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Project Report No. 63, Site Index Equations for Loblolly and Slash Pine Plantations in East Texas, Update: Fall 2000

Lanton Chumley

Stephen F. Austin State University

Kenneth Dotson

Stephen F. Austin State University

Brad Horn

Stephen F. Austin State University

Greg Kelley

Stephen F. Austin State University

Greg Mabus

Stephen F. Austin State University

See next page for additional authors

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Authors

Lanton Chumley, Kenneth Dotson, Brad Horn, Greg Kelley, Greg Mabus, Meredith Middlebrook, Jamie Oliver, Michael Russell, and Michelle Stegall

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**Site Index Equations
for
Loblolly and Slash Pine Plantations
in
East Texas**

Update: Fall 2000

by

Lanton Chumley
Kenneth Dotson
Brad Horn
Greg Kelley
Greg Mabus
Meredith Middlebrook
Jamie Oliver
Michael Russell
Michelle Stegall

(all of whom were FOR 317 students Fall 2000)



REPORT 63

From
the

East Texas Pine Plantation Research Project
Arthur Temple College of Forestry
SFASU
Nacogdoches, TX 75962

October ... 2000

S I T U A T I O N

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.
- Members FOR 317 Class Fall '98. 1998. Site index equations for loblolly and slash pine plantations in East Texas - Update: 1998. ETPPRP Report 62. 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:

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.
The Fall 1998 equations:	1,814 loblolly and 788 slash.

This update utilizes height-age pairs measured from 1982 - 1999. As a result, the number of observations available for analysis is 1,900 loblolly and 852 slash.

It is anticipated that the equations in this Fall 2000 update may quantify the productivity of East Texas loblolly and slash pine plantations in a more accurate and reliable manner than the eight previous sets of equations.

PLANTATION MEASUREMENTS

Each ETPRRP 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 three previous site index analyses, each subplot was considered a separate sampling unit in this Fall 2000 study.

The characteristics of the 1,900 loblolly pine and 852 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

Number
of
Years
Since Planting

(A)

LOBLOLLY...

Mean = 12.2 yrs.
Range = 1- 30 yrs

SLASH...

Mean = 12.0 yrs.
Range = 1- 29 yrs.

Plantation Height

Average total height
in feet
of tallest trees
in an area of interest

(H)

LOBLOLLY...

Mean = 40.1 ft.
Range = 2 - 100 ft.

SLASH...

Mean = 39.8 ft.
Range = 2 - 95 ft.

Site Index

Expected total height
in feet
of tallest trees
in an area of interest
at 25 years

(S)

LOBLOLLY...

Mean = 69.9ft.
Range = 25 - \geq 100 ft.

SLASH...

Mean = 75.0ft.
Range = 15 - \geq 100 ft.

P R E D I C T I N G H E I G H T

The same height prediction function used in 1986, 1993, 1994, 1995, 1996, 1997 and 1998 was utilized in this Fall 2000 update. As a result of fitting the Richards' function, using non-linear regression analysis, to the age and height pairs, height can be estimated as:

LOBLOLLY

$$H = 83.12133 [1 - \text{EXP}(-0.09196(A))]^{1.67042} \quad (1)$$

SLASH

$$H = 115.16206 [1 - \text{EXP}(-0.05069(A))]^{1.30545} \quad (2)$$

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.

