



CO-OP REDWOOD YIELD RESEARCH PROJECT

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CRYPTOS(I) - USER'S GUIDE

Cooperative Redwood Yield Project Timber
Output Simulator - Interactive Program

Version 3.0

by

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ABSTRACT

This research note provides instructions for using the interactive mode of the CRYPTOS computer program as it is currently being implemented on the University of California's PDP-11/70 computer system.

CONTENTS

- I. INTRODUCTION
- II. INPUT DATA FILES - STRUCTURE AND DEFINITION
- III. INITIALIZATION COMMANDS AND PROGRAM DEFAULTS
- IV. MAIN PROGRAM COMMANDS
- V. GROWING STANDS
- VI. HARVESTING TREES
- VII. INGROWTH
- VIII. OUTPUT DEFINITIONS AND CONVENTIONS
- IX. MISCELLANEOUS NOTES
- X. AN ILLUSTRATIVE EXAMPLE

I. INTRODUCTION

CRYPTOS(I) is one of the major end results of the Redwood Yield Research Cooperative. It is an interactive computer program written in standard Fortran IV and can be compiled with the f4p Fortran compiler. It is designed to simulate growth and harvests of single acre representations of forest stands found in the north coastal region of California. In essence, it is more than the "conventional simulator" which usually starts with some "average" hypothetical initial state and simulates system operation under "average" conditions. True, this program can be used for situations such as this where the initial state is "created" by the interactive program GENR (see Research Note No. 17).

However, this program will allow the user to provide a description of an initial starting state that may be the analogue of an actual 'on-the-ground' stand. Also, if prior information on stand development is available, it can be used to calibrate the program so that the initial projections of stand development conforms to what is already known about the stand. The design and architecture of the internal workings of the computer model are documented in Research Note No. 15 (Krumland and Wensel, 1980)

The program is organized into three distinct parts:

- (1) Reading in the initial stand description
- (2) Specifying initialization procedures (optional altering of program default values)
- (3) Projecting growth and harvests

The program responds to commands which consist of two letters.

NOTE: After typing in commands or any subsequent information requested by the computer, the "return" key must be pressed to signify the end of information.

II. INPUT DATA FILES - STRUCTURE AND DEFINITION

The first thing the program will request is an input fileset number. This number is between 1 and 15, and may not be 4 through 10 (i.e. 1-3 and 11-15. Fileset 5 is the standard input {keyboard}, fileset 6 is the output {screen}, and the remainder are used internally by the program.). Under the UNIX operating system of the U.C. Computer Center where the program is currently implemented (PDP-11/70 computer), this will imply that your input data file resides on a file called forxxx.dat where 'xxx' is the input fileset number (For example if the input fileset number is 2, this would indicate that the input data is on a file called for002.dat). Your data file is presumed to have the following structure:

Record(1) Stand identifier and tree record count (nrec) in format 10A2,I10. The stand identifier is composed of up to 20 alphanumeric characters.

- Record(2) 50 year base age site indices for (in this order) redwood, Douglas-fir, tanoak, and alder in format 4F5.0. Either the redwood and/or the Douglas-fir site index must be specified. Other site index values may be entered as zeros, in which case they will be estimated internally.
- Record(3) Breast high ages for redwood, Douglas-fir, tanoak, and alder in format 4F5.0. Zeros may be entered if the actual values are unknown or the species component is absent. (Age is a descriptive feature only and is not needed for the model to function.)
- Record(4-end) The 'nrec' tree records specified on record 1 follow. Each tree record has the following 5 items in format 5F8.3:

- 1) Species code (see below)
- 2) DBH in inches
- 3) Total height in feet
- 4) Live crown ratio (decimal fraction)
- 5) Per acre weight (i.e. the number of trees per acre represented by this tree record)

Species Codes - The following species codes are all that are permissible:

- 1 - young growth redwood
- 2 - " " Douglas-fir
- 3 - " " other conifers
- 4 - tanoak
- 5 - alder
- 6 - other hardwoods
- 7 - residual redwood
- 8 - other residual trees

The input file is rewound before any read operations if it is prefixed with a minus sign.

NOTE: - Version 3.0 of CRYPTOS has a maximum internal storage capacity for 200 tree records. If 'nrec' is greater than this amount, the program will abort.

