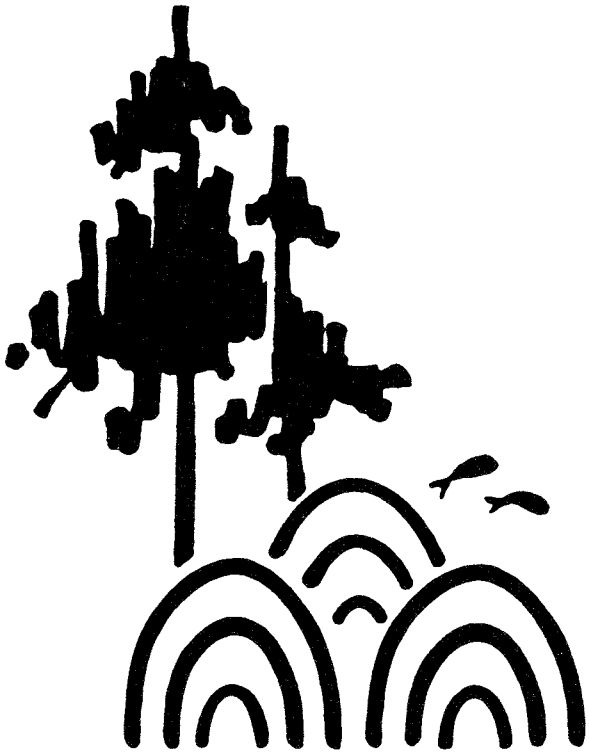
Yields and Size Class Distributions for Unthinned Loblolly Pine Plantations on Cutover Site-Prepared Lands



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

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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.

AUTHORS

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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.

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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.

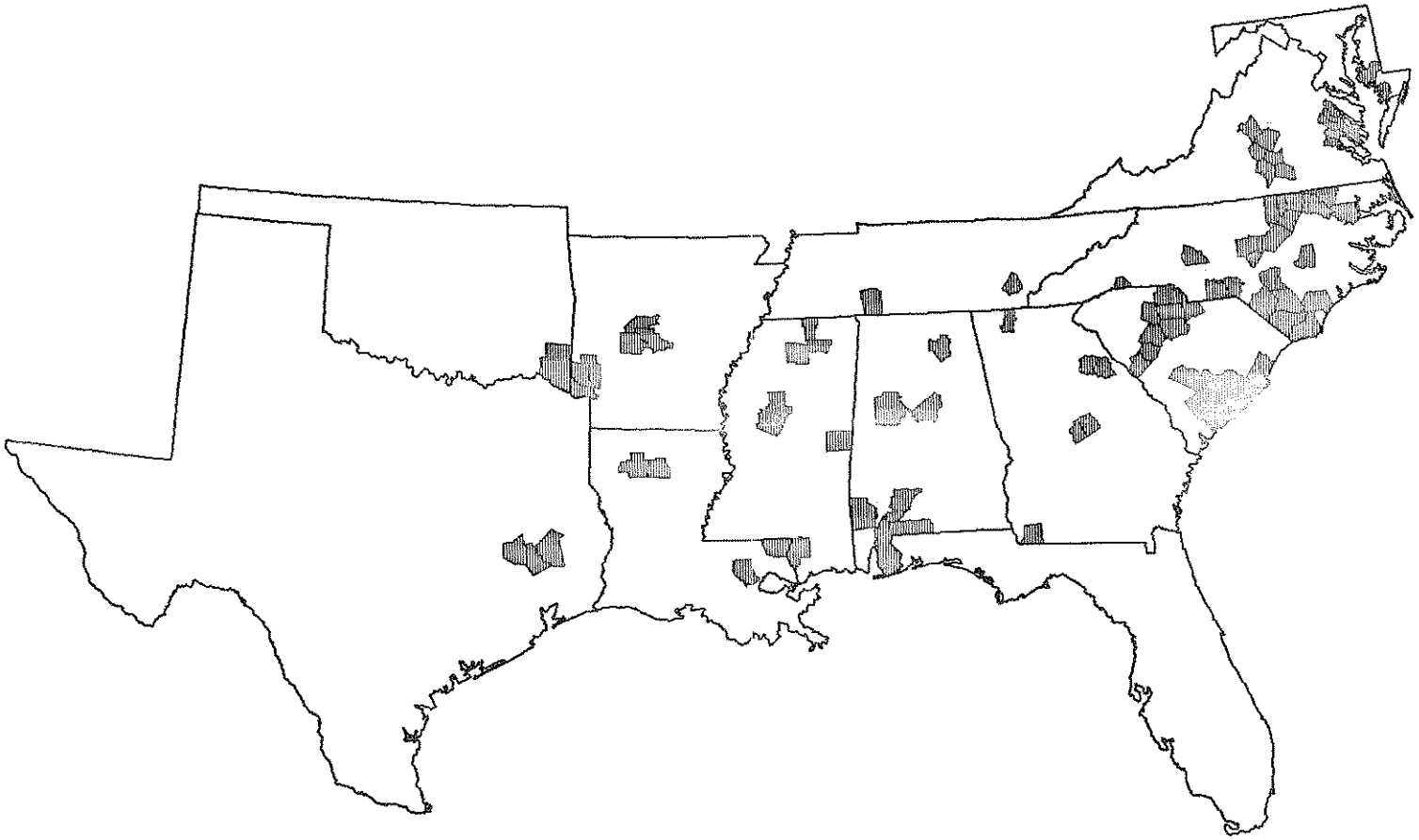

Figure 1. Map of 13 states showing the location of sample plots by county. Each darkened county contains one or more plot installations.

