United States
Department of
Agriculture

Forest Service

**Southern Forest
Experiment Station**

New Orleans,
Louisiana

Research Paper
SO-241

Comprehensive Outlook for Managed Pines Using Simulated Treatment' Experiments-Planted Loblolly Pine (COMPUTE-P-LOB): A User's Guide

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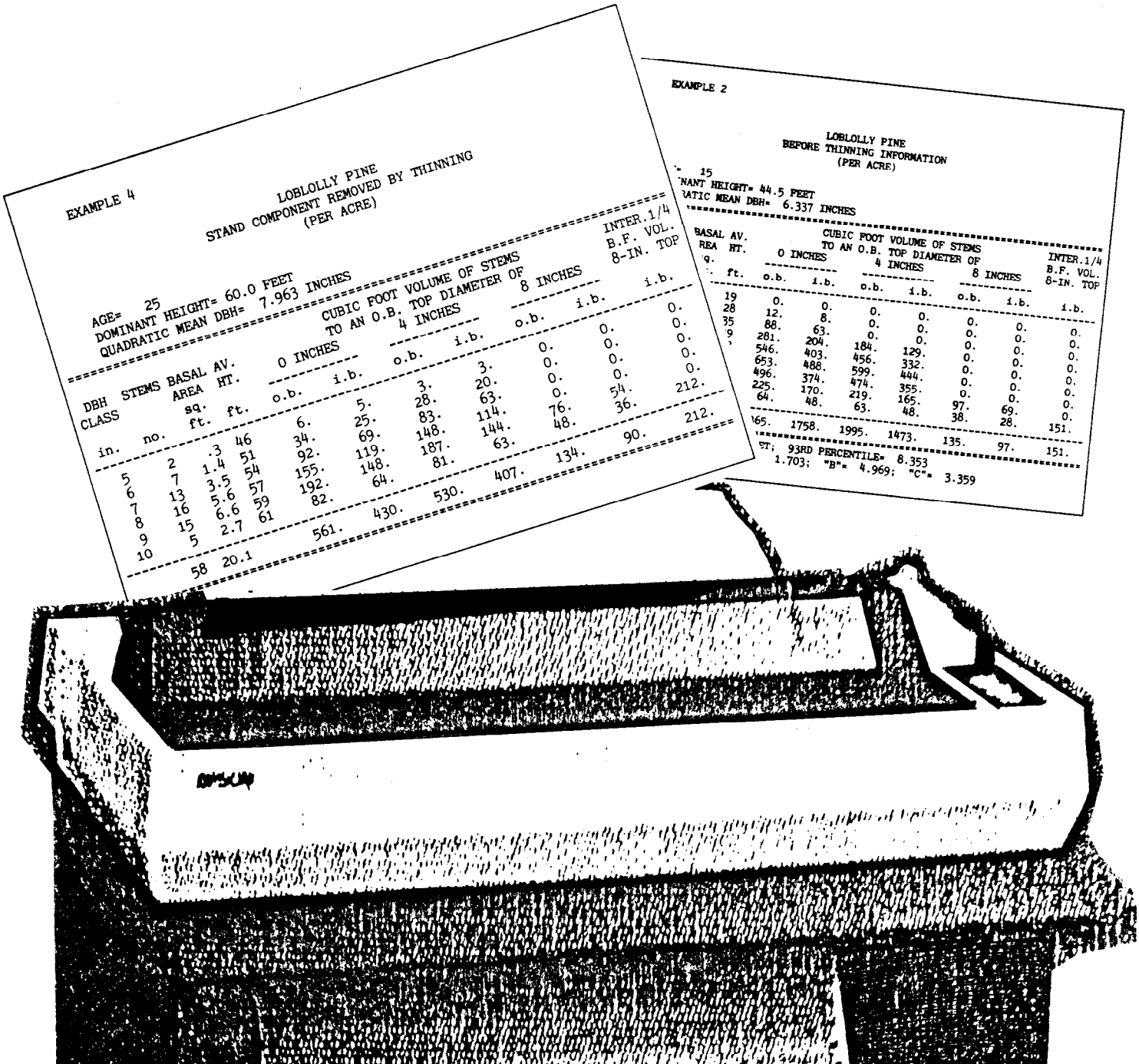

SUMMARY

"Comprehensive outlook for managed pines using simulated treatment experiments-planted loblolly pine" (COMPUTE_P-LOB) is a computerized growth and yield prediction program designed to use information from either thinned or unthinned stands to predict growth and yield. A variety of entry options allows the user to examine the effects of thinning a stand or growing the stand in an unthinned condition. The minimum initial variables required to run the program are age, a measure of density, and a measure of site quality. A highly detailed set of stand tables may be requested by the user for unthinned, before-thinned and after-thinned stands. The user may also obtain a table of the stand components removed by thinning to aid in merchandizing the stand. The generated tables may reflect either volume, green-weight, or dry-weight predictions.

ACKNOWLEDGMENT

Partial funding for this work was provided through a cooperative agreement with the U.S. Department of Energy and administered by the Tennessee Valley Authority (contract number TV-64328a).

September 1987

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INTRODUCTION

COMPUTE-P-LOB is an interactive program for predicting the performance of thinned and unthinned loblolly pine plantations in the west gulf region. The program operates the growth and yield prediction system developed by Baldwin and Feduccia (1987), which utilizes the whole stand projection-parameter recovery-diameter distribution approach of Matney and Sullivan (1982). COMPUTE-P-LOB has some things in common with the USLYCOWG model (Feduccia and others 1979); for example, both systems use similar input format and were developed from the same data set for the unthinned condition through age 30. However, COMPUTE-P-LOB models the unthinned stand beyond age 30, as well as thinned stands with data through age 45.

The Weibull function is used to predict the distribution of diameters. Values for the function's parameters are obtained after each growth projection by solving a set of equations in which the minimum (DMIN), quadratic mean (QMD), and 93rd percentile diameters (P93) are predicted as functions of age (A), site index (SI) or height of the dominant and codominant (HD) trees, and number of trees surviving (TS). Total stand values of volume, weight, and so forth are obtained by summation of the corresponding values predicted for each diameter class.

The data for the prediction system came from 859 measurements of thinned and unthinned long-term research study plots on cutover sites located in east Texas, Louisiana, and southern Mississippi. In all the thinned stand studies, the thinning interval was 5 years unless insufficient growth had occurred during that period. Selective thinning was generally from below, although a few plots were row thinned.

Readers are advised to refer to Baldwin and Feduccia (1987) for further details pertaining to their modeling rationale, the data base utilized, mathematical models selected, and equation coefficients. This paper describes the computer program and how to use it.

PROGRAM DESCRIPTION

Program options permit the user to obtain predictions of volume (cubic- and board-foot) or weight per acre yields (green- or oven-dry pounds, with or without bark) for all aboveground tree components (total stem, stem to any top diameter limit, branches, and foliage). Entry information is kept to a minimum, but the user has a variety of available options for processing and generating stand predictions. This diversity allows the user to investigate the effects of a large number of such potential treatments as: thinning levels, site indices, planting densities, thinning intervals, or even no thinning. The diversity of available options also helps generate extensive stand table information using l-inch diameter classes. The age of the data set modeled limits predictions to plantations from 10 to 50 years old.

The program directs the user into one of three general situations: starting and ending with an unthinned stand; starting with an unthinned stand, thinning at some age, and ending with a stand thinned a variable number of times; or starting with a previously thinned stand and ending with a stand thinned a variable number of times. The required initial values and the prediction process are summarized schematically in figure 1.

Individual program runs may be initiated with as little information as the age of the stand, a measure of either the mean height of the dominant and codominant stand component or the site index, and an estimate of either current trees surviving, basal area, or trees planted. Although optional, the inclusion of more initial information will produce more precise stand projections. This additional information would be used to key different equations available in the system that require more initial information but are mathematically more reliable in their predictions. To efficiently use the model, the user should organize the available entry data prior to using the program.

The thinned stand growth projection equations in

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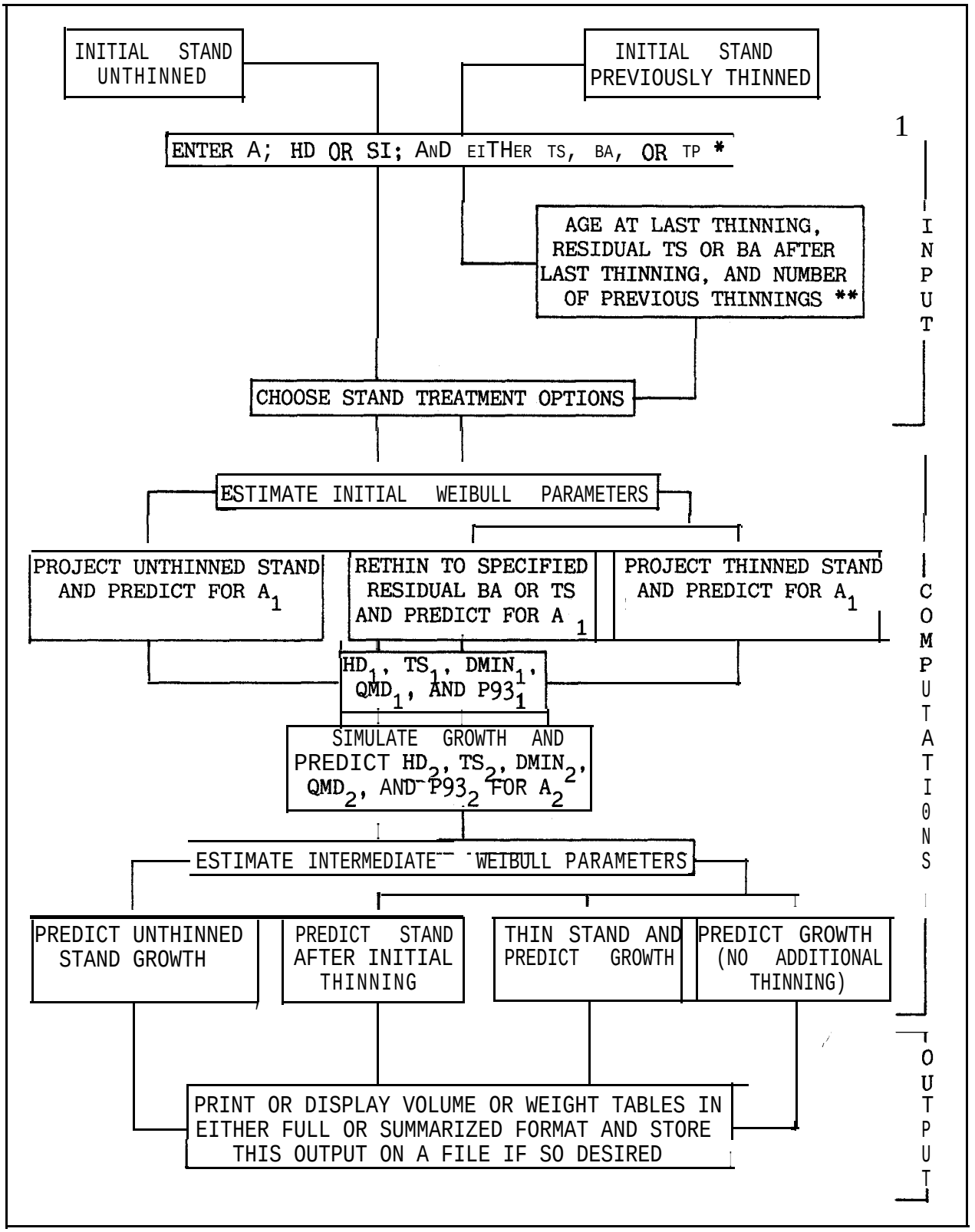

Figure *l.-Generalized schematic representation of the loblollypine growth and yield prediction system COMPUTE P-LOB (*This initial input is required for all stands, ** these inputs are required only when starting with a previously Thinned stand). Meanings of abbreviations are also given in the text.*

this system are not time invariant. Therefore, to achieve the most reliable and consistent predictions, after-thinning growth projection intervals should be in 5-year multiples. If necessary, the final projection should be done over the remaining years. If the user chooses a longer interval, the program will automatically divide the chosen interval into 5-year segments and compute the prediction in a stepwise manner. This procedure will not be visible to the user.

The COMPUTE-P-LOB program is currently available in FORTRAN-77 for use on the IBM-PC/XT with the Microsoft DOS 2.10 or later version operating system; the Data General MV/X000 series computers; the Digital Equipment Corporation's PDP 11/23 and MicroVAX II computers. A BASIC version is currently available for the IBM-PC and another is being developed for the Apple Computer Company's Apple IIc Microcomputer.

A listing of the program FORTRAN source code is presented in Appendix B. The current compiled program occupies approximately 130K bytes indicating that the user's system would need a 256K RAM machine. It is possible to use segmentation and overlay techniques to provide a usable program for a smaller capacity machine. Early attempts at this with the Apple IIc produced a prototype version that worked but was extremely slow.

PROGRAM OPERATION

Only the necessary instructions for operating the loaded program at execution time are reported in this paper; the peculiarities of loading and operating the user's particular computer system are not addressed. Four examples are provided in Appendix A to represent the more common situations encountered by the user. These examples are based on the IBM-PC/XT version of the model. Versions of the program compiled on other systems do not differ significantly in either input or output. Any problems encountered by the user should be referred directly to us if the user can not determine the- procedure to use.

Normal program operation involves responding to a set of questions keyed to the user's particular situation. Responses to these questions in the examples are enclosed in brackets [ ]. The brackets are used in this paper for clarity only and are not used. to respond to questions during the actual execution of the program. The questions are designated by a Q-number in the examples. These Q-numbers are presented in this guide for clarity and do not actually appear in the program. Certain other explanatory information is also included; these remarks, as well as Q-numbers are enclosed in parentheses ( ).

The user should note that some queries require more than one response. Some systems require each response item to be entered separately rather than in a string separated by commas. Other systems may allow true list directed I/O responses to be entered either as a string separated by commas or individually. The IBM-PC FORTRAN version is one such system. However, the IBM-PC BASIC version requires multiple responses to be entered as a string.

The program produces organized stand tables in either a detailed or summarized format. Current output format produces tables that are 80 characters wide to conform to the majority of printers now in use. Stand and stock tables may be specified for volume, dry-weight, or green-weight output. The user also has the option of printing cut tables that will provide a quick reference of what was actually removed from the stand by the model during a specified thinning treatment. The printing of cut tables does not reduce the 15-stand table limit imposed on the user for any given run cycle of the program.

Examples of output stand tables are presented in Appendix A. Stand tables for weight components are similar in form. If only summary information is desired, summary tables that give only the total values can be printed. Summary tables, although suitable for broad planning purposes, lack the detailed stand structure information needed by the silviculturist. All cut tables are presented as full tables regardless of the form of stand table requested.

Because of the modular structure of COMPUTE P-LOB, users may be tempted to change the programto include their own equations. However, any modification of our prediction equations or substitution of equations by the user may drastically affect the reliability of the stand predictions. Our equations were all developed from a common data base. Equations developed by others from differing data sets may not be compatible with this model and may result in unreliable stand predictions. Any user changes made to the program are the sole responsibility of the user. Reformatting the output to conform to a different printer width or some special report format is the user's responsibility.

LITERATURE CITED

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Example 1. Initial stand condition unthinned and no future thinnings.

Situation: Assume a 15 year-old stand with a site index of 60 feet (base age 25) and trees surviving of 500 stems per acre. The owner wants to know what will happen if the stand is grown unthinned to age 20 before any decision is made on thinning. The owner is interested in volume (cubic-foot and board-foot in International-1/4 inch) for both ages. The merchantable limits are to be set at 0- ,4- ,and 8-inch top diameters. The following set of queries illustrate how COMPUTE-P-LOB will process this information.

Inputs for Example 1.:

(Q1) Choose your output device
S = Screen output
H = Hardcopy printer
[S]

(Q2) Enter a label for your output (60 characters or less)
[EXAMPLE 1]

(Q3) Describe the stand by answering the following questions. Enter a zero (0) if you do not know the answer to a question requiring a numeric response. Use the designated character responses where indicated. Certain questions have a preset default response (Indicated by an asterisk (*) following the default). If you accept the default, just press the RETURN key.

At the very least you must provide STAND AGE, a measure of DOM/CODOM HEIGHT, and a measure of STAND DENSITY. If you are starting with the closing values of a previous run of the model, the answers must come from that output in order to set up the new run.

Are you starting with the closing values for a previous run of this program?
Y = Yes
N = No (*)
[N]

(Q4) Stand age?
[15]

(Q5) Height of dominants and codominants?
[0]

(Q6) Site index?
[60]

(Q7) Site index base age?
[25]

(Q8) Surviving trees per acre?
[500]

(Q9) Has this stand been thinned before?
Y = Yes
N = No (*)
[N]

(Q10) Are your initial stand inputs entered correctly?
Y = Yes (*)
N = No
[Y]

(Q11) How many new thinnings? -- (Must be LE 10)
[0]

(Q12) Choose form of output:
V = Volume (*)
G = Green weight
D = Dry weight
[V]

(Q13) Enter three top diameter limits for volume tables (0=total volume).
(Example 0,4,8: for total volume, volume to a 4-inch top, and volume to an 8-inch top, respectively.)
[0,4,8]

(Q14) Do you want single table per page or continuous output:
S = Single table per page
C = Continuous feed (*)
[C]

(Q15) Choose form of output tables:
F = Full tables (*)
S = Summary tables
[F]

(Q16) Choose a board foot volume rule:
I = International 1/4 (*)
S = Scribner
D = Doyle
[I]

(Q17) Number of stand tables (Do not include any cut tables in your count)? NOTE: You must run the before-thin situation at a given age before you can run the after thin.
[2]

(Q18) For each stand table requested enter the age and the thinning code:
N = No thinning
B = Before thinning
A = After thinning
(Example of input: 10,N; for age 10, no-thin table)

(Q18a) For stand table# 1, enter age and thinning code
[15,N]

(Q18b) For stand table# 2, enter age and thinning code
[20,N]

(Q19) Are your stand table specifications correct?
Y = Yes (*)
N = No
[Y]

Please wait. Your request is being processed.

(The program will now process the user's request and return the finished stand tables as specified by the user. After all tables have been output the user will be asked about storing the'-output on'a disk file. If you want to store this information, you must specify a proper file name and storage device as required by your system.)

(Q20) Do you want to save your output on a disk file?
Y = Yes
N = No (*)
[Y]
(Q21) Enter output file name.

