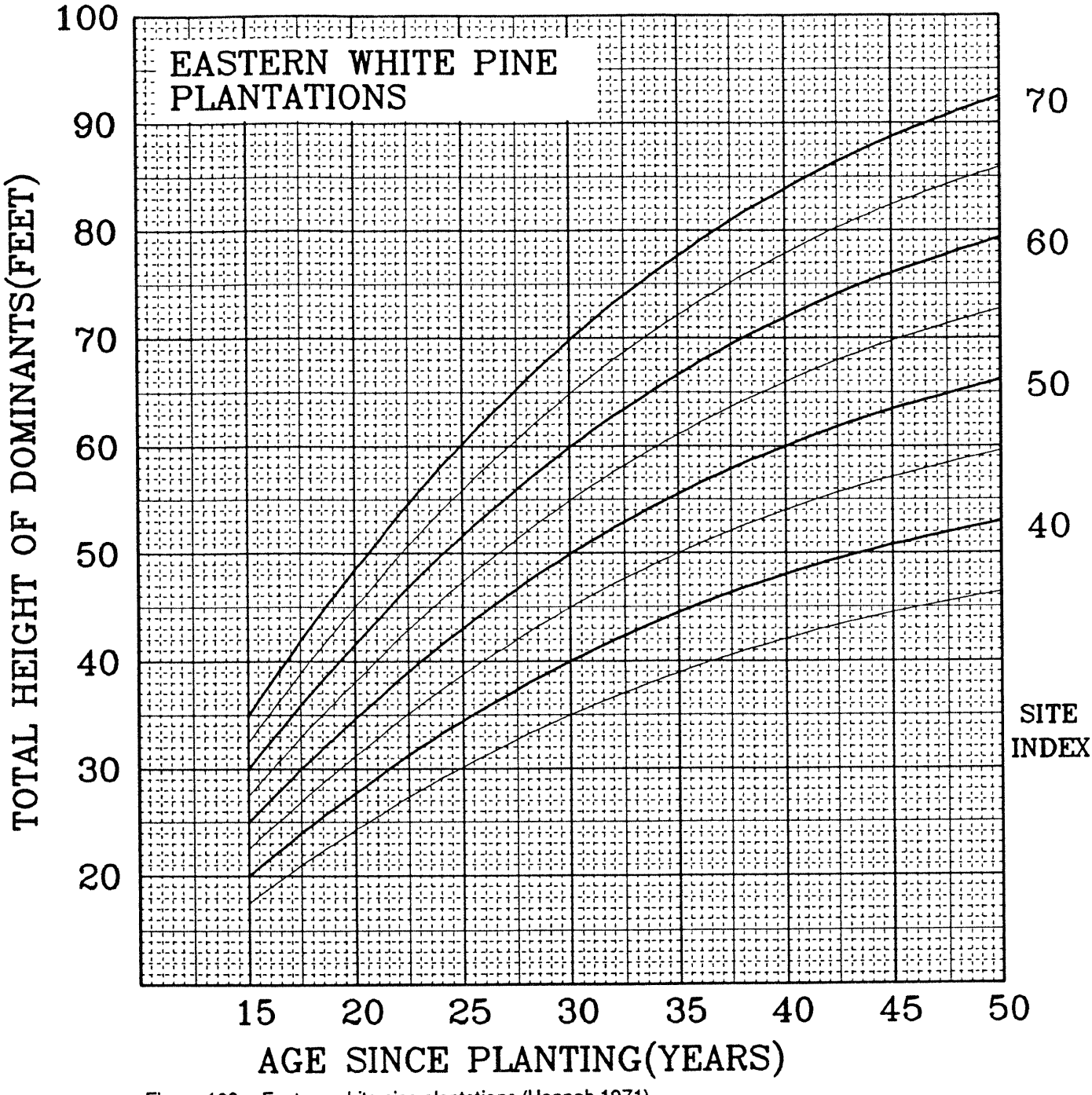


Figure 106.—Eastern white pine plantations (Hannah 1971)
Vermont
75 plots having 2 to 4 dominant trees on each plot
Total height and plantation age, anamorphic, logarithm equation
Site index is total height at 30 years plantation age
Add 9 years to d.b.h. age to obtain plantation age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.5269	0.9955	-0.0550	1.9118	0.00048	0.98	0.89	1.6
SI	0.6457	1.0096	-0.0564	-2.0691	-0.0119	0.98	0.86	1.5

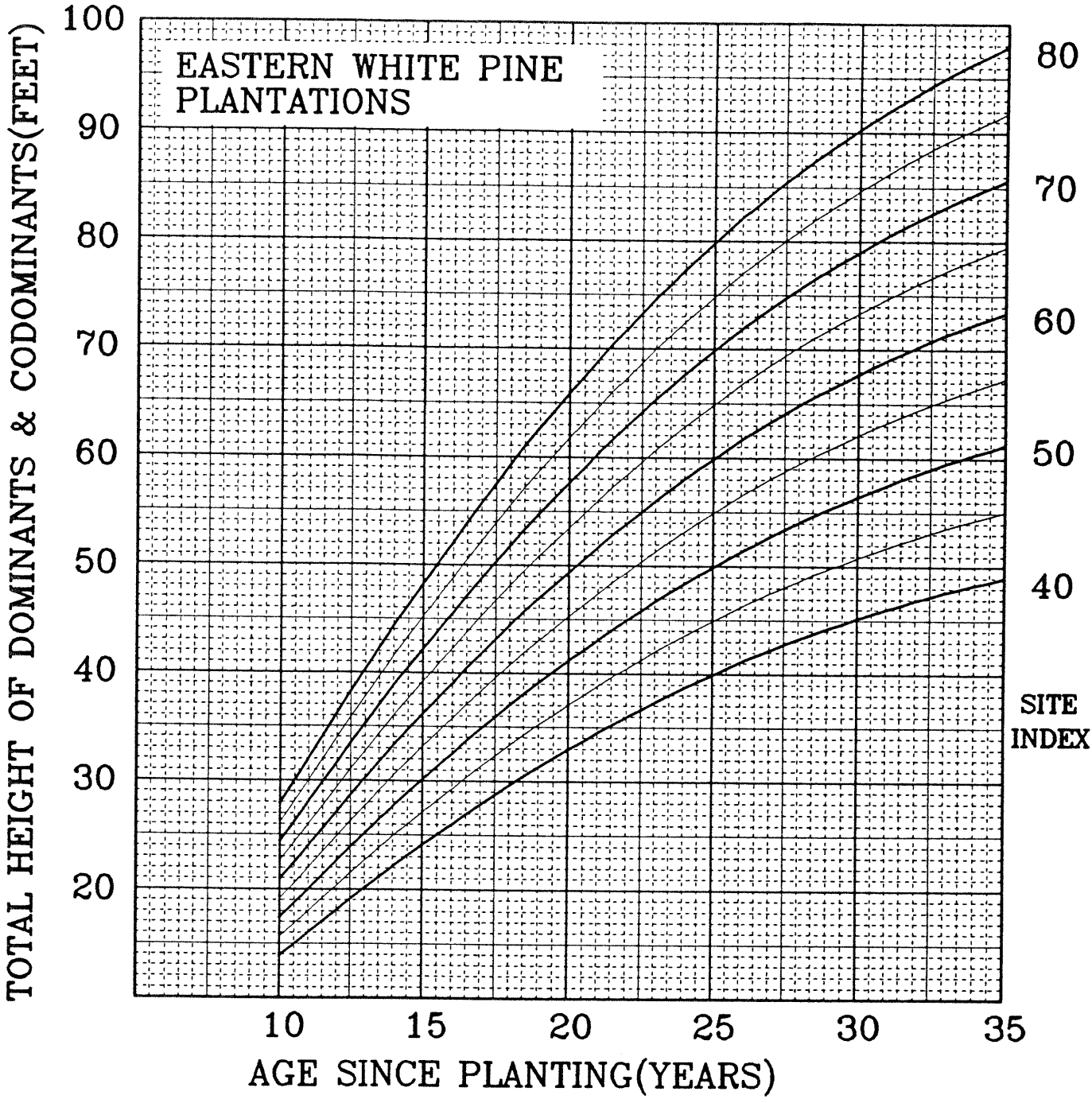


Figure 107.—Eastern white pine plantations (Vimmerstedt 1959, 1962)
Southern Appalachian Mountains of North Carolina, Tennessee, and Georgia
111 plots having 5 to 6 dominant and codominant trees on each plot
Total height and age, anamorphic, logarithm equation
Site index is total height at 25 years plantation age
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	50-65	66-80	81-95	96+
Years:	7	6	5	4

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.4638	0.9979	-0.0743	2.2460	-0.0040	0.99	0.51	0.9
SI	0.6590	1.0117	-0.0744	-2.5813	-0.0423	0.99	0.60	1.3

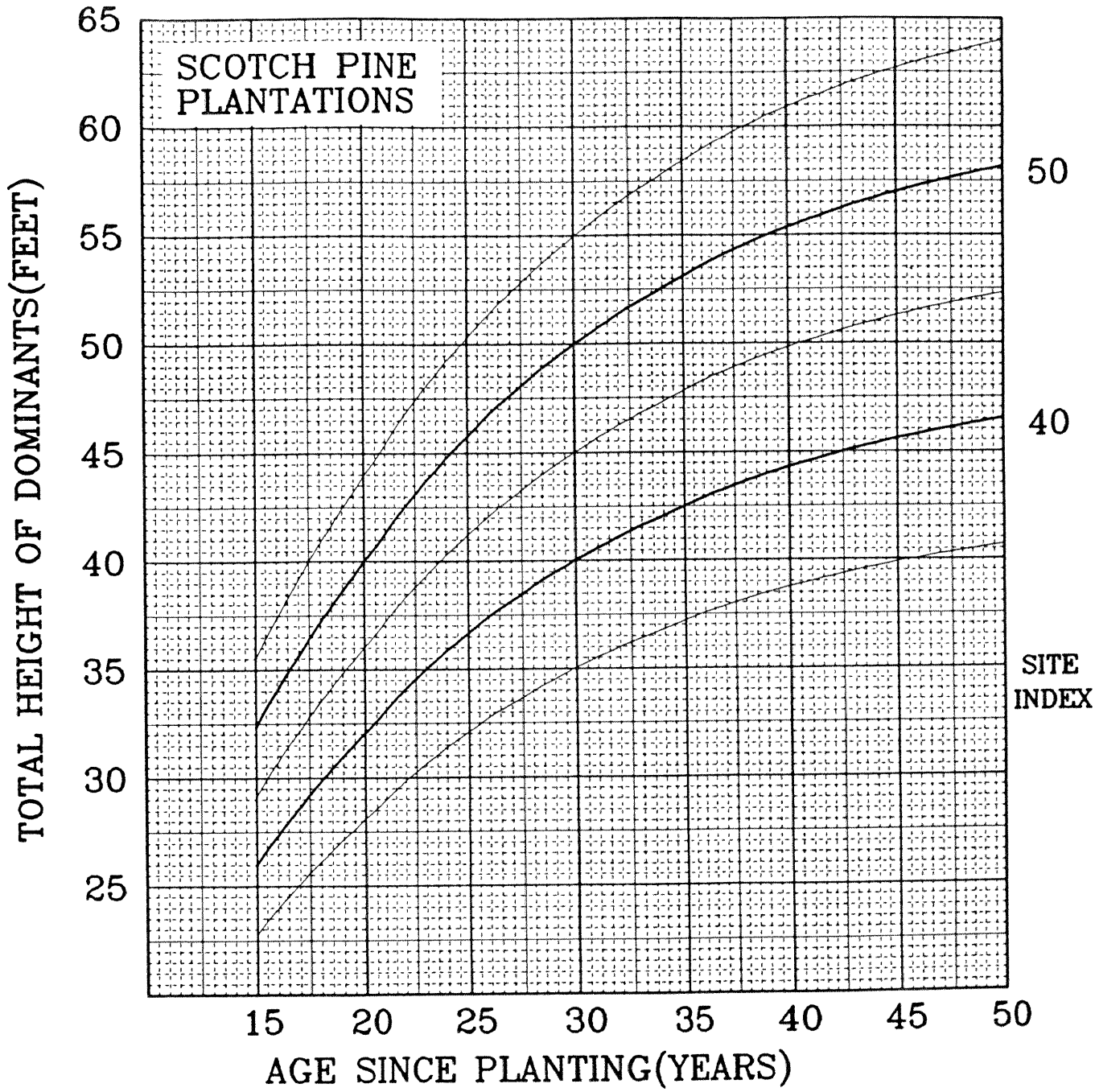


Figure 108.—Scotch pine plantations (Hannah 1971)
Vermont
31 plots having 2 to 4 dominant trees on each plot
Total height and plantation age, anamorphic, logarithm equation
Site index is total height at 30 years plantation age
Add 5 years to d.b.h. age to obtain plantation age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.2096	1.0027	-0.0671	1.2282	0.0335	0.99	1.50	1.1
SI	0.9618	0.9587	-0.0690	-0.7625	0.1719	0.99	1.49	1.2

