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*Guide for*

# EVALUATING CHERRYBARK OAK SITES

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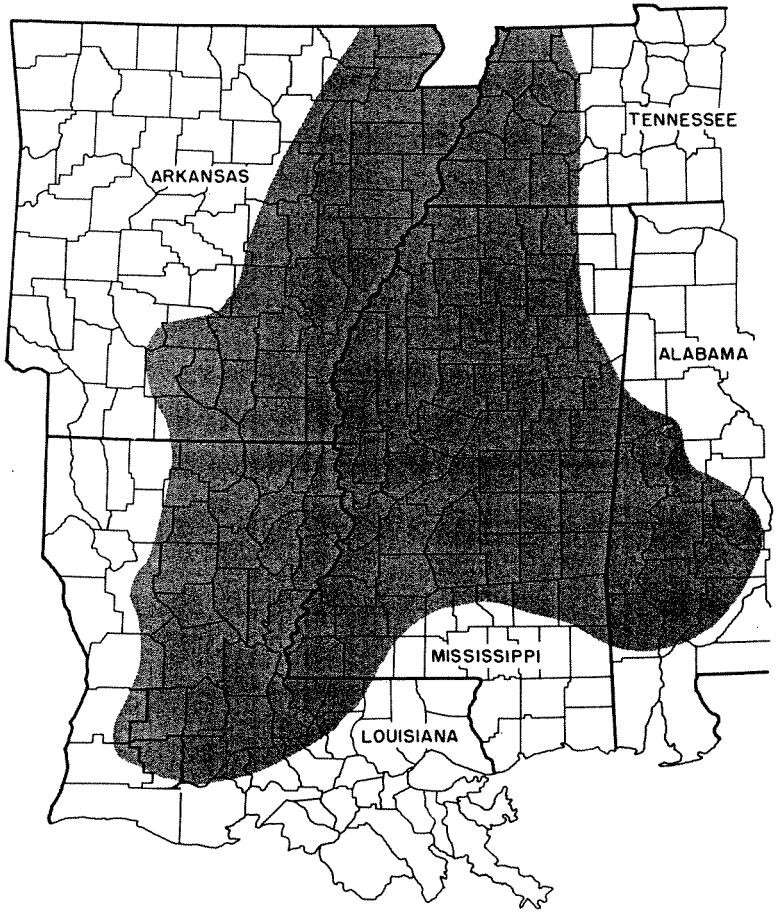


Figure 1.—*Sample plots were taken in the general area indicated by the shading.*

# Guide for

# EVALUATING CHERRYBARK OAK SITES

**W. M. Broadfoot**

This booklet briefly describes three ways of estimating the capabilities of soils in the Midsouth for growing cherrybark oak (*Quercus falcata* var. *pagodaefolia* Ell.). The procedures were developed at the Stoneville Research Center [1] with data from 285 sample plots [2] in the area mapped in figure 1. The total height that a free-growing forest tree will reach at age 50 years was taken as the standard measure of site index, or site capability.

The purpose of the research was to find a way of evaluating sites in terms of the physical and chemical properties of the soil. Tests of 1,022 single and multiple regression equations indicated that site index can be estimated from depth of topsoil, depth to fragipan, and depth to mottling. When imbibitional water was substituted for depth to mottling the equation was slightly more accurate, but imbibitional water must be determined in the laboratory, while depth to mottling is easily measured in the field.

In the first of the 3 appraisal methods, depth of topsoil and depth to pan and mottling are sampled and then site index is read from a table constructed from the 3-variable equation.

The second method permits a rapid field estimate from observations of soil texture, internal drainage, presence or absence of pan, depth of topsoil, and inherent moisture of the site.

The third procedure requires identification of soil series and phase, after which site index can be read from a table of averages.

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[1] Maintained at Stoneville, Mississippi, by the Southern Forest Experiment Station in cooperation with the Mississippi Agricultural Experiment Station and the Southern Hardwood Forest Research Group.

[2] Data for 26 plots were furnished by the Soil Conservation Service, U. S. Department of Agriculture.

## METHOD I

To use the first method, two small pits should be dug to a depth of 30 inches in representative soil of each site in the area that is to be evaluated. The following determinations should be made in each hole and the values averaged:

Depth of topsoil (A-horizon) to nearest inch, where it is less than 6 inches. If the depth is 6 inches or more, it should be recorded as 6+ inches. Where the A-horizon is poorly developed, as on clay flats and young soils of recent natural levees, the site can be considered as having 6 inches or more of topsoil.

Distance, by half-foot intervals up to 2½ feet, from the soil surface to distinct mottling or light gray color.

Presence or absence of hardpan within 30 inches of surface. Pans can be recognized by a cemented, firm, or compact condition in the B-horizon. Clods broken from a pan contain many unconnected voids or cavities. When these clods are pressed between the fingers, they will shatter or "explode."

