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Project Report No. 62, Site Index Equations for Loblolly and Slash Pine Plantations in East Texas, Update: Fall 1998

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Site Index Equations
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in
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Update: Fall 1998

by

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(all of whom were FOR 317 students Fall '98)

REPORT 62

From
the

SITUATION

Site index prediction equations for loblolly (*Pinus taeda* L.) and slash (*Pinus elliottii* Engelm.) pine plantations in East Texas have been previously developed and published by:

Lenhart, J. D., E. V. Hunt, Jr. and J. A. Blackard. 1986. Site index equations for loblolly and slash pine plantations on non-old-field 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. ETPPRP Report 27. College of Forestry. SFASU. 6 p.

Members FOR 317 Class Spring '94. 1994. Site index equations for loblolly and slash pine plantations in East Texas - Update: 1994. ETPPRP Report 29. College of Forestry. SFASU. 7 p.

Members FOR 317 Class Spring '95. 1995. Site index equations for loblolly and slash pine plantations in East Texas - Update: 1995. ETPPRP Report 37. College of Forestry. SFASU. 6 p.

Members FOR 317 Class Spring '96. 1996. Site index equations for loblolly and slash pine plantations in East Texas - Update: 1996. ETPPRP Report 43. College of Forestry. SFASU. 6 p.

Members FOR 317 Class Fall '96. 1996. Site index equations for loblolly and slash pine plantations in East Texas - Update: 1996. ETPPRP Report 50. College of Forestry. SFASU. 6 p.

Members FOR 317 Class Fall '97. 1997. Site index equations for loblolly and slash pine plantations in East Texas - Update: 1997. ETPPRP Report 59. Arthur Temple College of Forestry. SFASU. 6 p.

Each published set of equations was developed from analyses of East Texas Pine Plantation Research Project (ETPPRP) data collected from the array of ETPPRP permanent research plots located throughout East Texas.

Since the ETPPRP plots are measured on a 3-year cycle, the number of age-height pairs available for site index analysis is increasing:

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The 1986 equations:          150 loblolly and   75 slash.
The 1993 equations:          608 loblolly and  264 slash.
The 1994 equations:          653 loblolly and  296 slash.
The 1995 equations:        1,428 loblolly and  630 slash.
The Spring 1996 equations: 1,520 loblolly and  658 slash.
The Fall 1996 equations:   1,607 loblolly and  722 slash.
The Fall 1997 equations:   1,713 loblolly and  764 slash.
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This update utilizes height-age pairs measured from 1982 - 1998. As a result, the number of observations available for analysis is 1,814 loblolly and 788 slash.

It is anticipated that the equations in this Fall 1998 update may quantify the productivity of East Texas loblolly and slash pine plantations in a more accurate and reliable manner than the seven previous sets of equations.

PLANTATION MEASUREMENTS

Each ETPPRP plot consists of two subplots separated by a 60' buffer zone. An experimental design of this manner provides the opportunity to:

- Evaluate models in an independent manner.
- Explore effects of different treatments.
- Investigate regression models.

As was the practice in the two previous site index analyses, each subplot was considered a separate sampling unit in this Fall 1998 study.

The characteristics of the 1,814 loblolly pine and 788 slash pine observations at least one year old and one foot in height that were utilized in this study can be summarized as:

Plantation Age	Plantation Height	Site Index
Number of Years Since Planting	Average total height in feet of tallest trees in an area of interest	Expected total height in feet of tallest trees in an area of interest at 25 years
(A)	**(H)**	**(S)**
LOBLOLLY...	LOBLOLLY...	LOBLOLLY...
Mean = 11.9 yrs. Range = 1- 30 yrs	Mean = 39.2 ft. Range = 2 - 100 ft.	Mean = 69.5ft. Range = 24 - ≥100 ft.
SLASH...	SLASH...	SLASH...
Mean = 11.4 yrs. Range = 1- 28 yrs.	Mean = 38.2 ft. Range = 2 - 95 ft.	Mean = 75.8ft. Range = 15 - ≥100 ft.