[EXAMPLE1.DAT]

(In this case EXAMPLE1.DAT will be stored on the system default drive.)

(Q22) Do you want to continue?'
Y = Yes (*)
N = No
[Y]

(Q23) Is this a continuation of the run 'just completed?
Y = Yes (*)
N = No
[Y]

(This response will cause the program to recycle for a new run using the final values of this run to initiate the next run. This will reduce the required user responses considerably. Answer "Y" only if you want to start with these values.)

Output for Example 1.

EXAMPLE1

LOBLOLLY PINE
NO THINNING THIS YEAR
(PER ACRE)

AGE= 15
DOMINANT HEIGHT= 44.5 FEET
QUADRATIC MEAN DBH= 6.337 INCHES

DBH CLASS	STEMS	BASAL AREA	AV. HT.	CUBIC FOOT VOLUME OF STEMS TO AN O.B. TOP DIAMETER OF 0 INCHES		4 INCHES		8 INCHES		INTER.1/4 B.F. VOL. 8-IN. TOP
		sq.								
in.	no.	ft.	ft.	o.b.	i.b.	o.b.	i.b.	o.b.	i.b.	i.b.
2	1	0.0	19	0.	0.	0.	0.	0.	0.	0.
3	16	0.8	28	12.	8.	0.	0.	0.	0.	0.
4	54	4.7	35	88.	63:		0.	0.	0.	0.
5	101	13.8	39	281.	204.	1840:	129.	0.	0:	0.
6	129	25.3	42	546.	403.	456.	332.	0.	0.	0.
7	110	29.4	44	653.	488.	599.	444.	0.	0.	0.
8	62	21.6	46	496.	374.	474.	355.	0.		0.
9	22	9.7	47	225.	170.	219.	165.	97.	6;:	0.
10	5	2.7	48	64.	48.	63.	48:	38.	28.	151.
	500	108.1		2365.	1758.		1473.	135.	97.	151.

SI(BASE AGE 25)= 60 FEET; 93RD PERCENTILE= 8.353
WEIBULL PARAMETERS: "A"= 1.703; "B"= 4.969; "C"= 3.359

EXAMPLE1

LOBLOLLY PINE
NO THINNING THIS YEAR
(PER ACRE)

AGE= 20
DOMINANT HEIGHT= 52.9 FEET
QUADRATIC MEAN DBH= 7.304 INCHES

DBH CLASS	STEMS	BASAL AREA	AV. HT.	CUBIC FOOT VOLUME OF STEMS TO AN O.B. TOP DIAMETER OF 0 INCHES		4 INCHES		8 INCHES		INTER.1/4 B.F. VOL. 8-IN. TOP
		sq.								
in.	no.	ft	ft.	o.b.	i.b.	o.b.	i.b.	o.b.	i.b.	i.b.
3	5	0.2	32	4.	3.	0.	0.	0.	0.	0.
4	24	2.1	39	44.	32.	0.	0.	0.	0.	0.
5	54	7.4	44	169.	127.	111.	80.	0.	0.	0.
6	86	16.9	48	416.	318.	348.	261.	0.	0.	0.
7	101	27.0	50	683.	525.	626.	478.	0.	0.	0.
8	89	31.1	52	806.	625.	770.	594.	0.	0.	0.
9	56	24.7	54	659.	515.	641.	500.	284.	210.	0.
10	25	13.6	55	366.	287.	360.	282.	219.	166.	907.
11	7	4.6	57	127.	100.	126.	99.	92.	71.	389.
12	2	1.6	57	43.	34.	43.	34.	34.	27.	146.
	449	129.2		3317.	2566.	3025.	2328.	629.	474.	1444.

SI(BASE AGE 25)= 60 FEET: 93RD PERCENTILE= 9.615
WEIBULL PARAMETERS: "A"= 2.067; "B"= 5.619; "C"= 3.315

Example 2. Initial stand condition unthinned with future thinnings.

Situation: Assume the same stand used for Example 1 above. The owner has decided to thin the stand at age 15 to 80 square feet of basal area, check the volume removed and the residual stand and then project stand growth to age 20.

(Q1) Choose your output device
S = Screen output
H = Hardcopy printer
[S]

(Q2) Enter a label for your output (60 characters or less)
[EXAMPLE 23

(Q3) Describe the stand by answering the following questions. Enter a zero (0) if you do not know the answer to a question requiring a numeric response. Use the designated character responses where indicated. Certain questions have a preset default response (Indicated by an asterisk (*) following the default). If you accept the default, just press the RETURN key.

At the very least you must provide STAND AGE, a measure of DOM/CODOM HEIGHT, and a measure of STAND DENSITY. If you are starting with the closing values of a previous run of the model, the answers must come from that output in order to set up the new run.

Are you starting with the closing values for a previous run of this program?
Y = Yes
N = No (*)
[N]

(Q4) Stand age?
[15]

(Q5) Height of dominants and codominants?
[0]

(Q6) Site index?
[60]

(Q7) Site index base age?
[25]

(Q8) Surviving trees per acre?
[500]

(Q9) Has this stand been thinned before?
Y = Yes (*)
N = No
[N]

(Q10) Are **your initial** stand inputs entered correctly?
Y = Yes (*)
N = No
[Y]

(Q11) How many new thinnings? -- (Must be LE 10)
[1]

(Q12) Choose form of output:
V = Volume **(*)**
G = Green weight
D = Dry weight
[V]

(Q13) Choose method of thinning:
B = Thinning by residual BA per acre **(*)**
T = Thinning by residual trees per acre
[B]

(Q14) For **thinning#** 1 enter -- thinning age and residual BA per acre
(Example: 15.80)
[15,80]

(Q15) Do **you want cut** tables?
Y = Yes (*)
N = No
[Y]

(Q16) Enter three top diameter limits for volume tables
(0=total volume).
(Example: **0,4,8** for total volume, volume to a **4-inch** top
and volume to an **8-inch** top, respectively.)
[0,4,8]

(Ql7) Do **you** want single table per page or continuous output:
S = Single table per page
C = Continuous feed **(*)**
[C]

(Q18) Choose form of output tables:
F = Full tables **(*)**
S = Summary tables
[F]

(Q19) Choose a board foot volume rule:
I = International 1/4 **(*)**
S = **Scribner**
D = Doyle
[I]

(Q20) Number of stand tables (Do not include any cut tables
in your count)? NOTE: You must run the before-thin
situation at a given age before you can run the after thin.
[3]

(Q21) For each stand table requested enter the age and the thinning code:

N = No thinning
B = Before thinning
D = After thinning

(Example of input: 10,N; for age-lo, no-thin table)

(Q21a) For stand table# 1, enter age and thinning code
[15,B]

(Q21b) For stand table# 2, enter age and thinning code
[15,A]

(Q21c) For stand table# 3, enter age and thinning code
[20,N]

(Q22) Are your stand table specifications correct?

Y = Yes (*)
N = No

[Y]

Please wait. Your request is being processed.

(The program will now process the user's request and'return the finished stand tables as specified by the user. After all tables have been output the user will be asked about storing the output on a disk file. If you want to store this information you must specify a proper file name and storage device as required by your system.)

(Q23) Do you want to save your output on a disk file?

Y = Yes
N = No (*)

[Y]

(Q24) Enter output file name.
[EXAMPLE2.DAT]

(In this case EXAMPLE2.DAT will be stored on the system default drive.)

(Q25) Do you want to continue?

Y = Yes (*)
N = No

[N]
(The program will terminate.)

Output For Example 2.

EXAMPLE 2

LOBLOLLY FINE
BEFORE THINNING INFORMATION
(PER ACRE)

AGE= 15
DOMINANT HEIGHT= 44.5 FEET
QUADRATIC MEAN DBH= 6.337 INCHES

DBH CLASS	STEMS	BASAL AREA	AV. HT.	CUBIC FOOT VOLUME OF STEMS TO AN O.B. TOP DIAMETER OF 0 INCHES		4 INCHES		8 INCHES		INTER.1/4 B.F. VOL. 8-IN. TOP
in.	no.	sq. ft.	ft.	o.b.	i.b.	o.b.	i.b.	o.b.	i.b.	i.b.
2	1	0.0	19	0.	0.	0.	0.	0.	0.	0.
3	16	0.8	28	12.	8.	0.	0.	0.	0.	0.
4	54	4.7	35	88.	63:	0.	0.	0.	0.	0.
5	101	13.8	39	281.	204.	184.	129.	0.	0.	0.
6	129	25.3	42	546.	403.	456.	332.	0.	0.	0.
7	110	29.4	44	653.	488.	[illegible]	444.	0.	0.	0.
8	62	21.6	46	496.	374.	474.	355.	0.	0.	0.
9	22	9.7	47	225.	170.	219.	165.	97.	69.	0.
10	5	2.7	48	64.	48.	63.	48.	38.	28.	151.
	500	108.1		2365.	1758.	[illegible]	1473.	135.	97.	151.

SI(BASE AGE 25)= 60 FEET; 93RD PERCENTILE= 8.353
WEIBULL PARAMETERS: "A"= 1.703; "B"= 4.969; "C"= 3.359

EXAMPLE 2

LOBLOLLY PINE
RESIDUAL STAND -- AFTER THINNING
(PER ACRE)

AGE= 15
DOMINANT HEIGHT= 44.5 FEET
QUADRATIC MEAN DBH= 6.522 INCHES

DBH CLASS	STEMS	BASAL AREA sq.	AV. HT.	CUBIC FOOT VOLUME OF STEMS TO AN O.B. TOP DIAMETER OF 0 INCHES		4 INCHES		8 INCHES		INTER.1/4 B.F. VOL. 8-IN. TOP
in.	no.	ft.	ft.	o.b.	i.b.	o.b.	i.b.	o.b.	i.b.	i.b.
3										
4	30	2.6	38	49.	35.	0.	0.	0.	0.	0.
5	64	8.7	39							
6	89	17.5	42	178.	129.	315.	229.	0.	0.	0.
7	83	22.2	44	493.	368.	452.	335.	0.	0.	0.
8	50	17.5	46	400.	301.	-382.	287.	0.	0.	0.
9	18	8.0	47	184.	139.	179.	135.	79.	57.	0.
10	4	2.2	48	51.	39.	50.	38.	31.	22.	121.
	345	78.9		1736.	1293.	1495.	1106.	110.	79.	121.

SI(BASE AGE 25)= 60 FEET; 93RD PERCENTILE= 8.501
WEIBULL PARAMETERS: "A"= 2.014; "B"= 4.844; "C"= 3.349

EXAMPLE 2

LOBLOLLY PINE
STAND COMPONENT REMOVED BY THINNING
(PER ACRE)

AGE= 15
DOMINANT HEIGHT= 44.5 FEET
QUADRATIC MEAN DBH= 5.874 INCHES

DBH CLASS	STEMS	BASAL AREA	AV. HT.	CUBIC FOOT VOLUME OF STEMS TO AN O.B. TOP DIAMETER OF 0 INCHES		4 INCHES		8 INCHES		INTER.1/4 B.F. VOL. 8-IN. TOP
in.	no.	sq. ft.	ft.	o.b.	i.b.	o.b.	i.b.	o.b.	i.b.	i.b.
2	1	0.0	19	0.	0	0.	0.	0.	0.	0.
3	9	0.4	28	7.	4	0.	0.	0.	0.	0.
4	24	2.1	35	39.	28.	0.		0.	0.	0.
5	37	5.0	39	103.	75.	67.	4;:	0.	0.	0.
6	40	7.9	42	170.	125.	141.	103.	0.	0.	0.
7	27	7.2	44	160.	120.	147.	109.	0.	0.	0.
8	12	4.2	46	96.	73.	92.	68.	0.	0.	0.
9	4	1.8	47	41.	31.	40.	30.	18.	12.	0.
10	1	0.5	48	13.	9.	13.	10.	7.	6.	30.
	155	29.2		629.	465.	500.	367.	25.	18.	0.

EXAMPLE 2

LOBLOLLY PINE
NO THINNING THIS YEAR
(PER ACRE)

AGE= 20
DOMINANT HEIGHT= 52.9 FEET
QUADRATIC MEAN DBH= 7.902 INCHES

DBH CLASS	STEMS	BASAL AREA	AV. HT.	CUBIC FOOT VOLUME OF STEMS TO AN O.B. TOP DIAMETER OF 0 INCHES		4 INCHES		8 INCHES		INTER.1/4 B.F. VOL. 8-IN. TOP
		sq.								
in	no.	ft.	ft.	o.b.	i.b.	o.b.	i.b.	o.b.	i.b.	i.b.
4	6	0.5	39	10.		0.	0.	0.	0.	0.
5	24	3.3	44	70.	5::	41.	28.	0.	0.	0.
6	48	9.4	48	220.	163.	180.	130.	0.	0.	0.
7	67	17.9	51	446.	335.	408.	303.	0.	0.	0.
8	70	24.4	53	634.	480.	607.	457.	0.	0.	0.
9	54	23.9	55	645.	491.	629.	478:	256.	181.	0.
10	30	16.4	56	451.	345.	445.	340.	266.	195.	1149.
11	12	7.9	57	223.	171.	221.	170.	162.	122.	701.
12	3	2.4	58	68.	52.	67.	52.	55.	42.	240.
13	1	0.9	59	27.	21.	27.	21.	24.	18.	103.
	315	107.0		2794.	2116.	2625.	1979.	763.	558.	2193.

SI(BASE AGE 25)= 60 FEET; 93RD PERCENTILE= 10.230
WEIBULL PARAMETERS: "A"= 2.808; "B"= 5.485: "C"= 3.233

Example 3. Starting with a previously thinned stand.

Situation: Assume a 20 year old stand with a site index of 60 feet (base age 25) and trees surviving of 320 stems per acre. The stand was thinned at age 15 to 80 square feet of basal area and 350 trees per acre. The owner wants to thin again at age 20 to 80 square feet of basal area, examine the current stand before and after thinning, and project the growth of the residual stand to age 25.

Inputs for Example 1.:

(Q1) Choose your output device
S = Screen output
H = Hardcopy printer
[S]

(Q2) Enter a label for your output (60 characters or less)
[EXAMPLE 3]

(Q3) Describe the stand by answering the following questions. Enter a zero (0) if you do not know the answer to a question requiring a numeric response. Use the designated character responses where indicated. Certain questions have a preset default response (Indicated by an asterisk (*) following the default). If you accept the default, just press the RETURN key.

At the very least you must provide STAND AGE, a measure of DOM/CODOM HEIGHT, and a measure of STAND DENSITY. If you are starting with the closing values of a previous run of the model, the answers must come from that output in order to set up the new run.

Are you starting with the closing values for a previous run of this program?
Y = Yes
N = No (*)
[N]

(Q4) Stand age?
[20]

(Q5) Height of dominants and codominants?
[0]

(Q6) Site index?
[60]

(Q7) Site index base age?
L-251

(Q8) Surviving trees per acre?
[320]

(Q9) Has this stand been thinned before?
Y = Yes
N = No (*)
[Y]

(Q10) Times previously thinned?
[1]

(Q11) Age last thinned?
[15]

(Q12) Residual BA per acre after the last thinning?
[80]

(Q13) Residual trees per acre after the last thinning?
[350]

(Ql4) Are your initial stand inputs entered correctly?
Y = Yes (*)
N = No
[Y]

(Q15) How many new thinnings? -- (Must be LE 10)
[1]

(Q16) Choose form of output:
V = Volume (*)
G = Green weight
D = Dry weight
[V]

(Q17) Choose method of thinning:
B = Thinning to a residual BA per acre (*)
T = Thinning to residual trees per acre
[B]

(Q18) For thinning# 1 enter -- thinning age and residual BA per acre
(Example: 15,80)
[20,80]

(Q19) Do you want cut tables?
Y = Yes (*)
N = No
[Y]

(Q20) Enter three top diameter limits for volume tables
(0=total volume).
(Example: 0,4,8 for total volume, volume to a 4-inch top,
and volume to a 8-inch top, respectively.)
[0,4,8]

(Q21) Do you want single table per page or continuous output:
S = Single table per page
C = Continuous feed (*)
[C]

(Q22) Choose form of output tables:
F = Full tables (*)
S = Summary tables
[F]

(Q23) Choose a board foot volume rule:
I = International 1/4 (*)
S = Scribner
D = Doyle
[I]

(Q24) Number of stand tables (Do not include any cut tables in your count)? NOTE: You must run the before-thin situation at a given age before you can run the after thin.
[3]

(Q25) For each stand table requested enter the age and the thinning code:
N = No thinning
B = Before thinning
A = After thinning
(Example of input: 10,N; for age 10, no thin table)

(Q25a) For stand table# 1, enter age and thinning code
[20,B]

(Q25b) For stand table# 2, enter age and thinning code
[20,A]

(Q25c) For stand table# 3, enter age and thinning code
[25,N]

(Q26) Are your stand table specifications correct?
Y = Yes (*)
N = No
[Y]

Please wait. Your request is being processed.

(The program will now process the user's request and return the finished stand tables as specified by the user. After all tables have been output the user will be asked about storing the output on a disk file. If you want to store this information you must specify a proper file name and storage device as required by your system.)

(Q27) Do you want to save your output on a disk file?
Y = Yes
N = No (*)
[N]

(In this case the output will not be stored on a disk file.)

(Q28) Do you want to continue?
Y = Yes (*)
N = No
[N]

(This response will cause the program to terminate. A new run using the final values of this run to initiate the next run may be started again by entering the values of this output or by specifying a new set of initial values.)

Output For Example 3.

EXAMPLE 3

LOBLOLLY PINE
BEFORE THINNING INFORMATION
(PER ACRE)

AGE= 20
DOMINANT HEIGHT= 52.9 FEET
QUADRATIC MEAN DBH= 7.609 INCHES

DBH CLASS	STEMS	BASAL AREA	AV. HT.	CUBIC FOOT VOLUME OF STEMS TO AN O.B. TOP DIAMETER OF 0 INCHES		4 INCHES		8 INCHES		INTER.1/4 B.F. VOL. 8-IN. TOP
in.	no.	sq. ft.	ft.	o.b.	i.b.	o.b.	i.b.	o.b.	i.b.	i.b.
4	6	0.5	39	67.	7.			0.	0.	0.
5	23	3.1	44		49.	3;:	2;:	0.	0.	0.
6	51	10.0	48	234.	173.	191.	138.	0.	0.	0.
7										
8	884	229.3	53	761. 539.	576.	728. 493.	548.	0. 0. 0. 0.		0. 0.
9	54	23.9	55	645.	491.	629.	478.	256.	181.	0.
10	18	9.8	56	271.	207.	267.	204:	159.	117.	690.
11	3	2.0	57	56.	43.	55.	42.	40.	30.	175.
	320	100.3		2583.	1950.	2402.	1803.	455.	328.	865.

