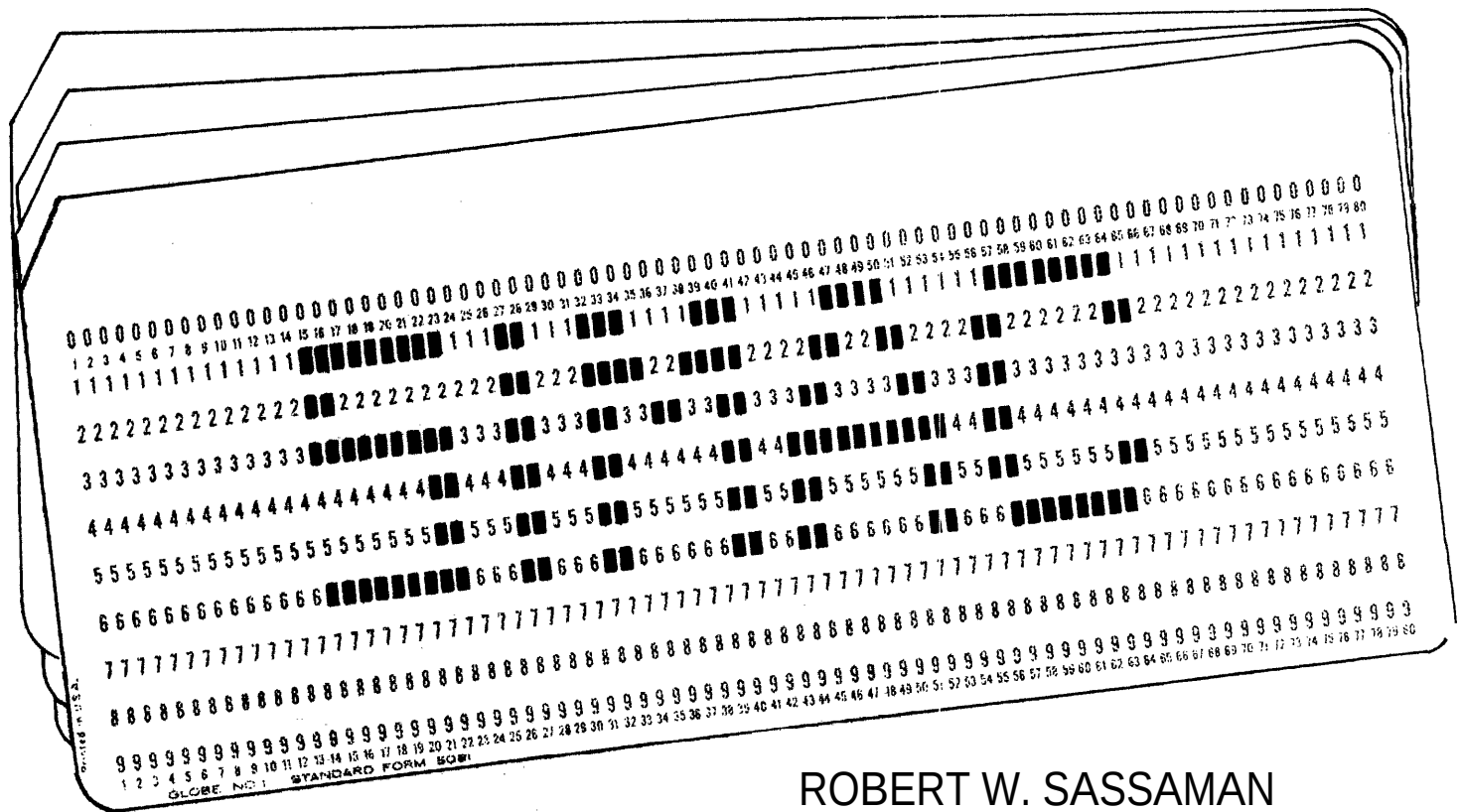


USER'S MANUAL FOR A COMPUTER PROGRAM FOR SIMULATING INTENSIVELY MANAGED ALLOWABLE CUT



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ABSTRACT

Detailed operating instructions are described for SIMAC, a computerized forest simulation model which calculates the allowable cut assuming volume regulation for forests with intensively managed stands. A sample problem illustrates the required inputs and expected output. SIMAC is written in FORTRAN IV and runs on a CDC 6400 computer with a SCOPE 3.3 operating system. The conceptual basis of the SIMAC method is not discussed in detail.

KEYWORDS: Allowable cut, programming (computer).

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INTRODUCTION

The purpose of this manual is to describe the SIMAC ^{1/} computer program and to illustrate its use by detailed instructions and examples of the required input and expected output. The emphasis is entirely on providing the necessary information for operating the program; the conceptual basis of the method is being prepared by Karl Bergsvik.^{2/}

SIMAC is a computerized forest simulation model that calculates the allowable cut associated with the stated forest management plan for even-aged stands. It can maximize an even flow of cut for some specified management regime, or a series of cuts may be specified for as many as the first 10 decades followed by even flow. It provides an alternative to earlier allowable cut computer programs, such as ARVOL,^{3/} VAREA,^{4/} and SORAC,^{5/} which were not designed to consider the effects of intensive management activities, and timber RAM, ^{6/}multiple use management planning system based on linear programing principles.

SIMAC computes a harvest rate based on present inventory and projected growth resulting from some or all of the following management practices: mortality salvage, precommercial and commercial thinning, commercial thinning only, forest genetics, and final harvest cuts. Other treatments, such as fertilization, can be included in conjunction with one or more of the above treatments. SIMAC must be told what treatments to apply, when, and on how many acres. No rotation age is set: instead, a minimum cutting age constraint is specified. SIMAC is not designed to handle economic values or costs, and it does not seek out alternative schedules or strategies.

¹ "SIMAC" is an acronym for Simulating Intensively, Managed Allowable Cut. The conceptual basis and early COBOL version of the SIMAC program were developed by Karl Bergsvik and Don Deberard of the Bureau of Land Management, Portland and Denver Service Centers, respectively. The FORTRAN version reported here was developed by Ed Holt and Bob Sassaman of the U.S. Forest Service's Pacific Northwest Forest and Range Experiment Station in cooperation with the Bureau of Land Management.

² Bureau of Land Management, Portland Service Center.

³ Daniel E. Chappelle. A computer program for calculating allowable cut using the area-volume check method. USDA Forest Serv. Res. Note PNW-44. Portland, Oreg., Pac. Northwest Forest & Range Exp. Stn., 4 p., 1966.

⁴ Robert W. Sassaman and Daniel E. Chappelle. A computer program for calculating allowable cut using area regulation and a comparison with the ARVOL method. USDA Forest Serv. Res. Note PNW-63. Portland, Oreg., Pac. Northwest Forest & Range Exp. Stn., 7 p., 1967.

⁵ Daniel E. Chappelle and Robert W. Sassaman. A computer program for scheduling allowable cut using either area or volume regulation during sequential planning periods. USDA Forest Serv. Res. Note PNW-93. Portland, Oreg., Pac. Northwest Forest & Range Exp. Stn., 9 p., 1968.

⁶ Daniel I. Navon. Timber RAM ... a long range planning method for commercial timber lands under multiple-use management. USDA Forest Serv. Res. Pap. PSW-70. Berkeley, Calif., Pac. Southwest Forest & Range Exp. Stn., 22 p., 1971.

II. PROGRAM CHARACTERISTICS

This section addresses the question, "What kinds of problems will SIMAC handle?" Program features are listed for the potential user to determine whether SIMAC is relevant to his timber harvest scheduling problem.

A. Program Operation--What SIMAC Does

Data for making allowable cut calculations for an area are read and printed.

1. Inventory volumes and annual growth rates are calculated and printed for the initial forest (if the print indicator is flagged).

Calculations are made for each of the decades (maximum. of 40) in the testing period in steps 2 to 6 which follow. Acreages and volumes in each age class which will be treated in the decade are computed using criteria and data specified in the input.

2. Acreages to be treated (and intermediate harvest volume in steps 2a and 2d) in each age class during the decade are computed for each of the following:

- a. mortality salvage
- b. reforestation with genetically improved trees
- c. precommercial thinning
- d. commercial thinning

3. The final harvest volume and acreage are taken from age classes according to criteria supplied by user until the total chargeable volume equals the cut level being tested.

4. The acreage distribution at the beginning of the decade is adjusted for acreage treated and final acreage harvested during the decade.

5. The new acreage distribution is used to compute the volume and annual growth of the forest at the end of the decade. A summary of the activities of the decade is printed (if the print indicator is flagged), including: the acres that were treated and the treatment they received, the volume removed from commercial thinning and mortality salvage, the acres that were final harvest but and their associated volumes, and the volume and growth of the stands remaining at the end of the decade.

6. When the projection period is completed, the standing volume and annual growth rate are checked to see if the trial allowable cut level is sustainable. If it is, the trial cut level is increased and the projection is repeated. If the cut is not sustainable, the trial cut level is decreased and the projection repeated. After all trial cut levels have been tested, the highest trial cut that was sustainable is used, and the projection is repeated for the last time with the print indicator flagged.

B. Description of SIMAC Features

The card-type numbers cited below are described in "SIMAC Input Data. "

1. General

- a. All input data assume an average site. ^{7/}
- b. A maximum of 52 age classes can be specified. Initial acreage in four basic treatment categories (nontreated, mortality salvage, genetic improvement, and thinned) must be provided for each age class (card-type 17). ^{8/}
- c. The allowable cut may be specified by the user for any of the first 10 decades (card-type 3). The trial cut level will be used in any decade for which an allowable cut is not specified by the user. For example, a user could specify a cut for decades 1, 2, 3, 6, 8, and 10. The trial allowable cut would then be used in decades 4, 5, 7, 9, 11, and all following decades.
- d. The user must specify the percent that each age class is to contribute to the total volume of final harvest cut (card-type 20). An "oldest-first" harvest rule is implemented by entering 100 as the percent for age class 500.
- e. Forest acreage can be modified by the user for decades 2 through 10. Land additions for practices such as site rehabilitation are treated as acreage of harvest cut in the previous decade. Land removals due to such practices as permanent road construction come from the acreage of harvest cut in the previous decade.

2. Yield Equations and Growth Equations

Eighteen yield equations are utilized in the SIMAC program. Described in the format of input data cards and coding forms (card-type 6), these apply to the calculation of final harvest volume, standing volume, and, in most cases, growth rate.

Eighteen growth equations are also utilized by SIMAC. These are the first derivatives of the yield equations and are determined by the program. The user can override six of these equations (for thinned stands less than 80 years old) by using his own growth equations (card-type 7).

3. Thinning

- a. Thinning cycles of 5 through 10 years are acceptable. In any age class, all thinned stands fall in one of six categories: precommercial followed by commercial thinning, and no precommercial thinning with the first commercial thinning at age 30, 40, 50, 60, or 70 years.
- b. For decades 1 through 10, the user specifies the percentage of acreage that will be precommercially thinned in age classes 10 and 20 (card-type 9) and the percentage of acreage that will be commercially thinned in age class 30 through age class 70 (card-type 10).

⁷ A three-site version of SIMAC is being developed.

⁸ The effects of fertilization can also be included. Refer to item number 3g in "Description of SIMAC Features. "

c. Volume tables are set by the user for intermediate harvests from commercial thinning. Six tables containing volumes per acre by age class and decade are read, one for each of the thinning categories. The user may specify growth equations for each of the thinning categories. If no growth equations are read, SIMAC uses the derivative of the yield equations for thinned stands plus the thinning volumes to determine growth rates.

d. Thinned stands have final harvest yield equations which are specified by the user (card-type 6). These equations are used to calculate final harvest volume and standing volume. If growth equations are not given, derivatives of the yield equations plus the volume from commercial thinnings determine the growth rates.

e. Acreage which can be thinned within a stand cannot be reduced (via input) from decade to decade except by clearcutting.

f. The first commercial thinning may begin as early as age 30 years. No commercial thinning cycle will be started that cannot be completed by age 80.

g. Any increased yields to be realized from the practice of fertilizing thinned stands must be reflected in the thinning yield data.

4. Mortality Salvage

a. Stands in age class 80 and older are eligible for mortality salvage operations.

b. An intermediate harvest volume table for mortality salvage is specified (card-type 16) which gives volumes per acre by age class and decade.

c. A yield equation must be provided for stands that have undergone mortality salvage (input card-type 6). This equation is used to determine final harvest volume and standing volume for stands 80 years old and older. For stands 80 through 120 years old the yield equation and the volume removed by mortality salvage are used to determine growth rates. The derivative of the yield equation and the volume removed by mortality salvage are used to calculate annual growth rates for stands greater than 120 years old.

d. Acreage in the mortality salvage category of an age class cannot be reduced by user inputs from decade to decade, except by clearcutting.