As part of the initialization procedures, the program attempts to triple each tree record, reapportion the per acre weights, and assign percent deviations to each tree record. Details are documented in Research Note No. 15. The net effect of the storage limitation is that if there are more than about 65 initial tree records, the tripling process will not be completed in a reasonable manner. Experience has indicated that about 15 tree records per species (the GENR default) is usually satisfactory.

III. INITIALIZATION COMMANDS AND PROGRAM DEFAULTS

Once you have told the program where the data is (i.e. entered an input fileset number), you will be given a one time only opportunity to alter some program parameters. If you choose to do this, you will enter an initialization routine and be given a prompt which is:

initgo:

At this point, you may enter any of the following commands:

- pc This will print a list of permissible initialization commands and what they do in case you do not have this writeup with you.
- cm This will print and allow changes in the current minimum DBH used in computing summary statistics for cubic foot volumes, basal area, and average (quadratic mean) DBH. Default is 0.0 inches.
- ct This will print and allow changes in the merchantable top limit for cubic foot volume estimation. may be 5, 6, 7, or 8 inches. Default is 5 inches.

NOTE: In estimating cubic volumes, if the merchantable top is less than cubic foot minimum DBH, trees will have 0 volume assigned to them.

- bm Same as the 'cm' command, only it applies to board foot Scribner volumes only. Default is ~~11.0~~ 11.0 inches DBH.
- bt Same as the 'ct' command, only it applies to board foot merchantable tops. Default is ~~8.0~~ 8.0 inches.

NOTE: If the board foot merchantable top is greater than a tree's DBH, 0 volume will be assigned to it.

- sp This will allow you to combine species into several possible groups for summary reporting, The following code indicators are permissible:

- 0 Report by totals (all species combined).
- 1 (This is the default). No combining occurs. Reports will be for all the species codes that were indicated as being permissible in the input section.
- 2 Make two groups:
 - (1) Whitewoods - composed of all conifer species
 - (2) Hardwoods - composed of all hardwood species

3 Make three groups:

- (1) Redwoods - young growth and residual redwoods
- (2) Whitewoods - all other conifers
- (3) Hardwoods - all hardwoods

4 Make four groups:

- (1) Redwoods - young growth redwoods
- (2) Whitewoods - all other young growth conifers
- (3) Hardwoods - all hardwoods
- (4) Residuals - all residuals

In any event, totals are always reported.

fl Set print flag for non-existent species groups:

- 0 - Print a line of 0's if the species is not present.
- 1 - Do not print if the species is not present (default).

yf Set yield table flag. Unbeknownst to you, there is a gnome in this program who keeps track of everything that happens (i.e. it makes a yield table and harvest report). This flag refers to the way you want this information accumulated:

- 0 - by totals only
- 1 - by the same criteria as specified with the 'fl' and 'sp' options (default).

cl Modify calibration options. Calibration procedures are still experimental and a methodological internal adjustment based on past tree growth is currently unavailable in the program. However, a provisional ad hoc procedure can be used to effect basal area growth changes.

A.) you will initially be asked for a species adjustment code which have the following definitions.

- 1 apply adjustments to all species
- 2 adjustments for each young-growth species will be entered separately. (no adjustments are made for old-growth)

A larger integer in the range (3-9) will return you to the initialization shell

B.) You will next be asked to enter the adjustment mode which is either a

- 1 for straight percentage adjustment or

- 1 for straight percentage adjustment or
- 2 for adjustments based on tree DBH

Adjustments are all relative to the model norm, hence the default adjustment is 100%.

C.) If the adjustment mode is "1", you will be asked to enter a percent of normal growth for all species or for each species group individually depending on the species adjustment code. For example, if you wanted to increase the initial basal area growth by 12%, you would enter 1.12. (A blank or a zero growth adjustment is interpreted to mean 100% - or normal growth.)

If the growth adjustment mode is "2", you will be asked to enter a lower DBH (dl), an upper DBH (du), a percent adjustment for dl (pl), and a percent adjustment for du (pu). Percent growth adjustments are typed in as decimal fractions. Trees less than dl are assigned an adjustment of pl, and trees larger than du are assigned pu. Straight line interpolation is used for trees with DBH's between dl and du. Depressing the return key without entering any information effectively defaults the adjustment to 100%.

ex Return to the regular part of the program.

