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A PRACTICAL FIELD METHOD OF

SITE EVALUATION FOR COMMERCIALLY IMPORTANT SOUTHERN HARDWOODS

James B. Baker
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SYCAMORE
SWAMP CHESTNUT OAK
YELLOW POPLAR
CHERRYBARK OAK
PECAN ■ GREEN ASH
SUGARBERRY
HACKBERRY ■ SWEETGUM
NUTTALL OAK
WILLOW OAK
SHUMARD OAK
COTTONWOOD
WATER OAK

Southern Forest Experiment Station

SUMMARY

This paper provides a method of site evaluation for cottonwood, green ash, hackberry, sugarberry, pecan, sweetgum, sycamore, yellow-poplar, and cherrybark, Nuttall, Shumard, swamp chestnut, water and willow oaks. The method incorporates an evaluation of the physical, moisture, nutrient, and aeration properties of a soil into a site quality rating. Field tests have demonstrated the accuracy of the technique. The site evaluation technique also provides a basis for possible soil improvement treatments for the 14 hardwood species and estimates of potential productivity for cottonwood, sweetgum, and sycamore plantations.

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PREFACE

In 1977, we published "A Practical Field Method of Site Evaluation for Eight Important Southern Hardwoods" (Baker and Broadfoot 1977). Demand for the guide was great and many requested us to expand it to include other commercially important southern hardwoods. This publication is intended to satisfy those requests.

The site evaluation tables for the original eight species are included here but have been slightly modified to make them clearer and more useful. In addition, site evaluation tables are now provided for six more southern hardwoods (hackberry, sugarberry, yellow-poplar, pecan, and Shumard and swamp chestnut oaks). To make finding a table for a particular species easier, we have added a TABLE OF CONTENTS, and put the evaluation tables in alphabetical order for easy reference. Estimated stand and production data for sweetgum and sycamore are now included (the earlier guide had these data for cottonwood only), and the Explanation of Terms in the APPENDIX has been expanded.

A Practical Field Method of Site Evaluation For Commercially Important Southern Hardwoods

JAMES B. BAKER
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This field guide is for use in estimating the suitability of sites for the following southern hardwood species: cottonwood *(Populus deltoides)*, green ash *(Fraxinus pennsylvanica)*, pecan *(Carya illinoensis)*, sycamore *(Platanus occidentalis)*, sweetgum *(Liquidambar styraciflua)*, yellow-poplar *(Liriodendron tulipifera)*, hackberry *(Celtis occidentalis)*, sugarberry *(C. laevigata)*, cherrybark oak *(Quercus falcata* var. *pagodaefolia)*, Nuttall oak *(Q. nuttallii)*, Shumard oak *(Q. shumardii)*, water oak *(Q. nigra)*, willow oak *(Q. phellos)*, and swamp chestnut oak *(Q. michauxii)*.

In establishing hardwood plantations, the forest manager must know whether a site is suitable for a particular species, and for investment planning he should have some idea of the potential productivity of the site. Tables 1-12 are the guides for applying the site-evaluation method; instructions on their use are given beginning on page 2. For cottonwood, sweetgum, and sycamore, tables 13 and 14 give estimated ranges in tree growth and volume production. A glossary of terms that may be unfamiliar to many readers is included as an appendix.

BACKGROUND

Many acres of hardwood plantations are established each year throughout the eastern United States. Johnson and Kerr (1976)reported that by 1981 cottonwood plantations alone could total about 70,000 acres, a 30,000-acre increase in 5 years. Other species, such as sycamore, sweetgum, and green ash, are also being planted at accelerated rates throughout the South.

Until recently the techniques available to aid in site selection and evaluation for hardwoods involved either objective or subjective

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approaches which had inherent shortcomings that limit their usefulness. The problems of objectively selecting and quantifying measurable soil variables that consistently reflect the growth potential of hardwoods over wide geographic areas appear to be insurmountable (Broadfoot 1969). On the other hand, subjective approaches provide only broad classes of soil suitability or productivity for hardwoods (Broadfoot 1964, Broadfoot et al. 1972), Maisenhelder 1960, McKnight 1970, and Smith 1957).

Our technique of site evaluation combines the best features of objective and subjective approaches. The technique is based on our experience and is not the result of formal experimentation, but it provides foresters with an accurate way of evaluating a site's suitability for any of 14 hardwood species. The method can also be used to obtain estimates of potential volume production of sweetgum, sycamore and cottonwood at various ages.

The advantages of the technique are: (1) it provides accurate estimates of site index under any soil or site condition; (2) it can be applied throughout the southern hardwood region except in those mountainous areas where aspect is important; (3) it does not require identification of soil series; and (4) it provides guidelines for soil ameliorative treatments. In the future, the method could possibly be modified to include species of trees from throughout the world if allowance is made for differences in climate, soils, and topography.

With field-plot data for hardwoods (Broadfoot 1976), the technique was tested for each species for a variety of soils and physiographic areas. Site index values estimated for a particular site by the new method were compared to measured site index values obtained by Broadfoot. These comparisons were subjected to correlation analysis and to the chi-square test of accuracy (Freese 1960). On the average, 20 sites were tested for each species; correlation coefficients ranged from 0.93 for sweetgum to 0.99 for cottonwood. The chi-square test for accuracy indicated that the new evaluation technique should provide estimates of site index that are within 5 feet of measured site index values 95 percent of the time, if all soil-site factors are correctly evaluated.

BASIS FOR AND DEVELOPMENT OF THE TECHNIQUE

Growth of hardwoods is dependent primarily on four major soil factors (Broadfoot 1969; Broadfoot et al. 1972, Kaszkurewicz 1973, Schreiner 1959, Waring 1961). These factors are:

(1) Soil physical condition.
(2) Moisture availability during the growing season.
(3) Nutrient availability.
(4) Aeration.

Each major factor consists of many soil and site properties that affect tree growth. The interaction of these properties within and among the major soil factors makes evaluation of a site a complex task.

The basis of our approach is the assumption that each of the major

soil factors is responsible for a certain percentage of tree growth. The proportion of growth accounted for by each major factor is composed of the contributions made by each of its soil-site properties.

We will use cottonwood to illustrate how the approach and the site evaluation guides were developed. We assumed maximum height growth of 130 feet in 30 years for cottonwood on an ideal site and assigned a site quality rating (SQR) to each of three possible conditions (best, medium, and poor) of each soil-site property for the four major soil factors (see numbers in brackets, table 1). We derived these ratings by determining what percentage of the 130 feet was contributed by each of the four major soil factors (fig. 1). For example, physical condition is responsible for about 35 percent (46 of 130 feet) of cottonwood growth, moisture availability also explains about 35 percent, nutrient availability accounts for about 20 percent (26 of 130 feet) and aeration explains about 10 percent (12 of 130 feet). Next, we assessed the influence of soil-site properties on each of the four major soil factors. For example, of the five soil-site properties that influence soil physical conditions, soil depth is responsible for about 35 percent (16 of 46 feet) of the total effect of these properties on soil physical condition (fig. 1). Texture, compaction, structure, and past use contribute 25 percent (11 of 46 feet), 20 percent (9 of 46 feet), 10 percent (5 of 46 feet), and 10 percent. Similar appraisals were made of soil-site properties for each of the other three major soil factors. Therefore, on an ideal site the sum of the SQR's for each major soil factor corresponds to a site index of 130 feet at 30 years. After SQR values were established for the best site condition, they were assigned to medium and poor sites by estimating height reductions caused by less than optimal conditions. The site evaluation guides for the other species (tables 2-12) were developed in like manner.

Tables 1-12 list the major soil factors and soil-site properties for the 14 species. The tables also present a range of soil-site conditions, from best to poor, that are likely to occur for each soil property. The soil-site conditions for each property are assigned numerical site-quality ratings (SQR), which are given in brackets.

FIELD USE OF THE EVALUATION TECHNIQUE

To obtain an SQR value for a particular species, match the soil-site conditions of your area as closely as possible to the range of conditions listed for each soil-site property in the appropriate table. A 30-year site index for cottonwood and a 50-year site index for the other species is obtained by adding the SQR's for each soil-site property. If a total SQR for any site does not exceed 80 feet for cottonwood; 75 feet for sweetgum and Nuttall oak; 70 feet for sycamore, pecan, yellow-poplar, and water, willow, cherrybark, and Shumard oaks; 65 feet for green ash and swamp chestnut oak; and 55 feet for hackberry and sugarberry, the area should be considered unsuitable for that species unless amelioration is used to improve soil conditions.

If an exact match is not possible, interpolate between conditions listed in the tables. If you are unable to determine a specific soil-site condition, do not hesitate to make an educated guess; a few poor estimations probably will not cause serious errors in the final site quality rating. A few hours of instruction from a soil scientist should enable people who are unfamiliar with various soil-site conditions to make accurate estimates.

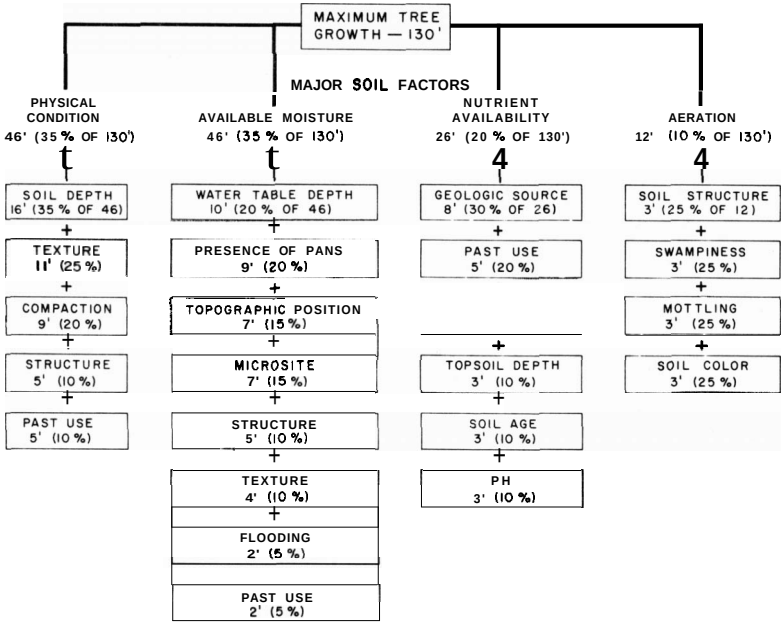

Figure 1.—*Contribution of various soil-site properties to the four major soil factors and to cottonwood growth (maximum growth expected on an ideal site at age 30).*

As an example of how the technique is applied, let us assume that the location to be evaluated is a recently abandoned old field in the Mississippi River floodplain that had been under intensive agronomic cropping for 25 years. The area is level and not subject to flooding. The soil is a loam with no profile development; it is granular in structure but is moderately compacted and has a plowpan at 10 inches. It is brown and mottled at 36 inches. A water table occurs at 5 feet during the growing season, pH is 6.5, and there is less than 1 percent organic matter in the A-horizon.

