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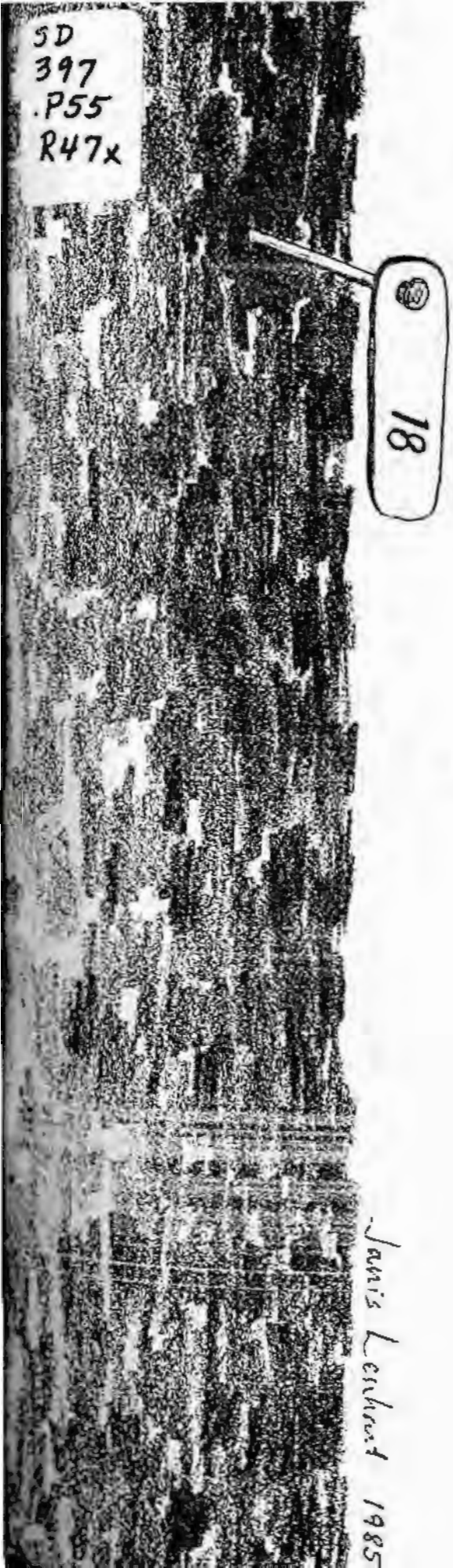
Research Report No. 3, Estimating Site Index

Jock A. Blackard



ESTIMATING SITE INDEX

by

Jock A. Blackard

REPORT NUMBER 3

TO

PARTICIPATING COMPANIES

IN THE

EAST TEXAS PINE PLANTATION RESEARCH PROJECT

A STUDY OF

LOBLOLLY AND SLASH PINE PLANTATIONS

IN

EAST TEXAS

CENTER FOR APPLIED STUDIES
SCHOOL OF FORESTRY
STEPHEN F. AUSTIN STATE UNIVERSITY
NACOGDOCHES, TEXAS 75962

December, 1985

This is the third report of a continuing series of reports describing results from the East Texas Pine Plantation Research Project.

Subject and content of each ETPPRP report will be regional in scope and of particular interest to loblolly and slash pine plantation owners in East Texas.

Any suggestions, ideas or comments will always be welcomed.

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Support from the participating companies...

Champion International Corporation,
International Paper Company,
Owens-Illinois, Inc. and
Temple-EasTex, Inc.

is gratefully appreciated.

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A manuscript on predicting site index for loblolly and slash pine plantations in East Texas has been accepted for publication sometime in 1986 in the Southern Journal of Applied Forestry. The manuscript is an expanded and more detailed version of this report.

Both the manuscript and this report are based on a thesis being written by Mr. Blackard to fulfill partial requirements for a MSF degree. Mr. Blackard expects to receive his degree in May, 1986.