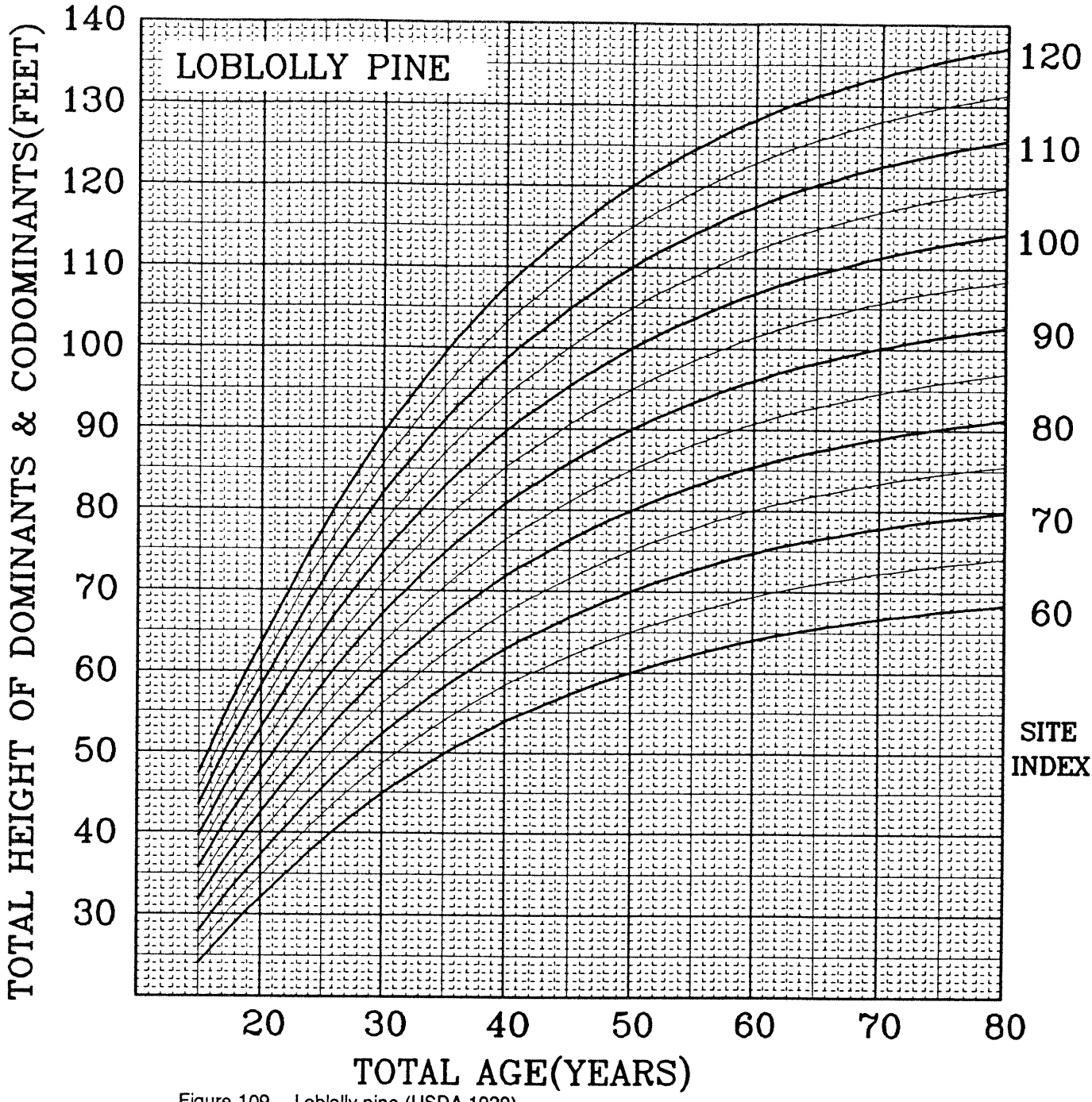


Figure 109.—Loblolly pine (USDA 1929)
Southern States
146 plots, number of dominants not given
Total height and total age, anamorphic, equation not given
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	60-75	76+
Years:	4	3

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.1727	1.0042	-0.0439	1.3558	0.0240	0.99	0.50	1.7
SI	0.8765	0.9902	-0.0447	-1.2443	0.0502	0.99	0.60	2.1

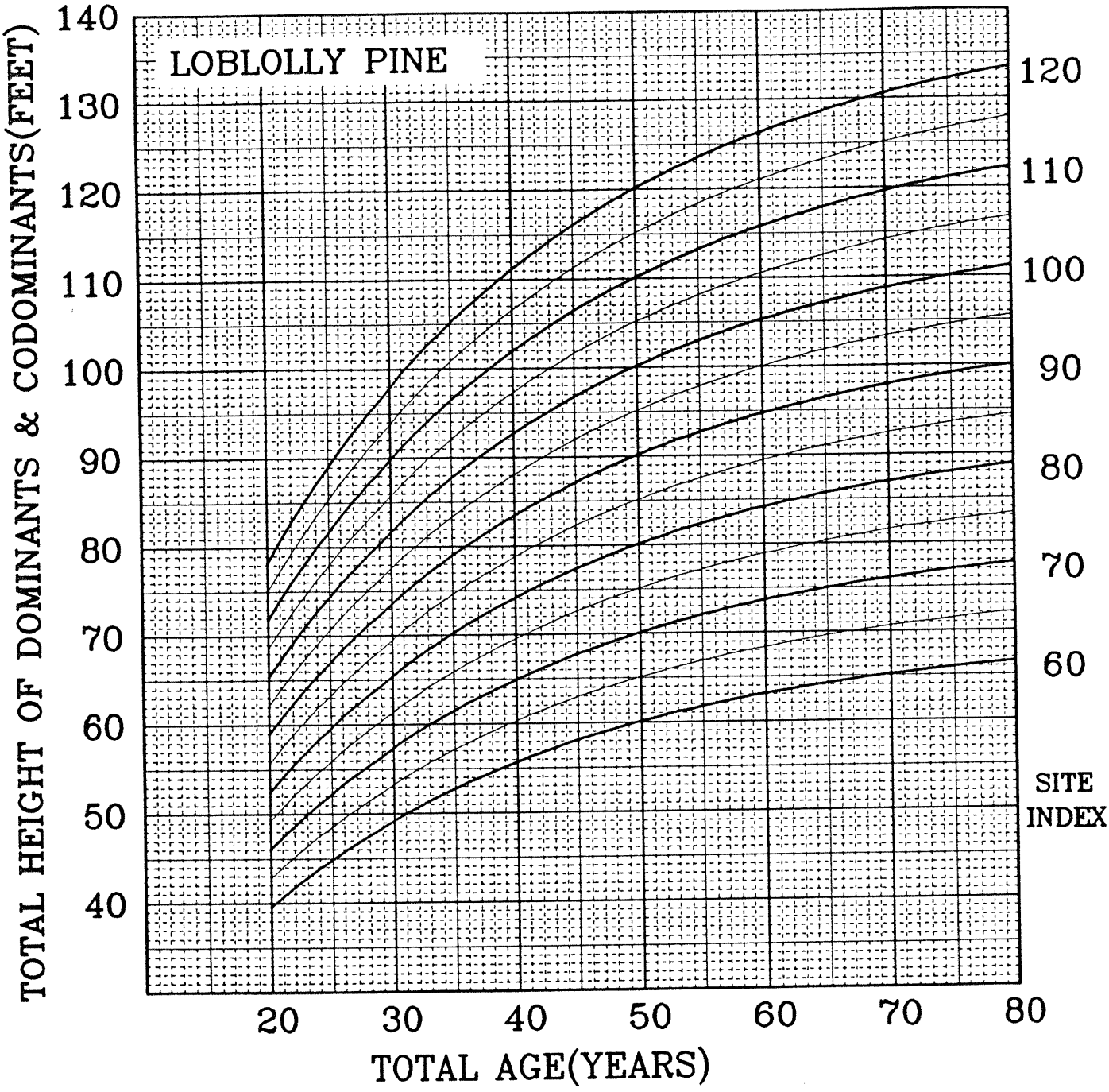


Figure 110.—Loblolly pine (Schumacher and Coile 1960, Coile and Schumacher 1964)

Coastal Plain from Chesapeake Bay, Maryland to Mobile Bay, Alabama
420 plots having 8 dominant and codominant trees on each plot
Total height and total age, anamorphic, logarithm equation
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	60-75	76+
Years:	4	3

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.1421	1.0042	-0.0374	0.7632	0.0358	0.99	0.73	2.2
SI	0.8485	1.0038	-0.0389	-1.0031	-0.0145	0.99	0.82	3.0

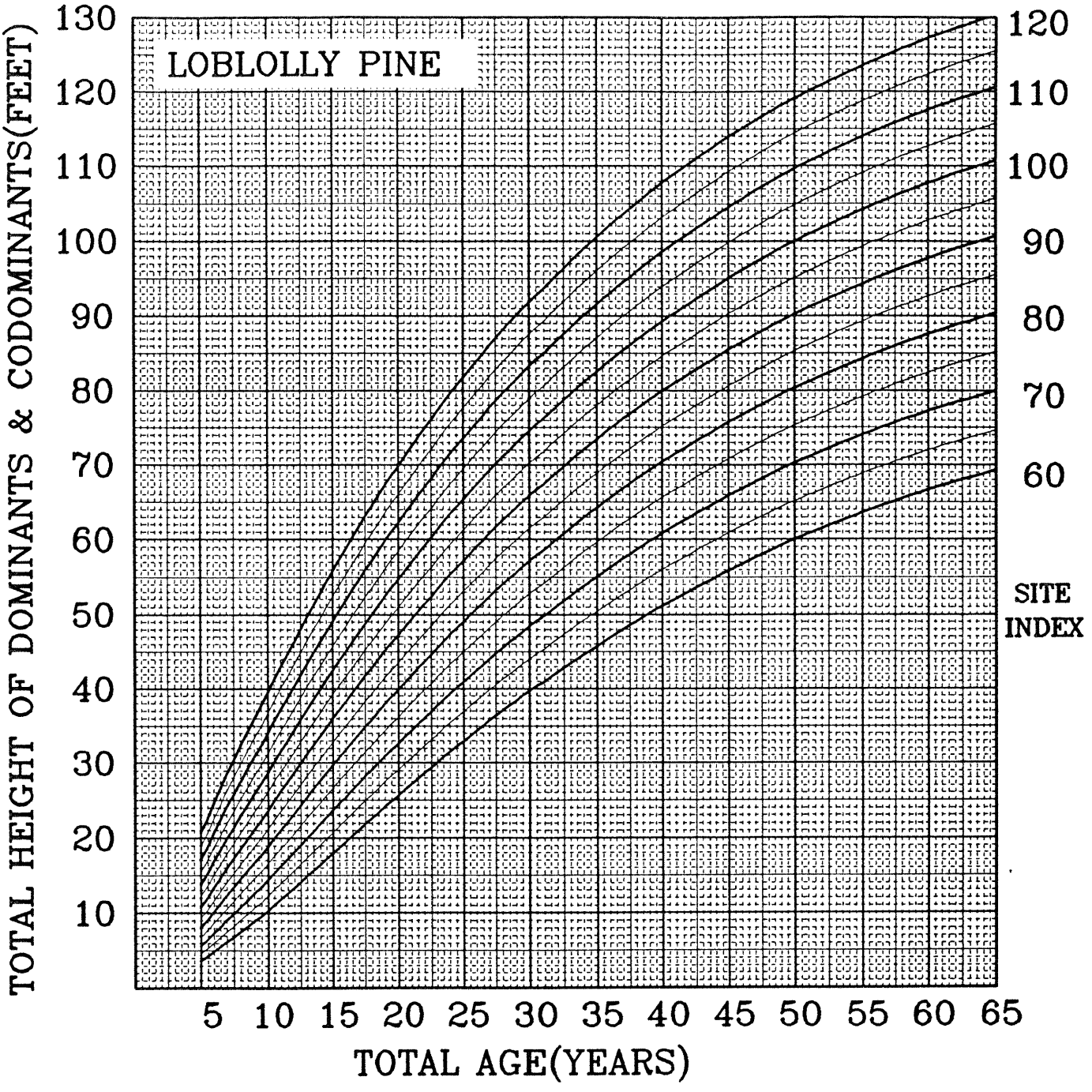


Figure 111.—Loblolly pine (Trousdell, Beck, and Lloyd 1974)
Coastal Plain of Virginia, North Carolina, and South Carolina
22 plots having 2 dominant and codominant trees on each plot
Stem analysis, polymorphic, nonlinear regression
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	60-75	76+
Years:	4	3

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	3.0849	0.8076	-0.0341	26.2342	-0.6702	0.99	1.45	5.2
SI	0.5694	1.0415	-0.0204	-1.4874	-0.1242	0.98	2.70	6.5