The SQR's for each soil-site characteristic of the hypothetical area, taken from table 1, are summed up and produce the following site evaluation for cottonwood:

MAJOR SOIL FACTORS							
(1) Physical condition		(2) Moisture availability		(3) Nutrient availability		(4) Aeration	
		Water table	10	Geologic source	8		
		Pans	6				
Soil depth and pans	11	Position	7	Past use	-3		
Texture	11	Microsite	5	% organic matter	-3	Structure	3
Compaction	6	Structure	5	Topsoil	3	Swampiness	3
Structure	5	Texture	4	Soil age	3	Mottling	3
Past use	-2	Flooding	-1	pH	3	Color	3
Total	31 ft		35 ft		11 ft		12 ft
(Total possible)	(46 ft)		(46 ft)		(26 ft)		(12 ft)
TOTAL SQR OR SITE INDEX = 89 ft							

This evaluation indicates that the site index for cottonwood on this particular area is 89 feet at **30** years.

By comparing the value obtained for each major factor with the maximum values possible for an ideal site, we can determine which major factor limits growth. In the example, physical condition received **31** of the **46 (67** percent) points possible; moisture availability and aeration received **76** and **100** percent, respectively, of the total possible points. Nutrient availability, however, received only **42** percent of its total possible points. Thus, a lack of sufficient nutrients would probably limit growth on this site, and fertilization might be used to improve the growth of cottonwood.

ESTIMATES OF POTENTIAL PRODUCTIVITY FOR COTTONWOOD, SWEETGUM, AND SYCAMORE BY SITE CLASSES

Once a forest manager has calculated the SQR for cottonwood, sweetgum, or sycamore for an area, he can obtain from tables **13** or **14** an estimate of productivity for various stages of development. These production estimates were measured from yields in cottonwood plantations through age **15** and from natural stand data for ages **20** through **30** years. Sweetgum and sycamore yields were estimated as a proportion of cottonwood yields. At present, plantation data are not adequate to prepare productivity tables for the other species. Derivation of the estimates for cottonwood was based on the following assumptions:

(1) Site preparation and plantation culture through the first growing season as described by McKnight **(1970).**

(2) Planting density of approximately **430** trees per acre; **20** percent planting mortality and **1** percent natural mortality per year after establishment.

(3) Proper thinning to maintain adequate growing space for crop trees. These thinnings included:

a. One-half of the trees (½ of the basal area) removed per acre as row thinnings on the Class I and II sites at age 5.
b. One-half of the trees (½ of the BA) removed as row thinnings on the Class III sites and one-third of the BA (38 percent of the trees from the lower half of the diameter range) removed by selection on the Class I and II sites at age 10.
c. One-third of the BA (38 percent of the trees from the lower half of the diameter range) removed by selection on all site classes at age 15.
d. One-third of the BA (38 percent of the trees from the lower half of the diameter range) removed by selection on the Class I sites at age 20.

Production estimates presented at each age are for standing trees at that time and do not include previous thinnings, but net production (final harvest cut + previous thinnings) is given for age 30. Net production for ages other than 30 years can be calculated by summing the volume of standing trees at the intermediate age and the volume obtained from previous thinnings. For example, net production in cords for cottonwood for the Class I sites at age 15 is 50 + (1/3 of 46) or 15.3 + (1/2 of 17) or 8.5, giving a total of 73.8 cords per acre (table 8).

It should be noted that values for ft.^{3}, cords, M bm, and dry matter represent the total production for a single product. For example, for cottonwood at age 30 the Class I sites would produce 11,170 ft.^{3} or 124 cords or 39 and 49 M bm (Doyle and Int.) or 830 tons of stem per acre (table 8). Estimates are not provided for multiple products.

LITERATURE CITED

Baker, James B., and W. M. Broadfoot.
1977. A practical field method of site evaluation for eight important southern hardwoods. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. SO-14, 31 p., South. For. Exp. Stn., New Orleans, La.

Broadfoot, W. M.
1964. Soil suitability for hardwoods in the Midsouth, U.S. Dep. Agric. For. Serv. Res. Note SO-10, 10 p., South. For. Exp. Stn., New Orleans, La.

Broadfoot, W. M.
1969. Problems in relating soil to site index for southern hardwoods. For. Sci. 15: 354-364.

Broadfoot, W. M.
1976. Hardwood suitability for and properties of important Midsouth soils. U.S. Dep. Agric. For. Serv. Res. Pap. SO-127, 84 p., South. For. Exp. Stn., New Orleans, La.

Broadfoot, W. M., B. G. Blackmon, and J. B. Baker.
1972. Soil management for hardwood production. In Proc. Symp. Southeast. Hardwoods 1971: 17-29. U.S. Dep. Agric. For. Serv. Southeast. Area, State and Priv, For., Atlanta, Ga.

Freese, Frank.
1960. Testing accuracy. For. Sci. 6: 139-145.

Grosenbaugh, L. R.
1954. New tree-measurement concepts: Height accumulation, giant tree, taper and shape. U.S. Dep. Agric. For. Serv. Occas. Pap. 134, 32 p., South. For. Exp. Stn., New Orleans, La.

Johnson, R. L., and Ed Kerr:
1976. The cottonwood success story. South. Lumberman 233: 78-79.

Kaszkurewicz, Anatol.
1973. Establishment and early growth of Populus deltoides Bartr. Ph.D. diss., La. State Univ., Baton Rouge, 312 p.

McKnight, J.S.
1970. Planting cottonwood cuttings for timber production in the South. U.S. Dep. Agric. For. Serv. Res. Pap. SO-60, 17 p., South. For. Exp. Stn., New Orleans, La.

Maisenhelder, L. C.
1960. Cottonwood plantations for southern bottomlands. U.S. Dep. Agric. For. Serv. Occas. Pap. 179, 24 p., South. For. Exp. Stn., New Orleans, La.

Mohn, C. A., and R. M. Krinard.
1971. Volume tables for small cottonwoods in plantations. U.S. Dep. Agric. For. Serv. Res. Note SO-113, 4 p., South. For. Exp. Stn., New Orleans, La.

Mueller, C. W.
1976. The accumulation of dry matter in plantations of eastern cottonwood on alluvial sites of the Mississippi River Valley, Unpubl. M.S. thesis, Miss. State Univ., Mississippi State, 88 p.

Putnam, J. A., G. M. Furnival, and J. S. McKnight.
1960. Management and inventory of southern hardwoods. U.S. Dep. Agric. For. Serv., Agric. Handb. 181., 102 p.

Schreiner, E. J.
1959. Production of poplar timber in Europe and its significance and application in the United States. U.S. Dep. Agric. For. Serv., Agric. Handb. 150, 124 p.

Smith, J. H. G.
1957. Some factors indicative of site quality for black cottonwood *(Populus trichocarpa* Torr. & Gray). J. For. 55: 578-580.

Soil Science Society of America.
1975. Glossary of soil science terms. Soil Sci. Soc. Am., Madison, Wisc. 34 p.

U.S. Department of Agriculture.
1951. Soil survey manual. U.S. Dep. Agric., Agric. Handb. 18, 503 p.

Waring H. D.
1961. The soil requirements of poplars. Aust. For. 25: 89-91.

Table 1. — Site Evaluation *Guide* for *COTTONWOOD1*

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
	Factor 1. Physical condition		
Soil depth and presence of artificial or inherent pan	Deep soil (> 4 feet); without pan 11612	Medium depth (2-4 feet), or a soil with a plowpan [11]	Shallow soil (< 2 feet), or a soil with an inherent pan [-11]
Texture (in rooting zone)	Medium-textured; silty or loamy [11]	Coarse-textured; sandy [8]	Fine-textured; clayey [-4]
Compaction (in surface foot)	No compaction; loose, porous, friable, bulk density < 1.4 g/cc [9]	Moderately compacted; firm, moderately tight, bulk density 1.4-1.7 g/cc [6]	Strongly compacted; tight, bulk density > 1.7 g/cc [-3]
Structure (in rooting zone)	Granular; structureless, single-grained if sandy, massive if loamy or silty [5]	Prismatic; blocky [3]	Massive (if clayey); platy [-3]
Past use and present cover	Undisturbed; near-virgin forest cover [5]	Moderate cultivation; cultivated < 20 years, or open with grass cover [2]	Intensive cultivation; cultivated > 20 years, or open and bare [-2]

Continued

Table 1. — Site Evaluation Guide for COTTONWOOD *(con't)*

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
Factor 2. Moisture availability during **growing** season			
Water table depth	2-6' [10]	1-2'; 7-10' 171	<1' [unsuitable]; >10' [0][3]
Artificial or inherent pans	No pans [9]	Plowpan [6]	Inherent pan 1-61
Topographic position	Floodplain or stream bottom [7]	Stream terraces or lower slopes [5]	Upland 1-51
Microsite	Concave; depression, pocket, trough 171	Level; flat 151	Convex; ridge, mound 1-21
Structure (in rooting zone)	Granular; structureless, massive (if silty, loamy, or clayey); stratified [5]	Prismatic; blocky [3]	Structureless, single-grained (if sandy); platy 1-31
Texture (in rooting zone)	Silty or loamy (or stratified) 141	Clayey 121	Sandy 1-21
Flooding	Winter through spring [2]	Winter only [1]	None [-I]; continuous [unsuitable]
Past use and present cover	Undisturbed; near-virgin forest cover 121	Moderate cultivation; cultivated < 10 years or open with grass cover 111	Intensive cultivation; cultivated > 10 years or open and bare 1-11