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

State	Physiographic Region			
	Coastal Plain	Piedmont	Other	Total
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	11	27	-	38
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	
Combination	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	
Combination	1								1	1	
						Other					
Hand											
Machine	8				10		10		1	8	
Combination	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)[a/]	33.5	62.8	97.3

[a/] 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 Index[a/]	Basal Area (sq.ft./acre)	Number Trees Surviving Per Acre 0-300	301-500	501-700	701+	Total
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

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

Table 4. (Continued)

Age	Site Index[a/]	Basal Area (sq.ft./acre)	Number of Trees Surviving Per Acre 0-300	301-500	501-700	701+	Total
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

a/ Computed using equation from Amateis and Burkhart (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

$$\ln(Hd)=\ln(S)((1/A)/(1/25))^{b_1 e^{b_2 (1/A-1/25)}} \qquad (1)$$

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.

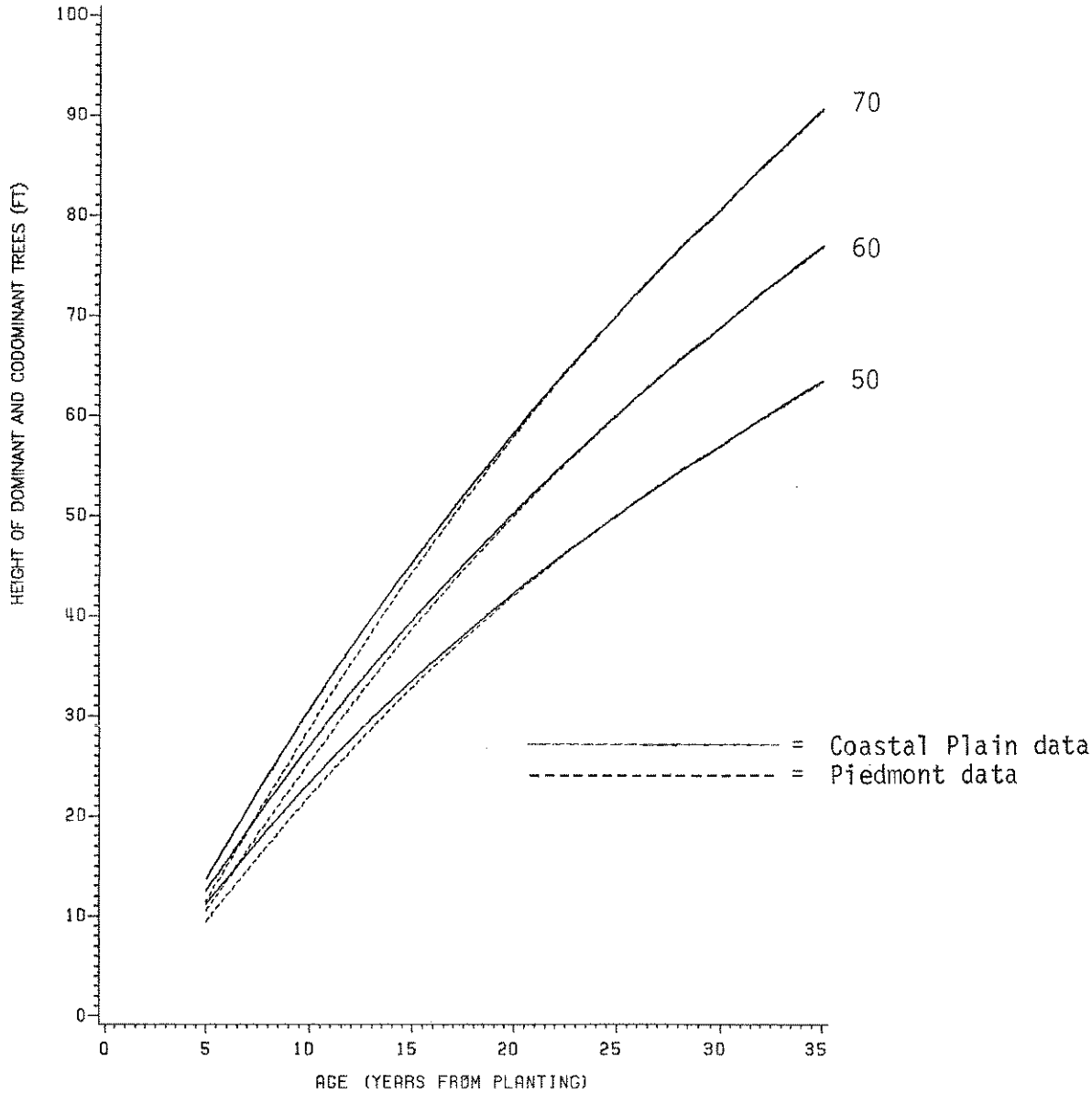

Figure 2. Site index curves developed using data from Coastal Plain and Piedmont sites for cutover, site prepared loblolly pine plantations.