5. Genetic improvements

a. Stands with genetic improvement are recognized at age 10 (card-type 8).

b. These stands are not thinned nor do they undergo mortality salvage operations.

c. Genetically improved stands have their own yield equations (card-type 6) for calculating final harvest volumes and standing volumes. The first derivatives of these equations are used to determine average annual growth rates.

d. SIMAC is not programed to accept intermediate harvests in genetically improved stands. However, intermediate harvests in these stands can be handled by increasing the yields of thinned stands.

6. Final Harvests

a. SIMAC determines the harvest volume each age class is to contribute toward the total final harvest volume based on the percentages previously described in item number 1d. To meet the volume contribution of the age class, the first harvest cut is in the nontreated stands, then the mortality salvaged stands, then the genetically improved stands, and finally the thinned stands.

b. Clearcut volumes are calculated on the basis of stand age at the middle of the decade.

- c. No age class younger than the minimum cutting age will be clearcut. If not specified by the user, a minimum cutting age of 40 years is assumed.
- d. If SIMAC schedules acres to be clearcut that have been thinned in the same decade, the volume from thinning is automatically decreased to avoid overstating the total harvest.
- e. Acres scheduled for final harvest in a given decade will not undergo mortality salvage in the same decade.
- f. Values produced by the nontreated yield equations and growth equations can be modified by the user over time for 12 ages (20, 30, . . . , 130) with the nontreated yield factors. Yield factors are averaged for nontreated stands and mortality-salvaged stands (card-types 18 and 19) for a yield factor for final harvests. For example, at age 85 the factors for age 80 in the program's current decade and age 90 in the next decade are averaged. For stands 140 years and older, the yield factor is assumed to be 1, since no change in yield is assumed in the future for these stands.

7. *Stand Regeneration*

Suppose that there is a harvest cut of 1,000 acres in a decade. SIMAC assumes these acres were cut at the rate of 100 acres per year. With a regeneration period of 5 years in the next decade, SIMAC would place 500 acres in the 1- through 5-year age class and 500 acres in the nonstocked class. With a regeneration period of 3 years, 200 acres would be assigned to the 10-year age class (ages 6-15), 500 acres to the 1- through 5-year age class, and 300 acres to the nonstocked class. The regeneration period is specified by the user as 0 through 10 years.

8. *Volume and Annual Growth*

Level of growing stock volumes and annual growths printed in the decade tables are calculated using ages at the end of the decade. A 30-year-old stand would use age 40 to calculate its volume and annual growth at the end of the decade.

9. *Trial Allowable Cut Tests*

- a. SIMAC averages the high and low allowable cut limits (initially specified by the user) for a trial cut. At the end of the test period, the cut is determined as sustainable or not sustainable. If it is sustainable, the trial cut replaces the low limit; if it is not sustainable, it replaces the upper limit. A new trial cut is determined and the program is rerun. After the user-designated number of trial cuts (as indicated by TESTS, card-type 2) has been made, the highest cut that was sustainable is rerun with all the results printed.
- b. If the designated number of trial cuts is tried and none found to be high, SIMAC uses the original upper limit as the cut and prints out the results. To obtain a more accurate calculation of the cut in such cases, a new run should be made with a higher allowable cut range.
- c. If after the designated number of tests no cut was found to be sustainable, SIMAC uses the original lower limit as the cut and prints out the results. If the original lower limit is too high, a new run should be made with a lower allowable cut range.
- d. When SIMAC is instructed to cut the trial allowable cut for up to 40 decades and is able to do so without exhausting the growing stock beforehand, it checks the total volume and the average annual growth between the next to the last and the last decade.

Four conditions are possible:

- (1) Standing volume is increasing and total annual growth is increasing.
- (2) Standing volume is increasing and total annual growth is decreasing.
- (3) Standing volume is decreasing and total annual growth is increasing.
- (4) Standing volume is decreasing and total annual growth is decreasing.

For cases 1 through 3, the allowable cut is assumed to be sustainable. For case 4, the allowable cut is depleting the resource and violates the even-flow principle.

C. SIMAC Input Data

In this section the input card types are listed, the variables on each card are defined, and a sample problem is shown on a SIMAC coding form. The input variables are also described at the beginning of the SIMAC listing.

SIMAC card-types

1. geographic identification
2. measurement units and miscellaneous information
3. specified allowable cuts for the first 10 decades
4. even-flow allowable cut range and minimum final harvest cutting age
5. land base adjustment by decade
6. yield equation coefficients
7. growth equation coefficients for thinned stands
8. genetic improvement percents
9. precommercial thinning percents
10. commercial thinning percents
11. mortality salvage percents
12. commercial thinning yield table for stands precommercially thinned
13. commercial thinning yield table for stands first thinned at age 30
14. commercial thinning yield table for stands first thinned at age 40
15. commercial thinning yield tables for stands first thinned at age 50, 60, or 70
16. mortality salvage yield table
17. initial acreage
18. yield factors for nontreated stands
19. yield factors for stands that have undergone mortality salvage
20. final harvest volume percents

Data for a typical west-side management unit (even-aged stands) have been developed and are shown on specially designed SIMAC coding forms in this section. The problem covers a 347, 000-acre tract managed on an even-flow system of harvests with a 10-year thinning cycle and a 3-year regeneration period. The allowable cut is based on intermediate and final harvests and is affected by the following management practices: genetic improvement, precommercial thinning, commercial thinning, and mortality salvage operations.

Output for the sample problem includes a description of the basic data, an initial inventory, a description of the projected forest conditions by decades, and a decade summary (described in the "SIMAC Output" section of the manual). Though the program ran four tests, each 40 decades, only the outputs for the highest even-flow level of the projected forest for decades 1, 2, 39, and 40 are included in this manual.

Format of Input Data Cards and Coding Forms

Card-type 1: Geographic identification

Program code	Item	Format	Card columns
STATE (3)	Geographical identification	3A4	1-12
DIST (3)	(district)	3A4	13-24
SYAREA (3)	(sustained yield area)	3A4	25-36
INDAT (2)	Date of inventory	2A4	37-44
MGMSYS (2)	System of management (even flow or modulated flow)	2A4	45-52
SPECIE (3)	Identification of the predominant commercial species	3A4	53-64

SIMAC coding form with sample problem data

[illegible]

Card-type 2: Measurement units and miscellaneous information

Program code	Item	Format	Card columns
UNIT (2)	Unit of measurement used	2A4	1-8
RULE (2)	Log rule	2A4	9-16
UTILIZ (6)	Utilization standard (e.g., all trees, 9-inch d.b.h. to a 7-inch top)	6A4	17-40
SITE	Site index	A3	41-43
PVOL	Partial volume indicator. If PVOL equals: 1, thinning and mortality salvage are included in the allowable cut. 2, neither thinning nor mortality salvage is included in the allowable cut 3, mortality salvage but not thinning is included in the allowable cut. 4, thinning but not mortality salvage is included in the allowable cut.	I1	44
LAG	Reforestation lag (years). The maximum lag is 10 years.	I2	45-46
TC	Thinning cycle (years). Five through 10 years is acceptable.	I2	47-48
BACRES	Base acreage.	I8	49-56
PER1	Ultimate percentage of any age class to undergo genetic improvement.	I2	57-58
PER2	Ultimate percentage of any age class to undergo commercial thinning.	I2	59-60
PER3	Ultimate percentage of any age class to undergo mortality salvage.	I2	61-62
SCUT	System of cut indicator. If SCUT equals 1, even flow. 2, modulated harvest.	I2	63-64
PRINT	Printed output indicator. The allowable cut is determined by an iterative technique (series of trial cuts). Only output from the final trial cut is printed unless PRINT is set equal to 1 (one)--then all trials are printed.	I1	68
TESTS	Number of trial allowable cuts. Before deciding on the number of trial allowable cuts (TESTS), the analyst should consider how precise the allowable cut calculation must be (e.g., nearest half-million board feet, or cubic feet, nearest million, etc.), and the confidence he has in his ability to select a range of allowable cut values that will include the allowable cut level which the program will calculate.	I2	69-70

How to select a value for TESTS and determine the allowable cut range:

Pick some range in which you feel the highest sustainable allowable cut will fall. Adjust the range so that it equals some power of 2 times the unit of precision desired. Set TESTS equal to the exponent of 2.

Card-type 2: Measurement units and miscellaneous information (continued)

Program code	Item	Format	Card columns
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TESTS
(continued)

For example, suppose you want the highest sustainable allowable cut to the closest million board feet (MMBF) and you think it is between 150 and 200 MMBF per decade. You want the range to equal 2^n x (unit of precision).

$$2^n \times 1 \text{ MMBF} = 200 \text{ MMBF} - 150 \text{ MMBF}$$

$$2^n \times 1 \text{ MMBF} = 50 \text{ MMBF}$$

$$2^n = 50$$

So n = between 5 and 6

Which one should we use? We select $n = 6$ because it is the smallest power of 2 that will cover the range (50 MMBF) in which the cut is expected to occur (i.e., $2^6 \times 1 \text{ MMBF} = 64 \text{ MMBF}$ which covers the 50 MMBF range, while $2^5 \times 1 \text{ MMBF} = 32 \text{ MMBF}$ which does not cover the range). So TESTS equals 6 and our upper and lower limits are 143 MMBF and 207 MMBF.

If you want the allowable cut to the nearest 0.5 MMBF, the range can be the same as above but change TESTS to 7 since $2^7 \times 0.5 \text{ MMBF} = 64 \text{ MMBF}$.

TDEC

Number of decades for each trial (maximum of 40)

12

71-72

SIMAC coding form with sample problem data

UNIT OF MEASURE		LOG RULE	UTILIZATION STANDARD		SITE INDEX	PART. VOL.	REGEN. LAG	THIN. CYCLE	BASE ACREAGE	%	%	%	SYSTEM OF CUT	PRINT INSTRUCTIONS	NUMBER OF TESTS	DECADES PER TEST
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68
69	70	71	72													

CODE EXPLANATION:

PARTIAL VOLUME

- 1 - Thinning and mortality salvage included in the allowable cut.
- 2 - Thinning and mortality salvage not included in the allowable cut.
- 3 - Thinning not included in the allowable cut.
- 4 - Mortality salvage not included in the allowable cut.

SYSTEM OF CUT

- 1 - Even flow.
- 2 - Modular.

PRINT INSTRUCTIONS

- 1 - Print all tests.
- Blank - Print last test only.

Card-type 3: Specified allowable cuts for the first 10 decades

Program code	Item	Format	Card columns
ACUT (10)	Allowable cut levels to be used the first 10 decades of the projection. For any decade an allowable cut level is not specified, the even-flow level is used. This card is read but ignored if the system of cut (SCUT) on the previous card is 1.	F8.0 F8.0 F8.0 etc.	1- 8 9-16 17-24 etc.

SMAC coding form with sample problem data

ALLOWABLE CUT BY DECADE (M FT.)

[illegible]

Card-type 4: Even-flow allowable cut range and minimum final harvest cutting age

Program code	Item	Format	Card columns
ACL	Initial lower limit of the even-flow allowable cut range (M ft. per decade)	F8.0	9-16
ACH	Initial upper limit of the even-flow allowable cut range (M ft. per decade)	F8.0	17-24
MINAG	Minimum age clearcutting is allowed. If a value is not read, 45 years is assumed to be the minimum acceptable age for clearcutting.	13	28-30

SIMAC coding form with sample problem data

DECADE CUT (M FT.)																	MINIMUM CUTTING AGE												
LOW								HIGH									AGE												
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
									3	9	0	0	0	0	0	2	9	8	0	0	0	0	0					4	5

Card-type 5: Land base adjustment **by** decade

Program code	Item	Format	Card columns
PADJ (10)	Percent of base acreage (from card-type 2) to be added or subtracted from the total forest acreage in decades 2 through 10. Variable PADJ(1) is not used. Land removed comes from the acreage clearcut in the preceding decade and cannot exceed the acreage clearcut. Land added is treated the same as acreage clearcut in the preceding decade. A blank card is acceptable.	F5.2	1- 5
		"	6-10
		"	11-15
		"	16-20
		"	21-25
		"	26-30
		"	31-35
		"	36-40
		"	41-45

SIMAC coding form with sample problem data

ACREAGE ADJUSTMENT BY DECADE
(PERCENT OF BASE ACREAGE)

