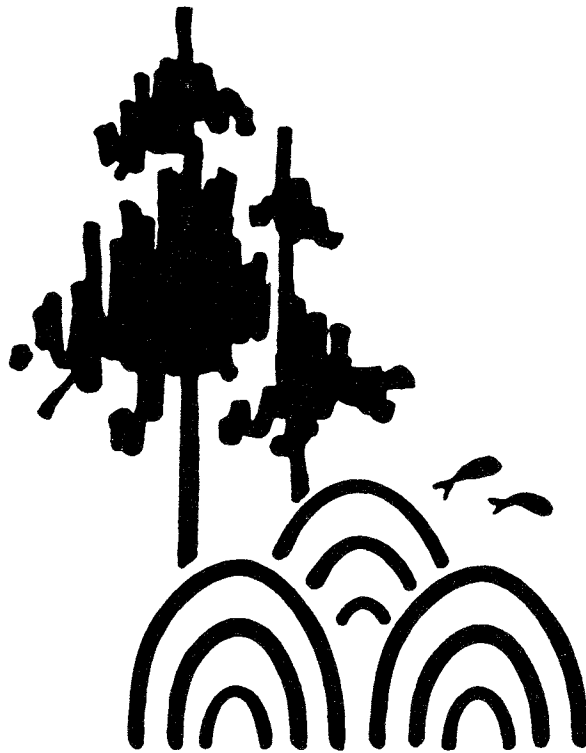


# **Yields and Size Class Distributions for Unthinned Loblolly Pine Plantations on Cutover Site-Prepared Lands**



**Publication No. FWS-2-84**

**School of Forestry and Wildlife Resources  
Virginia Polytechnic Institute and State University  
Blacksburg, Virginia 24061**

**1984**

YIELDS AND SIZE CLASS DISTRIBUTIONS  
FOR UNTHINNED LOBLOLLY PINE PLANTATIONS  
ON CUTOVER SITE-PREPARED LANDS

by

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## PREFACE

Program COYIELD presented here is available to interested users in either a FORTRAN batch version for mainframe computers or in IBM BASIC for the Personal Computer. A punched card deck of the FORTRAN version or a diskette of the BASIC version can be obtained by writing the Biometrics Section, School of Forestry and Wildlife Resources, Virginia Tech, Blacksburg, VA, 24061.

A charge of \$20.00 applies to either version to cover the cost of copying and mailing. Checks should be made out to the Department of Forestry, VPI & SU.

Although the software, to the best of our knowledge, contains no errors, neither Virginia Polytechnic Institute and State University, the School of Forestry and Wildlife Resources nor the authors claim any responsibility for its accuracy.

## ACKNOWLEDGEMENTS

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The input and output subroutines for program COYIELD were based on similar routines developed by Quang V. Cao (Cao et al. 1982) for program WTHIN. His contribution is appreciated.

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## ABSTRACT

Data from plots established in unthinned loblolly pine plantations on cutover site-prepared lands were used to develop size class distribution and yield predictions. The data come from plantations of loblolly pine established over much of its natural range and represent a wide variety of stand conditions and site-preparation treatments. A three parameter Weibull density function was used to model diameter distributions, and a computer program, COYIELD, was developed to predict yields from stand attributes. The predicted yields should satisfactorily represent many sites in the Piedmont and Coastal Plain regions of the Southern United States.

## TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES	v
LIST OF FIGURES	vi
INTRODUCTION	1
BACKGROUND	1
DATA	2
DEVELOPING THE MODEL	10
Input	10
Site Index	10
Mortality	13
Diameter Distribution	13
Height-Diameter Relationships	15
Output	15
APPLYING THE MODEL	18
EVALUATION AND DISCUSSION	21
LITERATURE CITED	31
APPENDICES	33

## LIST OF TABLES

<u>Table</u>	<u>Page</u>
1	Summary of plot locations by state and physiographic region. <span style="float: right;">5</span>
2	Summary of planting methods, site preparation and intermediate treatments by physiographic region for 186 locations. <span style="float: right;">6</span>
3	Summary statistics for the 186 analysis plots. <span style="float: right;">7</span>
4	Classification of 186 analysis plots by age, site index, basal area and number of trees per acre of planted loblolly pine. <span style="float: right;">8</span>
5	Volume and weight prediction equations for unthinned loblolly pine plantations. <span style="float: right;">17</span>
6	Mean and standard deviation of residual values using data from 79 plots on cutover site-prepared plantations in the Carolinas, Alabama, Mississippi and Texas. <span style="float: right;">24</span>
7	Comparison of total basal area (sq ft/ac) of planted loblolly pine from COYIELD, Clutter <u>et al.</u> (1984) and Feduccia <u>et al.</u> (1979). <span style="float: right;">25</span>
8	Comparison of total cubic-foot yields of planted loblolly pine for the 5-in class and above to a 4-in top diameter outside bark for COYIELD, Clutter <u>et al.</u> (1984) and Feduccia <u>et al.</u> (1979). <span style="float: right;">28</span>

## LIST OF FIGURES

<u>Figure</u>		<u>Page</u>
1	Map of 13 states showing the location of sample plots by county. Each darkened county contains one or more plot installations.	4
2	Site index curves developed using data from Coastal Plain and Piedmont sites for cutover site-prepared loblolly pine plantations.	12
3	Mean annual increment in total cubic feet per acre by site index 50, 60, 70, and 80 for 600 and 900 planted loblolly pine per acre.	23

## INTRODUCTION

During the 1950's and early 1960's, most of the loblolly pine plantations in the South were established on abandoned agricultural lands. Growth and yield relationships for these sites have been thoroughly researched and a number of yield prediction systems for them exist (Burkhart et al. 1981). Since then, the majority of plantations have been established on cutover sites receiving some type of site preparation treatment prior to planting. In order to effectively manage these lands, estimates of yields for various product objectives are needed.

The purpose of this study was to develop a size-class distribution model to predict yields of unthinned loblolly pine plantations on cutover site-prepared lands. The model presented here, program COYIELD, should provide satisfactory yield estimates for many different stand conditions over much of the natural range of loblolly pine. Versions of COYIELD were developed in FORTRAN for mainframe computers and in BASIC for the IBM Personal Computer.

## BACKGROUND

Yield models developed for cutover, site-prepared lands have been few due primarily to a scarcity of data. Feduccia et al. (1979) published a diameter distribution model for predicting yields in unthinned loblolly pine plantations on cutover sites in the West Gulf Coastal Plain. Clutter et al. (1984) developed a similar model based on data from the lower Coastal Plain areas of North Carolina, South Carolina and Georgia. These studies included data from a rather limited portion of the natural loblolly range.

Using the region-wide data discussed here, Burkhart et al. (1984) applied multiple regression techniques to predict total yield of the planted pine from stand variables such as age, average height of the dominant and codominant trees and surviving number of loblolly pine per acre. In their analysis, they found that variables describing the planted pine component of a stand were sufficient for predicting the yield of the planted pine, except at relatively high levels of hardwood competition. For these data, inclusion of variables describing the hardwood overstory and/or understory did not significantly improve prediction. In addition, a single yield equation and survival



equation were found to be adequate for all site preparation methods and physiographic regions. Further, the height of dominants and codominants versus age relationship was found to be similar for different site preparation treatments within the Coastal Plain and Piedmont regions but was significantly different between them. Clutter et al. (1976) found similar results in their analysis of relationships in slash pine plantations on site-prepared areas.

These findings suggest that stand age, average height of dominant and codominant trees and the number of planted pine surviving are adequate for predicting yields of the planted pine. (In the data used to develop program COYIELD, the percent of total basal area in the main canopy in hardwoods ranged from 0 to 27.8 and averaged 4.8.) They also imply separate coefficients for different site preparation treatments and geographic locations are not necessary. Program COYIELD was developed in light of these findings and produces yield estimates which represent a broad range of stand conditions and geographic localities.

#### DATA

Data for this study came from 186 plantations in which plots were established during the 1980-1981 and 1981-1982 dormant seasons. Initial measurement data from these plots were used for this study. Figure 1 and Tables 1 and 2 summarize the location and type of site preparation treatment information for these stands.

To be included in the sample, the plantations had to be at least eight years in age (defined as years since planting), unthinned, free of evidence of heavy disease or insect attack, not heavily damaged by ice or wind storms, free of interplanting, unpruned, not fertilized within the last four years, not planted with genetically improved stock, contain a minimum of 200-300 planted pine stems per acre that appear "free to grow", not more than 25 percent of the main canopy composed of volunteer pines, and established on a cutover area that received "typical" site preparation treatment for the site conditions and time at which the plantation was established.

In each stand, a set of three comparable, but not necessarily contiguous, plots was established. To be judged "comparable" the maximum spread in site index could not exceed

five feet (25-year base). Initial stocking was considered comparable if the maximum spread in trees per acre did not exceed 100 and the range in basal area did not exceed 20 square feet per acre for the three plots. The three plots were combined to form one analysis plot approximately 0.5 acres in size. Tables 3 and 4 provide a summary of the range of stand attributes in the data for these analysis plots.

General information collected for each plot included the type of site preparation, whether or not fertilized or released, age since planting and, in some cases, the number of trees planted.

The data recorded from all planted pine included dbh to the nearest 0.1 inch, total height to the nearest foot, height to the base of the live crown, crown class and stem quality assessment. A total of 56,989 planted pine was available for analysis.

The model presented here was developed using the initial measurements from a large, region-wide data set. Some components of the model come from the literature. Once remeasurement data become available, the model will be validated and, if necessary, modified and refined.

The next section of this report is a technical discussion of each component of COYIELD and may be skipped by those interested only in using the model.

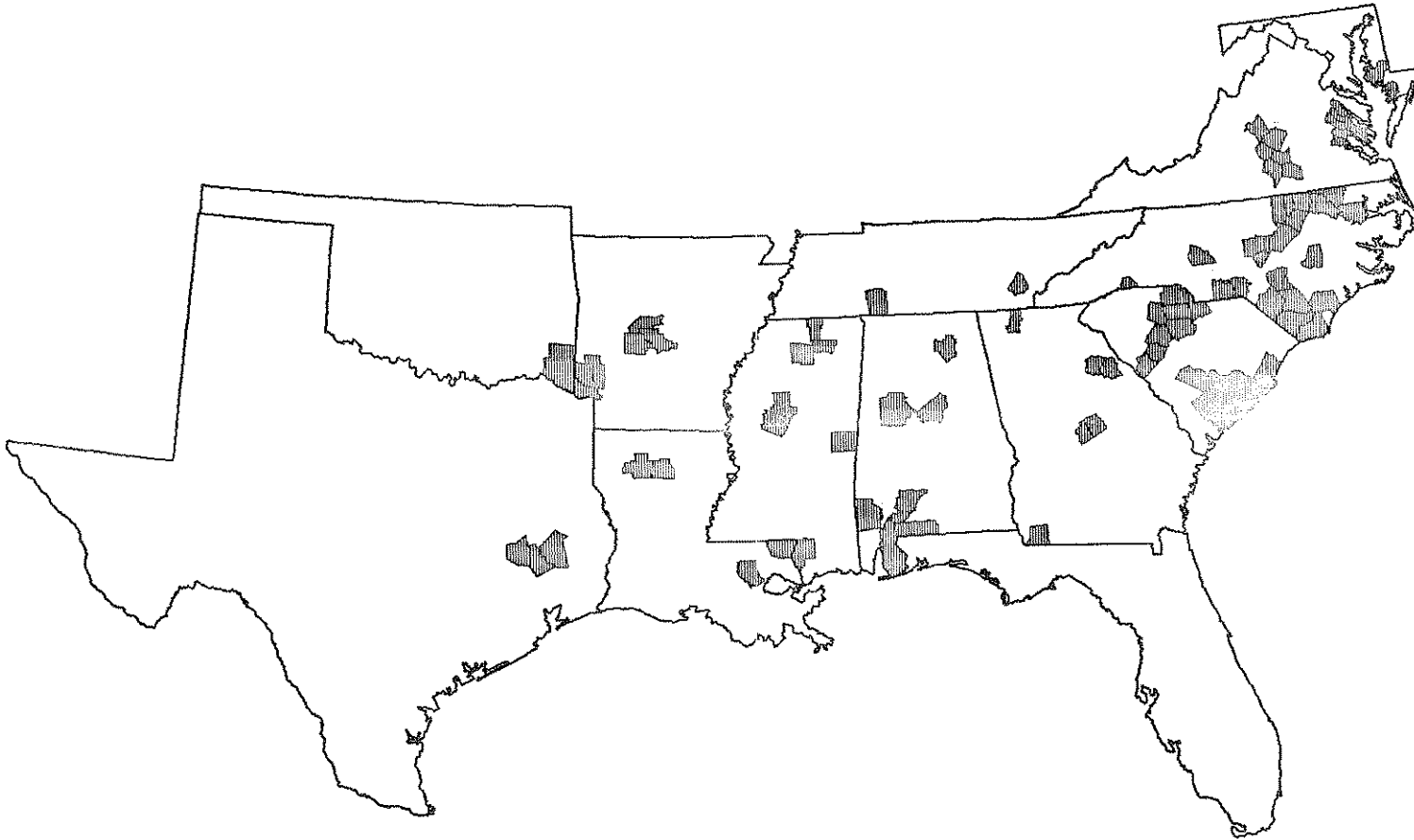


Figure 1. Map of 13 states showing the location of sample plots by county. Each darkened county contains one or more plot installations.

Table 1. Summary of Plot Locations by State and Physiographic Region.

State	Physiographic Region			Total
	Coastal Plain	Piedmont	Other	
Alabama	13	1	-	14
Arkansas	1	-	9	10
Georgia	7	8	-	15
Louisiana	23	-	-	23
Maryland	3	-	-	3
Mississippi	13	-	-	13
North Carolina	17	19	-	36
Oklahoma	-	-	1	1
South Carolina	10	11	-	21
Tennessee	1	2	3	6
Texas	6	-	-	6
Virginia	<u>11</u>	<u>27</u>	<u>-</u>	<u>38</u>
TOTAL	105	68	13	186

Table 2. Summary of planting methods, site preparation and intermediate treatments by physiographic region for 186 locations.

Planting Method	Site Preparation and Intermediate Treatments										
	Burn	Chop	Drain	Bed	Shear	Disc	Windrow	Spray	Other	Release	Fert.
Coastal Plain											
Hand	40	24	6	13	10	9	14		7	12	5
Machine	27	15		2	8	10	8		4	20	
Combina- tion	2	1			1	1	1		1	2	
Piedmont											
Hand	22	8			11	12	22	4	14	9	
Machine	10	5			8	10	11	1	1	4	
Combina- tion	1								1	1	
Other											
Hand											
Machine	8				10		10		1	8	
Combina- tion	1				1	2	1	2	1	2	
TOTAL	111	53	6	15	49	44	67	7	30	58	5

Table 3. Summary statistics for the 186 analysis plots.

Variable	Minimum	Mean	Maximum
Age	8	15.2	25
Number of planted loblolly surviving (tr/ac)	275	558	950
Arithmetic mean dbh of planted loblolly (in.)	2.7	5.7	9.4
Planted loblolly basal area (sq ft/ac)	22.9	105.1	230.9
Volume outside bark of planted loblolly (cu ft/ac)	229.3	2125.2	7589.2
Site index (ft, base age 25) <sup>a/</sup>	33.5	62.8	97.3

<sup>a/</sup> Computed using equation from Amateis and Burkhart (1984) with coefficients from combined Coastal Plain and Piedmont data.

Table 4. Classification of 186 analysis plots by age, site index, basal area and number of trees per acre of planted loblolly pine.

Age	Site <sup>a/</sup> Index	Basal Area (sq. ft./acre)	Number Trees Surviving Per Acre				Total
			0-300	301-500	501-700	701+	
8-12	33-55	0-75	1	4	7	3	15
		76-125					0
		126-175					0
		176-225					0
		Total	1	4	7	3	15
8-12	56-65	0-75		6	7		13
		76-125		2	7	1	10
		126-175					0
		176-225					0
		Total	0	8	14	1	23
8-12	66-75	0-75		4	1	1	6
		76-125		1	8		9
		126-175					0
		176-225					0
		Total	0	5	9	1	15
8-12	76+	0-75		2	1		3
		76-125		1	2		3
		126-175					0
		176-225					0
		Total	0	3	3	0	6
13-17	33-55	0-75		1	3		4
		76-125		2	5	4	11
		126-175				1	1
		176-225					0
		Total	0	3	8	5	16
13-17	56-65	0-75					0
		76-125		2	14	1	17
		126-175			2	2	4
		176-225					0
		Total	0	2	16	3	21

<sup>a/</sup> Computed using equations from Amateis and Burkhart (1984) with coefficients from combined Coastal Plain and Piedmont data.

Table 4. (Continued)

Age	Site <sup>a/</sup> Index	Basal Area (sq. ft./acre)	Number of Trees Surviving Per Acre				Total
			0-300	301-500	501-700	701+	
13-17	66-75	0-75		1			1
		76-125		2	6	1	9
		126-175		3	3	1	7
		176-225					0
		Total	0	6	9	2	17
13-17	76+	0-75					0
		76-125		2	1		3
		126-175		4	2	1	7
		176-225					0
		Total	0	6	3	1	10
18-25	33-55	0-75		1			1
		76-125		3	7		10
		126-175			5	1	6
		176-225					0
		Total	0	4	12	1	17
18-25	56-65	0-75					0
		76-125		6	4		10
		126-175		1	12	3	16
		176-225					0
		Total	0	7	16	3	26
18-25	66-75	0-75					0
		76-125		1	1		2
		126-175		6	5		11
		176-225					0
		Total	0	7	6	0	13
18-25	76+	0-75					0
		76-125					0
		126-175		4			4
		176-225		2	1		3
		Total	0	6	1	0	7

<sup>a/</sup> Computed using equation from Amateis and Burkhardt (1984) with coefficients from combined Coastal Plain and Piedmont data.



## DEVELOPING THE MODEL

Six components were integrated into a computer program called COYIELD, which was written in standard FORTRAN and IBM BASIC for predicting yields of unthinned loblolly pine plantations. The six components include input, site index, mortality, diameter distribution, height-diameter curve and output. COYIELD will project a stand through time from any point in the rotation. The FORTRAN version will also produce stand and stock tables for various combinations of age, site index and number of trees planted per acre. Following is a discussion of each component in the model.

Input

Input to the FORTRAN version of program COYIELD comes through one of two subroutines (Appendix 1a). Subroutine INPUT1 reads the necessary information for projecting a stand. Projection can be made starting at age 0 or at any point in the rotation using either number of pines planted or number surviving. Appendices 1b and 1c list the variables and associated formats for INPUT1. The BASIC version is interactive and prompts the user for the appropriate inputs.

Subroutine INPUT2 (FORTRAN version only) reads information for producing stand and stock tables for various combinations of age, site index and number of trees. Appendix 1d lists the variables and associated formats for INPUT2.

The user also has the option to specify a merchantability limit based on top diameter outside bark and diameter class limit, to print a title with the output, and to select between Coastal Plain, Piedmont or combined site index equation coefficients.

Site Index

The site index equation used in COYIELD is based on stem analysis data of dominant and codominant trees from the 186 plots used in this study (Amateis and Burkhart, 1984). In COYIELD, average height of dominant and codominant trees is predicted from equation (1) in subroutine HEIGHT

$$\ln(Hd) = \ln(S) \left( \frac{1/A}{(1/25)} \right)^{b_1} e^{b_2 (1/A - 1/25)} \quad (1)$$

where Hd = average height of dominant and codominant trees (feet)  
S = site index in feet (25-year base)

A = plantation age in years  
 ln = natural logarithm  
 e = base of the natural logarithm  
 $b_1, b_2$  = coefficients corresponding to Coastal Plain,  
 Piedmont or combined data for equation (1);  
 values of which are shown below.

	$b_1$	$b_2$
Combined Coastal Plain and Piedmont	-0.10283	-2.1676
Coastal Plain	-0.11092	-1.9036
Piedmont	-0.08596	-2.6055

Selection of the value for variable ISITE (Appendix 1b) in the input determines which set of coefficients,  $b_1, b_2$  is used in the model

ISITE = 1 - Combined Coastal Plain and Piedmont  
           coefficients  
           = 2 - Coastal Plain coefficients  
           = 3 - Piedmont coefficients

Evaluation of the three sets of coefficients suggests there is often little practical difference between them above age 15. Thus, for many purposes, it may be satisfactory to use the combined Coastal Plain and Piedmont coefficients. Figure 2 shows the relationship between curves for the Coastal Plain and the Piedmont for site index values of 50, 60, and 70.