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

$$\log(Np/Ns)=A(0.01348\log(Np)+0.0006078Hd-0.008412\sqrt{Hd})$$

where
- Np = number of pines planted (trees/ac)
- Ns = number of pine surviving (trees/ac)
- A = age (years from planting)
- Hd = 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, Np, and Hd. 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 cummulative distribution function,

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

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 pth 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,

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

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), Burkhart 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

$$\log(Hd/Hi) = -0.0400+(1/Di-1/Dmax)(0.4284-0.4975\log(Ts) +0.3638/A+1.0954\log(Hd)) \quad (4)$$

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

where
- log = logarithm base 10
- Hd = average height of the dominant and codominant pine (ft)
- Hi = total height of tree i (ft)
- Di = diameter at breast height of tree i (in)
- Dmax = tree of largest dbh in the stand (in)
- Ts = 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[1/]	Specifications: Size Limit	Specifications: Site Type
	Board Feet		
Burkhart *et al.* (1972)	$BF_I = -23.67532 + 0.01102\ D^2H$	6-in. top dib	old-field
Burkhart (unpublished)	$BF_D = 3.2492 + 0.00003386(D^2H)^{1.5651}$	6-in. top dib (included one bark).	old-field
Saucier *et al.* (1981)	$BF_S = -52.0724 + 0.01388\ D^2H$	7-in. top dob	old-field
	Cords		
Coile and Schumacher (1964)	$C = \frac{VOB}{92}$		
	Weight		
Clutter *et al.* (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 *et al.* (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)	$VOB = 0.1365 + 0.0024437\ D^2H$		old-field
	$VIB = 0.00296 + 0.00193881\ D^2H$		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.
BF_D = Board feet Doyle
BF_S = Board feet Scribner
GW = Total green weight (lbs)
DW = Total dry weight (lbs)
GW_T = Merchantable green weight (lbs)
DW_T = Merchantable dry weight (lbs)
D = Diameter breast height (in.)
H = Total tree height (ft)
T = Top diameter outside bark merchantability limit (in.)
C = Volume in standard cords
VOB = Volume outside bark (cu ft)
VIB = Volume inside bark (cu ft)
VOB_T = Merchantable volume outside bark (cu ft)
VIB_T = Merchantable volume inside bark (cu ft)

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.

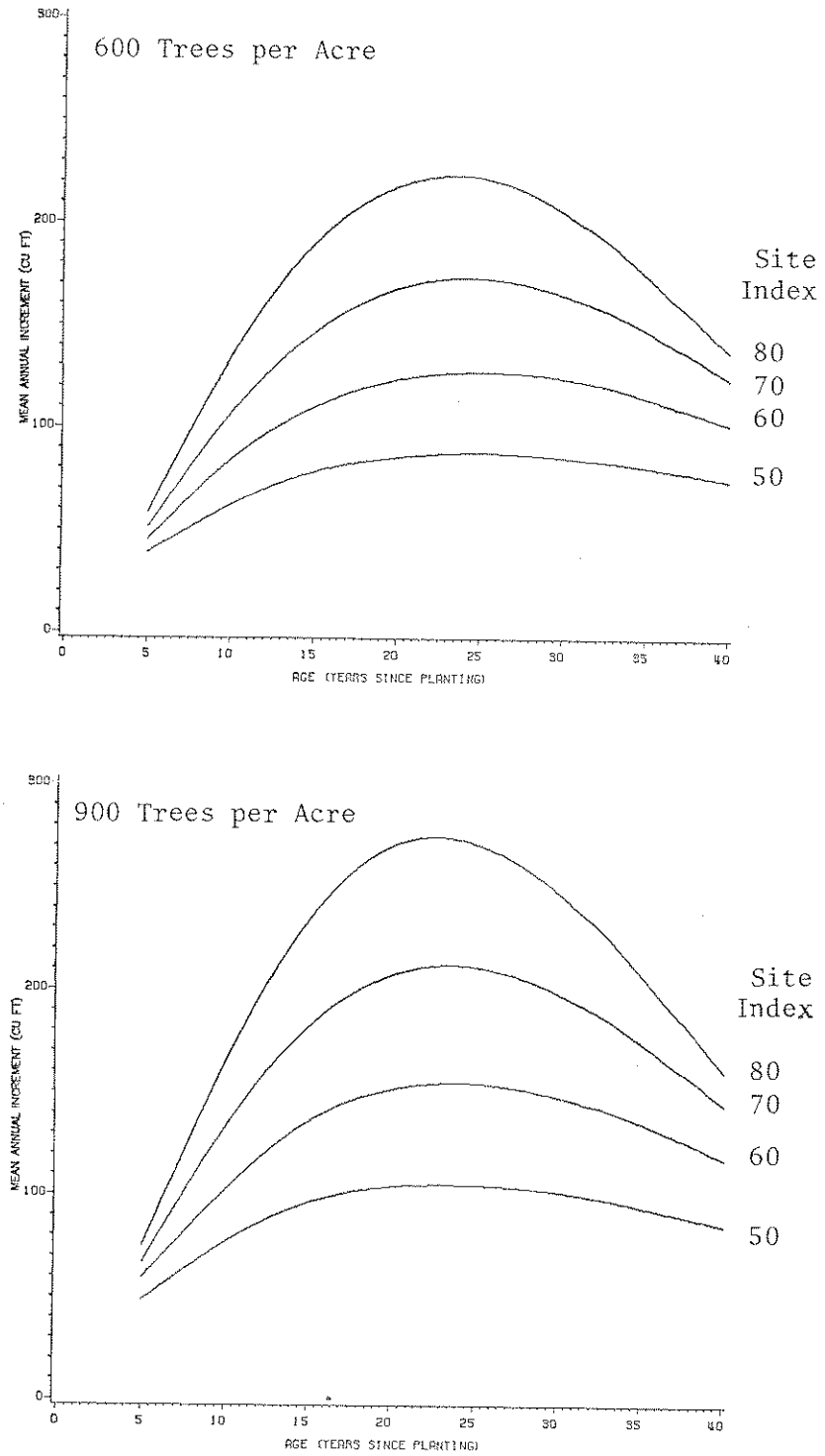

Figure 3. Mean annual increment in total cubic feet per acre for site indexes 50, 60, 70, and 80 with 600 (above) and 900 trees per acre planted.

