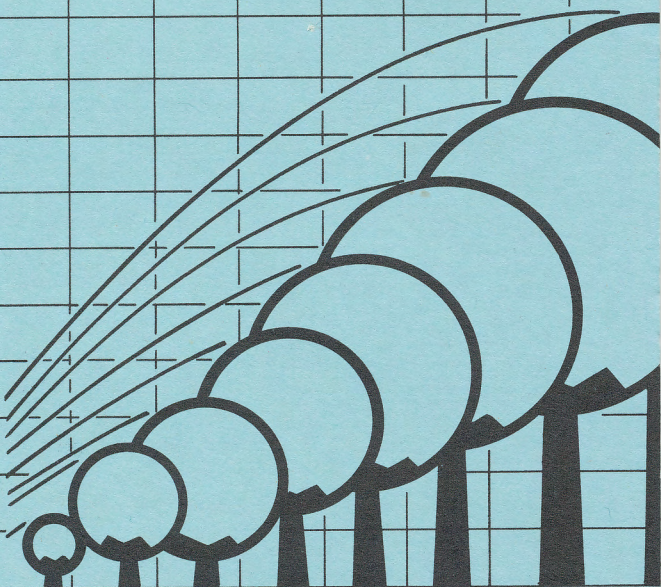


HOW TO estimate site index for oaks in the MISSOURI OZARKS



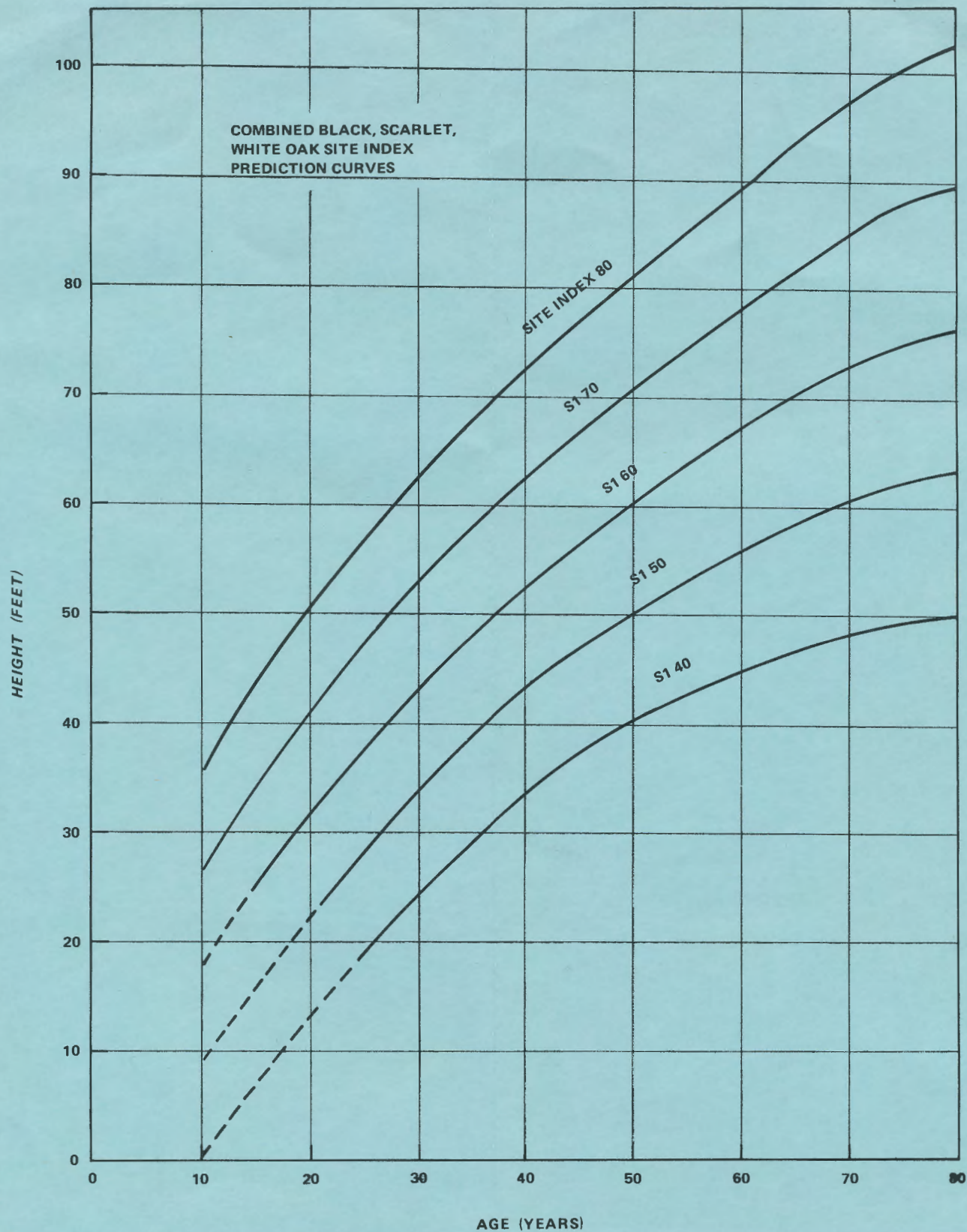
North Central Forest Experiment Station
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How well does a certain tree species grow on a specific tract of land? Foresters traditionally answer this question in terms of "site index"—the average height of dominant and codominant trees at age 50 years in fully stocked, even-aged stands. Site index is widely used as an index of site quality because it is easy to measure and because it correlates well with timber yields.