NOTE: If you happen to misspell a command, the program will respond with something equally unintelligible and mercifully allow you to try again.

IV. GROWING AND HARVESTING TREES - MAIN PROGRAM COMMANDS

Once your data file has been read in and initialization procedures are completed, you can now grow, harvest, and tailor the kinds of information resulting from these procedures to your own specifications. The possibilities are fairly obvious from the command descriptions. In the main program, the prompt is simply:

go:

- pc Print list of possible commands.
- pi Print initial stand description (stand identifier, site indices, and initial ages if they were supplied by species).
- pm Print cubic and board foot minimums and merchantable tops.
- dp Display the current status of your tree record file. You will be asked for a record skip (ISKIP) which will cause the program to only print every ISKIP tree record.

- st Print the current stand inventory (stock table indicating average DBH, stems/acre, basal area, cubic and board foot volumes by the species groups set by the 'sp' command.)
- cg Print most current five years growth.
- gr Grow the stand (see section V).
- ct Enter the harvesting routine (see section VI).
- dt Print graphs of the current diameter distribution. Immediately after this command you will be asked for the species code and a group indicator (2 digits in format 2I1):
- (a) If the group indicator is '0' or blank, the species code is presumed to refer to the species listed as permissible in the input data file.
 - (b) If the group indicator is '1' (or anything else), the species code indicates the condensed groups set by the 'sp' command.
 - (c) A species code of 0 will result in a graph of all species combined irregardless of the group indicator.
- pf This command behaves like the 'dt' command but instead of graphing the diameter distribution, it will display the average height and crown size by diameter class pictorially. Try it, you'll like it.
- et Print the simulated elapsed time since you installed your stand.
- sv Internally save the current state of the stand (useful if you might want to try several possible harvests and don't want to have to start all over). Only one stand state can be in saved status at any time.
- rt Internally restore a stand previously saved. If this command is executed, you have the opportunity to save the harvest and yield report for the stand up to the current elapsed time before the stand is restored to a previous state.
- yd Print the current yield table and harvest report for the stand up to its present state.
- cf Change the output fileset number. Initially, the output fileset in the screen (i.e. No. 6). If you want to store any information on some other fileset for later transfer to hardcopy for future reference, you can temporarily accomplish this with the 'cf' command.
- NOTE: Fileset numbers 4 through 10 are used by the program. Very strange things will happen if you attempt to use them.
- ns Start all over with a new stand. As with the 'rt' command, you have the opportunity to save the harvest and yield report for the current stand before this is done.

- os Remove any stand in internal saved status and truncate the yield table so that the current stand state is the first entry in the yield table. This command is useful if, for example, you are no longer interested in the first 20-50 years of simulation and get tired of printing out the entire yield table everytime you want to observe the results of a harvest.
- sc Print the species group code indicator and species groups.
- es Externally save the current stand status. You will be asked for a fileset number, and the pertinent stand and tree information will be written in standard CRYPTOS formats. You can subsequently use the 'ns' command to restore this stand. Stands 'saved' by this command are flagged by placing '100' in columns (70-72) of the first input record. This flag indicates to the program that the absolute height and basal area growth adjustments (user calibration factors x the program pseudo-stochastic assignments) are also preserved in the input file. If you restore such a stand, you will be given an opportunity to preserve these factors. This option is recommended because externally saved tree files have three times the number of tree records as the original file. If this option is bypassed, they will once again be tripled.
- ex Quit the program. The program will tell you on which file (9 or 10) the latest harvest and yield report resides.

V. GROWING TREES - the 'gr' command

After a 'gr' command, the computer will ask for 3 items:

- (1) Number of cycles: this is the number of 5 year periods for which growth is to be simulated.
- (2) Tree detail code:
 - 0 - ignored and no tree growth detail displayed.
 - 1 to 9 - functions as a skip increment in printing out individual tree growth detail (this is primarily the remains of debugging statements).
- (3) Summary code:
 - 0 - ignored
 - 1 - a summary of 5 year growth by the species groups specified by the 'sp' command option is printed every cycle.
 - 2 - summary for totals only.