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.

Component Analysis	Variable[1/]	Residual (Observed-Predicted) Mean	Standard Dev.
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
Entire Model Analysis			
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			
	10	300	400	500	600
Clutter *et al.*		44.3	49.7	52.5	53.3
Feduccia *et al.*		----	50.0	52.6	55.0
COYIELD		39.2	45.0	49.6	53.4
	20				
Clutter *et al.*		81.4	98.3	112.3	123.6
Feduccia *et al.*		95.2	111.9	125.0	----
COYIELD		74.4	89.3	102.0	113.8
	30				
Clutter *et al.*		124.7	154.5	180.8	----
Feduccia *et al.*		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			
	10	300	400	500	600
Clutter *et al.*		58.2	67.4	73.5	77.1
Feduccia *et al.*		----	63.5	68.2	72.1
COYIELD		47.4	55.3	61.7	67.3
	20				
Clutter *et al.*		95.9	117.2	135.2	150.4
Feduccia *et al.*		111.7	131.8	148.6	----
COYIELD		91.1	110.4	127.4	143.2
	30				
Clutter *et al.*		142.1	177.1	----	----
Feduccia *et al.*		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			
	10	300	400	500	600
Clutter *et al.*		70.2	83.1	92.6	99.3
Feduccia *et al.*		----	76.1	83.2	89.0
COYIELD		55.2	64.8	73.1	80.3
	20				
Clutter *et al.*		108.1	133.3	155.0	173.9
Feduccia *et al.*		125.0	149.3	170.2	----
COYIELD		108.2	132.3	153.6	173.7
	30				
Clutter *et al.*		156.7	196.4	----	----
Feduccia *et al.*		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			
	10	300	400	500	600
Clutter *et al.*		350	341	294	224
Feduccia *et al.*		---	393	338	280
COYIELD		274	269	241	206
	20				
Clutter *et al.*		1336	1583	1767	1895
Feduccia *et al.*		1722	2074	2213	---
COYIELD		1184	1373	1544	1667
	30				
Clutter *et al.*		2694	3325	3872	---
Feduccia *et al.*		3001	3474	3906	4262
COYIELD		2139	2571	2932	3248

Table 8. (Continued)

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

Table 8. (Continued)

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

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APPENDICES

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

Column	Format	Variable	Description
1	I1	IPROG	= 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	SI1	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. Sample stand projection for program COYIELD.

Site index	= 60 ft. (base age 25)
Age	= 0
Planted trees	= 700 (per acre)
Top diameter merchantability limit	= 4 inches
Threshold diameter class below which no merchantable timber will be harvested	= 5 inches

Combined Coastal Plain and Piedmont site index curves

Output at ages 10 and 25

Title: STAND PROJECTION -- EXAMPLE

Card input:

