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The Timber Resource Inventory Model (TRIM):

A Projection Model for Timber Supply and Policy Analysis

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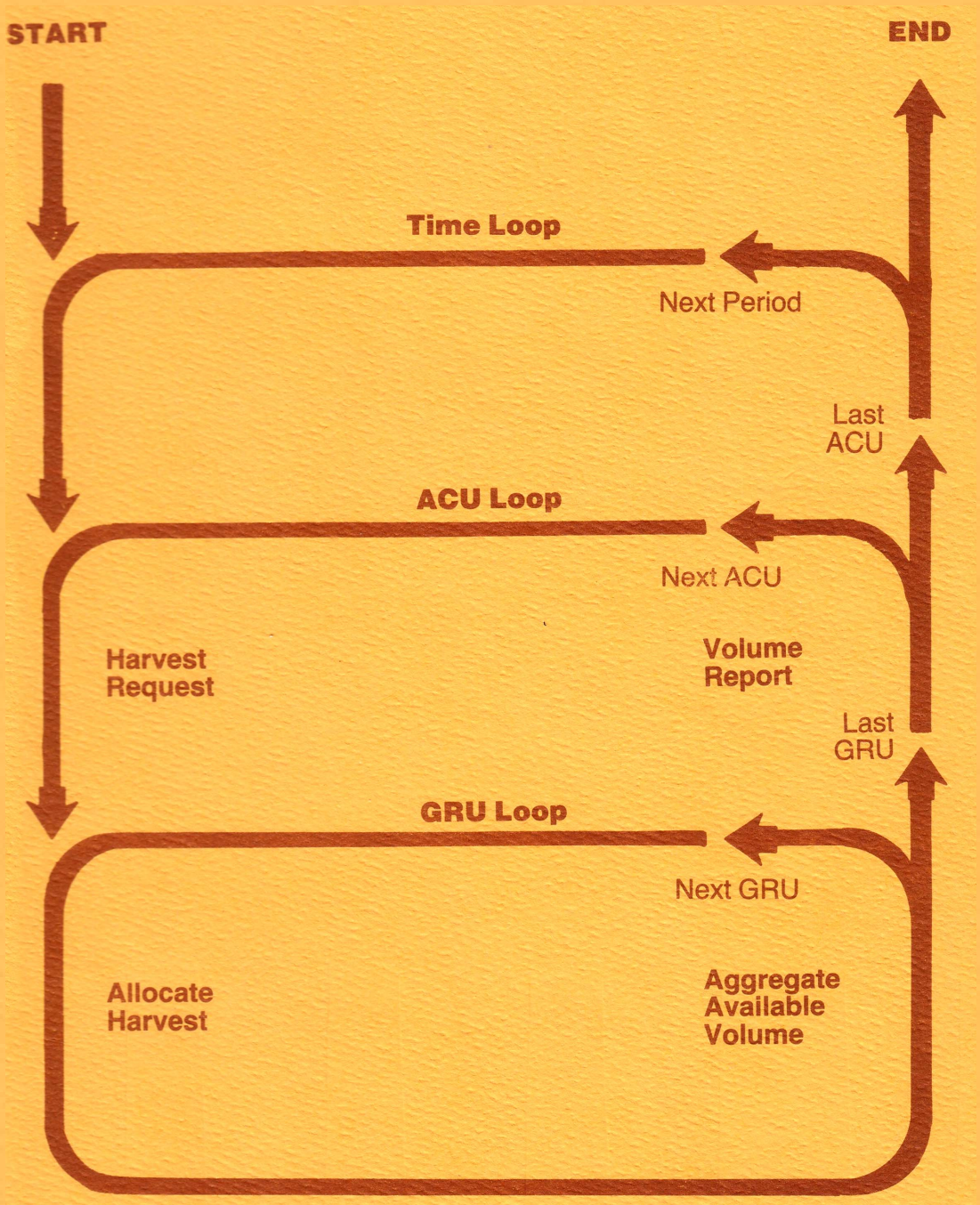

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Abstract

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TRIM (Timber Resource Inventory Model) is a yield table projection system developed for timber supply projections and policy analysis. TRIM simulates timber growth, inventories, management and area changes, and removals over the projection period. Programs in the TRIM system, card-by-card descriptions of required inputs, table formats, and sample results are presented. The programs are available from the Pacific Northwest Research Station.

Keywords: Computer programs/programing, models, timber inventory, timber supply, projections (supply/demand), simulation.

Contents

Introduction

The timber resource inventory model (TRIM) is a yield table projection system designed and developed to model forest inventory changes over time in response to different levels of management and to removals from either large or small forested areas.

TRIM is a series of four computer programs: BRUSCN processes the initial inventory; GRUSCN processes yield and management information; ACUSCN processes organization and removals information and appropriately matches the information produced by the first two programs; and the final program, TRIM, uses the computer data base file created in ACUSCN to simulate growth, yield, management changes, and removals over the length of the simulation.