	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
1	1	2	3	4	5	6	7	8	9
2	1	2	3	4	5	6	7	8	9
3	1	2	3	4	5	6	7	8	9
4	1	2	3	4	5	6	7	8	9
5	1	2	3	4	5	6	7	8	9
6	1	2	3	4	5	6	7	8	9
7	1	2	3	4	5	6	7	8	9
8	1	2	3	4	5	6	7	8	9
9	1	2	3	4	5	6	7	8	9
10	1	2	3	4	5	6	7	8	9
11	1	2	3	4	5	6	7	8	9
12	1	2	3	4	5	6	7	8	9
13	1	2	3	4	5	6	7	8	9
14	1	2	3	4	5	6	7	8	9
15	1	2	3	4	5	6	7	8	9
16	1	2	3	4	5	6	7	8	9
17	1	2	3	4	5	6	7	8	9
18	1	2	3	4	5	6	7	8	9
19	1	2	3	4	5	6	7	8	9
20	1	2	3	4	5	6	7	8	9
21	1	2	3	4	5	6	7	8	9
22	1	2	3	4	5	6	7	8	9
23	1	2	3	4	5	6	7	8	9
24	1	2	3	4	5	6	7	8	9
25	1	2	3	4	5	6	7	8	9
26	1	2	3	4	5	6	7	8	9
27	1	2	3	4	5	6	7	8	9
28	1	2	3	4	5	6	7	8	9
29	1	2	3	4	5	6	7	8	9
30	1	2	3	4	5	6	7	8	9
31	1	2	3	4	5	6	7	8	9
32	1	2	3	4	5	6	7	8	9
33	1	2	3	4	5	6	7	8	9
34	1	2	3	4	5	6	7	8	9
35	1	2	3	4	5	6	7	8	9
36	1	2	3	4	5	6	7	8	9
37	1	2	3	4	5	6	7	8	9
38	1	2	3	4	5	6	7	8	9
39	1	2	3	4	5	6	7	8	9
40	1	2	3	4	5	6	7	8	9
41	1	2	3	4	5	6	7	8	9
42	1	2	3	4	5	6	7	8	9
43	1	2	3	4	5	6	7	8	9
44	1	2	3	4	5	6	7	8	9
45	1	2	3	4	5	6	7	8	9

Card-type 6: Yield equation coefficients

Program code	Item	Format	Card columns
Y(2,9,3,)	Eighteen cards are used to input coefficients for 18 yield equations These equations are divided into two sets: 1. Stands less than 80 years old 2. Stands 80 years and older	F15.7 F15.7 F15.7	1-15 16-30 31-45
	Both sets contain nine equations, one for each of the following treatments: 1. Nontreated 2. Mortality salvage 3. Forest genetics 4. First commercially thinned at age 70 5. First commercially thinned at age 60 6. First commercially thinned at age 50 7. First commercially thinned at age 40 8. First commercially thinned at age 30 9. Precommercially thinned and then commercially thinned		
	Each card contains three coefficients, $Y\{1,J,1\} \cdot Y\{1,J,2\} \cdot Y\{1,J,3\}$ to be used in an equation of the form $Y\{1,J,1\} + Y\{1,J,2\} \cdot \text{AGE} + Y\{1,J,3\} \cdot \text{AGE}^2$ = yield per acre. A blank card is acceptable for any given yield equation.		

SIMAC coding form with sample problem data

YIELD EQUATIONS FOR STANDS LESS THAN 80 YEARS OLD

Y(1,J,1)	Y(1,J,2)	Y(1,J,3)	TREATMENT
-90056334	90574817	-20421798	nontreated
-92660000	87170943	-19604286	mortality salvage
-403992430	178416300	-61306594	forest genetics
-1139057100	446571430	-317142860	first commercially thinned at age 70
-1139057100	446571430	-317142860	first commercially thinned at age 60
-1139057100	446571430	-317142860	first commercially thinned at age 50
-210436000	137233000	-75700000	first commercially thinned at age 40
-210436000	137233000	-75700000	first commercially thinned at age 30
-210436000	137233000	-75700000	precommercially and then commercially thinned

YIELD EQUATIONS FOR STANDS 80 YEARS OLD AND OLDER

Y(2,J,1)	Y(2,J,2)	Y(2,J,3)	TREATMENT
-90056334	90574817	-20421798	nontreated
-92660000	87170943	-19604286	mortality salvage
-403992430	178416300	-61306594	forest genetics
-2830400000	697714290	-334285710	first commercially thinned at age 70
-875700000	241071430	-81428571	first commercially thinned at age 60
-707200000	200000000	-60000000	first commercially thinned at age 50
-1192818500	279022130	-90527932	first commercially thinned at age 40
-1192818500	279022130	-90527932	first commercially thinned at age 30
-1192818500	279022130	-90527932	precommercially and then commercially thinned

Card-type 8: Genetic improvement percents

Program code	Item	Format	Card columns
GEN(10)	Percentage of the acreage in age class 10 to undergo forest genetic improvement in decades 1 through 10. The percent shown for decade 10 also applies to decades 11 on. A blank card is acceptable. If any value is read, or if the initial forest has genetically improved acres, the appropriate yield equations must be read on card-type 6.	F5.2 " " " " " " " " "	3- 7 8-12 13-17 18-22 23-27 28-32 33-37 38-42 43-47 48-52

SIMAC coding form with sample problem data

[illegible]

Card-type 9: Precommercial thinning percents

Program code	Item	Format	Card columns
PT(7,10)	The first two rows of PT(7,10) contain the percent of the acreage in age classes 10 and 20 that will undergo precommercial thinning and later commercial thinning in decades 1 through 10. Two cards are needed, one for each age class. The percents shown for decade 10 apply to decades 11 on. Any precommercial thinning in a 20-year-old stand is in addition to the acres precommercially thinned of that stand at age 10. Blank cards are acceptable. If any value is read, or if the initial forest has stands that were precommercially thinned, appropriate yield equations (card-type 6) and the commercial thinning yield table for stands precommercially thinned (card-type 12) must be read.	F5.2	3- 7
		"	8-12
		"	13-17
		"	18-22
		"	23-27
		"	28-32
		"	33-37
		"	38-42
		"	43-47
		"	48-52

SMAC coding form with sample problem data

[illegible]

Card-type 10: Commercial thinning percents

Program code	Item	Format	Card columns
PT(7,10)	The last five rows of PT(7,10) contain commercial thinning percents. Five cards are used as input for the percent of the acreage in age classes 30 through 70 that will be commercially thinned in the first thinning to begin in each of the first 10 decades. Decades 11 on use the same percents as decade 10. The acreage in a stand to undergo commercial thinning can be increased by increasing the percent to thin over time, but the acreage cannot be decreased. Once an acre is placed in the thinned category, it is rethinned every thinning cycle until it reaches age 80 or harvest cut. Blank cards are acceptable. For any thinning treatment used during the projection period, the user must supply the appropriate yield equations (card-type 6) and the appropriate commercial thinning yield table (card-type 12, 13, 14, or 15).	F5.2	3- 7
		"	8-12
		"	13-17
		"	18-22
		"	23-27
		"	28-32
		"	33-37
		"	38-42
		"	43-47
		"	48-52

SMAC coding form with sample problem data

COMMERCIAL THINNING (%BY DECADE)																																																				
1st					2nd					3rd					4th					5th					6th					7th					8th					9th					10th					AGE CLASS		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	
			25					40					25				25			25			25			25			25			25			25			25			25			25			25			30		
			18					25					40				25			25			25			25			25			25			25			25			25			25			25			40		
			15					42					25				40			25			25			25			25			25			25			25			25			25			25			50		
			20					25					42				25			40			25			25			25			25			25			25			25			25			25			60		
			35					45					25				42			25			25			40			25			25			25			25			25			25			25			70		

F5.2	3- 7
"	8-12
"	13-17
"	18-22
"	23-27
"	28-32
"	33-37
"	38-42
"	43-47
"	48-52

SIMAC coding form with sample problem data

IK - If IK is set to 99, reading skips to commercial thinning volumes.

Card-type 12: Commercial thinning yield table for stands **precommercially** thinned

Program code	Item	Format	Card columns
VCT(6,7,10)	Seven cards are used as input for a thinning volume table for stands that have been precommercially thinned. This table gives volume per acre from commercial thinning practices on stands that have been precommercially thinned by thinning number and the decade the thinning begins. The first commercial thinning always begins at age 30 for these stands. Decades 8 on use the same volumes as decade 7. Blank cards are acceptable.	F5.0 " " " " " " " "	3- 7 8-12 13-17 18-22 23-27 28-32 33-37 38-42 43-47 48-52

SIMAC coding form with sample problem data

COMMERCIAL THINNING VOLUME (FT.) FOR STANDS THAT HAVE BEEN PRECOMMERCIALY THINNED																																																			
Thinning Number (First Thinning Begins at Age 30)																																																			
12345678910																																																			
12345678910111213141516171819202122232425262728293031323334353637383940414243444546474849505152																																																			
1st																																																			
2nd																																																			
3rd																																																			
4th																																																			
5th																																																			
6th																																																			
7th																																																			

EXPLANATION: If TC=5, the last thinning is the 10th, beginning at age 75.
 If TC=6, the last thinning is the 9th, beginning at age 72.
 If TC=7, the last thinning is the 8th, beginning at age 72.
 If TC=8, the last thinning is the 7th, beginning at age 70.
 If TC=9, the last thinning is the 6th, beginning at age 66.
 If TC=10, the last thinning is the 5th, beginning at age 70.

TC is thinning cycle read on card-type 2.

Card-type 13: Commercial thinning yield table for stands first thinned at age 30

Program code	Item	Format	Card columns
VCT(6,7,10)	Seven cards are used as input for a thinning volume table for stands that are not precommercially thinned and are commercially thinned for the first time at age 30. This table gives volume per acre from thinning practices by thinning number and the decade the thinning begins. Decades 8 on use the same volumes as decade 7. Blank cards are acceptable.	F5.0 " " " " " " " " "	3- 7 8-12 13-17 18-22 23-27 28-32 33-37 38-42 43-47 48-52

SIMAC coding form with sample problem data

COMMERCIAL THINNING VOLUME (FT.) FOR STANDS FIRST THINNED AT AGE 30

Thinning Number

[illegible]

Card-type 14: Commercial thinning yield table for stands first thinned at age 40

Program code	Item	Format	Card columns
VCT(6,7,10)	Seven cards are used as input for a thinning volume table for stands that are not precommercially thinned and are commercially thinned for the first time at age 40. This table gives volume per acre from thinning practices by thinning number and the decade the thinning begins. Decades 8 on use the same volumes as decade 7. Blank cards are acceptable.	F5.0 " " " " " " "	3- 7 8-12 13-17 18-22 23-27 28-32 33-37 38-42

SIMAC coding form with sample problem data

COMMERCIAL THINNING VOLUME (FT.) FOR STANDS FIRST THINNED AT AGE 40

[illegible]

Card-type 15: Commercial thinning yield tables for stands first thinned at age 50, 60, or 70

Program code	Item	Format	Card columns
VCT(6,7,10)	Seven cards are used as input for three thinning volume tables. These tables are for stands that are not precommercially thinned and are commercially thinned for the first time at either age 50, 60, or 70. These tables give volume per acre from thinning practices by thinning number and the decade the thinning begins. Decades 8 on use the same volumes as decade 7. Blank cards are acceptable.	F5.0	3- 7
		"	8-12
		"	13-17
		"	18-22
		"	23-27
		"	28-32
		"	39-43
		"	44-48
		"	49-53
		"	54-58
		"	65-69
		"	70-74

SIMAC coding form with sample problem data

[illegible]

Card-type 16: Mortality salvage yield table

Program code	Item	Format	Card columns
IK	See description of IK on input card-type 11.	I2	1- 2
VMS(43,7)	Volume (per acre) from mortality salvage in stands 80 years through 500 years old for the first 7 decades. These volumes correspond to the mortality salvage percentages on card-type 11. Volumes used in decade 7 apply to decades 8 on. A maximum of 43 cards can be read.	F8.0 " " " " " "	3-10 11-18 19-26 27-34 35-42 43-50 51-58

SIMAC coding form with sample problem data

MORTALITY SALVAGE VOLUME (FT.)

[illegible]

IK - If IK is set to 99, reading skips to initial acreage.

Card-type 17: Initial acreage

Program code	Item	Format	Card columns
IK	Physical control variable for the initial acreage data. Initial acreage cards must be read for the first 10 age classes (nonstocked, 1 through 5, 10, 20, . . . , 80). After these, cards need to be read only for age classes with acreage. If fewer than the maximum of 52 cards are read, assign IK a value of 99 on the last card and reading will skip to nontreated yield factors.	I2	1- 2
JL(6)	Used to input the initial acreage data.		
	JL(1) - Age class of the acreage on the same card (90, 100, . . . , 500).	I3	3- 5
	JL(2) - Nontreated acreage.	I10	6-15
	JL(3) - Mortality salvage acreage. JL(3) is not read for age classes less than 90 years old.	I10	16-25
	JL(4) - Genetically improved acreage. JL(4) is not read for age classes less than 20 years old.	I10	26-35
	JL(5) - Thinned acreage. JL(5) is not read for age classes less than 20 years old.	I10	36-45
	JL(6) - The age at which the acreage in JL(5) was first thinned if it was not precommercially thinned. If the acres in JL(5) were precommercially thinned, leave JL(6) blank.	I2	46-47

INITIAL ACREAGE BY AGE CLASS AND TYPE

Enter in columns 46 and 47 the age at which commercial thinning was first started. If the stand was precommercially thinned, leave the two columns blank.