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

           1
             6 0     0   7 0 0   0   4 5   1    2 1   0
           S T A N D   P R O J E C T I  O N - -  E X A M P L E
             1 0
             2 5
```

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....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.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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	PREDICTED
SITE INDEX = 50.00	AVERAGE HD = 22.78
AGE = 10.00	ARITH. MEAN DBH = 3.94
PLANTED TREES = 800.00	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.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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	PREDICTED
SITE INDEX = 50.00	AVERAGE HD = 33.23
AGE = 15.00	ARITH. MEAN DBH = 5.13
PLANTED TREES = 800.00	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.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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	PREDICTED
SITE INDEX = 50.00	AVERAGE HD = 42.15
AGE = 20.00	ARITH. MEAN DBH = 5.93
PLANTED TREES = 800.00	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.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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
SITE INDEX = 50.00	AVERAGE HD = 50.00
AGE = 25.00	ARITH. MEAN DBH = 6.58
PLANTED TREES = 800.00	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.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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	PREDICTED
SITE INDEX = 50.00	AVERAGE HD = 57.06
AGE = 30.00	ARITH. MEAN DBH = 7.15
PLANTED TREES = 800.00	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.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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		PREDICTED	
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

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	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	
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

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	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	
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

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	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		PREDICTED	
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

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	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	
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

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	6.4	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

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 = 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 = 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 = 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 = 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		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

INPUTS		PREDICTED	
SITE INDEX =	60.00	AVERAGE HD =	39.12
AGE =	15.00	ARITH. MEAN DBH =	5.82
PLANTED TREES =	700.00	QUAD. MEAN DBH =	5.98

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	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	503.0	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		PREDICTED	
SITE INDEX =	60.00	AVERAGE HD =	50.18
AGE =	20.00	ARITH. MEAN DBH =	6.75
PLANTED TREES =	700.00	QUAD. MEAN DBH =	6.95

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	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		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

INPUTS		PREDICTED	
SITE INDEX =	60.00	AVERAGE HD =	68.89
AGE =	30.00	ARITH. MEAN DBH =	8.27
PLANTED TREES =	700.00	QUAD. MEAN DBH =	8.55

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	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	PREDICTED
SITE INDEX = 60.00	AVERAGE HD = 26.36
AGE = 10.00	ARITH. MEAN DBH = 4.41
PLANTED TREES = 800.00	QUAD. MEAN DBH = 4.52

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	1.3	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
	607.3		67.6	969.4	675.2	445.7	236.5	7.4

INPUTS	PREDICTED
SITE INDEX = 60.00	AVERAGE HD = 39.12
AGE = 15.00	ARITH. MEAN DBH = 5.69
PLANTED TREES = 800.00	QUAD. MEAN DBH = 5.85

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	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	PREDICTED
SITE INDEX = 60.00	AVERAGE HD = 50.18
AGE = 20.00	ARITH. MEAN DBH = 6.63
PLANTED TREES = 800.00	QUAD. MEAN DBH = 6.83

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	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	PREDICTED
SITE INDEX = 60.00	AVERAGE HD = 60.00
AGE = 25.00	ARITH. MEAN DBH = 7.44
PLANTED TREES = 800.00	QUAD. MEAN DBH = 7.67

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
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	PREDICTED
SITE INDEX = 60.00	AVERAGE HD = 68.89
AGE = 30.00	ARITH. MEAN DBH = 8.18
PLANTED TREES = 800.00	QUAD. MEAN DBH = 8.45

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	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
	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 O.B. 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 = 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 O.B. 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	35.5	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 = 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 O.B. 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 = 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 O.B. 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	405.9	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 = 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 O.B. 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	PREDICTED
SITE INDEX = 70.00	AVERAGE HD = 29.81
AGE = 10.00	ARITH. MEAN DBH = 5.11
PLANTED TREES = 600.00	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	PREDICTED
SITE INDEX = 70.00	AVERAGE HD = 44.91
AGE = 15.00	ARITH. MEAN DBH = 6.49
PLANTED TREES = 600.00	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	PREDICTED
SITE INDEX = 70.00	AVERAGE HD = 58.15
AGE = 20.00	ARITH. MEAN DBH = 7.57
PLANTED TREES = 600.00	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	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	PREDICTED
SITE INDEX = 70.00	AVERAGE HD = 70.00
AGE = 25.00	ARITH. MEAN DBH = 8.52
PLANTED TREES = 600.00	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	PREDICTED
SITE INDEX = 70.00	AVERAGE HD = 80.79
AGE = 30.00	ARITH. MEAN DBH = 9.42
PLANTED TREES = 600.00	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 = 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.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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 = 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.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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 = 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.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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 = 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.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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	623.8	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 = 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.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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 = 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 O.B. TO 4.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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 = 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 O.B. TO 4.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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 = 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 O.B. TO 4.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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 = 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 O.B. TO 4.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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 = 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 O.B. TO 4.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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 = 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.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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
	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.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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
	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.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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
	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.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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	55.9	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.IN	VOLUME I.B. TO 4.IN	VOLUME (CORDS) TO 4.IN
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
      READ(5,500) IPROG                                                 COY00170
500   FORMAT(I1)                                                        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
      IMPLICIT REAL*8 (A-H,O-Z)                                         COY00340
      COMMON /ONE/ SI1,AGE1,XN1,AGE2,TOP,THRES,IOPT,NDEC,MORE,ISITE     COY00350
      COMMON /TWO/ AGE,HD,XN,PNTC1(30),BACL1(30),DMIN,DMAX              COY00360
     :             ,AAVG,QAVG,TBA1,IPLANT                               COY00370
      COMMON /THREE/ ITITLE(20),XNPLOG,HDLOG,XNLOG,XNP,ICHECK           COY00380
      DATA IBLANK/'    '/                                               COY00390
      DATA B1/0.01348D0/,  B2/0.00060783D0/,  B3/-0.0084124D0/          COY00400
C                                                                       COY00410
C-----   READ STAND DESCRIPTION CARD.                                  COY00420
C                                                                       COY00430
    1 READ(5,500,END=999) SI1,AGE1,XN1,IPLANT,TOP,THRES,ISITE,NDEC,IOPT COY00440
     :                    ,MORE                                        COY00450
500   FORMAT(2F3.0,F4.0,I2,2F2.0,4I2)                                   COY00460
C                                                                       COY00470
C-----   READ TITLE CARD IF ANY.                                       COY00480
C                                                                       COY00490
      DO 2 II=1,19                                                      COY00500
    2 ITITLE(II)=IBLANK                                                 COY00510
      IF(IOPT.EQ.1) READ(5,501) (ITITLE(II),II=1,19)                    COY00520
501   FORMAT(19A4)                                                      COY00530
      AGE=AGE1                                                          COY00540
      ICHECK=0                                                          COY00550
```

Appendix 3. (continued).