Continued

Table 1. — Site Evaluation Guide for COTTONWOOD *(con't)*

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
Factor 3. Nutrient availability			
Geologic source	Mississippi River, Loess, Blackland 181	Mixed Coastal Plain and other 151	Coastal Plain I-51
Past use and present cover	Undisturbed; near-virgin, forest cover, cultivated < 5 years [5]	Moderate cultivation; cultivated 5-10 years, or open with grass 13][4]	Intensive cultivation; cultivated > 10 years, or open and bare [-3][4]
Organic matter (A-horizon)	> 2% [4]	1-2% [3]	< 1% [-3]
Depth of topsoil (A-horizon)	> 6" or no profile development [3]	3-6" [2]	< 3" [-2]
Soil age	Young, no profile development (Entisols) [3]	Medium, moderate profile development (Inceptisols) [2]	Old, well-developed profile, leached (Alfisols, Ultisols) 1-21
pH (in rooting zone	5.5-7.5 [3]	4.5-5.5 or 7.6-8.5 [2]	< 4.5 or > 8.5 [-2]
Factor 4. Aeration			
Soil structure (in rooting zone)	Granular, porous; structureless, single-grained if sandy, massive if loamy or silty [3]	Prismatic; blocky [2]	Massive (if clayey); platy [-2]
Swampiness	Wet in winter only [3]	Wet January-July [2]	Waterlogged all year [Unsuitable]
Mottling	None to 18" depth I31	None to 8" depth [2]	Mottled to surface or gray mineral soil I-21
Soil color (in rooting zone)	Black, brown, red f31	Yellow, brownish-gray [2]	Gray [-2]

1130 feet at 30 years maximum S.I.; 80 feet minimum acceptable S.I.

[2] Each bracketed number indicates the site quality rating (SQR) of a particular soil-site condition.

[3] If the soil is a sand or loamy sand, then [-20].

[4] If cultural practices included annual fertilization, then [4].

Table 2. — Site Evaluation Guide for GREEN *ASH*[1]

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
Factor 1. Physical condition			
Soil depth and presence of artificial or inherent pan	Deep soil (> 4 feet); without pan [8][2]	Medium depth (2-4 feet), or a soil with a plowpan [5]	Shallow soil (< 2 feet), or a soil with an inherent pan [-3]
Texture (in rooting zone)	Medium-textured; silty or loamy [2]	Coarse-textured; sandy [1]	Fine-textured; clayey [-1]
Compaction (in surface foot)	No compaction; loose, porous, friable, bulk density < 1.4 g/cc [5]	Moderately compacted; firm, moderately tight, bulk density 1.4-1.7 g/cc [31]	Strongly compacted; tight, bulk density > 1.7 g/cc [0]
Structure (in rooting zone)	Granular; structureless, single-grained if sandy, massive if loamy or silty [2]	Prismatic; blocky [1]	Massive (if clayey); platy [0]
Past use and present cover	Undisturbed; near-virgin forest cover [4]	Moderate cultivation; cultivated < 20 years, or open with grass cover [2]	Intensive cultivation; cultivated > 20 years, or open and bare [1]

Continued

Table 2. — Site Evaluation Guide for GREEN ASH *(con't)*

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
Factor 2. Moisture availability during growing season			
Water table depth	2-6' [10]	1-2' [7]; 7-10' [5]	<1' [0]; >10'[-5]³
Artificial or inherent pans	No pans [9]	Plowpan [5]	Inherent pan 1-21
Topographic position	Floodplain or stream bottom [101	Stream terraces or lower slopes [7]	Upland 101
Microsite	Concave; depression, pocket, trough [5]	Level; flat [3]	Convex; ridge, mound [0]
Structure (in rooting zone)	Granular; structureless, massive (if silty, loamy, or clayey); stratified [2]	Prismatic; blocky [1]	Structureless, single-grained if sandy; platy [-1]
Texture (in rooting zone)	Silty or loamy, (or stratified) [2]	Clayey [1]	Sandy [-1]
Flooding	Winter through spring [7]	Winter only [4]	None 1-31; continuous [unsuitable]
Past use and present cover	Undisturbed; near-virgin forest cover [2]	Moderate cultivation; cultivated < 10 years or open with grass cover [1]	Intensive cultivation; cultivated > 10 years or open and bare [0]

Continued

Table 2. — Site Evaluation Guide for GREEN ASH *(con't)*

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
	Factor 3. Nutrient availability		
Geologic source	Mississippi River, Loess, Blackland [6]	Mixed Coastal Plain and other [2]	Coastal Plain [-2]
Past use and present cover	Undisturbed; near-virgin forest cover, cultivated < 5 years [6]	Moderate cultivation; cultivated 5-10 years, or open with grass [3][4]	Intensive cultivation; cultivated > 10 years, or open and bare [-1][4]
Organic matter (A-horizon)	> 2% [4]	1-2% [2]	< 1% 1-11
Depth of topsoil (A-horizon)	> 6" or no profile development. I41	3-6" [2]	< 3" [-1]
Soil age	Young, no profile development (Entisols) [3]	Medium, moderate profile development (Inceptisols) [2]	Old, well-developed profile, leached (Alfisols, Ultisols) [0]
pH (in rooting zone)	5.5-7.5 [3]	4.5-5.5 or 7.6-8.5 [2]	< 4.5 or > 8.5 1-21
	Factor 4. Aeration		
Soil structure (in rooting zone)	Granular, porous; structureless, single-grained if sandy, massive if loamy or silty [3]	Prismatic; blocky [2]	Massive (if clayey); platy [0]
Swampiness	Wet in winter only I31	Wet January-July [2]	Waterlogged all year [0]
Mottling	None to 18" depth [2]	None to 8" depth [11	Mottled to surface or gray mineral soil [0]
Soil color (in rooting zone)	Black, brown, red I21	Yellow, brownish-gray [1]	Gray [0]

1105 feet at 50 years maximum S.I.; 65 feet minimum acceptable S.I.

2 Each bracketed number indicates the site quality rating (SQR) of a particular soil-site condition.

3 If the soil is a sand or loamy sand, then [-10].

4 If cultural practices included annual fertilization, then [4].

Table 3. — Site Evaluation Guide for HACKBERRY and *SUGARBERRY*[1]

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
	Factor 1. Physical condition		
Soil depth and presence of artificial or inherent pan	Deep soil (> 4 feet); without pan [6][2]	Medium depth (2-4 feet), or a soil with a plowpan [4]	Shallow soil (< 2 feet), or a soil with an inherent pan 1-21
Texture (in rooting zone)	Medium-textured; silty or loamy [5]	Coarse-textured; sandy [3]	Fine-textured; clayey [1]
Compaction (in surface foot)	No compaction; loose, porous, friable, bulk density < 1.4 g/cc [5]	Moderately compacted; firm, moderately tight, bulk density 1.4-1.7 g/cc [3]	Strongly compacted; tight, bulk density > 1.7 g/cc [-1]
Structure (in rooting zone)	Granular; structureless, single-grained if sandy, massive if loamy or silty [4]	Prismatic; blocky [3]	Massive (if clayey); platy [1]
Past use and present cover	Undisturbed; near-virgin, forest cover [5]	Moderate cultivation; cultivated < 20 years, or open with grass cover [2]	Intensive cultivation; cultivated > 20 years, or open and bare [0]

Continued

Table 3. — Site Evaluation Guide for HACKBERRY and SUGARBERRY *(con't)*

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
Factor 2. Moisture availability during growing season			
Water table depth	2-6' [5]	1-2'; 7-10' [3]	< 1' [unsuitable]; > 10' [0][3]
Artificial or inherent pans	No pans [5]	Plowpan [2]	Inherent pan 1-21
Topographic position	Floodplain or stream bottom [4]	Stream terraces or lower slopes [2]	Upland [-4]
Microsite	Concave; depression, pocket, trough [2]	Level; flat [1]	Convex; ridge, mound 1-21
Structure (in rooting zone)	Granular; blocky; structureless; massive (if silty, loamy, or clayey); stratified [3]	Prismatic; platy 121	Structureless; single-grained if sandy [1]
Texture (in rooting zone)	Silty or loamy, (or stratified) [2]	Clayey [1]	Sandy [0]
Flooding	Winter through spring [2]	Winter only [1]	None I01 Continuous [Unsuitable]
Past use and present cover	Undisturbed; near-virgin. forest cover [2]	Moderate cultivation; cultivated < 10 years or open with grass cover [1]	Intensive cultivation: cultivated > 10 years or open and bare [0]

Continued

Table 3. — Site Evaluation Guide for HACKBERRY *and* SUGARBERRY *(con't)*

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
	Factor 3. Nutrient availability		
Geologic source	Mississippi River, Loess, Blackland [6]	Mixed Coastal Plain and other [4]	Coastal Plain [0]
Past use and present cover	Undisturbed; near-virgin forest cover, cultivated < 5 years [4]	Moderate cultivation; cultivated 5-10 years, or open with grass [2][4]	Intensive cultivation; cultivated > 10 years, or open and bare [0][4]
Organic matter (A-horizon)	> 2% [4]	1-2% [2]	< 1% 1-21
Depth of topsoil (A-horizon)	>6" or no profile development [41	3-6" [2]	<3" [0]
Soil age	Young, no profile development (Entisols) [4]	Medium, moderate profile development (Inceptisols) [2]	Old, well-developed profile, leached (Alfisols; Ultisols) [1]
pH (in rooting zone)	4.0-8.5 [3]	4.0-8.5 [31	4.0 -8.5 [31

Continued

Table 3. — Site Evaluation Guide for HACKBERRY and SUGARBERRY *(con't)*

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
	Factor 4. Aeration		
Soil structure (in rooting zone)	Granular, porous; structureless, single-grained if sandy, massive if loamy or silty [7]	Prismatic; blocky [5]	Massive (if clayey); platy [0]
Swampiness	Wet in winter only [6]	Wet January-July [4]	Waterlogged all year [Unsuitable]
Mottling	None to 18" depth [7]	None to 8" depth [5]	Mottled to surface or gray mineral soil [2]
Soil color (in rooting zone)	Black, brown, red [5]	Yellow, brownish-gray [4]	Gray [3]

1 100 feet at 50 years maximum S.I.; 55 feet minimum acceptable S.I.