NOTE: If the number of 5 year cycles is entered prefixed by a minus sign (e.g. -2), this will function to turn off the mortality estimates for the given number of growth cycles. Hence if, for example, you feel that after a simulated harvest, all mortality for the next 10 years is captured, and after that, mortality should proceed "as usual", then you initially execute the 'gr' command with the

number of cycles equal to "-2", and after that, whatever positive number of cycles you want.

VI. HARVESTING TREES - the 'ct' command

If the 'ct' command is executed, the program will enter a harvesting routine. The routine will initially request a label that will be printed in the harvest and yield report (see example in section X.) The purpose of the label is for the user to document the type of harvest operation that s/he specified. The prompt in this routine is:

cutgo:

The following commands can be executed:

- pc Print list of possible harvesting routine commands and functions.
- dt Print frequency diagrams (same as in main program).
- pf Graph heights and crowns (same as in main program)
- st Print the current stand summary (same as in main program).
- ra harvest some trees. The program will then ask you for a harvest prescription. You will be asked to input numerical values of the following variables in a specified format:

- (a) lower DBH (dl)
- (b) upper DBH (du)
- (c) percent of lower (pl)
- (d) percent of upper (pu)
- (e) species flag
- (f) species list

The species flag can have the following values and functions:

- 0 - (or blank). In this case, harvests will be made irrespective of species. No species list is required.
- 1 - Species definitions will apply to the species input list.
- 2 - Species definitions will apply to the species group definitions set by the 'sp' command.

If the species flag is 1 or 2, it must be followed by a list of species codes or species group codes that are to be harvested.

The program then sorts through the tree records and ignores trees if they are not the appropriate species. If they qualify, the next sequence of events follow:

- (a) if the tree diameter 'd' is between 'du' and 'dl', its per acre weight is reduced by the factor 'x' where:

$$x = pl - \{(d-dl)/(du - dl)\}(pl - pu)$$

Hence, if $d = 12.0$, $du = 18.0$, $dl = 6.0$, $pu = 0.2$, and $pl = 0.3$, then:

$$x = 0.3 - \{(12 - 6)/(18 - 6)\}(0.3 - 0.2) = 0.5$$

and .5 times the tree record's contributions to volume, basal area, etc. would be cumulated as harvests.

(b) if 'd' is less than 'dl', and 'dl' was entered prefixed by a minus sign, all of it would be removed. The same thing happens if 'd' is greater than 'du' and 'du' is prefixed with a minus sign.

(c) otherwise, the tree record is not altered.

NOTE: Several 'rm' commands can be executed successively so there is considerable flexibility in coding harvests.

ch Print cumulative harvests since you entered the harvesting routine.

ih The first time this is executed, it behaves as a 'ch' command. The next time it is executed, it prints the harvests that have occurred since the last time the 'ih' command was executed.

ex Allows you to return to the main program.

VII. INGROWTH

CRYPTOS makes no special provisions for ingrowth. The presumption is that the initial tree input list contains representations of all stems in the stand down to about 15 feet tall and 2 inches DBH. Stands with substantial components smaller than this may not work well in this model.

If you wish to add more trees to your stand at some point in the simulation to represent, for instance, sapling reproduction 10 to 15 years after a heavy harvest, this is accomplished by the 'ig' command.

You will next be asked whether or not you want to enter the ingrowth trees from the keyboard (mode = 1), or from a fileset (mode = 2).

Keyboard Ingrowth Input

You will initially be asked the number of ingrowth tree records you wish to add to your stand file in format I2.

For each tree record you will be asked to enter 6 items with the conventions for the first 5 items (species, DBH, total height, crown ratio, per acre weight) being the same as the "regular" tree record input list. The sixth item is the calibration factor (percent of normal

growth). If this value is zero (or blank), normal growth is assumed. Otherwise, it behaves like the adjustment factor described under the calibration options.

Fileset Ingrowth Inout

You will initially be asked the fileset number (between 1-3 and 11-15) on which your information resides. The file is rewound if the fileset number is prefixed by a minus sign. The first line on this file has the number of ingrowth tree records (IGREC) in format I5 (you may use the rest of the line as an external label). This is followed by an ingrowth tree record list with the same conventions as the regular list except that there are 6 fields in format F8.3 instead of 5. The last field is for the tree basal area growth calibration factor. If it is zero (or blank), normal growth is assumed. Otherwise it will be what is in the field.