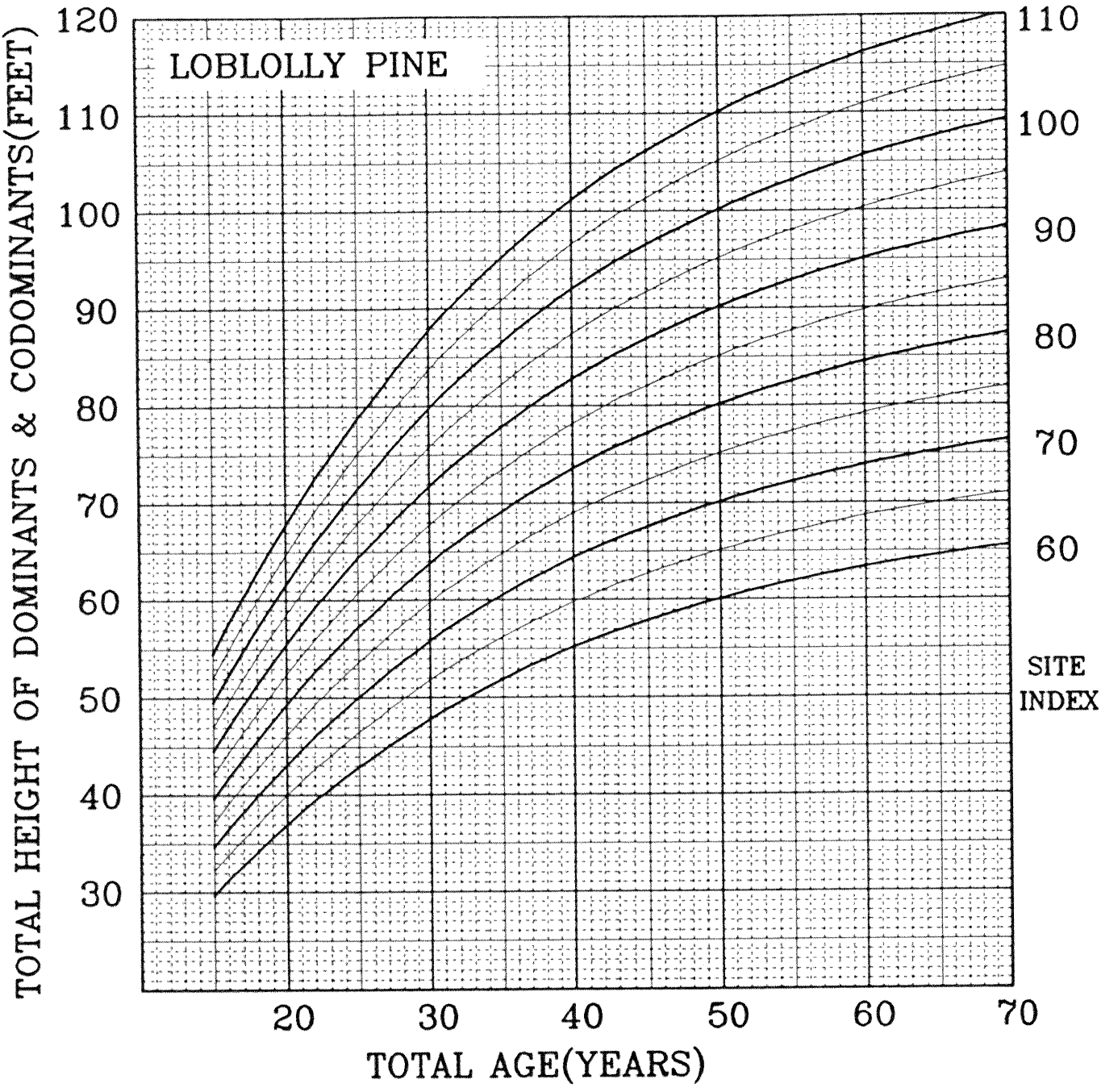


Figure 112.—Loblolly pine (Zahner 1962)
North Louisiana and southern Arkansas
211 plots on poorly aerated soils, number of dominant and codominant trees not given, additional site index curves given for loess soils and well-aerated soils
Total height and total age, anamorphic, age coefficient from soil-site regression
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	60-75	76+
Years:	4	3

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.1643	0.9999	-0.0413	1.1057	-0.0002	0.99	1.12	3.5
SI	0.7973	1.0165	-0.0408	-1.6634	-0.0974	0.99	1.22	4.6

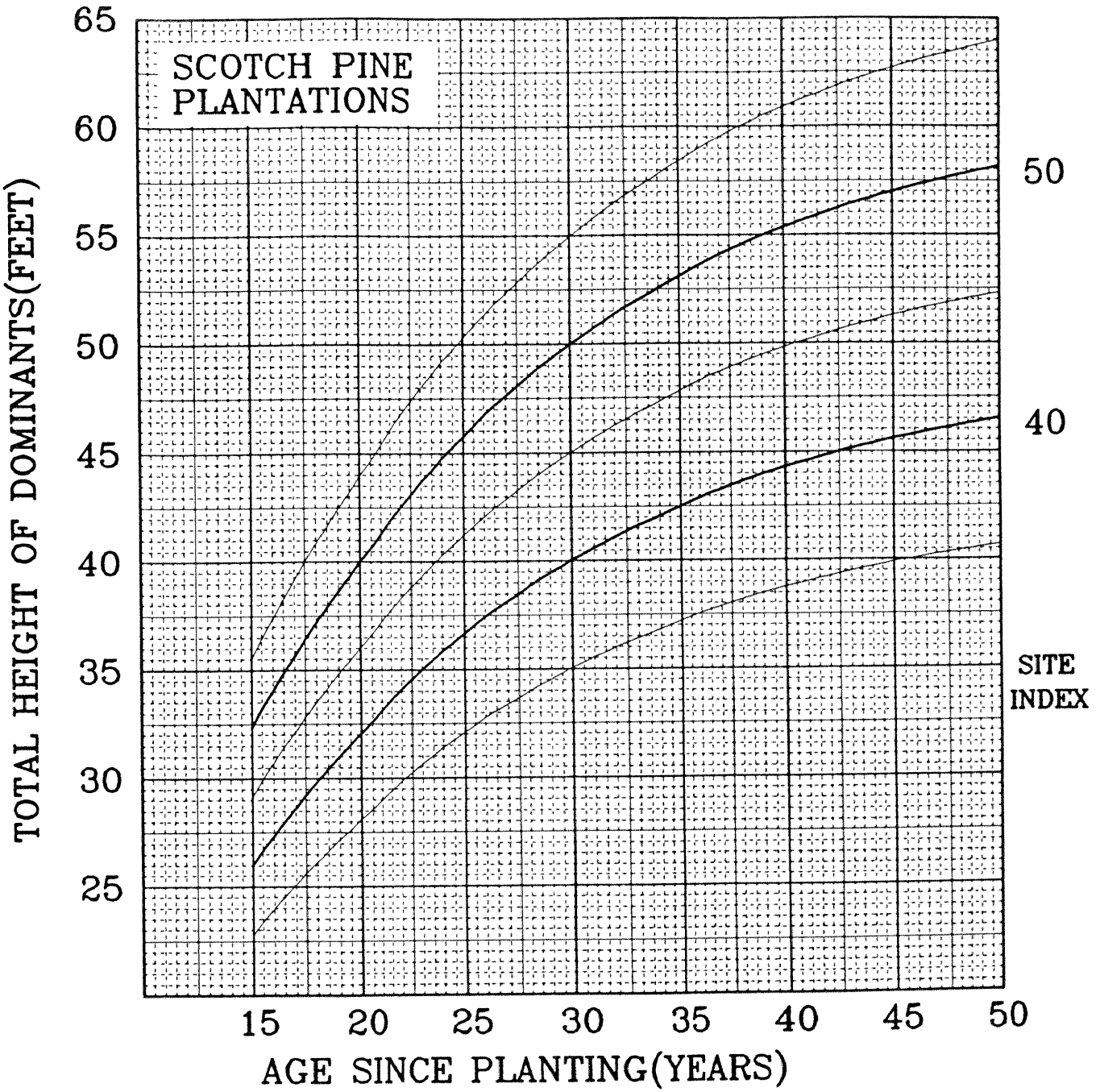


Figure 108.—Scotch pine plantations (Hannah 1971)
Vermont
31 plots having 2 to 4 dominant trees on each plot
Total height and plantation age, anamorphic, logarithm equation
Site index is total height at 30 years plantation age
Add 5 years to d.b.h. age to obtain plantation age (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.2096	1.0027	-0.0671	1.2282	0.0335	0.99	1.50	1.1
SI	0.9618	0.9587	-0.0690	-0.7625	0.1719	0.99	1.49	1.2

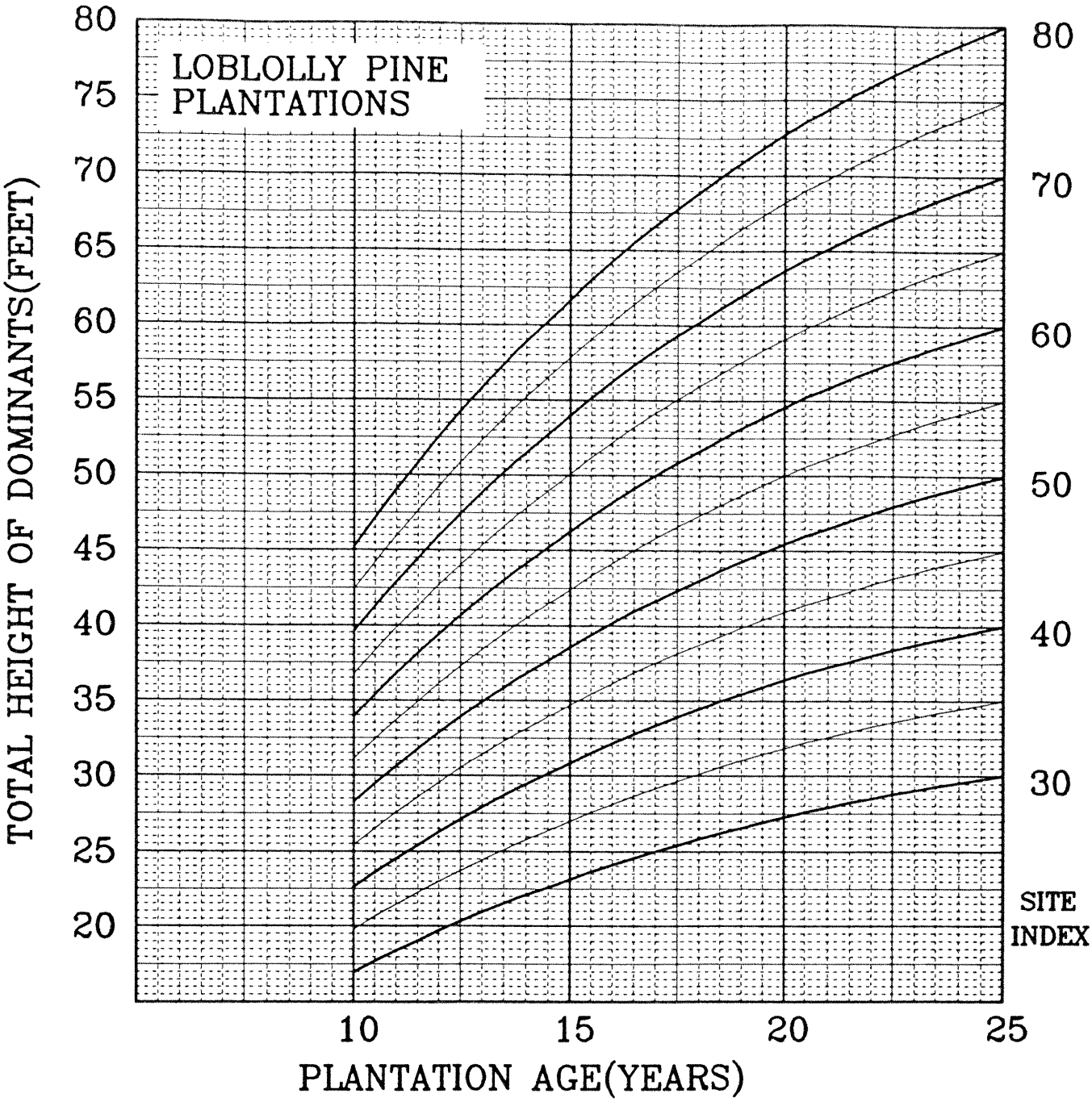


Figure 113.—Loblolly pine plantations (Shipman 1960)
South Carolina Piedmont
220 plantations, number of dominant trees not given
Total height and plantation age, anamorphic, logarithm equation
Site index is total height at 25 years plantation age
Convert d.b.h. age to plantation age by adding years according to site index (BH = 0.0):

SI:	<50	>50
Years:	3	2

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.1579	1.0000	-0.0930	1.4274	0.0001	0.99	0.15	0.3
SI	0.9150	0.9936	-0.1123	-1.5988	0.0347	0.99	0.74	2.2