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

      CALL HEIGHT                                                       COY00560
      XNPLOG=DLOG10(XN1)                                                COY00570
      XNPLOG=(DLOG10(XN1)+AGE*(B2*HD+B3*DSQRT(HD)))/                    COY00580
     :        (1-B1*AGE)                                                COY00590
      IF(IPLANT.EQ.1) XNPLOG=DLOG10(XN1)                                COY00600
      XNP=10.D0**XNPLOG                                                 COY00610
      CALL MORT                                                         COY00620
      CALL YIELD                                                        COY00630
      CALL OUTPUT                                                       COY00640
C                                                                       COY00650
C-----   READ DECISION CARDS.                                           COY00660
C                                                                       COY00670
   4  IF(MORE.EQ.1.AND.NDEC.EQ.0) GO TO 1                               COY00680
      IF(MORE.NE.1.AND.NDEC.EQ.0) RETURN                                COY00690
      DO 3 I=1,NDEC                                                     COY00700
      READ(5,502) AGE2                                                  COY00710
502   FORMAT(F3.0)                                                      COY00720
      ICHECK=0                                                          COY00730
      AGE=AGE2                                                          COY00740
      CALL HEIGHT                                                       COY00750
      CALL MORT                                                         COY00760
      CALL YIELD                                                        COY00770
      CALL OUTPUT                                                       COY00780
   3  CONTINUE                                                          COY00790
      IF(MORE.EQ.1) GO TO 1                                             COY00800
999   RETURN                                                            COY00810
      END                                                               COY00820
      SUBROUTINE INPUT2                                                 COY00830
C                                                                       COY00840
C                                                                       COY00850
C        ***************************************************            COY00860
C        *                                                 *            COY00870
C        *  SUBROUTINE INPUT2 READS THE NECESSARY INPUTS   *            COY00880
C        *  FOR STAND AND STOCK TABLES FOR VARIOUS         *            COY00890
C        *  COMBINATIONS OF AGE, SITE INDEX AND NUMBER     *            COY00900
C        *  OF TREES PLANTED.                              *            COY00910
C        *                                                 *            COY00920
C        ***************************************************            COY00930
C                                                                       COY00940
C                                                                       COY00950
      IMPLICIT REAL*8 (A-H,O-Z)                                         COY00960
      COMMON /ONE/ SI1,AGE1,XN1,AGE2,TOP,THRES,IOPT,NDEC,MORE,ISITE     COY00970
      COMMON /TWO/ AGE,HD,XN,PNTC1(30),BACL1(30),DMIN,DMAX              COY00980
     :             ,AAVG,QAVG,TBA1,IPLANT                               COY00990
      COMMON /THREE/ ITITLE(20),XNPLOG,HDLOG,XNLOG,XNP,ICHECK           COY01000
      DATA IBLANK/'    '/                                               COY01010
      DATA B1/0.01348D0/,  B2/0.00060783D0/,  B3/-0.0084124D0/          COY01020
   1  READ(5,500,END=999) ISB,ISE,ISI,IAB,IAE,IAI,INB,INE,INI,TOP,THRES COY01030
     :     ,ISITE,IOPT                                                  COY01040
500   FORMAT(9I4,2F3.0,2I2)                                             COY01050
      DO 2 II=1,19                                                      COY01060
   2  ITITLE(II)=IBLANK                                                 COY01070
      IF(IOPT.EQ.1) READ(5,501) (ITITLE(II),II=1,19)                    COY01080
501   FORMAT(19A4)                                                      COY01090
C                                                                       COY01100
```

Appendix 3. (continued).

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

C-----   DO LOOPS.  CHECK INDEX FOR INPUTS FOR STAND DENSITY.
C
      DO 40 IS=ISB,ISE,ISI
      SI1=DFLOAT(IS)
      DO 30 IA=IAB,IAE,IAI
      AGE=DFLOAT(IA)
      CALL HEIGHT
      DO 20 IN=INB,INE,INI
      XNPLOG=DLOG10(DFLOAT(IN))
      XNP=10.D0**XNPLOG
C
C-----   GET THE YIELD
C
      CALL MORT
      CALL YIELD
      CALL OUTPUT
   20 CONTINUE
   30 CONTINUE
   40 CONTINUE
      GO TO 1
999   RETURN
      END
      SUBROUTINE MORT
C
C
C        ***************************************************
C        *                                                 *
C        *  SUBROUTINE MORT PREDICTS NUMBER OF TREES       *
C        *  PLANTED AND SURVIVING BASED ON FEDUCCIA ET.AL. *
C        *  USDA FOR. SERV. RES. PAP. SO-148.              *
C        *                                                 *
C        ***************************************************
C
C
      IMPLICIT REAL*8 (A-H,O-Z)
      COMMON /ONE/ SI1,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 B1/0.01348D0/,  B2/0.00060783D0/,  B3/-0.0084124D0/
      IF (AGE.EQ.0.0) GO TO 10
      XNLOG=-(AGE*(B1*XNPLOG+B2*HD+B3*DSQRT(HD)))+XNPLOG
      XN=10.D0**XNLOG
      GO TO 999
   10 XN=XN1
  999 RETURN
      END
      SUBROUTINE HEIGHT
C
C
C        ***************************************************
C        *                                                 *
C        *  SUBROUTINE HEIGHT COMPUTES HEIGHT OF THE       *
C        *  DOMINANTS AND CODOMINANTS OF A STAND, GIVEN    *
C        *  SITE INDEX AND AGE.                            *
```

Appendix 3. (continued).