PREDICTING HEIGHT

The same height prediction function used in 1986, 1993, 1994,1995, 1996 and 1997 was utilized in this Fall 1998 update. As a result of fitting the Richards' function, using non-linear regression analysis, to the age and height pairs, height can estimated as:

LOBLOLLY

$$H = 81.98558[1-EXP(-0.09386(A))]^{1.68425} \tag{1}$$

SLASH

$$H = 120.27995[1-EXP(-0.04782(A))]^{1.28987} \tag{2}$$

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 readily available procedures, the height estimation or guide curves (1) and (2) were converted into equations to estimate site index with index age = 25 years as:
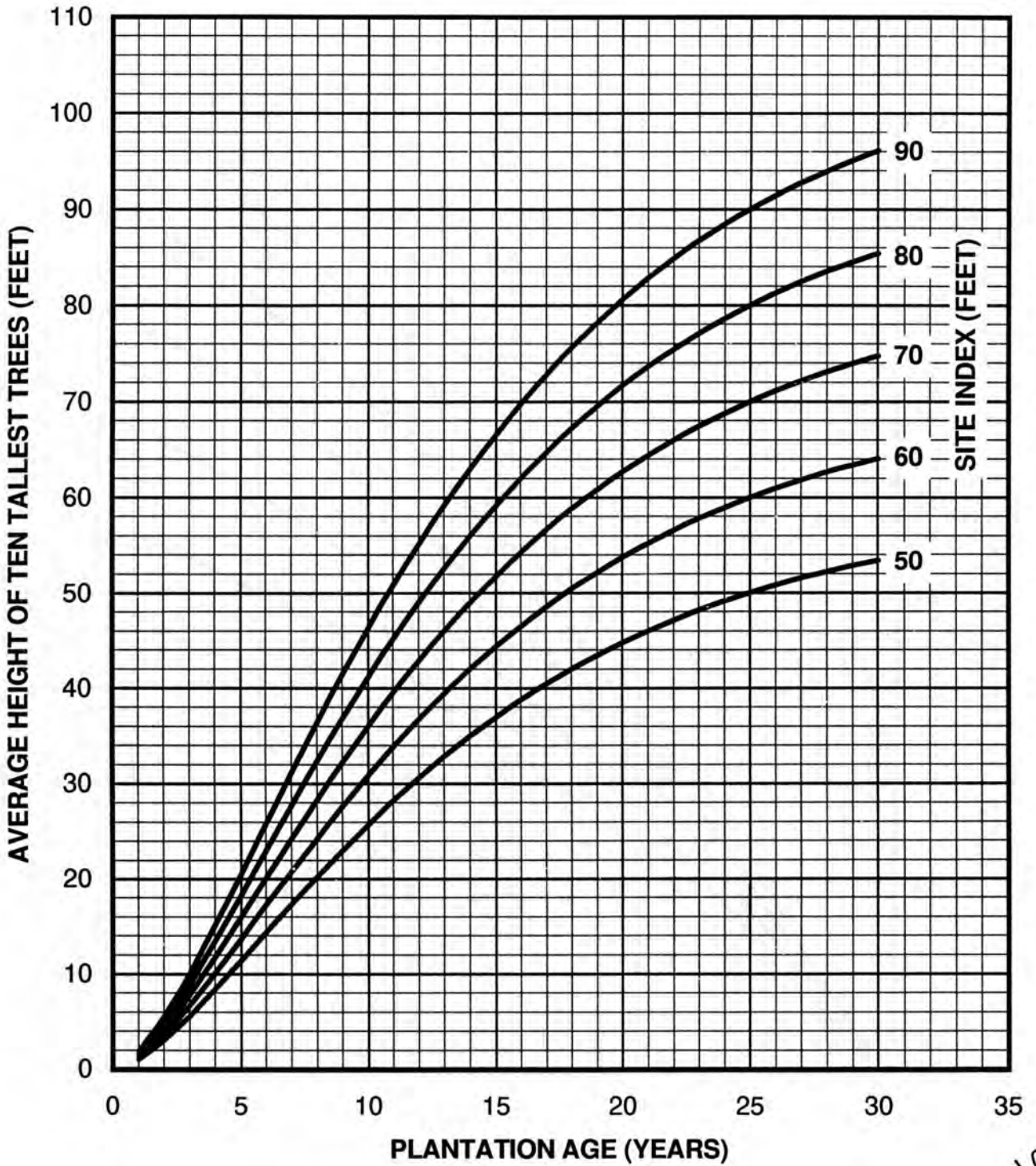
LOBLOLLY