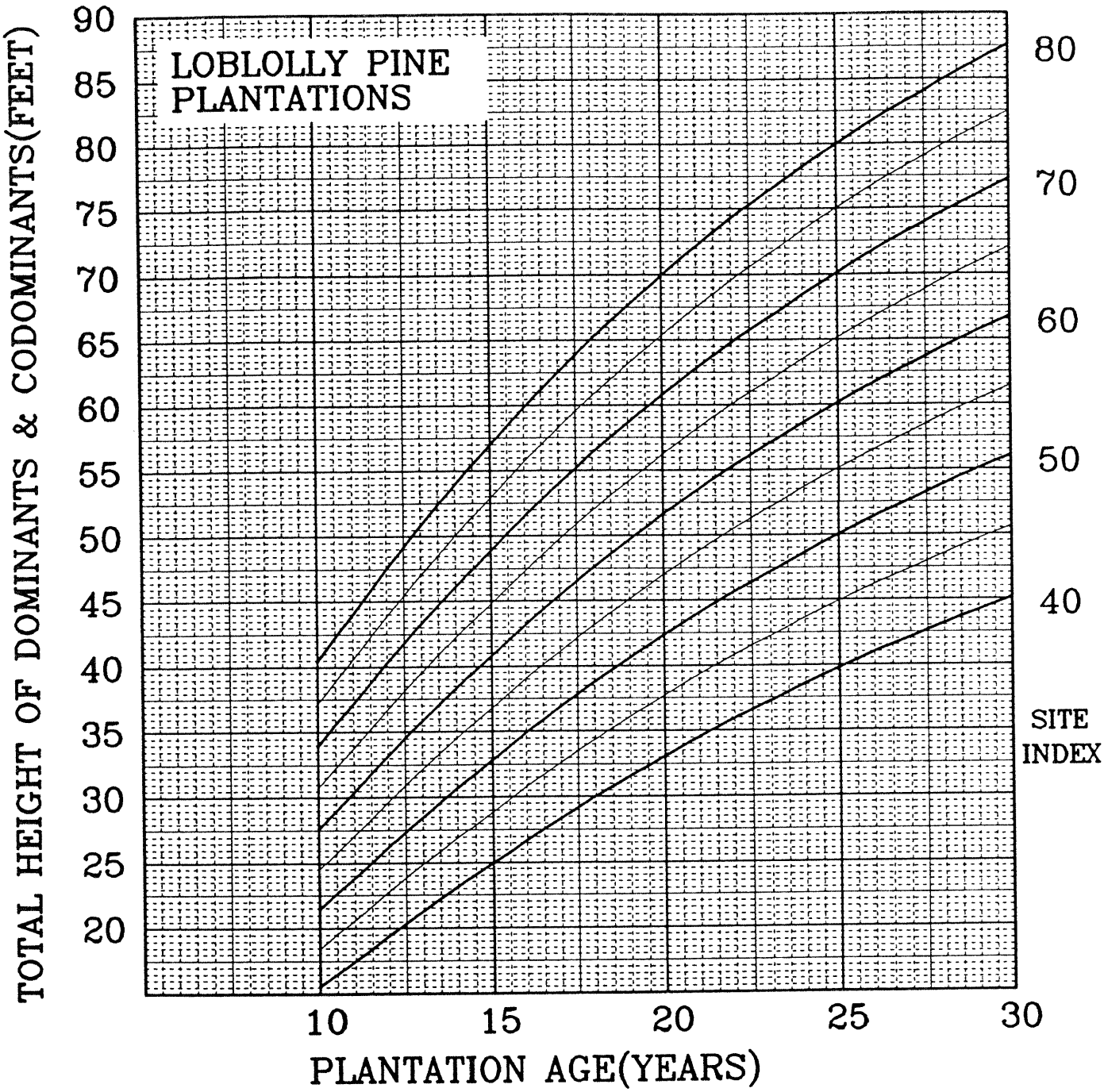


Figure 114.—Loblolly pine plantations (Clutter and Lenhart 1968)
Georgia Piedmont
141 dominant and codominant trees, number of plots not given
Stem analysis, polymorphic, nonlinear regression
Site index is total height at 25 years plantation age
Convert d.b.h. age to plantation age by adding years according to site index (BH = 0.0):

SI:	<50	>50
Years:	3	2

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	2.9579	0.8274	-0.0581	9.3221	-0.4616	0.99	0.37	1.3
SI	0.1483	1.2560	-0.0155	-2.5747	-0.2990	0.99	0.66	2.6

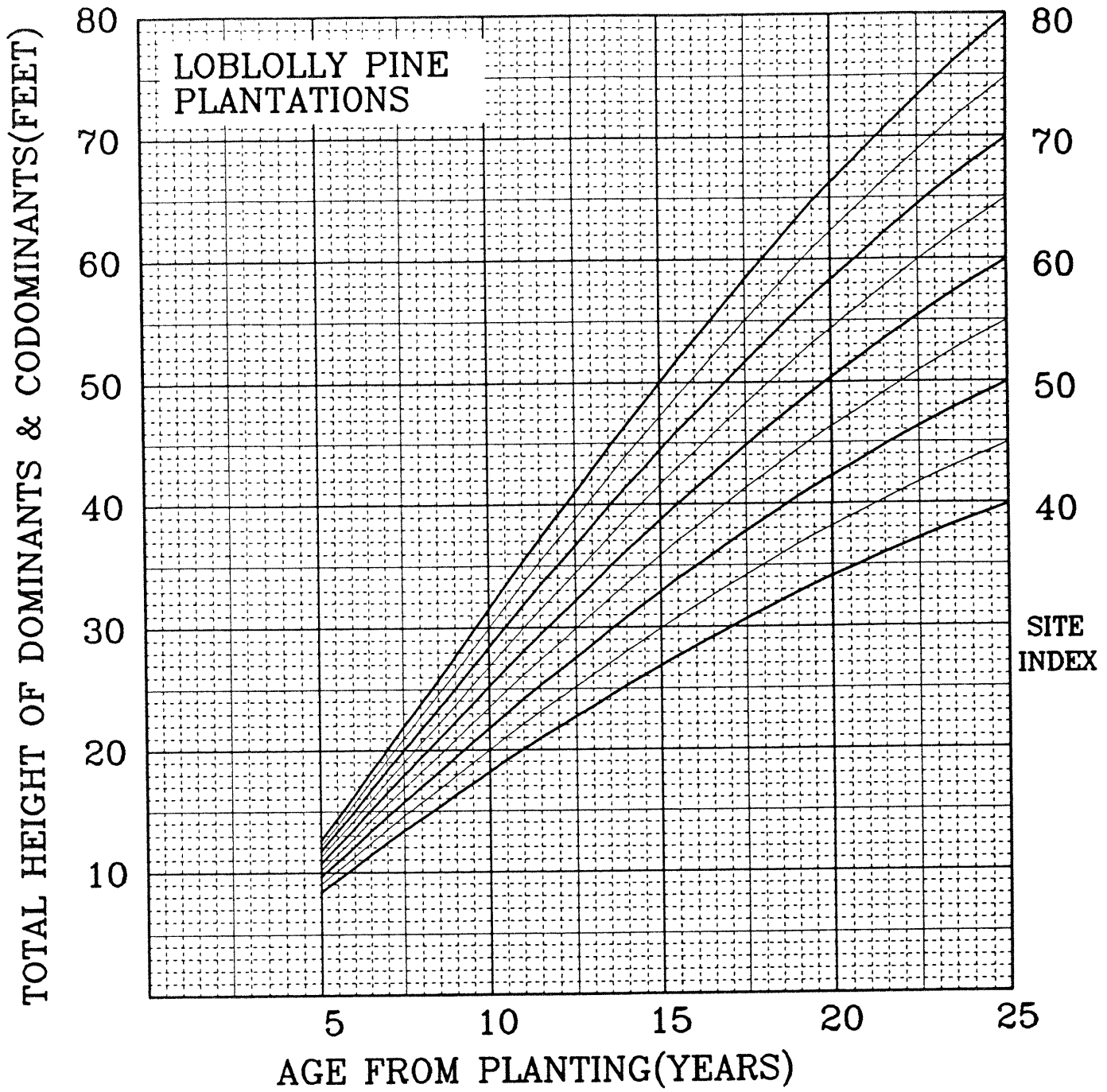


Figure 115.—Loblolly pine plantations--Piedmont (Amateis and Burkhart 1985)
Piedmont throughout most of natural range
68 plots, cutover and site prepared land, 1 dominant and 1 codominant tree on each plot
Stem analysis, differential equation, polymorphic
Site index is total height at 25 years since planting
Convert d.b.h. age to age since planting by adding years according to site index (BH = 0.0):

SI:	<50	>50
Years:	3	2

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.0060	1.1098	-0.0535	0.5548	0.2433	0.99	0.01	0.4
SI	0.8459	1.0028	-0.1241	-1.4067	0.2398	0.99	0.01	3.4

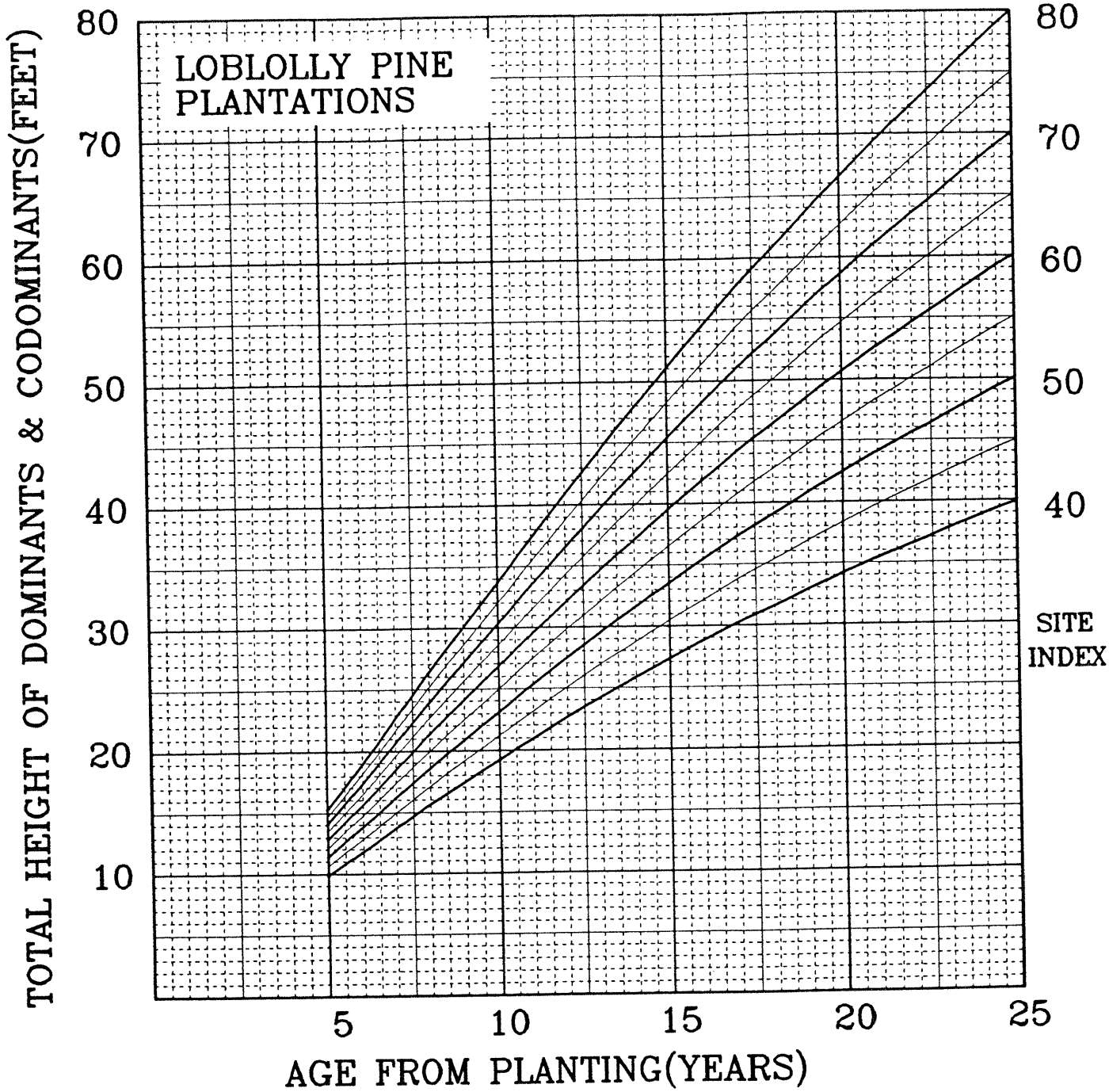


Figure 116.—Loblolly pine plantations--Coastal Plain (Amateis and Burkhart 1985)
Coastal Plain throughout most of natural range
105 plots, cutover and site prepared land, 1 dominant and 1 codominant tree on each plot
Stem analysis, differential equation, polymorphic
Site index is total height at 25 years since planting
Convert d.b.h. age to age since planting by adding years according to site index (BH = 0.0):

SI:	<50	>50
Years:	3	2

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.0107	1.1384	-0.0393	0.4584	0.2413	0.96	0.78	0.5
SI	0.9172	0.9646	-0.0982	-1.0330	0.2288	0.99	1.96	3.5