2 Each bracketed number indicates the site quality rating (SQR) of a particular soil-site condition.

3 If the soil is sand or loamy sand, then [-5].

4 If cultural practices included annual fertilization, then [3].

Table 4. — Site Evaluation Guide for *CHERRYBARK OAK*[1]

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
	Factor 1. Physical condition		
Soil depth and presence of artificial or inherent pan	Deep soil (> 4 feet); without pan [6][2]	Medium depth (2-4 feet), or a soil with a plowpan [4]	Shallow soil (< 2 feet), or a soil with an inherent pan 1-21
Texture (in rooting zone)	Medium-textured; silty or loamy [5]	Coarse-textured; sandy [3]	Fine-textured; clayey [1]
Compaction (in surface foot)	No compaction; loose, porous, friable, bulk density < 1.4 g/cc [6]	Moderately compacted; firm, moderately tight, bulk density 1.4-1.7 g/cc [4]	Strongly compacted; tight, bulk density > 1.7 g/cc 1-21
Structure (in rooting zone)	Granular; structureless, single-grained if sandy, massive if loamy or silty. [6]	Prismatic; blocky [4]	Massive (if clayey); platy [0]
Past use and present cover	Undisturbed; near-virgin forest cover [8]	Moderate cultivation; cultivated < 20 years, or open with grass cover [4]	Intensive cultivation; cultivated > 20 years, or open and bare [1]

Continued

Table 4. — Site Evaluation Guide for ***CHERRYBARK OAK (con't)***

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
Factor 2. Moisture availability during growing season			
Water table depth	2-6' [6]	1-2'; 7-10' [3]	<1' [unsuitablel: >10' [-3]³
Artificial or inherent pans	No pans [6]	Plowpan [3]	Inherent pan 1-21
Topographic position	Floodplain or stream bottom [6]	Stream terraces or lower slopes 141	Upland [0]
Microsite	Concave; depression, pocket, trough [2]	Level; flat [1]	Convex; ridge, mound [0]
Structure (in rooting zone)	Granular; structureless, massive (if silty, loamy, or clayey); stratified [5]	Prismatic; blocky [3]	Structureless, single-grained if sandy; platy [-1]
Texture (in rooting zone)	Silty or loamy, (or stratified) [5]	Clayey [3]	Sandy [0]
Flooding	Winter through spring 161	Winter only [3]	None [0]; continuous [unsuitable]
Past use and present cover	Undisturbed; near-virgin, forest cover [2]	Moderate cultivation; cultivated < 10 years or open with grass cover [1]	Intensive cultivation; cultivated > 10 years or open and bare [0]

Continued

Table 4. — Site Evaluation Guide for CHERRYBARK OAK *(con't)*

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
Factor 3. Nutrient availability			
Geologic source	Mississippi River, Loess, Blackland [3]	Mixed Coastal Plain and other [1]	Coastal Plain [0]
Past use and present cover	Undisturbed; near-virgin forest cover, cultivated < 5 years [5]	Moderate cultivation; cultivated 5-10 years, or open with grass [3][4]	Intensive cultivation; cultivated > 10 years, or open and bare [1][4]
Organic matter (A-horizon)	> 2% [5]	1-2% [3]	< 1% [0]
Depth of topsoil (A-horizon)	> 6" or no profile development [5]	3-6" [2]	< 3" [-3]
Soil age	Young, no profile development (Entisols) [2]	Medium, moderate profile development (Inceptisols) [1]	Old, well-developed profile, leached (Alfisols, Ultisols) [0]
pH (in rooting zone)	4.5-5.5 [5]	5.6-7.5 or 4.0-4.4 [3]	< 4.0 [-2] > 7.5 [Unsuitable]
Factor 4. Aeration			
Soil structure (in rooting zone)	Granular, porous; structureless, single-grained if sandy, massive if loamy or silty [8]	Prismatic; blocky [4]	Massive (if clayey); platy [0]
Swampiness	Wet in winter only [8]	Wet January-July [4]	Waterlogged all year [Unsuitable]
Mottling	None to 18" depth [8]	None to 8" depth [4]	Mottled to surface or gray mineral soil [-2]
Soil color (in rooting zone)	Black, brown, red [7]	Yellow, brownish-gray [4]	Gray [-2]

1125 feet at 50 years maximum S.I.; 70 feet minimum acceptable S.I.

[2] Each bracketed number indicates the site quality rating (SQR) of a particular soil-site condition.

[3] If the soil is a sand or loamy sand, then [-10].

[4] If cultural practices included annual fertilization, then [4].

Table 5. — Site Evaluation Guide for *NUTTALL OAK*[1]

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
	Factor 1. Physical condition		
Soil depth and presence of artificial or inherent pan	Deep soil (> 4 feet); without pan [8][2]	Medium depth (2-4 feet), or a soil with a plowpan [5]	Shallow soil (< 2 feet), or a soil with an inherent pan 1-31
Texture (in rooting zone)	Medium-textured; silty or loamy [2]	Coarse-textured; sandy [1]	Fine-textured; clayey [-1]
Compaction (in surface foot)	No compaction; loose, porous, friable, bulk density < 1.4 g/cc [6]	Moderately compacted; firm, moderately tight, bulk density 1.4-1.7 g/cc [3]	Strongly compacted; tight, bulk density > 1.7 g/cc [0]
Structure (in rooting zone)	Granular structureless, single-grained if sandy, massive if loamy or silty [3]	Prismatic; blocky [2]	Massive (if clayey); platy [0]
Past use and present cover	Undisturbed; near-virgin forest cover [5]	Moderate cultivation; cultivated < 20 years, or open with grass cover 131	Intensive cultivation; cultivated > 20 years, or open and bare 111

Continued

Table 5. — Site Evaluation Guide for *NUTTALL* OAK *(con't)*

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
Factor 2. Moisture availability during growing season			
Water table depth	2-6' [9]	1-2'; 7-10' [6]	<1' [unsuitable]; >10' [0][3]
Artificial or inherent pans	No pans [9]	Plowpan [4]	Inherent pan [-2]
Topographic position	Floodplain or stream bottom [8]	Stream terraces or lower slopes [5]	Upland [0]
Microsite	Concave; depression, pocket, trough [4]	Level; flat [2]	Convex; ridge, mound [0]
Structure (in rooting zone)	Granular; structureless, massive (if silty, loamy, or clayey); stratified [2]	Prismatic; blocky [1]	Structureless, single-grained if sandy; platy [0]
Texture (in rooting zone)	Silty or loamy, (or stratified) [2]	Clayey [1]	Sandy [0]
Flooding	Winter through spring [6]	Winter only [3]	None [0] continuous [unsuitable]
Past use and present cover	Undisturbed; near-virgin, forest cover [2]	Moderate cultivation; cultivated < 10 years or open with grass cover [1]	Intensive cultivation; cultivated > 10 years or open and bare [0]

Continued

Table 5. – Site Evaluation Guide for *NUTTALL OAK (con't)*

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
Factor 3. Nutrient availability			
Geologic source	Mississippi River, Loess, Blackland 131	Mixed Coastal Plain and other [1]	Coastal Plain 1-11
Past use and present cover	Undisturbed; near-virgin forest cover, cultivated < 5 years [6]	Moderate cultivation; cultivated 5-10 years, or open with grass [3][4]	Intensive cultivation; cultivated > 10 years, or open and bare 1014
Organic matter (A-horizon)	> 2% [6]	1-2% 131	< 1% [0]
Depth of topsoil (A-horizon)	> 6" or no profile development [6]	3-6" [3]	< 3" 1-31
Soil age	Young, no profile development (Entisols) [3]	Medium, moderate profile development (Inceptisols) 111	Old, well-developed profile, leached (Alfisols; Ultisols) I-11
pH (in rooting zone)	4.5-5.5 [6]	5.6-7.5 or 4.0-4.4 [4]	< 4.0 [-2] > 7.5 [Unsuitable]
Factor 4. Aeration			
Soil structure (in rooting zone)	Granular, porous; structureless, single-grained if sandy, massive if loamy or silty [7]	Prismatic; blocky [5]	Massive (if clayey); platy [0]
Swampiness	Wet in winter only 171	Wet January-July [5]	Waterlogged all year [Unsuitable]
Mottling	None to 18" depth [5]	None to 8" depth 131	Mottled to surface or gray mineral soil [1]
Soil color (in rooting zone)	Black, brown, red [5]	Yellow, brownish-gray [2]	Gray [0]

[1] 120 feet at 50 years maximum S.I.; 75 feet minimum acceptable S.I.

[2] Each bracketed number indicates the site quality rating (SQR) of a particular soil-site condition.

[3] If the soil is a sand or loamy sand, then [-10].

[4] If cultural practices included annual fertilization, then [4].