J. David Lenhart
Project Director
December 12, 1985

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ESTIMATING SITE INDEX

by

Jack A. Blackard[1]

ABSTRACT. Equations to predict site index (base age 25 years) for loblolly pine (*Pinus taeda* L.) and slash pine (*Pinus elliottii* Engelm.) plantations on non-old-fields in East Texas are presented. Productivity is estimated using plantation age and average height of the ten tallest trees in the plantation.

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INTRODUCTION

A principal factor influencing the management of pine plantations in East Texas is site productivity. Along with plantation age and density, productivity is a vital component in determining the growth and yield expected from the planted pines.

One way to quantify productivity is to estimate the site index of the area of interest. Average height of the trees in the upper canopy, plus plantation age, can be considered as an indication of the ability of the site to produce wood.

In this report, site index is estimated using average height of the ten tallest trees in a plantation and plantation age as predictors. A more detailed presentation of these site index prediction results will appear in the Southern Journal of Applied Forestry during 1986 (Lenhart *et al.* in press).

PLANTATION MEASUREMENTS

Plantation age and height values analyzed in this site index study were obtained during installation of 256 permanent monumented plots in unthinned loblolly and slash pine plantations located on non-old-fields throughout East Texas. The growth and yield plots were installed during 1982-84 by the School of Forestry at SFASU in plantations owned by the participating companies (Lenhart *et al* 1985).

Each plot consists of two subplots -- one to remain unthinned and the other to receive thinnings. The site index equations were developed using data from the subplot to remain unthinned. Since it was not possible in many of the younger plantations to classify tree crowns by their position in the canopy, the average height of the ten tallest trees in each subplot was selected as an indicator of site productivity. Plantation age is defined as the number of growing seasons completed since planting.

Observed height and age pairs were available from 150 loblolly and 75 slash pine subplots. This is a reduced sample size, because no heights were recorded in some subplots due to young age.

ESTIMATING LOBLOLLY PINE SITE INDEX

Analysis of the 150 pairs of loblolly pine observations indicated that the Richards' (1959) function represented the observed trend of height over age.

An height growth equation was developed using non-linear regression analysis as

$$H = 88.8715(1-EXP(-0.08005A))^{1.62857},$$

where H = Average height (feet) of the ten tallest trees on the area of interest and

A = Number of growing seasons completed since plantation establishment.

This height growth equation, which is also a guide curve, was converted into a general site index prediction equation as