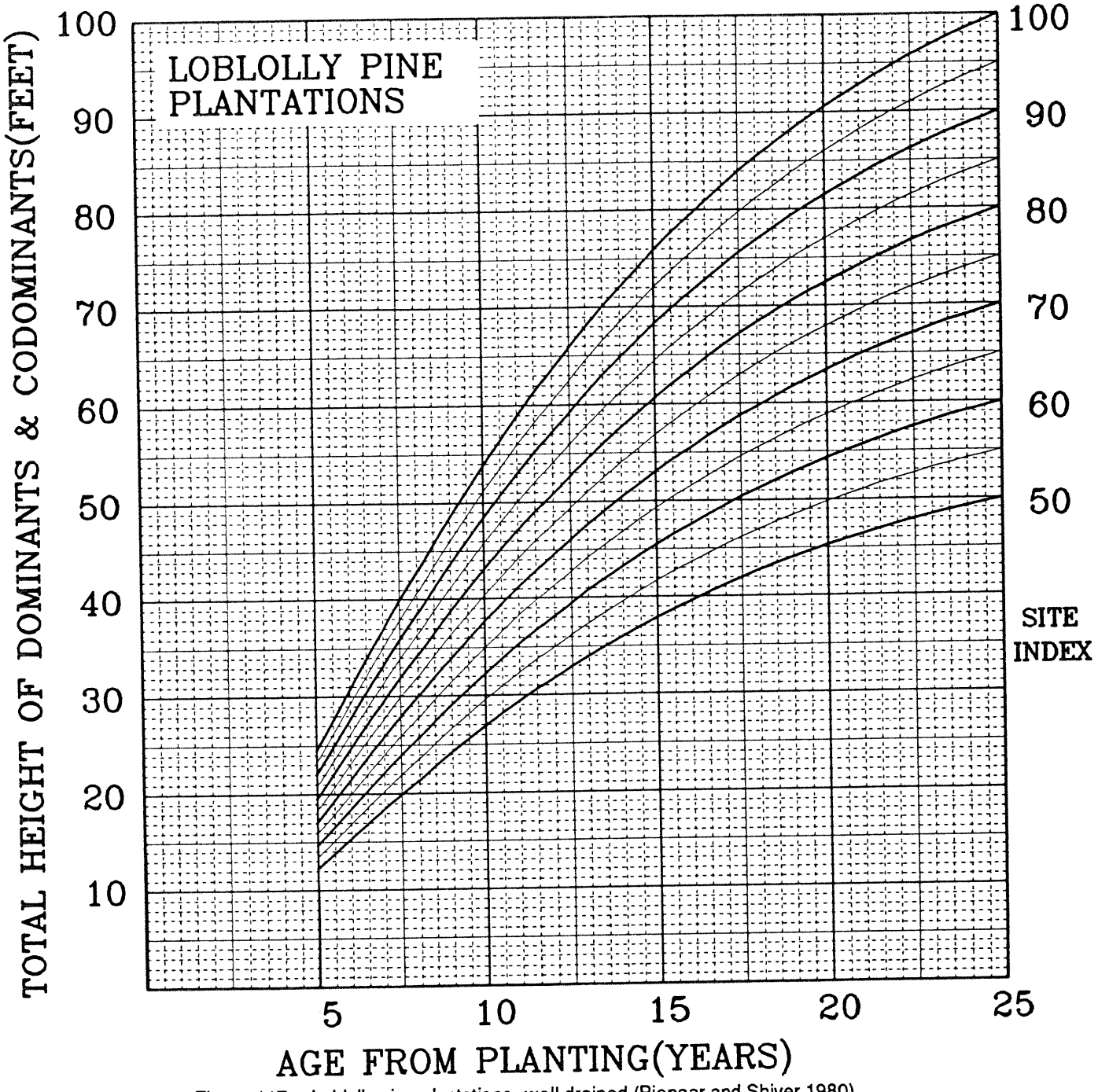


Figure 117.—Loblolly pine plantations--well drained (Pienaar and Shiver 1980)
Coastal plains of North and South Carolina—all except very poorly drained soils
154 plots, site prepared lands, 2 dominant and codominant trees on each plot
Stem analysis, nonlinear regression, anamorphic
Site index is total height at 25 years since planting
Convert d.b.h. age to age since planting by adding years according to site index (BH = 0.0):

SI:	<50	>50
Years:	4	3

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.1519	1.0000	-0.1003	1.6640	0.0001	0.99	0.08	0.01
SI	0.8680	1.0000	-0.1003	-1.6650	-0.00004	0.99	0.10	0.02

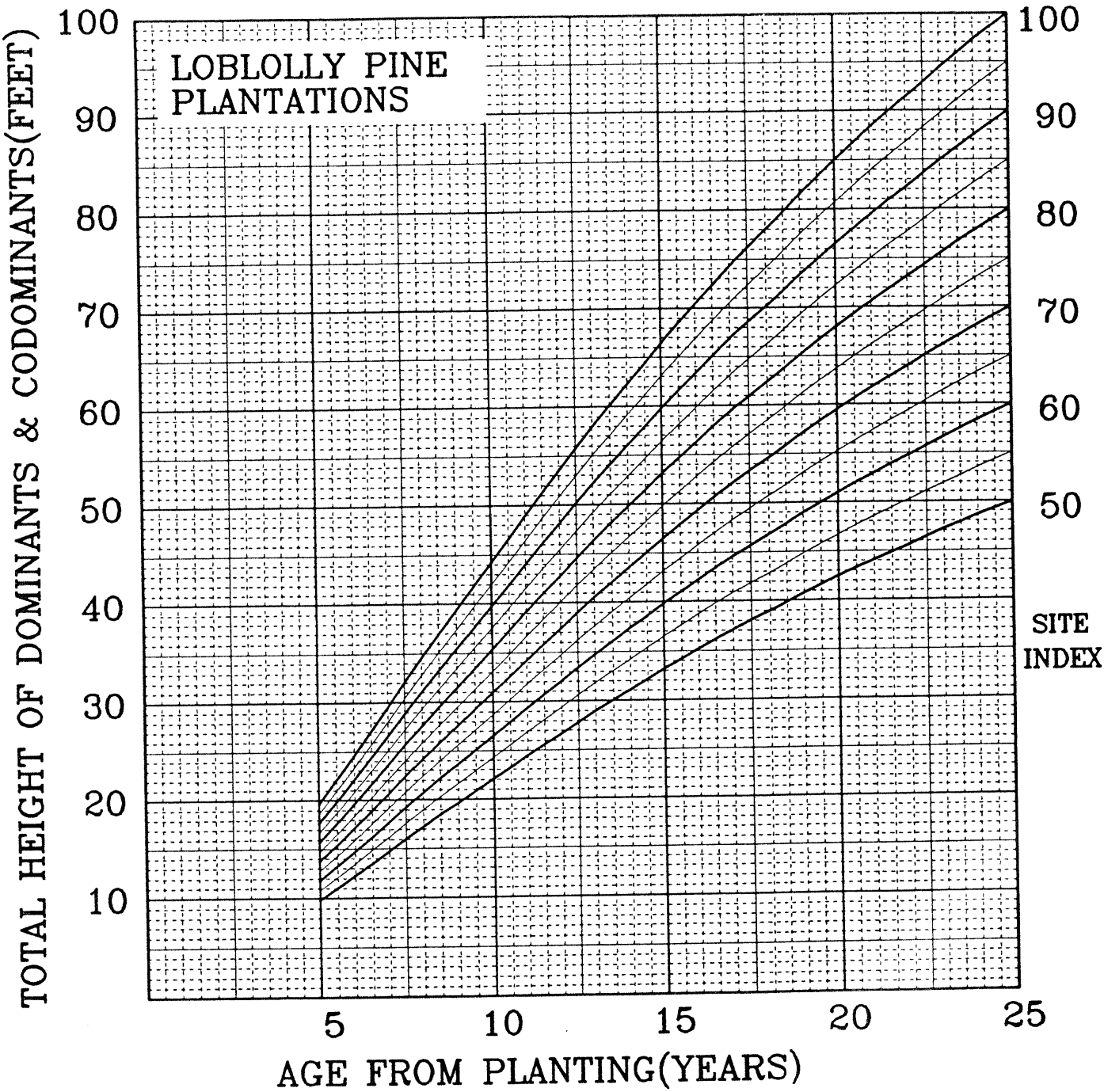


Figure 118.—Loblolly pine plantations--poorly drained (Pienaar and Shiver 1980)
Coastal Plains of North and South Carolina—very poorly drained soils in pocosins
25 plots, site prepared lands, 2 dominant and codominant trees on each plot
Stem analysis, nonlinear regression, anamorphic
Site index is total height at 25 years since planting
Convert d.b.h. age to age since planting by adding years according to site index (BH = 0.0):

SI:	<50	>50
Years:	4	3

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.5177	1.0000	-0.0551	1.4360	-0.0001	0.99	0.08	0.01
SI	0.6596	0.9998	-0.0551	-1.4347	0.0002	0.99	0.11	0.02

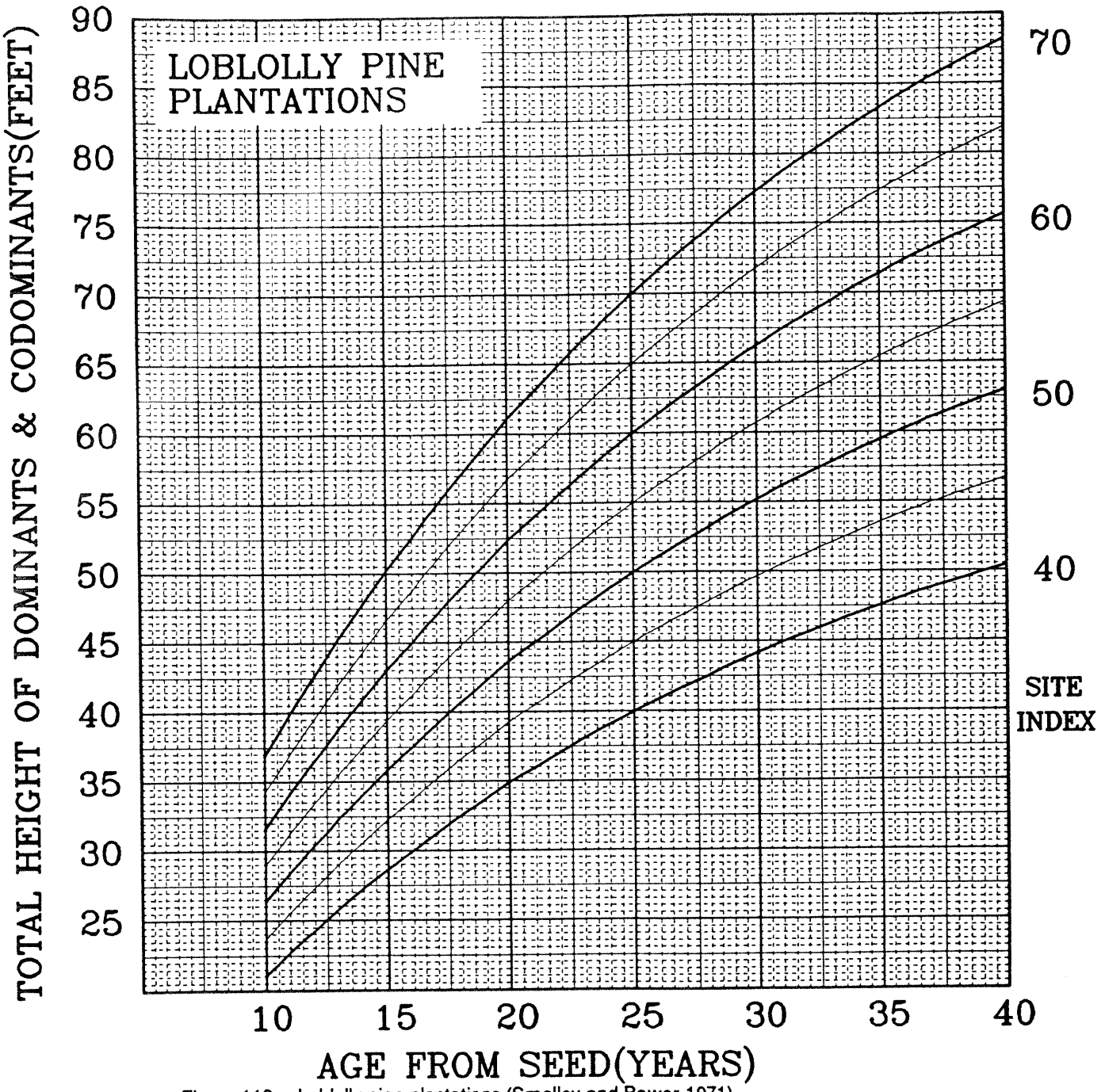


Figure 119.—Loblolly pine plantations (Smalley and Bower 1971)
Central Tennessee, Northern Alabama, and Northwest Georgia
270 plantations, number of dominant and codominant trees not given
Total height and age from seed, anamorphic, logarithm equation
Site index is total height at 25 years age from seed
Convert d.b.h. age to age from seed by adding years according to site index (BH = 0.0):

SI:	<50	>50
Years:	4	3

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.5861	0.9999	-0.0390	0.9753	-0.0017	0.99	0.28	0.7
SI	0.5990	1.0131	-0.0394	-1.0892	-0.0272	0.99	0.32	1.1