INTERIOR--BONNIEVILLE POWER ADMINISTRATION, PORTLAND, OREGON

Card-type 18: Yield factors for nontreated stands

Program code	Item	Format	Card columns
NTYF(12,10)	Nontreated yield factors for 12 ages (20, 30, . . . , 130) at the beginning of the first 10 decades allow the user to modify, over time, the values produced by the nontreated yield equation and growth equations.	F5.3	3- 7
		"	8-12
		"	13-17
		"	1a-22
		"	23-27
		"	28-32
		"	33-37
		"	38-42
		"	43-47
		"	48-52
	The initial inventory table uses factors for the beginning of the first decade in calculating volume and growth. The volumes and growth rates for nontreated stands at the end of the first decade use the factors for the beginning of the second decade. In the sample data below, a nontreated stand 40 years old at the beginning of the third decade (the end of the second decade) is expected to produce 90 percent of the volume per acre given by the nontreated yield equation. A nontreated stand in the 90-year age class at the beginning of the second decade will use age 95 and a yield factor of 1.025 in calculating volume per acre from harvest cutting. 1.025 is determined by averaging the yield factor of 1.020 for a stand 90 years old at the beginning of the second decade and the yield factor of 1.030 for a stand 100 years old at the beginning of the third decade. Nontreated stands 140 years old and older use 1.000 for a yield factor. Decades 11 on use the same factors as decade 10.		
	Twelve cards are read, one for each age class 20 through 130. Blank cards are acceptable. SIMAC assumes a value of 1.000 for any blank field.		

SIMAC coding form with sample problem data

PROJECTION OF PRESENT YIELDS AND GROWTH FOR NONTREATED STANDS
AT THE BEGINNING OF THE FIRST 10 DECADES

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	STAND AGE
1	2	3	4	5	6	7	8	9	10	11	20
			8.00	7.00	6.00	5.50	5.00	4.50	4.00	3.50	30
			9.50	8.50	8.00	7.00	6.50	6.00	5.50	5.00	40
			9.50	9.00	9.00	8.50	8.00	8.00	7.50	7.00	50
				9.50	9.50	9.50	9.50	9.00	9.00	9.00	60
				10.10	10.10	10.10	10.15	10.15	10.20	10.25	70
				10.10	10.20	10.40	10.50	10.60	10.80	10.90	80
				10.20	10.30	10.50	10.70	10.90	11.00	11.20	90
				10.20	10.30	10.50	10.70	10.90	11.20	11.40	100
				10.15	10.30	10.40	10.60	10.80	11.00	11.20	110
				10.15	10.20	10.40	10.50	10.60	10.80	10.90	120
				10.10	10.20	10.40	10.50	10.60	10.80	10.90	130
				10.10	10.20	10.40	10.50	10.60	10.80	10.90	

Card-type 19: Yield factors for stands that have undergone mortality salvage

Program code	Item	Format	Card columns
MYF(6,10)	Mortality salvage yield factors for six ages (80, 90, . . . , 130) at the beginning of the first 10 decades give the user a means to change, over time, the yields and growths produced by the mortality salvage yield equation and growth equation. The mortality salvage yield factors are used on stands that have undergone mortality salvage in the same manner the nontreated yield factors are used on nontreated stands as described for card-type 18. Six cards are read, one for each age class. Blank cards are acceptable. SIMAC assumes a value of 1.000 for any blank field.	F5.3 " " " " " " " " "	3- 7 8-12 13-17 18-22 23-27 28-32 33-37 38-42 43-47 48-52

SIMAC coding form with sample problem data

PROJECTION OF PRESENT YIELDS AND GROWTH FOR MORTALITY SALVAGE STANDS AT THE BEGINNING OF THE FIRST 10 DECADES

[illegible]

SIMAC coding form with sample problem data[illegible]

D. SIMAC Output

SIMAC determines the sustainable allowable cut by an iterative technique. Printed output is controlled by the variable "**PRINT**." Normally on production runs, only the final trial cut results are printed. On test runs, a print of an intermediate output may be of considerable value. For example, when the trial cut is too large it may be of interest to see the changes in stand structure by decades as the amount of **harvestable** timber declines.

A description of the printed output follows. There are four distinct sections of the format which remain unchanged from one trial cut to another. They are: a listing of the basic data entered, an initial inventory (acres and volume by age class), a description of the projected forest by decades, and a trial cut summary by decade. Each section is described in detail.

1. Basic Data

This section appears at the beginning of each trial cut printout and lists all the initial input. An example, using the sample problem, follows.

```

09/20/72                                INPUT                                PAGE

STATE                                SUSTAINED YIELD AREA            DATE OF INVENTORY            SYSTEM OF MANAGEMENT            COMMERCIAL SPECIES
P.N.W.                                EXP. STATION            SAMPLE PROB.            1/1/71            OVERAGE            DOUG. FIR

UNIT OF MEASURE            LOG RULE            UTILIZATION STANDARD            SITE INDEX            P ART. VOL            REGEN LAG            THIN CYCLE            BASE ACREAGE            ULTIMATE FG            PERCENT CT            MS            SYS CUT            PRINT            TESTS            DECADES
80.FT.            INT 1/8"            7"DBH TO FIXED 5"TOP            1-            3            11            347000            7.9%            25%            3%            3            4J

                                ALLOWABLE CUT (M. FT.)
1ST DECADE            2ND DECADE            3RD DECADE            4TH DECADE            5TH DECADE            6TH DECADE            7TH DECADE            8TH DECADE            9TH DECADE            10TH DECADE
2940000            2940000            2940000            2940000            2940000            2940000            2940000            2940000            2940000            2940000

INITIAL ALLOWABLE CUT RANGE (M. FT.)
LOW            HIGH            MINIMUM CUTTING AGE
2900000            2980000            00

                                ACREAGE ADJUSTMENT BY DECADE - PERCENT OF BASE ACREAGE
2ND DECADE            3RD DECADE            4TH DECADE            5TH DECADE            6TH DECADE            7TH DECADE            8TH DECADE            9TH DECADE            10TH DECADE
-.80            -.90            -.50            .20            .10            .13

```

In the sample problem, the growth equation cards were left blank; therefore, on the output the growth equations printed are the derivatives of the appropriate yield equations.

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* INPUT

PAGE 2

YIELD EQUATIONS FOR STANDS LESS THAN 80 YEARS OLD				Y = A + B*AGE + C*(AGE**2)
TREATMENT	A		C	
NON-TREATED	-9005.6334000	905.7481700	-2.0421798	
MORTALITY SALVAGE	-9266.0000000	871.7090300	-1.9604286	
FOREST GENETICS	-40399.2430000	1780.1630000	-6.1306594	
FIRST C.T. AT AGE 70	-113905.7100000	4465.7143000	-31.7142860	
FIRST C.T. AT AGE 60	-113905.7100000	4465.7143000	-31.7142860	
FIRST C.T. AT AGE 50	-113905.7100000	0465.7103300	-31.7142860	
FIRST C.T. AT AGE 46	-21043.6000000	1372.3300000	-7.5700000	
FIRST C.T. AT AGE 30	-21043.6000000	1372.3300000	-7.5700000	
P.C.T. ANC THEN C.T.	-2100.3600000	1372.3300000	-7.5700000	

YIELD EQUATIONS FOR STANDS 80 YEARS OLD AND OLDER				Y = A + B*AGE + C*(AGE**2)
TREATMENT	A	B	C	
NON-TREATED	-9005.6334000	905.7481700	-2.0421798	
MORTALITY SALVAGE	-9266.0000000	871.7090300	-1.9604286	
FOREST GENETICS	-40399.2430000	1780.1630000	-6.1306594	
FIRST C.T. AT AGE 70	-283040.0000000	6977.1429000	-33.4285710	
FIRST C.T. AT AGE 50	-97570.0000010	2413.7143000	-8.128671	
FIRST C.T. AT AGE 50	-70720.0030000	2000.0000000	-6.0000000	
FIRST C.T. AT AGE 40	-119281.8500000	2790.2213000	-9.0527932	
FIRST C.T. AT AGE 30	-119281.8500000	2790.2213000	-9.0527932	
P.C.T. ANC THEN C.T.	-119281.8500000	2700.2213000	-9.0527932	

GROWTH EQUATIONS FOR THINNED STANDS LESS THAN 80 YEARS OLD				Y = A + B*AGE + C*(AGE**2)
TREATMENT	A		C	
FIRST C.T. AT AGE 70	4465.7143000	-63.4285720		
FIRST C.T. AT AGE 60	4465.7143000	-63.4285720		
FIRST C.T. AT AGE 50	4465.7143000	-63.4285720		
FIRST C.T. AT AGE 40	1372.3300000	-15.1400000		
FIRST C.T. AT AGE 30	1372.3300000	-15.1400000		
P.C.T. ANC THEN C.T.	1372.3300000	-15.1400000		

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PAGE

GENETIC IMPROVEMENT (% 3Y DECADE)										
	1ST	2ND	3RD	4TH	5TH	6TH	7TH	8TH	9TH	10TH
AGE CLASS		25.00	75.00	75.00	75.00	75.00	75.00	75.00	70.00	
PRE-COMMERCIAL THINNING (% 5Y DECADE)										
	1ST	2ND	3RD	4TH	5TH	6TH	7TH	8TH	9TH	10TH
AGE CLASS 10	12.00	8.00	8.00	8.00	8.00	8.00	6.00	8.00	8.00	8.00
AGE CLASS 20	40.00	13.00	17.40	17.00	17.00	17.00	17.00	17.00	17.00	
COMMERCIAL THINNING (% BY DECADE)										
	1ST	2ND	3RD	4TH	5TH	6TH	7TH	8TH	9TH	10TH
AGE CLASS 30	25.00	40.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
AGE CLASS 40	15.00	15.00	40.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
AGE CLASS 50	15.00	25.00	40.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
AGE CLASS 60	25.00	25.00	42.00	25.00	40.00	25.00	25.00	25.00	25.00	25.00
AGE CLASS 70	35.00	5.00	25.00	25.00	25.00	20.00	25.00	25.00	25.00	25.00

If no mortality salvage percent data are read, this page will not appear in the printout.

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		MORTALITY SALVAGE (% BY DECADE)									
		1ST	2ND	3RD	4TH	5TH	6TH	7TH	8TH	9TH	10TH
AGE CLASS	20	3.00	4.00	3.00	3.00	3.00	3.00	3.00			
AGE CLASS	40	3.00	4.00	3.00	3.00	3.00	3.00	3.00			
AGE CLASS	60	3.00	4.00	4.00	3.00	3.00	3.33	3.00			
AGE CLASS	110	3.00	4.50	4.00	4.00	3.00		3.00			
AGE CLASS	200	3.00	4.00	4.00	4.05	4.00	3.00	3.00			
AGE CLASS	130	3.00	4.00	4.00	4.00	4.00	4.00	3.00			
AGE CLASS	40	6.00	5.00	4.00							
AGE CLASS	150	6.00	6.00	5.00							
AGE CLASS	60	6.00	6.01	6.00							
AGE CLASS	170	6.00	6.00	6.00							
AGE CLASS	80	6.00	6.00	6.00							
AGE CLASS	90	4.00	6.00	6.00							
AGE CLASS	200	4.00	4.00	6.00							
AGE CLASS	210	4.00	4.00	4.00							
AGE CLASS	220	4.00	4.01	4.00							
AGE CLASS	230	4.00	4.00	4.00							
AGE CLASS	240	12.00	12.00	4.03							
AGE CLASS	250	12.00	12.00	4.00							
AGE CLASS	260	12.00	12.01	12.00							
AGE CLASS	270	12.00	12.00	12.00							
AGE CLASS	280	12.00	12.00	12.00							
AGE CLASS	290		12.00	12.03							
AGE CLASS	300			12.00							
AGE CLASS	310	10.00	13.00	3.00							

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COMMERCIAL THINNING VOLUME (FT.) FOR STANDS THAT HAVE BEEN PRECOMMERCIALY THINNED

* * * * * THINNING NUMBER (FIRST THINNING BEGINS AT AGE 30) * * * * *

DECADE	-1-	-3-	-4-	-5-	-8-	-18-
1ST						
2ND	8000					
3RD	8000	11000				
4TH	8030	1500	10000			
5TH	8000	1500	9500	9000		
6TH	8000	1503	9500	9000	9000	
7TH	8000	1500	9500	9000	9000	

COMMERCIAL THINNING VOLUME (FT.) FOR STANDS FIRST THINNED AT AGE 30

.....* * * * * THINNING NUMBER * * * * *

DECADE	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-
1ST	1000									
2ND		1000								
3RD										
4TH										
5TH					9000					
6TH						8000				
7TH										

COMMERCIAL THINNING VOLUME (FT.) FOR STANDS FIRST THINNED AT AGE 4E								
	* * * * * THINNING NUMBER * * * * *							
DECADE	-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-
1ST	9000	11000						
260								
360				7000				
4TH								
5TH								
6TH								
7TH								

COMMERCIAL THINNING VOLUME (FT.) FOR STANDS FIRST THINNED AT AGE 5.							COMMERCIAL THINNING VOLUME (FT.) FOR STANDS FIRST THINNED AT AGE 60				C.T. VOLUME (FT.) FOR STANDS FIRST THINNED AT AGE 70	
	* * * * * THINNING NUMBER * * * * *							* THINNING NUMBER * * * *			THINNING NUMBER	
DECADE	-1-	-2-	-3-	-4-	-5-	-6-	-1-	-2-	-3-	-4-	-1-	-2-
1ST	1000						14000				18000	
2ND		130.1										
3RD												
4TH												
5TH												
6TH												
7TH												

If no mortality salvage percent data are read, this page will not appear in the printout.