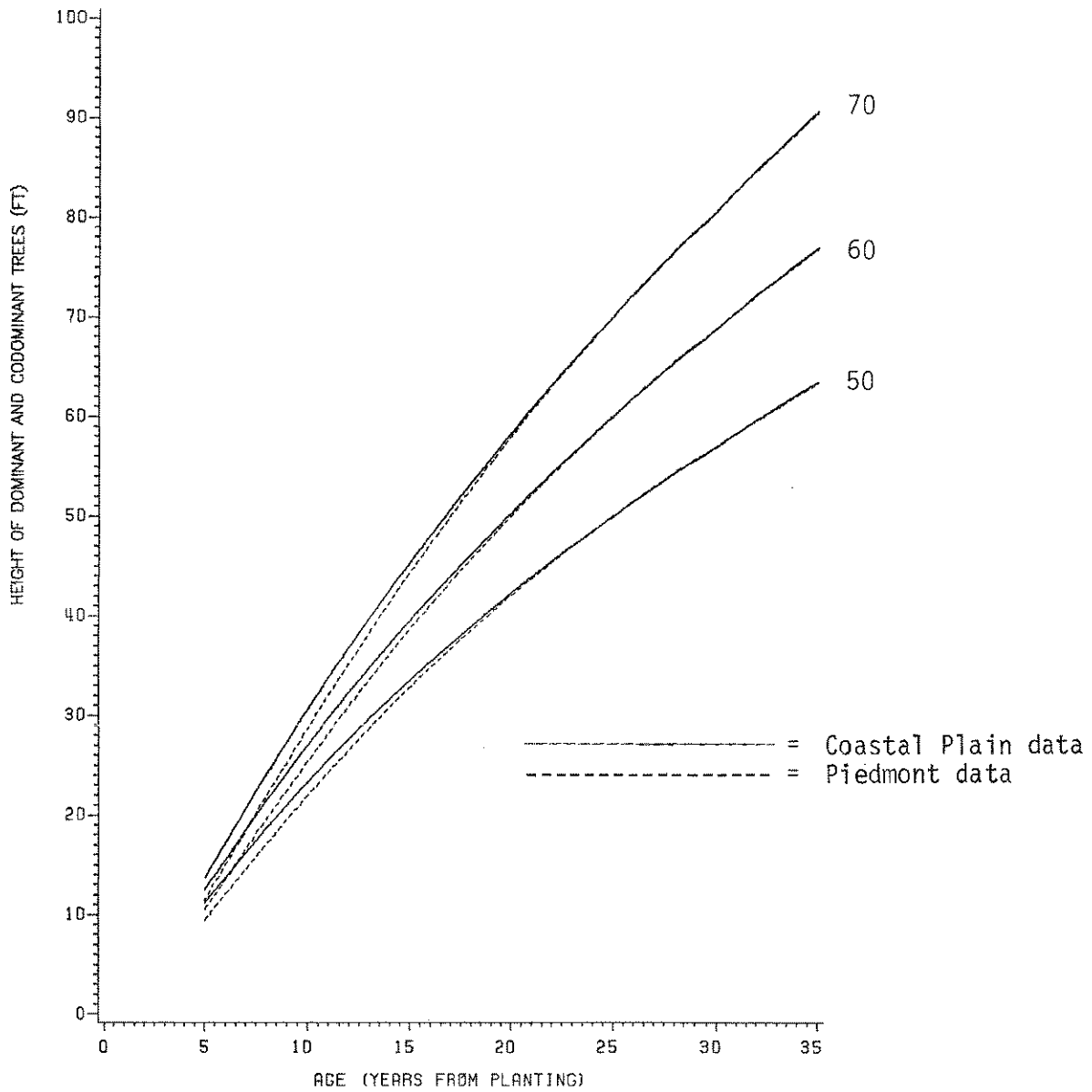


Figure 2. Site index curves developed using data from Coastal Plain and Piedmont sites for cutover, site prepared loblolly pine plantations.

## Mortality

Since remeasurement data were not available to develop a survival equation for these stands, a number of published equations were evaluated using the 75 plots which had an estimate of the number of trees planted at stand establishment. The equations considered were Coile and Schumacher (1964), Feduccia *et al.* (1979), Lenhart (1972), Lenhart and Clutter (1971), Smalley and Bailey (1974) and Clutter *et al.* (1984). From the number of trees planted, a predicted number of trees surviving at the time of plot establishment was obtained from each equation. Predicted and observed surviving number of trees were compared. Of the equations tested, the Feduccia *et al.* (1979) equation

$$\log(N_p/N_s) = A(0.01348 \log(N_p) + 0.0006078 H_d - 0.008412 \sqrt{H_d})$$

where  $N_p$  = number of pines planted (trees/ac)  
 $N_s$  = number of pine surviving (trees/ac)  
 $A$  = age (years from planting)  
 $H_d$  = average height of dominant and codominant pine (ft)  
 $\log$  = logarithm base 10

produced the smallest mean and mean absolute residuals. Examination of residual plots suggests that this equation performs satisfactorily for most combinations of  $A$ ,  $N_p$ , and  $H_d$ . Also, trends in the residuals were not evident across site preparation treatment and geographic or physiographic locality.

## Diameter Distribution

The three-parameter Weibull probability density function given below was used to approximate the diameter distribution.

$$f(x) = (c/b) [(x-a)/b]^{c-1} e^{-[(x-a)/b]^c}$$

where  $a$  = location parameter  
 $b$  = scale parameter  
 $c$  = shape parameter  
 $x$  = diameter random variable.  
 $a, b, c > 0$   
 $x > a$

The location parameter,  $a$  was obtained by determining the maximum likelihood estimate for  $a$  for each plot. These estimates were then regressed on stand characteristics to develop a suitable prediction equation. The scale and shape parameters,  $b$  and  $c$  were predicted according to procedures discussed by Bailey *et al.* (1982) for site-prepared slash pine plantations.

Given the Weibull cumulative distribution function,

$$F(x) = 1 - e^{-[(x-a)/b]^c} \quad (2)$$

where  $F(x)$  = the proportion of trees per acre having diameters less than or equal to  $x$ , and  $a, b, c$  are as defined previously,

an equation for the  $p$ th percentile,  $X_p$ , in terms of  $p$ , which is the proportion of trees having diameters less than  $X_p$ , and the Weibull parameters,  $a, b, c$  is obtained from (2) as,

$$X_p = a + b(-\ln(1-p))^{(1/c)} \quad (3)$$

With the following fitted prediction equations for  $a$ , and the 50th and 95th percentiles,  $X_{50}$  and  $X_{95}$  respectively, the system of three equations with three unknowns can be solved to obtain estimates of the parameters,  $a, b$ , and  $c$ .

$$a = -0.982644 + 0.073765Hd - 0.379953Hd/A$$

$$R^2 = 0.4778 \quad S_{y.x} = 0.8524$$

$$X_{50} = 12.44178 - 0.04491A + 0.067869Hd - 42.8976/Hd$$

$$- 1.19984 \ln(N)$$

$$R^2 = 0.8918 \quad S_{y.x} = 0.3940$$

$$X_{95} = 16.04111 + 0.00868A + 0.093124Hd - 43.7693/Hd$$

$$- 1.72270 \ln(N)$$

$$R^2 = 0.9201 \quad S_{y.x} = 0.4898$$

where  $A$  = age (years from planting)  
 $Hd$  = average height of dominant and codominant pine (ft)  
 $N$  = number of pine surviving (trees/ac)

Given  $a$ ,  $X_{50}$  and  $X_{95}$ , and equation (3), estimates of  $b$  and  $c$  are calculated by

$$\hat{b} = (\hat{x}_{95} - \hat{a}) / [(2.99573)^{(1/\hat{c})}]$$

$$\hat{c} = 1.4637 / \ln [(\hat{x}_{95} - \hat{a}) / (\hat{x}_{50} - \hat{a})]$$

Subroutine YIELD uses these equations to generate the diameter distribution.

### Height-Diameter Relationships

A number of different models for predicting average total tree height by diameter class were examined including equation forms presented by Feduccia *et al.* (1979), Bennett and Clutter (1968), Burkhardt and Strub (1974) and Lenhart (1968). These models were fitted to the 56,989 planted loblolly pine in the data and the resulting equations were evaluated on fit, predictive ability and exhibition of logical trends. The following model from Lenhart (1968) fitted to the combined data

$$\log(H_d/H_i) = -0.0400 + (1/D_i - 1/D_{max})(0.4284 - 0.4975 \log(T_s) + 0.3638/A + 1.0954 \log(H_d)) \quad (4)$$

$$R^2 = 0.65 \quad S_{y.x} = 0.041$$

where

- log = logarithm base 10
- H<sub>d</sub> = average height of the dominant and codominant pine (ft)
- H<sub>i</sub> = total height of tree i (ft)
- D<sub>i</sub> = diameter at breast height of tree i (in)
- D<sub>max</sub> = tree of largest dbh in the stand (in)
- T<sub>s</sub> = number of pine surviving (trees/ac)
- A = age (years from planting)

had similar  $R^2$ , MSE and PRESS statistics and exhibited better behavior at the small diameter classes than other models. Consequently, equation (4) was accepted for predicting heights for given dbh values.

### Output

Subroutine OUTPUT prints stand and stock tables. Listed at the top of each table are the input values of site index, stand age and number of trees planted per acre. Immediately opposite are predicted values of average height of dominant and codominant trees, and arithmetic and quadratic mean dbh. Predicted for each diameter class on a per acre basis are number of trees surviving, basal area, total cubic-foot volume outside and inside bark, merchantable cubic-foot volume outside and inside bark and cord volume outside bark to a 4-inch top o.b. Average tree height by diameter class is also predicted. Stand totals appear beneath each column. When particular combinations of input variables produce illogical values of the Weibull parameters,  $b$  and  $c$ , a

note is printed and execution continues to the next decision period.

Cubic foot volumes are computed using the total and merchantable cubic-foot volume equations presented by Burkhart (1977).

$$TVOB = 0.34864 + 0.00232D^2H$$

$$TVIB = 0.11691 + 0.00185D^2H$$

$$MVOB = TVOB(1 - 0.32354(T^{3.1579}/D^{2.7115}))$$

where TVOB = total volume outside bark (cu ft)  
 TVIB = total volume inside bark (cu ft)  
 MVOB = merchantable volume outside bark (cu ft)  
 D = dbh (in)  
 H = total tree height (ft)  
 T = top diameter outside bark merchantability  
 limit (in).

Cord volumes by diameter class are predicted from conversion factors suggested by Burkhart et al. (1972) for old-field loblolly pine plantations.

Any volume or weight equations based on dbh and total tree height can be substituted for the equations presented here. Table 5 lists a few of the many alternative equations for predicting various types of product volumes or weights.

Table 5. Volume and weight prediction equations for unthinned loblolly pine plantations.

Reference	Equation <sup>1/</sup>	Specifications	
		Size Limit	Site Type
----- Board Feet -----			
Burkhart <u>et al.</u> (1972)	$BF_I = -23.67532 + 0.01102 D^2 H$	6-in. top dib	old-field
Burkhart (unpublished)	$BF_D = 3.2492 + 0.00003386(D^2 H)^{1.5651}$	6-in. top dib (included one bark).	old-field
Saucier <u>et al.</u> (1981)	$BF_S = -52.0724 + 0.01388 D^2 H$	7-in. top dob	old-field
----- Cords -----			
Coile and Schumacher (1964)	$C = \frac{VOB}{92}$		
----- Weight -----			
Clutter <u>et al.</u> (1984)	$GW = 0.13328D^{1.9159}H^{1.0481}$		cutover
	$DW = 0.02893D^{1.8721}H^{1.2273}$		cutover
	$GW_T = GW(1 - 0.4819T^{3.3208}D^{-3.0622})$		cutover
	$DW_T = DW(1 - 0.4868T^{3.5503}D^{-3.3322})$		cutover
----- Cubic-Foot Volume -----			
Clutter <u>et al.</u> (1984)	$VOB = 0.0039557D^{1.8945}H^{0.9288}$		cutover
	$VIB = 0.0014821D^{1.9229}H^{1.1105}$		cutover
	$VOB_T = VOB(1 - 0.4724T^{3.3559}D^{-3.1135})$		cutover
	$VIB_T = VIB(1 - 0.5694T^{3.4304}D^{-3.2395})$		cutover
Van Deusen (1979)	$VOB = 0.1365 + 0.0024437 D^2 H$		old-field
	$VIB = 0.00296 + 0.00193881 D^2 H$		old-field
	$VOB_T = VOB(e^{-1.3974(\frac{T}{D})^{4.2529}})$		old-field
	$VIB_T = VIB(e^{-1.4968(\frac{T}{D})^{4.2579}})$		old-field

- 1/  $BF_I$  = Board feet International 1/4-in.       $H$  = Total tree height (ft)  
 $BF_D$  = Board feet Doyle       $T$  = Top diameter outside bark merchantability limit (in.)  
 $BF_S$  = Board feet Scribner       $C$  = Volume in standard cords  
 $GW$  = Total green weight (lbs)       $VOB$  = Volume outside bark (cu ft)  
 $DW$  = Total dry weight (lbs)       $VIB$  = Volume inside bark (cu ft)  
 $GW_T$  = Merchantable green weight (lbs)       $VOB_T$  = Merchantable volume outside bark (cu ft)  
 $DW_T$  = Merchantable dry weight (lbs)       $VIB_T$  = Merchantable volume inside bark (cu ft)  
 $D$  = Diameter breast height (in.)



## APPLYING THE MODEL

To use COYIELD, three stand characteristics must be specified; they are stand age (years since planting), site index (base age 25) and the number of trees planted or surviving per acre. The remaining input variables are decisions or judgements made by the user. The following is a step-by-step example of how to apply the model using the FORTRAN batch version. The BASIC version is interactive and prompts the user for the necessary inputs.

Example 1

Suppose a land manager has a tract of land where the timber has been cut and the land site-prepared using some site-preparation technique common to the locality. He would like to use COYIELD to obtain predicted yields for the land at specified ages. He knows the productivity of the land is average and estimates the site index at 60 feet (base age 25). Seven hundred trees per acre will be planted. Wood volume above a 4-inch top diameter outside bark is considered unmerchantable as are trees below 5 inches in dbh. He would like predicted yields at two points in time, ages 10 and 25.

Step 1.

Since stand projection is desired, a "1" is typed in column 1 of the first data card (see Appendix 1a).

Step 2.

The next data card is the stand description card for subprogram INPUT1 (see Appendix 1b). The site index (60 feet) is typed in columns 2-3; the stand age (in this case 0) is entered in column 6; the number of planted loblolly pine per acre (700) is entered in columns 8-10. A "0" is typed in column 12 since the age is 0 and thus the number of trees entered in columns 8-10 is the number planted. (For ages other than 0 either the number of trees planted or the number surviving can be used when making projections.) A "4" is entered in column 14 for the top limit and a "5" is entered in column 16 for the merchantable diameter class limit. The manager decides that combined Coastal Plain and Piedmont coefficients for the site index equation will be satisfactory so a "1" is punched in column 18. Since yield tables are desired for ages 10 and 25, two decision cards will be necessary and thus a "2" is entered in column 20. He wants to

put the title STAND PROJECTION -- EXAMPLE on each yield table so a "1" is typed in column 22. No other stand is to be projected so a "0" is entered in column 24.

### Step 3

The title card is entered next with the heading STAND PROJECTION -- EXAMPLE typed in any column.

### Step 4

The last step is to punch the two decision cards to obtain output at ages 10 and 25 (Appendix 1c). For the first decision card, a "10" is typed in columns 2-3; for the second decision card, a "25" is typed in columns 2-3.

The input and output for this stand projection example is given in Appendix 2a.

### Example 2

Stand and stock tables for various combinations of age, site index and number of trees planted per acre can be generated using the FORTRAN version of program COYIELD. For example, suppose a manager desires a range of stand and stock tables for site index classes 50, 60, and 70 feet. The number of trees planted per acre on each site is 600, 700, 800, and 900. Ages at which output is desired are 10, 15, 20, 25, and 30.

#### Step 1.

Since stand and stock tables are desired, a "2" is typed in column 1 of the first data card (see Appendix 1a).

#### Step2.

The next data card to be entered is the stand description card for subprogram INPUT2 (see Appendix 1d). The first site index value, 50, is typed in columns 3-4. The last site index value, 70, is typed in columns 7-8. The increment value for site index, which in this case is 10, is typed in columns 11-12. The first age, 10, is typed in columns 15-16. The last age, 30, is typed in columns 19-20. The increment value for age, which is 5,

is typed in column 24. The first number of trees planted per acre is entered in columns 26-28. The last number of trees planted per acre is entered in columns 30-32. The increment value for number of trees planted, which is 100, is entered in columns 34-36. The desired top diameter outside bark merchantability limit is four inches so a "4" is typed in column 39. The threshold diameter class below which all trees are unmerchantable is five so a "5" is typed in column 42. The combined Coastal Plain and Piedmont site index curves are desired so a "1" is entered in column 44. Finally, no title will be printed with each output so a "0" is entered in column 46.

Appendix 2b shows example input using subprogram INPUT2 and the resulting stand and stock tables for various combinations of age, site index and number of surviving planted pine.

The source listings for both the FORTRAN and BASIC versions of program COYIELD are shown in Appendixes 3 and 4.

## EVALUATION AND DISCUSSION

The observed age, site index (combined Coastal Plain and Piedmont coefficients), and trees per acre for the 186 plots were inputted into program COYIELD and basal area and volumes were calculated. The mean residuals (observed minus predicted) for total cubic-foot volume outside bark, total cubic-foot volume inside bark and basal area were 29.4 cu ft, -28.4 cu ft, and -1.5 sq ft, respectively. No significant trends in the residuals were apparent across the range of ages, sites and number of trees surviving per acre. In addition, residual patterns were not observable across state codes, physiographic province or site preparation method.

The number of trees planted and site index for the 75 plots for which an estimate of trees planted existed were inputted into COYIELD and stand projections were made to the age of plot establishment. The average residuals for total volume outside bark, total volume inside bark, basal area and number of trees surviving were 91.5 cu ft, 28.5 cu ft, 2.3 sq ft, and 30.6 trees, respectively.

Stand projection through time for various values of site index and initial number of trees planted produced logical trends in mean annual increment (MAI) culmination. That is, MAI culminated sooner on higher quality sites with greater stocking. Figure 3 illustrates this relationship for site indexes 50, 60, 70 and 80 with 600 and 900 trees per acre planted.

Data from 79 plots in cutover, site-prepared plantations on Champion International lands throughout the Carolinas, Alabama, Mississippi and East Texas were used to validate the separate components of COYIELD and the model as a whole. First, height-age pairs from dominant and codominant stem analysis trees on the plots were used to validate the site index equation. Using the Amateis and Burkhart (1984) site index model with the combined Coastal Plain-Piedmont coefficients, a site index for each tree was determined based on the total height and total age of the tree. This site index value was used to predict heights at each age. A residual (observed minus predicted) height at each age was determined. Second, Smalian's formula was applied to the dominant, codominant and intermediate trees to calculate observed individual tree volumes. Predicted total tree inside and outside bark volumes were calculated using Burkhart's (1977) volume equation. Residual total volume for each tree was determined. Third, using the age, average height of dominant and codominant trees, number of trees surviving and maximum tree diameter for each plot, plus the individual tree heights and diameters, the height prediction equation was evaluated. Predicted total tree

heights were calculated and compared to the observed height. Fourth, in order to validate the Feduccia et al., (1979) survival equation, the number of trees planted was estimated from the planting spacing given in the validation data. This estimate of the number planted was carried forward along the survival curve to the age of plot establishment. The predicted number of surviving trees per acre was then compared to the observed number of trees at the age of plot establishment.

In addition to the individual component evaluations, the entire model (all components combined) was validated using the estimated number of trees planted from the planting spacing and the site index for each plot and projecting each plot to the age of plot measurement. The predicted total basal area and yields (inside and outside bark) were then compared to the observed values at measurement age. Table 6 shows the mean and standard deviation of the residuals for each component of the model and for the entire model. Plots of the residuals failed to show any significant trends across independent variables for any of the components or the entire model.

Cubic-foot volume yields and basal areas for various combinations of age, site index and number of trees surviving were predicted from COYIELD and compared to corresponding predictions from Feduccia et al. (1979) and Clutter et al. (1984). Predictions of basal area and merchantable volume were, in general, less for COYIELD than for either of the other two systems. This is due primarily to the type of data upon which the models were based. Feduccia et al. (1979) used data collected from sites which had been repeatedly burned and grazed and then planted. Clutter et al. (1984) apparently had few nonplanted pines and hardwoods in their data. Many of the plots used to develop COYIELD, however, contained significant numbers of volunteers, which may explain the lower predicted yields from COYIELD. Some of the differences may also be attributed to the fact that different tree volume equations were used in COYIELD than were applied by Feduccia et al. (1979) or Clutter et al. (1984). Tables 7 and 8 summarize these comparisons for various combinations of age, site index and number of trees surviving.