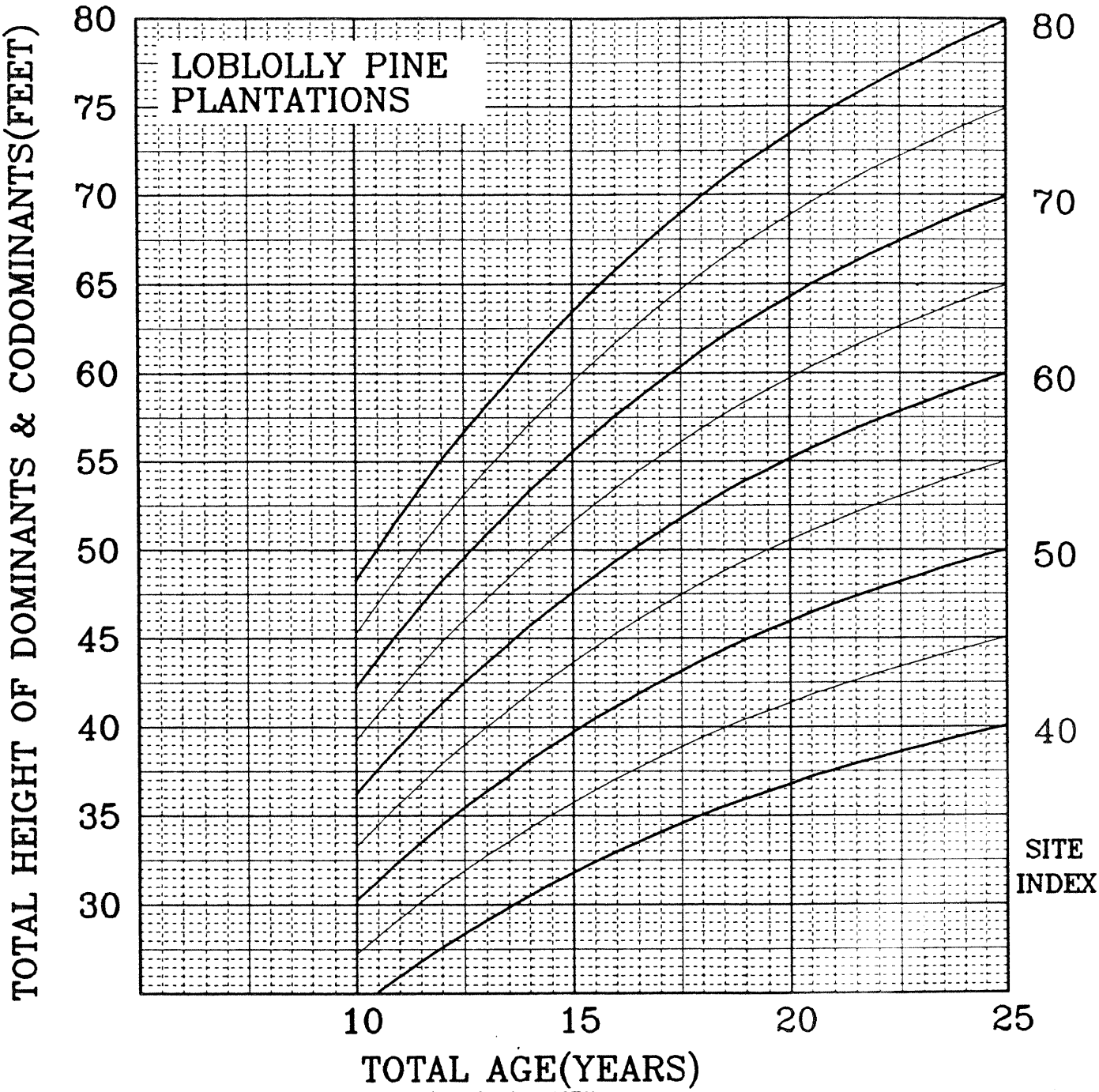


Figure 120.—Loblolly pine plantations (Lenhart 1971)
Interior West Gulf Coastal Plain of Texas, Louisiana, and Arkansas
699 plots, number of dominant and codominant trees not given
Total height and total age, anamorphic, logarithm equation
Site index is total height at 25 years total age
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	<50	>50
Years:	4	3

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.1547	0.9973	-0.0915	1.2294	0.0029	0.96	0.59	0.8
SI	0.8550	1.0066	-0.0931	-1.3579	-0.0163	0.97	0.65	1.2

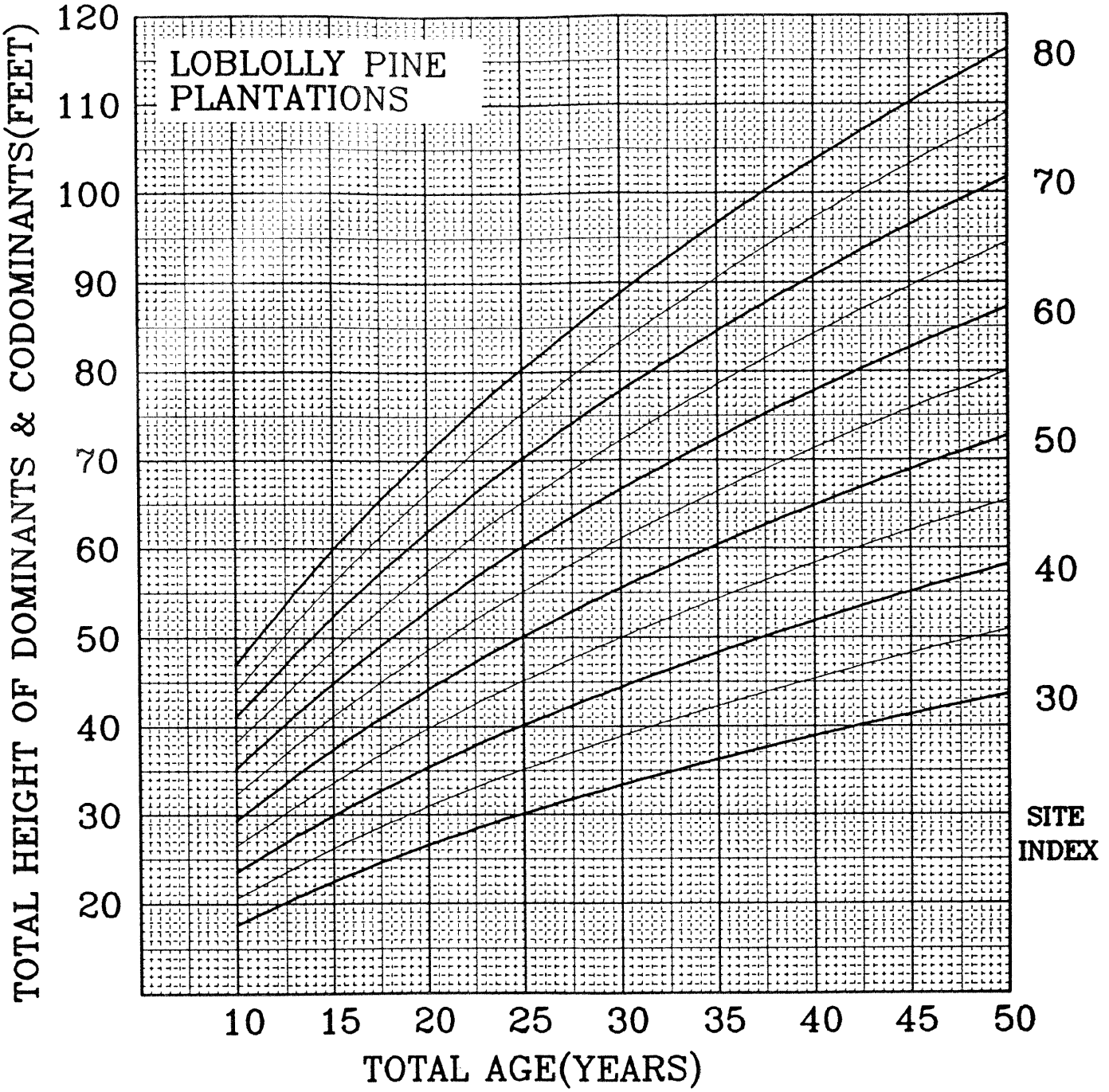


Figure 121.—Loblolly pine plantations (Popham *et al.* 1979)

Lower West Gulf Coastal Plain of eastern Texas, Louisiana, Arkansas, and Alabama

293 permanent growth plots on cutover sites, number of dominant and codominant trees not given

Remeasurements of total height and total age, anamorphic, regression equations

Site index is total height at 25 years total age

Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	<50	>50
Years:	4	3

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	2.7644	0.9991	-0.0090	0.6293	0.0003	0.99	1.20	4.9
SI	0.2937	1.0738	-0.0112	-0.9033	-0.0801	0.99	1.42	6.9

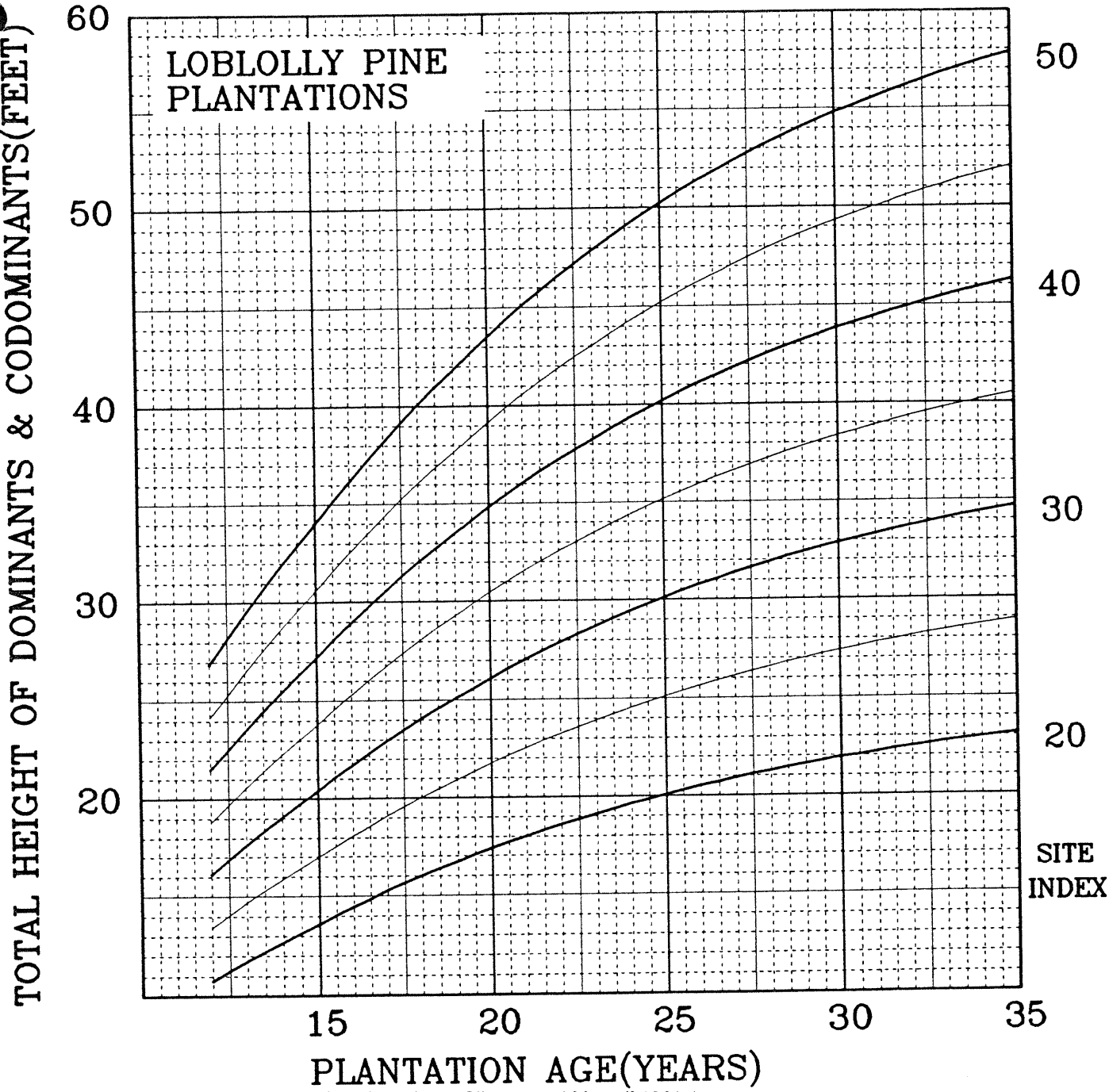


Figure 122.—Loblolly pine plantations (Gilmore and Metcalf 1961a)
Southern Illinois
53 plantations, number of dominant trees not given
Total height and plantation age, anamorphic, logarithm equation
Site index is total height at 25 years plantation age
Convert d.b.h. age to plantation age by adding years according to site index (BH = 0.0):

SI:	<35	>35
Years:	4	3

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.2697	1.0002	-0.0885	2.0238	0.0006	0.99	0.73	2.3
SI	0.7050	1.0303	-0.0860	-2.7362	-0.1026	0.99	1.17	3.8