Table 6. — Site Evaluation Guide for SHUMARD *OAK*[1]

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
	Factor 1. Physical condition		
Soil depth and presence of artificial or inherent pan	Deep soil (> 4 feet); without pan [6][2]	Medium depth (2-4 feet), or a soil with a plowpan [4]	Shallow soil (< 2 feet), or a soil with an inherent pan [-2]
Texture (in rooting zone)	Medium-textured; silty or loamy [5]	Coarse-textured; sandy [3]	Fine-textured; clayey [1]
Compaction (in surface foot)	No compaction; loose, porous, friable, bulk density < 1.4 g/cc [6]	Moderately compacted; firm, moderately tight, bulk density 1.4-1.7 g/cc [4]	Strongly compacted, tight. bulk density > 1.7 g/cc [-2]
Structure (in rooting zone)	Granular; structureless, single-grained if sandy, massive if loamy or silty [6]	Prismatic; blocky [4]	Massive (if clayey); platy [0]
Past use and present cover	Undisturbed; near-virgin, forest cover [8]	Moderate cultivation; cultivated < 20 years, or open with grass cover [4]	Intensive cultivation; cultivated > 20 years, or open and bare [1]

Continued

Table 6. — Site Evaluation Guide for SHUMARD OAK *(con't)*

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
Factor 2. Moisture availability during growing season			
Water table depth	2-6' [5]	1-2'; 7-10' [2]	< 1' [unsuitable]; > 10' [0][3]
Artificial or inherent pans	No pans [5]	Plowpan [2]	Inherent pan [-1]
Topographic position	Floodplain or stream bottom [5]	Stream terraces or lower slopes [3]	Upland [0]
Microsite	Concave; depression, pocket, trough [2]	Level; flat [1]	Convex; ridge, mound [0]
Structure (in rooting zone)	Granular; blocky; structureless; massive (if silty, loamy, or clayey); stratified [4]	Prismatic; platy [2]	Structureless; single-grained if sandy [0]
Texture (in rooting zone)	Silty or loamy, (or stratified) [4]	Clayey [2]	Sandy [0]
Flooding	Winter through spring [5]	Winter only [2]	None [1] Continuous [Unsuitable]
Past use and present cover	Undisturbed; near-virgin, forest cover [2]	Moderate cultivation; cultivated < 10 years or open with grass cover [1]	Intensive cultivation; cultivated > 10 years or open and bare [0]

Continued

Table 6. — Site Evaluation Guide for SHUMARD OAK *(con't)*

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
Factor 3. Nutrient availability			
Geologic source	Mississippi River, Loess, Blackland [4]	Mixed Coastal Plain and other [2]	Coastal Plain [1]
Past use and present cover	Undisturbed; near-virgin forest cover, cultivated < 5 years [6]	Moderate cultivation; cultivated 5-10 years, or open with grass [4][4]	Intensive cultivation; cultivated > 10 years, or open and bare [2][4]
Organic matter (A-horizon)	> 2% [5]	1-2% [3]	< 1% [0]
Depth of topsoil (A-horizon)	>6" or no profile development [6]	3-6" [3]	<3" [-4]
Soil age	Young, no profile development (Entisols) [3]	Medium, moderate profile development (Inceptisols) [2]	Old, well-developed profile, leached (Alfisols; Ultisols) [1]
pH (in rooting zone)	4.5-5.5 [5]	5.6-7.5 or 4.0 -4.4 [3]	< 4.0 [-2] > 7.5 [Unsuitable]

Continued

Table 6. — Site Evaluation Guide for SHUMARD OAK *(con't)*

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
	Factor 4. Aeration		
Soil structure (in rooting zone)	Granular, porous; structureless, single-grained if sandy, massive if loamy or silty [7]	Prismatic; blocky [3]	Massive (if clayey); platy [1]
Swampiness	Wet in winter only [7]	Wet January-July [3]	Waterlogged all year [Unsuitable]
Mottling	None to 18" depth [8]	None to 8" depth [4]	Mottled to surface or gray mineral soil [-1]
Soil color (in rooting zone)	Black, brown, red [8]	Yellow, brownish-gray [4]	Gray [-1]

1120 feet at 50 years maximum S.I.; 70 feet minimum acceptable S.I.

2 Each bracketed number indicates the site quality rating (SQR) of a particular soil-site condition.

3 If the soil is sand or loamy sand, then [-5].

4 If cultural practices included annual fertilization, then [5].

Table 7. — *Site* Evaluation *Guide* for *SWAMP CHESTNUT OAK*[1]

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
	Factor 1. Physical condition		
Soil depth and presence of artificial or inherent pan	Deep soil (> 4 feet); without pan [8][2]	Medium depth (2-4 feet), or a soil with a plowpan [5]	Shallow soil (< 2 feet), or a soil with an inherent pan [-1]
Texture (in rooting zone)	Medium-textured; silty or loamy [4]	Coarse-textured; sandy [2]	Fine-textured; clayey [1]
Compaction (in surface foot)	No compaction; loose, porous, friable, bulk density < 1.4 g/cc [5]	Moderately compacted; firm, moderately tight, bulk density 1.4-1.7 g/cc [3]	Strongly compacted, tight, bulk density > 1.7 g/cc [-1]
Structure (in rooting zone)	Granular; structureless, single-grained if sandy, massive if loamy or silty [5]	Prismatic; blocky [3]	Massive (if clayey); platy [0]
Past use and present cover	Undisturbed; near-virgin, forest cover [6]	Moderate cultivation; cultivated < 20 years, or open with grass cover [3]	Intensive cultivation; cultivated > 20 years, or open and bare [0]

Continued

Table 7. — Site Evaluation Guide for SWAMP CHESTNUT OAK *(con't)*

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
Factor 2. Moisture availability during growing season			
Water table depth	2-6' [4]	1-2'; 7-10' [3]	< 1' [unsuitablel; > 10' [-1]3
Artificial or inherent pans	No pans [6]	Plowpan [3]	Inherent pan [-2]
Topographic position	Floodplain or stream bottom [6]	Stream terraces or lower slopes [4]	Upland 1-11
Microsite	Concave; depression, pocket. trough [2]	Level; flat [1]	Convex; ridge, mound [0]
Structure (in rooting zone)	Granular; blocky; structureless; massive (if silty, loamy, or clayey); stratified [4]	Prismatic; platy [2]	Structureless; single-grained if sandy [0]
Texture (in rooting zone)	Silty or loamy, (or stratified) [3]	Clayey [1]	Sandy 1-11
Flooding	Winter through spring [3]	Winter only [2]	None [0] Continuous [Unsuitable]
Past use and present cover	Undisturbed; near-virgin, forest cover [3]	Moderate cultivation; cultivated < 10 years or open with grass cover [1]	Intensive cultivation; cultivated > 10 years or open and bare [-1]

Continued

Table 7. — Site Evaluation Guide for SWAMP CHESTNUT OAK *(con't)*

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
	Factor 3. Nutrient availability		
Geologic source	Mississippi River, Loess, Blackland [3]	Mixed Coastal Plain and other [1]	Coastal Plain [0]
Past use and present cover	Undisturbed; near-virgin forest cover, cultivated < 5 years [5]	Moderate cultivation; cultivated 5-10 years, or open with grass [3][4]	Intensive cultivation; cultivated > 10 years, or open and bare 1114
Organic matter (A-horizon)	> 2% [4]	1-2% [2]	< 1% [0]
Depth of topsoil (A-horizon)	>6" or no profile development [5]	3-6" [2]	<3" [-3]
Soil age	Young, no profile development (Entisols) [2]	Medium, moderate profile development (Inceptisols) [1]	Old, well-developed profile, leached (Alfisols; Ultisols) [0]
pH (in rooting zone)	4.5-5.5 [5]	5.5-7.5 or 4.0-4.4 [3]	< 4.0 [-2] > 7.5 [Unsuitable]

Continued

Table 7. — Site Evaluation Guide for SWAMP CHESTNUT OAK *(con't)*

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
Factor 4. Aeration			
Soil structure (in rooting zone)	Granular, porous; structureless, single-grained if sandy, massive if loamy or silty [6]	Prismatic; blocky [4]	Massive (if clayey); platy [2]
Swampiness	Wet in winter only [6]	Wet January-July [4]	Waterlogged all year [Unsuitable]
Mottling	None to 18" depth [7]	None to 8" depth [4]	Mottled to surface or gray mineral soil [0]
Soil color (in rooting zone)	Black, brown, red [7]	Yellow, brownish-gray [3]	Gray [-1]

[1] 110 feet at 50 years maximum S.I.; 65 feet minimum acceptable S.I.

[2] Each bracketed number indicates the site quality rating (SQR) of a particular soil-site condition.

[3] If the soil is sand or loamy sand, then [-5].

[4] If cultural practices included annual fertilization, then [5].

Table 8. — Site Evaluation Guide for *WATER OAK* and *WILLOW OAK*[1]

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
Factor 1. Physical condition			
Soil depth and presence of artificial or inherent pan	Deep soil (> 4 feet); without pan [6][2]	Medium depth (2-4 feet), or a soil with a plowpan [4]	Shallow soil (< 2 feet), or a soil with an inherent pan [-2]
Texture (in rooting zone)	Medium-textured; silty or loamy [4]	Coarse-textured; sandy [2]	Fine-textured; clayey [1]
Compaction (in surface foot)	No compaction; loose, porous, friable, bulk density < 1.4 g/cc [6]	Moderately compacted; firm, moderately tight, bulk density 1.4-1.7 g/cc [4]	Strongly compacted, tight, bulk density > 1.7 g/cc [1]
Structure (in rooting zone)	Granular; structureless, single-grained if sandy, massive if loamy or silty [6]	Prismatic; blocky [4]	Massive (if clayey); platy [0]
Past use and present cover	Undisturbed; near-virgin, forest cover [7]	Moderate cultivation; cultivated < 20 years, or open with grass cover [4]	Intensive cultivation; cultivated > 20 years, or open and bare [1]

