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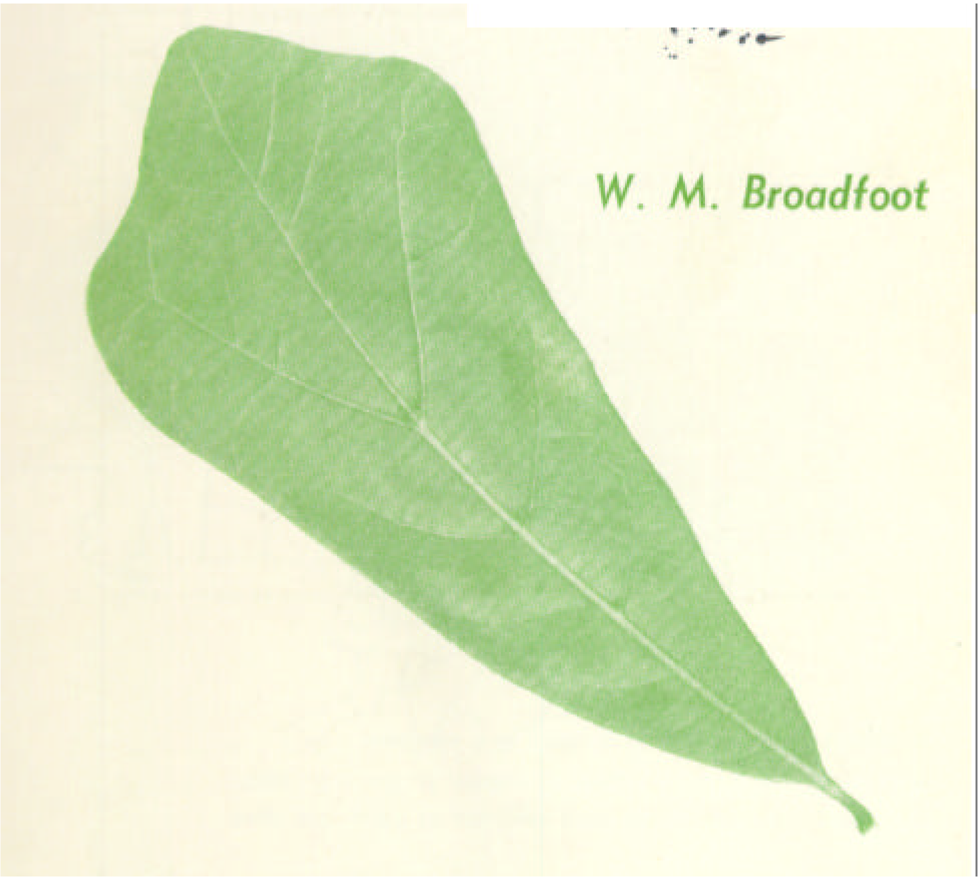
Guide for EVALUATING WATER OAK SITES