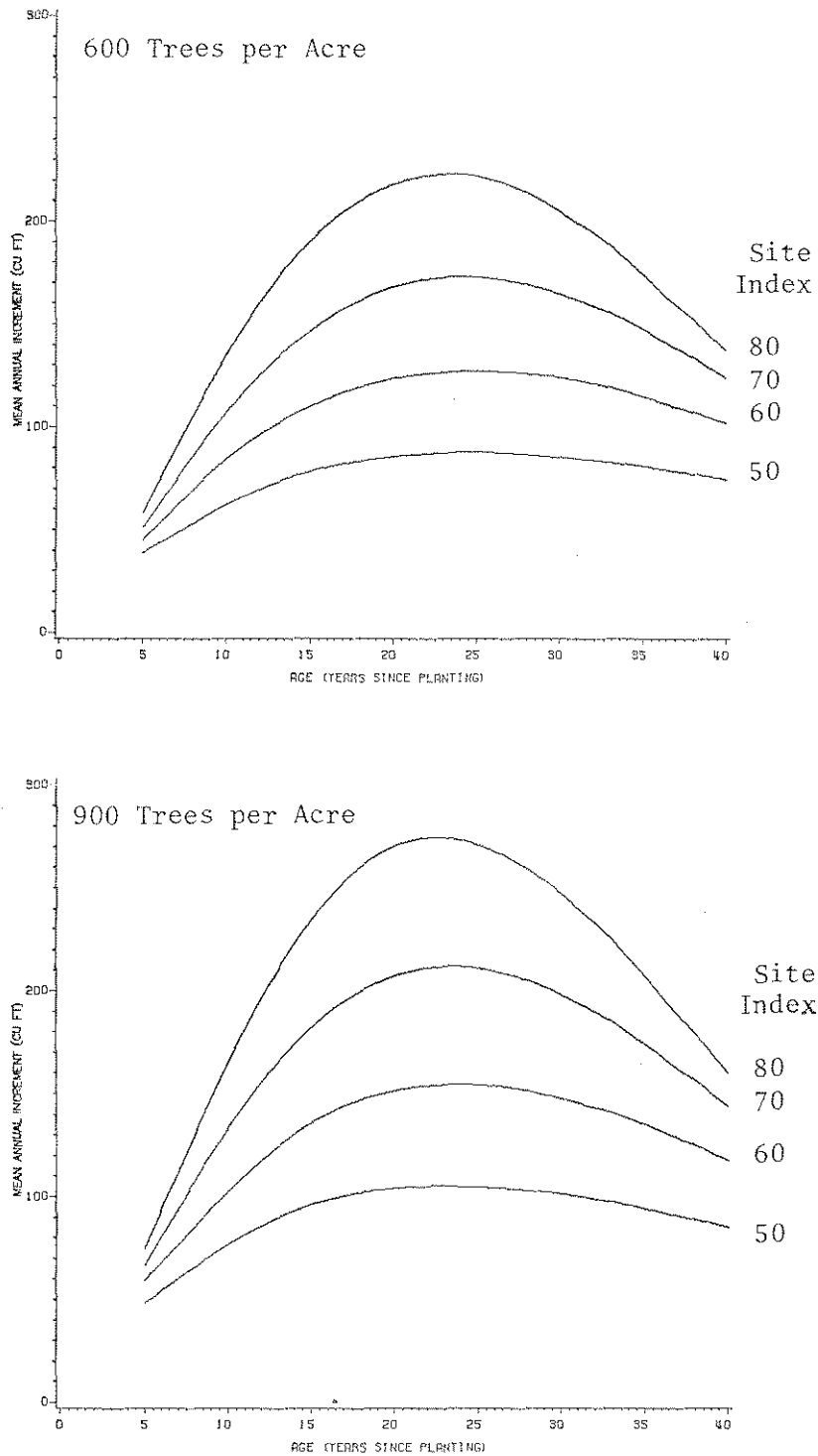


Figure 3. Mean annual increment in total cubic feet per acre for site indexes 50, 60, 70, and 80 with 600 (above) and 900 trees per acre planted.

Table 6. Mean and standard deviation of residuals (observed minus predicted) using data from 79 plots on cutover site-prepared plantations in the Carolinas, Alabama, Mississippi and Texas.

<u>Component Analysis</u>	<u>Variable</u> <sup>1/</sup>	<u>Residual</u> <u>(Observed-Predicted)</u>	
		<u>Mean</u>	<u>Standard Dev.</u>
Site Index Equation	HD	0.4	3.3
Volume Equation	V	0.2	0.9
Height-Diameter Equation	H	0.2	3.9
Mortality Equation	TS	36.6	137.1
 <u>Entire Model Analysis</u>			
Basal Area	BA	-1.4	28.3
Total Yield Outside Bark	TVOB	-48.1	641.6
Total Yield Inside Bark	TVIB	-42.7	526.3

- 1/ HD = average height of dominant and codominant trees (ft)  
V = individual tree volume outside bark (cu ft)  
H = individual tree height (ft)  
TS = number of trees surviving per acre  
BA = basal area (sq ft/ac)  
TVOB = total yield outside bark (cu ft/ac)  
TVIB = total yield inside bark (cu ft/ac)

Table 7. Comparison of predicted total basal area (sq ft /acre) of planted loblolly pine from COYIELD, Clutter *et al.* (1984) and Feduccia *et al.* (1979).

Site Index 50					
	Age	Number of Trees Surviving			
	<u>10</u>	<u>300</u>	<u>400</u>	<u>500</u>	<u>600</u>
Clutter <i>et al.</i>		44.3	49.7	52.5	53.3
Feduccia <i>et al.</i>		----	50.0	52.6	55.0
COYIELD		39.2	45.0	49.6	53.4
	<u>20</u>				
Clutter <i>et al.</i>		81.4	98.3	112.3	123.6
Feduccia <i>et al.</i>		95.2	111.9	125.0	----
COYIELD		74.4	89.3	102.0	113.8
	<u>30</u>				
Clutter <i>et al.</i>		124.7	154.5	180.8	----
Feduccia <i>et al.</i>		124.6	148.8	169.5	189.1
COYIELD		98.2	119.1	138.3	155.9



Table 7. (Continued)

Site Index 60				
Age	Number of Trees Surviving			
	300	400	500	600
<u>10</u>				
Clutter <u>et al.</u>	58.2	67.4	73.5	77.1
Feduccia <u>et al.</u>	----	63.5	68.2	72.1
COYIELD	47.4	55.3	61.7	67.3
<u>20</u>				
Clutter <u>et al.</u>	95.9	117.2	135.2	150.4
Feduccia <u>et al.</u>	111.7	131.8	148.6	----
COYIELD	91.1	110.4	127.4	143.2
<u>30</u>				
Clutter <u>et al.</u>	142.1	177.1	----	----
Feduccia <u>et al.</u>	142.9	170.9	196.6	218.4
COYIELD	123.7	152.3	178.3	201.9

Table 7. (Continued)

Site Index 70					
	Age	Number of Trees Surviving			
		300	400	500	600
	<u>10</u>				
Clutter <u>et al.</u>		70.2	83.1	92.6	99.3
Feduccia <u>et al.</u>		----	76.1	83.2	89.0
COYIELD		55.2	64.8	73.1	80.3
	<u>20</u>				
Clutter <u>et al.</u>		108.1	133.3	155.0	173.9
Feduccia <u>et al.</u>		125.0	149.3	170.2	----
COYIELD		108.2	132.3	153.6	173.7
	<u>30</u>				
Clutter <u>et al.</u>		156.7	196.4	----	----
Feduccia <u>et al.</u>		159.3	191.3	221.0	246.6
COYIELD		151.9	187.7	221.4	252.9

Table 8. Comparison of cubic-foot yields of planted loblolly pine for the 5-inch class and above to a 4-inch top diameter outside bark for COYIELD, Clutter et al. (1984) and Feduccia et al. (1979).

Site Index 50					
	Age	Number of Trees Surviving			
		300	400	500	600
	<u>10</u>				
Clutter <u>et al.</u>		350	341	294	224
Feduccia <u>et al.</u>		---	393	338	280
COYIELD		274	269	241	206
	<u>20</u>				
Clutter <u>et al.</u>		1336	1583	1767	1895
Feduccia <u>et al.</u>		1722	2074	2213	---
COYIELD		1184	1373	1544	1667
	<u>30</u>				
Clutter <u>et al.</u>		2694	3325	3872	---
Feduccia <u>et al.</u>		3001	3474	3906	4262
COYIELD		2139	2571	2932	3248

Table 8. (Continued)

<u>Site Index 60</u>					
	<u>Age</u>	<u>Number of Trees Surviving</u>			
	<u>10</u>	<u>300</u>	<u>400</u>	<u>500</u>	<u>600</u>
Clutter <u>et al.</u>		661	720	726	686
Feduccia <u>et al.</u>		---	681	661	608
COYIELD		434	458	467	448
	<u>20</u>				
Clutter <u>et al.</u>		1926	2329	2651	2906
Feduccia <u>et al.</u>		2585	2984	3285	---
COYIELD		1773	2106	2415	2666
	<u>30</u>				
Clutter <u>et al.</u>		3643	4529	---	---
Feduccia <u>et al.</u>		4170	4874	5573	6034
COYIELD		3256	4076	4717	5364

Table 8. (Continued)

Site Index 70					
	<u>Age</u>	<u>Number of Trees Surviving</u>			
	<u>10</u>	<u>300</u>	<u>400</u>	<u>500</u>	<u>600</u>
Clutter <u>et al.</u>		1019	1166	1248	1272
Feduccia <u>et al.</u>		----	1036	1043	1041
COYIELD		599	672	707	720
	<u>20</u>				
Clutter <u>et al.</u>		2557	3130	3610	4010
Feduccia <u>et al.</u>		3437	3998	4438	----
COYIELD		2491	2995	3473	3875
	<u>30</u>				
Clutter <u>et al.</u>		4636	5802	----	----
Feduccia <u>et al.</u>		5444	6499	7396	8183
COYIELD		4890	6041	7069	8020

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## APPENDICES

<u>Appendix</u>	<u>Page</u>	
1	Input variable formats and descriptions for program COYIELD	
1a.	Subprogram identification card (first card)	34
1b.	Stand description card for subprogram INPUT1	35
1c.	Decision card for subprogram INPUT1	36
1d.	Stand description card for subprogram INPUT2	37
2	Example runs using program COYIELD	
2a.	Sample stand projection	38
2b.	Sample stand and stock table output	40
3	FORTRAN source listing for program COYIELD	53
4	BASIC source listing for program COYIELD	60



Appendix 1a: Input variable format and description for program  
COYIELD -- Subprogram identification card(first  
card).

Column	Format	Variable	Description
1	I1	I PROG	= 1 = Call INPUT1: Stand projection through time
			= 2 = Call INPUT2: Produce stand and stock tables for various combinations of age, site index and number of trees per acre.

Appendix 1b. Input variable formats and descriptions for program COYIELD -  
 - Stand description card for subprogram INPUT1.

Column	Format	Variable	Description
1-3	F3.0	SII	Site index in feet (base age 25 years)
4-6	F3.0	AGE1	Age (years from planting) of the present stand
7-10	F4.0	XN1	Number of loblolly pine per acre
11-12	I2	IPLANT	0 = If AGE1 is 0 or XN1 is the number of trees surviving at AGE1 1 = If AGE1 is other than 0 and XN1 is the number of trees planted (used when the number of trees surviving at a mid-rotation age is not known)
13-14	F3.0	TOP	Top diameter outside bark merchantability limit (in.)
15-16	F3.0	THRES	Diameter class below which all trees are unmerchantable (in.)
17-18	I2	ISITE	Selected site index curves 1 = Combined Coastal Plain and Piedmont coefficients 2 = Coastal Plain coefficients 3 = Piedmont coefficients
19-20	I2	NDEC	Number of decision cards
21-22	I2	IOPT	Optional title card 0 = no title card follows 1 = title card immediately follows
23-24	I2	MORE	Continue with another stand or stop 0 = stop after this stand 1 = another stand follows

Appendix 1C. Input variable formats and description for program  
COYIELD -- Decision card for subprogram INPUT1.

---

Column	Format	Variable	Description
1-3	F3.0	AGE2	Age (years from planting) when the next stand output is desired.

---

Appendix 1d. Input variable formats and description for program  
COYIELD -- Stand description card for subprogram  
INPUT2.

Column	Format	Variable	Description
1-4	I4	ISB	Beginning site index in feet (base age 25)
5-8	I4	ISE	Ending site index
9-12	I4	ISE	Increment for site index
13-16	I4	IAB	Beginning age (years from planting)
17-20	I4	IAE	Ending age
21-24	I4	IAI	Increment for age
25-28	I4	INB	Beginning number of planted trees per acre
29-32	I4	INE	Ending number of planted trees per acre
33-36	I4	INI	Increment for number of planted trees
37-39	F3.0	TOP	Top diameter outside bark merchantability limit (inches)
40-42	F3.0	THRES	Diameter class below which all trees are unmerchantable
43-44	I2	ISITE	Selected site index curve 1 = Combined Coastal Plain and Piedmont coefficients 2 = Coastal Plain coefficients 3 = Piedmont coefficients
45-46	I2	IOPT	Optional title card 0 = no title card follows 1 = title card immediately follows



## Appendix 2a. (continued).

## STAND PROJECTION -- EXAMPLE

INPUTS				PREDICTED				
SITE INDEX = 60.00				AVERAGE HD = 0.0				
AGE = 0.0				ARITH. MEAN DBH = 0.0				
PLANTED TREES = 700.00				QUAD. MEAN DBH = 0.0				
DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4. IN	VOLUME I.B. TO 4. IN	VOLUME (CORDS) TO 4. IN
-----	-----	-----	-----	-----	-----	-----	-----	-----
	0.0		0.0	0.0	0.0	0.0	0.0	0.0

## STAND PROJECTION -- EXAMPLE

INPUTS				PREDICTED				
SITE INDEX = 60.00				AVERAGE HD = 26.36				
AGE = 10.00				ARITH. MEAN DBH = 4.54				
PLANTED TREES = 700.00				QUAD. MEAN DBH = 4.66				
DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4. IN	VOLUME I.B. TO 4. IN	VOLUME (CORDS) TO 4. IN
-----	-----	-----	-----	-----	-----	-----	-----	-----
1	1.0	9.0	0.0	0.4	0.1	0.0	0.0	0.0
2	13.9	17.8	0.3	7.1	3.5	0.0	0.0	0.0
3	67.0	22.3	3.3	54.6	32.7	0.0	0.0	0.0
4	166.8	25.0	14.6	212.9	142.9	0.0	0.0	0.0
5	200.1	26.7	27.3	380.1	270.9	255.4	120.0	4.5
6	84.7	28.0	16.6	227.4	167.7	181.9	114.7	2.7
7	7.6	28.9	2.0	27.6	20.8	24.0	16.7	0.3
-----	-----	-----	-----	-----	-----	-----	-----	-----
	541.0		64.1	910.1	638.5	461.3	251.3	7.5

## STAND PROJECTION -- EXAMPLE

INPUTS				PREDICTED				
SITE INDEX = 60.00				AVERAGE HD = 60.00				
AGE = 25.00				ARITH. MEAN DBH = 7.54				
PLANTED TREES = 700.00				QUAD. MEAN DBH = 7.78				
DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4. IN	VOLUME I.B. TO 4. IN	VOLUME (CORDS) TO 4. IN
-----	-----	-----	-----	-----	-----	-----	-----	-----
3	2.6	35.1	0.1	2.8	1.8	0.0	0.0	0.0
4	16.8	43.0	1.5	32.6	23.3	0.0	0.0	0.0
5	40.1	48.6	5.5	127.0	94.8	85.3	42.0	1.5
6	64.1	52.8	12.6	305.0	232.9	244.0	159.3	3.6
7	78.5	56.0	21.0	526.8	407.5	457.4	327.7	6.1
8	76.4	58.5	26.7	689.8	537.7	626.5	468.2	7.7
9	59.4	60.5	26.3	696.2	545.6	649.8	496.7	7.7
10	36.7	62.2	20.0	542.4	426.6	515.3	399.1	5.9
11	17.8	63.6	11.7	323.8	255.4	311.3	243.1	3.5
12	6.7	64.8	5.2	146.4	115.7	142.0	111.5	1.6
13	1.9	65.8	1.7	49.4	39.1	48.2	38.0	0.5
-----	-----	-----	-----	-----	-----	-----	-----	-----
	401.0		132.3	3442.4	2680.4	3079.8	2285.4	37.9

Appendix 2b. Sample stand and stock table output using program COYIELD for various combinations of age, site index and number of trees planted per acre.

Combinations:

Site index : 50, 60, 70 feet (base age 25).

Stand age : 10, 15, 20, 25, 30 years.

Number trees planted: 600, 700, 800, 900

Other Information:

Top diameter merchantability limit: 4 inches o.b.

Threshold diameter class below which  
no merchantable timber will be  
harvested : 5 inches

Combined Coastal Plain and  
Piedmont site index curves.

No title desired

Card Input:

								1			2			3			4			5				
Column:	1	2	3	4	5	6	7	8	9	0	...	5	...	0	...	5	...	0	...	5	...	0	...	5

2	5	0	7	0	10	10	30	5	600	900	100	4	5	1	0
---	---	---	---	---	----	----	----	---	-----	-----	-----	---	---	---	---

INPUTS  
 SITE INDEX = 50.00  
 AGE = 10.00  
 PLANTED TREES = 600.00  
 PREDICTED  
 AVERAGE HD = 22.78  
 ARITH. MEAN DBH = 4.24  
 QUAD. MEAN DBH = 4.36

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4.1N	VOLUME I.B. TO 4.1N	VOLUME (CORDS) TO 4.1N
1	1.7	8.4	0.0	0.6	0.2	0.0	0.0	0.0
2	19.6	15.9	0.4	9.7	4.6	0.0	0.0	0.0
3	81.9	19.6	4.0	62.1	36.3	0.0	0.0	0.0
4	168.7	21.8	14.7	195.3	128.6	0.0	0.0	0.0
5	150.2	23.2	20.5	254.7	178.9	171.1	79.2	3.0
6	40.3	24.2	7.9	95.7	69.8	76.5	47.7	1.1
7	1.9	25.0	0.5	5.9	4.4	5.1	3.5	0.1
-----			-----					
464.2			48.1	624.0	422.8	252.8	130.5	4.2

INPUTS  
 SITE INDEX = 50.00  
 AGE = 15.00  
 PLANTED TREES = 600.00  
 PREDICTED  
 AVERAGE HD = 33.23  
 ARITH. MEAN DBH = 5.40  
 QUAD. MEAN DBH = 5.56

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4.1N	VOLUME I.B. TO 4.1N	VOLUME (CORDS) TO 4.1N
2	5.8	18.5	0.1	3.0	1.5	0.0	0.0	0.0
3	28.4	24.7	1.4	24.5	15.0	0.0	0.0	0.0
4	73.2	28.6	6.4	103.3	70.6	0.0	0.0	0.0
5	119.4	31.2	16.3	257.7	186.2	173.1	82.5	3.1
6	120.9	33.1	23.7	376.0	280.4	300.8	191.7	4.4
7	68.7	34.5	18.3	293.0	222.6	254.4	179.0	3.4
8	18.7	35.6	6.5	105.4	81.1	95.8	70.6	1.2
9	2.0	36.4	0.9	14.5	11.2	13.5	10.2	0.2
-----			-----					
437.0			73.7	1177.4	868.5	837.6	534.0	12.2

INPUTS  
 SITE INDEX = 50.00  
 AGE = 20.00  
 PLANTED TREES = 600.00  
 PREDICTED  
 AVERAGE HD = 42.15  
 ARITH. MEAN DBH = 6.18  
 QUAD. MEAN DBH = 6.38

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4.1N	VOLUME I.B. TO 4.1N	VOLUME (CORDS) TO 4.1N
2	2.1	19.9	0.0	1.1	0.6	0.0	0.0	0.0
3	15.3	28.1	0.8	14.3	8.9	0.0	0.0	0.0
4	43.0	33.3	3.8	68.2	47.5	0.0	0.0	0.0
5	77.1	36.9	10.5	192.0	140.7	129.0	62.3	2.3
6	97.7	39.6	19.2	356.9	268.9	285.5	183.9	4.2
7	88.2	41.5	23.6	447.0	342.3	388.2	275.3	5.1
8	54.7	43.1	19.1	369.1	285.5	335.2	248.6	4.1
9	22.1	44.3	9.8	192.2	149.7	179.4	136.3	2.1
10	5.5	45.4	3.0	59.5	46.6	56.5	43.6	0.6
11	0.8	46.2	0.5	10.2	8.0	9.8	7.7	0.1
-----			-----					
406.5			90.2	1710.7	1298.6	1383.7	957.5	18.6

INPUTS  
 SITE INDEX = 50.00  
 AGE = 25.00  
 PLANTED TREES = 600.00  
 PREDICTED  
 AVERAGE HD = 50.00  
 ARITH. MEAN DBH = 6.81  
 QUAD. MEAN DBH = 7.04

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4.1N	VOLUME I.B. TO 4.1N	VOLUME (CORDS) TO 4.1N
3	8.6	30.9	0.4	8.6	5.4	0.0	0.0	0.0
4	28.6	37.4	2.5	49.7	35.0	0.0	0.0	0.0
5	54.0	41.9	7.4	150.1	111.0	100.9	49.2	1.8
6	73.6	45.3	14.4	304.0	230.5	243.1	157.6	3.6
7	77.0	47.8	20.6	445.7	343.0	387.0	275.8	5.1
8	62.6	49.8	21.8	484.8	376.5	440.4	327.8	5.4
9	39.1	51.4	17.3	391.8	306.1	365.7	278.7	4.3
10	18.5	52.8	10.1	232.8	182.6	221.1	170.8	2.5
11	6.5	53.9	4.3	100.0	78.7	96.1	74.9	1.1
12	1.6	54.8	1.3	30.4	24.0	29.5	23.1	0.3
-----			-----					
370.1			100.1	2197.8	1692.9	1883.7	1358.0	24.1

INPUTS  
 SITE INDEX = 50.00  
 AGE = 30.00  
 PLANTED TREES = 600.00  
 PREDICTED  
 AVERAGE HD = 57.06  
 ARITH. MEAN DBH = 7.36  
 QUAD. MEAN DBH = 7.63

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4.1N	VOLUME I.B. TO 4.1N	VOLUME (CORDS) TO 4.1N
3	4.0	32.5	0.2	4.1	2.6	0.0	0.0	0.0
4	19.4	40.0	1.7	35.6	25.3	0.0	0.0	0.0
5	39.4	45.4	5.4	117.3	87.2	78.9	38.6	1.4
6	55.9	49.3	11.0	249.8	190.2	199.8	130.1	2.9
7	62.6	52.3	16.7	393.9	304.0	342.0	244.5	4.5
8	57.2	54.7	20.0	484.7	377.3	440.3	328.5	5.4
9	43.3	56.7	19.1	475.7	372.4	444.0	339.0	5.2
10	27.1	58.2	14.8	375.7	295.2	356.9	276.1	4.1
11	14.0	59.6	9.2	239.2	188.5	229.9	179.4	2.6
12	5.9	60.7	4.7	122.5	96.7	118.8	93.2	1.3
13	2.0	61.7	1.9	50.3	39.7	49.0	38.6	0.5
14	0.6	62.6	0.6	16.4	13.0	16.1	12.7	0.2
-----			-----					
331.4			105.2	2565.3	1992.2	2275.6	1680.8	28.1