$$S = H((1-EXP(-0.08005I))/(1-EXP(-0.08005A)))^{1.62857},$$

where S = Site index (feet) for index age I and

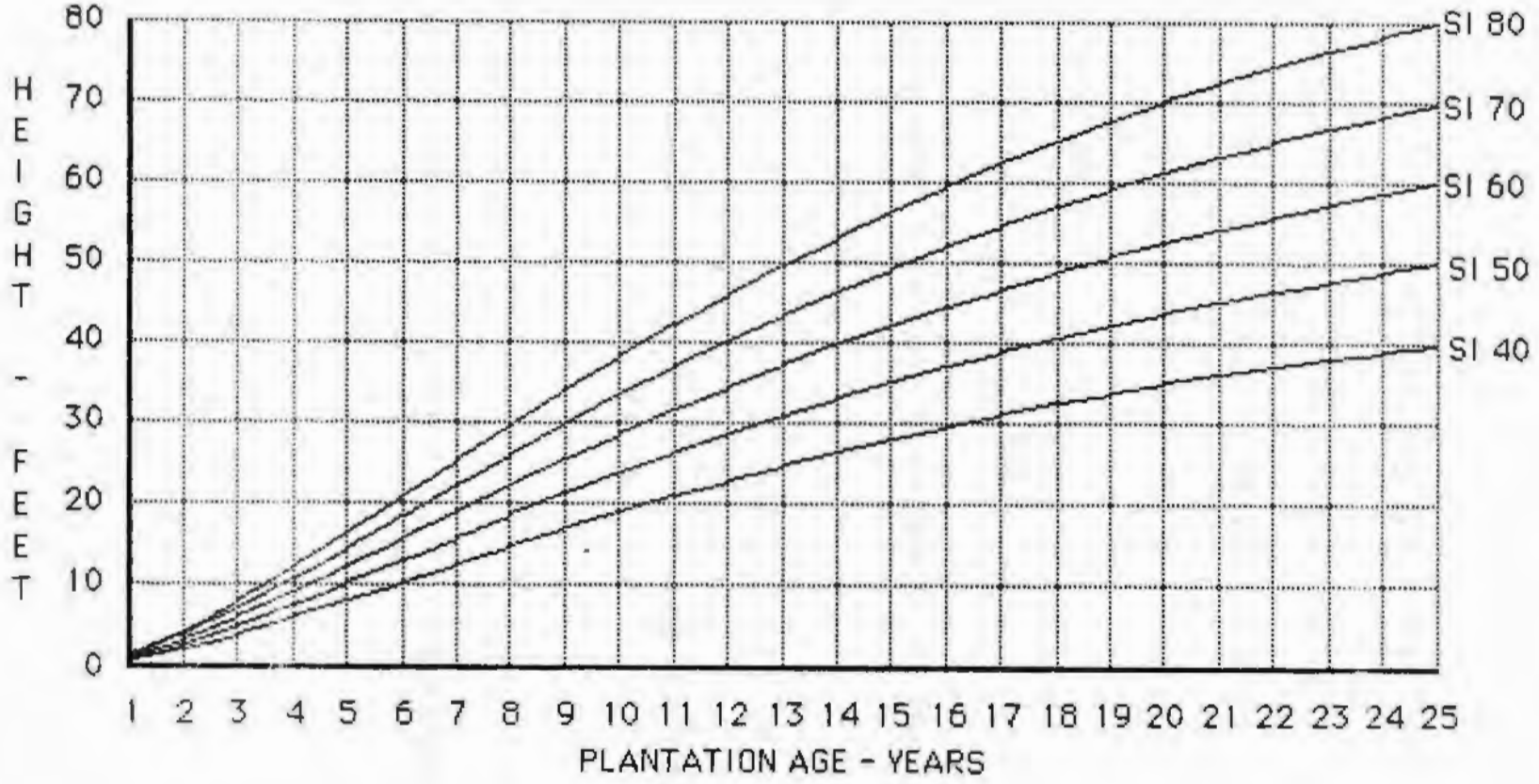
I = Index age (years).

The general site index was simplified for estimating loblolly pine site index with an index age of 25 years as

$$S_{25} = H(0.86484/(1-EXP(-0.08005A)))^{1.62857}.$$

Loblolly pine site index curves are shown in Figure 1.

FIGURE 1. LOBLOLLY PINE SITE INDEX CURVES, INDEX AGE 25,
FOR PLANTATIONS ON NON-OLD-FIELDS IN EAST TEXAS.



ESTIMATING SLASH PINE SITE INDEX

A plotting of the observed slash pine height and age pairs indicated that a Richards' (1959) growth function would be appropriate.

An height growth equation based on the 75 slash pine observations was developed as

$$H = 85.5553(1-EXP(-0.07489A))^{1.45024}.$$

This guide curve was converted into a general site index prediction equation for slash pine as