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1963

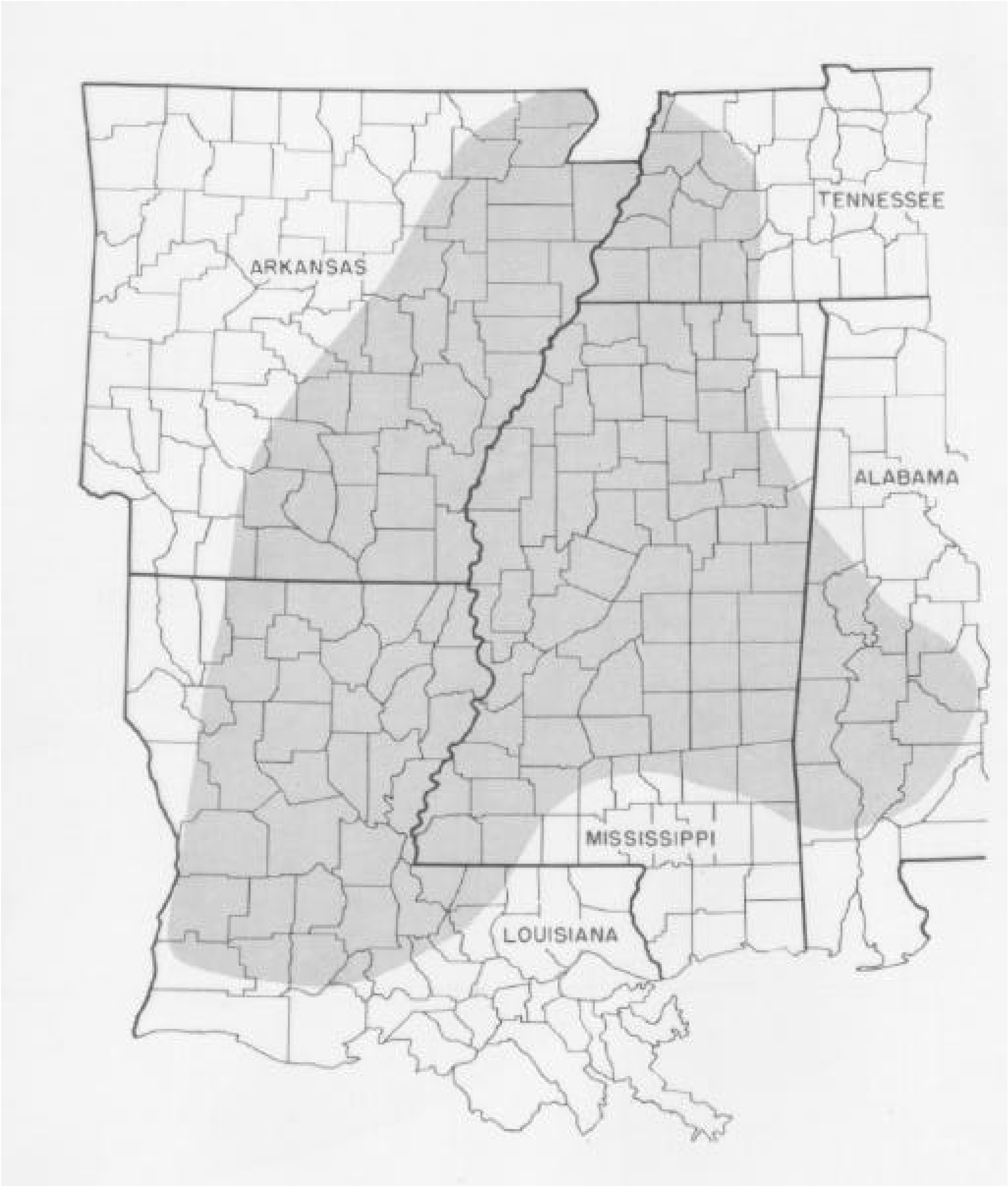

Figure 1.-*Sample plots were in the area indicated by the shading.*

Broadfoot, Walter M.

1963. Guide for evaluating water oak sites. South. Forest Expt. Sta., New Orleans, La. 8 pp., illus. (U. S. Forest Serv. Res. Paper SO-1)

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Guide for

EVALUATING WATER OAK SITES

W. M. Broadfoot

The ability of soils in the Midsouth to produce water oak *(Quercus nigra* L.) can be estimated by any of three procedures developed recently in studies at the Southern Hardwoods Laboratory.[1]'

The procedures are based on data from 135 sample plots[2] in the area shown in figure 1. The purpose of the research was to find ways of estimating site index from soil and site factors that can be measured objectively. To this end, about 75 physical and chemical soil properties were studied. Site index was expressed as the total height, at age 50 years, of a dominant tree in a well-stocked stand.

In the first of the three procedures, site index is estimated from amount of exchangeable sodium in the soil, depth of topsoil, and presence or absence of an underlying hardpan. This method requires laboratory analysis of soil samples.

By the second method, quick estimates of site can be made in the field, from determinations of soil texture, depth to distinct mottling, presence of hardpan, depth of topsoil, and inherent moisture condition of the site.

The third method 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 22 plots in Louisiana and Arkansas were furnished by the Soil Conservation Service, U. S. Department of Agriculture.