INPUTS  
 SITE INDEX = 50.00  
 AGE = 10.00  
 PLANTED TREES = 700.00

PREDICTED  
 AVERAGE HD = 22.78  
 ARITH. MEAN DBH = 4.08  
 QUAD. MEAN DBH = 4.19

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4.1N	VOLUME I.B. TO 4.1N	VOLUME (CORDS) TO 4.1N
1	2.2	8.9	0.0	0.8	0.3	0.0	0.0	0.0
2	26.3	16.2	0.6	13.1	6.2	0.0	0.0	0.0
3	109.5	19.9	5.4	83.6	49.0	0.0	0.0	0.0
4	210.3	22.0	18.4	244.7	161.3	0.0	0.0	0.0
5	154.0	23.3	21.0	261.9	184.1	176.0	81.5	3.1
6	27.5	24.3	5.4	65.3	47.7	52.2	32.6	0.8
7	0.6	25.0	0.2	1.8	1.4	1.6	1.1	0.0
	530.4		50.9	671.4	449.9	229.9	115.2	3.9

INPUTS  
 SITE INDEX = 50.00  
 AGE = 15.00  
 PLANTED TREES = 700.00

PREDICTED  
 AVERAGE HD = 33.23  
 ARITH. MEAN DBH = 5.25  
 QUAD. MEAN DBH = 5.41

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4.1N	VOLUME I.B. TO 4.1N	VOLUME (CORDS) TO 4.1N
2	7.4	18.9	0.2	3.9	1.9	0.0	0.0	0.0
3	36.2	25.1	1.8	31.6	19.4	0.0	0.0	0.0
4	92.0	28.8	8.0	130.5	89.3	0.0	0.0	0.0
5	143.7	31.4	19.6	311.6	225.3	209.4	99.8	3.7
6	133.8	33.2	26.3	417.5	311.4	334.0	212.9	4.9
7	65.8	34.5	17.6	281.2	213.6	244.2	171.8	3.2
8	14.3	35.6	5.0	80.5	61.9	73.1	53.9	0.9
9	1.1	36.4	0.5	7.9	6.1	7.3	5.5	0.1
	494.2		78.9	1264.6	928.8	867.9	543.9	12.8

INPUTS  
 SITE INDEX = 50.00  
 AGE = 20.00  
 PLANTED TREES = 700.00

PREDICTED  
 AVERAGE HD = 42.15  
 ARITH. MEAN DBH = 6.04  
 QUAD. MEAN DBH = 6.23

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4.1N	VOLUME I.B. TO 4.1N	VOLUME (CORDS) TO 4.1N
2	2.7	20.8	0.1	1.5	0.7	0.0	0.0	0.0
3	19.0	29.0	0.9	18.1	11.4	0.0	0.0	0.0
4	52.7	34.3	4.6	85.3	59.5	0.0	0.0	0.0
5	92.2	37.8	12.6	234.6	172.2	157.6	76.3	2.8
6	112.7	40.5	22.1	420.0	316.8	336.0	216.6	4.9
7	96.1	42.4	25.7	496.9	380.8	431.4	306.2	5.7
8	55.0	44.0	19.2	378.1	292.6	343.4	254.8	4.2
9	19.9	45.2	8.8	176.1	137.2	164.4	124.9	1.9
10	4.3	46.2	2.3	47.1	36.9	44.7	34.5	0.5
	454.4		96.3	1857.7	1408.1	1477.6	1013.3	20.1

INPUTS  
 SITE INDEX = 50.00  
 AGE = 25.00  
 PLANTED TREES = 700.00

PREDICTED  
 AVERAGE HD = 50.00  
 ARITH. MEAN DBH = 6.68  
 QUAD. MEAN DBH = 6.91

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4.1N	VOLUME I.B. TO 4.1N	VOLUME (CORDS) TO 4.1N
2	0.5	21.5	0.0	0.3	0.2	0.0	0.0	0.0
3	10.5	31.3	0.5	10.5	6.7	0.0	0.0	0.0
4	34.3	37.7	3.0	60.0	42.3	0.0	0.0	0.0
5	63.5	42.2	8.7	177.7	131.4	119.4	58.2	2.1
6	84.6	45.5	16.6	350.8	266.1	280.6	182.0	4.1
7	85.8	48.0	22.9	497.9	383.2	432.3	308.2	5.7
8	66.9	49.9	23.4	519.5	403.4	471.8	351.3	5.8
9	39.7	51.5	17.5	398.3	311.2	371.8	283.3	4.4
10	17.6	52.8	9.6	221.9	174.1	210.8	162.8	2.4
11	5.7	53.9	3.8	88.2	69.4	84.8	66.1	0.9
12	1.3	54.8	1.0	24.5	19.3	23.7	18.6	0.3
	410.6		107.0	2349.5	1807.4	1995.2	1430.5	25.7

INPUTS  
 SITE INDEX = 50.00  
 AGE = 30.00  
 PLANTED TREES = 700.00

PREDICTED  
 AVERAGE HD = 57.06  
 ARITH. MEAN DBH = 7.24  
 QUAD. MEAN DBH = 7.51

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4.1N	VOLUME I.B. TO 4.1N	VOLUME (CORDS) TO 4.1N
3	4.8	33.3	0.2	5.0	3.2	0.0	0.0	0.0
4	22.9	40.9	2.0	42.7	30.4	0.0	0.0	0.0
5	45.6	46.2	6.2	138.2	102.9	92.9	45.6	1.6
6	63.6	50.2	12.5	288.8	220.0	231.0	150.5	3.4
7	69.6	53.2	18.6	445.6	344.1	386.9	276.7	5.1
8	62.1	55.6	21.7	534.2	416.0	485.2	362.2	5.9
9	45.6	57.5	20.1	508.7	398.3	474.8	362.6	5.6
10	27.6	59.1	15.0	387.9	304.9	368.5	285.2	4.2
11	13.7	60.5	9.0	237.4	187.1	228.2	178.1	2.6
12	5.6	61.6	4.4	116.3	91.8	112.7	88.5	1.2
13	1.8	62.6	1.7	45.4	35.9	44.3	34.9	0.5
	362.8		111.5	2750.1	2134.5	2424.4	1784.1	30.2

INPUTS  
 -----  
 SITE INDEX = 50.00  
 AGE = 10.00  
 PLANTED TREES = 800.00  
 PREDICTED  
 -----  
 AVERAGE HD = 22.78  
 ARITH. MEAN DBH = 3.94  
 QUAD. MEAN DBH = 4.05

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4.1N	VOLUME I.B. TO 4.1N	VOLUME (CORDS) TO 4.1N
1	2.8	9.6	0.0	1.1	0.4	0.0	0.0	0.0
2	34.3	17.0	0.7	17.4	8.3	0.0	0.0	0.0
3	141.2	20.6	6.9	110.1	65.0	0.0	0.0	0.0
4	251.0	22.7	21.9	299.1	198.0	0.0	0.0	0.0
5	148.8	24.0	20.3	259.3	182.8	174.3	81.0	3.1
6	17.1	25.0	3.4	41.6	30.4	33.3	20.8	0.5
	595.2		53.2	728.5	485.1	207.6	101.8	3.6

INPUTS  
 -----  
 SITE INDEX = 50.00  
 AGE = 25.00  
 PLANTED TREES = 800.00  
 PREDICTED  
 -----  
 AVERAGE HD = 50.00  
 ARITH. MEAN DBH = 6.58  
 QUAD. MEAN DBH = 6.81

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4.1N	VOLUME I.B. TO 4.1N	VOLUME (CORDS) TO 4.1N
2	0.7	21.9	0.0	0.4	0.2	0.0	0.0	0.0
3	12.5	31.6	0.6	12.6	8.0	0.0	0.0	0.0
4	40.1	38.0	3.5	70.6	49.8	0.0	0.0	0.0
5	73.1	42.4	10.0	205.4	152.0	138.0	67.3	2.4
6	95.3	45.6	18.7	396.4	300.7	317.1	205.7	4.7
7	93.9	48.1	25.1	545.9	420.2	474.0	337.9	6.3
8	70.5	50.0	24.6	548.0	425.6	497.7	370.6	6.1
9	39.9	51.6	17.6	400.3	312.8	373.6	284.7	4.4
10	16.7	52.9	9.1	210.2	164.9	199.7	154.3	2.3
11	5.0	53.9	3.3	77.9	61.3	74.9	58.3	0.8
12	1.1	54.8	0.8	19.9	15.7	19.3	15.1	0.2
	448.7		113.4	2487.5	1911.3	2094.2	1494.0	27.2

INPUTS  
 -----  
 SITE INDEX = 50.00  
 AGE = 15.00  
 PLANTED TREES = 800.00  
 PREDICTED  
 -----  
 AVERAGE HD = 33.23  
 ARITH. MEAN DBH = 5.13  
 QUAD. MEAN DBH = 5.28

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4.1N	VOLUME I.B. TO 4.1N	VOLUME (CORDS) TO 4.1N
2	9.2	19.3	0.2	4.9	2.4	0.0	0.0	0.0
3	44.9	25.4	2.2	39.4	24.2	0.0	0.0	0.0
4	112.0	29.1	9.8	159.8	109.4	0.0	0.0	0.0
5	167.7	31.5	22.9	365.1	264.1	245.4	117.0	4.3
6	143.7	33.3	28.2	449.4	335.3	359.5	229.3	5.3
7	61.1	34.6	16.3	261.8	198.9	227.3	159.9	3.0
8	10.6	35.6	3.7	59.6	45.8	54.1	39.9	0.7
9	0.6	36.4	0.3	4.1	3.2	3.9	2.9	0.0
	549.8		83.5	1344.2	983.3	890.2	549.0	13.4

INPUTS  
 -----  
 SITE INDEX = 50.00  
 AGE = 30.00  
 PLANTED TREES = 800.00  
 PREDICTED  
 -----  
 AVERAGE HD = 57.06  
 ARITH. MEAN DBH = 7.15  
 QUAD. MEAN DBH = 7.41

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4.1N	VOLUME I.B. TO 4.1N	VOLUME (CORDS) TO 4.1N
3	5.6	33.7	0.3	5.9	3.8	0.0	0.0	0.0
4	26.4	41.2	2.3	49.5	35.2	0.0	0.0	0.0
5	51.8	46.5	7.1	157.6	117.3	105.9	52.0	1.9
6	71.0	50.4	13.9	323.5	246.6	258.8	168.6	3.8
7	76.3	53.4	20.4	489.2	377.8	424.7	303.8	5.6
8	66.5	55.7	23.2	572.8	446.1	520.3	388.4	6.4
9	47.5	57.6	21.0	530.6	415.5	495.2	378.2	5.8
10	27.9	59.2	15.2	392.1	308.2	372.5	288.3	4.3
11	13.4	60.5	8.8	231.5	182.5	222.6	173.7	2.5
12	5.2	61.6	4.1	109.0	86.1	105.7	82.9	1.2
13	1.6	62.6	1.5	40.8	32.2	39.8	31.3	0.4
	393.0		117.7	2902.4	2251.1	2545.4	1867.2	31.8

INPUTS  
 -----  
 SITE INDEX = 50.00  
 AGE = 20.00  
 PLANTED TREES = 800.00  
 PREDICTED  
 -----  
 AVERAGE HD = 42.15  
 ARITH. MEAN DBH = 5.93  
 QUAD. MEAN DBH = 6.12

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4.1N	VOLUME I.B. TO 4.1N	VOLUME (CORDS) TO 4.1N
2	3.3	21.2	0.1	1.8	0.9	0.0	0.0	0.0
3	22.9	29.3	1.1	22.0	13.9	0.0	0.0	0.0
4	62.8	34.5	5.5	102.3	71.4	0.0	0.0	0.0
5	107.6	38.0	14.7	274.7	201.8	184.6	89.4	3.3
6	126.9	40.6	24.9	474.3	357.8	379.4	244.7	5.6
7	102.5	42.5	27.4	531.2	407.1	461.2	327.4	6.1
8	54.3	44.0	19.0	373.9	289.4	339.6	252.0	4.2
9	17.7	45.2	7.8	156.7	122.1	146.2	111.1	1.7
10	3.3	46.2	1.8	36.5	28.5	34.6	26.7	0.4
	501.2		102.2	1973.4	1492.9	1545.8	1051.2	21.2

INPUTS				PREDICTED					
DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4. IN	VOLUME I.B. TO 4. IN	VOLUME (CORDS) TO 4. IN	
SITE INDEX = 50.00				AVERAGE HD = 22.78					
AGE = 10.00				ARITH. MEAN DBH = 3.82					
PLANTED TREES = 900.00				QUAD. MEAN DBH = 3.93					
1	3.5	10.0	0.0	1.3	0.5	0.0	0.0	0.0	
2	43.5	17.3	0.9	22.2	10.7	0.0	0.0	0.0	
3	177.0	20.8	8.7	138.6	82.0	0.0	0.0	0.0	
4	289.0	22.8	25.2	345.3	228.8	0.0	0.0	0.0	
5	136.5	24.1	18.6	238.2	168.0	160.1	74.4	2.8	
6	9.7	25.0	1.9	23.7	17.3	19.0	11.9	0.3	
-----			659.2	55.4	769.3	507.3	179.1	86.3	3.1

INPUTS				PREDICTED					
DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4. IN	VOLUME I.B. TO 4. IN	VOLUME (CORDS) TO 4. IN	
SITE INDEX = 50.00				AVERAGE HD = 50.00					
AGE = 25.00				ARITH. MEAN DBH = 6.49					
PLANTED TREES = 900.00				QUAD. MEAN DBH = 6.71					
2	0.8	22.3	0.0	0.4	0.2	0.0	0.0	0.0	
3	14.6	31.9	0.7	14.8	9.4	0.0	0.0	0.0	
4	46.1	38.2	4.0	81.6	57.6	0.0	0.0	0.0	
5	82.8	42.6	11.3	233.3	172.7	156.8	76.5	2.8	
6	105.6	45.8	20.7	440.7	334.4	352.5	228.7	5.2	
7	101.2	48.2	27.1	590.1	454.2	512.4	365.3	6.8	
8	73.4	50.1	25.6	571.4	443.8	518.9	386.4	6.3	
9	39.7	51.6	17.5	399.0	311.8	372.4	283.8	4.4	
10	15.7	52.9	8.6	198.3	155.6	188.4	145.6	2.2	
11	4.4	53.9	2.9	68.8	54.2	66.2	51.6	0.7	
12	0.9	54.8	0.7	16.3	12.8	15.8	12.4	0.2	
-----			485.2	119.2	2614.7	2006.8	2183.4	1550.2	28.5

INPUTS				PREDICTED					
DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4. IN	VOLUME I.B. TO 4. IN	VOLUME (CORDS) TO 4. IN	
SITE INDEX = 50.00				AVERAGE HD = 33.23					
AGE = 15.00				ARITH. MEAN DBH = 5.01					
PLANTED TREES = 900.00				QUAD. MEAN DBH = 5.16					
2	11.2	20.1	0.2	6.0	3.0	0.0	0.0	0.0	
3	54.3	26.2	2.7	48.6	30.0	0.0	0.0	0.0	
4	133.2	29.9	11.6	194.3	133.5	0.0	0.0	0.0	
5	191.2	32.4	26.1	425.5	308.5	285.9	136.6	5.1	
6	150.6	34.1	29.6	481.4	359.6	385.1	245.9	5.7	
7	55.5	35.4	14.8	242.6	184.5	210.7	148.4	2.8	
8	7.6	36.4	2.7	44.0	33.8	39.9	29.5	0.5	
-----			603.6	87.7	1442.4	1053.0	921.6	560.4	14.0

INPUTS				PREDICTED					
DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4. IN	VOLUME I.B. TO 4. IN	VOLUME (CORDS) TO 4. IN	
SITE INDEX = 50.00				AVERAGE HD = 57.06					
AGE = 30.00				ARITH. MEAN DBH = 7.07					
PLANTED TREES = 900.00				QUAD. MEAN DBH = 7.33					
3	6.4	34.0	0.3	6.8	4.4	0.0	0.0	0.0	
4	29.9	41.4	2.6	56.4	40.1	0.0	0.0	0.0	
5	57.9	46.7	7.9	176.9	131.7	118.8	58.3	2.1	
6	78.2	50.5	15.4	357.3	272.3	285.8	186.2	4.2	
7	82.5	53.5	22.0	530.3	409.6	460.5	329.4	6.1	
8	70.4	55.8	24.6	607.6	473.2	551.9	412.0	6.8	
9	49.1	57.7	21.7	548.8	429.8	512.3	391.2	6.0	
10	28.0	59.2	15.3	394.1	309.7	374.3	289.7	4.3	
11	13.0	60.5	8.6	225.3	177.5	216.5	169.0	2.4	
12	4.9	61.6	3.8	102.3	80.8	99.2	77.8	1.1	
13	1.5	62.6	1.4	36.8	29.1	35.9	28.2	0.4	
-----			421.7	123.5	3042.5	2358.2	2655.2	1942.0	33.4

INPUTS				PREDICTED					
DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4. IN	VOLUME I.B. TO 4. IN	VOLUME (CORDS) TO 4. IN	
SITE INDEX = 50.00				AVERAGE HD = 42.15					
AGE = 20.00				ARITH. MEAN DBH = 5.82					
PLANTED TREES = 900.00				QUAD. MEAN DBH = 6.01					
2	3.9	21.6	0.1	2.1	1.1	0.0	0.0	0.0	
3	27.1	29.6	1.3	26.3	16.6	0.0	0.0	0.0	
4	73.3	34.7	6.4	120.1	83.9	0.0	0.0	0.0	
5	123.0	38.2	16.8	315.4	231.7	211.9	102.6	3.8	
6	140.3	40.7	27.5	525.7	396.6	420.5	271.2	6.2	
7	107.6	42.6	28.8	558.7	428.2	485.1	344.3	6.4	
8	53.0	44.1	18.5	365.0	282.6	331.6	246.0	4.1	
9	15.6	45.3	6.9	138.2	107.7	129.0	98.0	1.5	
10	2.5	46.2	1.4	28.2	22.1	26.8	20.6	0.3	
-----			546.4	107.7	2079.7	1570.4	1604.9	1082.9	22.2

INPUTS  
 SITE INDEX = 60.00  
 AGE = 10.00  
 PLANTED TREES = 600.00

PREDICTED  
 AVERAGE HD = 26.36  
 ARITH. MEAN DBH = 4.70  
 QUAD. MEAN DBH = 4.82

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4. IN	VOLUME I.B. TO 4. IN	VOLUME (CORDS) TO 4. IN
1	0.8	8.5	0.0	0.3	0.1	0.0	0.0	0.0
2	10.5	17.4	0.2	5.4	2.6	0.0	0.0	0.0
3	50.3	22.0	2.5	40.7	24.4	0.0	0.0	0.0
4	129.2	24.8	11.3	164.1	110.0	0.0	0.0	0.0
5	173.4	26.6	23.6	328.4	233.9	220.6	103.6	3.9
6	95.0	27.9	18.6	254.7	187.8	203.8	128.5	3.0
7	14.0	28.9	3.8	51.0	38.4	44.3	30.9	0.6
	473.2		60.0	844.6	597.2	468.7	263.0	7.5

INPUTS  
 SITE INDEX = 60.00  
 AGE = 25.00  
 PLANTED TREES = 600.00

PREDICTED  
 AVERAGE HD = 60.00  
 ARITH. MEAN DBH = 7.67  
 QUAD. MEAN DBH = 7.91

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4. IN	VOLUME I.B. TO 4. IN	VOLUME (CORDS) TO 4. IN
3	2.1	34.1	0.1	2.2	1.5	0.0	0.0	0.0
4	13.9	42.1	1.2	26.6	19.0	0.0	0.0	0.0
5	33.8	47.7	4.6	105.2	78.4	70.7	34.7	1.3
6	55.0	51.8	10.8	257.2	196.2	205.7	134.2	3.0
7	68.8	55.0	18.4	454.5	351.3	394.6	282.5	5.2
8	68.9	57.5	24.1	612.5	477.3	556.4	415.6	6.8
9	55.5	59.6	24.5	641.1	502.2	598.3	457.2	7.0
10	35.9	61.2	19.6	522.0	410.5	495.9	384.0	5.7
11	18.3	62.7	12.1	328.7	259.1	316.0	246.7	3.5
12	7.3	63.9	5.7	158.2	125.0	153.4	120.4	1.7
13	2.2	64.9	2.1	57.4	45.4	56.0	44.1	0.6
14	0.5	65.8	0.5	15.4	12.2	15.1	12.0	0.2
	362.3		123.7	3181.0	2478.2	2862.1	2131.4	35.0