SI(BASE AGE 25)= 60 FEET; 93RD PERCENTILE= 9.495
WEIBULL PARAMETERS: "A"= 1.968; "B"= 6.043; "C"= 4.453

EXAMPLE 3

LOBLOLLY PINE
RESIDUAL STAND -- AFTER THINNING
(PER ACRE)

AGE= 20
DOMINANT HEIGHT= 52.9 FEET
QUADRATIC MEAN DBH= 8.010 INCHES

DBH CLASS	STEMS	BASAL AREA	AV. HT.	CUBIC FOOT VOLUME OF STEMS TO AN O.B. TOP DIAMETER OF 0 INCHES		4 INCHES		8 INCHES		INTER.1/4 B.F. VOL. 8-IN. TOP
		sq.								
in.	no.	ft.	ft.	o.b.	i.b.	o.b.	i.b.	o.b.	i.b.	i.b.
		0.2	39							
4	2	1.2	44	3.	19.	15.	10.	0.	0.	0.
5	9			26.	88.	97.	70.	0.	0.	0.
6	26	5.1	48	119.				0.	0.	0.
7				340.		310.				0.
8	69	24.1 13.6	51 53	625.	473.	598.	238. 458.	0.0.	0.0.	0.
9	51	22.5	55	609.	464.	594.	452.	242.	171.	0.
10	18	9.8	56	271.	207.	267.	204.	159.	117.	690.
11	3	2.0	57	56.	43.	55.	42.	40.	30.	175.
	229	78.6		2049.	1551.	1936.	1458.	441.	318.	865.

SI(BASE AGE 25)= 60 FEET; 93RD PERCENTILE= 9.782
WEIBULL PARAMETERS: "A"= 2.581; "B"= 5.823; "C"= 4.604

EXAMPLE 3

LOBLOLLY PINE
STAND COMPONENT REMOVED BY THINNING
(PER ACRE)

AGE= 20
DOMINANT HEIGHT= 52.9 FEET
QUADRATIC MEAN DBH= 6.619 INCHES

DBH CLASS	STEMS	BASAL AREA	AV. HT.	CUBIC FOOT VOLUME OF STEMS TO AN O.B. TOP DIAMETER OF 0 INCHES		4 INCHES		8 INCHES		INTER.1/4 B.F. VOL. 8-IN. TOP
in.	no.	sq. ft.	ft.	o.b.	i.b.	o.b.	i.b.	o.b.	i.b.	i.b.
4	4	0.3	39		5.	0.	0.	0.	0.	0.
5	14	1.9	44	4::	30.	24.	17.	0.	0.	0.
6	25	4:g	48	115.	85.	94.	68.	0.	0.	0.
7	30	8.0	51	199.	149.	183.	136.	0.	0.	0.
8	15	5.2	53	136.	103.	130.	98.	0.	0.	0.
9	3	1.3	55	36.	27.	35.	26.	14.	10.	0.
	91	21.7		534.	.	466.	345.	14.	10.	0.

EXAMPLE 3

LOBLOLLY PINE
NO THINNING THIS YEAR
(PER YEAR)

AGE= 25
DOMINANT HEIGHT= 60.0 FEET
QUADRATIC MEAN DBH= 9.186 INCHES

DBH CLASS	STEMS	BASAL AREA	AV. HT.	CUBIC FOOT VOLUME OF STEMS TO AN O.B. TOP DIAMETER OF 0 INCHES		4 INCHES		8 INCHES		INTER.1/4 B.F. VOL. 8-IN. TOP
		sq.								
in.	no.	ft.	ft.	o.b.	i.b.	o.b.	i.b.	o.b.	i.b.	i.b.
5	3	0.4	46		7.	5.		0.	0.	0.
6	10	2.0	51	4;:	36.	40.	2;:	0.	0.	0.
7	24	6.4	54	169.	128.	154.	116.	0.	0.	0.
8	42	14.7	57	408.	313.	390.	298.	0.	0.	0.
9	55	24.3	59	702.	542.	685.	528.	279.	200.	0.
10	48	26.2	61	784.	610.	773.	601.	461.	345.	2038.
11	27	17.8	62	544:	424.	539.	421.	394.	301.	1752.
12	8	6.3	63	195.	153.	194.	152.	159.	123.	704.
13	1	0.9	64,	29.	23.	29:	23.	26.	20.	114.
	218	98.9		2889.	2236.	2809.	2172.	1319.	989.	4608.

SI(BASE AGE 25)= 60 FEET; 93RD PERCENTILE= ii.242
WEIBULL PARAMETERS: "A"= 3.137; "B"= 6.497; "C"= 4.423

Example 4. Starting with closing information from a previous run.

Situation: Assume a 25-year-old stand with a site index of 60 feet (base age 25) that you have run the program on previously. The stand was thinned at ages 15 and 20 to 80 square feet of basal area per acre. The owner wants to thin again at age 25 to 80 square feet of basal area and examine the current stand before and after thinning and project the growth of the residual stand to age 30. The owner has run the model before and wants to begin the model with the final computed stand values without rerunning the full set of previous tables.

(Ql) Choose your output device
S = Screen output
H = Hardcopy printer
[S]

(Q2) Enter a label for your output (60 characters or less)
[EXAMPLE 43

(Q3) Describe the stand by answering the following questions. Enter a zero (0) if you do not know the answer to a question requiring a numeric response. Use the designated character responses where indicated. Certain questions have a preset default response (Indicated by an asterisk (*) following the default). If you accept the default, just press the RETURN key.

At the very least you must provide STAND AGE, a measure of DOM/CODOM HEIGHT, and a measure of STAND DENSITY. If you are starting with the closing values of a previous run of the model, the answers must come from that output in order to set up the new run.

Are you starting with the closing values for a previous run of this program?
Y = Yes
N = No (*)
[Y]

(Q4) Enter "A" parameter
[3.137]

(Q5) Enter quadratic mean diameter
[9.186]

(Q6) Enter diameter of the 93rd percentile
[11.242]

(Q7) Stand age?
[25]

(Q8) Height of dominants and codominants?
[0]

(Q9) Site index?
[60]

(Q10) Site index base age?
[25]

(Q11) Surviving trees per acre?
[218]

(Q12) Has this stand been thinned before?
Y = Yes
N = No (*)
[Y]

(Q13) Times previously thinned?
[2]

(Q14) Age last thinned?
[20]

(Q15) Are your initial stand inputs entered correctly?
Y = Yes (*)
N = No
[Y]

(Q16) How many new thinnings? -- (Must be LE 10)
[1]

(Q17) Choose form of output:
V = Volume (*)
G = Green weight
D = Dry weight
[V]

(Q18) Choose method of thinning:
B = Thinning to a residual BA per acre (*)
T = Thinning to residual trees per acre
[B]

(Q19) For thinning# 1 enter -- thinning age and residual BA per acre
(Example: 15,80)
[25,80]

(Q20) Do you want cut tables?
Y = Yes (*)
N = No
[Y]

(Q21) Enter three top diameter limits for volume tables
(0=total volume).
(Example: 0,4,8 for total volume, volume to a 4-inch top,
and volume to an 8-inch top, respectively.)
[0,4,8]

(Q22) Do you want single table table per page or continuous output:
S = Single table per page
C = Continuous feed (*)
[S]

(Q23) Choose form of output tables:
F = Full tables (*)
S = Summary tables
[F]

(Q24) Choose a board foot volume rule:
I = International 1/4 (*)
S = Scribner
D = Doyle
[I]

(Q25) Number of stand tables (Do not include any cut tables in your count)? NOTE: You must run the before-thin situation at a given age before you can run the after thin.
[3]

(Q26) For each stand table requested enter the age and the thinning code:
N = No thinning
B = Before thinning
A = After thinning
(Example of input: 10.1; for age 10, no-thin table)

(Q26a) For stand table# 1, enter age and thinning code
[25,B]

(Q26b) For stand table# 2, enter age and thinning code
[25,A]

(Q26c) For stand table# 3, enter age and thinning code
[30,N]

(Q27) Are your stand table specifications correct?
Y = Yes (*)
N = No
[Y]

Please wait. Your request is being processed.

(The requested information is now processed and the desired output is printed. The user may then examine the results and decide whether to store the results on a disk file. After that the user decides whether to continue the program for additional cycles of this example, or a new run with new inputs or to terminate the program.)

(Q28) Do you want to save your output on a disk file?
Y = Yes
N = No (*)
[Y]

(Q29) Enter output file name
EXAMPLE4.DAT

(The output will now be stored in file EXAMPLE4.DAT on the user's system default drive.)

(Q30) Do you want to continue?
Y = Yes (*)
N = No
[N]

Output For Example 4.

EXAMPLE 4

LOBLOLLY PINE
BEFORE THINNING INFORMATION
(PER ACRE)

AGE= 25
DOMINANT HEIGHT= 60.0 FEET
QUADRATIC MEAN DBH= 9.186 INCHES

DBH CLASS	STEMS	BASAL AREA	AV. HT.	CUBIC FOOT VOLUME OF STEMS TO AN O.B. TOP DIAMETER OF 0 INCHES		4 INCHES		8 INCHES		INTER.1/4 B.F. VOL. 8-IN. TOP
		sq.								
in.	no.	ft.	ft.	o.b.	i.b.	o.b.	i.b.	o.b.	i.b.	i.b.
5	3	.4	46		7.	5.		0.	0.	0.
6	10	2.0	51	4; :	36.	40.	2; :	0.	0.	0.
7	24	6.4	54	169.	128.	154.	116.	0.	0.	0.
8	42	14.7	57	408.	313.	390.	298.	0.	0.	0.
9	55	24.3	59	702.	542.	685.	528.	.	200.	0.
10	48	26.2	61	784.	610.	773:	601.	461.	345.	2038.
11	27	17.8	62	544:	424.	539.	421.	394.	301.	1752.
12	8	6.3	63	195.	153.	194.	152.	.	123.	704.
13	1	.9	64	29.	23.	29.	23.	26.	20.	114.
	218	98.9		2889.	2236.	2809.	2172.	1319.	989.	4608.

SI(BASE AGE 25)=60 FEET; 93RD PERCENTILE= 11.242
WEIBULL PARAMETERS: "A"=3.137; "B"=6.497; "C"=4.422

EXAMPLE 4

LOBLOLLY PINE
RESIDUAL STAND -- AFTER THINNING
(PER ACRE)

AGE= 25
DOMINANT HEIGHT= 60.0 FEET
QUADRATIC MEAN DBH= 9.571 INCHES

DBH CLASS	STEMS	BASAL AREA	AV. HT.	CUBIC FOOT VOLUME OF STEMS TO AN O.B. TOP DIAMETER OF 0 INCHES		4 INCHES		8 INCHES		INTER.1/4 B.F. VOL. 8-IN. TOP
		sq.								
in.	no.	ft.	ft.	o.b.	i.b.	o.b.	i.b.	o.b.	i.b.	i.b.
5	1	.1	46	3.	2.	2.	1.	0.	0.	0.
6	3	.6	51	15.	11.	12.	9.	0.	0.	0.
7	11	2.9	54	77.	59.	71.	53.	0.	0.	0.
8	26	9.1	57	253.	194.	242.	184.	0.	0.	0.
9	40	17.7	59	510.	394.	498.	384.	203.	146.	0.
10	43	23.5	61	702.	546.	692.	538.	413.	309.	1826.
11	27	17.8	62	544.	424.	539.	421.	394.	301.	1752.
12	8	6.3	63	195.	153.	194.	152.	159.	123.	704.
13	1	.9	64	29.	23.	29.	23.	26.	20.	114.
	160	78.9		2328.	1806.	2279.	1765.	1195.	899.	4396.

SI(BASE AGE 25)= 60 FEET; 93RD PERCENTILE= 11.476
WEIBULL PARAMETERS: "A"= 3.719; "B"= 6.286; "C"= 4.651

EXAMPLE 4

LOBLOLLY PINE
STAND COMPONENT REMOVED BY THINNING
(PER ACRE)

AGE= 25
DOMINANT HEIGHT= 60.0 FEET
QUADRATIC MEAN DBH= 7.963 INCHES

DBH CLASS	STEMS	BASAL AREA	AV. HT.	CUBIC FOOT VOLUME OF STEMS TO AN O.B. TOP DIAMETER OF 0 INCHES		4 INCHES		8 INCHES		INTER.1/4 B.F. VOL. 8-IN. TOP
in.	no.	sq. ft.	ft.	o.b.	i.b.	o.b.	i.b.	o.b.	i.b.	i.b.
5	2	.3	46	6.	5.	3.	3.	0.	0.	0.
6	7	1.4	51	34.	25.	28.	20.	0.	0.	0.
7	13	3.5	54	92.	69.	83.	63.	0.	0.	0.
8	16	5.6	57	155.	119.	148.	114,	0.	0.	0.
9	15	6.6	59	192.	148.	187.	144.	76.	54.	0.
10	5	2.7	61	82.	64.	81.	63.	48.	36.	212.
	58	20.1		561.	430.	530.	407.	134.	go.	212.

EXAMPLE 4

LOBLOLLY PINE
NO THINNING THIS YEAR
(PER YEAR)

AGE= 30
DOMINANT HEIGHT= 66.0 FEET
QUADRATIC MEAN DBH= 10.608 INCHES

DBH CLASS	STEMS	BASAL AREA	AV. HT.	CUBIC FOOT VOLUME, OF STEMS TO AN O.B. TOP DIAMETER OF 0 INCHES		4 INCHES		8 INCHES		INTER.1/4 B.F. VOL. 8-IN. TOP
in.	no.	sq. ft.	ft.	o.b.	i.b.	o.b.	i.b.	o.b.	i.b.	i.b.
6	1	.2	53		4.	4.	3.	0.	0.	0.
7	5	1.3	57	3;:	28.	34.	26.	0.	0.	0.
8	12	4.2	60	122.	95.	117.	90.	0.	0.	0.
9	24	10.6	62	321.	251.	313.	244.	128.	92.	0.
10	35	19.1	64	598.	470.	590.	463.	352.	266.	1573.
11	38	25.1	66	812.	642.	805.	636.	589.	455.	2667.
12	26	20.4	68	682.	543.	679.	540.	557.	437.	2522.
13	11	10.1	69	345.	275.	343.	274.	302.	239.	1378.
14	3	3.2	70	111.	89.	111.	88.	101.	81.	467.
	155	94.3		3033.	.	2996.	2364.	2029.	1570.	8607.