Continued

Table 8. – Site Evaluation Guide for WATER OAK and WILLOW OAK *(con't)*

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
Factor 2. Moisture availability during growing season			
Water table depth	2-6' [5]	1-2'; 7-10' [2]	< 1' (unsuitable); > 10' [-3][3]
Artificial or inherent pans	No pans [5]	Plowpan [2]	Inherent pan [-2]
Topographic position	Floodplain or stream bottom [5]	Stream terraces or lower slopes [3]	Upland [0]
Microsite	Concave; depression, pocket, trough [2]	Level; flat [1]	Convex; ridge, mound [-3]
Structure (in rooting zone)	Granular; structureless, massive (if silty, loamy, or clayey); stratified [5]	Prismatic; platy [5]	Structureless; single-grained if sandy; platy [3]
Texture (in rooting zone)	Silty or loamy, (or stratified) [5]	Clayey [3]	Sandy [0]
Flooding	Winter through spring [5]	Winter only [3]	None [-1]; Continuous [unsuitable]
Past use and present cover	Undisturbed; near-virgin, forest cover [2]	Moderate cultivation; cultivated < 10 years or open with grass cover [1]	Intensive cultivation; cultivated > 10 years or open and bare [0]

Continued

Table 8. — Site Evaluation Guide for ***WATER OAK*** and ***WILLOW OAK (con't)***

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
Factor 3. Nutrient availability			
Geologic source	Mississippi River, Loess, Blackland [2]	Mixed Coastal Plain and other [1]	Coastal Plain [0]
Past use and present cover	Undisturbed; near-virgin forest cover, cultivated < 5 years [5]	Moderate cultivation; cultivated 5-10 years. or open with grass 13[4]	Intensive cultivation; cultivated > 10 years. or open and bare [1][4]
Organic matter (A-horizon)	> 2% [4]	1-2% [2]	< 1% [0]
Depth of topsoil (A-horizon)	>6" or no profile development [5]	3-6" [2]	<3" 1-31
Soil age	Young, no profile development (Entisols) [2]	Medium, moderate profile development (Inceptisols) [1]	Old. well-developed profile. leached (Alfisols; Ultisols) [0]
pH (in rooting zone)	4.5-5.5 [5]	5.6-7.5 or 4.0-4.4 131	< 4.0 1-21 > 7.5 [Unsuitable]
Factor 4. Aeration			
Soil structure (in rooting zone)	Granular. porous: structureless. single-grained if sandy. massive if loamy or silty [7]	Prismatic: blocky [5]	Massive (if clayey); platy [0]
Swampiness	Wet in winter only [8]	Wet January-July [4]	Waterlogged all year [Unsuitable1
Mottling	None to 18" depth [7]	None to 8" depth [5]	Mottled to surface or gray mineral soil 1-21
Soil color (in rooting zone)	Black. brown, red [7]	Yellow, brownish-gray [5]	Gray [-2]

[1] 115 feet at 50 years maximum S.I.: 70 feet minimum acceptable S.I.

[2] Each bracketed number indicates the site quality rating (SQR) of a particular soil-site condition.

[3] If the soil is sand or loamy sand. then 1-101.

[4] If cultural practices included annual fertilization. then [4].

Table 9. — Site Evaluation Guide for PECAN[1]

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
	Factor 1. Physical condition		
Soil depth and presence of artificial or inherent pan	Deep soil (> 4 feet); without pan [6][2]	Medium depth (2-4 feet), or a soil with a plowpan [4]	Shallow soil (< 2 feet), or a soil with an inherent pan [-2]
Texture (in rooting zone)	Medium-textured; silty or loamy [5]	Coarse-textured; sandy [4]	Fine-textured; clayey [1]
Compaction (in surface foot)	No compaction; loose, porous, friable, bulk density < 1.4 g/cc [6]	Moderately compacted; firm, moderately tight, bulk density 1.4-1.7 g/cc [4]	Strongly compacted; tight, bulk density > 1.7 g/cc [-2]
Structure (in rooting zone)	Granular; structureless, single-grained if sandy, massive if loamy or silty [4]	Prismatic; blocky [3]	Massive (if clayey); platy [1]
Past use and present cover	Undisturbed; near-virgin, forest cover [6]	Moderate cultivation; cultivated < 20 years, or open with grass cover [3]	Intensive cultivation; cultivated > 20 years, or open and bare [0]

Continued

Table 9. — Site Evaluation Guide for PECAN *(con't)*

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
Factor 2. Moisture availability during growing season			
Water table depth	2-6' [4]	1-2'; 7-10 [2]	< 1' [unsuitable]; > 10' [0][3]
Artificial or inherent pans	No pans [5][1]	Plowpan [2]	Inherent pan [1-2][1]
Topographic position	Floodplain or stream bottom [5]	Stream terraces or lower slopes [3]	Upland [0]
Microsite	Concave; depression, pocket, trough [2]	Level; flat [1]	Convex; ridge, mound [0]
Structure (in rooting zone)	Granular; blocky; structureless; massive (if silty, loamy, or clayey); stratified [1][4]	Prismatic; platy [1][2]	Structureless; single-grained if sandy [0]
Texture (in rooting zone)	Silty or loamy, (or stratified) [1][4]	Clayey [2]	Sandy [0]
Flooding	Winter through spring [4]	Winter only [2]	None [0] Continuous [Unsuitable]
Past use and present cover	Undisturbed; near-virgin, forest cover [2]	Moderate cultivation; cultivated < 10 years or open with grass cover [1]	Intensive cultivation; cultivated > 10 years or open and bare [0]

Continued

Table 9. — *Site* Evaluation *Guide* for PECAN *(con't)*

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
	Factor 3. Nutrient availability		
Geologic source	Mississippi River, Loess, Blackland [5]	Mixed Coastal Plain and other [3]	Coastal Plain [2]
Past use and present cover	Undisturbed; near-virgin forest cover, cultivated < 5 years [6]	Moderate cultivation; cultivated 5-10 years, or open with grass [4][4]	Intensive cultivation; cultivated > 10 years, or open and bare [2][4]
Organic matter (A-horizon)	> 2% [5]	1-2% [3]	< 1% [0]
Depth of topsoil (A-horizon)	>6" or no profile development [6]	3-6" [3]	<3" [-4]
Soil age	Young, no profile development (Entisols) [3]	Medium, moderate profile development (Inceptisols) [2]	Old, well-developed profile, leached (Alfisols; Ultisols) [1]
pH (in rooting zone)	5.5-7.5 [5]	4.5-5.5 or 7.6-8.5 [5]	< 4.5 or > 8.5 [3]
	Factor 4. Aeration		
Soil structure (in rooting zone)	Granular, porous; structureless, single-grained if sandy. massive if loamy or silty [5]	Prismatic; blocky [2]	Massive (if clayey); platy [0]
Swampiness	Wet in winter only [7]	Wet January-July [3]	Waterlogged all year [Unsuitable]
Mottling	None to 18" depth [8]	None to 8" depth [4]	Mottled to surface or gray mineral soil [-1]
Soil color (in rooting zone)	Black, brown, red [8]	Yellow, brownish-gray [4]	Gray [-1]

[1] 115 feet at 50 years maximum S.I ; 70 feet minimum acceptable S.I.

[2] Each bracketed number indicates the site quality rating (SQR) of a particular soil-site condition.

[3] If the soil is sand or loamy sand. then [-4].

[4] If cultural practices included annual fertilization, then [5].

Table 10. — Site Evaluation Guide for *SWEETGUM*[1]

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
	Factor 1. Physical condition		
Soil depth and presence of artificial or inherent pan	Deep soil (> 4 feet); without pan [6][2]	Medium depth (2-4 feet), or a soil with a plowpan [4]	Shallow soil (< 2 feet), or a soil with an inherent pan [2]
Texture (in rooting zone)	Medium-textured; silty or loamy [4]	Coarse-textured; sandy [2]	Fine-textured; clayey [1]
Compaction (in surface foot)	No compaction; loose, porous, friable, bulk density < 1.4 g/cc [6]	Moderately compacted; firm, moderately tight, bulk density 1.4-1.7 g/cc [4]	Strongly compacted, tight, bulk density > 1.7 g/cc [2]
Structure (in rooting zone)	Granular; blocky; structureless, single-grained if sandy, massive if loamy or silty [6]	Prismatic; platy [4]	Massive (if clayey); [0]
Past use and present cover	Undisturbed; near-virgin, forest cover [8]	Moderate cultivation; cultivated < 20 years, or open with grass cover [5]	Intensive cultivation; cultivated > 20 years, or open and bare [2]

Continued

Table 10. — Site Evaluation Guide for *SWEETGUM (con't)*

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
Factor 2. Moisture availability during growing season			
Water table depth	2-6' [6]	1-2'; 7-10' [3]	< 1' [unsuitable]; > 10' [-3][3]
Artificial or inherent pans	No pans [6]	Plowpan [3]	Inherent pan [-3]
Topographic position	Floodplain or stream bottom [5]	Stream terraces or lower slopes [3]	Upland [-2]
Microsite	Concave; depression, pocket, trough [2]	Level; flat [1]	Convex; ridge, mound [-2]
Structure (in rooting zone)	Granular; blocky; structureless, massive (if silty, loamy, or clayey); stratified [5]	Prismatic; platy [3]	Structureless, single-grained if sandy [-1]
Texture (in rooting zone)	Silty or loamy, (or stratified) [5]	Clayey [2]	Sandy [0]
Flooding	Winter through spring [5]	Winter only [3]	None [0] Continuous [Unsuitable]
Past use and present cover	Undisturbed; near-virgin, forest cover [2]	Moderate cultivation; cultivated < 10 years or open with grass cover [1]	Intensive cultivation; cultivated > 10 years or open and bare [0]

Continued

Table 10. — Site Evaluation Guide for *SWEETGUM (con't)*

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
Factor 3. Nutrient availability			
Geologic source	Mississippi River, Loess, Blackland [15]	Mixed Coastal Plain and other [4]	Coastal Plain [2]
Past use and present cover	Undisturbed; near-virgin forest cover, cultivated < 5 years [5]	Moderate cultivation; cultivated 5-10 years, or open with grass [3]	Intensive cultivation; cultivated > 10 years, or open and bare [1]
Organic matter (A-horizon)	> 2% [4]	1-2% [2]	< 1% [1]
Depth of topsoil (A-horizon)	>6" or no profile development [15]	3-6" [2]	<3" [-3]
Soil age	Young, no profile development (Entisols) [4]	Medium, moderate profile development (Inceptisols) [2]	Old, well-developed profile, leached (Alfisols; Ultisols) [0]
pH (in rooting zone)	5.5-7.5 [1]	4.5-5.5 or 7.6-8.5 [0]	> 4.5 or < 8.5 [-11]
Factor 4. Aeration			
Soil structure (in rooting zone)	Granular, porous; blocky; structureless, single-grained if sandy, massive if loamy or silty [18]	Prismatic; platy [4]	Massive (if clayey) [-21]
Swampiness	Wet in winter only [8]	Wet January-July [4]	Waterlogged all year [Unsuitable]
Mottling	None to 18" depth [7]	None to 8" depth [5]	Mottled to surface or gray mineral soil [-21]
Soil color (in rooting zone)	Black, brown, red [7]	Yellow, brownish-gray [4]	Gray [-21]

[1] 20 feet at 50 years maximum S.I.; 75 feet minimum acceptable S.I.