MORTALITY SALVAGE VOLUME								
AGE CLASS	1ST DECADE	2ND DECADE	3RD DECADE	4TH DECADE	5TH DECADE	6TH DECADE	7TH DECADE	
80	7060	5500	4000	4000	4000	4000	4000	
90	7000	5500	4000	4000	4000	4000	4000	
100	7000	5500	4000	4000	4000	4000	4000	
110	7000	5500	4000	4000	4000	4000	4000	
120	7060	5500	4000	4000	4060	4000	4000	
130	7000	5500	4000	4000	4060	4000	4000	
140	7000	5000	2500					
150	7000	5000	2500					
160	7000	5000	2500					
170	7000	5000	2500					
180	6000	6010	2500					
190	6000	6010	2500					
200	6000	6000	2500					
210	6000	6000	2500					
220	6000	6000	2500					
230	7000	6000	2500					
240	7000	6000	2500					
250	7000	6000	2500					
260	7000	6000	2500					
270	7000	6000	2500					
280		6006	2500					
290								
300	8600	6406	2596					
310		6000	2500					
323			2500					
333								
340								
350								
360								
370								
383								
390								

INITIAL ACREAGE BY AGE CLASS AND TYPE					
AGE CLASS	NON-TREATED	MORTALITY SALVAGE	FOREST GENETICS	THINNED	AGE FIRST THINNED
N/S	23000				
1-5	20000				
10	40000				
20	30000				
30	15000				
40	15000				
50	15000				
60	23000				
70	30000				
80	25000				
90	10000				
100	15000				
110	10000				
120	5000				
130	5000				
140	1000				
150	1000				
160	500				
170	500				
180	1000				
190	500				
200	2000				
210	500				
220	1000				
230	500				
240	500				
250					
260	2500				
270	1000				
280	1000				
290	2000				
300	27000				

Blanks on the **nontreated** yield factor cards and the mortality yield factor cards are changed to 1.000 by **SIMAC**.

PROJECTION OF PRESENT YIELDS & GROWTH FOR NONTREATED STANDS AT THE BEGINNING OF THE FIRST TEN DECADES --- NONTREATED YIELD FACTORS										
STAND AGE	1ST	2ND	3RD	4TH	5TH	6TH	7TH	8TH	9TH	10TH
20	1.000	.800	.700	.600	.550	.500	.450	.400	.350	.300
30	1.000	.950	.850	.800	.700	.650	.600	.550	.500	.450
40	1.030	.950	.900	.850	.800	.750	.700	.650	.600	.550
50	1.000	1.000	1.000	.950	.950	.900	.900	.850	.800	.750
60	1.000	1.000	1.010	1.010	1.010	1.015	1.015	1.020	1.025	1.030
70	1.000	1.010	1.020	1.040	1.050	1.064	1.080	1.096	1.110	1.110
80	1.000	1.020	1.030	1.050	1.070	1.090	1.100	1.120	1.140	1.140
90	1.000	1.020	1.030	1.050	1.070	1.094	1.100	1.120	1.140	1.140
100	1.030	1.015	1.030	1.040	1.060	1.080	1.090	1.106	1.120	1.120
110	1.000	1.015	1.020	1.040	1.050	1.060	1.080	1.090	1.106	1.100
120	1.000	1.010	1.020	1.040	1.050	1.064	1.080	1.090	1.106	1.100
130	1.000	1.010	1.020	1.040	1.050	1.060	1.080	1.090	1.106	1.100

PROJECTION OF PRESENT YIELDS AND GROWTHS FOR MORTALITY SALVAGE STANDS AT THE BEGINNING OF THE FIRST TEN DECADES --- MORTALITY SALVAGE YIELD FACTORS ---										
STAND AGE	1ST	2ND	3RD	4TH	5TH	6TH	7TH	8TH	9TH	10TH
80	1.000	1.020	1.030	1.050	1.070	1.090	1.100	1.120	1.146	1.140
90	1.000	1.020	1.030	1.050	1.070	1.090	1.110	1.120	1.146	1.140
100	1.000	1.020	1.030	1.040	1.060	1.080	1.090	1.100	1.120	1.120
110	1.000	1.010	1.024	1.040	1.050	1.060	1.090	1.090	1.100	1.100
120	1.000	1.010	1.020	1.040	1.050	1.060	1.080	1.090	1.100	1.100
130	1.000	1.010	1.020	1.040	1.050	1.060	1.080	1.090	1.100	1.100

PERCENT OF TOTAL FINAL HARVEST VOLUME TO BE CUT FROM EACH AGE CLASS

AGE CLASS	PERCENT	AGE CLASS	PERCENT
3C		270	1.0
4		28C	2.0
5C		29C	2.0
6C		31	2.0
7C		310	2.0
81	9.0	32C	2.0
9C	8.0	33C	
10C	8.0	340	-
11C	9.1	351	27.0
12C	8.1	36C	-
13C	2.4	371	
14C	2.4	381	
15C	2.4	391	
16C	2.4		
17C	2.4	41C	
18C	1.2	42C	
191	1.2	43C	
20C	1.2	440	
21C	1.2	45C	
221	1.2	46C	
23C	1.1	47C	
24C	1.1	481	
25C	1.1	49C	
26C	1.1	50C	

2. Initial Inventory

The initial inventory is listed immediately after the "Basic Data" output section in a five-column table with these column headings:

- Age class
- Treatment class
- Acres
- Total volume
- Annual growth

The initial inventory output statement for the sample problem will serve as a sample of the second section of the printed output.

SAMPLE PROB.		09/20/72 ILLUSTRATIVE CUT COMPUTATIONS EVENFLOW										PAGE 11	
YEAR 1971		INITIAL TEST LEVEL											
AGE CLASS	TREATMENT CLASS	ACRES	TOTAL VOL M FT.	ANNUAL GROWTH FT.	VOLUME COMM. THINNING	CUT MORTALITY SALVAGE	M FT. FINAL HARVEST	FOREST GENETICS	ACRES P. COMM. THINNING	HARVESTED COMM. THINNING	MORTALITY SALVAGE	FINAL HARVEST	
15	NON-TREATED	20110											
25	NON-TREATED	20000											
30	NON-TREATED	30000											
40	NON-TREATED	15000	489865	2349621									
50	NON-TREATED	15000	359352	1131607									
60	NON-TREATED	15000	4676.5	1322553									
70	NON-TREATED	15000	569811	9911299									
80	NON-TREATED	20000	887801	239686.									
90	NON-TREATED	30000	1511529	7369982									
100	NON-TREATED	250.0	1390251	13453895									
110	NON-TREATED	110.3	61147.	4973122									
120	NON-TREATED	15000	58E744	6947129									
130	NON-TREATED	10110	702768	4156250									
140	NON-TREATED	500.	371144	1873907									
150	NON-TREATED	52.1	388862	1665689									
160	NON-TREATED	1000	36908	29309.									

		YEAR 1971				INITIAL TEST LEVEL						
AGE CLASS	TREATMENT CLASS	ACRES	TOTAL VOL M FT.	ANNUAL GROWTH FT.	V GLUME CORM. THINNING	CUT MORTALITY SALVAGE	MFT. FINAL HARVEST	A C RES P. COMM. THINNING	FOREST GENETICS	HARVESTED COMM. THINNING	MORTALITY SALVAGE	FINAL HARVEST
160	NON-TREATED	1100	83634	252251								
170	NON-TREATED	500	42976	105704								
180	NON-TREATED	1000	87862	170563								
190	NON-TREATED	500	44682	64860								
200	NON-TREATED	2000	181914	177753								
210	NON-TREATED	506	45571	24016								
220	NON-TREATED	1000	91417	7185								
230	NON-TREATED	500	45643	-16827								
240	NON-TREATED	500	45372	-37249								
260	NON-TREATED	2500	221094	-390463								
270	NON-TREATED	1000	8E671	-197C29								
280	NON-TREATED	1100	8.497	-237873								
290	NON-TREATED	2000	163828	-557432								
300	NON-TREATED	27000	2131911	-8628112								
INITIAL LEVEL		3.7000	12184226	138836559								

3. Decade Statement

The projected forest is described each decade in a printed output table. The first column of the table gives each stand's age at the beginning of the decade. The next four columns relate to the structure of the stands at the end of the decade. The last eight columns describe what occurred during the decade. Listed by age class and treatment are the number of acres treated and the volume realized from the application of that treatment. The ingrowth listed at the end of each decade table is the volume in the 20-year age class at age 25 years.

Following are the first two decades and the last two decades of a 40-year projection period using the sample data.

Output table for decade 1

SAMPLE PROB.		ALLOWABLE CUT COMPUTATIONS										PAGE 13	
		09/20/72 2940000 M. BO.FT. INT 1/8" DECADE CUT * * EVENFLOW * *											
1971		YEAR 1980										1971 - 1980	
AGE CLASS	TREATMENT CLASS	ACRES	TOTAL VOL M FT.	ANNUAL GROWTH FT.	VOLUME COMM. THINNING	CUT MORTALITY SALVAGE	M FT. FINAL HARVEST	ACRES FOREST GENETICS	P. COMM. THINNING	HARVESTED COMM. THINNING	MORTALITY SALVAGE	FINAL HARVEST	
N/S	NON-TREATED	20000											
1-5	NON-TREATED	20000											
10	NON-TREATED	35200											
10	PC & C THIN	4890											
	CLASS TOTAL	40000											
20	NON-TREATED	18000	279223	11928016									
20	PC & C THIN	12000	159760	11017561									
	CLASS TOTAL	30000	438983	22945576									
30	NON-TREATED	22500	512677	6285825									
30	C THIN 30-70	7500	163032	6500475	7500								
	CLASS TOTAL	30000	675109	22786300	7500								
40	NON-TREATED	12300	383469	8841814									
40	C THIN 40-70	2700	77349	4091391	24300								
	CLASS TOTAL	15000	460818	2933205	24300								
50	NON-TREATED	12750	484339	8949561									
50	C THIN 50-70	2250	85698	3960000	24750								
	CLASS TOTAL	15000	574037	12909561	24750								
60	NON-TREATED	12000	538007	8329194									
60	C THIN 60-70	3000	129883	4277143	42000								
	CLASS TOTAL	15000	667890	2606337	42000								
70	NON-TREATED	13000	6E8095	86-.C212									
70	C THIN 70	7000	.28320	24000001	126000								
	CLASS TOTAL	20000	109E415	32640213	125061								
80	NON-TREATED	25000	1432888	5848814			21509E						
80	MORT. SALV.	900	48937	1158891		630;					900		
	CLASS TOTAL	25999	1481825	7007705		6300	21509E				900		

SAMPLE PROB.		ALLOWABLE CUT COMPUTATIONS										PAGE 14	
		09/20/72 2940000 M. BO.FT. INT 1/8" DECADE CUT * * EVENFLOW * *											
1971		YEAR 1980										1971 - 1980	
AGE CLASS	TREATMENT CLASS	ACRES	TOTAL VOL M FT.	ANNUAL GROWTH FT.	VOLUME COMM. THINNING	CUT MORTALITY SALVAGE	M FT. FINAL HARVEST	ACRES FOREST GENETICS	P. COMM. THINNING	HARVESTED COMM. THINNING	MORTALITY SALVAGE	FINAL HARVEST	
90	NON-TREATED	206,7	1278965	11635226			215117						3643
90	MORT. SALV.	750	44603	939198		525;					750		
	CLASS TOTAL	21357	1323565	2574424		525,	215117				750		3603
100	NON-TREATED	6303	424379	3349350			215049						0007
100	MORT. SALV.	300	19059	364283		210;					300		
	CLASS TOTAL	6E43	443438	3713639		210,	215049				300		3307
110	NON-TREATED	11409	805805	5590490			215122						3101
110	MORT. SALV.	450	30501	500871		315;					450		
	CLASS TOTAL	11659	846306	6135360		315,	215122				450		3101
120	NON-TREATED	674	555305	2538E57			215089						2960
120	MORT. SALV.	300	21490	309325		210;					300		
	CLASS TOTAL	7000	52E795	2847982		210,	215089				300		29E.
130	NON-TREATED	4002	311205	1336415			00492						848
130	MORT. SALV.	170	11152	147567		1050					150		
	CLASS TOTAL	4152	322397	1484386		1150	04492				150		848
140	NON-TREATED	3887	314488	1139257			04545						813
140	MORT. SALV.	300	23214	290074		2100					300		
	CLASS TOTAL	417	337702	1434332		2100	04545				300		813
150	NON-TREATED	147	12294	37061			65281						793
150	MORT. SALV.	60	4801	56662		420					60		
	CLASS TOTAL	207	17055	93743		420,	65281				60		793
160	NON-TREATED						84844						1000
170	NON-TREATED						43479						500
180	NON-TREATED	576	51474	74719			32274						364
180	MORT. SALV.	60	5135	43E15		360					60		
	CLASS TOTAL	636	5E609	118323		360	32274				60		364

SAMPLE PROB.