METHOD I

To use the first method, two representative bulk soil samples should be collected from each homogeneous or uniform site that is to be evaluated. Samples are taken with a bucket auger to a depth of 4 feet. Soil from both auger holes is mixed and about one pint saved for laboratory analysis.

While the holes are being dug, the depth of topsoil or A-horizon should be measured to the nearest inch and presence or absence of a pan should be noted. If present, pans are usually in the surface 30 inches of soil. They are most frequent on flat terraces and uplands, and never occur on young bottom-land soils. They can be recognized by a cemented, firm, or compact condition in the B-horizon. Clods broken from a pan have many unconnected voids or cavities. When the clods are pressed between the fingers they shatter. Normally the pan is grayer and has a more distinct color-mottling than the soil just above it. In winter or at other times when the soil is saturated, presence of a pan can be established by probing the soil with a stout stick or with a blunt iron rod about 1/4-inch in diameter. The probe will enter the soil easily until it reaches the pan. Resistance to the probe may vary from place to place, depending on the strength of the pan, and therefore the site should be probed in several spots.

The samples collected from the holes may be either analyzed locally or turned over to a soils laboratory for determination of pounds of exchangeable sodium per acre.

Site index can be read from table 1 after the amount of sodium, depth of topsoil, and presence of a pan have been measured or established.

Table 1.--*Site index of water oak as estimated from depth of topsoil and amount of exchangeable sodium. in 4-foot soil depth*

If there is a pan within 30 inches of the surface, subtract 13 from the values.

Depth of topsoil	Sodium, in pounds per acre								
	0	100	200	300	400	500	~ 600	700	800
Inches					*Feet*				
0	87	85	82	79	77	74	71	69	66
2	90	88	85	82	80	77	74	72	69
4	93	91	88	86	83	80	78	75	72
6	96	94	91	89	86	83	81	78	75
8	100	97	94	92	89	86	84	81	78
10	103	100	98	95	92	90	87	84	82
12	106	103	101	98	95	93	90	87	85

Figure 2. –Water oak stand on slack-water soils-Sharkey, Tunica, and Bowdre.
. *Site index ranges from 80 to 104 feet in this area.*

METHOD II

In this method a soil auger or spade is used to determine predominant texture of the upper 4 feet of soil, depth to mottling, depth of topsoil, and whether there is a pan. Inherent moisture condition is established by observation.

Texture.-Classify the surface 4 feet of soil either as predominantly fine (clays-buckshot and gumbo) or medium to coarse (all others).

Depth to mottling.-Measure in inches the depth from the surface to the first distinct gray color, or to gray and reddish-brown mottles.

Depth of topsoil.-Determine if the topsoil or A-horizon is more or less than 6 inches deep. 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.

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

Inherent moisture.-Classify a site as moist if it is: (1) level or situated so that it receives extra surface water or run-on; (2) a narrow branch or creek bottom; (3) a lower slope; or (4) a slope steeper than 17 percent in a loess area (such slopes are usually the sides of huge old gullies; the loose, silty loess receives moisture more readily than clay and holds it more strongly than sandy soils). Class the 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 in items 2, 3, and 4 for moist sites). Generally no further classification of inherent moisture condition is necessary, but sometimes nearness of root zone to mean low water in streams or lakes may have to be considered.

After the five components have been determined, site index can be read from table 2.

Table 2.-*Key to water oak site index for soils of the Midsouth*

Soil-site description[1]	Site index
	Feet
I. Fine texture	
A. Less than 6 inches to mottling	
1- Less than 6 inches of topsoil	75-84
2. 6 inches or more of topsoil	
a. Inherently moist	75- 84
b. Inherently dry	85- 94
B. 6 inches or more to mottling	90- 99
II. Medium to coarse texture	
A. Less than 18 inches to mottling	
1. Without pan	9O- 99
2. With pan	75- 84
B. 18 to 29 inches to mottling, and 6 inches or more of topsoil	100-109
C 30 inches or more to mottling	
1. Less than 6 inches of topsoil	75- 84
2. 6 inches or more of topsoil	
a. Inherently moist	95-104
b.Inherently dry	85- 94

[1] Categories not listed are nonexistent, were not found in the field, or were not significantly different in site index from next order or breakdown in the key.