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

C         *    FROM:    AMATEIS AND BURKHART. 1983. SITE     *
C         *             INDEX CURVES FOR LOBLOLLY PINE       *
C         *             PLANTATIONS ON CUTOVER SITE-         *
C         *             PREPARED LANDS.  COOP REPORT NO. 24 *
C         *             LOBLOLLY PINE GROWTH AND YIELD       *
C         *             RESEARCH COOPERATIVE.                *
C         *                                                  *
C         ****************************************************
C
C
      IMPLICIT REAL*8 (A-H,O-Z)
      DIMENSION B1(3),B2(3)
      COMMON /ONE/ SI1,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 X0/0.04D0/, B1/-0.10283D0,  -0.11092D0,  -0.08596D0 /
     :     ,B2/-2.1676D0,  -1.9036D0,  -2.6055D0 /
      IF (AGE.EQ.0.0) HD=0.
      IF (AGE.EQ.0.0) RETURN
      X=1.0D0/AGE
      Y0=DLOG(SI1)
      HDLOG=Y0*(X/X0)**B1(ISITE)*DEXP(B2(ISITE)*(X-X0))
      HD=DEXP(HDLOG)
      RETURN
      END
      SUBROUTINE YIELD
C        ********************************************************
C        *                                                      *
C        *  SUBROUTINE YIELD USES PERCENTILE ESTIMATORS TO      *
C        *  CALCULATE A THREE PARAMETER WEIBULL                 *
C        *  DISTRIBUTION FROM STAND CHARACTERISTICS.            *
C        *                                                      *
C        *   INPUTS TO THE ROUTINE ARE :                        *
C        *          AGE = STAND AGE                             *
C        *           HD = AVERAGE HEIGHT OF THE DOMS AND CODOMS*
C        *           XN = NUMBER OF TREES PER ACRE              *
C        ********************************************************
C
C
      IMPLICIT REAL*8 (A-H,O-Z)
      COMMON /ONE/ SI1,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
      INTEGER CLASS
      IF(AGE.EQ.0.D0) RETURN
      A=-0.982644D0 + 0.073765D0*HD - 0.379953D0*HD/AGE
      IF(A.LT.0.D0) A=0.D0
      P50=12.441780D0-0.044910D0*AGE+0.067869D0*HD-42.897600D0/HD
     :    - 1.199840D0*DLOG(XN)
      P95=16.041112D0+0.008676164D0*AGE+0.093124D0*HD-43.769283D0/HD
     :    - 1.722701D0*DLOG(XN)
      IF (P50.GT.0.0.AND.P95.GT.0.0) GO TO 5
       ICHECK=1
```

Appendix 3. (continued).

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

      GO TO 999                                                          COY02210
    5 C = 1.4637D0/DLOG((P95-A)/(P50-A))                                 COY02220
      B = (P95-A)/(2.99573D0**(1/C))                                     COY02230
      TBA1=0.0D0                                                         COY02240
      DAVG1=0.0D0                                                        COY02250
      TTEMP=0.0D0                                                        COY02260
      CLASS=0                                                            COY02270
      TPNTC1=0.0D0                                                       COY02280
      IMIN=0                                                             COY02290
   91 CLASS=CLASS+1                                                      COY02300
      TP1=DFLOAT(CLASS)+0.5D0                                            COY02310
      BT1=DFLOAT(CLASS)-0.5D0                                            COY02320
      IF(TP1.LE.A)TC=0.0D0                                               COY02330
      IF(BT1.LE.A.AND.TP1.GT.A)                                          COY02340
     :  TC=XN*(1-DEXP(-(((TP1-A)/B)**C)))                                COY02350
      IF(BT1.GT.A)                                                       COY02360
     :  TC=XN*(DEXP(-(((BT1-A)/B)**C))-DEXP(-(((TP1-A)/B)**C)))          COY02370
      TTEMP=TTEMP+TC                                                     COY02380
      IF (TC.LT..5D0.AND.TTEMP.GT.5.D0)GO TO 90                          COY02390
      IF(TC.LT..5D0)GO TO 91                                             COY02400
      PNTC1(CLASS)=TC                                                    COY02410
      BACL1(CLASS)=0.005454D0*DFLOAT(CLASS)*DFLOAT(CLASS)*PNTC1(CLASS)   COY02420
      IF(IMIN.EQ.0)DMIN=CLASS                                            COY02430
      IMIN=1                                                             COY02440
      DAVG1=DAVG1+(PNTC1(CLASS)*DFLOAT(CLASS))                           COY02450
      TPNTC1=TPNTC1+PNTC1(CLASS)                                         COY02460
      TBA1=TBA1+BACL1(CLASS)                                             COY02470
      GO TO 91                                                           COY02480
   90 DMAX=CLASS-1.0D0                                                   COY02490
      AAVG=DAVG1/TPNTC1                                                  COY02500
      QAVG=(TBA1/(0.005454D0*TPNTC1))**0.5D0                             COY02510
      AINC=TBA1/AGE                                                      COY02520
  999 RETURN                                                             COY02530
      END                                                                COY02540
      SUBROUTINE OUTPUT                                                  COY02550
C                                                                        COY02560
C                                                                        COY02570
C        ***************************************************             COY02580
C        *                                                 *             COY02590
C        *  SUBROUTINE OUTPUT PRINTS THE STAND AND STOCK   *             COY02600
C        *  TABLE.                                         *             COY02610
C        *                                                 *             COY02620
C        ***************************************************             COY02630
C                                                                        COY02640
C                                                                        COY02650
      IMPLICIT REAL*8 (A-H,O-Z)                                          COY02660
      DIMENSION CF(20),ROB(3),RIB(3),BOB(2),BIB(2)                       COY02670
      COMMON /ONE/ SI1,AGE1,XN1,AGE2,TOP,THRES,IOPT,NDEC,MORE,ISITE      COY02680
      COMMON /TWO/ AGE,HD,XN,PNTC1(30),BACL1(30),DMIN,DMAX               COY02690
     :             ,AAVG,QAVG,TBA1,IPLANT                                COY02700
      COMMON /THREE/ ITITLE(20),XNPLOG,HDLOG,XNLOG,XNP,ICHECK            COY02710
      DATA ROB/-0.32354D0,  3.1579D0, 2.7115D0/                          COY02720
     :    ,RIB/-0.77135D0,  3.3736D0, 3.1080D0/                          COY02730
     :    ,BOB/ 0.34864D0,  0.00232D0/                                   COY02740
     :    ,BIB/ 0.11691D0,  0.00185D0/                                   COY02750
```

Appendix 3. (continued).