ALLOWABLE CUT COMPUTATIONS

09/20/72

2940003 M.

80.FT. INT 1/8" DECADE CUT

PAGE 15

1971	1980							1981				
AGE CLASS	TREATMENT CLASS	ACRES	TOTAL VOL M FT.	ANNUAL GROWTH FT.	VOLUME COMM. THINNING	CUT MORTALITY SALVAGE	M FT. FINAL HARVEST	FOREST GENETICS	ACRES P. COMM. THINNING	HARVESTED COMM. THINNING	MORTALITY SALVAGE	FINAL HARVEST
190	NON-TREATED	122	11036	18843			32266					358
190	MORT. SALV.	24	1733	13751		120					20	
	CLASS TOTAL	42	12769	24594		120	32206				20	358
200	NON-TREATED	1565	142636	75171			32252					355
200	MORT. SALV.	80	6987	51866		48					80	
	CLASS TOTAL	1645	149623	127037		480	32252				80	355
210	NON-TREATED	26	11519	906			32331					354
210	MORT. SALV.	23	1753	12182		12					20	
	CLASS TOTAL	49	13271	11308		120	32331				20	354
220	NON-TREATED	607	55410	-20428			32265					353
220	MORT. SALV.	40	3501	22796		245					40	
	CLASS TOTAL	647	58911	2160		240	32265				40	353
230	NON-TREATED	91	0258	-6779			3525					389
230	MORT. SALV.	20	1740	1261		140					20	
	CLASS TOTAL	111	9998	5035		140	35425				20	389
240	NON-TREATED						45160					307
260	NON-TREATED	1893	164669	-372976			26895					317
260	MORT. SALV.	300	24954	153923		2100					300	
	CLASS TOTAL	2193	189623	-219052		2100	26395				300	317
270	NON-TREATED	566	17825	-13463E			26889					314
270	MORT. SALV.	20	9734	56E64		840					20	
	CLASS TOTAL	586	57559	-77772		840	26889				20	314
280	NON-TREATED	234	19168	-65220			53784					640
280	MORT. SALV.	120	9439	-31E41							120	
	CLASS TOTAL	354	20607	-97660			53784				120	640

SAMPLE PROP.

ALLOWABLE CUT COMPUTATIONS

09/20/72

2940003 M.

80.FT. INT 1/8" DECADE CUT

PAGE 16

1971		1980		1971 - 1980			1971 - 1980		1971 - 1980			
AGE CLASS	TREATMENT CLASS	ACRES	TOTAL VOL M FT.	ANNUAL GROWTH FT.	VOLUME COMM. THINNING	CUT MORTALITY SALVAGE	M FT. FINAL HARVEST	FOREST GENETICS	ACRES P. COMM. THINNING	HARVESTED COMM. THINNING	MORTALITY SALVAGE	FINAL HARVEST
290	NON-TREATED	1332	15125	-42554			53'54					006
330	NON-TREATED	15500	1171963	-5592739			867258					11482
DECADE TOTALS		369054	11059836	155991734	224550	2687	2688606		168,0	22.50	3990	27142
ACRES CLEAR CUT		37146	INGROWTH	31934876	PARTIAL CUT VOLUME		251426					
TOTAL ACRES		347000	AN GROWTH	187925612	TOTAL DECADE VOLUME		2940026					

Output table for decade 2

SAMPLE PROB.		09/20/72 294000. M. 80.FT. INT 1/8" DECADE CUT * * EVENFLOW *										PAGE 17	
		ALLOWABLE CUT COMPUTATIONS											
1981		YEAR 1990										1981 - 1990	
AGE CLASS	TREATMENT CLASS	ACRES	TOTAL VOL M FT.	ANNUAL GROWTH FT.	VOLUME COMM. THINNING	DEATH MORTALITY SALVAGE	CUT M FT. FINAL HARVEST	FOREST GENETICS	ACRES P. COMM. THINNING	HARVESTED COMM. THINNING	ESTIMATED MORTALITY SALVAGE	FINAL HARVEST	
N/S	NON-TREATED	10311											
1-5	NON-TREATED	17186											
10	NON-TREATED	31405											
10	FOREST GEN.	11719						11719					
10	PC N C THIN	3755							3755				
	CLASS TOTAL	46874						11719	3755				
20	NON-TREATED	30000	416386	22413713									
20	PC V C THIN	0000	133133	9181366						5200			
	CLASS TOTAL	40330	5.5519	31595013					52				
30	NON-TREATED	8000	398100	2360524									
30	PC 8 C THIN	2315	260851	18830760	96300						12000		
	CLASS TOTAL	30L35	6.8951	31161284	56000						12000		
40	NON-TREATED	22500	711467	17727541									
40	C THIN 30-70	7500	214859	11364975	67500						7500		
	CLASS TOTAL	30.01	916327	29092516	67500						7500		
50	NON-TREATED	8700	333795	649428E									
50	C THIN 40-70	6300	214478	9852759	693 A0						6360		
	CLASS TOTAL	1600.	54E274	16347.5	A8303						6300		
60	NON-TREATED	11250	505376	8377166									
60	C THIN 50-71	3750	162354	4971428	48750						3750		
	CLASS TOTAL	5000	671729	3346594	48750						3750		
70	NON-TREATED	8250	428111	575C545									
70	C THIN 60-70	6750	358917	9276.36	108000						6750		
	CLASS TOTAL	15000	787057	20026581	108000						6750		

SAMPLE PROB.		09/20/72 294000. M. 80.FT. INT 1/8" DECADE CUT * * EVENFLOW *										PAGE 1A	
		ALLOWABLE CUT COMPUTATIONS											
1981		YEAR 1990										1981 - 1990	
AGE CLASS	TREATMENT CLASS	ACRES	TOTAL VOL M FT.	ANNUAL GROWTH FT.	VOLUME COMM. THINNING	DEATH MORTALITY SALVAGE	CUT M FT. FINAL HARVEST	FOREST GENETICS	ACRES P. COMM. THINNING	HARVESTED COMM. THINNING	ESTIMATED MORTALITY SALVAGE	FINAL HARVEST	
8C	NON-TREATED	9516	49.9.3	5196629			2.6995					3684	
8C	MCRT. SALV.	800	42926	938E93	4400						800		
8A	C THIN 70	7000	51692.	6720631									
	CLASS TOTAL	16316	1253786	2855323	4400		200995				800	3684	
90	NON-TREATED	21E13	3E1225	12391336			201011					2346	
90	TORT. SALV.	1100	62452	1151343	572						1100		
	CLASS TOTAL	22653	423677	39.2E79	572		211.11				1100	33.E	
00	NON-TREATED	17396	1169613	9561560			201009					31.7	
A0	ORT. SALV.	8500	54792	914535	.697						8500		
	CLASS TOTAL	8250	224405	10478094	4697		201009				8500	31.7	
110	NON-TREATED	3440	246970	767730			201017					2899	
110	MCRT. SALV.	3000	21535	320053	165						3000		
	CLASS TOTAL	3744	257409	2387783	.50		211017				3000	2899	
20	NON-TREATED	8000	654618	2960194			2.1211					A739	
20	MCRT. SALV.	474	30291	422982	2637						474		
	CLASS TOTAL	9120	6889109	3363176	2637		201011				474	2736	
30	NON-TREATED	5951	462823	761072			60305					709	
30	MCRT. SALV.	3000	223.5	225.31	523						3000		
	CLASS TOTAL	6251	495128	98E013	150.		60305				3000	709	
40	NON-TREATED	3185	257691	933565			60258					759	
40	MCRT. SALV.	208	16095	162985	.40						208		
	CLASS TOTAL	3393	273786	1096490	100		13258				208	759	
50	NON-TREATED	1534	128295	386952			193714					2353	
50	MCRT. SALV.	3000	24.36	223312	531						3000		
	CLASS TOTAL	1834	152331	610264	1500		193704				3000	2353	

SAMPLE PRCB.

 ALLOWABLE CUT COMPUTATIONS
 09/20/72
 2940000 M. 80.FT. INT 1/8" DECADE CUT
 * * EVENFLOW * *

PAGE 19

		YEAR 1990			OVERFLOW			1981 - 1990				
AGE CLASS	TREATMENT CLASS	ACRES	TOTAL VOL M FT.	ANNUAL GROWTH FT.	VOLUME CCM. THINNING	CUT MORTALITY SALVAGE	M FT. FINAL HARVEST	ACRES FOREST GENETICS	P. COMM. THINNING	HARVESTED COMM. THINNING	ESTED MORTALITY SALVAGE	FINAL HARVEST
160	NON-TREATED						2472					147
160	MORT. SALV.						4872					60
	CLASS TOTAL						7344					207
190	NON-TREATED	48	4342	4266			47500					528
190	MORT. SALV.	60	5200	41252		360					60	
	CLASS TOTAL	108	9541	45518		360	7500				60	528
200	NON-TREATED						11084					122
200	MORT. SALV.						1741					20
	CLASS TOTAL						2825					142
210	NON-TREATED	702	64175	5047			78818					863
210	MORT. SALV.	80	7110	48730		480					80	
	CLASS TOTAL	792	71185	53776		480	78818				80	863
220	NON-TREATED						11517					126
220	MORT. SALV.						1752					20
	CLASS TOTAL						3269					146
230	NON-TREATED						55277					607
230	MORT. SALV.						3.93					40
	CLASS TOTAL						58771					647
240	NON-TREATED						8219					91
240	MORT. SALV.						1733					20
	CLASS TOTAL						9952					111
270	NON-TREATED	1416	119648	-336827			40848					477
270	MORT. SALV.	300	24335	112161		1803					300	
	CLASS TOTAL	1716	143982	-224667		1100	40848				300	477
210	NON-TREATED						47123					566
280	MORT. SALV.						9592					120
	CLASS TOTAL						5671					686

SAMPLE PROB.

 ALLOWABLE CUT COMPUTATIONS
 19/21/72
 2940000 M. 80.FT. INT 1/3" DECADE CUT
 * * EVENFLOW * *

PAGE 2:

1981		YEAR 1990			VOLUME CUT			1981		1990		
AGE CLASS	TREATMENT CLASS	ACRES	TOTAL VOL M FT.	ANNUAL GROWTH FT.	CMM. THINNING	MORTALITY SALVAGE	M FT. FINAL HARVEST	FOREST GENETICS	ACRES P. COMM. THINNING	HARVESTED COMM. THINNING	MORTALITY SALVAGE	FINAL HARVEST
290	NON-TREATED						10830					234
290	MORT. SALV. CLASS TOTAL						9274					12
							21104					354
300	NON-TREATED	682	51507	-245795			50228					650
310	NON-TREATED	2928	209900	-1174851			778910					10573
310	MORT. SALV.	2017	139039	437760		12132					2017	
	CLASS TOTAL	4945	349010	-737391		12102	778910				2017	10573
DECADE 2 TOTALS		309165	1631E492	190492586	385550	37850	2512592	11719	1900	36300	0733	00060
ACRES CLEAR CUT		35.60	INGRCHTH	39128628	PARTIAL CUT VOLUME		427466					
TOTAL ACREAGE		344225	AN GRWTH	229611214	TOTAL DECADE VOLUME		2939998					

SAMPLE PROB.