VIII. OUTPUT DEFINITIONS

In interpreting the output of CRYPTOS(I), captions are somewhat terse for the sake of presenting concise summaries. The following is a list of caption definitions:

et Elapsed time in years since the start of the projection.

dbar Average stand quadratic mean DBH in inches.

basar Basal area per acre in square feet.

cfvol Cubic foot volume per acre in thousands.

bdvol Board foot volume per acre in thousands.

tpa Stems per acre.

bagro Five year basal area growth per acre in square feet.

cvgro Five year cubic foot volume growth per acre in thousands.

bdgro Five year board foot volume growth per acre in thousands.

The following items apply to individual trees if lists are requested.

sp species code

sg species group

dbn tree diameter at breast height in inches

ht total height in feet
cr crown ratio expressed as a decimal fraction
exp tree weight (expansion factor) on a per acre basis
dgro current five year DBH growth in inches
hgro current five year total height growth in feet
hcal absolute fraction of normal height growth
dcal absolute fraction of normal basal area growth

IX. MISCELLANEOUS NOTES

- 1) All growth estimates are net figures (gross growth minus mortality) and include trees that are part of the internal tree list that grow into the size classes specified by the 'cm' and 'bm' program options.
- 2) Lumpiness in periodic growth trends is due to the conventions listed in '1' above and the discrete nature of the growth projection (growth is based on a finite number of trees).
- 3) If the input fileset number is typed in immediately followed (in field 4) by a digit in the range of 1-9, all introductory messages and initialization options are bypassed. Strict program defaults are utilized and you are passed immediately to the simulation start.
- 4) Harvest statistics are computed as the difference between before and after cut stand summaries. Hence, a negative harvest 'dbar' is indicative of a cut induced increase in average stand DBH.
- 5) Young growth volume equations are applied to old growth trees. Panoak volume equations are used for the "other hardwood" group.
- 6) Species codes are initially truncated to be 'real number' representations of integers in the range of 1-3. Tree records outside this range are deleted from the tree list on input.

X. AN ILLUSTRATIVE EXAMPLE

This section contains an illustrative example of using the program. Circled items were typed in on the keyboard. Free hand script incircled by boxes is intended to be a commentary on program events.

% (main.out)

INVOKE PROGRAM

WELCOME TO CRYPTOS
INITIALIZATION PROCEDURES

enter input file no. (13) 001

DATA IS ON FILE 1

In this program, if the computer is waiting for a command it will give you a prompt that is
go: If you are in the main program
initgo: If you are in the initialization routine
cutgo: If you are in the cutting routine

A list of commands can be obtained by typing pc. but first, do you want to change any of the initial (default) control options? (1 = yes, 2 = no) 2

DEFAULT SUMMARY OPTIONS

And here we go (current output file is 6 (the screen))

go (st)

PRINT CURRENT INVENTORY

STOCK TABLE

elapsed time = 0. years

species	dbar	tpa	basar	cfvol	bdvol
redwds	8.23	175.	64.7	0.90	2.57
dougfir	7.25	125.	35.9	0.62	1.35
totals	7.34	300.	100.5	1.52	3.92

go (pi)

INITIAL DESCRIPTION

Initial Description
stand label = Illustrative Stand
rdwd dougfir tanoak alder
sites 115. 115. 74. 95.
ages 20. 20. 18. 20.

go (gr)

30 YEAR PROJECTION

enter no. 5 year cycles, tree detail code, and summary code (i2,2i1)

go (sv)

"SAVE" the STAND AT THIS POINT

go (gr)

enter no. 5 year cycles, tree detail code, and summary code (i2,2i1)

10

PROJECT FOR 50 MORE YRS

go (yd)

PRINT YIELD TABLE

YIELD SUMMARY

stand label = Illustrative Stand

redwood site 115. init. age 20.
 doug fir site 115. init. age 20.