Site index can be measured directly from 50-year-old trees, but for younger or older trees it must be estimated from the tree's present height and age. Fortunately, trees grow in fairly uniform and predictable patterns, and by knowing these patterns and the tree's present height and age, SI can easily be estimated.

Site index prediction curves based on tree height and age were developed for black, scarlet, and white oak in southeastern Missouri from measurements of more than 700 sample trees. Data from these species were similar enough for general purposes to warrant combining them into one set of curves for all three species.

Even though the height growth patterns (and thus the site index prediction curves) are fairly similar, the growth **rates** differ among the three species. Thus black, white, and scarlet oak trees growing side-by-side on a uniform soil do not grow at the same rate and will not be the same height at age 50 (i.e., site index). Therefore, when stating a site index value, the species to which it refers must also be stated. The relations among the site index values of the three species (plus post oak) are fairly consistent however, which makes it possible to estimate the site index of one species knowing the SI of another species. Because black



oak is the most abundant oak species in the Ozarks and is commonly found on a wide variety of sites, we recommend that it be used as the standard site index reference species wherever possible.

Estimates of stand site index are, of course, not exact, and often it is helpful to know how precise an estimate is, especially when comparing different sites. Therefore, precision values have been included in this site index estimation procedure; the precision of a stand site index estimate increases the closer the stand age is to 50 and the more sample trees are measured.

Here is the step-by-step procedure for determining the site index of a stand or area:

1. Delineate a stand or area that is **fairly uniform** in tree age and height.

2. Decide how precise you want your site index estimate to be in terms of feet of site index, and then determine the number of trees to measure from the following table (precision intervals correct in 95 percent of the cases):

Tree age (years)	Precision desired (± feet SI)			
20	15	10	7	5
40	8	5	4	3
60	7	4	3	3
80	12	8	5	4
Number of trees to measure	1	3	5	10

The size of the area, as long as it is fairly uniform, will not affect the number of sample trees necessary to attain a given level of

precision. Errors in the measurement of heights and ages of standing trees may add 10 to 25 percent to the above precision values.

3. Choose an indicator species (black, white, or scarlet oak), and select representative sample trees of that species from throughout the area. Trees of the other two species (or post oak if it is between 40 and 60 years old) may be selected as sample trees if necessary, but conversions will be necessary later (Step 5). Sample trees should be straight and have crowns of about average size for the codominant trees in the stand. Avoid trees with damaged tops, or those with excessive insect, disease, or fire damage. Avoid also trees with crowns larger or smaller in diameter than the average for the codominant trees in the stand; larger or smaller crowns may indicate age differences that could lead to errors in site index determination.

4. Measure the heights of the sample trees to the nearest foot with an Abney level or similar instrument. Determine the age with an increment borer 4½ feet above ground, and add 2 years to get total age. Eliminate any sample tree whose increment core shows signs of suppressed diameter growth—especially when the tree was young. If the stand is truly even-aged, tree ages may be determined from recently-cut stumps, if available.

5. From the SI chart, determine the SI for each sample tree; if necessary, convert the SI of other species into equivalent SI of the indicator species using the following conversion factors:

Black oak SI	=	Scarlet oak SI	- 3
		White oak SI	+ 4
		Post oak SI	+ 6
Scarlet oak SI	=	Black oak SI	+ 3
		White oak SI	+ 7
		Post oak SI	+ 9
White oak SI	=	Black oak SI	- 4
		Scarlet oak SI	- 7
		Post oak SI	+ 2

Average the site index values and express the average site index (specifying the indicator species) to the nearest foot $\pm$ the precision value from Step 2; for example, black oak SI 54 $\pm$ 7 feet, or white oak SI 66 $\pm$ 4 feet.

6. To estimate the site index for a species that does not presently occur on an area, determine the SI for one that does, and apply the appropriate conversion factor from Step 5.

Information in this leaflet is presented in more detail in the following publications:

McQuilkin, R. A. 1974. Site index prediction tables for black, scarlet, and white oaks in southeastern Missouri. USDA For. Serv. Res. Pap. NC-108, 8 p. North Cent. For. Exp. Stn., St. Paul, Minnesota.

McQuilkin, R. A. 1975. Errors in site index determination caused by tree age variation in even-aged oak stands. USDA For. Serv. Res. Note NC-185, 4 p. North Cent. For. Exp. Stn., St. Paul, Minnesota.

McQuilkin, R. A., and R. Rogers. [In press.] A method for determining the precision of stand site index estimates made from site index prediction functions. For. Sci.

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