P R E D I C T I N G S I T E I N D E X

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

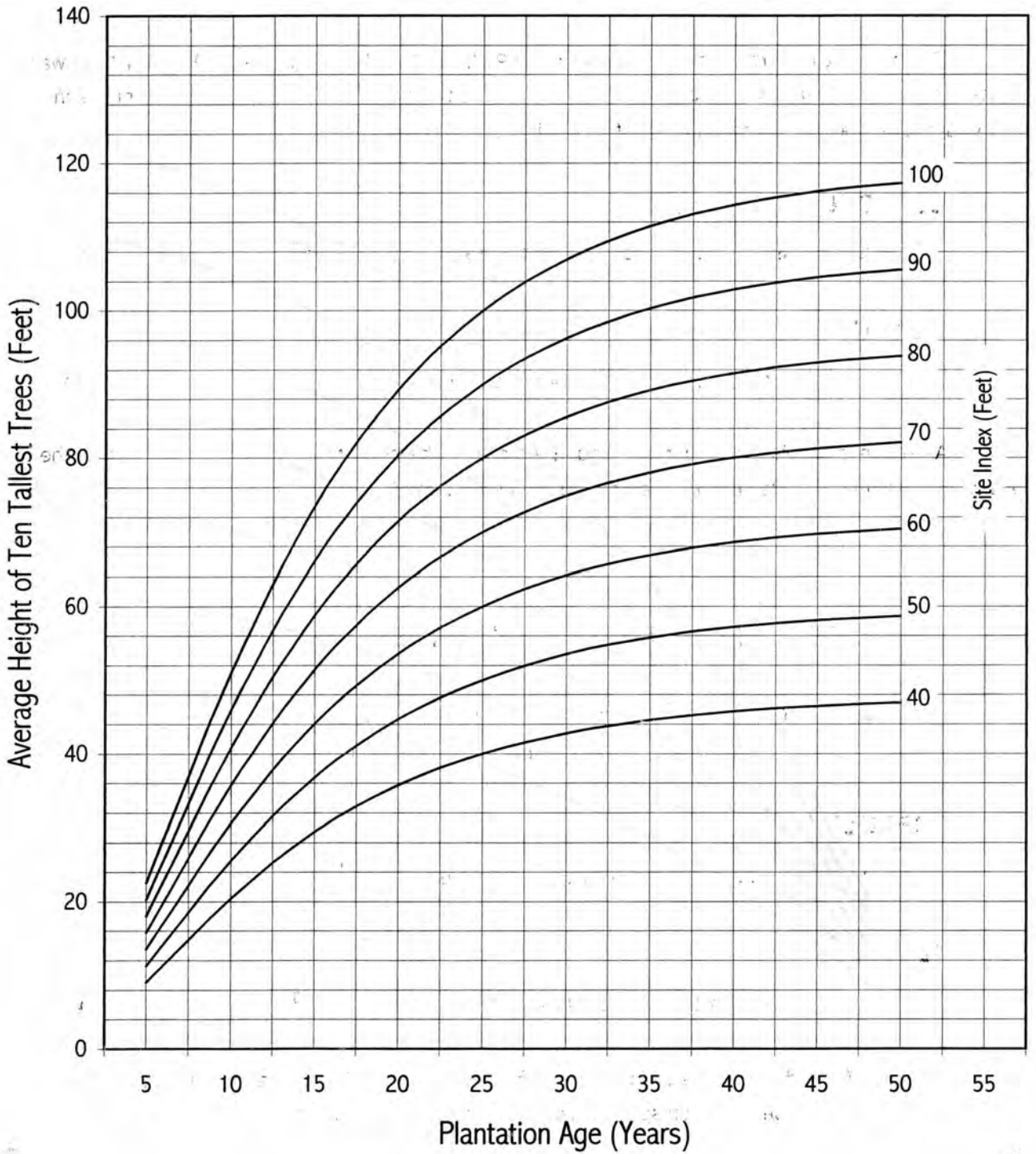
$$S = H \{0.89965 / [1 - \text{EXP}(-0.09196(A))] \}^{1.67042} \quad (3)$$