species	et	dbar	tpa	basar	cfvol	bdvol	bagro	cvgro	bdgro
redwds	0.	8.23	175.0	64.7	0.90	2.57	0.0	0.00	0.00
dougfr	0.	7.25	125.0	35.9	0.62	1.35	0.0	0.00	0.00
totals	0.	7.84	300.0	100.5	1.52	3.92	0.0	0.00	0.00
redwds	5.	9.17	170.1	77.9	1.30	4.26	13.3	0.40	1.70
dougfr	5.	8.51	113.8	47.0	0.99	2.97	11.1	0.37	1.62
totals	5.	8.90	283.9	124.9	2.30	7.23	24.4	0.77	3.31
redwds	10.	10.04	165.9	91.1	1.77	6.27	13.2	0.46	2.01
dougfr	10.	9.64	113.7	57.7	1.46	5.04	10.7	0.47	2.07
totals	10.	9.83	279.6	148.8	3.23	11.31	23.9	0.93	4.03
redwds	15.	10.84	162.4	104.0	2.29	8.91	12.8	0.52	2.64
dougfr	15.	10.64	109.3	67.4	1.94	7.39	9.8	0.43	2.35
totals	15.	10.76	271.6	171.4	4.23	16.30	22.6	1.00	4.99
redwds	20.	11.58	153.3	116.5	2.84	11.75	12.6	0.55	2.84
dougfr	20.	11.53	105.4	76.4	2.46	10.23	9.0	0.52	2.34
totals	20.	11.56	264.7	193.0	5.31	21.98	21.5	1.08	5.68
redwds	25.	12.28	156.6	128.9	3.43	14.93	12.3	0.53	3.18
dougfr	25.	12.33	102.0	84.7	2.98	13.21	8.3	0.52	2.98
totals	25.	12.30	258.7	213.5	6.41	28.14	20.6	1.10	6.16
redwds	30.	12.94	154.3	141.0	4.06	18.63	12.1	0.64	3.69
dougfr	30.	13.08	99.0	92.4	3.51	16.42	7.7	0.53	3.21
totals	30.	13.00	253.3	233.4	7.57	35.05	19.9	1.16	6.90
redwds	35.	13.57	152.3	153.0	4.70	22.49	11.9	0.64	3.86
dougfr	35.	13.78	96.3	99.7	4.04	20.11	7.3	0.53	3.69
totals	35.	13.65	248.5	252.7	8.74	42.60	19.2	1.17	7.55
redwds	40.	14.17	150.4	164.8	5.36	26.53	11.8	0.66	4.04
dougfr	40.	14.44	93.8	106.6	4.57	23.59	6.9	0.53	3.43
totals	40.	14.27	244.2	271.4	9.93	50.12	18.7	1.19	7.52
redwds	45.	14.74	148.8	176.4	6.04	30.89	11.6	0.68	4.36
dougfr	45.	15.06	91.5	113.2	5.10	27.16	6.6	0.54	3.57
totals	45.	14.87	240.3	289.6	11.15	58.05	18.2	1.22	7.93
redwds	50.	15.24	147.3	187.9	6.74	35.43	11.5	0.69	4.54
dougfr	50.	15.66	89.4	119.5	5.62	30.79	6.3	0.51	3.63
totals	50.	15.43	236.7	307.4	12.35	66.22	17.8	1.20	8.17
redwds	55.	15.82	145.9	199.3	7.44	40.43	11.4	0.70	5.00
dougfr	55.	16.23	87.4	125.6	6.12	34.44	6.0	0.50	3.65
totals	55.	15.97	233.4	324.8	13.56	74.88	17.4	1.20	8.66
redwds	60.	16.33	144.7	210.5	8.15	45.36	11.2	0.71	4.92
dougfr	60.	16.77	85.6	131.3	6.61	38.09	5.8	0.49	3.65
totals	60.	16.50	230.3	341.8	14.76	83.45	17.0	1.20	8.57
redwds	65.	16.82	143.6	221.6	8.86	50.53	11.1	0.72	5.18
dougfr	65.	17.29	34.0	136.9	7.08	41.75	5.6	0.48	3.65
totals	65.	17.00	227.5	358.5	15.95	92.29	16.7	1.19	8.84
redwds	70.	17.30	142.5	232.5	9.59	55.76	11.0	0.72	5.22
dougfr	70.	17.79	32.4	142.3	7.54	45.34	5.4	0.46	3.58
totals	70.	17.43	224.9	374.8	17.13	101.09	16.3	1.18	8.81
redwds	75.	17.75	141.6	243.4	10.31	61.11	10.8	0.72	5.35
dougfr	75.	18.28	30.9	147.4	7.99	48.86	5.2	0.44	3.53
totals	75.	17.95	222.5	390.8	18.30	109.97	16.0	1.17	8.88
redwds	80.	18.20	140.7	254.1	11.04	66.78	10.7	0.73	5.66
dougfr	80.	18.74	79.5	152.4	8.42	52.31	5.0	0.43	3.45
totals	80.	18.40	220.2	406.4	19.45	119.09	15.7	1.15	9.11

go (rt)