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

      DATA CF/0.D0,0.D0,0.D0,0.D0                                       COY02760
     :         ,84.D0,85.D0,87.D0,90.D0,91.D0,92.D0,93.D0,94.D0         COY02770
     :         ,95.D0,95.D0,95.D0,95.D0,95.D0,95.D0,95.D0,95.D0/        COY02780
C                                                                       COY02790
C-----   WRITE HEADINGS.                                                COY02800
C                                                                       COY02810
      WRITE(6,501)                                                      COY02820
501   FORMAT('1')                                                       COY02830
      IF(IOPT.EQ.1) WRITE(6,502) (ITITLE(II),II=1,19)                   COY02840
502   FORMAT(//10X,19A4)                                                COY02850
      WRITE(6,503) SI1,HD,AGE,AAVG,XNP,QAVG                             COY02860
503   FORMAT(////26X,'INPUTS',22X,'PREDICTED'/26X,6('-'),22X,9('-')     COY02870
     :   /18X,'SITE INDEX =',F7.2,9X,' AVERAGE HD =',F6.2               COY02880
     :   /25X,'AGE =',F7.2,5X,'ARITH. MEAN DBH =',F6.2                  COY02890
     :   /13X,'  PLANTED TREES =',F7.2,6X,'QUAD. MEAN DBH =',F6.2)      COY02900
      WRITE(6,504) TOP,TOP                                              COY02910
504   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('-'))                   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                                                                       COY03080
C-----   INITIALIZATION.                                                COY03090
C                                                                       COY03100
      AAVG=0.D0                                                         COY03110
      QAVG=0.D0                                                         COY03120
      BB=0.D0                                                           COY03130
      XNRES=0.D0                                                        COY03140
      TVOB=0.D0                                                         COY03150
      TVIB=0.D0                                                         COY03160
      TVOB4=0.D0                                                        COY03170
      TVIB4=0.D0                                                        COY03180
      CVOB4=0.D0                                                        COY03190
      XNT=XN                                                            COY03200
      IMIN=DMIN                                                         COY03210
      IMAX=DMAX                                                         COY03220
      IF (AGE.EQ.0.0) GO TO 7                                           COY03230
C                                                                       COY03240
C-----   LOOP OVER DBH CLASSES.                                         COY03250
C                                                                       COY03260
      DO 5 I=IMIN,IMAX                                                  COY03270
      XI=DFLOAT(I)                                                      COY03280
      HH=HDLOG/2.30259D0+0.040006D0-(1.D0/XI-1.D0/DMAX)*(0.428373D0-    COY03290
     :0.497483D0*DLOG10(XN)-0.363755D0*(1.D0/AGE)+1.095404*HDLOG/2.3026 COY03300
```

Appendix 3. (continued).

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

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

Appendix 4. BASIC source listing for program COYIELD.

```
COYIELD                    10:09:27   07-04-1984                    Page 1
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   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
          PNTCl(30),
          BACLl(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).


```
      |     90,
      |     91,
      |     92,
      |     93,
      |     94,
      |     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
                                                                          site
                     putted
```

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
         SI1>100 OR SI1<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
                                                - any other number to accept i
                     nputted                                                age a
                     nd continue";ASICK:
                  IF
                     ASICK=0
                        THEN
                           GOTO 400
 450  IF
         AGE>0
            THEN
               PRINT:
               INPUT
                  "Enter - 0 to input number of trees planted
                                                - any other number to input nu
                     mber of trees                                          survi
                     ving";IPLANT
 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                                                ed nu
                      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
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 600  IF
         THRES<0 OR THRES>8
            THEN
               PRINT:
               PRINT "DBH merchantablilty limit excessive...":
               PRINT:
               INPUT
                  "Enter - 0 for a new value
                                                  - any other number to continue
                      on";THSICK:
                  IF
                     THSICK=0
                        THEN
                           GOTO 580
 610  IF
         TOP >= THRES
            THEN
               PRINT:
               PRINT
                  "Note:  Top limit must be less than dbh merchantablilty limi
                     t":
                  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).

```
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                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).

```
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                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  CLAS%=0
1250  TPNTC1=0
1260  IMIN=0
1270  CLAS%=CLAS%+1
1280  TP1=CLAS% + .5
1290  BT1=CLAS% -.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).

```
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1330  TTEMP=TTEMP+TC
1340  IF
          TC<.5 AND TTEMP>5
             THEN
                GOTO 1440
1350  IF
          TC <.5
             THEN
                GOTO 1270
1360  PNTC1(CLAS%)=TC
1370  BACL1(CLAS%)=.005454*CLAS%*CLAS%*PNTC1(CLAS%)
1380  IF
          IMIN=0
             THEN
                DMIN=CLAS%
1390  IMIN=1
1400  DAVG1=DAVG1+(PNTC1(CLAS%)*CLAS%)
1410  TPNTC1=TPNTC1+PNTC1(CLAS%)
1420  TBA1=TBA1+BACL1(CLAS%)
1430  GOTO 1270
1440  DMAX=CLAS%-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= ###.#";SI1,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).

```
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                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
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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
```