INPUTS  
 SITE INDEX = 60.00  
 AGE = 15.00  
 PLANTED TREES = 600.00

PREDICTED  
 AVERAGE HD = 39.12  
 ARITH. MEAN DBH = 5.97  
 QUAD. MEAN DBH = 6.13

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4. IN	VOLUME I.B. TO 4. IN	VOLUME (CORDS) TO 4. IN
2	2.5	20.0	0.1	1.3	0.7	0.0	0.0	0.0
3	16.1	27.5	0.8	14.8	9.2	0.0	0.0	0.0
4	48.7	32.2	4.2	75.2	52.1	0.0	0.0	0.0
5	94.2	35.4	12.8	226.3	165.3	152.1	73.2	2.7
6	122.2	37.8	24.0	427.9	321.6	342.3	219.9	5.0
7	101.1	39.5	27.0	489.6	374.1	425.1	300.8	5.6
8	48.1	40.9	16.8	309.1	238.7	280.8	207.9	3.4
9	11.5	42.0	5.1	94.6	73.5	88.2	67.0	1.0
10	1.2	42.9	0.6	11.9	9.3	11.3	8.7	0.1
	445.5		91.5	1650.7	1244.5	1299.8	877.5	18.0

INPUTS  
 SITE INDEX = 60.00  
 AGE = 30.00  
 PLANTED TREES = 600.00

PREDICTED  
 AVERAGE HD = 68.89  
 ARITH. MEAN DBH = 8.38  
 QUAD. MEAN DBH = 8.66

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4. IN	VOLUME I.B. TO 4. IN	VOLUME (CORDS) TO 4. IN
4	6.4	45.7	0.6	13.1	9.4	0.0	0.0	0.0
5	20.9	52.4	2.9	71.0	53.2	47.7	23.6	0.8
6	37.2	57.4	7.3	191.4	146.6	153.1	100.3	2.3
7	49.7	61.3	13.3	363.5	281.9	315.6	226.7	4.2
8	54.3	64.4	18.9	537.7	420.0	488.4	365.7	6.0
9	50.0	66.9	22.1	645.8	506.9	602.8	461.5	7.1
10	39.3	68.9	21.4	641.8	505.5	609.7	472.8	7.0
11	26.4	70.7	17.4	532.5	420.3	511.9	400.1	5.7
12	15.1	72.2	11.9	369.9	292.5	358.6	281.8	3.9
13	7.4	73.4	6.8	215.2	170.4	209.9	165.5	2.3
14	3.1	74.6	3.3	104.6	82.9	102.5	81.1	1.1
15	1.1	75.5	1.3	42.4	33.6	41.7	33.0	0.4
	310.7		127.1	3728.8	2923.4	3441.8	2612.0	40.8

INPUTS  
 SITE INDEX = 60.00  
 AGE = 20.00  
 PLANTED TREES = 600.00

PREDICTED  
 AVERAGE HD = 50.18  
 ARITH. MEAN DBH = 6.89  
 QUAD. MEAN DBH = 7.09

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4. IN	VOLUME I.B. TO 4. IN	VOLUME (CORDS) TO 4. IN
3	6.9	31.4	0.3	6.9	4.4	0.0	0.0	0.0
4	25.5	37.9	2.2	44.7	31.6	0.0	0.0	0.0
5	54.2	42.4	7.4	152.1	112.6	102.2	49.8	1.8
6	81.9	45.6	16.1	340.6	258.4	272.5	176.7	4.0
7	92.1	48.1	24.6	536.0	412.6	465.4	331.8	6.2
8	76.6	50.1	26.7	597.0	463.7	542.2	403.7	6.6
9	45.8	51.7	20.2	461.3	360.5	430.5	328.1	5.1
10	18.9	53.0	10.3	238.7	187.3	226.7	175.2	2.6
11	5.1	54.1	3.4	79.0	62.2	76.0	59.2	0.8
12	0.8	55.0	0.7	15.9	12.5	15.4	12.1	0.2
	407.8		111.9	2472.2	1905.7	2130.9	1536.7	27.3

INPUTS  
 SITE INDEX = 60.00  
 AGE = 10.00  
 PLANTED TREES = 700.00

PREDICTED  
 AVERAGE HD = 26.36  
 ARITH. MEAN DBH = 4.54  
 QUAD. MEAN DBH = 4.66

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME TO 4. IN	VOLUME TO 4. IN	VOLUME (CORDS) TO 4. IN
1	1.0	9.0	0.0	0.4	0.1	0.0	0.0	0.0
2	13.9	17.8	0.3	7.1	3.5	0.0	0.0	0.0
3	67.0	22.3	3.3	54.6	32.7	0.0	0.0	0.0
4	166.8	25.0	14.6	212.9	142.9	0.0	0.0	0.0
5	200.1	26.7	27.3	380.1	270.9	255.4	120.0	4.5
6	84.7	28.0	16.6	227.4	167.7	181.9	114.7	2.7
7	7.6	28.9	2.0	27.6	20.8	24.0	16.7	0.3
	541.0		64.1	910.1	638.5	461.3	251.3	7.5

INPUTS  
 SITE INDEX = 60.00  
 AGE = 25.00  
 PLANTED TREES = 700.00

PREDICTED  
 AVERAGE HD = 60.00  
 ARITH. MEAN DBH = 7.54  
 QUAD. MEAN DBH = 7.78

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME TO 4. IN	VOLUME TO 4. IN	VOLUME (CORDS) TO 4. IN
3	2.6	35.1	0.1	2.8	1.8	0.0	0.0	0.0
4	16.8	43.0	1.5	32.6	23.3	0.0	0.0	0.0
5	40.1	48.6	5.5	127.0	94.8	85.3	42.0	1.5
6	64.1	52.8	12.6	305.0	232.9	244.0	159.3	3.6
7	78.5	56.0	21.0	526.8	407.5	457.4	327.7	6.1
8	76.4	58.5	26.7	689.8	537.7	626.5	468.2	7.7
9	59.4	60.5	26.3	696.2	545.6	649.8	496.7	7.7
10	36.7	62.2	20.0	542.4	426.6	515.3	399.1	5.9
11	17.8	63.6	11.7	323.8	255.4	311.3	243.1	3.5
12	6.7	64.8	5.2	146.4	115.7	142.0	111.5	1.6
13	1.9	65.8	1.7	49.4	39.1	48.2	38.0	0.5
	401.0		132.3	3442.4	2680.4	3079.8	2285.4	37.9

INPUTS  
 SITE INDEX = 60.00  
 AGE = 15.00  
 PLANTED TREES = 700.00

PREDICTED  
 AVERAGE HD = 39.12  
 ARITH. MEAN DBH = 5.82  
 QUAD. MEAN DBH = 5.98

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME TO 4. IN	VOLUME TO 4. IN	VOLUME (CORDS) TO 4. IN
2	3.2	20.5	0.1	1.7	0.9	0.0	0.0	0.0
3	20.5	27.8	1.0	19.0	11.9	0.0	0.0	0.0
4	61.3	32.5	5.3	95.3	66.1	0.0	0.0	0.0
5	115.7	35.6	15.8	279.4	204.2	187.8	90.4	3.3
6	142.5	37.9	28.0	501.0	376.5	400.8	257.5	5.9
7	107.6	39.6	28.7	522.1	399.0	453.3	320.9	6.0
8	44.2	41.0	15.4	283.9	219.3	257.8	190.9	3.2
9	8.4	42.0	3.7	69.4	54.0	64.7	49.1	0.8
10	0.6	42.9	0.3	6.3	4.9	6.0	4.6	0.1
	503.9		98.4	1778.1	1336.7	1370.4	913.4	19.2

INPUTS  
 SITE INDEX = 60.00  
 AGE = 30.00  
 PLANTED TREES = 700.00

PREDICTED  
 AVERAGE HD = 68.89  
 ARITH. MEAN DBH = 8.27  
 QUAD. MEAN DBH = 8.55

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME TO 4. IN	VOLUME TO 4. IN	VOLUME (CORDS) TO 4. IN
4	7.6	46.1	0.7	15.7	11.3	0.0	0.0	0.0
5	24.4	52.8	3.3	83.3	62.5	56.0	27.7	1.0
6	42.8	57.7	8.4	221.1	169.4	176.9	115.9	2.6
7	56.2	61.5	15.0	412.9	320.2	358.5	257.5	4.7
8	60.3	64.6	21.1	599.1	468.0	544.2	407.5	6.7
9	54.4	67.0	24.0	703.8	552.5	656.9	503.0	7.7
10	41.7	69.1	22.7	682.2	537.2	648.0	502.5	7.4
11	27.2	70.8	18.0	550.1	434.3	528.8	413.4	5.9
12	15.1	72.2	11.9	370.2	292.8	358.9	282.0	3.9
13	7.1	73.5	6.6	208.0	164.7	202.8	160.0	2.2
14	2.8	74.6	3.0	97.3	77.2	95.4	75.4	1.0
15	1.0	75.5	1.2	37.8	30.0	37.2	29.5	0.4
	340.7		135.8	3981.5	3120.0	3663.6	2774.3	43.6

INPUTS  
 SITE INDEX = 60.00  
 AGE = 20.00  
 PLANTED TREES = 700.00

PREDICTED  
 AVERAGE HD = 50.18  
 ARITH. MEAN DBH = 6.75  
 QUAD. MEAN DBH = 6.95

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME TO 4. IN	VOLUME TO 4. IN	VOLUME (CORDS) TO 4. IN
2	0.5	22.1	0.0	0.3	0.1	0.0	0.0	0.0
3	8.5	31.9	0.4	8.7	5.5	0.0	0.0	0.0
4	31.3	38.2	2.7	55.3	39.0	0.0	0.0	0.0
5	65.5	42.6	8.9	184.7	136.8	124.1	60.6	2.2
6	96.5	45.9	18.9	403.1	305.9	322.5	209.2	4.7
7	104.5	48.3	27.9	610.5	470.0	530.1	378.0	7.0
8	82.5	50.2	28.8	644.0	500.2	584.9	435.6	7.2
9	45.8	51.8	20.2	461.9	360.9	431.1	328.6	5.1
10	17.1	53.1	9.3	216.6	170.0	205.8	159.0	2.4
11	4.1	54.1	2.7	63.3	49.8	60.8	47.4	0.7
12	0.6	55.0	0.5	10.9	8.6	10.5	8.3	0.1
	456.9		120.5	2659.3	2046.9	2269.9	1626.6	29.3

INPUTS  
 -----  
 SITE INDEX = 60.00  
 AGE = 10.00  
 PLANTED TREES = 800.00

PREDICTED  
 -----  
 AVERAGE HD = 26.36  
 ARITH. MEAN DBH = 4.41  
 QUAD. MEAN DBH = 4.52

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME TO 4.1N O.B.	VOLUME TO 4.1N I.B.	VOLUME (CORDS) TO 4.1N
1	1.3	9.5	0.0	0.5	0.2	0.0	0.0	0.0
2	17.8	18.2	0.4	9.2	4.5	0.0	0.0	0.0
3	86.2	22.6	4.2	70.7	42.5	0.0	0.0	0.0
4	207.4	25.1	18.1	265.9	178.6	0.0	0.0	0.0
5	220.3	26.8	30.0	419.6	299.1	282.0	132.5	5.0
6	70.7	28.0	13.9	190.1	140.2	152.1	95.9	2.2
7	3.7	28.9	1.0	13.4	10.1	11.7	8.1	0.2
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	607.3		67.6	969.4	675.2	445.7	236.5	7.4

INPUTS  
 -----  
 SITE INDEX = 60.00  
 AGE = 15.00  
 PLANTED TREES = 800.00

PREDICTED  
 -----  
 AVERAGE HD = 39.12  
 ARITH. MEAN DBH = 5.69  
 QUAD. MEAN DBH = 5.85

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME TO 4.1N O.B.	VOLUME TO 4.1N I.B.	VOLUME (CORDS) TO 4.1N
2	3.9	21.3	0.1	2.2	1.1	0.0	0.0	0.0
3	25.2	28.8	1.2	24.0	15.0	0.0	0.0	0.0
4	74.9	33.4	6.5	119.1	82.9	0.0	0.0	0.0
5	137.9	36.6	18.8	340.5	249.3	228.8	110.4	4.1
6	161.5	38.8	31.7	579.8	436.3	463.8	298.4	6.8
7	111.3	40.5	29.7	551.2	421.6	478.6	339.0	6.3
8	39.4	41.8	13.8	258.6	199.9	234.9	174.0	2.9
9	6.0	42.9	2.7	50.6	39.4	47.3	35.9	0.6
-----	-----	-----	-----	-----	-----	-----	-----	-----
	560.2		104.5	1925.9	1445.5	1453.3	957.8	20.6

INPUTS  
 -----  
 SITE INDEX = 60.00  
 AGE = 20.00  
 PLANTED TREES = 800.00

PREDICTED  
 -----  
 AVERAGE HD = 50.18  
 ARITH. MEAN DBH = 6.63  
 QUAD. MEAN DBH = 6.83

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME TO 4.1N O.B.	VOLUME TO 4.1N I.B.	VOLUME (CORDS) TO 4.1N
2	0.6	22.9	0.0	0.3	0.2	0.0	0.0	0.0
3	10.3	32.8	0.5	10.7	6.8	0.0	0.0	0.0
4	37.4	39.2	3.3	67.4	47.7	0.0	0.0	0.0
5	77.1	43.6	10.5	221.7	164.4	149.0	72.8	2.6
6	111.0	46.8	21.8	472.4	358.8	377.9	245.4	5.6
7	116.1	49.2	31.0	690.4	531.8	599.4	427.7	7.9
8	87.1	51.2	30.4	691.8	537.6	628.4	468.1	7.7
9	45.1	52.7	19.9	462.6	361.6	431.8	329.2	5.1
10	15.4	54.0	8.4	197.8	155.3	187.9	145.2	2.2
11	3.2	55.0	2.1	51.3	40.4	49.3	38.5	0.6
-----	-----	-----	-----	-----	-----	-----	-----	-----
	503.3		128.0	2866.5	2204.7	2423.8	1726.9	31.6

INPUTS  
 -----  
 SITE INDEX = 60.00  
 AGE = 25.00  
 PLANTED TREES = 800.00

PREDICTED  
 -----  
 AVERAGE HD = 60.00  
 ARITH. MEAN DBH = 7.44  
 QUAD. MEAN DBH = 7.67

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME TO 4.1N O.B.	VOLUME TO 4.1N I.B.	VOLUME (CORDS) TO 4.1N
3	3.1	35.5	0.2	3.4	2.2	0.0	0.0	0.0
4	19.7	43.3	1.7	38.6	27.6	0.0	0.0	0.0
5	46.5	48.9	6.3	148.0	110.5	99.4	48.9	1.8
6	73.2	53.0	14.4	349.4	266.8	279.5	182.5	4.1
7	87.8	56.1	23.5	590.8	457.0	513.0	367.5	6.8
8	83.2	58.6	29.1	753.1	587.1	684.0	511.2	8.4
9	62.7	60.6	27.7	735.2	576.2	686.2	524.5	8.1
10	37.2	62.2	20.3	550.0	432.6	522.4	404.6	6.0
11	17.2	63.6	11.3	312.8	246.7	300.7	234.8	3.4
12	6.1	64.8	4.8	133.6	105.6	129.5	101.7	1.4
13	1.6	65.8	1.5	42.2	33.4	41.2	32.5	0.4
-----	-----	-----	-----	-----	-----	-----	-----	-----
	438.2		140.7	3657.0	2845.5	3255.9	2408.2	40.3

INPUTS  
 -----  
 SITE INDEX = 60.00  
 AGE = 30.00  
 PLANTED TREES = 800.00

PREDICTED  
 -----  
 AVERAGE HD = 68.89  
 ARITH. MEAN DBH = 8.18  
 QUAD. MEAN DBH = 8.45

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME TO 4.1N O.B.	VOLUME TO 4.1N I.B.	VOLUME (CORDS) TO 4.1N
4	8.8	46.4	0.8	18.3	13.2	0.0	0.0	0.0
5	28.0	53.0	3.8	95.7	71.8	64.3	31.8	1.1
6	48.3	57.9	9.5	250.5	192.0	200.4	131.3	2.9
7	62.5	61.7	16.7	460.6	357.2	399.9	287.3	5.3
8	66.0	64.7	23.0	656.8	513.1	596.6	446.8	7.3
9	58.3	67.1	25.8	756.4	593.8	706.0	540.6	8.3
10	43.7	69.1	23.8	716.7	564.5	680.8	528.0	7.8
11	27.8	70.8	18.4	563.4	444.8	541.6	423.4	6.1
12	15.0	72.3	11.8	368.6	291.5	357.3	280.8	3.9
13	6.9	73.5	6.3	200.7	158.9	195.8	154.4	2.1
14	2.6	74.6	2.8	90.8	72.0	89.0	70.3	1.0
15	0.9	75.5	1.0	34.0	27.0	33.5	26.5	0.4
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	369.0		143.8	4212.6	3299.7	3865.1	2921.1	46.2

INPUTS  
 SITE INDEX = 60.00  
 AGE = 10.00  
 PLANTED TREES = 900.00

PREDICTED  
 AVERAGE HD = 26.36  
 ARITH. MEAN DBH = 4.29  
 QUAD. MEAN DBH = 4.39

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME TO 4. IN	VOLUME I.B. TO 4. IN	VOLUME (CORDS) TO 4. IN
1	1.6	9.9	0.0	0.6	0.2	0.0	0.0	0.0
2	22.2	18.5	0.5	11.6	5.6	0.0	0.0	0.0
3	108.1	22.8	5.3	89.2	53.7	0.0	0.0	0.0
4	250.2	25.3	21.8	322.0	216.5	0.0	0.0	0.0
5	233.1	26.9	31.8	445.0	317.3	299.1	140.5	5.3
6	55.7	28.1	10.9	150.1	110.7	120.0	75.7	1.8
7	1.6	28.9	0.4	5.9	4.4	5.1	3.6	0.1
	672.5		70.8	1024.3	708.5	424.2	219.8	7.1

INPUTS  
 SITE INDEX = 60.00  
 AGE = 25.00  
 PLANTED TREES = 900.00

PREDICTED  
 AVERAGE HD = 60.00  
 ARITH. MEAN DBH = 7.35  
 QUAD. MEAN DBH = 7.58

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME TO 4. IN	VOLUME I.B. TO 4. IN	VOLUME (CORDS) TO 4. IN
3	3.6	35.8	0.2	4.0	2.6	0.0	0.0	0.0
4	22.7	43.6	2.0	44.8	32.0	0.0	0.0	0.0
5	52.9	49.1	7.2	169.3	126.5	113.8	56.0	2.0
6	82.2	53.2	16.1	393.5	300.6	314.8	205.5	4.6
7	96.7	56.3	25.9	652.5	504.7	566.5	409.9	7.5
8	89.5	58.7	31.2	811.2	632.5	736.8	550.7	9.0
9	65.4	60.7	28.9	767.9	601.8	716.7	547.8	8.4
10	37.4	62.3	20.4	553.2	435.1	525.5	407.0	6.0
11	16.5	63.6	10.9	300.9	237.3	289.3	225.9	3.2
12	5.5	64.8	4.4	122.0	96.4	118.2	92.8	1.3
13	1.4	65.8	1.3	36.3	28.7	35.4	27.9	0.4
	473.9		148.4	3855.6	2998.1	3417.0	2519.6	42.5

INPUTS  
 SITE INDEX = 60.00  
 AGE = 15.00  
 PLANTED TREES = 900.00

PREDICTED  
 AVERAGE HD = 39.12  
 ARITH. MEAN DBH = 5.58  
 QUAD. MEAN DBH = 5.73

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME TO 4. IN	VOLUME I.B. TO 4. IN	VOLUME (CORDS) TO 4. IN
2	4.8	21.7	0.1	2.6	1.3	0.0	0.0	0.0
3	30.5	29.1	1.5	29.1	18.3	0.0	0.0	0.0
4	89.5	33.6	7.8	143.0	99.6	0.0	0.0	0.0
5	160.8	36.7	21.9	398.4	291.8	267.7	129.2	4.7
6	178.8	38.9	35.1	643.7	484.5	514.9	331.3	7.6
7	112.5	40.6	30.1	558.3	427.0	484.7	343.4	6.4
8	34.5	41.9	12.0	226.2	174.8	205.5	152.2	2.5
9	4.2	42.9	1.9	35.9	27.7	33.2	25.2	0.4
	615.6		110.4	2036.8	1525.0	1505.9	981.4	21.6

INPUTS  
 SITE INDEX = 60.00  
 AGE = 30.00  
 PLANTED TREES = 900.00

PREDICTED  
 AVERAGE HD = 68.89  
 ARITH. MEAN DBH = 8.10  
 QUAD. MEAN DBH = 8.37

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME TO 4. IN	VOLUME I.B. TO 4. IN	VOLUME (CORDS) TO 4. IN
4	10.1	46.7	0.9	21.1	15.2	0.0	0.0	0.0
5	31.5	53.3	4.3	108.3	81.3	72.7	36.0	1.3
6	53.7	58.1	10.5	279.5	214.3	223.6	146.5	3.3
7	68.6	61.9	18.3	506.8	393.1	440.0	316.1	5.8
8	71.3	64.8	24.9	711.3	555.7	646.1	483.9	7.9
9	62.0	67.2	27.4	804.4	631.5	750.8	574.8	8.8
10	45.5	69.2	24.8	746.6	588.0	709.2	550.0	8.1
11	28.3	70.9	18.7	573.4	452.7	551.3	430.9	6.2
12	14.9	72.3	11.7	365.6	289.1	354.5	278.5	3.9
13	6.6	73.5	6.1	193.5	153.3	188.8	148.9	2.0
14	2.5	74.6	2.6	84.9	67.3	83.2	65.8	0.9
15	0.8	75.5	0.9	30.8	24.4	30.3	24.0	0.3
	395.8		151.3	4426.2	3465.7	4050.4	3055.5	48.6

