Project Report No. 50, Site Index Equations for Loblolly and Slash Pine Plantations in East Texas, Update: Fall 1996

Chris Bergt  
*Stephen F. Austin State University*

Chris Edmonson  
*Stephen F. Austin State University*

Jason Gibson  
*Stephen F. Austin State University*

Robert Hactel  
*Stephen F. Austin State University*

John Hamilton  
*Stephen F. Austin State University*

See next page for additional authors

Follow this and additional works at: [http://scholarworks.sfasu.edu/etpprp_project_reports](http://scholarworks.sfasu.edu/etpprp_project_reports)

Part of the [Other Forestry and Forest Sciences Commons](http://scholarworks.sfasu.edu/etpprp_project_reports)

Tell us how this article helped you.

Recommended Citation

Bergt, Chris; Edmonson, Chris; Gibson, Jason; Hactel, Robert; Hamilton, John; Hasagama, Michael; Jordan, Justin; Leary, David; Motheral, Cliff; Smith, Nathan; Wallace, Jason; and Wright, Steven, "Project Report No. 50, Site Index Equations for Loblolly and Slash Pine Plantations in East Texas, Update: Fall 1996" (1996). *Informal Project Reports*. Paper 22.

[http://scholarworks.sfasu.edu/etpprp_project_reports/22](http://scholarworks.sfasu.edu/etpprp_project_reports/22)
Site Index Equations for Loblolly and Slash Pine Plantations in East Texas

Update: Fall 1996

by

Chris Bergt
Chris Edmonson
Jason Gibson
Robert Hactel
John Hamilton
Michael Hasagama
Justin Jordan
David Leary
Clif Motheral
Nathan Smith
Jason Wallace
Steven Wright

(all of whom were FOR 317 students Fall '96)

REPORT 50

From the

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

November ... 1996
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:


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:

<table>
<thead>
<tr>
<th>Year</th>
<th>Loblolly</th>
<th>Slash</th>
</tr>
</thead>
<tbody>
<tr>
<td>1986</td>
<td>150</td>
<td>75</td>
</tr>
<tr>
<td>1993</td>
<td>608</td>
<td>264</td>
</tr>
<tr>
<td>1994</td>
<td>653</td>
<td>296</td>
</tr>
<tr>
<td>1995</td>
<td>1,428</td>
<td>630</td>
</tr>
<tr>
<td>1996</td>
<td>1,520</td>
<td>658</td>
</tr>
</tbody>
</table>

This update utilizes height-age pairs measured from 1982 - 1996. As a result, the number of observations available for analysis is 1,607 loblolly and 722 slash.

It is anticipated that the equations in this Fall 1996 update may quantify the productivity of East Texas loblolly and slash pine plantations in a more accurate and reliable manner than the five 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 1996 study.

The characteristics of the 1,607 loblolly pine and 722 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**

<table>
<thead>
<tr>
<th>Number of Years Since Planting</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(A)</strong></td>
</tr>
<tr>
<td>LOBLOLLY...</td>
</tr>
<tr>
<td>Mean = 10.9 yrs.</td>
</tr>
<tr>
<td>Range = 1 - 27 yrs</td>
</tr>
<tr>
<td>SLASH...</td>
</tr>
<tr>
<td>Mean = 10.7 yrs.</td>
</tr>
<tr>
<td>Range = 1 - 26 yrs</td>
</tr>
</tbody>
</table>

**Plantation Height**

<table>
<thead>
<tr>
<th>Average total height in feet of tallest trees in an area of interest</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(H)</strong></td>
</tr>
<tr>
<td>LOBLOLLY...</td>
</tr>
<tr>
<td>Mean = 36.4 ft.</td>
</tr>
<tr>
<td>Range = 2 - 100 ft.</td>
</tr>
<tr>
<td>SLASH...</td>
</tr>
<tr>
<td>Mean = 35.8 ft.</td>
</tr>
<tr>
<td>Range = 2 - 89 ft.</td>
</tr>
</tbody>
</table>

**Site Index**

<table>
<thead>
<tr>
<th>Expected total height in feet of tallest trees in an area of interest at 25 years</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(S)</strong></td>
</tr>
<tr>
<td>LOBLOLLY...</td>
</tr>
<tr>
<td>Mean = 69.3 ft.</td>
</tr>
<tr>
<td>Range = 24 - 246 ft.</td>
</tr>
<tr>
<td>SLASH...</td>
</tr>
<tr>
<td>Mean = 74.8 ft.</td>
</tr>
<tr>
<td>Range = 15 - 132</td>
</tr>
</tbody>
</table>
PREDICTING HEIGHT

The same height prediction function used in 1986, 1993, 1994, 1995 and 1996 was utilized in this Fall 1996 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

\[ H = 81.27099 \cdot [1 - \exp(-0.09509A)]^{1.69251} \]

SLASH

\[ H = 113.71600 \cdot [1 - \exp(-0.05151A)]^{1.31033} \]

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 from the five previous papers, the height estimation or guide curves (1) and (2) were converted into equations to estimate site index with index age = 25 years as:

LOBLOLLY

\[ S = H \cdot [0.90719/\exp(-0.09509A)]^{1.69251} \]

SLASH

\[ S = H \cdot [0.72411/\exp(-0.05151A)]^{1.31033} \]

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.