SI(BASE AGE 25)= 60 FEET; 93RD PERCENTILE= 12.759
WEIBULL PARAMETERS: "A"= 4.0 "B"= 7.008; "C"= 4.587

```
**************************************************************************
*                                                                        *
*                            COMPUTE-PLOB                                *
*                                                                        *
*       (  COMPREHENSIVE  OUTLOOK  FOR  MANAGED  PINES  USING  SIMULATED *
*             TREATMENT  EXPERIMENTS-PLANTED  LOBLOLLY  PINE  )          *
*                                                                        *
*           BY:                                                          *
*              V.C.  BALDWIN,  JR., PRINCIPAL    MENSURATIONIST        *
*              D.P. FEDUCCIA, SILVICULTURIST                             *
*              R.B. FERGUSON, FORESTER/PROGRAMMER                        *
*                                                                        *
*            SILVICULTURE OF SOUTHERN PINES RESEARCH WORK UNIT           *
*                    SOUTHERN  FOREST  EXPERIMENT  STATION               *
*           2500 SHREVEPORT HIGHWAY, PINEVILLE, LOUISIANA 71360          *
*                           (318)-473-7216                               *
*                                                                        *
**************************************************************************
C
C   The main program for this prediction system consists of minimum
C   source code necessary to begin and direct the flow to the major
C   processing   subroutines.  The major variables in this section are:
C
C      IERCD - An error test variable used to detect a fatal error
C              requiring a complete restart of the program.
C
C      OUT   - A character variable used to designate the output device
C              for the final results.
C
C      TITLE - A character variable allowing the user to enter a title
C              header for the final results (60 Character Limit).
C
C   The main program allows the user to begin a new run without having
C   to restart the entire process.
C
C   The user is cautioned that any alterations made to this program may
C   result in erroneous or unreliable results.
C
**************************************************************************
      PROGRAM PLOB
      CHARACTER"5 OUT,ANS
      CHARACTER*60 TITLE
      COMMON /OUTPUT/ OUT,TITLE
      I=0
      II=0
  100 WRITE(*,200)
  200 FORMAT(/,/,6X,'Choose your output device',/,10X,'S = Screen'
     1,' output',/,10X,'H = Hardcopy   printer',/)
      READ(*,'(A5)') ANS
      IF((ANS.EQ.'S').OR.(ANS.EQ.'s')) OUT='CON:'
      IF((ANS.EQ.'H').OR.(ANS.EQ.'h')) OUT='LPT1:'
```

```
      OPEN(1,FILE=OUT)
    5 WRITE(1,11)
   11 FORMAT(/,/)
      IF((I.GT.0).OR.(II.GT.0)) GOT0 10
      WRITE(1,12)
   12 FORMAT(10X,61('*'))
      WRITE(1,16)
   16 FORMAT(2(10X,'*',59X,'*',/),10X,'*',9X,'Loblolly Pine Plantation'
     1,1X,'Growth and Yield',9X,'*',/,10X,'*',9X,'Prediction System'
     2,1X,'for the West Gulf Region',8X,'*',/,10X,'*',59X,'*',/,10X,'*'
     3,28X,'By',29X,'*',/,10X,'*',59X,'*',/,10X,'*',10X,'V.C.Baldwin'
     4,1X,'Jr., Principal Mensurationist',7X,'*',/,10X,'*',10X,'D.P.Fe'
     5,'duccia, Silviculturist',20X,'*',/,10X,'*',10X,'R.B. Ferguson, F'
     6,'orester/Programmer',15X,'*',/,10X,'*',59X,'*',/,10X,'*',5X,'Sil'
     7,'viculture of Southern Pines Research Work Unit',5X,'*',/,10X
     8,'*',13X,'Southern Forest Experiment Station',12X,'*',/,10X,'*'
     9,4X,'2500 Shreveport Highway, Pineville, Louisiana 71360',4X,'*')
      WRITE(1,21)
   21 FORMAT(10X,'*',22X,'(318)-473-7216',23X,'*',2(/,10X,'*',59X,'*'))
      WRITE(1,12)
      WRITE(1,11)
   10 WRITE(*,17)
   17 FORMAT(6X,'Enter a label for your output (60 characters or less)')
      READ(*,'(A60)') TITLE
      CALL   INPUT(IERCD,I)
      IF(IERCD.GT.0) GOT0 25
      IF(IERCD.EQ.2)  GOT0  35
      CALL   DECIDE(IERCD)
      IF(IERCD.GT.0) GOT0 25
      IF(IERCD.EQ.2)  GOT0  35
      CALL STDTBL
   15 WRITE(*,20)
   20 FORMAT(/,/,6X,'Do you want to continue?',/,10X,'Y = Yes (*)'
     1,/,10X,'N = No',/)
      READ (*,'(A5)') ANS
      IF((ANS.EQ.'N').OR.(ANS.EQ.'n')) GOT0 35
      WRITE(*,22)
   22 FORMAT(/,6X,'Is this a continuation of the run just completed?'
     1,/,10X,'Y = Yes (*)',/,10X,'N = No',/)
      READ(*,'(A5)') ANS
      II=1
      I=1
      IF((ANS.EQ.'N').OR.(ANS.EQ.'n')) I=0
      GOT0  100
   25 WRITE(*,30)
   30 FORMAT(/,/,6X,'You made a mistake.  Do you want to try again?',/,
     110X,'Y = Yes (*)',/,10X,'N = No',/)
      READ(*,'(A5)') ANS
      I=0
      IF((ANS.EQ.'N').OR.(ANS.EQ.'n')) GOT0 35
      GOT0 100
   35 STOP
        END
*************************************************************************
```

```
C
c    The INPUT subroutine consists of a set of questions used to set the
C    initial stand condition and subsequent treatments.  Certain values
C    are required to run the program.  These inputs are protected by
C    error traps to insure their entry.  Other requested information is
C    optional but may result in more accurate predictions.  The equations
c    used by the program are determined by this subroutine.
C
C-----------------------------------------------------------------------
C
C              COMMON  Variable  Definitions
c
C    /INFO/
c       NTAB   - Number of tables requested in this run
C       TCODE  - Thinning code array
C       BA     - Basal area array
C       BH     - Site index to a base age 25
C       AGE    - Age array
c       BFCD   - Board-foot volume code option selected
C       QMD    - Quadratic mean Dbh array
C       P93    - Diameter of the 93rd percentile
C       STC    - Stand table code - full or summary table output
C       IPTHIN - Number of previous thinnings before starting the run
C       ICTCD  - Option to either print or not print cut tables
C       IK     - Tracks the stand thinning history during a run
C       ITAB   - Sets the option for volume, green weight, or dry weight
C       TD     - Top diameter(s) for the output tables
C       ITHIN  - Thinning method - by residual BA or residual trees/ac
c       B      - Weibull parameter array
C       TS     - Trees surviving array
C       HD     - Mean dominant and co-dominant height of the stand
C       IWEIB  - Set the program to begin with final values
C                from a previous run
c       BTTS   - Before-thin trees surviving from the previous run
c       ITAGE  - Age of the last thinning for a previously thinned stand
C       BSAG   - Base age of a user supplied site index
C       SI     - Site index supplied by the user
C       IPG    - Output page option - one table per page or continuous
C                printing
C       AINP   - Array used to hold the values of the last run
C
C    /TNTYPE/
C       DMIN   - Minimum-diameter array
C       ITT    - Sets the program to start the run with a stand that was
C                thinned at some age prior to the current age
C       TARGET - Thinning age and matching target thinning level
C       IBA    - Residual BA after the last thinning of a previously
C                thinned stand
c       ITPA   - Trees per acre after the last thinning of a previously
C                thinned stand
C       NTHIN  - Number of thinnings to be done during the run (0 to 10)
c
**************************************************************************
      SUBROUTINE INPUT(IERCD,ICNT)
```

```
      CHARACTER*5 ANS,OUT
      CHARACTER"60 TITLE
      INTEGERAGE(16),TCODE(16),STC,BFCD
      REAL BA(16),TS(16),HD(16),QMD(16),DMIN(16),P93(16),B(3,16),IBA
     1,ITPA,TARGET(2,10),TD(3),AINP(16)
      COMMON /INFO/NTAB,TCODE,BA,BH,AGE,BFCD,QMD,P93,STC,IPTHIN
     1,ICTCD,IK,ITAB,TD,ITHIN,B,TS,HD,IWEIB,BTTS,ITAGE,BSAG,SI,IPG,AINP
      COMMON /TNTYPE/DMIN,ITT,TARGET,IBA,ITPA,NTHIN
      COMMON /OUTPUT/OUT,TITLE
      NN=16
      IF(ICNT.GE.l) NN=15
        DO 5 I=1,NN
      BA(I)=0.
      TS(I)=0.
      HD(I)=0.
      QMD(I)=0.
      AGE(I)=0
      DMIN(I)=0.
   5    CONTINUE
      BA(16)=0.
      IF(ICNT.GE.l)  GOT0  7
      DO  6 I=1,16
      AINP(I)=0.
   6 BA(I)=0.
 7 I P G = 0
      IK=0
      ITAB=1
      ITHIN=1
      STC=1
      BFCD=1
      ICTCD=1
      AGE(16)=AINP(1)
      HD(16)=AINP(2)
      SI=AINP(3)
      BSAG=AINP(4)
      TS(16)=AINP(5)
      TP=AINP(7)
      ITT=NINT(AINP(8))
      IPTHIN=NINT(AINP(9))
      ITAGE=NINT(AINP(10))
      IBA=AINP(11)
      ITPA=AINP(12)
      B(1,16)=AINP(13)
      QMD(16)=AINP(14)
      P93(16)=AINP(15)
      IWEIB=ICNT
      TD(1)=0.
      TD(2)=0.
      TD(3)=0.
      BTTS=0.
      BH=0.
      IF(ICNT.GE.1) GOT0 117
      WRITE(*,25)
```

```
25 FORMAT(/,6X,'Describe the stand by answering the following'
   1,' questions. Enter a',/,6X,'zero (0) if you do not know the'
   2,' answer to a question requiring a',/,6X,'numeric response.'
   3,'  Use the designated character responses where',/,6X,'indicated'
   4,'.  Certain questions have a preset default response',/,6X
   5,'(Indicated by a asterisk (*) following the default).'
   6,'  If you accept',/,6X,' the default, press the RETURN Key.'
   7,/,/,6X,'At the very least you must provide STAND AGE,'
   8,'a measure of DOM/CODOM',/,6X,'HEIGHT, and a measure of STAND '
   9,'DENSITY.  If you are starting with the')
    WRITE(*,26)
26 FORMAT(6X,'closing values of a previous run of the'
   1,' model, the answers must come',/,6X,'from that output in order'
   2,' to set up the new run.',/)
29 WRITE(*,50)
50 FORMAT(6X,'Are you starting with the closing values for a'
   1,' previous run of this',/,6X,'program?',/,10X,'Y = Yes',/,10X
   2,'N = No (*)')
    READ (*,'(A5)') ANS
    IF((ANS.EQ.'Y').OR.(ANS.EQ.'y')) IWEIB=1
    AINP(16)=FLOAT(IWEIB)
    IF(IWEIB.EQ.0) GOT0 55
    WRITE(*,30)
30  FORMAT(6X,'Enter "A" parameter')
    READ (*,*)B(1,16)
    AINP(13)=B(1,16)
    WRITE(*,35)
35  FORMAT(/,6X,'Enter quadratic mean diameter')
    READ (*,*)QMD(16)
    AINP(14)=QMD(16)
    WRITE(*,40)
40  FORMAT(/,6X,'Enter diameter of the 93rd percentile')
    READ (*,*)P93(16)
    AINP(15)=P93(16)
55  WRITE(*,60)
60  FORMAT(/,6X,'Standage?')
    READ (*,*)AGE(16)
    IF((AGE(16).GE.10).AND.(AGE(16).LE.50)) GOT0 64
    WRITE(*,355)
    GOT0 55
64  AG=FLOAT(AGE(16))
    AINP(1)=AG
31  WRITE(*,65)
65  FORMAT(/,6X,'Height of dominants and codominants?')
    READ (*,*) HD(16)
    AINP(2)=HD(16)
    IF(HD(16).GT.0.) GOT0 75
    WRITE(*,70)
70  FORMAT(/,6X,'Siteindex?')
    READ (*,*) SI
    AINP(3)=SI
    WRITE(*,72)
72  FORMAT(/,6X,'Site index base age?')
    READ (*,*)BSAG
```

```
      AINP(4)=BSAG
      IF((HD(16).GT.0.).OR.(SI.GT.0.)) GOT0 75
      WRITE(*,400)
      GOT0  31
 7 5   WRITE(*,80)
 80 FORMAT(/,6X,'Surviving trees per acre?')
      READ  (*,*) TS(16)
      AINP(5)=TS(16)
      IF(TS(16).GT.0.) GOT0 100
      IF(IWEIB.NE.1)  GOTO  85
      WRITE(*,401)
      GOT0  75
 8 5   WRITE(*,90)
 90 FORMAT(/,6X,'Basal area per acre?')
      READ  (*,*) BA(16)
      AINP(6)=BA(16)
      IF(TS(16).GT.0.) GOT0 100
      WRITE(*,95)
 95 FORMAT(/,6X,'Trees planted per acre?')
      READ (*,*) TP
      AINP(7)=TP
      IF((TS(16).GT.0.).OR.(TP.GT.0.).OR.(BA(16).GT.0.)) GOT0 100
      WRITE(*,402)
      GOT0  75
100  WRITE(*,105)
105  FORMAT(/,6X,'Has this stand been thinned before?',/,10X,'Y = Yes'
     1,/,10X,'N = No (*)')
      READ (*,'(A5)') ANS
      IF((ANS.EQ.'Y').OR.(ANS.EQ.'y')) ITT=1
      AINP(8)=FLOAT(ITT)
      IF(ITT.NE.1) GOT0  135
109   WRITE(*,110)
110  FORMAT(/,6X,'How many times previously thinned?')
      READ (*,*)IPTHIN
      AINP(9)=FLOAT(IPTHIN)
      IF(IPTHIN.GT.0) GOT0 114
      WRITE(*,111)
111  FORMAT(3X,'ERROR! Give the number of previous thinnings.',/)
      GOT0  109
114   WRITE(*,115)
115  FORMAT(/,6X,'Age last thinned?',/)
      READ (*,*)ITAGE
      AINP(10)=FLOAT(ITAGE)
      IF(ITAGE.GT.0) GOT0 117
      WRITE(*,116)
116  FORMAT(3X,'ERROR! Give the stand age at the last thinning.',/)
      GOT0  114
117  IF(ITAGE.LT.AGE(16))  TCODE(16)=2
      IF(ITAGE.EQ.AGE(16)) TCODE(16)=3
      IF(ICNT.GE.l)   GOT0   181
      IF((IWEIB.GT.0).AND.(ITAGE.LT.AGE(16))) GOT0 140
      IF(ITAGE.NE.AGE(16)) GOT0 120
      IBA=BA(16)
      ITPA=TS(16)
```

```
     AINP(11)=IBA
     AINP(12)=ITPA
     GOT0  140
120  WRITE(*,125)
125 FORMAT(/,6X,'Residual BA per acre after the last thinning?')
     READ (*,*)IBA
     WRITE(*,130)
130 FORMAT(/,6X,'Residual trees per acre after the last thinning?')
     READ (*,*)ITPA
     IF((IBA.LE.0.).AND.(ITPA.LE.0.))   GOT0   131
     AINP(11)=IBA
     AINP(12)=ITPA
     GOT0  140
131  WRITE(*,132)
132 FORMAT(3X,'ERROR! Give residual BA per acre or trees per acre'
    1,' after  the  last  thinning.',/)
     GOT0  120
135  TCODE(16)=1
140  WRITE(*,145)
145 FORMAT(/,6X,'Are your initial stand inputs entered correctly?'
    1,/,10X,'Y = Yes (*)',/,10X,'N = No')
     READ (*,'(A5)') ANS
     IF((ANS.EQ.'N').OR.(ANS.EQ.'n')) GOT0 146
     GOT0  181
146  WRITE(*,147)
147 FORMAT(/,6X,'Can you correct them?',/,10x,'Y = Yes (*)',/,10X