INPUTS  
 SITE INDEX = 60.00  
 AGE = 20.00  
 PLANTED TREES = 900.00

PREDICTED  
 AVERAGE HD = 50.18  
 ARITH. MEAN DBH = 6.53  
 QUAD. MEAN DBH = 6.72

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME TO 4. IN	VOLUME I.B. TO 4. IN	VOLUME (CORDS) TO 4. IN
2	0.7	23.3	0.0	0.4	0.2	0.0	0.0	0.0
3	12.2	33.1	0.6	12.7	8.2	0.0	0.0	0.0
4	43.8	39.4	3.8	79.3	56.2	0.0	0.0	0.0
5	89.0	43.8	12.1	257.0	190.6	172.7	84.4	3.1
6	125.3	46.9	24.6	535.1	406.5	428.0	278.0	6.3
7	126.8	49.3	33.9	755.5	582.0	655.9	468.0	8.7
8	90.6	51.2	31.6	720.9	560.2	654.7	487.8	8.0
9	43.9	52.7	19.4	450.9	352.5	420.9	320.9	5.0
10	13.7	54.0	7.5	176.6	138.6	167.8	129.7	1.9
11	2.6	55.0	1.7	41.0	32.3	39.4	30.7	0.4
	548.7		135.3	3029.4	2327.3	2539.4	1799.5	33.4

INPUTS  
 -----  
 SITE INDEX = 70.00  
 AGE = 10.00  
 PLANTED TREES = 600.00

PREDICTED  
 -----  
 AVERAGE HD = 29.81  
 ARITH. MEAN DBH = 5.11  
 QUAD. MEAN DBH = 5.23

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4. IN	VOLUME I.B. TO 4. IN	VOLUME (CORDS) TO 4. IN
2	6.2	18.3	0.1	3.2	1.6	0.0	0.0	0.0
3	32.8	23.7	1.6	27.6	16.8	0.0	0.0	0.0
4	95.8	26.9	8.4	129.1	87.6	0.0	0.0	0.0
5	162.7	29.1	22.2	331.3	238.0	222.6	105.4	3.9
6	137.3	30.6	27.0	399.3	296.3	319.4	202.6	4.7
7	42.4	31.8	11.3	168.0	127.1	145.9	102.2	1.9
8	3.0	32.7	1.1	15.8	12.1	14.4	10.6	0.2
	480.2		71.6	1074.4	779.4	702.3	420.8	10.7

INPUTS  
 -----  
 SITE INDEX = 70.00  
 AGE = 25.00  
 PLANTED TREES = 600.00

PREDICTED  
 -----  
 AVERAGE HD = 70.00  
 ARITH. MEAN DBH = 8.52  
 QUAD. MEAN DBH = 8.77

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4. IN	VOLUME I.B. TO 4. IN	VOLUME (CORDS) TO 4. IN
4	5.2	46.8	0.5	10.8	7.8	0.0	0.0	0.0
5	18.7	53.6	2.5	64.5	48.4	43.3	21.4	0.8
6	36.6	58.6	7.2	191.9	147.1	153.5	100.6	2.3
7	53.2	62.5	14.2	396.2	307.4	344.0	247.2	4.6
8	62.1	65.6	21.7	626.7	489.7	569.2	426.4	7.0
9	60.0	68.1	26.5	788.6	619.1	736.0	563.6	8.7
10	48.1	70.1	26.3	800.3	630.4	760.2	589.7	8.7
11	32.0	71.9	21.1	656.6	518.4	631.2	493.5	7.1
12	17.5	73.4	13.7	433.9	343.2	420.7	330.6	4.6
13	7.7	74.7	7.1	229.3	181.6	223.7	176.4	2.4
14	2.8	75.8	2.9	96.0	76.1	94.1	74.4	1.0
15	0.8	76.8	1.0	31.5	25.0	31.0	24.5	0.3
	344.6		144.7	4326.3	3394.3	4006.8	3048.4	47.3

INPUTS  
 -----  
 SITE INDEX = 70.00  
 AGE = 15.00  
 PLANTED TREES = 600.00

PREDICTED  
 -----  
 AVERAGE HD = 44.91  
 ARITH. MEAN DBH = 6.49  
 QUAD. MEAN DBH = 6.67

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4. IN	VOLUME I.B. TO 4. IN	VOLUME (CORDS) TO 4. IN
2	1.0	21.2	0.0	0.6	0.3	0.0	0.0	0.0
3	9.2	29.9	0.5	9.0	5.7	0.0	0.0	0.0
4	32.3	35.5	2.8	53.8	37.7	0.0	0.0	0.0
5	70.6	39.3	9.6	185.7	136.7	124.8	60.6	2.2
6	107.6	42.1	21.1	416.2	314.5	332.9	215.1	4.9
7	113.3	44.2	30.3	609.2	467.5	528.9	376.0	7.0
8	77.2	45.9	27.0	553.4	428.8	502.6	373.4	6.1
9	31.0	47.2	13.7	285.6	222.8	266.6	202.8	3.1
10	6.4	48.3	3.5	74.6	58.4	70.8	54.6	0.8
11	0.6	49.2	0.4	8.5	6.7	8.2	6.4	0.1
	449.3		108.9	2196.6	1679.2	1834.9	1288.9	24.3

INPUTS  
 -----  
 SITE INDEX = 70.00  
 AGE = 30.00  
 PLANTED TREES = 600.00

PREDICTED  
 -----  
 AVERAGE HD = 80.79  
 ARITH. MEAN DBH = 9.42  
 QUAD. MEAN DBH = 9.71

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4. IN	VOLUME I.B. TO 4. IN	VOLUME (CORDS) TO 4. IN
4	0.7	50.3	0.1	1.5	1.1	0.0	0.0	0.0
5	8.3	58.3	1.1	30.9	23.3	20.8	10.3	0.4
6	20.7	64.4	4.1	118.6	91.3	94.9	62.4	1.4
7	33.3	69.1	8.9	273.1	212.4	237.1	170.8	3.1
8	42.4	72.8	14.8	473.0	370.3	429.6	322.4	5.3
9	45.5	75.9	20.1	664.4	522.5	620.2	475.7	7.3
10	42.2	78.4	23.0	782.9	617.5	743.7	577.6	8.5
11	34.3	80.6	22.6	786.5	621.6	756.1	591.8	8.5
12	24.4	82.4	19.1	679.2	537.7	658.4	517.9	7.2
13	15.2	84.0	14.0	506.1	401.1	493.7	389.7	5.3
14	8.3	85.3	8.9	325.9	258.5	319.3	252.6	3.4
15	4.0	86.6	4.9	181.2	143.9	178.2	141.2	1.9
16	1.7	87.6	2.3	87.0	69.1	85.7	68.0	0.9
17	0.6	88.6	0.9	35.9	28.5	35.5	28.2	0.4
	281.5		144.9	4946.2	3898.8	4673.1	3608.7	53.6

INPUTS  
 -----  
 SITE INDEX = 70.00  
 AGE = 20.00  
 PLANTED TREES = 600.00

PREDICTED  
 -----  
 AVERAGE HD = 58.15  
 ARITH. MEAN DBH = 7.57  
 QUAD. MEAN DBH = 7.78

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4. IN	VOLUME I.B. TO 4. IN	VOLUME (CORDS) TO 4. IN
3	2.6	34.4	0.1	2.7	1.8	0.0	0.0	0.0
4	14.2	42.0	1.2	27.1	19.3	0.0	0.0	0.0
5	35.9	47.4	4.9	111.2	82.9	74.8	36.7	1.3
6	62.3	51.4	12.2	288.8	220.2	231.0	150.6	3.4
7	81.8	54.4	21.9	534.1	412.7	463.8	331.9	6.1
8	83.0	56.8	29.0	729.1	568.0	662.3	494.6	8.1
9	64.5	58.7	28.5	734.7	575.5	685.7	523.9	8.1
10	37.4	60.3	20.4	536.8	422.0	509.9	394.8	5.8
11	15.7	61.7	10.3	276.5	218.0	265.8	207.5	3.0
12	4.5	62.8	3.6	97.0	76.6	94.0	73.8	1.0
13	0.9	63.8	0.8	22.3	17.6	21.7	17.1	0.2
	402.8		133.0	3360.3	2614.7	3008.9	2230.9	37.1



INPUTS  
 -----  
 SITE INDEX = 70.00  
 AGE = 10.00  
 PLANTED TREES = 700.00

PREDICTED  
 -----  
 AVERAGE HD = 29.81  
 ARITH. MEAN DBH = 4.94  
 QUAD. MEAN DBH = 5.06

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4.1N	VOLUME I.B. TO 4.1N	VOLUME (CORDS) TO 4.1N
1	0.5	8.9	0.0	0.2	0.1	0.0	0.0	0.0
2	8.1	18.7	0.2	4.2	2.1	0.0	0.0	0.0
3	43.3	24.0	2.1	36.8	22.4	0.0	0.0	0.0
4	124.9	27.2	10.9	169.5	115.0	0.0	0.0	0.0
5	198.5	29.2	27.1	405.9	291.7	272.8	129.2	4.8
6	141.5	30.7	27.8	412.5	306.2	330.0	209.4	4.9
7	31.2	31.8	8.3	123.6	93.6	107.3	75.2	1.4
8	1.2	32.7	0.4	6.3	4.8	5.7	4.2	0.1
	549.1		76.8	1159.1	835.8	715.8	418.0	11.2

INPUTS  
 -----  
 SITE INDEX = 70.00  
 AGE = 25.00  
 PLANTED TREES = 700.00

PREDICTED  
 -----  
 AVERAGE HD = 70.00  
 ARITH. MEAN DBH = 8.40  
 QUAD. MEAN DBH = 8.65

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4.1N	VOLUME I.B. TO 4.1N	VOLUME (CORDS) TO 4.1N
4	6.3	47.2	0.5	13.2	9.5	0.0	0.0	0.0
5	22.2	53.9	3.0	77.3	58.1	51.9	25.7	0.9
6	43.0	58.9	8.4	226.6	173.7	181.2	118.8	2.7
7	61.5	62.7	16.4	459.7	356.7	399.1	286.8	5.3
8	70.4	65.8	24.6	711.9	556.3	646.6	484.4	7.9
9	66.3	68.2	29.3	872.7	685.2	814.5	632.8	9.6
10	51.5	70.3	28.1	858.1	676.0	815.1	632.3	9.3
11	33.0	72.0	21.8	678.0	535.4	651.8	509.6	7.3
12	17.2	73.4	13.5	428.8	339.1	415.7	326.7	4.6
13	7.3	74.7	6.7	215.3	170.5	210.0	165.7	2.3
14	2.4	75.8	2.6	85.1	67.4	83.4	65.9	0.9
15	0.6	76.8	0.8	26.1	20.7	25.7	20.4	0.3
	381.8		155.8	4652.8	3648.7	4295.1	3260.1	51.0

INPUTS  
 -----  
 SITE INDEX = 70.00  
 AGE = 15.00  
 PLANTED TREES = 700.00

PREDICTED  
 -----  
 AVERAGE HD = 44.91  
 ARITH. MEAN DBH = 6.35  
 QUAD. MEAN DBH = 6.51

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4.1N	VOLUME I.B. TO 4.1N	VOLUME (CORDS) TO 4.1N
2	1.3	22.1	0.0	0.7	0.4	0.0	0.0	0.0
3	11.7	30.9	0.6	11.6	7.4	0.0	0.0	0.0
4	40.6	36.5	3.5	69.2	48.6	0.0	0.0	0.0
5	87.4	40.3	11.9	234.9	173.3	157.9	76.7	2.8
6	128.8	43.1	25.3	508.7	384.9	406.9	263.2	6.0
7	127.6	45.2	34.1	700.0	537.7	607.8	432.4	8.0
8	78.7	46.8	27.5	575.0	445.9	522.3	388.2	6.4
9	27.1	48.2	12.0	254.8	198.8	237.8	181.0	2.8
10	4.5	49.2	2.5	53.4	41.9	50.7	39.1	0.6
	507.8		117.4	2408.4	1838.7	1983.5	1380.7	26.6

INPUTS  
 -----  
 SITE INDEX = 70.00  
 AGE = 30.00  
 PLANTED TREES = 700.00

PREDICTED  
 -----  
 AVERAGE HD = 80.79  
 ARITH. MEAN DBH = 9.32  
 QUAD. MEAN DBH = 9.60

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4.1N	VOLUME I.B. TO 4.1N	VOLUME (CORDS) TO 4.1N
4	0.8	50.7	0.1	1.9	1.3	0.0	0.0	0.0
5	9.7	58.7	1.3	36.5	27.6	24.6	12.2	0.4
6	24.0	64.7	4.7	138.2	106.3	110.5	72.7	1.6
7	38.1	69.3	10.2	313.6	243.9	272.3	196.2	3.6
8	47.8	73.0	16.7	535.0	418.9	485.9	364.7	5.9
9	50.5	76.1	22.3	739.1	581.3	689.9	529.2	8.1
10	46.0	78.6	25.1	854.8	674.2	812.0	630.6	9.3
11	36.6	80.7	24.1	840.9	664.6	808.4	632.7	9.0
12	25.4	82.5	20.0	709.5	561.6	687.8	541.1	7.5
13	15.5	84.0	14.3	515.3	408.4	502.7	396.8	5.4
14	8.2	85.4	8.8	322.7	256.0	316.2	250.2	3.4
15	3.8	86.6	4.7	174.1	138.2	171.2	135.7	1.8
16	1.5	87.6	2.2	80.9	64.3	79.8	63.3	0.9
17	0.5	88.6	0.9	32.3	25.7	31.9	25.3	0.3
	308.6		155.3	5294.8	4172.4	4993.1	3850.7	57.5

INPUTS  
 -----  
 SITE INDEX = 70.00  
 AGE = 20.00  
 PLANTED TREES = 700.00

PREDICTED  
 -----  
 AVERAGE HD = 58.15  
 ARITH. MEAN DBH = 7.43  
 QUAD. MEAN DBH = 7.64

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4.1N	VOLUME I.B. TO 4.1N	VOLUME (CORDS) TO 4.1N
3	3.2	34.9	0.2	3.4	2.2	0.0	0.0	0.0
4	17.4	42.4	1.5	33.5	23.9	0.0	0.0	0.0
5	43.5	47.7	5.9	135.7	101.2	91.2	44.8	1.6
6	74.2	51.6	14.6	345.7	263.7	276.5	180.3	4.1
7	95.0	54.6	25.4	622.5	481.1	540.5	386.9	7.2
8	93.0	56.9	32.4	818.4	637.6	743.3	555.2	9.1
9	68.7	58.8	30.3	783.3	613.5	731.1	558.5	8.6
10	37.2	60.4	20.3	534.8	420.5	508.0	393.3	5.8
11	14.3	61.7	9.4	252.6	199.1	242.8	189.6	2.7
12	3.7	62.8	2.9	79.5	62.8	77.1	60.5	0.8
13	0.6	63.8	0.6	16.0	12.6	15.6	12.3	0.2
	450.9		143.6	3625.4	2818.3	3226.2	2381.4	40.1

INPUTS  
 SITE INDEX = 70.00  
 AGE = 10.00  
 PLANTED TREES = 800.00

PREDICTED  
 AVERAGE HD = 29.81  
 ARITH. MEAN DBH = 4.81  
 QUAD. MEAN DBH = 4.92

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME TO 4.1N O.B.	VOLUME TO 4.1N I.B.	VOLUME (CORDS) TO 4.1N
1	0.6	9.6	0.0	0.2	0.1	0.0	0.0	0.0
2	10.2	19.6	0.2	5.4	2.7	0.0	0.0	0.0
3	55.3	24.9	2.7	48.1	29.4	0.0	0.0	0.0
4	157.4	28.1	13.7	218.8	149.1	0.0	0.0	0.0
5	232.6	30.1	31.7	487.7	351.4	327.7	155.6	5.8
6	138.5	31.6	27.2	413.9	307.8	331.1	210.5	4.9
7	21.3	32.7	5.7	86.6	65.6	75.2	52.8	1.0
	616.0		81.3	1260.7	906.1	734.0	418.9	11.7

INPUTS  
 SITE INDEX = 70.00  
 AGE = 25.00  
 PLANTED TREES = 800.00

PREDICTED  
 AVERAGE HD = 70.00  
 ARITH. MEAN DBH = 8.30  
 QUAD. MEAN DBH = 8.54

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME TO 4.1N O.B.	VOLUME TO 4.1N I.B.	VOLUME (CORDS) TO 4.1N
4	7.4	47.6	0.6	15.7	11.3	0.0	0.0	0.0
5	25.9	54.2	3.5	90.5	68.0	60.8	30.1	1.1
6	49.5	59.2	9.7	261.6	200.6	209.3	137.2	3.1
7	69.6	62.9	18.6	522.4	405.3	453.6	326.0	6.0
8	78.2	65.9	27.3	793.3	620.0	720.6	539.8	8.8
9	72.0	68.4	31.8	949.6	745.7	886.4	678.8	10.4
10	54.4	70.4	29.7	907.3	714.7	861.8	668.5	9.9
11	33.7	72.1	22.2	692.7	547.0	665.9	520.7	7.4
12	16.9	73.5	13.3	420.8	332.9	408.0	320.6	4.5
13	6.8	74.7	6.3	201.8	159.8	196.9	155.3	2.1
14	2.2	75.8	2.3	75.7	60.0	74.1	58.6	0.8
15	0.5	76.8	0.7	21.9	17.4	21.6	17.1	0.2
	417.1		166.0	4953.4	3882.7	4558.9	3452.8	54.3

INPUTS  
 SITE INDEX = 70.00  
 AGE = 15.00  
 PLANTED TREES = 800.00

PREDICTED  
 AVERAGE HD = 44.91  
 ARITH. MEAN DBH = 6.22  
 QUAD. MEAN DBH = 6.38

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME TO 4.1N O.B.	VOLUME TO 4.1N I.B.	VOLUME (CORDS) TO 4.1N
2	1.6	22.6	0.0	0.9	0.5	0.0	0.0	0.0
3	14.4	31.3	0.7	14.4	9.2	0.0	0.0	0.0
4	49.6	36.8	4.3	85.0	59.8	0.0	0.0	0.0
5	105.2	40.5	14.3	283.9	209.5	190.8	92.8	3.4
6	149.9	43.3	29.4	594.0	449.5	475.1	307.4	7.0
7	139.8	45.3	37.4	768.9	590.6	667.6	475.0	8.8
8	78.2	46.9	27.3	572.1	443.6	519.6	386.2	6.4
9	23.2	48.2	10.3	218.2	170.3	203.7	155.0	2.4
10	3.1	49.2	1.7	36.9	28.9	35.0	27.0	0.4
	565.1		125.5	2574.4	1961.8	2091.9	1443.4	28.4

INPUTS  
 SITE INDEX = 70.00  
 AGE = 30.00  
 PLANTED TREES = 800.00

PREDICTED  
 AVERAGE HD = 80.79  
 ARITH. MEAN DBH = 9.21  
 QUAD. MEAN DBH = 9.49

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME TO 4.1N O.B.	VOLUME TO 4.1N I.B.	VOLUME (CORDS) TO 4.1N
4	1.0	51.6	0.1	2.2	1.6	0.0	0.0	0.0
5	11.2	59.6	1.5	42.7	32.3	28.7	14.3	0.5
6	27.3	65.6	5.4	159.3	122.6	127.4	83.8	1.9
7	42.8	70.3	11.4	357.0	277.8	310.0	223.4	4.1
8	53.0	74.0	18.5	600.8	470.6	545.7	409.7	6.7
9	55.2	77.0	24.4	817.8	643.3	763.3	585.6	9.0
10	49.5	79.5	27.0	930.0	733.6	883.5	686.2	10.1
11	38.6	81.6	25.5	897.9	709.8	863.2	675.7	9.7
12	26.3	83.4	20.6	742.0	587.5	719.4	565.9	7.9
13	15.6	85.0	14.4	526.8	417.6	513.9	405.7	5.5
14	8.1	86.3	8.7	321.8	255.3	315.4	249.5	3.4
15	3.7	87.5	4.5	169.1	134.2	166.3	131.8	1.8
16	1.4	88.6	2.0	76.3	60.6	75.3	59.7	0.8
	333.7		164.0	5643.9	4446.8	5311.9	4091.4	61.3

INPUTS  
 SITE INDEX = 70.00  
 AGE = 20.00  
 PLANTED TREES = 800.00

PREDICTED  
 AVERAGE HD = 58.15  
 ARITH. MEAN DBH = 7.31  
 QUAD. MEAN DBH = 7.52

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME TO 4.1N O.B.	VOLUME TO 4.1N I.B.	VOLUME (CORDS) TO 4.1N
3	3.9	35.8	0.2	4.2	2.8	0.0	0.0	0.0
4	20.8	43.4	1.8	40.8	29.2	0.0	0.0	0.0
5	51.5	48.7	7.0	163.4	122.0	109.8	54.0	1.9
6	86.3	52.6	16.9	409.2	312.4	327.4	213.7	4.8
7	107.8	55.6	28.8	718.9	555.9	624.2	447.0	8.3
8	102.0	57.9	35.6	912.3	711.1	828.7	619.2	10.1
9	71.8	59.8	31.7	832.3	652.1	776.8	593.6	9.1
10	36.6	61.4	19.9	533.4	419.4	506.7	392.3	5.8
11	13.0	62.7	8.5	232.4	183.2	223.4	174.4	2.5
12	3.1	63.8	2.4	66.1	52.2	64.1	50.3	0.7
	496.6		153.0	3913.1	3040.3	3460.9	2544.6	43.3