[2] Each bracketed number indicates the site quality rating (SQR) of a particular soil-site condition.

[3] If the soil is sand or loamy sand, then [-10].

[4] If cultural practices included annual fertilization, then [4].

Table 11. — Site Evaluation Guide for SYCAMORE'

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
Factor 1. Physical condition			
Soil depth and presence of artificial or inherent pan	Deep soil (> 4 feet); without pan [10][2]	Medium depth (2-4 feet), or a soil with a plowpan [5]	Shallow soil (< 2 feet), or a soil with an inherent pan [-51]
Texture (in rooting zone)	Medium-textured; silty or loamy [8]	Coarse-textured; sandy [41]	Fine-textured; clayey [0]
Compaction (in surface foot)	No compaction; loose, porous, friable, bulk density <1.4 g/cc [8]	Moderately compacted; firm, moderately tight, bulk density 1.4-1.7 g/cc [4]	Strongly compacted; tight, bulk density > 1.7 g/cc [-2]
Structure (in rooting zone)	Granular; structureless, single-grained if sandy, massive if loamy or silty [31]	Prismatic; blocky [1]	Massive (if clayey); platy [-3]
Past use and present cover	Undisturbed; near-virgin, forest cover [31]	Moderate cultivation; cultivated < 20 years, or open with grass cover [1]	Intensive cultivation; cultivated > 20 years, or open and bare [0]

Continued

Table 11. — Site Evaluation Guide for SYCAMORE *(con't)*

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
Factor 2. Moisture availability during growing season			
Water table depth	2-6' [5]	1-2'; 7-10' [2]	< 1' [unsuitable]; > 10' [-5][3]
Artificial or inherent pans	No pans [5]	Plowpan [2]	Inherent pan [-5][1]
Topographic position	Floodplain or stream bottom [2]	Stream terraces or lower slopes [1]	Upland [-2][1]
Microsite	Concave; depression, pocket, trough [2]	Level; flat [1]	Convex; ridge, mound [-2]
Structure (in rooting zone)	Granular; structureless; massive (if silty, loamy, or clayey); stratified [1]	Prismatic; blocky [0]	Structureless, single-grained if sandy; platy [-1]
Texture (in rooting zone)	Silty or loamy, (or stratified) [1]	Clayey [0]	Sandy [-1][1]
Flooding	Winter through spring [3]	Winter only [1]	None [-5]; Continuous [unsuitable]
Past use and present cover	Undisturbed; near-virgin, forest cover [1]	Moderate cultivation; cultivated < 10 years or open with grass cover [0]	Intensive cultivation; cultivated > 10 years or open and bare [-1]

Continued

Table 11. — Site Evaluation Guide for SYCAMORE *(con't)*

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
Factor 3. Nutrient availability			
Geologic source	Mississippi River, Loess, Blackland [12]	Mixed Coastal Plain and other [8]	Coastal Plain [3]
Past use and present cover	Undisturbed; near-virgin forest cover, cultivated < 5 years [10]	Moderate cultivation; cultivated 5-10 years, or open with grass [6][4]	Intensive cultivation; cultivated > 10 years, or open and bare [2][4]
Organic matter (A-horizon)	> 2% [6]	1-2% [3]	< 190 [0]
Depth of topsoil (A-horizon)	>6" or no profile development [6]	3-6" [2]	<3" [-4]
Soil age	Young, no profile development (Entisols) [4]	Medium, moderate profile development (Inceptisols) [2]	Old, well-developed profile, leached (Alfisols; Ultisols) 1-1]
pH (in rooting zone)	5.5-7.5 111	4.5-5.5 or 7.6-8.5 10]	< 4.5 or > 8.5 111
Factor 4. Aeration			
Soil structure (in rooting zone)	Granular, porous; structureless, single-grained if sandy, massive if loamy or silty) [7]	Prismatic; blocky I41	Massive (if clayey); platy I-41
Swampiness	Wet in winter only [10]	Wet January-July [8]	Waterlogged all year [Unsuitable]
Mottling	None to 18" depth [12]	None to 8" depth [10]	Mottled to surface or gray mineral soil I-51
Soil color (in rooting zone)	Black, brown, red [10]	Yellow, brownish-gray [8]	Gray 1-51

1130 feet at 50 years maximum S.I.; 70 feet minimum acceptable S.I.

2 Each bracketed number indicates the site quality rating (SQR) of a particular soil-site condition.

3 If the soil is sand or loamy sand, then [-10].

4 If cultural practices included annual fertilization, then [8].

Table 12. — Site Evaluation Guide for YELLOW POPLAR]

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
Factor 1. Physical condition			
Soil depth and presence of artificial or inherent pan	Deep soil (> 4 feet); without pan [10][2]	Medium depth (2-4 feet), or a soil with a plowpan [4]	Shallow soil (< 2 feet), or a soil with an inherent pan [-5]
Texture (in rooting zone)	Medium-textured; silty or loamy [12]	Coarse-textured; sandy [5]	Fine-textured; clayey 1-21
Compaction (in surface foot)	No compaction: loose, porous. friable, bulk density 1.4 g/cc [8]	Moderately compacted; firm, moderately tight, bulk density 1.4-1.7g/cc [4]	Strongly compacted; tight, bulk density 1.7 g/cc [-2]
Structure (in rooting zone)	Granular; structureless, single-grained if sandy, massive if loamy or silty [5]	Prismatic: blocky [3]	Massive (if clayey); platy [0]
Past use and present cover	Undisturbed; near-virgin, forest cover [5]	Moderate cultivation; cultivated < 20 years, or open with grass cover [2]	Intensive cultivation; cultivated > 20 years, or open and bare [1]

Continued

Table 12. — Site Evaluation Guide for YELLOW POPLAR *(con't)*

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
Factor 2. Moisture availability during growing season			
Water table depth	2-6' [5]	1-2'; 7-10' [3]	< 1' [unsuitable]; > 10' [-3][3]
Artificial or inherent pans	No pans [6]	Plowpan [3]	Inherent pan 1-51
Topographic position	Floodplain or stream bottom [6]	Stream terraces or lower slopes [4]	Upland [0]
Microsite	Concave; depression, pocket, trough [3]	Level; flat [2]	Convex; ridge. mound [1]
Structure (in rooting zone)	Granular; blocky; structureless;- massive (if silty, loamy, or clayey); stratified [2]	Prismatic; platy [1]	Structureless; single-grained if sandy [0]
Texture (in rooting zone)	Silty or loamy, (or stratified) [2]	Clayey [1]	Sandy [0]
Flooding	Winter through spring [3]	Winter only [2]	None [-1] Continuous [Unsuitable]
Past use and present cover	Undisturbed; near-virgin, forest cover [3]	Moderate cultivation; cultivated < 10 years or open with grass cover [21]	Intensive cultivation; cultivated > 10 years or open and bare [0]

Continued

Table 12. — Site Evaluation Guide for *YELLOW POPLAR (con't)*

Soil-site property	Soil-site condition and relative quality		
	Best	Medium	Poor
Factor 3. Nutrient availability			
Geologic source	Mississippi River. Loess, Blackland [4]	Mixed Coastal Plain and other [31]	Coastal Plain [2]
Past use and present cover	Undisturbed; near-virgin forest cover, cultivated < 5 years [4]	Moderate cultivation; cultivated 5-10 years, or open with grass [2][4]	Intensive cultivation; cultivated > 10 years, or open and bare [0][4]
Organic matter (A-horizon)	> 2% [5]	1-2% [3]	< 1% [0]
Depth of topsoil (A-horizon)	>6" or no profile development [6]	3-6" [3]	<3" I-21
Soil age	Young, no profile development (Entisols) [3]	Medium, moderate profile development (Inceptisols) [2]	Old, well-developed profile, leached (Alfisols; Ultisols) [1]
pH (in rooting zone)	4.5-7.5 [3]	7.6-8.5 [0]	< 4.5 or > 8.5 I-31
Factor 4. Aeration			
Soil structure (in rooting zone)	Granular, porous; structureless single-grained if sandy, massive if loamy or silty) [8]	Prismatic; blocky [2]	Massive (if clayey); platy I-41
Swampiness	Wet in winter only [6]	Wet January-July [3]	Waterlogged all year [Unsuitable]
Mottling	None to 18" depth [8]	None to 8" depth [4]	Mottled to surface or gray mineral soil [-1]
Soil color (in rooting zone)	Black, brown, red [8]	Yellow, brownish-gray [4]	Gray I-11

1125 feet at 50 years maximum S.I.; 70 feet minimum acceptable S.I.

[2] Each bracketed number indicates the site quality rating (SQR) of a particular soil-site condition.

[3] If the soil is sand or loamy sand, then [-5].

[4] If cultural practices included annual fertilization, then [3].