    1,'N = No')
     READ (*,'(A5)') ANS
     IF((ANS.EQ.'N').OR.(ANS.EQ.'n')) GOT0 148
     GOT0  29
148  IERCD=2
     RETURN
181  IF(SI.GT.0.) BH=VAL(SI,BSAG,1)
     IF(SI.LE.0.) BH=VAL(HD(16),AG,1)
     IF(SI.LE.0.) BSAG=25.
     IF(SI.LE.0.) SI=BH
215  IF(HD(16).LE.0.) HD(16)=VAL(BH,AG,2)
190  IF(ITT.EQ.l) GOT0 200
     IF((TS(16).EQ.0.).AND.((TP.NE.0.).OR.(BA(16).NE.0.))) GOT0 195
     GOT0  221
195  CALL TPA(TS(16),TP,AGE(16),HD(16),BA(16))
     GOT0  221
200  IF((TS(16).EQ.0.).AND.((BA(16).NE.0.).OR.(IBA.NE.0.).OR.
    1(ITPA.NE.0.))) GOTO 205
     GOT0  221
205  CALL TNTPA(TS(16),IBA,ITPA,ITAGE,AGE(16),BA(16),HD(16))
221  IF((TS(16).NE.0.).AND.(BA(16).NE.0.)) QMD(16)=VAL(BA(16),TS(16),4)
     WRITE(*,225)
225  FORMAT(/,6X,'How many new thinnings? -- (Must be LE 10)')
     READ (*,*) NTHIN
     IF(NTHIN.GT.l0)   GOT0   227
     GOT0  229
227  WRITE(*,228)
228 FORMAT(3X,'ERROR! Too many thinnings requested.',/)
```

```
     GOT0  221
229  WRITE(*,241)
241 FORMAT(/,6X,'Choose form of output:',/,10X,'V = Volume (*)',/,10X
    1,'G = Green weight',/,10X,'D = Dry weight')
     READ (*,'(A5)') ANS
     IF((ANS.EQ.'G').OR.(ANS.EQ.'g')) ITAB=2
     IF((ANS.EQ.'D').OR.(ANS.EQ.'d')) ITAB=3
     IF(NTHIN.LE.0) GOT0 296
232  WRITE(*,235)
235 FORMAT(/,6X,'Choose method of thinning:',/,10X,'B = Thinning to a'
    1,' residual BA per acre (*)',/,10X,'T = Thinning to a residual'
    2,' trees per acre')
     READ (*,'(A5)') ANS
     IF((ANS.EQ.'T').OR.(ANS.EQ.'t')) ITHIN=2
     IF((ITHIN.LT.1).OR.(ITHIN.GT.2)) GOT0 236
     GOT0  239
236  WRITE(*,237)
237 FORMAT(3X,'ERROR! Your choice of thinning method is incorrect.')
     GOTO 232
239    DO 265 I=1,NTHIN
240  WRITE(*,245) I
     IF(ITHIN.EQ.l) WRITE(*,275)
     IF(ITHIN.EQ.2) WRITE(*,280)
245 FORMAT(/,6X,'For Thinning',I3,' enter -- thinning age',\)
275 FORMAT(' and residual BA per acre',/,10X,'(Example: 15,80)')
280 FORMAT(' and residual trees per acre',/,10X,'Example: 15,400)')
     READ (*,*) TARGET(1,I),TARGET(2,I)
     IF((TARGET(1,I).LT.10.).OR.(TARGET(1,I).GT.50.)) GOT0 255
     GOTO 265
255  WRITE(*,260)
260 FORMAT(6X,'ERROR! Age limits violated -- TRY AGAIN!',/)
     GOT0 240
265    CONTINUE
     WRITE(*,231)
231 FORMAT(/,6X,'Do you want cut tables?',/,10X,'Y = Yes (*)',/,
    110X,'N = No')
     READ(*,'(A5)') ANS
     IF((ANS.EQ.'N').OR.(ANS.EQ.'n')) ICTCD=0
296 IF(ITAB.EQ.l) GOT0  396
     WRITE(*,297)
297 FORMAT(/,6X,'Enter the top diameter limit for weight tables.')
     READ (*,*)TD(1)
     GOT0  311
396  WRITE(*,397)
397 FORMAT(/,6X,'Enter three top diameter limits for volume tables'
    1,/,6X,'(0=total volume)',/,10X,'(Example: 0,4,8 for total volume'
    2,', volume to a 4-inch top,',/,20X,'and volume to an 8-inch top,'
    3,' respectively.)',/)
     READ(*,*) TD(1),TD(2),TD(3)
311 IF(OUT.EQ.'CON:') GOT0 315
     WRITE(*,312)
312 FORMAT(/,6X,'Do you want single table per page or continuous'
    1,' output:',/,10X,'S = Single table per page',/,10x,'C = Con'
    2,'tinuous feed (*)',/)
```

```
     READ(*,'(A5)') ANS
     IF((ANS.EQ.'S').OR.(ANS.EQ.'s')) IPG=1
315  WRITE(*,316)
316  FORMAT(/,6X,'Choose form of output tables:',/,10X,'F = Full'
    1,' tables (*)',/,10X,'S = Summary tables')
     READ (*,'(A5)') ANS
     IF((ANS.EQ.'S').OR.(ANS.EQ.'s')) STC=2
     IF(ITAB.NE.l) GOT0 309
     WRITE(*,317)
317  FORMAT(/,6X,'Choose a board-foot volume rule:',/,10X,'I = Interna'
    1,'tional 1/4 (*)',/,10X,'S = Scribner',/,10X,'D = Doyle')
     READ (*,'(A5)') ANS
     IF((ANS.EQ.'S').OR.(ANS.EQ.'s')) BFCD=2
     IF((ANS.EQ.'D').OR.(ANS.EQ.'d')) BFCD=3
309  WRITE(*,310)
310  FORMAT(/,6X,'Number of stand tables (Do not include any cut'
    1,' tables',/,6X,'in your count)? NOTE: You must run the '
    2,'before-thin',/,6X,'situation at a given age before you can'
    3,' run the after thin.',/)
     READ(*,*) NTAB
     IF(NTAB.GT.15)  GOT0  361
318  WRITE(*,320)
320  FORMAT(/,6X,'For each stand table requested, enter the age and,'
    1,'the',/,6X,'thinning code:',/,10X,'N = No thinning',/,10X
    2, 'B = Before thinning',/,10X,'A = After thinning',/,20X,'(Example'
    3" of input: 10,N; for age 10,',/,20X,'no-thinning table)',/)
     IF(NTHIN.LE.O) TCODE(16)=1
     IF((NTHIN.LE.O).AND.(ITT.GE.1).AND.(AGE(16).EQ.ITAGE)) TCODE(16)=3
       DO 360 I=1,NTAB
325  WRITE(*,330)I
330 FORMAT(/,/,6X,'For stand table#',I2,', enter age and thinning'
    1,' code.')
     READ (*,'(I3,A5)')AGE(I),ANS
     IF((ANS.EQ.'N').OR.(ANS.EQ.'n')) TCODE(I)=1
     IF((ANS.EQ.'B').OR.(ANS.EQ.'b')) TCODE(I)=2
     IF((ANS.EQ.'A').OR.(ANS.EQ.'a')) TCODE(I)=3
     IF((AGE(I).LT.10).OR.(AGE(I).GT.50)) GOT0 350
     IF((AGE(I).EQ.AGE(16)).AND.(TCODE(I).EQ.1)) TCODE(16)=1
     IF((AGE(I).EQ.AGE(16)).AND.(ITT.NE.1).AND.(TCODE(I).EQ.3))
    1TCODE(16)=2
     IF((ITT.EQ.1).AND.(AGE(I).LT.AGE(16))) GOT0 340
     IF(I.EQ.l)  GOT0  360
     IF((TCODE(I).EQ.3).AND.((TCODE(I-1).EQ.3).OR.(AGE(I-1).NE
    1.AGE(I)))) GOT0 356
     GOTO 360
340  WRITE(*,345)
345 FORMAT(6X,'ERROR! Previously thinned stand. You can not work'
    1,1X,'backward.',/,6X,'Age must be GE the current age input.',/)
     GOT0  325
350  WRITE(*,355)
355  FORMAT(/,6X,'ERROR! Age limits violated. -- (Must be LE 50 or'
    1,' GE 10.)'',/)
     GOT0 325'
356  WRITE(*,357)
```

```
 357  FORMAT(/,6X,'ERROR! You can not run the after thin situation'
     1,' without  first',/,' running  the  before  thin.',/)
      GOTO 325
 360    CONTINUE
 363  WRITE(*,364)
 364  FORMAT(/,/,6X,'Are your stand table specifications correct?'
     1,/,10X,'Y = Yes (*)',/,10X,'N = No')
      READ(*,'(A5)')ANS
      IF((ANS.EQ.'N').OR.(ANS.EQ.'n')) GOTO 365
      GOTO 380
 365  WRITE(*,366)
 366  FORMAT(/,6X,'Give stand table# to correct. (Enter 999 to end'
     1,' corrections.)',/)
      READ(*,*) JJ
      IF(JJ.GT.15) GOTO 380
 367  WRITE(*,330) JJ
      READ(*,'(I3,A5)')AGE(JJ),ANS
      IF((ANS.EQ.'N').OR.(ANS.EQ.'n')) TCODE(JJ)=1
      IF((ANS.EQ.'B').OR.(ANS.EQ.'b')) TCODE(JJ)=2
      IF((ANS.EQ.'A').OR.(ANS.EQ.'a')) TCODE(JJ)=3
      IF((AGE(JJ).GE.10).AND.(AGE(JJ).LE.50)) GOTO 368
      WRITE(*,355)
      GOTO 367
 368  IF((AGE(JJ).EQ.AGE(16)).AND.(TCODE(JJ).EQ.1)) TCODE(16)=1
      IF((AGE(JJ).EQ.AGE(16)).AND.(ITT.NE.1).AND.(TCODE(JJ).EQ.3))
     1 TCODE(16)=2
      IF((TCODE(JJ).EQ.3).AND.((TCODE(JJ-1).EQ.3).OR.(AGE(JJ-1).NE
     1.AGE(JJ)))) WRITE(*,357)
      IF((TCODE(JJ).EQ.3).AND.((TCODE(JJ-1).EQ.3).OR.(AGE(JJ-1).NE
     1.AGE(JJ)))) GOTO 367
      GOTO 363
 400  FORMAT(/,6X,'ERROR! Give either height of Dom. & Codom. or SI',/)
 401  FORMAT(/,6X,'ERROR! Trees surviving is required',/)
 402  FORMAT(/,6X,'ERROR! Give either trees planted or trees surviving'
     1,/)
 380  IF((IWEIB.EQ.0).OR.(TCODE(16).NE.3)) GOTO 499
      WRITE(*,82)
  82  FORMAT(6X,'Give the before thin trees per acre from your previous'
     1,' run. ')
      READ(*,*) BTTS
      GOTO 499
 361  WRITE(*,362)
 362  FORMAT(6X,'ERROR! The maximum number of tables is 15',/)
      GOTO 309
 499  IERCD=0
      WRITE(*,500)
 500  FORMAT(/,/,/,6X,'Pleasewait.  Your  request  is  being  processed.'
     1,/)
        RETURN
 370  IERCD=1
        RETURN
        END
*************************************************************************
C
```

```
C    The DECIDE subroutine examines the set of options entered in INPUT
C    subroutine and decides which functions and subroutines to call.
C
C    The COMMON variables in this subroutine are defined in the INPUT
C    subroutine.
C
*************************************************************************
        SUBROUTINE    DECIDE(IERCD)
       INTEGERAGE(16),TCODE(16),STC,BFCD
       REAL HD(16),TS(16),B(3,16),BA(16),QMD(16),DMIN(16),P93(16)
      1,TARGET(2,10),IBA,ITPA,TD(3),AINP(16)
       COMMON/INFO/NTAB,TCODE,BA,BH,AGE,BFCD,QMD,P93,STC,IPTHIN
      1,ICTCD,IK,ITAB,TD,ITHIN,B,TS,HD,IWEIB,BTTS,ITAGE,BSAG,SI,IPG,AINP
       COMMON/TNTYPE/DMIN,ITT,TARGET,IBA,ITPA,NTHIN
       IT=0
       I=16
       A1=FLOAT(AGE(I))
       A2=FLOAT(ITAGE)
       IF(ITT.EQ.l) IT=IT+IPTHIN
       IF(I'IT.EQ.l)IK=IK+1
       IF(IWEIB.GE.l DMIN(16)=B(1,16)/.6
       IF(IWEIB.EQ.l) GOT0 20
       IF(IIT.EQ.l)  GOT0  10
       CALL MOMENT(DMIN(I),QMD(I),P93(I),A1,HD(I),TS(I))
       GOT0  15
  10 CALL THMOM(DMIN(I),QMD(I),P93(I),A1,A2,HD(I),TS(I),BA(I)
     1,IBA,ITPA,IPTHIN)
  15 CALL SOLVE(DMIN(I),QMD(I),P93(I),BA(I),TS(I),B,I,2)
       GOT0  25
  20 CALL SOLVE(DMIN(I),QMD(I),P93(I),BA(I),TS(I),B,I,IWEIB)
  25    DO 135 I=1,NTAB
       IF((I.GT.1).AND.(AGE(I).GT.AGE(16)))KK=I-1
       IF((I.GT.1).AND.(AGE(I).EQ.AGE(16))) KK=16
       IF((I.EQ.1).OR.(AGE(I).LT.AGE(16))) KK=16
       IA1=AGE(KK)
       IA2=AGE(I)
       DM1=DMIN(KK)
       TS1=TS(KK)
       QM1=QMD(KK)
       QM2=0.
       P91=P93(KK)
       A1=FLOAT(IA1)
       A2=FLOAT(IA2)
       H1=VAL(BH,A1,2)
       H2=VAL(BH,A2,2)
       B1=BA(KK)
       IF((IA2-IA1).GT.5) GOT0 315
       II=1
       IR=0
       GOT0  320
 315 II=0
       IQ=(IA2-IA1)/5
       IR=MOD((IA2-IA1),5)
       IF(IR.GE.l) II=II+1
```

```
      II=II+IQ
320   IAG=IA1
      IF(TCODE(I).EQ.3) IK=IK+1
      IF((AGE(I).NE.AGE(16)).OR.(TCODE(I).NE.TCODE(16))) GOT0 30
      L=16
      GOT0  130
 30   IF(TCODE(I).NE.3) GOT0 95
        DO 35 J=1,NTHIN
      IF((ITHIN.EQ.1).AND.(AGE(I).EQ.INT(TARGET(1,J))))
     1BA(I)=TARGET(2,J)
      IF((ITHIN.EQ.2).AND.(AGE(I).EQ.INT(TARGET(1,J))))
     1TS(I)=TARGET(2,J)
 35     CONTINUE
      IT=IT+1
      IF(I.NE.l) GOT0 50
      IF(TCODE(16).EQ.3) GOT0 55
      IF(AGE(16).LT.AGE(I)) GOT0 60
 40   IF(B1.LE.O.) B1=VAL(TS1,QM1,3)
      CALL CHANGE(DMIN(I),QMD(I),P93(I),BA(I),TS(I),IT,DM1,QM1,P91,B1
     1,TS1,H1,ITHIN,TCODE(I),IK,ITT)
      HD(I)=H1
      GOT0 45
 50   IF(TCODE(I-1).EQ.3) GOT0 60
      IF((TCODE(I-1).EQ.2).OR.(IK.GE.1)) GOT0 40
 55   IF(AGE(16).GT.AGE(I)) GOT0 70
 60   DO 350 JJ=1,II
      IF(II.EQ.l) IAG=IA2
      IF(II.EQ.l) GOT0 330
      IF((JJ.EQ.II).AND.(IR.GT.O))   GOT0   325
      IAG=IAG+5
      GOT0 330
325   IAG=IAG+IR
330   A1=FLOAT(IA1)
      A2=FLOAT(IAG)
      IF((ITT.EQ.1).OR.(IK.GE.1)) GOTO 65
331   CALL UNTGRO(DM2,QM2,P92,B2,A1,A2,BH,B1,TS1,TS2)
      IF(DM2.LT.DM1) DM2=DM1+(DM1*(.03*(A2-A1)))
      IF(QM2.LT.QM1) QM2=QM1
      IF(P92.LT.P91) P92=P91
      GOT0 340
 65   CALL THNGRO(DM2,QM2,P92,B2,DM1,QM1,P91,A1,A2,BH,TS1,TS2)
      IF(ANINT(B2).LT.125.) GOT0 340
      IK=0
      ITT=0
      GOT0 331
340   IA1=IAG
      DM1=DM2
      QM1=QM2
      P91=P92
      TS1=TS2
      B1=B2
350   CONTINUE
      GOT0 81
 70   WRITE(*,75)
```

```
 75 FORMAT(3X,'ERROR! You can not estimate backwards in this case.')
    GOT0 140
 81  CALL CHANGE(DMIN(I),QMD(I),P93(I),BA(I),TS(I),IT,DM2,QM2,P92,B2
   1,TS2,H2,ITHIN,TCODE(I),IK,ITT)
    HD(I)=H2
 45  IBA=BA(I)
    ITPA=TS(I)
    ITAGE=AGE(I)
    IF(TCODE(I).EQ.4) GOT0 125
    IF(ITHIN.EQ.1) GOTO 85
    BA(I)=VAL(TS(I),QMD(I),3)
    GOT0  125
 85 TS(I)=VAL(BA(I) ,QMD(I) ,5)
    GOT0  125
 95  DO 450 JJ=1,II
    IF(II.EQ.l) IAG=IA2
    IF(II.EQ.l) GOT0 430
    IF((JJ.EQ.II).AND.(IR.GT.0))   GOT0   425
    IAG=IAG+5
    GOT0  430
425  IAG=IAG+IR
430  A1=FLOAT(IA1)
    A2=FLOAT(IAG)
    IF((ITT.EQ.1).OR.(IK.GE.1)) GOT0 115
110  CALL UNTGRO(DM2,QM2,P92,B2,A1,A2,BH,B1,TS1,TS2)
    IF(DM2.LT.DM1) DM2=DM1+(DM1*(.03*(A2-A1)))
    IF(QM2.LT.QM1) QM2=QM1
    IF(P92.LT.P91) P92=P91
    GOT0  440
115  CALL THNGRO(DM2,QM2,P92,B2,DM1,QM1,P91,A1,A2,BH,TS1,TS2)
    IF(ANINT(B2).LT.125.) GOT0 440
    IK=0
    ITT=0
    GOT0  110
440  IA1=IAG
    DM1=DM2
    QM1=QM2
    P91=P92
    TS1=TS2
    B1=B2
450  CONTINUE
121  BA(I)=B2
    DMIN(I)=DM2
    TS(I)=TS2
    QMD(I)=QM2
    P93(I)=P92
    HD(I)=H2
125  CALL SOLVE(DMIN(I),QMD(I),P93(I),BA(I),TS(I),B,I,2)
    GOT0  135
130  HD(I)=HD(L)
    TS(I)=TS(L)
    P93(I)=P93(L)
    DMIN(I)=DMIN(L)
    QMD(I)=QMD(L)
```

```
      BA(I)=BA(L)
      B(1,I)=B(1,L)
      B(2,I)=B(2,L)
      B(3,I)=B(3,L)
  135   CONTINUE
      IERCD=0
        RETURN
  140 IERCD=1
        RETURN
        END
************************************************************************
C
C   THMOM subroutine calculates the quadratic mean dbh, the minimum dbh,
C   and the diameter of the 93rd percentile for an initial stand which
C   has been previously thinned.  This subroutine will only be used once
C   during any run to get the initial start-up values.
C
************************************************************************
        SUBROUTINETHMOM(DM,QM,P9,A1,A2,H,T1,B1,B2,T2,IP)
      P=FLOAT(IP)
      IF(A2.LT.A1) GOT0 10
      IF(B2.NE.0.)  GOT0  5
      P9=EXP(1.52776-.20735*ALOG(T1)-6.37968/A1+.56741*ALOG(H)-.02799*P)
        GOT0  20
    5 P9=EXP(2.47250-.39193*ALOG(T1)-4.50229/A1+.07186*ALOG(H)
     1+.43344*ALOG(B1)-.01569*P)
        GOT0  20
   10 IF(B2.NE.0.)  GOT0  15
      P9=EXP(1.62513-.20090*ALOG(T2)-6.21844/A1+.53681*ALOG(H)-.02830*P)
        GOT0  20
   15 P9=EXP(2.41821+.29965*ALOG(B2)-.34964*ALOG(T1)-4.09880/A1
     1+.1923*ALOG(H)-.02193*P)
   20 IF(A2.LT.A1) GOT0 30
      IF(B2.NE.0.) GOTO 25
      DM=-1.87098*ALOG(T1)+3.57714*ALOG(H)
        GOT0  40