ALLOWABLE CUT COMPUTATIONS

09/20/72

2940000 M.

80.FT. INT

DECADE CUT

PAGE 99

2351		-----	YEAR	2360	-----	2351		236	-----
AGE	TREATMENT			TOTAL VOL	ANNUAL	VOLUME	CUT	M FT.	ACRES
CLASS	CLASS	ACRES		M FT.	GROWTH FT.	THINNING	MORTALITY	FINAL	FOREST
									GENETICS
									THINNING
									THINNING
									SALVAGE
									HARVEST
N/S	NON TREATED	12713							
1-5	NON TREATED	21188							
10	NON-TREATED	7189							
10	FOREST GEN.	31717							31717
10	PC & C THIN	3383							3383
	CLASS TOTAL	42289							31717
									3383
20	FOREST GEN.	31635	240681	4485392					
20	PC & C THIN	10545	146389	9681E81					7171
	CLASS TOTAL	42180	381070	54487073					7171
30	FOREST GEN.	31553	667635	40820439					
30	PC & C THIN	10517	228614	16477299	8413E				15517
	CLASS TOTAL	4207E	89E22	57297739	84136				10517
40	FOREST GEN.	314E8	1053521	36852187					
40	PC & C THIN	10489	300488	17467646	110134				11489
	CLASS TOTAL	41957	1354118	54319729	110134				11489
50	FOREST GEN.	31384	1299104	32905618					
50	PC & C THIN	13461	35E136	14791122	95379				10461
	CLASS TOTAL	41845	1755240	4769E751	55379				10461
60	FOREST GEN.	31300	1704346	28979752					
60	PC & C THIN	10433	395687	12550325	53857				10433
	CLASS TOTAL	41733	2100033	41630078	53897				10433
70	FOREST GEN.	1897	115696	1523779				1727593	29317
70	PC & C THIN	10404	47E563	23323421	53636				10404
	CLASS TOTAL	123J1	590259	24847203	5363E			1727593	134E4
									25317

SAMPLE PROB.

ALLOWABLE CUT COMPUTATIONS

9/2E/72

2940000 M.

80.FT. INT

1/3" DECADE CUT

PAGE 99

2351		-----	Y	2360	-----	2351		236	-----
AGE	TREATMENT			TOTAL VOL	ANNUAL	VOLUME	CUT	M FT.	ACRES
CLASS	CLASS	ACRES		M FT.	GROWTH FT.	THINNING	MORTALITY	FINAL	FOREST
									GENETICS
									THINNING
									THINNING
									SALVAGE
									HARVEST
80	FOREST GEN.							186753	2789
80	PC & C THIN							544485	11175
	CLASS TOTAL							731239	13164
DECADE	35 TOTALS	298276	7084929	290278558		481183		2458931	31717
	ACRES CLEAR CUT	42481	INGROWTH	11178993		PARTIAL CUT VOLUME		481183	1.584
	TOTAL ACREAGE	340757	AN GROWTH	290457551		TOTAL DECADE VOLUME		2943314	50304

Output table for decade 40

SAMPLE PROB.			ALLOWABLE CUT COMPUTATIONS						2940000 M. BD.FT. INT 1/8" DECADE CUT		29/21/72 * * EVENFLOW * *				PAGE 97			
2361 - - - - - YEAR 2370 - - - - -													2361 - 2370					
AGE CLASS	TREATMENT CLASS	ACRES	TOTAL VOL M FT.	ANNUAL GROWTH FT.	V O I COMM. THINNING	U M E MORTALITY SALVAGE	C U T FINAL HARVEST	M FT. FINAL HARVEST	2361 FOREST GENETICS	2370 A C R E S P. COMM. THINNING	H A R V E S T E D COMM. THINNING	MORTALITY SALVAGE	FINAL HARVEST					
N/S	NON-TREATED	12744																
1-5	NON-TREATED	21241																
10	NON-TREATED	7267																
10	FOREST GEN.	31798							31798									
10	PC 8 C THIN	3392								3392								
	CLASS TOTAL	42397							31798	3392								
23	FOREST GEN.	31717	241305	44921530														
20	PC 8 C THIN	10572	144748	970647C						7189								
	CLASS TOTAL	42289	382053	54628001						7189								
30	FOREST GEN.	31635	665346	40926524														
30	PC 8 C THIN	10545	229223	16521168	84360						10545							
	CLASS TOTAL	42180	898563	57447692	84360						10545							
40	FOREST GEN.	31553	1656466	3E951626														
40	PC 8 C THIN	10517	301290	17514276	116428						10517							
	CLASS TOTAL	42070	1357756	54465901	110-28						10517							
50	FOREST GEN.	31468	1432849	3299369C														
50	PC 8 C THIN	10489	357196	14830712	99645						1E489							
	CLASS TOTAL	41957	1759938	47824462	99645						10489							
60	FOREST GEN.	31384	1708920	29057526														
60	PC 8 C THIN	10461	79E749	12684276	94149						14461							
	CLASS TOTAL	41845	2105669	41741802	94149						134E1							
70	FOREST GEN.	1017	64170	816913				1784517					30283					
70	PC 8 C THIN	10433	479897	23388432	93897						10433							
	CLASS TOTAL	11450	544067	24205345	93897			1784517			10433		30283					

SAMPLE PROB.		(9/20/72)										PAGE. 98	
		ALLOWABLE CUT COMPUTATIONS											
		294000. M. 80.FT. INT 1/8" DECADE GUT											
		2361 - 2370											
		OVERFLOW											
		2361 - 2370											
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4. Trial Cut Summary by Decade

Included for each decade are totals for forest acreage, standing volume at the end of the decade, average annual growth at the end of the decade, volume from commercial thinning, volume from mortality salvage, volume from final harvest cut, acres to undergo forest genetic improvement; acres precommercially thinned, acres commercially thinned, acres that underwent mortality salvage, and acres of harvest cut. On the second line of each decade summary are the change in total standing volume from the previous decade, the change in average annual growth from the previous decade, and the percent of the total volume harvested that was contributed during the decade by commercial thinning, mortality salvage, and harvest cutting. The trial cut summary by decade for the sample problem follows.

SAMPLE PROBLEM		ALLOWABLE CUT COMPUTATIONS										1970/72				PAGE 99			
												29466.0 M. 80. FT. INT 1/8- DECADE CUT							
												EVENFLOW							
												DECADE SUMMARIES							
DECADE	ACRES	TOTAL VOL MFT.	GROWTH FT.	COMM. THINNING	MORTALITY SALVAGE	FINAL HARVEST	FOREST GENETICS	P. COMM. THINNING	COMM. THINNING	MORTALITY SALVAGE	FINAL HARVEST	FOREST GENETICS	P. COMM. THINNING	COMM. THINNING	MORTALITY SALVAGE	FINAL HARVEST	FOREST GENETICS	P. COMM. THINNING	COMM. THINNING
INITIAL LEVEL	347000	12194226	108834559																
DECADE TOTAL	347000	11.59836 -1124391	187925E12 79696653	22455, 7.6 %	26876 .9 %	2608666 91.1 %		16840	22450	3996	37146								
2 DECADE TOTAL	344225	1031E492 -743344	229611214 41684E02	389550 3.3 %	37850 1.3 %	2512592 85.5 %	11719	8950	36350	6733	35064								
3 DECADE TOTAL	341143	973E696 -580396	248824569 19209	387500 3.2 %	15711 .5 %	2536799 86.3 %	25414	10680	39550	4218	35207								
4 DECADE TOTAL	3393E9	9200080 -536016	251466218 26.5E49	430352 14.6 %	1,376 %	2495258 84.9 %	24184	8340	47519	3594	34521								
5 DECADE TOTAL	340463	8853080 -307000	26088451 17414233	453818 15.4 %	3600 .1 %	2-82624 84.4 %	25366	8187	49090	900	34259								
6 DECADE TOTAL	340.10	8742.76 -150600	28998572E 21105275	452744 5.7 %	360; .1 %	2473679 80.1 %	26320	8556	50251	900	36608								
7 DECADE TOTAL	340757	8084952 -57520	289291811 -693515	428226 10.6 %	3600 %	2508190 85.3 %	26307	8772	46706	900	60344								
8 DECADE TOTAL	340757	8602710 -81242	283171376 -6120435	417251 10.2 %		2522763 85.8 %	28224	3974	45479		41033								
9 DECADE TOTAL	3.0757	9451963 -151747	279563759 -3607577	381379 13.3 %		2548651 86.7 %	30359	9635	2529		44720								
DECADE TOTAL	340757	8337182 -11.781	280340776 .77E977	39532E 3.6 %		2540704 86.4 %	13.728	10159	43466		37708								

					DECADE LEVEL SUMMARIES			ACRES						
DECADE		TOTAL VOL			VOLUME CUT		MFT.		A		C		R E S	
		MFT.	GROWTH	FT.	THINNING	MORTALITY	FINAL	FOREST	THINNING	COMM.	THINNING	COMM.	THINNING	FINAL
11	DECADE	TOTAL	340757	8285973	291694113	418152	2521882	30589	10173	45525				37346
12	DECADE	TOTAL	340757	8285544	295075921	435450	2554574	28226	9831	47312				38133
13	DECADE	TOTAL	340757	8281531	292025251	447536	2492481	28128	9398	485E8				38961
14	DECADE	TOTAL	340757	8245749	289565227	453628	2486395	28724	9440	49258				39403
15	DECADE	TOTAL	340757	8197993	288533091	452336	2487635	29288	9634	49176				39731
16	DECADE	TOTAL	345757	8136059	287955053	446865	2493115	29651	9795	48630				39897
17	DECADE	TOTAL	345757	8071398	287928336	442637	2497375	29823	9891	48150				39853
18	DECADE	TOTAL	340757	8058975	288081176	441455	2498522	29917	9951	47988				3578-
19	DECADE	TOTAL	340757	7954508	288941669	446421	2.93596	29579	555d	48520				3 9841
20	DECADE	TOTAL	340757	7507206	289515446	451917	2488589	29846	9957	49116				40558
21	DECADE	TOTAL	340757	7862018	289574859	455487	2484521	29914	9956	49502				45286
22	DECADE	TOTAL	340757	7815270	289375505	457178	2482831	35577	9988	49659				40472

SAMPLE PROB.		69/20/72 294000 M. 80.FT. INT 1/8- DECADE CUT										PAGE 142	
ALLCHAELE CUT COMPUTATIONS													
***** EVENFLOW *****													
----- DECADE SUMMARIES -----													
DECADE	ACRES	TOTAL VOL MFT.	GROWTH FT.	FT.	VOLUME CCMM. THINNING	CUT MORTALITY SALVAGE	FINAL HARVEST	FT.	ACRES FOREST GENETICS	P. COMM. THINNING	HARVEST COMM. THINNING	MORTALITY SALVAGE	FINAL HARVEST
35	DECADE TOTAL 340757	7238249 -39968	291.203864 75923		475742 6.2 %		2464321 83.8 %		31384	14442	51708		42047
36	DECADE TOTAL 340757	7199018 -39231	292274005 70141		477146 6.2 %		2462847 83.8 0		31468	14470	51865		42158
37	DECADE TOTAL 340757	7160421 -38597	290337016 63011		478535 6.3 %		2461455 83.7 %		31553	10498	52016		42268
38	DECADE TOTAL 340757	7122379 -30042	290298960 61944		479877 6.3 %		2460152 83.7 %		31635	11525	52162		42376
39	DECADE TOTAL 340757	7484929 -17450	294457551 58591		401183 6.4 %		2458831 83.6		31717	11554	52344		42481
40	DECADE TOTAL 340757	7448046 -3E883	296518236 64E85		482481 6.4 %		2457549 83.6		31798	11561	52445		42584

E. Data Processing Requirements

SIMAC is written in FORTRAN IV and runs on a CDC 6400 computer with a SCOPE 3. 3 operating system. The SIMAC program should run on other computers with only minor program or control card modifications. FORTRAN statements that are not in common use were avoided in coding SIMAC.

The core requirement for the SIMAC object deck and system routines is just under 17,000 words, decimal (41,000 words, octal).