$$S = H\{0.90430/[1-EXP(-0.09386(A))]\}^{1.68425} \tag{3}$$

SLASH

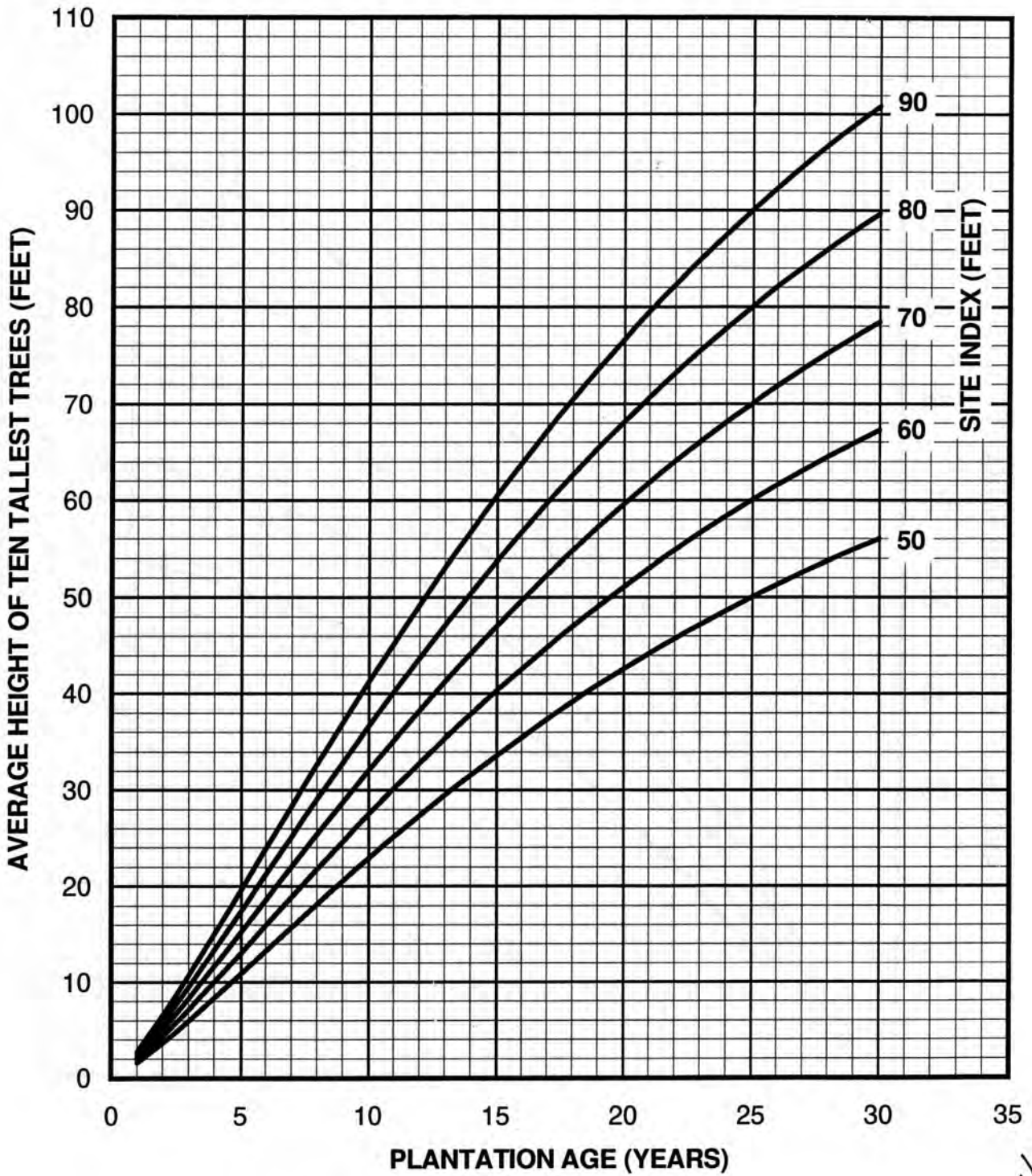$$S = H\{0.69745/[1-EXP(-0.04782(A))]\}^{1.28987} \tag{4}$$

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).

SITE INDEX CURVES FOR LOBLOLLY PINE PLANTATIONS IN EAST TEXAS (BASE AGE 25 YEARS)

SITE INDEX CURVES FOR SLASH PINE PLANTATIONS IN EAST TEXAS (BASE AGE 25 YEARS)

Chart: X-axis labeled "PLANTATION AGE (YEARS)" ranging 0 to 35. Left Y-axis labeled "AVERAGE HEIGHT OF TEN TALLEST TREES (FEET)" ranging 0 to 110. Right Y-axis labeled "SITE INDEX (FEET)". Curves labeled 90, 80, 70, 60, 50.

JG