SLASH

$$S = H \{0.71836 / [1 - \text{EXP}(-0.05069(A))] \}^{1.30545} \quad (4)$$

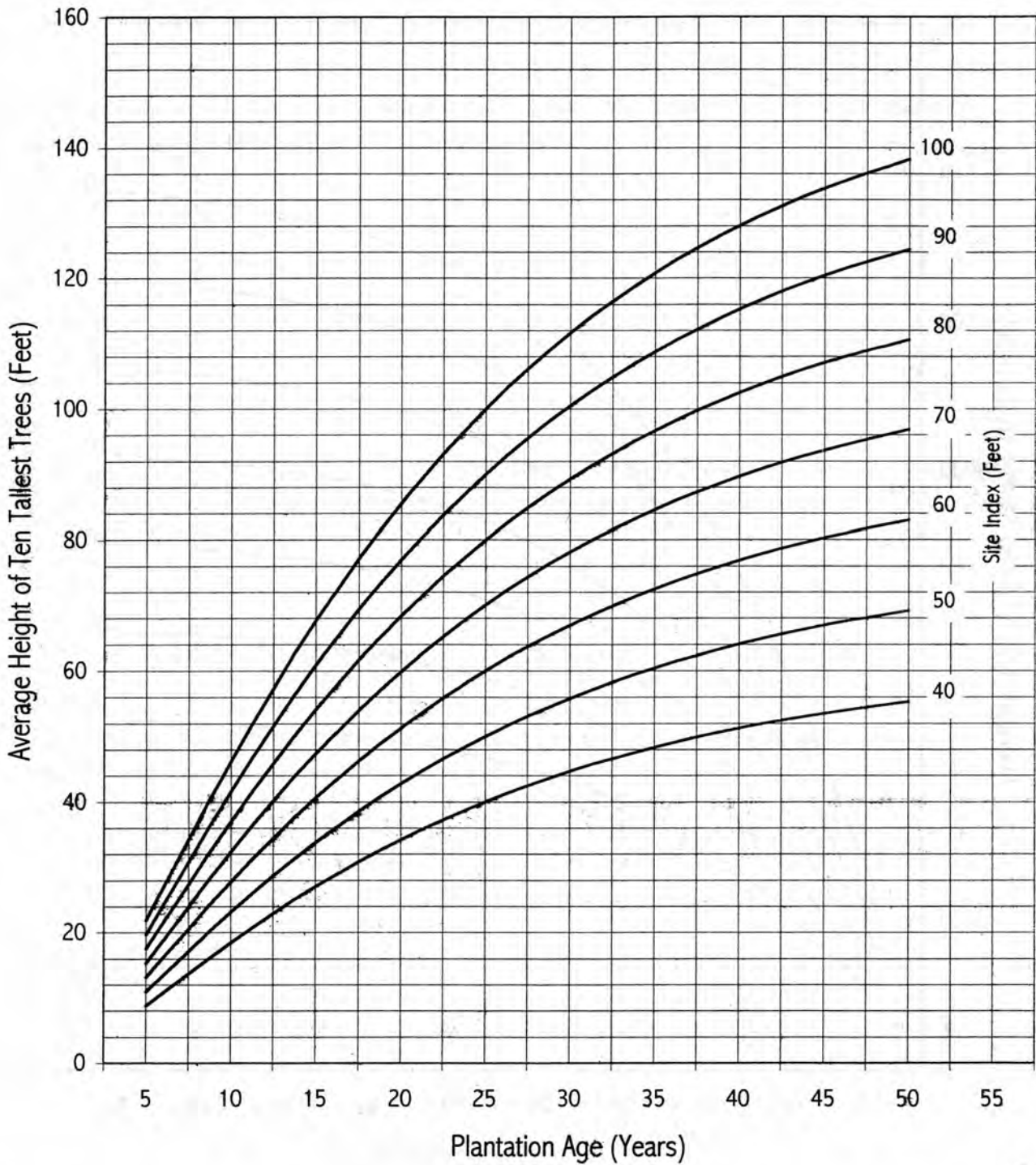
Equations (3) and (4) were rearranged to estimate H for a given A and S, and anamorphic site index curves were developed for each species (last two pages in this update).

Site Index Curves for Loblolly Pine Plantations In East Texas (Base Age 25 Years)



MAM

Site Index Curves for Slash Pine Plantations in East Texas (Base Age 25 Years)



MAM