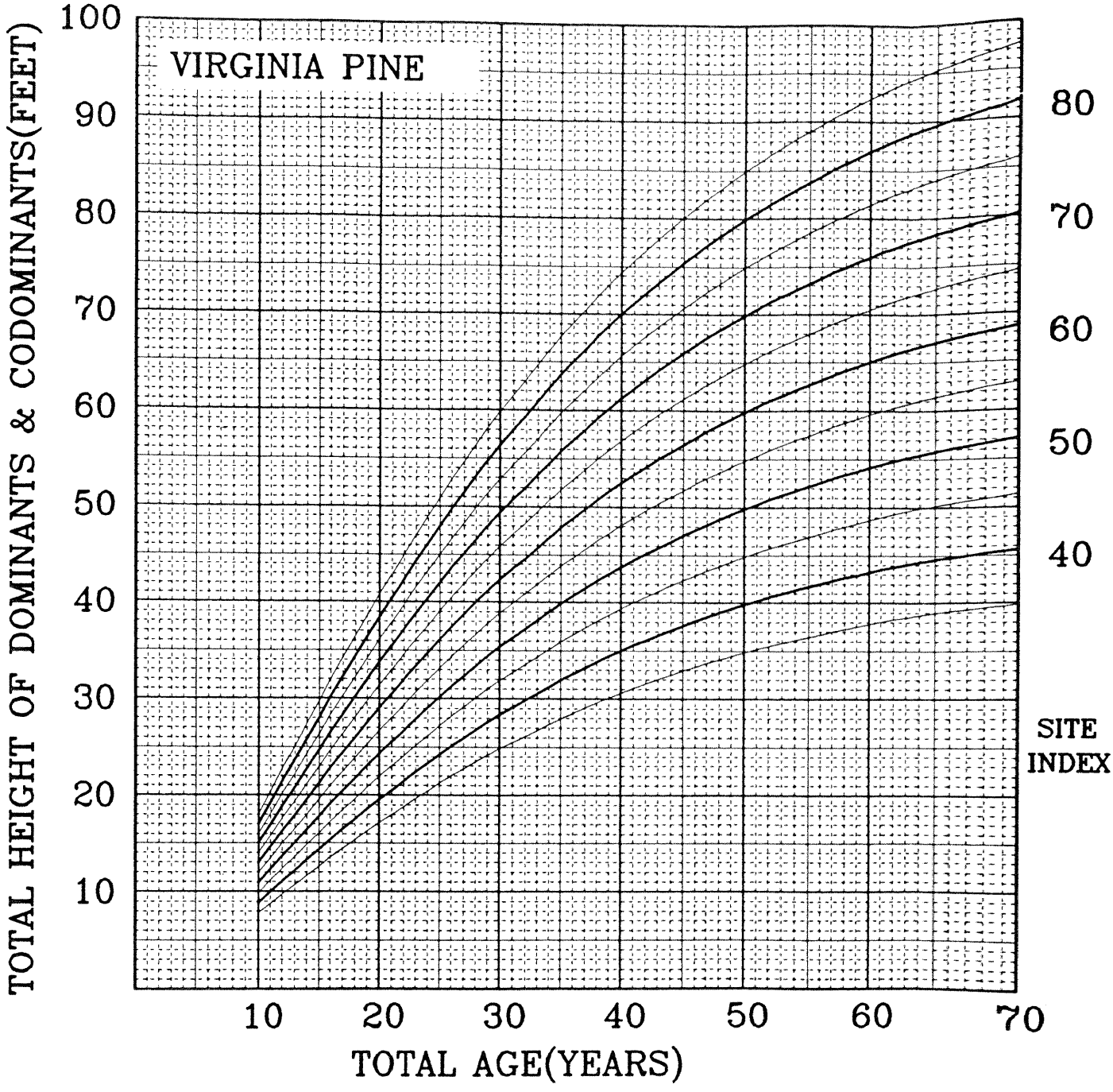


Figure 123.—Virginia pine (Slocum and Miller 1953)
Piedmont of Durham County, North Carolina
116 plots, number of dominant and codominant trees not given
Total height and total age, anamorphic, equation not given
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	<45	45-75	>75
Years:	6	5	4

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.2096	1.0140	-0.0380	1.3247	0.0374	0.99	0.87	3.7
SI	0.9100	0.9645	-0.0396	-1.0279	0.1133	0.99	1.10	5.6

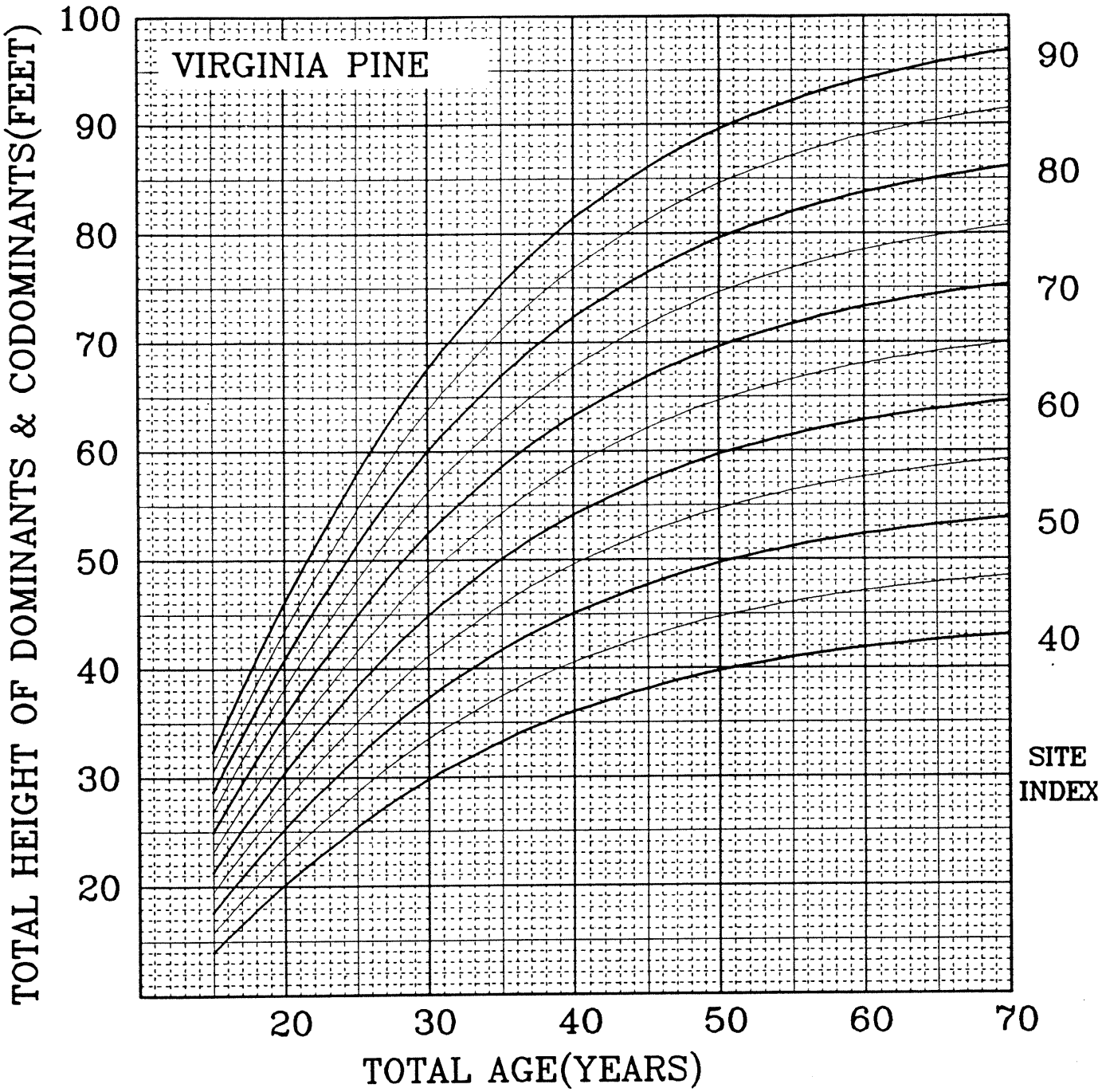


Figure 124.—Virginia pine (Chaiken and Nelson 1959; Nelson, Clutter, and Chaiken 1961)

Piedmont of Maryland, Virginia, and the Carolinas

166 plots, number of dominant and codominant trees not given

Total height and total age, anamorphic, logarithm equation not given

Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	<45	45-75	>75
Years:	6	5	4

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.1204	0.9984	-0.0597	2.4448	-0.0284	0.99	0.92	4.6
SI	0.8421	1.0090	-0.0490	-2.1682	-0.0762	0.99	0.99	4.3

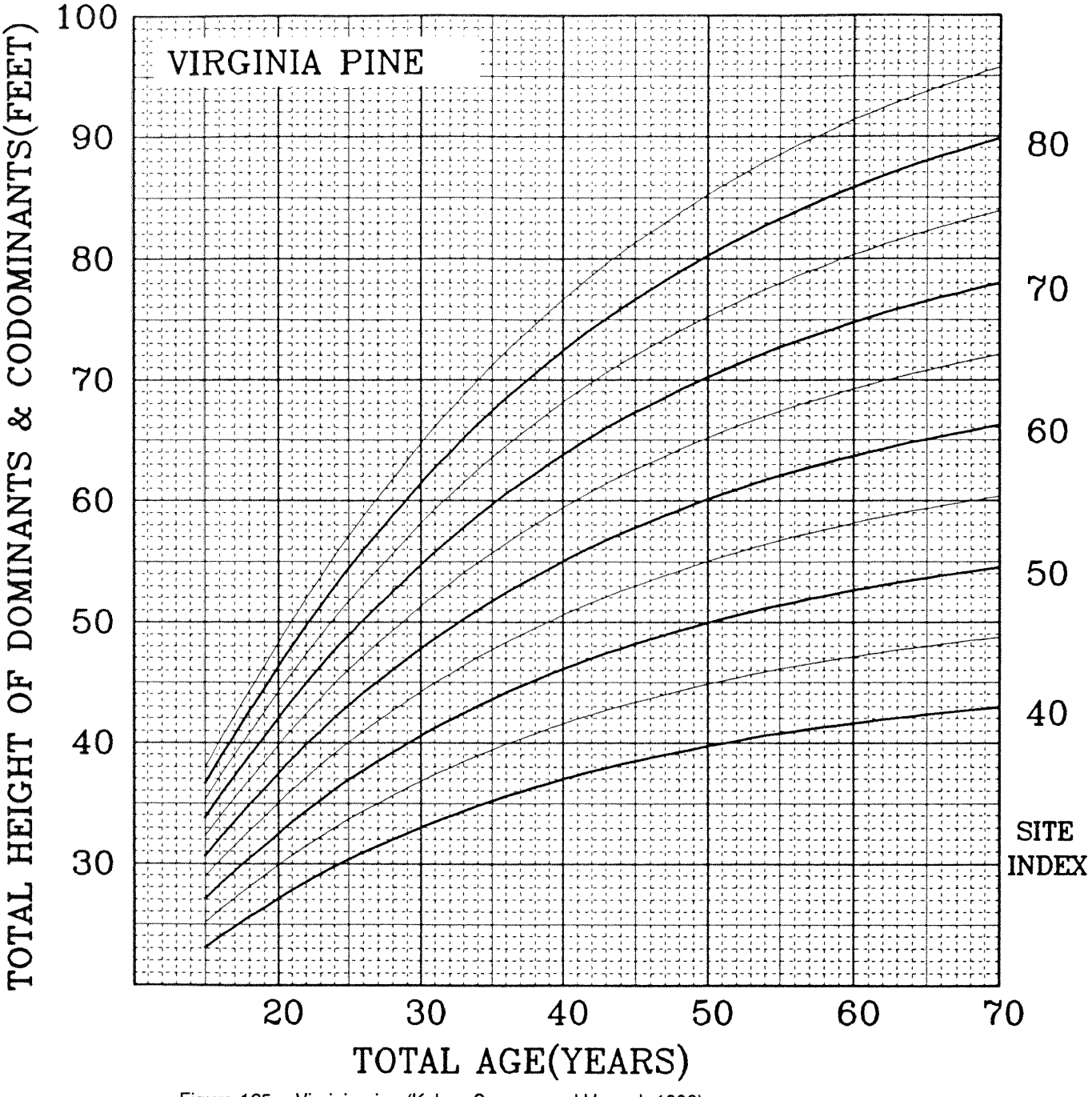


Figure 125.—Virginia pine (Kulow, Sowers, and Heesch 1966)
West Virginia, Maryland, and Pennsylvania
922 dominant and codominant trees, number of plots not given
Total height and total age, anamorphic, logarithm equation
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	<45	45-75	>75
Years:	6	5	4

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	0.7716	1.1087	-0.0348	0.1099	0.5274	0.99	0.88	3.1
SI	1.0955	0.9455	-0.0527	-0.3886	0.3628	0.99	1.25	4.3