   25 DM=-2.55643*ALOG(T1)+2.14632*ALOG(H)+2.06889*ALOG(B2)
        GOT0  40
   30 IF(B2.NE.0.)  GOT0  35
      DM=-2.23250*ALOG(T2)+4.30786*ALOG(H)-.44458*P
        GOT0  40
   35 DM=2.40481*ALOG(B2)-2.54703*ALOG(T1)+1.87307*ALOG(H)
   40 IF(QM.LE.0.) GOT0 45
        GOTO 65
   45 IF(A2.LT.A1) GOT0 55
      IF(B2.NE.0.) GOT0  50
      QM=EXP(1.51587-.28708*ALOG(T1)-2.16571/A1+.57165*ALOG(H)-.01419*P)
        GOTO 65
   50 B1=B2
        GOTO 65
   55 IF(B2.NE.0.)  GOT0  60
      B1=EXP(-1.97764+0.39567*ALOG(T2)-5.05779/A1+1.13626*ALOG(H)
     1-.03388*P)
        GOTO 65
```

```
  60  B1=EXP(.76544*ALOG(B2)+.06726*ALOG(T1)+2.91111/A1+.18343*ALOG(H))
  65 IF(QM.GT.O.) GOT0 70
     QM=VAL(B1,T1,4)
  70   RETURN
       END
*******************************************************************************
C
C   MOMENT subroutine is used to estimate the quadratic mean dbh, the
C   minimum dbh, and the diameter of the 93rd percentile for an initial
C   unthinned  stand.  This subroutine will only be used once for any
C   given  stand.
C
*******************************************************************************
       SUBROUTINEMOMENT(DM,QM,P9,A,H,T)
      P9=2.24213*H**.71401*T**(-.22932)*EXP(.45967/A)
      DM=2.14462*H**.70266*T**(-.36282)*EXP(-1.96895/A)
      IF(QM.LE.O.) QM=2.14462*H**.70266*T**(-.25968)*EXP(.45967/A)
       RETURN
       END
*******************************************************************************
C
C   UNTGRO subroutine computes the stand values of an unthinned stand
C   that is grown to a given age.  This subroutine will be used each
C   time the stand is grown until such time as the stand is thinned.  It
C   will again be used on a thinned stand as soon as the stand recovers
C   to carry a BA per acre of 125 sq. ft.
C
*******************************************************************************
       SUBROUTINEUNTGRO(DM,QM,P9,B2,A1,A2,S,B1,T1,T2)
      T2=100.*((T1/100.)**(-.87372)+(.01859-.39120/S)*((A2/10.)
     1**2.11947-(A1/10.)**2.11947))**(-1.14454)
      H2=VAL(S,A2,2)
      DM=2.14462*H2**.70266*T2**(-.36282)*EXP(-1.96895/A2)
      QM=2.14462*H2**.70266*T2**(-.25968)*EXP(.45967/A2)
      P9=2.24213*H2**.71401*T2**(-.22932)*EXP(.45967/A2)
      B2=VAL(T2,QM,3)
      IF(B2.GE.B1) GOT0 50
      B2=B1
      T2=VAL(B2,QM,5)
  50  TEST1=QM/P9
      IF(TEST1.GT.0.9) QM=P9*.9
      TEST=DM/QM
      IF(TEST.GT.0.9) DM=QM*.9
       RETURN
       END
*******************************************************************************
C
C   SOLVE  subroutine  solves  for  the  Weibull  Parameters  for  each  age.
C
*******************************************************************************
       SUBROUTINESOLVE(DM,QM,P9,B1,T,B,J,K)
      REAL B(3,16),MEAN,R1(51),R2(51)
      IF(K.EQ.l) AHAT=B(1,J)
      IF(K.NE.l) AHAT=DM*.6
```

```
      QM2=QM**2
      R1(1)=1.
      R2(1)=16.
      CHAT=0.
      F=P9
      COEF=2.65926
        DO 15 I=1,50
      MEAN=(R1(I)+R2(I))/2.
      TRIAL1=AHAT**2-QM2+(2.*AHAT*(F-AHAT)*GAMMA(1.+1./R1(I)))
     1/(COEF**(1./R1(I)))+(F-AHAT)**2*(GAMMA(1.+2./R1(I)))
     2/(COEF**(2./R1(I)))
      TRIAL2=AHAT**2-QM2+(2.*AHAT*(F-AHAT)*GAMMA(1.+1./MEAN))
     1/(COEF**(1./MEAN))+(F-AHAT)**2*(GAMMA(1.+2./MEAN))
     2/(COEF**(2./MEAN))
      IF((TRIAL1*TRIAL2).LE.0.) GOT0 5
      R1(I+1)=MEAN
      R2(I+1)=R2(I)
      GOT0 10
    5 R1(I+1)=R1(I)
      R2(I+1)=MEAN
   10 IF((R2(I+1)-R1(I+1)).LE.1.OE-4) GOT0 25
   15   CONTINUE
      IF(CHAT.EQ.0.) WRITE(1,20) I
   20 FORMAT(/,/,5X,'A unique CHAT was not found for table#',I3,/,/)
      CHAT=100.
      GOT0 30
   25 CHAT=(R2(I+1)+R1(I+1))/2.
   30 IF(K.NE.l) B(1,J)=AHAT
      B(2,J)=(F-AHAT)/(COEF**(1./CHAT))
      B(3,J)=CHAT
   35 IF(B1.LE.0.) B1=5.454154E-3*T*(B(1,J)**2+2.*B(1,J)*B(2,J)*GAMMA
     1(1./B(3,J)+1.)+B(2,J)**2*GAMMA(2./B(3,J)+1.))
      IF(DM.LE.0.) DM=B(1,J)/.6
        RETURN
        END
*************************************************************************
C
c   THNGRO subroutine is used to estimate the survival and growth of a
C   thinned stand for each growth period until the BA per acre recovers
c   to 125 sq. ft.  The program then switches back to use the UNTGRO
C   subroutine.
C
*************************************************************************
        SUBROUTINETHNGRO(DM,QM,P9,B2,DM1,QM1,P91,A1,A2,S,T1,T2)
      AGR=A2/A1
      T2=100.0*((T1/100.0)**(-1.06699)+(.00941+15.4317/S)*
     1((A2/10.0)**.29683-(A1/10.0)**.29683))**(-.93722)
      IF(T2.GT.T1) T2=T1
      DM=(-529.896+.59995*T1+529.896*AGR-.59995*T1*AGR+AGR*DM1
     1**3.39763)**(1./3.39763)
      QM=(-109.987+.12169*T1+109.987*AGR-.12169*T1*AGR+AGR*QM1
     1**2.39998)**(1./2.39998)
      P9=(-146.841+.15598*T1+146.841*AGR-.15598*T1*AGR+AGR*P91
     1**2.33778)**(1./2.33778)
```

```
      TEST1=QM/P9
      IF(TEST1.GT.0.9) QM=P9*.9
      B2=VAL(T2,QM,3)
      TEST=DM/QM
      IF(TEST.GT.0.9) DM=0.9*QM
   20   RETURN
        END
************************************************************************
C
C    CHANGE subroutine computes the change in the stand values that occur
C    due to the effects of thinning.
C
************************************************************************
        SUBROUTINECHANGE(DM2,QM2,P92,B2,T2,IT,DM1,QM1,P91,B1,T1,H1
     1,ITHIN,ITCD,IK,ITT)
       IF((ITHIN.EQ.1).AND.(B1.LE.B2))GOT0 20
       IF((ITHIN.EQ.2).AND.(T1.LE.T2))GOT0 20
       IF((ITHIN.EQ.2).AND.(IT.EQ.1)) B2=B1*(1.-(1.-T2/T1)**.83888)
     1**.71395
       IF((ITHIN.EQ.2).AND.(IT.GE.2)) B2=B1*(1.-(1.-T2/T1)**.85566)
     1**.56963
       BR=B2/B1
       IF(IT.GE.2)  GOT0  5
C
C    First thinning
C
       DM2=1.28767*DM1-.41040*BR
       QM2=1.06959*QM1-.35092*BR
       IF(ITHIN.EQ.l) T2=VAL(B2,QM2,5)
       IF(ITHIN.EQ.2) B2=VAL(T2,QM2,3)
       P92=.95074*P91+.01749*H1-.29853*BR
         GOT0  25
C
C   A1I thinnings after the first thinning
C
    5  DM2=2.63243+.76635*DM1+.06102*H1-5.14425*BR
       QM2=1.27816+.95387*QM1+.00898*H1-1.26501*BR
       IF(ITHIN.EQ.l) T2=VAL(B2,QM2,5)
       IF(ITHIN.EQ.2) B2=VAL(T2,QM2,3)
       P92=1.08464+.97212*P91-.67333*BR
         GOT0  25
C
C    Settings if there is insufficient BA/ac or trees/ac to thin
C
   20  ITCD=4
       DM2=DM1
       QM2=QM1
       P92=P91
       B2=B1
       T2=T1
       IT-IT-1
         GOTO 30
C
C    Test for crossover
```

```
C
  25 TEST1=QM2/P92
     IF(TEST1.GT.0.9) QM2=P92*.9
     IF((TEST1.GT.0.9).AND.(IT.EQ.1)) T2=VAL(B2,QM,5)
     IF((TEST1.GT.0.9).AND.(IT.EQ.2)) B2=VAL(T2,QM2,3)
     TEST=DM2/QM2
     IF(TEST.GT.0.9) DM2=QM2*.9
C
C   Test for stand recovery from previous thinning effects
C
  30 IF(ANINT(B2).LT.125.) GOT0 35
     IK=0
     ITT=0
  35   RETURN
       END
*************************************************************************
C
C   The STDTBL subroutine constructs the output stand tables requested
C   by the user by computing the final table values and then adjusting
C   these values for rounding error or the loss of partial trees in the
C   distribution.    This subroutine also calls the subroutines and
C   functions to determine the volume or weight values.
C
C-------------------------------------------------------------------
C
C            COMMON  Variable  Definitions
C
C   /INFO/   (These variables were defined in the INPUT subroutine)
C
C   /TNTYPE/ (These variables were defined in the INPUT subroutine)
C
C   /STTAB/
C      SUMT   - Total adjusted number of trees in a stand table
C      SUM    - Total adjusted BA per acre for a stand table
C      BBA    - Adjusted BA for a given diameter class
C      IDM    - Array to hold the values of the minimum & maximum Dbh
C
C   /TABVAL/
C      TC     - Total trees within a diameter class
C      H      - Height of a given diameter class
C      TL     - The values of a given table line
C      BL     - The bottom line values of a the stand tables
C
*************************************************************************
       SUBROUTINE STDTBL
      CHARACTER"5 OUT,ANS
      CHARACTER*60 TITLE
      CHARACTER"15 DSKF
      INTEGERAGE(16),TCODE(16),STC,BFCD,SUMT(15),IDM(2,15)
      REAL B(3,16),HD(16),TS(16),BA(16),QMD(16),TL(35,7,15),BL(7,15)
     1,CL(7),CT(7),BBA(35,2,15),TC(35,2,15),P93(16),SUM(15),TD(3)
     2,H(35,15),AINP(16),TARGET(2,10),DMIN(16),IBA,ITPA
      COMMON/OUTPUT/OUT,TITLE
```

```
      COMMON/INFO/NTAB,TCODE,BA,BH,AGE,BFCD,QMD,P93,STC,IPTHIN
     1,ICTCD,IK,ITAB,TD,ITHIN,B,TS,HD,IWEIB,BTTS,ITAGE,BSAG,SI,IPG,AINP
      COMMON /STTAB/ SUMT,SUM,BBA,IDM
      COMMON /TABVAL/ TC,H,TL,BL
      COMMON /TNTYPE/ DMIN,ITT,TARGET,IBA,ITPA,NTHIN
      K=1
      KCOUNT=0
        DO 5 L=1,15
        SUMT(L)=0
        SUM(L)=0.
        DO 4 I=1,35
        H(I,L)=0.
        DO 2 J=1,7
        TL(I,J,L)=0.
        BL(J,L)=0.
    2   CONTINUE
        DO 3 N=1,2
        IDM(N,L)=0
        BBA(I,N,L)=0.
        TC(I,N,L)=0.
    3   CONTINUE
    4   CONTINUE
    5   CONTINUE
        IT=IPTHIN
        DO 160 L=1,NTAB
C
C   Cumulative Distribution Function
C
      CUML=0.
      IF(TCODE(L).EQ.3) N=2
      IF(TCODE(L).NE.3) N=1
        DO 30 I=1,35
      IF(TS(L)-CUML-1.0E-5)30,20,20
   20 DU=FLOAT(I)+.55
      IF(DU.LE.B(1,L)) GOT0 30
      EX=((DU-B(1,L))/B(2,L))**B(3,L)
      PROB=1.
      IF(EX.LT.85.)PROB=1.-EXP(-EX)
      CUMU=TS(L)"PROB
      TC(I,N,L)=CUMU-CUML
      CUML=CUMU
   30   CONTINUE
C
c   Determine the minimum and maximum Dbh from the distribution
C
      IDM(1,L)=99
      IDM(2,L)=-1
        DO 35 I=1,35
      IF(TC(I,N,L).LT.0.5) GOT0 35
      IDM(1,L)=MINO(IDM(1,L),I)
      IDM(2,L)=MAXO(IDM(2,L),I)
   35   CONTINUE
      IF(L.EQ.1) GOT0 800
C
```

```
c   Determine if the estimate of trees within a diameter class for the
C   after thin stand exceeds the number within that class before
c   thinning and adjust accordingly.
C
      IF((TCODE(L).EQ.3).AND.(IDM(1,L).LT.IDM(1,L-1)).AND.(TCODE(L-1)
     1.EQ.2)) IDM(l,L)=IDM(l,L-1)
      IF((TCODE(L).EQ.3).AND.(IDM(2,L).GT.IDM(2,L-1)).AND.(TCODE(L-1)
     1.EQ.2)) IDM(2,L)=IDM(2,L-1)
C
C   Recover any partial trees in diameter classes less than the minimum
C
 800 TC1=0.
      IM=IDM(l,L)-1
      IF(IM.LE.0) GOT0 1000
        DO 900 I=1,IM
      TC1=TC1+TC(I,N,L)
      TC(I,N,L)=0.
 900    CONTINUE
      IF(TC1.LT.0.5) TC(IM+1,N,L)=TC(IM+1,N,L)+TC1
      IF((TC1.GE.0.5).AND.((TCODE(L).NE.3).OR.(L.EQ.1)))IDM(l,L)=IM
      IF((TC1.GE.0.5).AND.((TCODE(L).NE.3).OR.(L.EQ.1))) TC(IM,N,L)=TC1
      IF(L.EQ.l) GOT0 1000
      IF((TC1.GE.0.5).AND.(TCODE(L).EQ.3).AND.(TCODE(L-1).EQ.2).AND.
     l(IDM(l,L).GT.IDM(l,L-1))) TC(IM,N,L)=TC1
      IF((TC1.GE.0.5).AND.(TCODE(L).EQ.3).AND.(TCODE(L-1).EQ.2).AND.
     l(IDM(l,L).EQ.IDM(l,L-1))) TC(IM+1,N,L)=TC(IM+1,N,L)+TC1
      IF((TC1.GE.0.5).AND.(TCODE(L).EQ.3).AND.((TCODE(L-1).NE.2).OR.
     1(IDM(1,L).LT.IDM(1,L-1)))) TC(IM+1,N,L)=TC(IM+1,N,L)+TC1
      IF((TC1.GE.0.5).AND.(TCODE(L).EQ.3).AND.(TCODE(L-1).EQ.2).AND.
     1(IDM(1,L).GT.IDM(1,L-1))) IDM(1,L)=IM
      IF((IDM(1,L).LT.IDM(1,L-1)).AND.(TCODE(L).EQ.3).AND.(TCODE(L-1)
     1.EQ.2)) IDM(l,L)=IDM(l,L-1)
C
C   Recover any partial trees in diameter classes greater than the
c   maximum
C
1000  TC2=0.
      IX=IDM(2,L)+1
      IF(IX.GT.35) GOT0 1100
        DO 1050 I=IX,35
      TC2=TC2+TC(I,N,L)
      TC(I,N,L)=0.
1050    CONTINUE
      IF(TC2.LT.0.5 TC(IX-1,N,L)=TC(IX-1,N,L)+TC2
      IF((TC2.GE.0.5).AND.((TCODE(L).NE.3).OR.(L.EQ.1))) IDM(2,L)=IX
      IF((TC2.GE.0.5).AND.((TCODE(L).NE.3).OR.(L.EQ.1))) TC(IX,N,L)=TC2
      IF(L.EQ.l) GOT0 1100
      IF((TC2.GE.0.5).AND.(TCODE(L).EQ.3).AND.(TCODE(L-1).EQ.2).AND.
     1(IDM(2,L).LT.IDM(2,L-1))) TC(IX,N,L)=TC2
      IF((TC2.GE.0.5).AND.(TCODE(L).EQ.3).AND.(TCODE(L-1).EQ.2).AND.
     1(IDM(2,L).EQ.IDM(2,L-1))) TC(IX-1,N,L)=TC(IX-1,N,L)+TC2
      IF((TC2.GE.0.5).AND.(TCODE(L).EQ.3).AND.((TCODE(L-1).NE.2).OR.
     1(IDM(2,L).GT.IDM(2,L-1)))) TC(IX-1,N,L)=TC(IX-1,N,L)+TC2
```

```
      IF((TC2.GE.0.5).AND.(TCODE(L).EQ.3).AND.(TCODE(L-1).EQ.2).AND.
     1(IDM(2,L).LT.IDM(2,L-1))) IDM(2,L)=IX
      IF((IDM(2,L).GT.IDM(2,L-1)).AND.(TCODE(L).EQ.3).AND.(TCODE(L-1)
     1.EQ.2)) IDM(2,L)=IDM(2,L-1)
C
C   Determine which Height x Dbh class equation to use
C
1100  A=FLOAT(AGE(L))
      TRS=TS(L)
      IF(TCODE(L).EQ.3) IT=IT+1
      IF(TCODE(L).EQ.3) ITT=1
      M=0
      IF(TCODE(L).EQ.3) M=l
      IF((M.EQ.0).AND.(IT.LE.0)) II=1
      IF((M.EQ.0).AND.(IT.GE.1)) II=2
      IF((M.GE.1).AND.(IT.LE.0)) II=2
      IF((M.GE.1).AND.(IT.GE.1)) II=3
      IF((M.GE.1).AND.(L.EQ.1)) II=4
      IF(L.GT.l)  GOT0  1150
      IF((M.EQ.1).AND.(IT.GE.1).AND.(IWEIB.GE.1).AND.(IPTHIN.LE.0)) II=1
      IF((M.EQ.1).AND.(IT.GE.1).AND.(IWEIB.GE.1).AND.(IPTHIN.GE.1)) II=2
      IF((L.EQ.1).AND.(M.EQ.1).AND.(IT.GE.1).AND.(IWEIB.GE.1).AND
     1.(IPTHIN.EQ.1).AND.(ITAGE.EQ.AGE(L))) II=1
      IF((L.EQ.1).AND.(IWEIB.GE.1).AND.(TCODE(L).EQ.3))TRS=BTTS
1150    DO 40 I=IDM(1,L),IDM(2,L)
      DBH=FLOAT(I)
      GOTO(36,37,38,39) ,II
C
C   Heights for an unthinned stand
C
  36  H(I,L)=EXP(1.20324+.75123*ALOG(HD(L))-1.76775/A+.04891
     1*ALOG(TRS/DBH)+9.05758/(A*DBH)-3.11400/DBH)
      GOT0 40
C