Do you want to save the yield table for the old stand? (1 = yes) (2)

RESTORE STAND TO 30 YEARS

NO SAVE

go (et)

elapsed time = 30. years

go (os)

TRUNCATE THE YIELD TABLE

go (ct)

HARVEST ROUTINE - enter harvest label (up to 40 chars)
train from below

ENTER HARVEST ROUTINE

cutgo (dt)

enter species code (0 for all species)
and species group indicator (blank is default) - 2i1 (0)

PRINT ENTIRE STAND DBH DISTRIBUTION

species = All Species

dbh trees		15	30	45	60
0 - 2	0.				
2 - 4	6.				
4 - 6	22.				
6 - 8	33.				
8 - 10	41.				
10-12	31.				
12-14	35.				
14-16	30.				
16-18	23.				
18-20	15.				
20-22	8.				
22-24	8.				
24-26	2.				
26-28	0.				

total	253.				

cutgo (pf)

enter species code (0 for all species)
and species group indicator (blank is default) - 2i1 (1)

PLOT AVERAGE HEIGHT AND CROWN SIZE FOR REDWOOD

species = Redwoods

DBH Trees		feet above ground											
		24	48	72	96	120	144	168	192	216	240		
0 - 2	0.												
2 - 4	4.	=====>>>											
4 - 6	16.	=====>>>>>											
6 - 8	19.	=====>>>>>>											
8 - 10	28.	=====>>>>>>>											
10-12	20.	=====>>>>>>>>											
12-14	15.	=====>>>>>>>>>											
14-16	22.	=====>>>>>>>>>>											
16-18	10.	=====>>>>>>>>>											
18-20	3.	=====>>>>>>>>>>>											
20-22	5.	=====>>>>>>>>>>>>											
22-24	5.	=====>>>>>>>>>>>>>											
24-26	2.	=====>>>>>>>>>>>>>>											
26-28	0.												

total	154.												

cutgo (pf)

enter species code (0 for all species)
and species group indicator (blank is default) - 2i1 (2)

SAME FOR DOUGLAS FIR

species = Douglas-fir

species = Douglas-fir

DBH	Trees	feet above ground									
		24	48	72	96	120	144	168	192	216	240
0 - 2	0.									
2 - 4	2.	=====>>									
4 - 6	6.	=====>>>>									
6 - 8	14.	=====>>>>>>>									
8 - 10	13.	=====>>>>>>>>>									
10-12	11.	=====>>>>>>>>>>									
12-14	20.	=====>>>>>>>>>>>									
14-16	8.	=====>>>>>>>>>>>									
16-18	13.	=====>>>>>>>>>>>									
18-20	7.	=====>>>>>>>>>>>									
20-22	3.	=====>>>>>>>>>>>									
22-24	2.	=====>>>>>>>>>>>									
total	99.										

cutgo:rn
enter d1, du, pl, nu, species I.D. and species list(opt.) (4f4.0,i1,9i1)

0.0010.01.001.00

cutgo(ch)

REMOVE ALL TREES
LESS THAN 10" DBH

CUMULATIVE HARVESTS

elapsed time = 30. years

species	dbar	tpa	basar	cfvol	bdvol
redwds	-2.99	67.	19.6	0.42	1.06
dougfr	-2.19	35.	10.7	0.36	0.91
totals	-2.66	101.	30.3	0.78	1.97

PRINT HARVESTS

cutgo(ex)

EXIT HARVEST ROUTINE

go:gr
enter no. 5 year cycles, tree detail code, and summary code (i2,2i1)

-2

GROW FOR 10YRS - NO MORTALITY

go:gr
enter no. 5 year cycles, tree detail code, and summary code (i2,2i1)

3

GROW FOR 40 MORE YEARS

go(st)

STOCK TABLE

elapsed time = 30. years

species	dbar	tpa	basar	cfvol	bdvol
redwds	21.91	86.	224.9	10.17	63.64
dougfr	22.22	59.	157.6	8.65	52.35
totals	22.04	144.	382.5	18.82	113.99