METHOD III

To use method III, the soil series and local erosion and site-moisture phases must be identified. This can be done 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 these phases can be translated into moist and dry conditions as described under method II.

The standard soil maps indicate depth of topsoil. For values less than 6 inches, the soil is classified as an eroded phase. It no erosion is mapped, the soil is considered to be uneroded-that is, to have 6 inches or more of topsoil.

When soil series and phase have been determined, site index can be read in table 3. This table omits soils on which qualified sample trees were not found during the study.

Figure 3.- *An excellent water oak on moist Bowdre clay loam soil with a site index of 100. This sample tree is 24 inches in d.b.h.*

Table 3.–*Site index of water 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	70-79			90-99		
Alligator (eroded)				75-84		
Bibb	85-94					
Bosket				95-104		
Bowdre	95-104			90-99		
Buxin	80-89					
Calloway				75-84		
Chastain	80-89			85-94		
Collins	100-109	107±3	5			
Commerce	105-114			100-109		
Daugherty (eroded)				70-79		
Dundee	95-104			90-99	95±5	5
Falaya	90-99	93 ±7	6	100-109		
Flint	95-104			90-99		
Forestdale	85-94	90±4	5	85-94	92±8	6
Gallion				80-89		
Grenada				75-84		
Hebert	85-94					
Henry				70-79		
Iuka	95-104	102±9	5	85-94		
Lintonia	100-109					
Loring				85-94	90 ±5	5
Loring (eroded)				80-89		
Mantachie	90-99	95±5	7			
Mhoon	85-94					
Muskogee	85-94					
Myatt				80-89		
Ochlockonee	95-104					
Perry	70-79			80-89		
Sharkey	85-94	88±5	14	90-99	97±5	11
Tickfaw	90-99					
Tombigbee	105-114					
Tunica	80-89			80-89		
Urbo	90-99					
Waverly	90-99			90-99		
Yahola	90-99					

[1] Blank indicates less than 5 plots

SITE INDEX CURVES

Expected heights of water oak on sites of various quality can be estimated from the site index curves in figure 4. Site evaluations made by any of the three methods can be checked by use of these curves. Making a check requires counting the annual rings for total age and measuring the heights of dominant and codominant trees in well-stocked stands that have had no modifying influence or treatment. For example, trees 95 feet tall at age 60 would signify a site index of 90.

The curves apply only to water oak in the Midsouth. Information for constructing them was obtained by felling trees on a wide range of sites and counting the annual rings at 8-foot intervals up the stem, from a 1-foot stump to the top. These data were supplemented with height-age data from all the study plots.

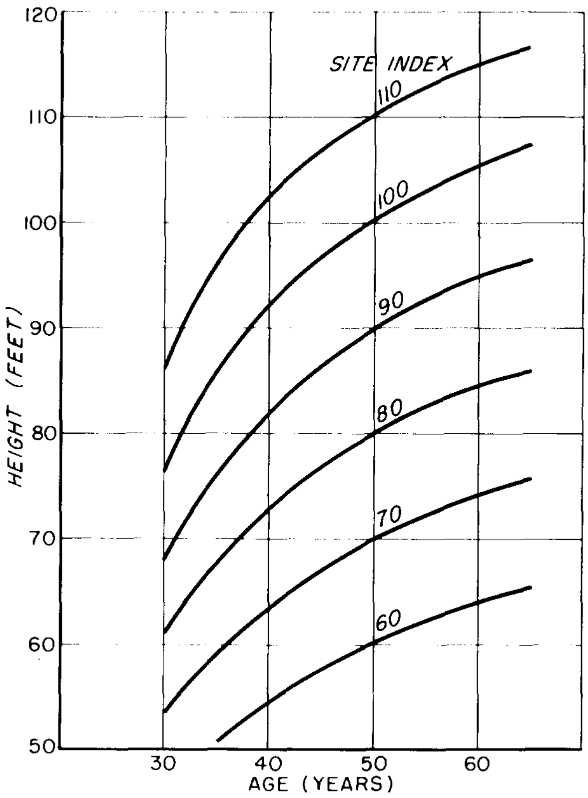

Figure 4.-Growth curves of water oak.