C   Heights for a thinned stand grown to the next age before thinning
C   again
C
  37  H(I,L)=EXP(1.12436+.80562*ALOG(HD(L))-3.88053/A+.04933
     1*ALOG(TRS/DBH)+42.2794/(A*DBH)-4.81699/DBH)
      GOT0 40
C
C   Heights for a stand immediately following thinning
C
  38  H(I,L)=H(I,L-1)
      GOTO 40
C
C   Heights for an initial thinned stand with no closing values from
C   a previous run of this program
C
  39  H(I,L)=EXP(.93576+.83421*ALOG(HD(L))-2.45172/A+.04747
     1*ALOG(TRS/DBH)+24.5897/(A*DBH)-3.84592/DBH)
  40    CONTINUE
C
C   Adjustments for rounding error
```

```
C
      IF((L.EQ.1).OR.(TCODE(L).NE.3).OR.(AGE(L).NE.AGE(L-1))) GOTO 1250
        DO 45 I=1,35
      IF(TC(I,N,L).GT.TC(I,N-1,L-1)) TC(I,N,L)=TC(I,N-1,L-1)
   45   CONTINUE
 1250  TTT=0.
        DO 1300 I=1,35
      H(I,L)=ANINT(H(I,L))
      TC(I,N,L)=ANINT(TC(I,N,L))
      TTT=TTT+TC(I,N,L)
 1300   CONTINUE
      IQM=NINT(QMD(L))
      N2=IDM(2,L)
      ISTP=1
      TT=ANINT(TS(L))-TTT
      IF(TT) 1400,50,1301
 1301 IF((TCODE(L).EQ.3).AND.(L.GT.1)) GOTO 1350
        DO 1375 I=IQM,IDM(2,L)
      IF(TT.GT.2.) AA=2.
      IF(TT.LE.2.) AA=TT
      TC(I,N,L)=TC(I,N,L)+AA
      TT=TT-AA
      IF(TT.LE.0.) GOTO 600
 1375   CONTINUE
      GOTO  600
 1400   DO 1450 I=IDM(1,L),IDM(2,L)
      IF(ABS(TT).GT.2.) AA=2.
      IF(ABS(TT).LE.2.)AA=ABS(TT)
      IF(AA.GT.TC(I,N,L))     AA=TC(I,N,L)
      TC(I,N,L)=TC(I,N,L)-AA
      TT=TT+AA
      IF(TT.GE.0.) GOTO 600
 1450   CONTINUE
  600 IDM(1,L)=99
      IDM(2,L)=-1
        DO 1500 I=1,35
      IF(TC(I,N,L).LT.0.5) GOTO 1500
      IDM(1,L)=MINO(IDM(1,L),I)
      IDM(2,L)=MAXO(IDM(2,L),I)
 1500   CONTINUE
      GOTO  50
 1350   DO 1200 I=IQM,N2,ISTP
      IF(TT.GT.2.) AA=2.
      IF(TT.LE.2.) AA=TT
      A2=TC(I,N-1,L-1)-TC(I,N,L)
      IF((A2.LE.2.).AND.(A2.LE.AA)) TC(I,N,L)=TC(I,N,L)+A2
      IF(((A2.LE.2.).AND.(A2.GT.AA)).OR.(A2.GT.2.))
     1 TC(I,N,L)=TC(I,N,L)+AA
      IF((A2.LE.2.).AND.(A2.LE.AA))TT=TT-A2
      IF(((A2.LE.2.).AND.(A2.GT.AA)).OR.(A2.GT.2.))TT=TT-AA
      IF(TT.LE.0.) GOTO 600
 1200   CONTINUE
      N2=IDM(1,L)
      ISTP=-1
```

```
      GOT0 1350
C
C   Calculate the final values for the stand table
C
  50    DO 46 I=IDM(1,L),IDM(2,L)
      D=FLOAT(I)
      BBA(I,N,L)=VAL(TC(I,N,L),D,3)
      SUM(L)=SUM(L)+BBA(I,N,L)
      SUMT(L)=SUMT(L)+NINT(TC(I,N,L))
  46    CONTINUE
      GOTO(51,55,55),ITAB
  51 CALL VOLUME(IDM(1,L),IDM(2,L),TD,L,N,IT,IPTHIN,II)
      IF(IDM(2,L).LT.10) GOT0 159
      CALL BFVOL(IDM(2,L),BFCD,L,N,II,IT)
      GOT0 159
  55 CALL WEIGHT(IDM(1,L),IDM(2,L),A,TD(1),L,N,ITAB,IT,IPTHIN,II)
 159 IF(IT.GE.l) IPTHIN=IPTHIN+1
 160    CONTINUE
C
C   Output the finished stand table
C
 161 KCOUNT=KCOUNT+1
      WRITE(K,'(1H1,/,/,6X,A60,/)') TITLE
      WRITE(K,500) NINT(AINP(l))
      IF(AINP(2).LE.0.) GOT0 162
      WRITE(K,501)AINP(2)
      GOT0 163
 162 WRITE(K,502) NINT(AINP(3)),NINT(AINP(4))
 163 IF(AINP(5).LE.0.) GOT0 164
      WRITE(K,503) AINP(5)
      GOTO 166
 164 IF(AINP(6).LE.0.) GOT0 165
      WRITE(K,504)AINP(6)
      GOT0 166
 165 WRITE(K,505) NINT(AINP(7))
 166 IF(AINP(8).LE.0.) WRITE(K,506)
      IF(AINP(8).GT.0.) WRITE(K,507) NINT(AINP(9))
      IF(AINP(9).LE.0.) GOT0 167
      WRITE(K,508) NINT(AINP(l0))
      IF(AINP(11).GT.0.)WRITE(K,509) AINP(ll)
      IF(AINP(12).GT.0.)WRITE(K,510) AINP(12)
      IF(AINP(13).LE.0.) GOT0 167
      WRITE(K,511) AINP(13),AINP(14),AINP(15)
 500 FORMAT(/,6X,'Original Inputs:',/,10X,'Age =',I3)
 501 FORMAT(10X,'Height of dominants and codominants =',F5.1)
 502 FORMAT(10X,'Site index =',I3,' ( Base age',I3,')')
 503 FORMAT(l0X,'Trees surviving =',F5.0)
 504 FORMAT(10X,'Basal area =',F6.1)
 505 FORMAT(10X,'Trees planted =',I4)
 506 FORMAT(10X,'Previously unthinned stand')
 507 FORMAT(10X,'Previously thinned ',I2,' times')
 508 FORMAT(10X,'Age at last thinning =',I3)
 509 FORMAT(10X,'Basal area after the last thinning =',F6.1)
 510 FORMAT(10x,'Trees surviving after the last thinning =',F6.1)
```

```
511 FORMAT(6X,'Closing Values From Previous Run:',/,10X,'A =',F7.3,/
    1,10X,'Quadratic mean =',F7.3,/,10X,'Diameter of the 93rd percent'
    2,'ile =',F7.3)
167 WRITE(K,'(/,/,/)')
    IF (KCOUNT.GT.l) GOT0 168
    IF(OUT.EQ.'CON:') PAUSE
168   DO 80 L=1,NTAB
    IF(KCOUNT.GT.l) GOT0 60
    IF(IPG.EQ.l) WRITE(K,'(1H1)')
 60 WRITE(K,'(/,6X,A60)') TITLE
    IF(TCODE(L).EQ.3) N=2
    IF(TCODE(L).NE.3) N=1
 65 IF((TCODE(L).EQ.1).OR.(TCODE(L).EQ.4)) WRITE(K,145)
    IF(TCODE(L).EQ.2) WRITE(K,150)
    IF(TCODE(L).EQ.3) WRITE(K,155)
    IF((TCODE(L).EQ.4).AND.(ITHIN.EQ.1)) WRITE(K,146)
    IF((TCODE(L).EQ.4).AND.(ITHIN.EQ.2)) WRITE(K,147)
    IF(ITAB.EQ.2) WRITE(K,310)
    IF(ITAB.EQ.3) WRITE(K,320)
    IF(STC.GE.2) WRITE(K,120)
    WRITE(K,127) AGE(L),HD(L),QMD(L)
    IF(ITAB.GT.l) GOT0 376
    IF(BFCD.EQ.l) WRITE(K,130)
    IF(BFCD.EQ.2) WRITE(K,135)
    IF(BFCD.EQ.3) WRITE(K,140)
    IF(STC.LE.l) WRITE(K,141)NINT(TD(1)),NINT(TD(2)),NINT(TD(3))
    IF(STC.GE.2) WRITE(K,142)NINT(TD(1)),NINT(TD(2)),NINT(TD(3))
    IF(STC.LE.l) WRITE(K,143)
    IF(STC.GE.2) WRITE(K,144)
    GOTO 377
376 WRITE(K, 340)
    IF(STC.LE.l) WRITE(K,341) NINT(TD(l))
    IF(STC.GE.2) WRITE(K,342) NINT(TD(l))
377 IF(STC.GE.2) GOT0 86
      DO 85 I=IDM(1,L),IDM(2,L)
    BB=BBA(I,N,L)
    IF(ITAB.EQ.l)WRITE(K,115)I,NINT(TC(I,N,L)),BB,NINT(H(I,L))
   1,(TL(I,J,L),J=1,7)
    IF(ITAB.GT.l)WRITE(K,325)I,NINT(TC(I,N,L)),BB,NINT(H(I,L))
   1,(TL(I,J,L), J=1,7)
 85   CONTINUE
 86 IF(ITAB.GT.l) GOT0 350
    IF(STC.EQ.l)WRITE(K,105)SUMT(L),SUM(L),(BL(J,L),J=1,7)
    IF(STC.GE.2)WRITE(K,110)SUMT(L),SUM(L),(BL(J,L),J=1,7)
    GOT0 351
350 IF(STC.EQ.l) WRITE(K,330) SUMT(L),SUM(L),(BL(J,L), J-1.7)
    IF(STC.EQ.2) WRITE(K,335) SUMT(L),SUM(L),(BL(J,L), J=1,7)
351 WRITE(K,125) NINT(BSAG),NINT(SI),P93(L)
    WRITE(K,126) B(1,L),B(2,L),B(3,L)
    IF(KCOUNT.GT.l) GOT0 352
    IF(OUT.EQ.'CON:') WRITE(K,'(/)')
    IF(OUT.EQ.'CON:') PAUSE
352 IF((TCODE(L).EQ.3).AND.(ICTCD.EQ.1)) GOT0 100
    GOT0 80
```

```
C
C   Construct the cut table
C
100  IF(KCOUNT.GT.l)  GOT0  101
     IF(IPG.EQ.l) WRITE(K,'(1H1)')
101  IF((L.EQ.1).OR.(TCODE(L-1).NE.2).OR.(AGE(L-1).NE.AGE(L))) GOT0 104
     XSUM=SUM(L-1)-SUM(L)
     ISUMT=SUMT(L-1)-SUMT(L)
     Q=VAL(XSUM,FLOAT(ISUMT),4)
     WRITE(K,'(/,6X,A60)') TITLE
     WRITE(K,148)
     IF(ITAB.EQ.2) WRITE(K,310)
     IF(ITAB.EQ.3) WRITE(K,320)
     WRITE(K,127) AGE(L),HD(L),Q
     IF(ITAB.GT.l) GOT0 374
     IF(BFCD.EQ.l) WRITE(K,130)
     IF(BFCD.EQ.2) WRITE(K,135)
     IF(BFCD.EQ.3) WRITE(K,140)
     WRITE(K,141) NINT(TD(1)),NINT(TD(2)),NINT(TD(3))
     WRITE(K,143)
     GOTO 375
374  WRITE(K,340)
     WRITE(K,341) NINT(TD(l))
375    DO 200 I=IDM(1,L-1),IDM(2,L-1)
     IPA=NINT(TC(I,1,L-1)-TC(I,2,L))
     IF(IPA.LE.0) GOT0 200
     BB=BBA(I,1,L-1)-BBA(I,2,L)
     IF(H(I,L).GT.0.H1=(H(I,L-1)+H(I,L))/2.
     IF(H(I,L).LE.0.)     Hl=H(I,L-1)
       DO 102 J=1,7
102   CL(J)=TL(I,J,L-1)-TL(I,J,L)
     IF(ITAB.GT.l)  GOT0  201
     WRITE(K,115) I,IPA,BB,NINT(H1),(CL(J), J=1,7)
     GOT0  200
201  WRITE(K,325) I,IPA,BB,NINT(H1),(CL(J), J=1,7)
200    CONTINUE
       DO 103 J=1,7
103  CT(J)=BL(J,L-1)-BL(J,L)
     IF(ITAB.GT.l) GOT0 203
     WRITE(K,105)ISUMT,XSUM,(CT(J), J=1,7)
     GOT0  79
203  WRITE(K,330) ISUMT,XSUM,(CT(J), J=1,7)
     GOT0 79
104  WRITE(K,204)
204  FORMAT(/,/,3X,77('*'),/,3X,'No cut table can be output without '
    1,'both the before and after thinned tables',/,3X,77('*'),/)
 79  IF(KCOUNT.GT.l) GOT0 80
     IF(OUT.EQ.'CON:') WRITE(K,'(/)')
     IF(OUT.EQ.'CON:') PAUSE
 80    CONTINUE
     IF(KCOUNT.GT.l)  GOT0  81
     WRITE(*,400)
400  FORMAT(6X,'Do you want to save your output on a disk file?',/
    1,10X,'Y = Yes',/,10X,'N = No (*)',/)
```

```
      READ(*,'(A5)') ANS
      IF((ANS.EQ.'N').OR.(ANS.EQ.'n').OR.(ANS.EQ.' ')) GOT0 82
      WRITE(*,401)
  401 FORMAT(6X,'Enter output file name.',/)
      READ(*,'(A15)') DSKF
      OPEN(K,FILE=DSKF,STATUS='NEW')
      GOT0 161
   81 CLOSE(2)
   82 L=NTAB
      AINP(l)=FLOAT(AGE(L))
      AINP(2)=HD(L)
      AINP(3)=SI
      AINP(4)=BSAG
      AINP(5)=TS(L)
      AINP(6)=0.
      AINP(7)=0.
      AINP(8)=FLOAT(ITT)
      AINP(9)=FLOAT(IT)
      AINP(l0)=FLOAT(ITAGE)
      AINP(11)=IBA
      AINP(12)=ITPA
      AINP(13)=B(1,L)
      AINP(14)=QMD(L)
      AINP(15)=P93(L)
      AINP(16)=IWEIB
C
C   Stand table FORMAT specifications
C
  310 FORMAT(30X,'GREEN WEIGHT(POUNDS)')
  320 FORMAT(31X,'DRY WEIGHT(POUNDS)')
  325 FORMAT(2I5,F6.1,I4,F8.0,1X,3(F8.0,1X,F8.0))
  330 FORMAT(80('-'),/,5X,I5,F6.1,4X,F8.0,1X,3(F8.0,1X,F8.0)
     1,/,80('='),)
  335 FORMAT(5X,I5,F6.1,4X,F8.0,1X,3(F8.0,1X,F8.0),/,80('='))
  340 FORMAT(22X,'TOTAL',6x,2('TOTAL WEIGHT',5X),'  WEIGHTOF',/,22X
     1,'CROWN',11X,'OF',15X,'OF',11X,'MERCHSTEM')
  341 FORMAT(2X,'DBH STEMS BASAL AV. WEIGHT',9X,'WOODY',12X,'BOLE',13X
     1,I2,'"',/,1X,'CLASS      AREA HT. W/FOL.       COMPONENT',25X,
     2'TOP DIA.',/,13X,'sq.',16X,14('-'),3X,14('-'),3X,14('-'),/,
     3'  in. no. ft. ft. o.b.      o.b.      i.b.     o.b.      i.b.'
     4,'    o.b.     i.b.',/,80('-'))
  342 FORMAT(6X,'STEMS BASAL AV. WEIGHT',9X,'WOODY',12X,'BOLE',13X,I2,
     1'"',/,12X,'AREA  HT. W/FOL.       COMPONENT',25X,'TOPDIA.',/,
     213X,'sq.',16X,14('-'),3X,14('-'),3X,15('-'),/,7X,'no. ft. ft.'
     3,'    o.b.     o.b.      i.b.     o.b.      i.b.      o.b.      i.b.',/
     4,80('-'),)
  120 FORMAT(29X,'(SUMMARY INFORMATION)"/)
  105 FORMAT(80('-'),/,7X,I4,F6.1,4X,6(1X,F7.0),2X,F7.0,/,80('='))
  110 FORMAT(/,7X,I4,F6.1,4X,6(1X,F7.0),2X,F7.0,/,80('='))
  1   1   5     FORMAT(2X,I3,2X,I4,F6.1,1X,I3,6(2X,F6.0),3X,F6.0)
  125 FORMAT(3X,'SI(BASE AGE ',I3,')=',I4,' FEET;',' 93RD PERCEN'
     1,'TILE=',F7.3)
  126 FORMAT(3X,'WEIBULL PARAMETERS:  "A"=',F7.3,'; "B"=',F7.3
     1,';  "C"=',F7.3)
```

```
127 FORMAT(35X,'(PER ACRE)',/,/,6X,'AGE=',I5,/,6X,'DOMINANT HEIGHT='
    1,F5.1,' FEET',/,6X,'QUADRATIC MEAN DBH=',F7.3,' INCHES',/,80('='))
130 FORMAT(34X,'CUBIC FOOT VOLUME OF STEMS',11X,'INTER.1/4')
135 FORMAT(34X,'CUBIC FOOT VOLUME OF STEMS',12X,'SCRIBNER')
140 FORMAT(34X,'CUBIC FOOT VOLUME OF STEMS',13X,'DOYLE')
141 FORMAT(2X,'DBH STEMS BASAL AV.',12X,'TO AN O.B. TOP DIAMETER OF'
    1,11X,'B.F. VOL.',/,' CLASS',7X,'AREA HT. ',3(3X,I2,' INCHES',4X)
    2,'8-IN.TOP')
142 FORMAT(7X,'STEMS BASAL AV.', 12X,'TO AN O.B. TOP DIAMETER OF',11X,
    1'B.F. VOL.',/,13X,'AREA HT. ',3(3X,I2,' INCHES',4X),'8-IN. TOP')
143 FORMAT(14X,'sq.',7X,3(' ----------    '),/,' in.   no.   ft.',
    1' ft.  o.b.    i.b.',2('    o.b.    i.b.'),5X,'i.b.',/,80('-'))
144 FORMAT(14X,'sq.',7X,3(' ----------    '),/,8X,'no.   ft.  ft.',
    1'   o.b.   i.b.',2('   o.b.    i.b.'),5X,'i.b.',/,80('-'))
145 FORMAT(/,/,33X,'LOBLOLLY PINE',/,29X,'NO THINNING THIS YEAR')
146 FORMAT(21X,'(INSUFFICIENT BASAL AREA/ACRE TO THIN)')
147 FORMAT(24X,'(INSUFFICIENT TREES/ACRE TO THIN)')
148 FORMAT(/,/,33X,'LOBLOLLY PINE',/,23X,'STAND COMPONENT REMOVED BY'
    1,1X,'THINNING')
150 FORMAT(/,/,33X,'LOBLOLLY PINE',/,26X,'BEFORE THINNING'
    1,' INFORMATION')
155 FORMAT(/,/,33X,'LOBLOLLY PINE',/,24X,'RESIDUAL STAND -- AFTER'
    1,1X,'THINNING')
      RETURN
      END
*************************************************************************
C
C   GAMMA function used by SOLVE subroutine to solve for the Weibull
C   parameters.
C
*************************************************************************
      FUNCTION GAMMA(AA)
     G=1.
      IF(AA-1.) 4,5,1
  1  AA=AA-1.
      IF(AA-1.) 3,3,2
  2  G=G*AA
      GOT0 1
  3 CALL POLMUL(AA,V)
      GAMMA=G*V
      RETURN
  4 CALL POLMUL(AA,V)
      GAMMA=V/AA
  5   RETURN
      END
*************************************************************************
C
C   POLMUL subroutine is used by the GAMMA function
C
*************************************************************************
      SUBROUTINE   POLMUL(A,V)
     REAL W(9),A,V
```

```
      DATA W/1.0,-.577191652,.988205891,-.897056937
     1,.918206857,-.756704078,.482199394,-.193527818
     2,.035868343/
      V=W(8)+A*W(9)
      DO 5 I=2,8
    5 V=W(9-I)+A*V
        RETURN
        END
*************************************************************************
C
C   VOLUME subroutine computes the cubic-foot volumes both inside and
c   outside bark for either a thinned or unthinned stand to the given
C   top diameters specified in INPUT subroutine.
C
*************************************************************************
        SUBROUTINEVOLUME(MN,MX,TD,L,N,IT,IP,II)
      REAL TL(35,7,15),TD(3),TC(35,2,15),H(35,15),BL(7,15)
      COMMON /TABVAL/ TC,H,TL,BL
        DO 50 M=MN,MX
      D=FLOAT(M)
      DL=ALOG(D)
      H1=ALOG(H(M,L))
      IF(II.EQ.1) GOT0 15
      IF((IT.GT.1).OR.(IP.GE.1)) GOT0 16
C
C   Total volume -- unthinned stands
C
   15 V1=EXP(-5.73174+1.89645*DL+1.01025*H1)*TC(M,N,L)
      V2=EXP(-6.89719+1.88683*DL+1.24584*H1)*TC(M,N,L)
      GOT0 20
C
C   Total volume -- thinned stands
C
   16 V1=EXP(-5.81609+2.0364*DL+.95354*H1)*TC(M,N,L)
      V2=EXP(-6.88533+2.04100*DL+1.15002*H1)*TC(M,N,L)
   20  J=l
        DO 100 I=1,3
      VMO=0.
      VMI=0.
      GD=TD(I)+1.
