Research Report No. 29, Site Index Equations for Loblolly and Slash Pine Plantations in East Texas, Update: 1994

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SITE INDEX EQUATIONS
FOR
LOBLOLLY AND SLASH PINE PLANTATIONS
IN
EAST TEXAS

UPDATE: 1994

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REPORT 29

FROM
THE

EAST TEXAS PINE PLANTATION RESEARCH PROJECT
COLLEGE OF FORESTRY
SFASU
NACOGDOCHES, TX 75962

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SITUATION

In 1986, equations to estimate site index in loblolly and slash pine plantations in East Texas were published (Lenhart et al. 1986). Subsequently, updated site index prediction equations were published in 1993 (Vaughn et al. 1993). Both sets of equations were developed using data collected from East Texas Pine Plantation Research Project (ETPPRP) permanent plots distributed throughout East Texas. The site index prediction equations were designed to estimate tree height 25 years from planting, ie., index age = 25 years.

Data for the 1986 and 1993 site index prediction equations were from measurements of the ETPPRP permanent plots during 1982-1984 (a 3-year period) and 1982-1992 (an11-year period), respectively.

In this 1994 update, new versions of site index prediction equations are presented for loblolly and slash pine plantations in East Texas based on information from repeated measurements of the ETPPRP permanent plots during 1982-1993. During this 12-year period, the ETPPRP plots have been measured four times. As a result, the new loblolly pine site index equation is based on the analysis of 653 age-height pairs, and the new slash pine site index prediction equation is derived from 296 age-height pairs.

The equations in this 1994 update should quantify the productivity of East Texas loblolly and slash pine plantations in a more accurate and reliable manner than the two previous sets of equations.

OBSERVED STAND STRUCTURE CHARACTERISTICS

Each ETPPRP permanent plot consists of two subplots - one for developing mensurational models (DEV) and the other for evaluating mensurational models (EVAL).

The characteristics of the 653 loblolly pine and 296 slash pine observations from plantations at least one year old and one foot in height that were utilized in this study can be summarized as:

PLANTATION AGE - number of years since planting (A).
> LOBLOLLY
>> Mean = 9.7 years with a range of 1-24 years.
> SLASH
>> Mean = 9.5 years with a range of 1-24 years.

HEIGHT - Average height in feet of the ten tallest trees (H) in an area of interest.
> LOBLOLLY
>> Mean = 32.6 feet for both subplots with a range of 2-94 feet (DEV) and 2-100 feet (EVAL).
> SLASH
>> Mean = 31.9 feet for both subplots with a range of 2-73 feet (DEV) and 2-80 feet (EVAL).

SITE INDEX - Average expected total height in feet of the ten tallest trees at 25 years (S).
> LOBLOLLY
>> Mean = 69.4 feet with a range of 24-178 feet (DEV) and 70 feet with a range of 24-229 feet (EVAL).
> SLASH
>> Mean = 72.6 feet with a range of 14-142 feet (DEV) and 72.4 with a range of 21-142 feet (EVAL).

NUMBER OF TREES PER ACRE
> LOBLOLLY
>> Mean = 476.7 with a range of 87-1001 (DEV) and 471.4 with a range of 147-937 (EVAL).
> SLASH
>> Mean = 405.6 with a range of 90-1002 (DEV) and 415.2 with a range of 91-1032 (EVAL).

PREDICTING HEIGHT

The same height prediction function used in 1986 and 1993 was utilized in this 1994 update. As a result of fitting the Richards' function, using non-linear regression analysis, to the age and height pairs from the development subplots, height can estimated as:

LOBLOLLY

$$H = 84.02268[1\text{-EXP}(-0.087478(A))]^{1.60797} \tag{1}$$

SLASH

$$H = 97.06955[1\text{-EXP}(-0.06560(A))]^{1.40559} \tag{2}$$

A residual analysis of equations (1) and (2) compared the predicted and observed heights for the evaluation subplot data sets and indicated no bias or adverse trends for either species.

PREDICTING SITE INDEX

Using procedures described by Clutter et al. (1983), the height estimation or guide curves (1) and (2) were converted into equations to estimate site index with index age = 25 years as:

LOBLOLLY

$$S = H\{0.88774/[1\text{-EXP}(-0.087478(A))]\}^{1.60797} \tag{3}$$

SLASH

$$S = H\{0.80602/[1\text{-EXP}(-0.06560(A))]\}^{1.40559} \tag{4}$$

Equations (3) and (4) were rearranged to estimate H for a given A and S, and anamorphic site index curves were developed for each species (last two pages in this update).

LITERATURE CITED

Clutter, J. L., J. C. Fortson, L. V. Pienaar, G. H. Brister and R. L. Bailey. 1983. Timber Management: A Quantitative Approach. John Wiley & Sons, New York. 333 p.

Lenhart, J. D., E. V. Hunt, Jr. and J. A. Blackard. 1986. Site index equations for loblolly and slash pine plantations on non-old-fields in East Texas. South. J. Appl. For. 10(2):109-112.

Vaughn, A. B., J. Lapongan and J. D. Lenhart. 1993. Site index equations for loblolly and slash pine plantations in East Texas. Update: 1993. College of Forestry. SFASU. 6 p.

SLASH PINE PLANTATIONS ... EAST TEXAS

SITE INDEX CURVES

(BASED ON ETPPRP DATA...1982-93)