PRINT FINAL
INVENTORY

go(yd)

PRINT YIELD TABLE

YIELD SUMMARY

stand label = Illustrative Stand

redwood site 115. init. age 20.
doug fir site 115. init. age 20.

species	et	dbar	tpa	basar	cfvol	bdvol	bagro	cvgro	bdgro
redwds	30.	12.94	154.3	141.0	4.06	18.65	0.0	0.00	0.00
dougfr	30.	13.03	99.0	92.4	3.51	16.42	0.0	0.00	0.00
totals	30.	13.00	253.3	233.4	7.57	35.05	0.0	0.00	0.00

HARVESTS : thin from below

redwds	30.	-2.93	66.6	19.6	0.42	1.06			
dougfr	30.	-2.19	34.3	10.7	0.36	0.91			
totals	30.	-2.66	101.4	30.3	0.78	1.97			

STAND AFTER HARVEST

redwds	30.	15.93	87.7	121.4	3.64	17.57	0.0	0.00	0.00
dougfr	30.	15.28	64.2	81.7	3.15	15.51	0.0	0.00	0.00
totals	30.	15.66	151.9	203.1	6.79	33.07	0.0	0.00	0.00
redwds	35.	16.65	87.7	132.6	4.24	21.26	11.2	0.60	3.70
dougfr	35.	16.13	64.2	91.8	3.76	19.29	10.1	0.61	3.73
totals	35.	16.46	151.9	224.4	8.00	40.56	21.3	1.21	7.43
redwds	40.	17.33	87.7	143.6	4.86	25.23	11.1	0.62	3.97
dougfr	40.	17.03	64.2	101.6	4.38	23.34	9.8	0.62	4.04
totals	40.	17.20	151.9	245.2	9.24	48.57	20.3	1.24	3.02
redwds	45.	17.99	87.4	154.1	5.49	29.39	10.5	0.63	4.15
dougfr	45.	17.83	63.3	109.6	4.95	27.24	8.0	0.57	3.90
totals	45.	17.92	150.6	263.8	10.43	56.63	18.5	1.19	8.05
redwds	50.	18.61	87.1	164.5	6.13	33.76	10.4	0.64	4.33
dougfr	50.	18.57	62.4	117.4	5.51	31.24	7.7	0.56	4.00
totals	50.	18.60	149.5	281.9	11.64	65.00	18.1	1.21	8.33
redwds	55.	19.21	86.8	174.8	6.78	38.34	10.3	0.65	4.58
dougfr	55.	19.27	61.6	124.3	6.07	35.30	7.4	0.56	4.06
totals	55.	19.24	148.4	299.6	12.85	73.64	17.7	1.21	8.64
redwds	60.	19.79	86.6	185.0	7.45	43.11	10.2	0.66	4.76
dougfr	60.	19.93	60.9	131.9	6.61	39.37	7.1	0.55	4.08
totals	60.	19.85	147.5	316.9	14.06	82.48	17.3	1.21	8.84
redwds	65.	20.35	86.4	195.1	8.12	48.04	10.1	0.67	4.93
dougfr	65.	20.55	60.2	138.7	7.15	43.44	6.8	0.53	4.07
totals	65.	20.43	146.6	333.8	15.27	91.43	16.9	1.21	9.00
redwds	70.	20.88	86.2	205.1	8.80	53.11	10.0	0.68	5.07
dougfr	70.	21.14	59.6	145.3	7.66	47.48	6.6	0.52	4.04
totals	70.	20.99	145.8	350.4	16.46	100.58	16.6	1.20	9.11
redwds	75.	21.40	86.1	215.1	9.48	58.31	9.9	0.68	5.21
dougfr	75.	21.63	59.0	151.6	8.17	51.46	6.3	0.50	3.98
totals	75.	21.52	145.1	366.6	17.65	109.77	16.2	1.19	9.19
redwds	80.	21.91	85.9	224.9	10.17	63.64	9.9	0.69	5.32
dougfr	80.	22.22	58.5	157.6	8.65	55.35	6.0	0.48	3.89
totals	80.	22.04	144.4	382.5	18.82	118.99	15.9	1.17	9.22

go ex

yield summary is on file 9

stop

EXIT PROGRAM