Site index can be read from table 1 after the three variables have been measured.

Table 1.—*Site index of cherrybark oak as determined from depth to mottling and depth of topsoil*

If there is a pan within 30 inches of the surface, subtract 11 from the values.

| Depth to mottling (inches) | Depth of topsoil in inches | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 or more |
| | *Feet* | | | | | |
| 0 to 5.9 | 62 | 68 | 75 | 81 | 87 | 93 |
| 6.0 to 11.9 | 65 | 71 | 77 | 83 | 89 | 96 |
| 12.0 to 17.9 | 67 | 74 | 80 | 86 | 92 | 98 |
| 18.0 to 23.9 | 70 | 76 | 83 | 89 | 95 | 101 |
| 24+ | 73 | 79 | 85 | 91 | 97 | 104 |

Figure 2.—*Depth of topsoil is the most influential factor in the prediction of site quality for cherrybark oak. The plot shown at left has less than 6 inches of topsoil; that at the right has more than 6 inches. All other soil-site factors are approximately equal.*

## METHOD II

In this method, a soil auger or spade is used to determine texture, internal drainage, depth of topsoil, and depth to pan. Another site factor, inherent moisture condition, is established by observation.

*Depth of topsoil.*—If there is more than 6 inches, classify as without erosion; if less than 6 inches, classify as eroded.

*Texture.*—Classify the surface 2 feet as fine, medium, or coarse. Clays (buckshot and gumbo) are classed as fine, sandy soils as coarse, and all others as medium.

*Internal drainage.*—If profile has distinct gray or reddish-brown mottles within the surface 18 inches, classify internal drainage as poor. If such markings do not occur, classify as good.

*Pan.*—If a compact or cemented zone occurs within 30 inches of the surface, classify the site as with pan.

*Inherent moisture.*—Classify site as moist if it is: (1) level or situated so that it is subject to brief or temporary flooding; (2) a narrow branch or creek bottom; (3) a slope steeper than 17 percent *in loess areas*; or (4) a lower slope. Classify site as dry if it is sloping or on a ridge in a broad river bottom, or situated so that floodwater or heavy rains drain off (otherwise than as specified for moist sites). Generally no further classification of inherent moisture is necessary, but sometimes factors such as nearness of root zone to mean low water in rivers, streams, or lakes may have to be considered. After the five components have been determined, site index is read from table 2.

Table 2.—*Key to cherrybark oak site index for soils of the Midsouth*

| Soil-site description | Not eroded (more than 6 in. of topsoil) | Eroded (less than 6 in. of topsoil) |
|---|---|---|
| | — — — — *Site index* — — — — | |
| I. Fine texture | | |
| A. Good internal drainage | 95-104 | 80-89 |
| B. Poor internal drainage | | |
| 1. Without pan | | |
| a. Moist | 80-89 | 65-74 |
| b. Dry | 90-99 | 75-84 |
| 2. With pan | 75-84 | 60-69 |
| II. Medium texture | | |
| A. Good internal drainage | | |
| 1. Without pan | | |
| a. Moist | 110-119 | 95-104 |
| b. Dry | 100-109 | 85-94 |
| 2. With pan | 85-94 | 70-79 |
| B. Poor internal drainage | | |
| 1. Without pan | | |
| a. Moist | 90-99 | 75-84 |
| b. Dry | 95-104 | 80-89 |
| 2. With pan | 80-89 | 65-74 |
| III. Coarse texture | | |
| A. Good internal drainage | | |
| 1. Without pan | | |
| a. Moist | 105-114 | 90-99 |
| b. Dry | 95-104 | 80-89 |
| 2. With pan | 80-89 | 65-74 |
| B. Poor internal drainage | | |
| 1. Without pan | | |
| a. Moist | 95-104 | 80-89 |
| b. Dry | 90-99 | 75-84 |
| 2. With pan | 75-84 | 60-69 |

## METHOD III

To apply the third method, the soil series and the local site-moisture phase must be identified. This can be done either in the field by a qualified soil scientist or from a standard county survey map if one is available. Standard soil maps do not show inherent moisture phases, but they delineate slopes and physiographic positions so that phases can be translated into moist or dry condition by the procedure outlined in method II.

When soil series and inherent moisture have been determined, site index can be read from table 3. The table gives the average index and standard deviation for soils of which 5 or more samples were available. Where samples were fewer than 5, only the range of site index is indicated.