Table 13. — *Expected stand and production data for cottonwood at various ages by site class*

Site index range (Ft @ 30 yrs)	Site class	Thinning	STAND DATA: No. trees per acre	STAND DATA: Mean ht (ft)[a]	STAND DATA: Mean dia (in)	STAND DATA: Basal area (ft²)	EXPECTED PRODUCTION PER ACRE: VOLUME: ft³	VOLUME: Cords[c]	VOLUME: M bm[d] Doyle	VOLUME: M bm[d] Int. ¼	DRY MATTER (TONS)[e]: Branches	DRY MATTER (TONS)[e]: Stems
AT AGE 5 (Before thinning)												
80 - 90	III (Low)	None	325 ± 20	30 ± 5	4 ± 1	30 ± 5	250 ± 80	3 ± 1	–	–	4 ± 1	4 ± 1
100 - 110	II (Med.)	1/2 BA	325 ± 20	35 ± 5	6 ± 1	65 ± 10	735 ± 205	8 ± 2	–	–	5 ± 1	8 ± 2
120 - 130	I (High)	1/2 BA	325 ± 20	45 ± 5	7 ± 1	85 ± 10	1505 ± 310	17 ± 3	–	–	7 ± 1	14 ± 3
AT AGE 10 (Before thinning)												
80 - 90	III (Low)	1/2 BA	310 ± 20	45 ± 5	7 ± 1	80 ± 10	1430 ± 250	16 ± 3	–	–	6 ± 1	14 ± 2
100 - 110	II (Med.)	1/3 BA	155 ± 15	60 ± 5	10 ± 1	85 ± 10	2185 ± 375	24 ± 4	–	–	5 ± 1	18 ± 4
120 - 130	I (High)	1/3 BA	155 ± 15	80 ± 5	13 ± 2	140 ± 20	4155 ± 565	46 ± 6	–	–	8 ± 1	43 ± 7
AT AGE 15 (Before thinning)												
80 - 90	III (Low)	1/3 BA	145 ± 15	60 ± 5	9 ± 1	65 ± 5	1450 ± 200	16 ± 3	–	–	4 ± 1	15 ± 3
100 - 110	II (Med.)	1/3 BA	90 ± 15	80 ± 5	13 ± 2	85 ± 10	2510 ± 360	28 ± 4	3 ± 1	6 ± 2	6 ± 1	29 ± 4
120 - 130	I (High)	1/3 BA	90 ± 15	100 ± 5	16 ± 2	125 ± 15	4470 ± 520	50 ± 6	10 ± 3	16 ± 4	8 ± 1	58 ± 7
AT AGE 20 (Before thinning)												
80 - 90	III (Low)	None	85 ± 15	70 ± 5	11 ± 2	55 ± 5	1600 ± 250	18 ± 3	–	–	4 ± 1	17 ± 3
100 - 110	II (Med.)	None	55 ± 10	90 ± 5	16 ± 2	75 ± 10	2675 ± 390	30 ± 4	6 ± 2	10 ± 3	5 ± 1	30 ± 6
120 - 130	I (High)	1/3 BA	55 ± 10	110 ± 5	18 ± 2	95 ± 10	4260 ± 530	48 ± 6	11 ± 3	16 ± 4	6 ± 1	50 ± 7
AT AGE 30												
80 - 90	III (Low)	CC	75 ± 10	85 ± 5	14 ± 2	80 ± 10	2730 ± 450	30 ± 5	5 ± 2	8 ± 2	5 ± 1	31 ± 6
100 - 110	II (Med.)	CC	50 ± 5	105 ± 5	20 ± 2	110 ± 20	4255 ± 585	48 ± 6	15 ± 4	21 ± 5	6 ± 1	51 ± 7
120 - 130	I (High)	CC	30 ± 5	125 ± 5	28 ± 3	130 ± 25	6125 ± 615	68 ± 7	32 ± 6	38 ± 6	8 ± 1	73 ± 8
NET PRODUCTION AT AGE 30 (Clear-cut @ age 30 plus previous thinnings)												
80 - 90	III (Low)						3930 ± 640	43 ± 7	5 ± 2	8 ± 2	9 ± 1	43 ± 8
100 - 110	II (Med.)						6190 ± 935	69 ± 10	16 ± 4	23 ± 5	13 ± 2	71 ± 10
120 - 130	I (High)						11170 ± 1305	124 ± 14	39 ± 8	49 ± 8	19 ± 2	130 ± 15

[a] Dominants and codominants.

[b] From Mohn and Krinard's (1971) volume equations for merchantable volume outside bark to a 3½-inch top.

[c] Cords = ft³ volume ÷ 90.

[d] From giant-tree volume tables (F.C. = 78) for gross tree volume outside bark to a 10-inch top (Grosenbaugh 1954, Putnam *et al.* 1960). Remaining tops left on site and not included in ft³ or cord production.

[e] From Mueller's (1976) dry matter equations.

Table 14. — Estimated stand and production data for *sweetgum* and sycamore at age 30 by site class

Site index range (ft. @ 50 yrs)	STAND DATA: No. trees per acre	Mean ht (ft)[a]	Mean dia (in)	Basal area (ft^2)	ESTIMATED PRODUCTION PER ACRE[b]: ft^3	Cords[c]	M bm: Doyle	M bm: Int. ¼
				SWEETGUM				
75 - 85	145 ± 15	55 ± 5	8 t 2	50 a 5	1965 t 320	20 a 3	—	—
95 - 105	100 ± 10	70 ± 5	11 ± 2	65 t 10	3095 a 470	34 ± 5	—	—
115 - 125	60 ± 5	90 ± 5	15 t 2	75 ± 15	5585 ± 650	62 ± 7	6 ± 2	9 ± 2
				SYCAMORE				
80 - 90	100 ± 10	60 a 5	10 t 2	55 ± 5	2633 ± 430	29 t 5	—	—
100 - 110	65 a 5	80 ± 5	14 ± 2	70 ± 10	4147 t 625	46 ± 7	4 ± 1	7 t 2
120 - 130	40 ± 5	100 a 5	19 ± 2	80 ± 15	7485 t 875	83 ± 10	10 ± 3	14 ± 3

[a] Dominants and codominants

[b] Production estimated as a proportion of cottonwood production based on early growth and development on various sites.

[c] Cords = ft3 volume ÷ 90

APPENDIX

Explanation of Terms

The explanation of terms is for use with tables 1-12. For terms not defined, see *Glossary of Soil Science Terms* (1975)or *Soil Survey Manual* (1951).

Compaction: Any process by which the soil grains are rearranged to decrease void or air spaces and bring them into closer contact with one another. In most cases, the process is caused by traffic or other artificial means. Some clayey, non-montimorillionitic soils are described as being firm or tight in regard to compaction. This compaction, resulting from a natural alinement of fine particles, occurs because of a lack of shrinking and swelling.

Depth of Topsoil or A-Horizon: Depth of surface soil or depth to B-horizon. Topsoil depth can be distinguished by a rather abrupt change in soil color or texture. Topsoil is ordinarily darker in color and coarser in texture than subsoil.

Geologic Source: Geologic origin of the soil or the physiographic area in which the soil occurs. Soils in the Mississippi River, Loess, and Blackland areas are generally high in native fertility. Coastal Plain soils are relatively low in native fertility and have low pH (< 5.5); when mixed with other geologic sources that are more fertile, they usually have a pH higher than 5.5.

Mottling: Spots or blotches of different color (normally gray, yellow, or light brown) interspersed within the dominant color of the soil. Mottling is usually caused by poor internal drainage and poor aeration.

Organic Matter The organic fraction of the soil: includes plant and animal residues at various stages of decomposition. Soils with high organic matter content are generally dark in color and have visible humus particles, while soils with low organic matter content are light colored.

Pans: Layers in the soil that are strongly compacted, hardened, or very high in clay content. Pans often restrict root penetration and vertical movement of soil water.

Artificial Pans (Plowpans or Pressure Pans) **A** subsurface soil layer that is compacted as a result of normal tillage operations or other artificial means. These pans can normally be detected as resistance to downward movement of a soil auger and by the tightly compacted, dense, and often dry soil condition.

Inherent or Genetic Pans **A** natural subsurface soil layer that is harder or more cemented or brittle than the soil above and below it. Often called claypan or fragipan.

Soil Depth: The depth or thickness of soil that can be easily permeated by tree roots and water. Soil depth is commonly controlled by artificial or inherent pans, rock, or stagnate water tables.

Soil Structure: The combination or arrangement of primary soil particles in units or aggregations. These units are often arranged in the profile so that they give a distinctive characteristic pattern. Some common classes of soil structure are: granular, blocky, platy, prismatic, and structureless (single-grained or massive). Detailed descriptions of these structural classes and how to recognize them are given in most Soils textbooks.

Soil Texture: The relative proportions of various size groups of individual soil particles in a mass of soil. Specifically, it refers to the proportions of clay, silt, and sand below 2 mm in diameter.

Water Table Depth: The average depth to a non-stagnant "true" water table during the growing season. Water table depth can often be determined by soil boring to free water or by observing free water elevations in nearby streams, lakes, ponds, etc., in relation to the elevation of the site. For impervious (clayey)soils or soils with pans, the presence of a perched water table during the growing season will tend to improve available moisture. Therefore for these conditions, select the medium category for moisture availability even though a "true" water table occurs at depths $>$ 10 feet.

BAKER, JAMES B. and W. M. BROADFOOT.

1979. A practical field method of site evaluation for commercially important southern hardwoods. U.S. Dep. Agric. For. Serv. Gen. Tech. Rep. SO-26, 51 p. South For. Exp. Stn., New Orleans, La.

A new method of evaluating sites for planted cottonwood, sweetgum, sycamore, green ash, hackberry, sugarberry, pecan, yellow poplar and Nuttall, water, willow, swamp chestnut, Shumard and cherrybark oaks is presented.

Additional keywords: Site index, soil properties, ***Populus deltoides, Liquidambar styraciflua, Platanus occidentalis, Fraxinus pennsylvanica, Celtis occidentalis, C. laevigata, Carya illinoensis, Liriodendron tulipifera, Q. nuttallii, Q. nigm, Q. phellos, Q. michauxii, Q. shumardii, Quercus falcata*** var. ***pagodaefolia.***

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