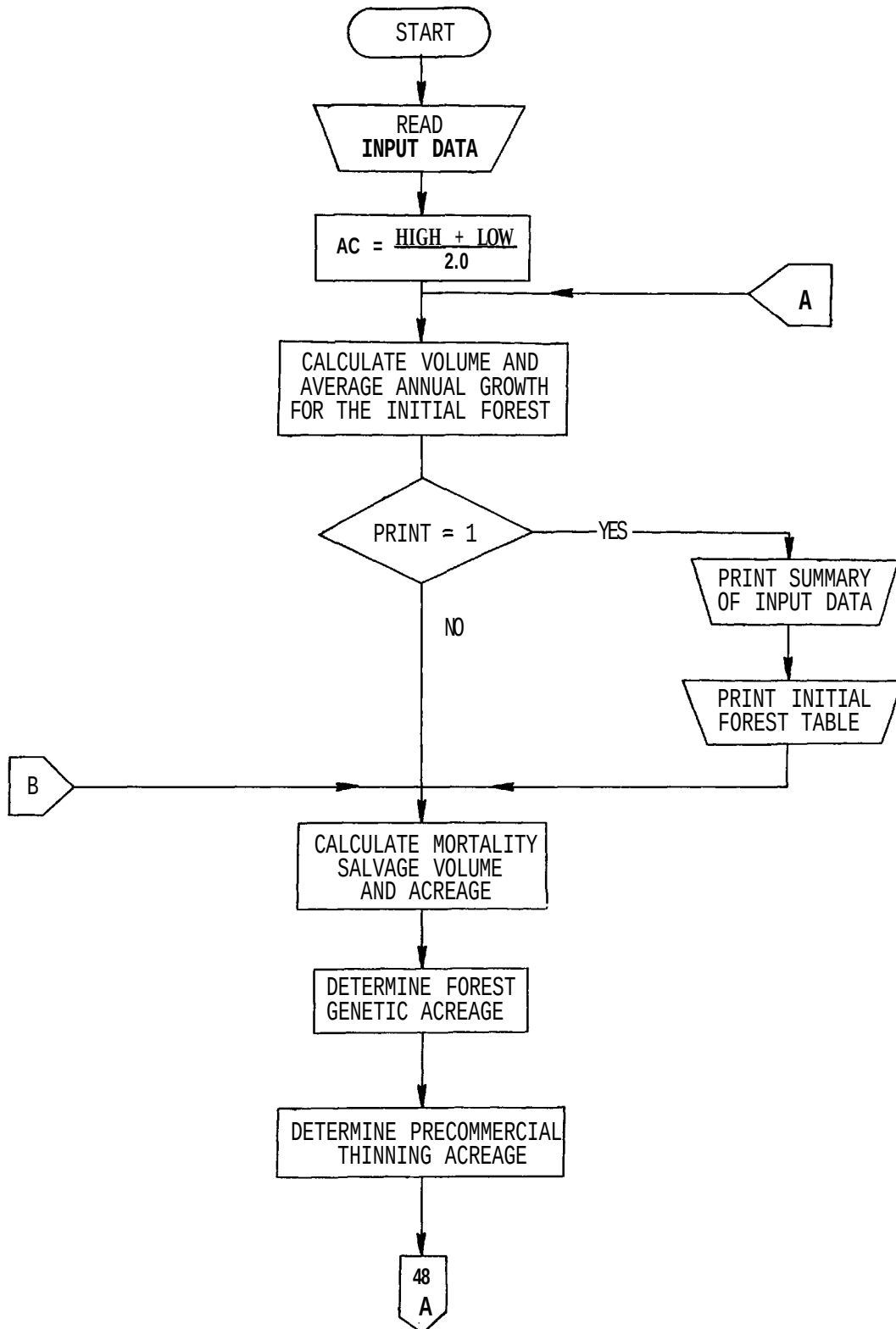
A typical SIMAC run on the CDC 6400, printing all the output for 40 decades for each of four tests, runs in less than 120 seconds. By printing only the highest sustainable level test for 40 decades, the time can be cut to less than 60 seconds.

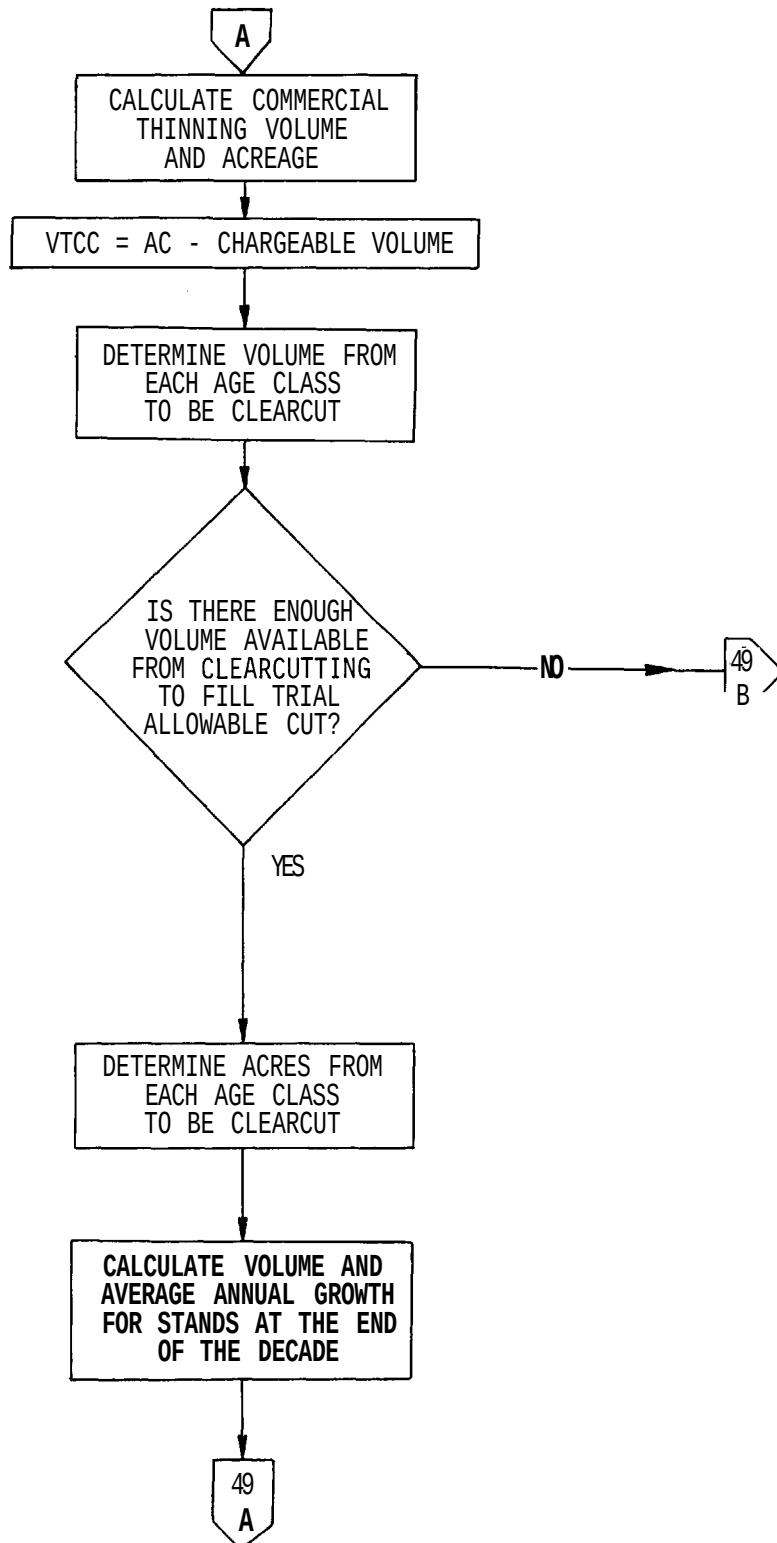
F. SIMAC FORTRAN IV Source Deck

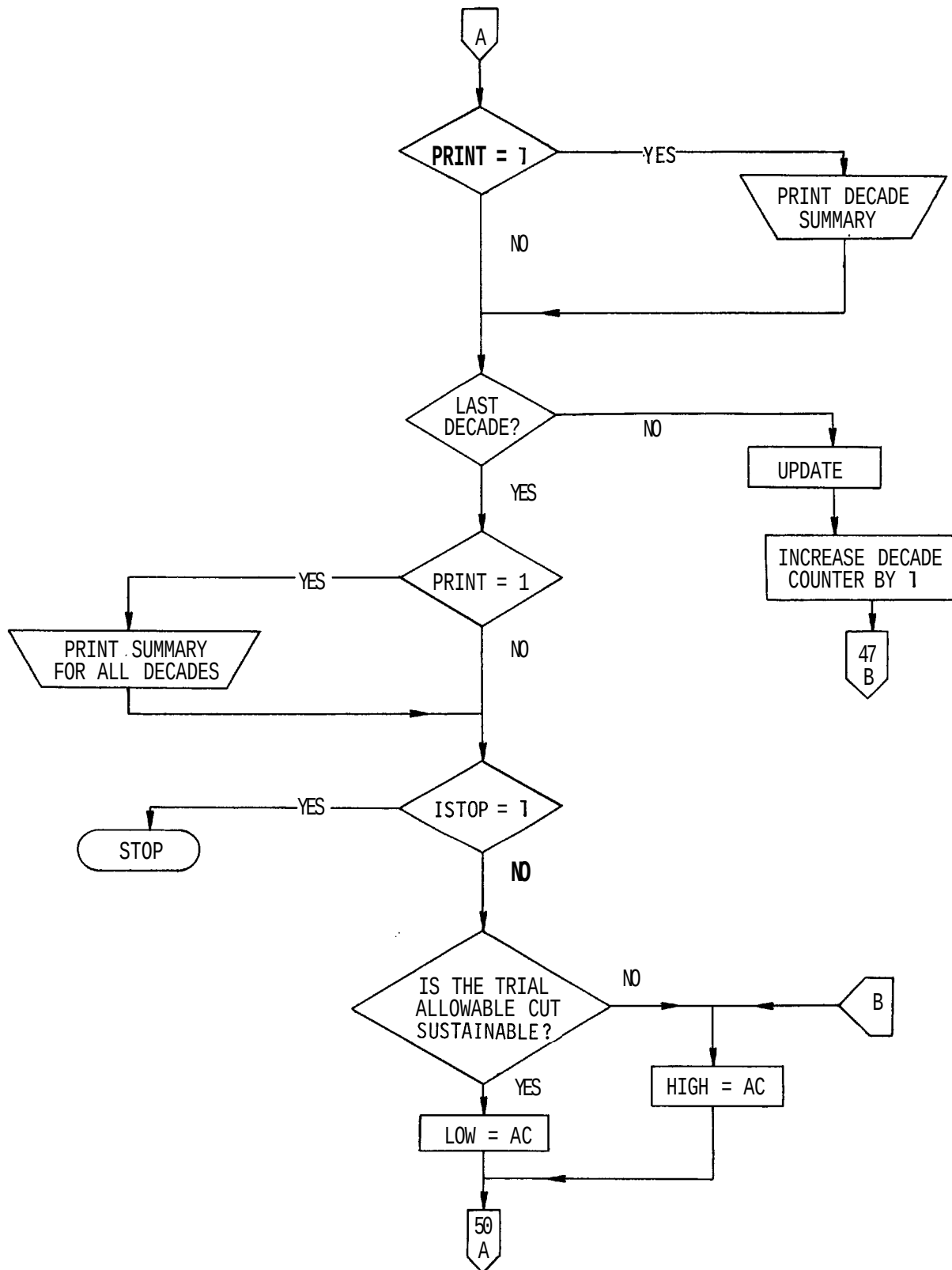
Requests for a FORTRAN IV source deck (approximately 2, 000 cards) and a sample problem data deck may be addressed to the Director, Pacific Northwest Forest and Range Experiment Station, Forest Service, U.S. Department of Agriculture, P.O. Box 3141, Portland, Oregon 97208.

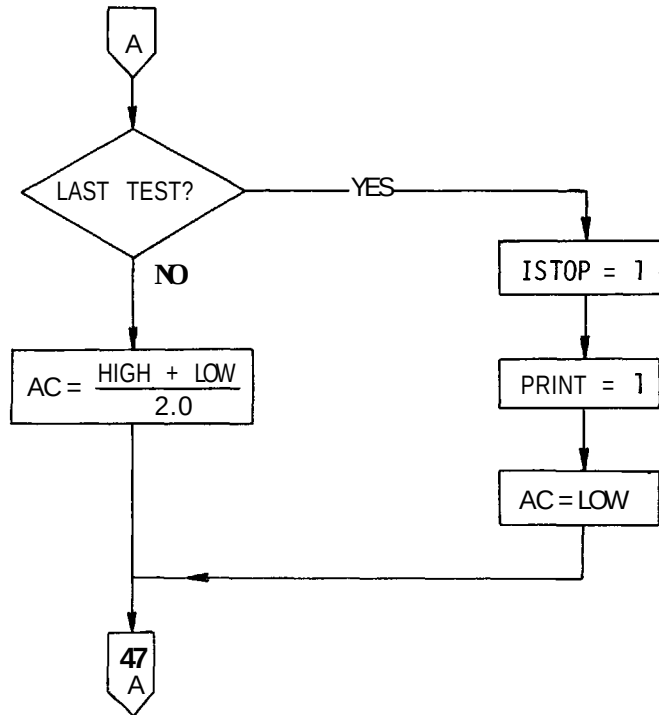
APPENDIX

SIMAC General Logic Flow Chart









The mission of the PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION is to provide the knowledge, technology, and alternatives for present and future protection, management, and use of forest, range, and related environments.

Within this overall mission, the Station conducts and stimulates research to facilitate and to accelerate progress toward the following goals:

1. Providing safe and efficient technology for inventory, protection, and use of resources.
2. Development and evaluation of alternative methods and levels of resource management.
3. Achievement of optimum sustained resource productivity consistent with maintaining a high quality forest environment.

The area of research encompasses Oregon, Washington, Alaska, and, in some cases, California, Hawaii, the Western States, and the Nation. Results of the research will be made available promptly. Project headquarters are at:

Fairbanks, Alaska	Portland, Oregon
Juneau, Alaska	Olympia, Washington
Bend, Oregon	Seattle, Washington
Corvallis, Oregon	Wenatchee, Washington
La Grande, Oregon	



The FOREST SERVICE of the U. S. Department of Agriculture is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives — as directed by Congress -- to provide increasingly greater service to a growing Nation.