      IF(D.LT.GD) GOT0 30
C
C   Merchantable volume to a top diameter of TD(I) -- unthinned stands
C
      IF(II.EQ.1) GOTO 25
      IF((IT.GT.1).OR.(IP.GE.1)) GOTO 26
   2 5 VMO=EXP(-.79902*(TD(I)**4.97575/D**4.68617))*V1
      VMI=EXP(-.93801*(TD(I)**4.95034/D**4.70603))*V2
      GOT0 30
C
C   Merchantable volume to a top diameter of TD(I) -- thinned stands
C
   26 VMO=EXP(-1.71891*(TD(I)**5.26178/D**5.26290))*V1
      VMI=EXP(-2.17744*(TD(I)**5.23946/D**5.31408))*V2
```

```
  30  TL(M,J,L)=ANINT(VMO)
      TL(M,J+1,L)=ANINT(VMI)
      J=J+2
 100    CONTINUE
  50    CONTINUE
        DO 150 M=MN,MX
        DO 125 J=1,6
      IF(TL(M,J,L).LT.0.) TL(M,J,L)=0.
      BL(J,L)=BL(J,L)+TL(M,J,L)
 125    CONTINUE
 150    CONTINUE
        RETURN
        END
*******************************************************************************
C
C   The WEIGHT subroutine computes either the green or dry weights for
C   the stand both inside and outside bark to the top diameter given in
C   the INPUT subroutine.  Equations used will depend upon whether the
C   stand is thinned or unthinned.
C
*******************************************************************************
        SUBROUTINEWEIGHT(MN,MX,AG,TD,L,N,ITAB,IT,IP,II)
      REAL TL(35,7,15),BL(7,15),TC(35,2,15),H(35,15)
      COMMON /TABVAL/ TC,H,TL,BL
        DO 100 M=MN,MX
      D=FLOAT(M)
      DL=ALOG(D)
      H1=ALOG(H(M,L))
      IF(ITAB.EQ.3) GOT0 20
C------------------------------------------------------------------------------
C
C   Green-weight estimates
C
C------------------------------------------------------------------------------
C
C   Total bole weight --  inside  and  outside  bark
C
      TL(M,4,L)=EXP(-2.06033+1.93926*DL+1.05077*H1+.00006*AG**2)
      TL(M,5,L)=EXP(-2.53232+1.96524*DL+1.12691*H1+.00006*AG**2)
      IF(II.EQ.l) GOT0 5
      IF((IT.GT.1).OR.(IP.GE.1)) GOT0 10
C
C   Weight ratio to a given top diameter -- unthinned stands
C
   5  RO=EXP(-1.15373*(TD**4.91154/D**4.72388))
      RI=EXP(-1.17135*(TD**4.95718/D**4.77292))
      GOT0  15
C
C   Weight ratio to a given top diameter -- thinned stands
C
  10  RO=EXP(-2.05891*(TD**5.12487/D**5.17042))
      RI=EXP(-2.07504*(TD**5.17200/D**5.21817))
C
C   Weight of the merchantable stem to a given top diameter
```

```
C
  15 TL(M,6,L)=TL(M,4,L)*RO
     TL(M,7,L)=TL(M,5,L)*RI
C
C   Total crown weight with foliage
C
     TL(M,1,L)=EXP(3.49415+3.23016*DL-1.36525*H1)
C
C   Calculate total weight of the woody component
C
     CGWW=EXP(1.73522+3.49229*DL-1.24339*H1)
     TL(M,3,L)=CGWW+TL(M,5,L)
     CGWB=EXP(1.20315+3.02391*DL-1.13603*H1)
     TL(M,2,L)=CGWW+CGWB+TL(M,4,L)
     GOT0  50
C-----------------------------------------------------------------------
C
C   Dry-weight    calculations
C
C-----------------------------------------------------------------------
C
C   Total weight of the bole
C
  20 TL(M,4,L)=EXP(-3.31353+1.91029*DL+1.19118*H1+.00008*AG**2)
     TL(M,5,L)=EXP(-4.20913+1.87667*DL+1.38064*H1+.00009*AG**2)
     IF(II.EQ.1) GOTO 25
     IF((IT.GT.0).OR.(IP.GE.l))   GOT0   30
C
C   Weight   ratios --  unthinned  stands
C
  25 RO=EXP(-.84251*(TD**5.12820/D**4.85489))
     RI=EXP(-.93273*(TD**5.10185/D**4.85745))
     GOT0  35
C
C   Weight   ratios --  thinned  stands
C
  30 RO=EXP(-1.87520*(TD**5.34603/D**5.39776))
     RI=EXP(-2.02028*(TD**5.36731/D**5.43664))
C
C   Weight of merchantable stem to a given top diameter
C
  35 TL(M,6,L)=TL(M,4,L)*RO
     TL(M,7,L)=TL(M,5,L)*RI
C
C   Total crown weight with foliage
C
     TL(M,1,L)=EXP(2.47216+3.25630*DL-1.32822*H1)
C
C   Total weight of the woody component
C
     CDWW=EXP(.37905+3.45439*DL-1.08845*H1)
     TL(M,3,L)=CDWW+TL(M,5,L)
     CDWB=EXP(.26483+3.03393*DL-1.10982*H1)
     TL(M,2,L)=CDWW+CDWB+TL(M,4,L)
```

```
 50     DO 75 J=1,7
        IF(TL(M,J,L).LT.0.) TL(M,J,L)=0.
        TL(M,J,L)=ANINT(TL(M,J,L)*TC(M,N,L))
        BL(J,L)=BL(J,L)+TL(M,J,L)
 75     CONTINUE
100     CONTINUE
        RETURN
        END
C*******************************************************************************
C
C   BFVOL subroutine computes the board-foot volume using the board-foot
C   volume rule selected by the user in INPUT subroutine.
C
C*******************************************************************************
        SUBROUTINE BFVOL(MX,IBF,L,N,IH,ITH)
      REAL TC(35,2,15),TEST(8),HLOG(8),SEDIB(8),TL(35,7,15),BL(7,15)
     1,H(35,15)
      COMMON /TABVAL/ TC,H,TL,BL
        DO 90 M=10,MX
      D=FLOAT(M)
      VOLBF-0.
      JJ=0
      GD=8.0
        DO 2 II=1,8
      HLOG(II)=0.
      TEST(II)=0.
   2  SEDIB(II)=0.
C
C   Get merchantable heights and small-end diameter inside bark for each
C   log by DBH class
C
      CALL HTEST(HMERCH,H(M,L),GD,D,IH,ITH)
  21  IF(HMERCH.LT.8.8) GOTO 90
      IF(HMERCH.LE.16.8) GOTO 35
      HLOG(1)=16.8
      JJ=1
      SEDIB(1)=DIB(D,H(M,L),HLOG(1),IH,ITH)
      I=2
  25  TEST(I-1)=HMERCH-HLOG(I-1)
      IF(TEST(I-1).EQ.0.) GOTO 40 ,
      IF(TEST(I-1).LT.16.3) GOTO 30
      HLOG(I)=HLOG(I-1)+16.3
      JJ=I
      SEDIB(I)=DIB(D,H(M,L),HLOG(I),IH,ITH)
      I=I+1
      GOTO 25
  30  HLOG(I)=HMERCH
      SEDIB(I)=DIB(D,H(M,L),HLOG(I),IH,ITH)
      I=I+1
      GOTO 25
  35  HLOG(1)=HMERCH
      SEDIB(1)=DIB(D,H(M,L),HLOG(1),IH,ITH)
  40  GOTO(75,60,45) ,IBF
C
```

```
C   Doyle log rule
C
  45 IF(JJ.EQ.0) GOT0 55
     DO 50 J=1,JJ
  50 VOLBF=VOLBF+(SEDIB(J)-4.)**2
     VOLBF=VOLBF+((HMERCH-HLOG(JJ))*(SEDIB(JJ+1)-4.)**2/16.)
       GOT0 88
  55 VOLBF=(HMERCH-.8)*(SEDIB(1)-4.)**2/16.
       GOT0 88
C
C   Scribner log rule
C
  60 IF(JJ.EQ.0) GOT0 70
     DO 65 J=1,JJ
  65 VOLBF=VOLBF+(.79*SEDIB(J)**2-2.*SEDIB(J)-4.)
     VOLBF=VOLBF+(HMERCH-HLOG(JJ))*(.0494*SEDIB(JJ+1)**2-.124
    1*SEDIB(JJ+1)+.269)
       GOT0 88
  70 VOLBF=(HMERCH-.8)*(.0494*SEDIB(1)**2-.124*SEDIB(1)+.269)
       GOT0 88
C
C   International-l/h inch log rule
C
  75 IF(JJ.EQ.0) GOT0 85
       DO 80 J=1,JJ
  80 VOLBF=VOLBF+(0.796*SEDIB(J)**2-1.375*SEDIB(J)-1.230)
     VOLBF=VOLBF+(.0498*(SEDIB(JJ+1))**2*(HMERCH-HLOG(JJ))-.185
    1*SEDIB(JJ+1)*(HMERCH-HLOG(JJ))+.0422*(HMERCH-HLOG(JJ))+.00622
    2*SEDIB(JJ+1)*(HMERCH-HLOG(JJ))**2+.00026*(HMERCH-HLOG(JJ))**3
    3-.0116*(HMERCH-HLOG(JJ))**2)
       GOT0 88
  85 VOLBF=.0498*SEDIB(1)**2*(HMERCH-.8)-.185*SEDIB(1)*(HMERCH-.8)
    1+.0422*(HMERCH-.8)+.00622*SEDIB(1)*(HMERCH-.8)**2+.00026
    2*(HMERCH-.8)**3-.0116*(HMERCH-.8)**2
  88 TL(M,7,L)=ANINT(VOLBF*TC(M,N,L))
     BL(7,L)=BL(7,L)+TL(M,7,L)
  90   CONTINUE
       RETURN
       END
*************************************************************************
C
C   HTEST subroutine computes the merchantable height of a tree of a
C   given total height and dbh to a top diameter of 8 inches.
C
*************************************************************************
       SUBROUTINE HTEST(HMERCH,H1,GD,D,IH,ITH)
      REAL I1,I2
      IF(((IH.EQ.1).OR.(IH.EQ.3)).AND.(ITH.LE.1)) GOT0 10
      IF((IH.EQ.2).OR.((IH.EQ.3).AND.(ITH.GE.2))) GOT0 20
C
C   Coefficients for unthinned stands
C
  10 A1=.89406
     A2=.05703
```

```
      B1=-8.07778
      B2=4.02542
      B3=-3.65499
      B4=229.739
      GOTO 17
C
C   Coefficients for thinned stands
C
  20  A1=.91195
      A2=.06035
      B1=-13.3139
      B2=6.73098
      B3=-6.65501
      B4=203.959
  17  D1=D*SQRT(B1*(A1-1.)+B2*(A1**2-1.))
      D2=D*SQRT(B1*(A2-1.)+B2*(A2**2-1.)+B3*(A1-A2)**2)
      IF(GD.GE.D1) GOTO 11
      I1=0.
      GOTO 12
  11  I1=1.
  12 IF(GD.GE.D2) GOTO 13
      I2=0.
      GOTO 14
  13  I2=1.
  14  A=B2+I1*B3+I2*B4
      B=B1-2*I1*A1*B3-2*I2*A2*B4
      C=-B1-B2-(GD**2)/(D**2)+I1*A1*A1*B3+I2*A2*A2*B4
      RHT1=(-B+SQRT(B**2-4.*A*C))/(2*A)
      RHT2=(-B-SQRT(B**2-4.*A*C))/(2*A)
      IF((RHT1.GE.1.).OR.(RHT1.LE.0.)) GOTO 15
      IF((RHT1.LT.RHT2).AND.(RHT2.LT.1.)) GOTO 15
      HMERCH=H1*RHT1
      GOTO 16
  15 IF((RHT2.GE.1.).OR.(RHT2.LE.0.)) GOTO 18
     HMERCH=H1*RHT2
      GOTO 16
  18  HMERCH=-1.
  16  RETURN
        END
*******************************************************************************
C
C   The DIB function computes the diameter inside bark at the small end
C   of a log
C
*******************************************************************************
        FUNCTIONDIB(D,H1,HLOG,I,J)
      X=HLOG/H1
      IF(((I.EQ.1).OR.(I.EQ.3)).AND.(J.LE.1)) GOTO 10
      IF((I.EQ.2).OR.((I.EQ.3).AND.(J.GE.2))) GOTO 20
  10  A1=. 80645
      A2=.05980
      X1=-4.58266*(X-1.)+2.24195*(X**2-1.)
      IF((X.LE.A1).AND.(X.LE.A2)) DIB=D*SQRT(X1-2.34978*(A1-X)**2
     1+138.546*(A2-X)**2)
```

```
      IF((X.LE.A1).AND.(X.GT.A2)) DIB=D*SQRT(X1-2.34978*(A1-X)**2)
      IF(X1.GT.0.) GOT0 15
      DIB=.00001
      RETURN
   15 IF((X.GT.A1).AND.(X.GT.A2)) DIB=D*SQRT(X1)
      RETURN
   20 A1=.85190
      A2=.04833
      X1=-7.43322*(X-1.)+3.74079*(X**2-1.)
      IF((X.LE.A1).AND.(X.LE.A2)) DIB=D*SQRT(X1-4.03112*(A1-X)**2
     1+191.149*(A2-X)**2)
      IF((X.LE.A1).AND.(X.GT.A2)) DIB=D*SQRT(X1-4.03112*(A1-X)**2)
      IF(X1.GT.0.) GOTO 25
      DIB=.00001
      RETURN
   25 IF((X.GT.A1).AND.(X.GT.A2))DIB=D*SQRT(xl)
   21 RETURN
        END
************************************************************************
C
C   Function VAL is a collection of commonly used and related equations
C   used throughout the program. They are grouped here for simplicity.
C
************************************************************************
        FUNCTIONVAL(V1,V2,K)
      COEF=5.454154E-3
      GOTO(1,2,3,4,5), K
*         K=1=SIF; K=2=HTF; K=3=BAF; K=4=QMF; K=5=TSURV
    1 VAL=V1*(.4653/(1.-EXP(-.02504*V2)))**.75587
        RETURN
    2 VAL=V1*(2.14915*(1.-EXP(-.02504*V2)))**.75587
        RETURN
    3 VAL=V1*COEF*V2**2
        RETURN
    4 VAL=SQRT(V1/(COEF*V2))
        RETURN
    5 VAL=V1/(COEF*V2**2)
        RETURN
        END
************************************************************************
C
C   Subroutine TPA estimates the initial stand survival when not given
C   by the user. This subroutine is used only once in any given run.
C
************************************************************************
        SUBROUTINETPA(TS1,TP,IAG,HD1,BA1)
      AG=FLOAT(IAG)
      IF((BA1.GT.0.).AND.(TP.LE.0.)) GOT0 5
      IF((BA1.LE.0.).AND.(TP.GT.0.)) GOT0 10
      IF((BA1.GT.0.).AND.(TP.GT.0.)) GOT0 15
C
C   Compute survival when initial BA per acre is known and number of trees
C   planted is unknown.
C
```

```
    5 TS1=770.439*BA1**1.44102*AG**.20927*HD1**(-2.06002)
        RETURN
C
C   Compute survival when initial BA per acre is unknown and number of trees
C   trees planted is known.
C
   10 TS1=TP/(EXP(AG*(.01348*ALOG(TP)+.00140*HD1-.01937*HD1**.5)))
        RETURN
C
C   Compute survival when BA per acre and trees planted are both known.
C
   15 TS1=54.2829*TP**.48472*HD1**(-1.21868)*BA1**.77999*EXP(-.34826/AG)
        RETURN
        END
************************************************************************
C
C   Subroutine TNTPA computes the initial stand survival of a stand
C   thinned in the past when the current survival is unknown.  The value
C   is based upon the stand immediately following the last thinning.
C
************************************************************************
        SUBROUTINETNTPA(T2,B2,T1,IA2,IA1,B1,H1)
      A1=FLOAT(IA1)
      A2=FLOAT(IA2)
      IF(A2.LT.A1) GOT0 10
      IF(T1.NE.0.) GOT0 5
      B1=B2
      A1=A2
      T2=EXP(8.88470+1.46161*ALOG(B1)+5.99660/A1-2.53453*ALOG(H1))
        RETURN
    5 T2=T1
        RETURN
   10 IF(T1.NE.0.) GOT0 15
      T2=EXP(9.36090+1.36683*ALOG(B2)-2.50256*ALOG(H1))
        RETURN
   15 T2=(T1**(-.49173)+.02615*(A1**.22923-A2**.22923))**(1./.49173)
        RETURN
        END
```

☆U.S. GOVERNMENT PRINTING OFFICE:1987-761-086/60045

Ferguson, R. B.; Baldwin, V. C., Jr. 1987. Comprehensive outlook for managed pines using simulated treatment experiments-planted loblolly pine (COMPUTE-P-LOB): A user's guide. Res. Pap. SO-241. New Orleans, LA: U.S. Department of Agriculture, Forest Service, Southern Forest Experiment Station. 64 p.

Complete instructions for user operation of COMPUT_P-LOB to include detailed examples of computer input and output, of a growth and yield prediction system providing volume and weight yields in stand and stock table format. A complete program listing is provided.

Additional keywords: *Pinus taeda* L., volume predictions, weight predictions, unthinned or thinned plantation yields, Weibull distribution, diameter distribution moments, parameter recovery, problem free sites, FORTRAN computer program.

The computer program is available on request with the understanding that the U.S. Department of Agriculture cannot assure its accuracy, completeness, reliability, or suitability for any other purpose than that reported. The recipient may not assert any proprietary rights thereto nor represent it to anyone as other than a Government-produced computer program. For cost information, please write to either of the authors at the Southern Forest Experiment Station, 2500 Shreveport Highway, Pineville, LA 71360.

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