Table 3.—*Site index of cherrybark oak by soil series and phase*

| Soil series | Moist phase | | | Dry phase | | |
|---|---|---|---|---|---|---|
| | Range | Average and standard deviation | Plots [1] | Range | Average and standard deviation | Plots [1] |
| | *Feet* | *Feet* | *Number* | *Feet* | *Feet* | *Number* |
| Alligator | 75-84 | 80 ± 3 | 10 | 90-99 | 95 ± 10 | 10 |
| Alligator (eroded) | | | | 75-84 | | |
| Bibb | 85-94 | 91 ± 5 | 17 | 90-99 | | |
| Bosket | 100-109 | | | | | |
| Brittain | 90-99 | 93 ± 5 | 9 | 100-109 | | |
| Buxin-Midland | 80-89 | | | | | |
| Carroll | 75-84 | | | 75-84 | | |
| Collins | 110-119 | 115 ± 5 | 12 | 105-114 | | |
| Daugherty (eroded) | | | | 80-89 | | |
| Dundee | 95-104 | | | 100-109 | 105 ± 5 | 16 |
| Falaya | 95-104 | 98 ± 6 | 17 | 95-104 | 102 ± 7 | 11 |
| Flint-Muskogee | | | | 100-109 | | |
| Forestdale | 85-94 | 89 ± 8 | 14 | 95-104 | 98 ± 6 | 17 |
| Gore (eroded) | 70-79 | | | 70-79 | | |
| Hebert | 90-99 | 94 ± 1 | 6 | | | |
| Henry-Grenada (eroded) | 80-89 | | | 80-89 | | |
| Ina | 95-104 | 100 ± 4 | 10 | 95-104 | 102 ± 6 | 5 |
| Iuka | 110-119 | | | 95-104 | 98 ± 7 | 8 |
| Lintonia | 110-119 | | | | | |
| Mantachie | 95-104 | 98 ± 3 | 8 | 95-104 | 98 ± 3 | 8 |
| Memphis-Loring | | | | 95-104 | 98 ± 5 | 17 |
| Memphis-Loring (eroded) | | | | 80-89 | 83 ± 5 | 18 |
| Memphis-Loring-Natchez | 105-114 | 111 ± 1 | 5 | | | |
| Mhoon-Waverly | 90-99 | | | | | |
| Olivier | 80-89 | 86 ± 5 | 5 | 80-89 | 86 ± 5 | 5 |
| Perry | 75-84 | 82 ± 8 | 5 | 80-89 | | |
| Richland-Houlka-Gallion-Bowdre | | | | 95-104 | | |
| Scipio-Myatt | 85-94 | | | 85-94 | | |
| Shannon | 105-114 | | | | | |
| Sharkey | 75-84 | | | 85-94 | | |
| Tunica | 80-89 | | | 90-99 | | |
| Urbo | | | | 90-99 | | |
| Yahola | 95-104 | | | | | |

[1] Blank indicates less than 5 plots.

## SITE INDEX CURVES

The standard site index curves in figure 3 indicate the expectable height of cherrybark oak trees on sites of various quality. They can be used to check the evaluations made by any of the three methods. Making a check requires counting the yearly rings and measuring the heights of dominant and codominant trees in well-stocked stands that have had no modifying influence or treatment. For example, trees 75 feet tall at age 40 would signify a site index of 80.

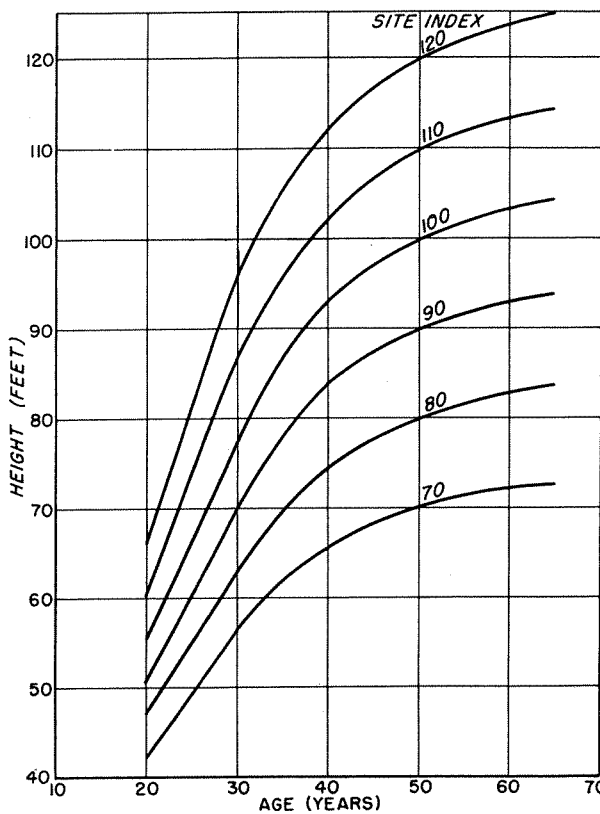


Figure 3.—*Expectable heights of cherrybark oak on various sites.*

The curves apply only to cherrybark oak in the Midsouth. Information for constructing them was obtained by felling trees on a wide range of sites and counting the rings at 8-foot intervals up the stem, from a 1-foot stump to the top. These data were plotted and checked against height-age data from the study plots. Finally, smooth curves were drawn by eye and the site index of each plot was read.