INPUTS  
 -----  
 SITE INDEX = 70.00  
 AGE = 10.00  
 PLANTED TREES = 900.00

PREDICTED  
 -----  
 AVERAGE HD = 29.81  
 ARITH. MEAN DBH = 4.69  
 QUAD. MEAN DBH = 4.80

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4.1N	VOLUME I.B. TO 4.1N	VOLUME (CORDS) TO 4.1N
1	0.7	10.1	0.0	0.3	0.1	0.0	0.0	0.0
2	12.6	20.0	0.3	6.7	3.3	0.0	0.0	0.0
3	69.0	25.2	3.4	60.3	37.0	0.0	0.0	0.0
4	192.9	28.2	16.8	269.2	183.6	0.0	0.0	0.0
5	263.8	30.2	36.0	554.4	399.6	372.5	177.0	6.6
6	129.8	31.6	25.5	388.2	288.6	310.5	197.4	4.6
7	13.6	32.7	3.6	55.4	42.0	48.1	33.8	0.6
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	682.4		85.6	1334.5	954.2	731.2	408.1	11.8

INPUTS  
 -----  
 SITE INDEX = 70.00  
 AGE = 15.00  
 PLANTED TREES = 900.00

PREDICTED  
 -----  
 AVERAGE HD = 44.91  
 ARITH. MEAN DBH = 6.11  
 QUAD. MEAN DBH = 6.27

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4.1N	VOLUME I.B. TO 4.1N	VOLUME (CORDS) TO 4.1N
2	1.9	23.0	0.0	1.1	0.6	0.0	0.0	0.0
3	17.3	31.6	0.8	17.4	11.1	0.0	0.0	0.0
4	59.3	37.0	5.2	102.2	71.9	0.0	0.0	0.0
5	123.7	40.7	16.9	335.4	247.5	225.4	109.6	4.0
6	170.8	43.4	33.5	678.3	513.4	542.6	351.1	8.0
7	150.1	45.4	40.1	826.7	635.1	717.8	510.7	9.5
8	76.2	47.0	26.6	557.9	432.6	506.7	376.7	6.2
9	19.5	48.2	8.6	183.7	143.3	171.4	130.5	2.0
10	2.1	49.2	1.2	25.1	19.7	23.8	18.4	0.3
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	620.9		132.9	2727.8	2075.2	2187.8	1497.0	30.0

INPUTS  
 -----  
 SITE INDEX = 70.00  
 AGE = 20.00  
 PLANTED TREES = 900.00

PREDICTED  
 -----  
 AVERAGE HD = 58.15  
 ARITH. MEAN DBH = 7.21  
 QUAD. MEAN DBH = 7.41

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4.1N	VOLUME I.B. TO 4.1N	VOLUME (CORDS) TO 4.1N
3	4.6	36.2	0.2	5.1	3.3	0.0	0.0	0.0
4	24.4	43.7	2.1	48.2	34.5	0.0	0.0	0.0
5	59.7	49.0	8.1	190.3	142.1	127.9	63.0	2.3
6	98.5	52.8	19.3	468.7	357.9	374.9	244.8	5.5
7	120.3	55.7	32.1	804.0	621.7	698.1	500.0	9.2
8	110.1	58.0	38.4	986.7	769.1	896.2	669.7	11.0
9	74.1	59.9	32.7	860.0	673.8	802.7	613.4	9.5
10	35.6	61.4	19.4	519.1	408.2	493.1	381.8	5.6
11	11.7	62.7	7.7	209.5	165.2	201.4	157.3	2.3
12	2.5	63.8	2.0	54.2	42.8	52.6	41.3	0.6
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	541.4		162.2	4145.8	3218.7	3646.9	2671.1	45.9

INPUTS  
 -----  
 SITE INDEX = 70.00  
 AGE = 25.00  
 PLANTED TREES = 900.00

PREDICTED  
 -----  
 AVERAGE HD = 70.00  
 ARITH. MEAN DBH = 8.20  
 QUAD. MEAN DBH = 8.44

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4.1N	VOLUME I.B. TO 4.1N	VOLUME (CORDS) TO 4.1N
4	8.6	48.5	0.8	18.5	13.4	0.0	0.0	0.0
5	29.7	55.2	4.0	105.2	79.1	70.7	35.0	1.3
6	95.9	60.1	11.0	300.4	230.5	240.3	157.6	3.5
7	77.6	63.9	20.7	591.1	458.8	513.2	369.0	6.8
8	85.8	66.9	29.9	881.7	689.3	800.9	600.2	9.8
9	77.2	69.3	34.1	1032.6	810.9	963.7	738.2	11.3
10	56.9	71.3	31.0	960.6	756.9	912.5	707.9	10.4
11	34.1	73.0	22.5	710.7	561.2	683.2	534.3	7.6
12	16.5	74.4	13.0	416.2	329.2	403.5	317.1	4.4
13	6.4	75.7	5.9	191.3	151.5	186.6	147.2	2.0
14	1.9	76.8	2.1	68.4	54.2	67.0	53.0	0.7
-----	-----	-----	-----	-----	-----	-----	-----	-----
	450.6		175.0	5276.7	4135.1	4841.6	3659.6	58.0

INPUTS  
 -----  
 SITE INDEX = 70.00  
 AGE = 30.00  
 PLANTED TREES = 900.00

PREDICTED  
 -----  
 AVERAGE HD = 80.79  
 ARITH. MEAN DBH = 9.13  
 QUAD. MEAN DBH = 9.41

DBH CLASS	NUMBER TREES	AVERAGE HEIGHT	BASAL AREA	TOTAL VOLUME O.B.	TOTAL VOLUME I.B.	VOLUME O.B. TO 4.1N	VOLUME I.B. TO 4.1N	VOLUME (CORDS) TO 4.1N
4	1.1	52.0	0.1	2.6	1.9	0.0	0.0	0.0
5	12.7	59.9	1.7	48.6	36.7	32.7	16.3	0.6
6	30.6	65.9	6.0	178.9	137.8	143.1	94.2	2.1
7	47.4	70.5	12.7	396.4	308.5	344.2	248.1	4.6
8	58.0	74.2	20.2	659.0	516.2	598.6	449.4	7.3
9	59.6	77.2	26.3	884.8	696.0	825.9	633.6	9.7
10	52.6	79.6	28.7	990.9	781.7	941.3	731.2	10.8
11	40.4	81.7	26.7	940.5	743.5	904.2	707.8	10.1
12	27.0	83.5	21.2	762.7	603.8	739.4	581.7	8.1
13	15.7	85.0	14.5	530.5	420.5	517.4	408.4	5.6
14	8.0	86.4	8.5	316.9	251.4	310.5	245.7	3.3
15	3.5	87.5	4.3	162.5	129.0	159.8	126.7	1.7
16	1.4	88.6	1.9	71.5	56.8	70.5	56.0	0.8
-----	-----	-----	-----	-----	-----	-----	-----	-----
	358.1		172.9	5946.0	4683.8	5587.6	4299.0	64.7

### Appendix 3. FORTRAN source listing for program COYIELD.

```
COYIELD FORTRAN A1 07/04/84 8:41 RALPH F 80 361 RECS VA TECH  
  
C COY00010  
C COY00020  
C ***** COY00030  
C * COY00040  
C * PROGRAM COYIELD PRODUCES STAND AND STOCK TABLES* COY00050  
C * FOR UNTHINNED LOBLOLLY PINE PLANTATIONS ON * COY00060  
C * CUTOVER SITE-PREPARED LANDS. * COY00070  
C * COY00080  
C * DEVELOPED BY RALPH L. AMATEIS, * COY00090  
C * LOBLOLLY PINE GROWTH AND YIELD * COY00100  
C * RESEARCH COOPERATIVE, * COY00110  
C * VPI & SU. APRIL, 1984 * COY00120  
C * COY00130  
C ***** COY00140  
C COY00150  
C COY00160  
C READ(5,500) IPROGRAM COY00170  
500 FORMAT(11) COY00180  
IF(IPROG.EQ.1) CALL INPUT1 COY00190  
IF(IPROG.EQ.2) CALL INPUT2 COY00200  
RETURN COY00210  
END COY00220  
SUBROUTINE INPUT1 COY00230  
C COY00240  
C COY00250  
C ***** COY00260  
C * COY00270  
C * SUBROUTINE INPUT1 READS THE NECESSARY INPUTS * COY00280  
C * FOR STAND PROJECTION * COY00290  
C * * COY00300  
C ***** COY00310  
C COY00320  
C COY00330  
C COY00340  
C COY00350  
C COY00360  
C COY00370  
C COY00380  
C COY00390  
C COY00400  
C COY00410  
C COY00420  
C COY00430  
C COY00440  
C COY00450  
C COY00460  
C COY00470  
C COY00480  
C COY00490  
C COY00500  
C COY00510  
C COY00520  
C COY00530  
C COY00540  
C COY00550  
  
IMPLICIT REAL*8 (A-H,O-Z)  
COMMON /ONE/ S11,AGE1,XN1,AGE2, TOP, THRES, IOPT, NDEC, MORE, ISITE  
COMMON /TWO/ AGE,HD,XN, PNTC1(30), BACL1(30), DMIN, DMAX  
: ,AAVG, QAVG, TBA1, IPLANT  
COMMON /THREE/ ITITLE(20), XNPLOG, HDLOG, XNLOG, XNP, ICHECK  
DATA IBLANK/' /  
DATA B1/0.01348D0/, B2/0.00060783D0/, B3/-0.0084124D0/  
  
C  
C----- READ STAND DESCRIPTION CARD.  
C  
1 READ(5,500,END=999) S11,AGE1,XN1, IPLANT, TOP, THRES, ISITE, NDEC, IOPT  
: ,MORE  
500 FORMAT(2F3.0, F4.0, I2, 2F2.0, 4I2)  
C  
C----- READ TITLE CARD IF ANY.  
C  
DO 2 I1=1, 19  
2 ITITLE(I1)=IBLANK  
IF(IOPT.EQ.1) READ(5,501) (ITITLE(I1), I1=1,19)  
501 FORMAT(19A4)  
AGE=AGE1  
ICHECK=0
```

## Appendix 3. (continued).

```

COYIELD  FORTRAN  A1  07/04/84  8:41 RALPH      F 80      361 RECS      VA TECH

      CALL HEIGHT
      XNPLOG=DLOG10(XN1)
      XNPLOG=(DLOG10(XN1)+AGE*(B2*HD+B3*DSQRT(HD)))/
      : (1-B1*AGE)
      IF(IPLANT.EQ.1) XNPLOG=DLOG10(XN1)
      XNP=10.DO**XNPLOG
      CALL MORT
      CALL YIELD
      CALL OUTPUT
C
C----- READ DECISION CARDS.
C
      4 IF(MORE.EQ.1.AND.NDEC.EQ.0) GO TO 1
      IF(MORE.NE.1.AND.NDEC.EQ.0) RETURN
      DO 3 I=1,NDEC
502  READ(5,502) AGE2
      FORMAT(F3.0)
      ICHECK=0
      AGE=AGE2
      CALL HEIGHT
      CALL MORT
      CALL YIELD
      CALL OUTPUT
      3 CONTINUE
      IF(MORE.EQ.1) GO TO 1
999  RETURN
      END
      SUBROUTINE INPUT2
C
C
C      *****
C      *
C      * SUBROUTINE INPUT2 READS THE NECESSARY INPUTS *
C      * FOR STAND AND STOCK TABLES FOR VARIOUS *
C      * COMBINATIONS OF AGE, SITE INDEX AND NUMBER *
C      * OF TREES PLANTED. *
C      *
C      *****
C
      IMPLICIT REAL*8 (A-H,O-Z)
      COMMON /ONE/ S11,AGE1,XN1,AGE2, TOP, THRES, IOPT, NDEC, MORE, ISITE
      COMMON /TWO/ AGE, HD, XN, PNTC1(30), BACL1(30), DMIN, DMAX
      : ,AAVG,QAVG, TBA1, IPLANT
      COMMON /THREE/ ITITLE(20), XNPLOG, HDLOG, XNLOG, XNP, ICHECK
      DATA IBLANK/' '/
      DATA B1/0.01348D0/, B2/0.00060783D0/, B3/-0.0084124D0/
      1 READ(5,500,END=999) ISB, ISE, IS1, IAB, IAE, IAI, INB, INE, INI, TOP, THRES
      : , ISITE, IOPT
500  FORMAT(9I4,2F3.0,2I2)
      DO 2 II=1,19
      2 ITITLE(II)=IBLANK
      IF(IOPT.EQ.1) READ(5,501) (ITITLE(II), II=1,19)
501  FORMAT(19A4)
C

```

```

COY00560
COY00570
COY00580
COY00590
COY00600
COY00610
COY00620
COY00630
COY00640
COY00650
COY00660
COY00670
COY00680
COY00690
COY00700
COY00710
COY00720
COY00730
COY00740
COY00750
COY00760
COY00770
COY00780
COY00790
COY00800
COY00810
COY00820
COY00830
COY00840
COY00850
COY00860
COY00870
COY00880
COY00890
COY00900
COY00910
COY00920
COY00930
COY00940
COY00950
COY00960
COY00970
COY00980
COY00990
COY01000
COY01010
COY01020
COY01030
COY01040
COY01050
COY01060
COY01070
COY01080
COY01090
COY01100

```



Appendix 3. (continued).

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COYIELD  FORTRAN  A1  07/04/84  8:41 RALPH      F 80      361 RECS   VA TECH

C      * FROM:  AMATEIS AND BURKHART. 1983. SITE * COY01660
C      * INDEX CURVES FOR LOBLOLLY PINE * COY01670
C      * PLANTATIONS ON CUTOVER SITE- * COY01680
C      * PREPARED LANDS. COOP REPORT NO. 24 * COY01690
C      * LOBLOLLY PINE GROWTH AND YIELD * COY01700
C      * RESEARCH COOPERATIVE. * COY01710
C      * * COY01720
C      ***** COY01730
C      COY01740
C      COY01750
C      IMPLICIT REAL*8 (A-H,O-Z) COY01760
C      DIMENSION B1(3),B2(3) COY01770
C      COMMON /ONE/ S11,AGE1,XN1,AGE2, TOP, THRES, IOPT, NDEC, MORE, ISITE COY01780
C      COMMON /TWO/ AGE,HD,XN, PNTC1(30), BACL1(30), DM1N, DMAX COY01790
C      : ,AAVG, QAVG, TBA1, IPLANT COY01800
C      COMMON /THREE/ ITITLE(20), XNPLOG, HDLOG, XNLOG, XNP, ICHECK COY01810
C      DATA X0/0.04D0/, B1/-0.10283D0, -0.11092D0, -0.08596D0 / COY01820
C      : ,B2/-2.1676D0, -1.9036D0, -2.6055D0 / COY01830
C      IF (AGE.EQ.0.0) HD=0. COY01840
C      IF (AGE.EQ.0.0) RETURN COY01850
C      X=1.0D0/AGE COY01860
C      Y0=DLOG(S11) COY01870
C      HDLOG=Y0*(X/X0)**B1( ISITE)*DEXP(B2( ISITE)*(X-X0)) COY01880
C      HD=DEXP(HDLOG) COY01890
C      RETURN COY01900
C      END COY01910
C      SUBROUTINE YIELD COY01920
C      ***** COY01930
C      * COY01940
C      * SUBROUTINE YIELD USES PERCENTILE ESTIMATORS TO * COY01950
C      * CALCULATE A THREE PARAMETER WEIBULL * COY01960
C      * DISTRIBUTION FROM STAND CHARACTERISTICS. * COY01970
C      * * COY01980
C      * INPUTS TO THE ROUTINE ARE : * COY01990
C      * AGE = STAND AGE * COY02000
C      * HD = AVERAGE HEIGHT OF THE DOMS AND CODOMS * COY02010
C      * XN = NUMBER OF TREES PER ACRE * COY02020
C      * ***** COY02030
C      COY02040
C      COY02050
C      IMPLICIT REAL*8 (A-H,O-Z) COY02060
C      COMMON /ONE/ S11,AGE1,XN1,AGE2, TOP, THRES, IOPT, NDEC, MORE, ISITE COY02070
C      COMMON /TWO/ AGE,HD,XN, PNTC1(30), BACL1(30), DM1N, DMAX COY02080
C      : ,AAVG, QAVG, TBA1, IPLANT COY02090
C      COMMON /THREE/ ITITLE(20), XNPLOG, HDLOG, XNLOG, XNP, ICHECK COY02100
C      INTEGER CLASS COY02110
C      IF (AGE.EQ.0.D0) RETURN COY02120
C      A=-0.982644D0 + 0.073765D0*HD - 0.379953D0*HD/AGE COY02130
C      IF (A.LT.0.D0) A=0.D0 COY02140
C      P50=12.441780D0-0.044910D0*AGE+0.067869D0*HD-42.897600D0/HD COY02150
C      : - 1.199840D0*DLOG(XN) COY02160
C      P95=16.041112D0+0.008676164D0*AGE+0.093124D0*HD-43.769283D0/HD COY02170
C      : - 1.722701D0*DLOG(XN) COY02180
C      IF (P50.GT.0.0.AND.P95.GT.0.0) GO TO 5 COY02190
C      ICHECK=1 COY02200

```

## Appendix 3. (continued).

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COYIELD  FORTRAN  A1  07/04/84  8:41  RALPH      F 80      361 RECS      VA TECH

      GO TO 999
5  C = 1.4637D0/DLOG((P95-A)/(P50-A))
  B = (P95-A)/(2.99573D0**(1/C))
  TBA1=0.0D0
  DAVG1=0.0D0
  TTEMP=0.0D0
  CLASS=0
  TPNTC1=0.0D0
  IMIN=0
91 CLASS=CLASS+1
  TP1=DFLOAT(CLASS)+0.5D0
  BT1=DFLOAT(CLASS)-0.5D0
  IF(TP1.LE.A)TC=0.0D0
  IF(BT1.LE.A.AND.TP1.GT.A)
:   TC=XN*(1-DEXP(-((TP1-A)/B)**C))
  IF(BT1.GT.A)
:   TC=XN*(DEXP(-((BT1-A)/B)**C))-DEXP(-((TP1-A)/B)**C))
  TTEMP=TTEMP+TC
  IF(TC.LT..5D0.AND.TTEMP.GT.5.D0)GO TO 90
  IF(TC.LT..5D0)GO TO 91
  PNTC1(CLASS)=TC
  BACL1(CLASS)=0.005454D0*DFLOAT(CLASS)*DFLOAT(CLASS)*PNTC1(CLASS)
  IF(IMIN.EQ.0)DMIN=CLASS
  IMIN=1
  DAVG1=DAVG1+(PNTC1(CLASS)*DFLOAT(CLASS))
  TPNTC1=TPNTC1+PNTC1(CLASS)
  TBA1=TBA1+BACL1(CLASS)
  GO TO 91
90 DMAX=CLASS-1.0D0
  AAVG=DAVG1/TPNTC1
  QAVG=(TBA1/(0.005454D0*TPNTC1))**0.5D0
  AINC=TBA1/AGE
999 RETURN
  END
  SUBROUTINE OUTPUT

C
C
C      *****
C      *
C      *   SUBROUTINE OUTPUT PRINTS THE STAND AND STOCK   *
C      *   TABLE.                                         *
C      *
C      *****
C
C
C      IMPLICIT REAL*8 (A-H,O-Z)
      DIMENSION CF(20),ROB(3),RIB(3),BOB(2),BIB(2)
      COMMON /ONE/  S11,AGE1,XN1,AGE2, TOP, THRES, IOPT, NDEC, MORE, ISITE
      COMMON /TWO/  AGE,HD,XN, PNTC1(30), BACL1(30), DMIN, DMAX
:      , AAVG, QAVG, TBA1, IPLANT
      COMMON /THREE/ ITITLE(20), XNPLOG, HDLOG, XNLOG, XNP, ICHECK
      DATA ROB/ -0.32354D0,  3.1579D0,  2.7115D0/
:      , RIB/ -0.77135D0,  3.3736D0,  3.1080D0/
:      , BOB/  0.34864D0,  0.00232D0/
:      , BIB/  0.11691D0,  0.00185D0/
COY02210
COY02220
COY02230
COY02240
COY02250
COY02260
COY02270
COY02280
COY02290
COY02300
COY02310
COY02320
COY02330
COY02340
COY02350
COY02360
COY02370
COY02380
COY02390
COY02400
COY02410
COY02420
COY02430
COY02440
COY02450
COY02460
COY02470
COY02480
COY02490
COY02500
COY02510
COY02520
COY02530
COY02540
COY02550
COY02560
COY02570
COY02580
COY02590
COY02600
COY02610
COY02620
COY02630
COY02640
COY02650
COY02660
COY02670
COY02680
COY02690
COY02700
COY02710
COY02720
COY02730
COY02740
COY02750

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## Appendix 3. (continued).

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COYIELD  FORTRAN  A1  07/04/84  8:41 RALPH      F 80      361 RECS      VA TECH

      DATA CF/0.DO,0.DO,0.DO,0.DO                                COY02760
      :      ,84.DO,85.DO,87.DO,90.DO,91.DO,92.DO,93.DO,94.DO      COY02770
      :      ,95.DO,95.DO,95.DO,95.DO,95.DO,95.DO,95.DO,95.DO/    COY02780
C
C-----  WRITE HEADINGS.                                       COY02790
C                                                    COY02800
501  WRITE(6,501)                                               COY02810
      FORMAT('1')                                               COY02820
      IF(1OPT.EQ.1) WRITE(6,502) (ITITLE(II),II=1,19)           COY02830
502  FORMAT(//10X,19A4)                                         COY02840
      WRITE(6,503) S11,HD,AGE,AAVG,XNP,QAVG                     COY02850
503  FORMAT(///26X,'INPUTS',22X,'PREDICTED'/26X,6(' '),22X,9(' ') COY02860
      : /18X,'SITE INDEX =',F7.2,9X,'AVERAGE HD =',F6.2        COY02870
      : /25X,'AGE =',F7.2,5X,'ARITH. MEAN DBH =',F6.2           COY02880
      : /13X,'PLANTED TREES =',F7.2,6X,'QUAD. MEAN DBH =',F6.2  COY02890
504  WRITE(6,504) TOP, TOP                                       COY02900
      FORMAT(//37X,'TOTAL',3X,'TOTAL',3X,'VOLUME',3X,'VOLUME',3X, COY02920
      : 'VOLUME'                                                 COY02930
      : /3X,'DBH',3X,'NUMBER',2X,'AVERAGE',4X,'BASAL',3X,      COY02940
      : 'VOLUME',3X,'VOLUME',5X,'O.B.',5X,'I.B.',2X,'(CORDS)'   COY02950
      : /1X,'CLASS',1X,'TREES',3X,'HEIGHT',5X,'AREA',          COY02960
      : 5X,'O.B.',5X,'I.B.',2X,'TO',F3.0,'IN',2X,'TO',F3.0,'IN', COY02970
      : 2X,'TO 4.IN')                                           COY02980
      WRITE(6,505)                                               COY02990
505  FORMAT(1X,5(' '),3X,6(' '),2X,7(' '),4X,5(' '),3X,6(' '),   COY03000
      : 3X,6(' '),2X,7(' '),2X,7(' '),2X,7(' '),2X,7(' '))       COY03010
      IF (ICHECK.EQ.1) WRITE (6,100)                             COY03020
100  FORMAT (///,10X,'WEIBULL PARAMETERS OUT OF RANGE' /      COY03030
      : 10X,'WITH THIS COMBINATION OF INPUT VARIABLES' // 10X,  COY03040
      : 'NO DIAMETER DISTRIBUTION AVAILABLE SO' / 10X,          COY03050
      : 'SKIPPING TO NEXT DECISION PERIOD',///)                 COY03060
      IF (ICHECK.EQ.1) RETURN                                     COY03070
C
C-----  INITIALIZATION.                                       COY03080
C                                                    COY03090
C                                                    COY03100
      AAVG=0.DO                                                  COY03110
      QAVG=0.DO                                                  COY03120
      BB=0.DO                                                    COY03130
      XNRES=0.DO                                                 COY03140
      TVOB=0.DO                                                  COY03150
      TVIB=0.DO                                                  COY03160
      TVOB4=0.DO                                                 COY03170
      TVIB4=0.DO                                                 COY03180
      CVOB4=0.DO                                                 COY03190
      XNT=XN                                                     COY03200
      IMIN=DMIN                                                  COY03210
      IMAX=DMAX                                                  COY03220
      IF (AGE.EQ.0.0) GO TO 7                                    COY03230
C
C-----  LOOP OVER DBH CLASSES.                                 COY03240
C                                                    COY03250
C                                                    COY03260
      DO 5 I=IMIN,IMAX                                          COY03270
      XI=DFLOAT(I)                                              COY03280
      HH=HDLOG/2.30259D0+0.040006D0-(1.DO/XI-1.DO/DMAX)*(0.428373D0- COY03290
      :0.497483D0*DLOG10(XN))-0.363755D0*(1.DO/AGE)+1.095404*HDLOG/2.3026 COY03300