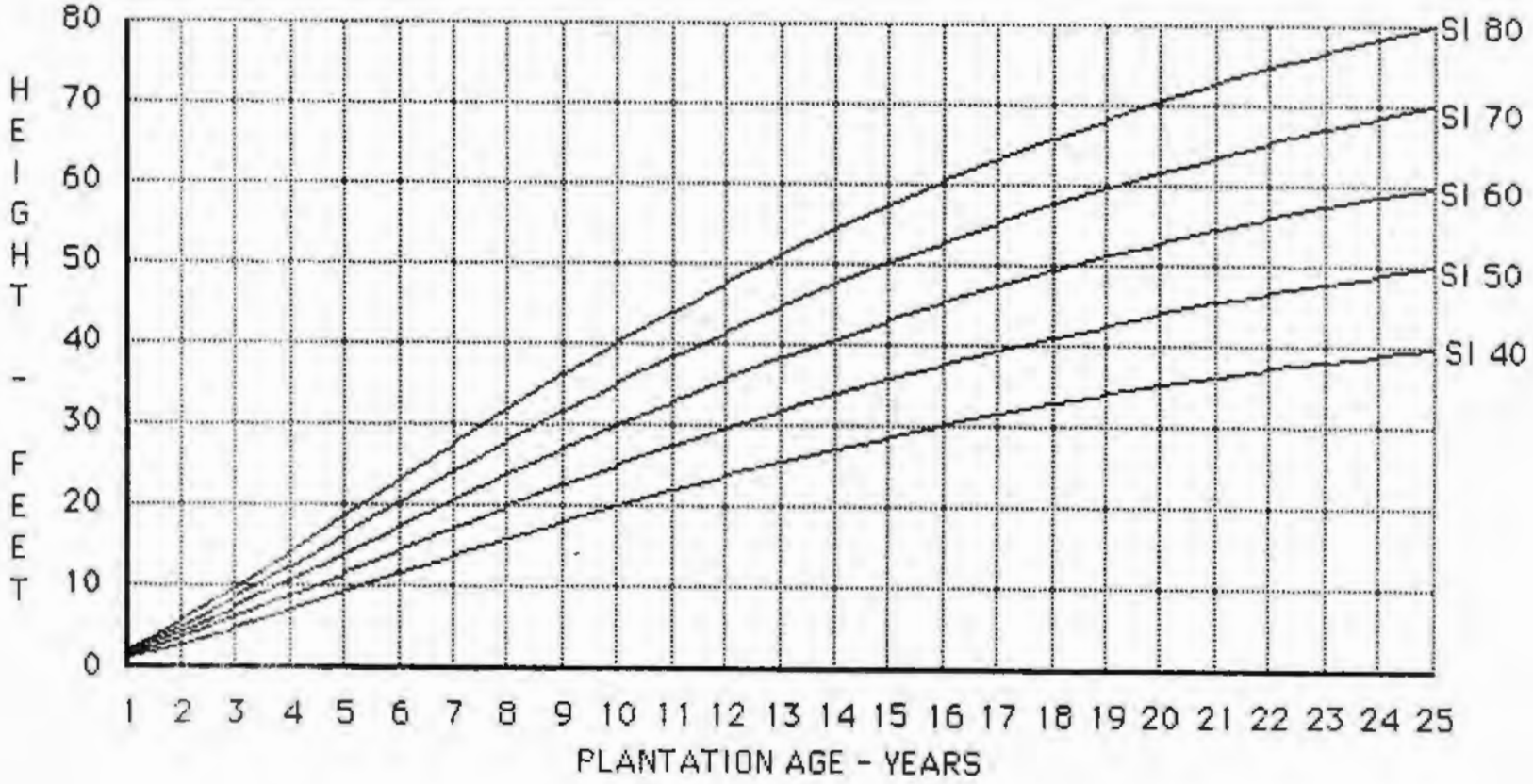
$$S = H((1-EXP(-0.07489I))/(1-EXP(-0.07489A)))^{1.45024}.$$

An equation to estimate site index for index age 25 years was developed as

$$S = H(0.84622/(1-EXP(-0.07489A)))^{1.45024}.$$

A family of slash pine site index curves is shown in Figure 2.

FIGURE 2. SLASH PINE SITE INDEX CURVES, INDEX AGE 25, FOR PLANTATIONS ON NON-OLD-FIELDS IN EAST TEXAS.



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