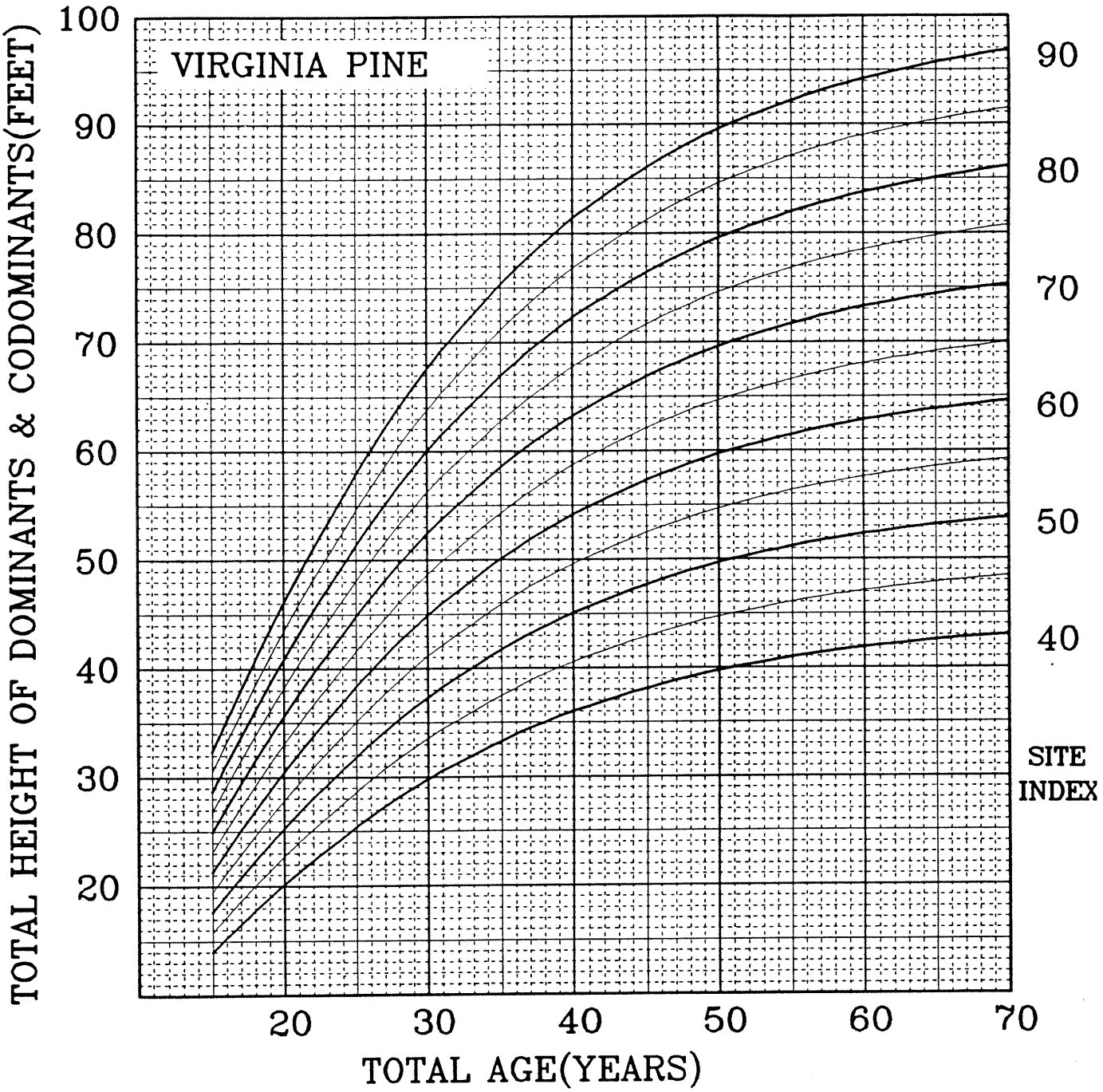


Figure 124.—Virginia pine (Chaiken and Nelson 1959; Nelson, Clutter, and Chaiken 1961)

Piedmont of Maryland, Virginia, and the Carolinas

166 plots, number of dominant and codominant trees not given

Total height and total age, anamorphic, logarithm equation not given

Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	<45	45-75	>75
Years:	6	5	4

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.1204	0.9984	-0.0597	2.4448	-0.0284	0.99	0.92	4.6
SI	0.8421	1.0090	-0.0490	-2.1682	-0.0762	0.99	0.99	4.3

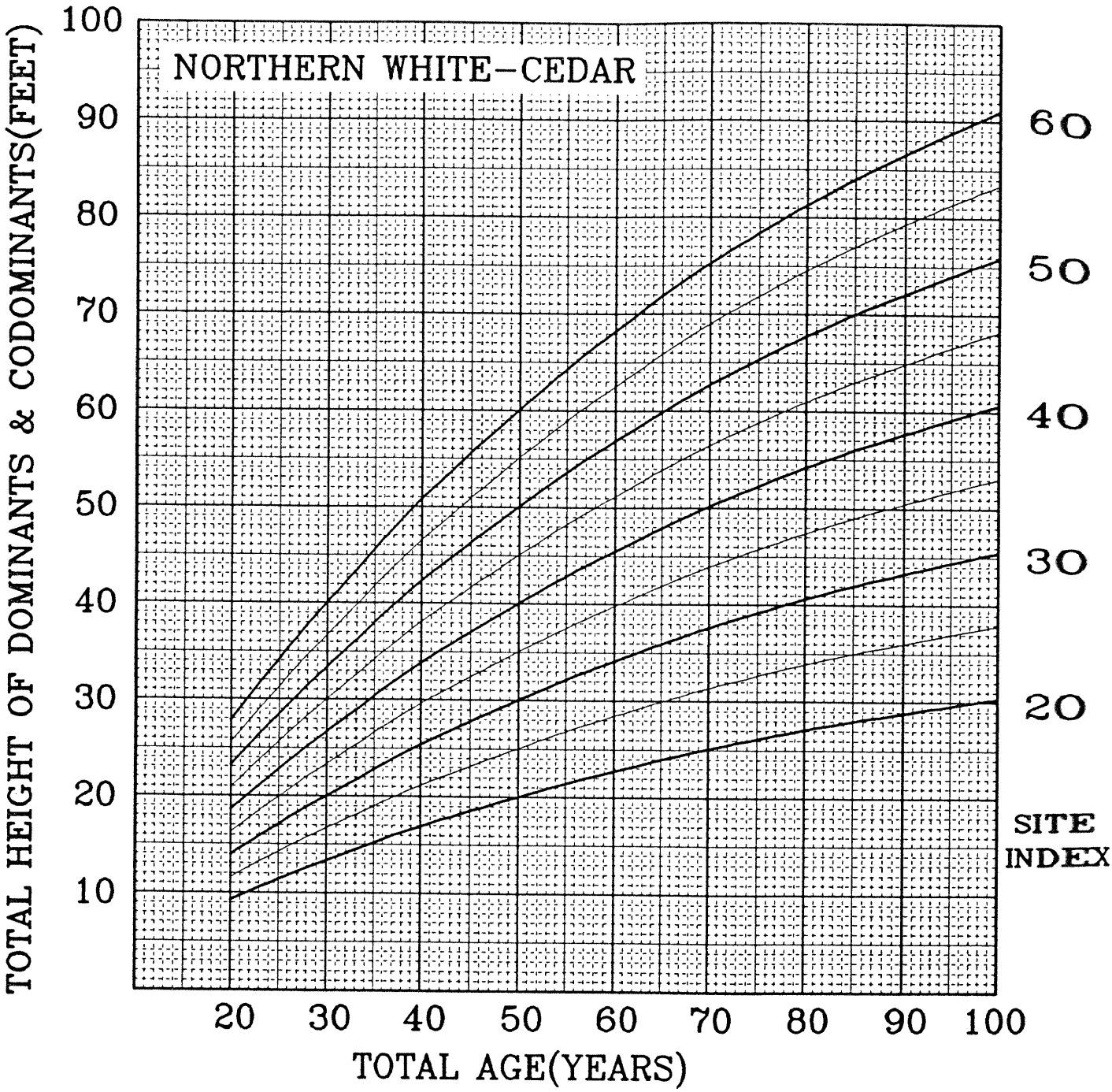


Figure 126.—Northern white-cedar (Gevorkiantz 1957e)
Lake States
Number of plots and number of dominant and codominant trees not given
Total height and total age, anamorphic, equation not given
Convert d.b.h. age to total age by adding years according to site index (BH = 0.0):

SI:	20	30	40	50	60
Years:	20	15	15	10	10

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	1.9730	1.0000	-0.0154	1.0895	0.0000	0.99	0.66	1.7
SI	0.5068	1.0000	-0.0154	-1.0895	0.0000	0.99	0.66	1.7

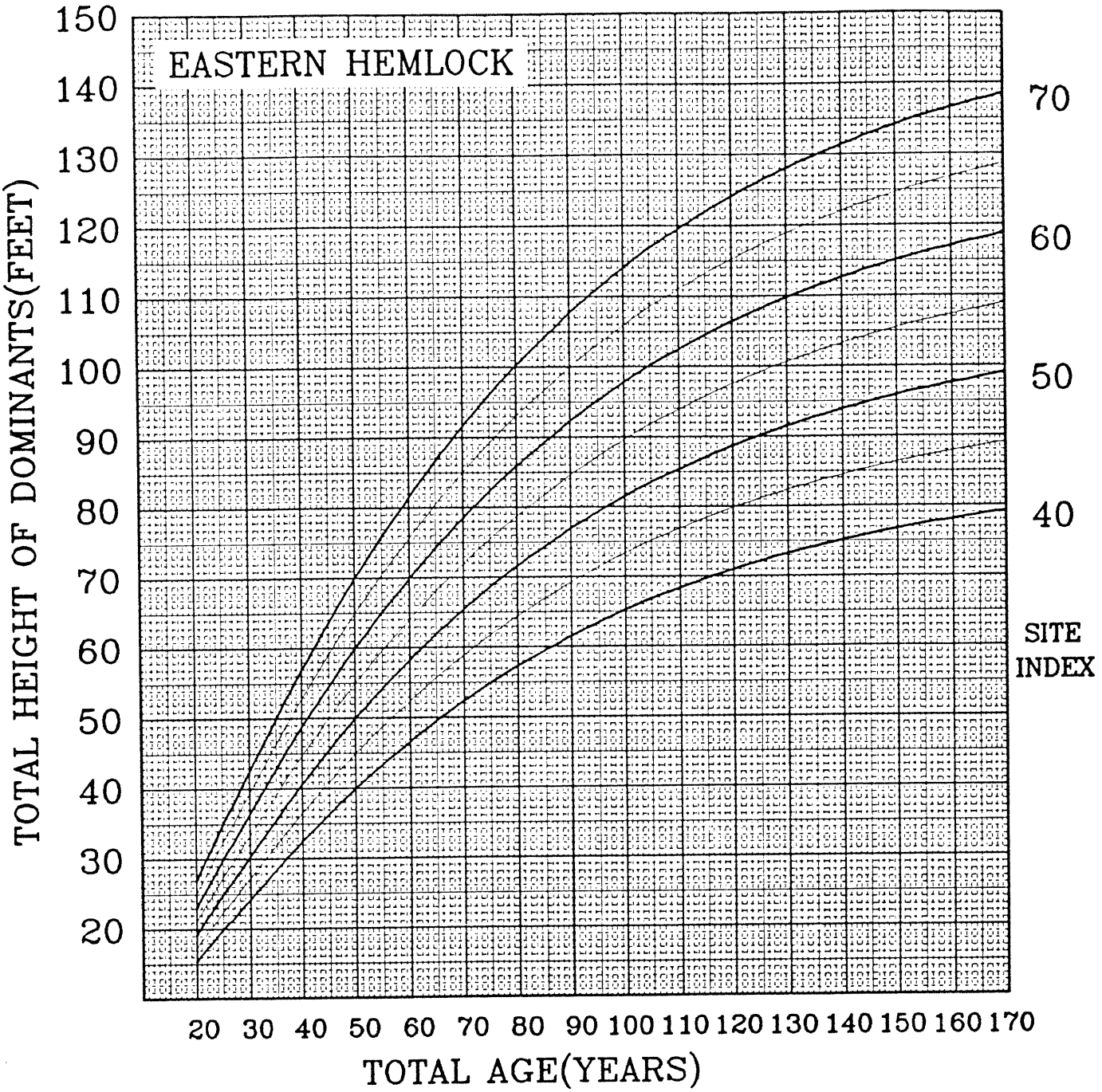


Figure 127.—Eastern hemlock (Frothingham 1915a)
Based on average of "maximum" height growth curves from stands in New York, Michigan, and Southern Appalachian Mountains
Number of plots and number of dominant trees not given
Total height and age, anamorphic, equation not given
Add 6 years to d.b.h. age to obtain total age. Vigorous uninjured free-growing dominants in even aged stands are particularly important for estimating site index of hemlock (BH = 0.0)

	b_1	b_2	b_3	b_4	b_5	R^2	SE	Maximum difference
H	2.1493	0.9979	-0.0175	1.4086	-0.0008	0.99	0.50	1.6
SI	0.2172	1.1309	-0.0105	-1.9120	-0.1327	0.99	1.20	3.4

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Carmean, Willard H.; Hahn, Jerold T.; Jacobs, Rodney D.
1989. Site index curves for forest species in the eastern United States. Gen. Tech. Rep. NC-128. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. 142 p.

Site index curves are given for forest tree species found in the eastern United States. A total of 127 site curves are presented including formulations for computing both total height and site index.

KEY WORDS: Site quality estimation, formulations for height growth and site index.

Our job at the North Central Forest Experiment Station is discovering and creating new knowledge and technology in the field of natural resources and conveying this information to the people who can use it. As a new generation of forests emerges in our region, managers are confronted with two unique challenges: (1) Dealing with the great diversity in composition, quality, and ownership of the forests, and (2) Reconciling the conflicting demands of the people who use them. Helping the forest manager meet these challenges while protecting the environment is what research at North Central is all about.

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