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A useful measure of forest land productivity is site index, which is defined as the average total height of the dominant and codominant trees in unthinned even-aged stands at an arbitrarily chosen index age. In order to apply the concept of site index, it is necessary to project presently measured heights forward or backward in time to the specified index age using a prediction equation or a family of site index curves.

An equation to predict height from age has been developed for old-field loblolly pine plantations in Northeast Texas as:

\[
\log_{10} \text{height} = 1.97083 - 4.87221 \frac{1}{\text{age}},
\]

with \( r^2 = 0.652 \), and

\( S_{y-x} = 0.049 \), and

where \( \text{height} \) = average height of dominant and codominant trees, and

\( \text{age} \) = plantation age.
The height-age prediction equation was based on data from 261 temporary sample plots, each consisting of 25 planting spaces located in unthinned old-field loblolly pine plantations throughout Northeast Texas (Fig. 1). The age of each plot was determined, and its average dominant stand height was calculated by measuring the heights of three dominant and three codominant trees. The distribution of the sample plot values with respect to age and site index classes is shown in Table 1. About 94 percent of the plots were measured in plantations 17 years or younger, and 94 percent had heights between 25 and 55 feet. Average age and height values were 13 years and 39 feet, respectively.

| Table 1. FREQUENCY DISTRIBUTION OF 261 TEMPORARY SAMPLE PLOTS BY AGE AND HEIGHT CLASSES |
|---------------|-----|-----|-----|-----|-----|-----|-----|
| Age (years)  | 20  | 30  | 40  | 50  | 60  | 70  | 80  | Total |
| 10           | 1   | 76  | 52  | 2   |     |     |     | 131   |
| 15           |     | 18  | 79  | 17  |     |     |     | 114   |
| 20           |     |     | 4   |     |     |     |     | 4     |
| 25           |     |     |     | 3   | 3   |     |     | 6     |
| 30           |     |     |     |     | 5   | 1   |     | 6     |
| Total        | 1   | 94  | 131 | 23  | 3   | 8   | 1   | 261   |

In determining optimum cutting schedules for plantations in the South, it is not unusual to use rotation ages of 17-25 years to maximize certain economic criteria. With this in consideration, plus the fact that the average age of the sample from the plantations in Northeast Texas was 13 years, an index age of 18 years was selected on which to base the family of site index curves.

By algebraically manipulating the height-age equation, a site index equation to predict site index at an index age of 18 years was developed as:

\[
\log_{\text{site index}} = \log_{\text{height}} - 4.87221 \left(1 - \frac{1}{18 \cdot \text{age}}\right).
\]

Using the site index prediction equation, a family of site index curves was developed (Fig. 2). Site index may be calculated by inserting appropriate height and age values in the prediction equation or by interpolating the curves in Figure 2.
Figure 1. Frequency Distribution of 261 Temporary Sample Plots By Counties.
Figure 2. Site Index Curves at an Index Age of 18 Years for Old-Field Unthinned Loblolly Pine Plantations in Northeast Texas.