11-1998

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
for
Sblolly and Slash Pine Plantations
in
East Texas
Update: Fall 1998
by
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REPORT 62

From
the

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

November ... 1998
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>Obelolly</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>Spring 1996</td>
<td>1,520</td>
<td>658</td>
</tr>
<tr>
<td>Fall 1996</td>
<td>1,607</td>
<td>722</td>
</tr>
<tr>
<td>Fall 1997</td>
<td>1,713</td>
<td>764</td>
</tr>
</tbody>
</table>

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**
Number of Years Since Planting
(A)

LOBLOLLY...
Mean = 11.9 yrs.
Range = 1 - 30 yrs

SLASH...
Mean = 11.4 yrs.
Range = 1 - 28 yrs.

**Plantation Height**
Average total height in feet of tallest trees in an area of interest
(H)

LOBLOLLY...
Mean = 39.2 ft.
Range = 2 - 100 ft.

SLASH...
Mean = 38.2 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 = 69.5 ft.
Range = 24 - ≥100 ft.

SLASH...
Mean = 75.8 ft.
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**

\[ H = 81.98558 \times [1 - \exp(-0.09386(A))]^{1.68425} \]  \hspace{1cm} (1)

**SLASH**

\[ H = 120.27995 \times [1 - \exp(-0.04782(A))]^{1.28987} \]  \hspace{1cm} (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**

\[ S = H \times (0.90430 / [1 - \exp(-0.09386(A))])^{1.68425} \]  \hspace{1cm} (3)

**SLASH**

\[ S = H \times (0.69745 / [1 - \exp(-0.04782(A))])^{1.28987} \]  \hspace{1cm} (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)