```

## Appendix 3. (continued).

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COYIELD  FORTRAN  A1  07/04/84  8:41  RALPH      F 80      361 RECS      VA TECH

      :DO)
      H=10.D0**HH
      D2H=XI*X1*H
      VOB=PNTC1(I)*(BOB(1)+BOB(2)*D2H)
      VIB=PNTC1(I)*(BIB(1)+BIB(2)*D2H)
      VOB4=0.D0
      VIB4=0.D0
      VOB4C=0.D0
      IF(I.LT.THRES) GO TO 6
      VOB4=VOB*(1.D0+ROB(1))*(TOP**ROB(2)/XI**ROB(3))
      VIB4=VIB*(1.D0+RIB(1))*(TOP**RIB(2)/XI**RIB(3))
      IF(I.LT.5) GO TO 6
      VOB4C=VOB/CF(I)
6     BB=BB+BACL1(I)
      XNRES=XNRES+PNTC1(I)
      TVOB=TVOB+VOB
      TVIB=TVIB+VIB
      TVOB4=TVOB4+VOB4
      TVIB4=TVIB4+VIB4
      CVOB4=CVOB4+VOB4C
506    WRITE(6,506) I,PNTC1(I),H,BACL1(I),VOB,VIB,VOB4,VIB4,VOB4C
      FORMAT(I6,F9.1,7F9.1)
      5 CONTINUE
C
C-----  END LOOP.
C
507    7 WRITE(6,507) XNRES,BB,TVOB,TVIB,TVOB4,TVIB4,CVOB4
      FORMAT(9X,6(' '),13X,5(' '),3(3X,6(' ')),2(2X,7(' ')),
      :/4X,F11.1,8X,F10.1,5F9.1)
      RETURN
      END
COY03310
COY03320
COY03330
COY03340
COY03350
COY03360
COY03370
COY03380
COY03390
COY03400
COY03410
COY03420
COY03430
COY03440
COY03450
COY03460
COY03470
COY03480
COY03490
COY03500
COY03510
COY03520
COY03530
COY03540
COY03550
COY03560
COY03570
COY03580
COY03590
COY03600
COY03610

```

## Appendix 4. BASIC source listing for program COYIELD.

```

COYIELD                               10:09:27  07-04-1984                               Page 1
      IBM Personal Computer BASIC Formatter and Cross-Reference V 1.00

10  REM IBM BASIC version of program COYIELD for unthinned loblolly pine
      plantations on cutover site-prepared lands.

20  REM By Ralph Amateis, VPI&SU, April, 1984

30  REM read in necessary data

40  DIM
      PNTC1(30),
      BAAC1(30),
      CF(25)
50  FOR I%=1 TO 3
60  |  READ AA(I%)
70  |  DATA
      |      -.10283,
      |      -.11092,
      |      -.08596
80  NEXT I%
90  FOR J%=1 TO 3
100 |  READ BB(J%)
110 |  DATA
      |      -2.1676,
      |      -1.9036,
      |      -2.6055
120 NEXT J%
130 READ B1,B2,B3
140 DATA
      0.01348,
      0.00060783,
      -0.0084124
150 READ ROB1,ROB2,ROB3,RIB1,RIB2,RIB3,BOB1,BOB2,BIB1,BIB2
160 DATA
      -0.32354,
      3.1579,
      2.7115,
      -0.77135,
      3.3736,
      3.1080,
      0.34864,
      0.00232,
      0.11691,
      0.00185
170 FOR I%=1 TO 25
180 |  READ CF(I%)
190 |  DATA
      |      0,
      |      0,
      |      0,
      |      0,
      |      84,
      |      85,
      |      87,

```

## Appendix 4. (continued).

```

COYIELD                               10:09:27  07-04-1984                     Page 2
IBM Personal Computer BASIC Formatter and Cross-Reference V 1.00

|      90,
|      91,
|      92,
|      93,
|      94,
|      95,
|      95,
|      95,
|      95,
|      95,
|      95,
|      95,
|      95,
|      95,
|      95,
|      95,
|      95,
|      95,
|      95,
|      95
200 NEXT I%
210 CLS
220 PRINT
230 PRINT
240 PRINT "                PROGRAM COYIELD"
250 PRINT "                LOBLOLLY PINE GROWTH AND YIELD RESEARCH COOPERATIVE"
260 PRINT "                VPI & SU, APRIL, 1984"
270 PRINT
280 PRINT
290 PRINT
300 PRINT
    "                Note:  To halt execution at any time, hold
                          CNTL and BREAK keys simultaneously"
310 PRINT
320 PRINT "                To reexecute program, type RUN"
330 PRINT
340 PRINT

350 REM Input the necessary stand attributes and error trap

360 INPUT "Enter stand site index (base 25)";SI1
370 IF
    SI1>100 OR SI1 <34
        THEN
            PRINT:
            PRINT
            "Site index out of range of data (data range from 34-90 feet
              at 25 years)":
            PRINT
380 IF
    SI1>100 OR SI1<34
        THEN
            PRINT
            "Enter - 0 for a new value
            - any other value to accept in
            putted                                 site

```

## Appendix 4. (continued).

```

COYIELD                               10:09:27  07-04-1984                Page 3
      IBM Personal Computer BASIC Formatter and Cross-Reference V 1.00

      index and continue"
390 IF
      SII>100 OR SII<34
      THEN
      INPUT ISICK:
      IF
      ISICK=0
      THEN
      GOTO 360
400 PRINT
410 INPUT "Enter stand age";AGE
420 IF
      AGE=0
      THEN
      PRINT:
      GOTO 480
430 IF
      AGE<0 OR AGE>30
      THEN
      PRINT:
      PRINT "Age out of range of data (data range from 8-25 years)":
      PRINT
440 IF
      AGE<0 OR AGE>30
      THEN
      INPUT
      "Enter - 0 for a new age
      nputed
      nd continue";ASICK:
      IF
      ASICK=0
      THEN
      GOTO 400
450 IF
      AGE>0
      THEN
      PRINT:
      INPUT
      "Enter - 0 to input number of trees planted
      mber of trees
      ving";IPLANT
      - any other number to accept i
      age a
      - any other number to input nu
      survi
460 IF
      IPLANT=0
      THEN
      PRINT:
      INPUT "Enter number of trees planted";XN1:
      NSICK=1:
      GOTO 500
470 IF
      IPLANT>0 OR IPLANT<0
      THEN
      PRINT:

```

## Appendix 4. (continued).

```

COYIELD                      10:09:27  07-04-1984                      Page 4
      IBM Personal Computer BASIC Formatter and Cross-Reference  V 1.00

      INPUT "Enter number of trees surviving";XN1:
      NSICK=1:
      GOTO 500
480  NSICK=1
490  INPUT "Enter number of trees planted";XN1
500  IF
      XN1>1000 OR XN1<250
      THEN
      PRINT:
      PRINT
      "Number of trees out of range of the data (data range from 2
      75-1000 surviving per acre)":
      PRINT
510  IF
      XN1>1000 OR XN1<250
      THEN
      INPUT
      "Enter - 0 for a new value
      - any other number to accept i
      nputt
      mber of trees and continue";NSICK:
      PRINT
520  IF
      NSICK=0 AND AGE=0
      THEN
      GOTO 480
530  IF
      NSICK=0 AND AGE>0 AND IPLANT=0
      THEN
      GOTO 460
540  IF
      NSICK=0 AND AGE>0 AND (IPLANT<0 OR IPLANT>0)
      THEN
      GOTO 470
550  PRINT
560  INPUT "Enter top diameter (o.b.) merchantability limit";TOP
570  IF
      TOP<0 OR TOP>10
      THEN
      PRINT:
      PRINT "Top diameter limit excessive...":
      PRINT:
      INPUT
      "Enter 0 - for a new value
      - any other number to contin
      ue on";TOPSICK:
      IF
      TOPSICK=0
      THEN
      GOTO 550
580  PRINT
590  INPUT
      "Enter dbh merchantability limit below which trees are unmerchantable
      " ;THRES

```

## Appendix 4. (continued).

```

COYIELD                      10:09:27  07-04-1984                      Page 5
      IBM Personal Computer BASIC Formatter and Cross-Reference V 1.00

600  IF
      THRES<0 OR THRES>8
      THEN
      PRINT:
      PRINT "DBH merchantability limit excessive...":
      PRINT:
      INPUT
      "Enter - 0 for a new value
      on";THSICK:
      IF
      THSICK=0
      THEN
      GOTO 580
      - any other number to continue

610  IF
      TOP >= THRES
      THEN
      PRINT:
      PRINT
      "Note: Top limit must be less than dbh merchantability limit":
      PRINT:
      GOTO 560

620  PRINT
630  PRINT "Choose a site index curve: 1=Combined Coastal Plain and Piedmont"
640  PRINT "
      2=Coastal Plain"
650  PRINT "
      3=Piedmont"
660  INPUT " Enter desired number";ISITE%
670  IF
      ISITE%<1 OR ISITE%>7
      THEN
      PRINT:
      PRINT "Invalid choice...please try again":
      GOTO 620

680  CLS
690  GOSUB 910
700  XNPLOG=LOG(XN1)/2.30259
710  XNPLOG=((LOG(XN1)/2.30259+AGE*(B2*HD+B3*SQR(HD)))/(1-B1*AGE))
720  IF
      IPLANT=0
      THEN
      XNPLOG=LOG(XN1)/2.30259

730  XNP=10^XNPLOG
740  GOSUB 1020
750  GOSUB 1100
760  GOSUB 1490
770  PRINT
780  INPUT
      "Enter 0=stop, 1=project the current stand, or 2=do another stand";
      IPR

790  IF
      IPR>2 OR IPR<0
      THEN
      PRINT:

```

## Appendix 4. (continued).

```

COYIELD                      10:09:27  07-04-1984                      Page 6
                              IBM Personal Computer BASIC Formatter and Cross-Reference V 1.00

      PRINT "Invalid choice...please try again":
      GOTO 780
800  IF
      IPR=0
      THEN
      GOSUB 900
810  IF
      IPR=2
      THEN
      GOTO 210
820  IF
      IPR=1
      THEN
      PRINT:
      INPUT "Enter age at next decision period";AGE
830  CLS
840  ICHECK%=0
850  GOSUB 910
860  GOSUB 1020
870  GOSUB 1100
880  GOSUB 1490
890  GOTO 770
900  END

910  REM Computes height of the dominants and codominants of a stand given
      site index and age

920  REM From Amateis and Burkhart, 1983

930  IF
      AGE=0
      THEN
      HD=0
940  IF
      AGE=0
      THEN
      RETURN
950  X=1/AGE
960  Y0=LOG(SI1)
970  AX=AA(ISITE%)
980  BX=BB(ISITE%)
990  HDLOG=Y0*(X/.04)^AX*EXP(BX*(X-.04))
1000 HD=EXP(HDLOG)
1010 RETURN

1020 REM Computes number of trees surviving based on Feduccia et.al.,USDA

1030 REM For Serv. Res. Pap. SO-148.

1040 IF
      AGE=0
      THEN

```



## Appendix 4. (continued).

```

COYIELD                                10:09:27  07-04-1984                                Page 7
      IBM Personal Computer BASIC Formatter and Cross-Reference V 1.00

      GOTO 1080
1050  XNLOG=- (AGE*(B1*XNPLOG+B2*HD+B3*SQR(HD)))+XNPLOG
1060  XN=10^XNLOG
1070  GOTO 1090
1080  XN=XN1
1090  RETURN

1100  REM Uses percentile estimators to calculate a three parameter weibull
      distribution

1110  IF
      AGE=0
      THEN
      RETURN
1120  A=-.982644+.073765*HD-.379953*HD/AGE
1130  IF
      A<0
      THEN
      A=0
1140  P50=12.44178-.04491*AGE+.067869*HD-42.8976/HD-1.19984*LOG(XN)
1150  P95=16.041112#+8.676164E-03*AGE+.093124*HD-43.769283#/HD-1.722701*LOG(
      XN)
1160  IF
      P50 AND P95 >0
      THEN
      GOTO 1190
      ELSE
      ICHECK%=1:
      RETURN
1170  ICHECK%=1
1180  GOTO 1490
1190  C=1.4637/LOG((P95-A)/(P50-A))
1200  B=(P95-A)/(2.99573^(1/C))
1210  TBA1=0
1220  DAVG1=0
1230  TTEMP=0
1240  CLASS%=0
1250  TPNTC1=0
1260  IMIN=0
1270  CLASS%=CLASS%+1
1280  TP1=CLASS% + .5
1290  BT1=CLASS% -.5
1300  IF
      TP1<=A
      THEN
      TC=0
1310  IF
      BT1<=A AND TP1>A
      THEN
      TC=XN*(1-EXP(-(((TP1-A)/B)^C)))
1320  IF
      BT1>A
      THEN
      TC=XN*(EXP(-(((BT1-A)/B)^C))-EXP(-(((TP1-A)/B)^C)))

```

## Appendix 4. (continued).

```

COYIELD                                10:09:27  07-04-1984                                Page 8
      IBM Personal Computer BASIC Formatter and Cross-Reference V 1.00

1330 TTEMP=TTEMP+TC
1340 IF
      TC<.5 AND TTEMP>5
      THEN
      GOTO 1440

1350 IF
      TC <.5
      THEN
      GOTO 1270
1360 PNTC1(CLASS%)=TC
1370 BACL1(CLASS%)=.005454*CLASS%*CLASS%*PNTC1(CLASS%)
1380 IF
      IMIN=0
      THEN
      DMIN=CLASS%

1390 IMIN=1
1400 DAVG1=DAVG1+(PNTC1(CLASS%)*CLASS%)
1410 TPNTC1=TPNTC1+PNTC1(CLASS%)
1420 TBA1=TBA1+BACL1(CLASS%)
1430 GOTO 1270
1440 DMAX=CLASS%-1
1450 AAVG=DAVG1/TPNTC1
1460 QAVG=(TBA1/(.005454*TPNTC1))^.5
1470 AINC=TBA1/AGE
1480 RETURN

1490 REM Prints the stand and stock table

1500 REM Write headings

1510 PRINT
1520 PRINT "                Inputs                Predicted"
1530 PRINT "                -----"
1540 PRINT USING "          Site Index= ###.##          Average HD= ###.##";S11,HD
1550 PRINT USING "          Age= ###.##          Arith. Mean DBH= ###.##";AGE,AAVG
1560 PRINT USING "          Planted Trees=####.##          Quad. Mean DBH= ###.##";XNP,QAVG
1570 PRINT
1580 PRINT
      "                ----Cubic-Foot Volumes Per Acre----"
      "
1590 PRINT
      "          DBH Number Average Basal Total Total OB To IB To
          Volume"
1600 PRINT USING
      "          Class Trees Height Area OB IB ##in OB ##in OB
          (Cords)";TOP,TOP
1610 PRINT
      "          -----"
      "          -----"
      "          -----"
      "          -----"
1620 PRINT
1630 IF
      ICHECK%=1
      THEN

```

## Appendix 4. (continued).

```

COYIELD                                10:09:27  07-04-1984                                Page 9
      IBM Personal Computer BASIC Formatter and Cross-Reference V 1.00

      PRINT "                                Weibull parameters out of range"
1640 IF
      ICHECK%=1
      THEN
      PRINT
      "                                with this combination of input variable
      s."
1650 IF
      ICHECK%=1
      THEN
      PRINT
1660 IF
      ICHECK%=1
      THEN
      PRINT
      "                                No diameter distribution available so"
1670 IF
      ICHECK%=1
      THEN
      PRINT "                                skipping to next decision period."
1680 IF
      ICHECK%=1
      THEN
      RETURN

1690 REM Initialize

1700 AAVG=0
1710 QAVG=0
1720 BB=0
1730 XNRES=0
1740 VOB4=0
1750 VIB4=0
1760 VOB4C=0
1770 TVOB=0
1780 TVIB=0
1790 TVOB4=0
1800 TVIB4=0
1810 CVOB4=0
1820 IF
      AGE=0
      THEN
      XNRES=XN1
1830 IF
      AGE=0
      THEN
      GOTO 2090

1840 XNT=XN
1850 IMIN=DMIN
1860 IMAX=DMAX

1870 REM Loop over dbh classes

1880 FOR I%=IMIN TO IMAX

```

## Appendix 4. (continued).

```

COYIELD                                10:09:27  07-04-1984                                Page 10
IBM Personal Computer BASIC Formatter and Cross-Reference V 1.00

1890 | HH=HDLOG/2.30259+.040006-(1/ I% -1/DMAX)*( .428373-.497483*(LOG(XN)))/
      | 2.30259 -.363755*(1/AGE)+1.095404*HDLOG/2.30259)
1900 | H=10^HH
1910 | D2H= I% * I% *H
1920 | VOB=PNTC1( I% )*(BOB1+BOB2*D2H)
1930 | VIB=PNTC1( I% )*(BIB1+BIB2*D2H)
1940 | IF
      | I% <THRES
      | THEN
      | GOTO 1990
1950 | VOB4=VOB*(1+ROB1*(TOP^ROB2/ I% ^ROB3))
1960 | VIB4=VIB*(1+RIB1*(TOP^RIB2/ I% ^RIB3))
1970 | IF
      | I% <5
      | THEN
      | GOTO 1990
1980 | VOB4C=VOB/CF( I% )
1990 | BB=BB+BACL1( I% )
2000 | XNRES=XNRES+PNTC1( I% )
2010 | TVOB=TVOB+VOB
2020 | TVIB=TVIB+VIB
2030 | TVOB4=TVOB4+VOB4
2040 | TVIB4=TVIB4+VIB4
2050 | CVOB4=CVOB4+VOB4C
2060 | PRINT USING
      | " ## ###.# ##.# ##.# ###.# ###.# ###.# ###.# ##
      | #.# ###.#"; I% ,PNTC1( I% ),H,BACL1( I% ),VOB,VIB,VOB4,VIB4,VOB4C
2070 NEXT
2080 REM End loop
2090 PRINT
      "
      "
2100 PRINT USING
      " ###.# ##.# ###.# ###.# ###.# ###.#
      ###.#";XNRES,BB,TVOB,TVIB,TVOB4,TVIB4,CVOB4
2110 RETURN

```