TRIM requires data input at three levels: (1) initial inventory for BRUSCN; (2) yield and management for GRUSCN; and (3) organization and removals for ACUSCN. Figure 1 illustrates the three levels of input. The initial inventory is specified in a BRU (basic resource unit), which contains unstocked acres, donor acres, and timberland acres. In figure 1, there are six BRU's, each of which represents a different location and site. A GRU (grouped resource unit) provides the data necessary

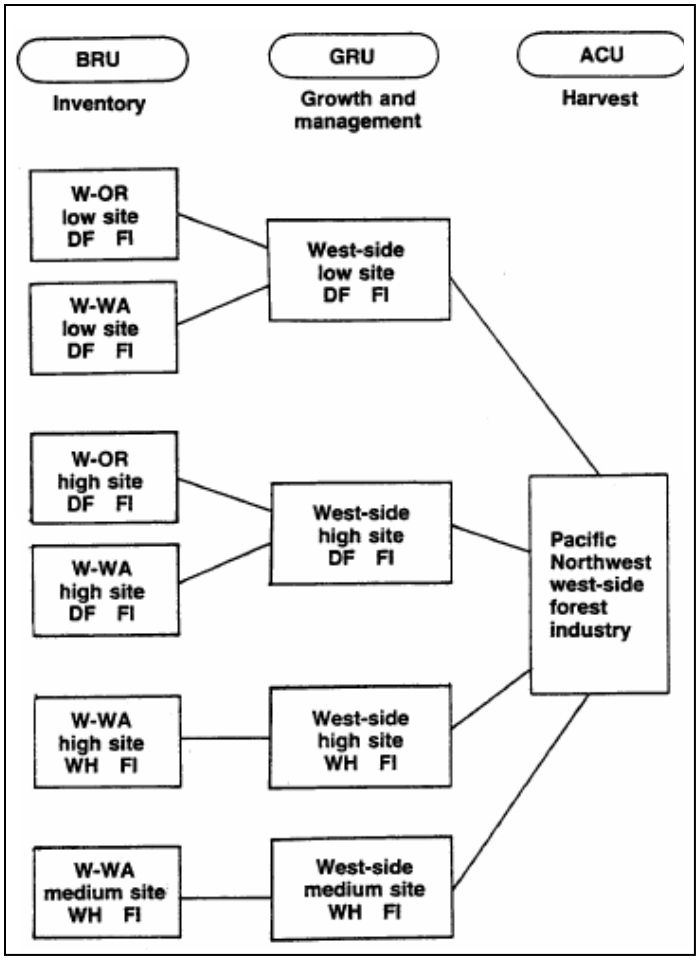

Figure 1—Example of BRU, GRU, and ACU aggregation.

to simulate yield and management for the initial inventory and for future inventtories. The GRU contains either one or a group of BRU's that are summed to provide a combined GRU-level inventory, which is the most detailed subdivision recognized by the TRIM program. After BRU's are summed into a GRU, further identification of the BRU is not possible. Growth and management options provided at the GRU level apply, as well, to this combined inventory. Some types of information needed for a GRU are the BRU membership list, volume yield tables by age class and management intensity, volume unit conversion factors, specifications for shifting acres to and from donors and among management intensities, treatment options (such as precommercial and commercial thinning and fertilization), regeneration options, and revenue and cost data for economic reports. In figure 1, the first two GRU's have two BRU's assigned to them; the last two GRU's have only one BRU each.

A collection of GRU's comprise an ACU (allowable cut unit). ACU information includes the GRU membership list, harvest requests, and labels for treatments, management intensities, sites, and species types. In figure 1, all four GRU's are grouped into the single ACU.

TRIM System Details

TRIM simulations can require large amounts of data as inputs. This possibility and the need for detailed checking for errors led to development of the three models, BRUSCN, GRUSCN, and ACUSCN. These three models are data processing programs that scan all input values, flag illegal or unusual values, provide default values automatically, and print compact reports. Figure 2 illustrates how each program processes its own data input and how it supplies the appropriate information for the next step in the process. At the BRU level, the initial inventory data is read by BRUSCN, is processed into a BRURAF (a RAF is a random access file), and is available when the ACUSCN model is run. At the GRU level, the management data is read by GRUSCN, is processed into a GRURAF, and is available when the ACUSCN model is run. As indicated by figure 2, the BRUSCN and GRUSCN models are run independently of each other. For example, if there is a mistake in one of the BRU's, GRUSCN would not have to be run again, just BRUSCN. Or, if you wanted to change yield tables in several GRU's, only a rerun of the GRUSCN model would be necessary. At the ACU level, harvest data are read by ACUSCN, are processed into another random access file called BIGRAF, and are ready for a TRIM run. If changes are made in a BRURAF or GRURAF or in the harvest data input for ACUSCN, ACUSCN would have to be run again. There are therefore, four computer runs that must be made to complete a TRIM simulation. If, however, data changes in only the harvest requests were made, only the ACUSCN and TRIM would need to be run again. In the course of making large simulations, alternate runs of any programs can create multiple data and RAF's on the computer. The TRIM system provides a date and time for efficient record keeping for all RAF's created with the four programs.

BRUSCN

The BRUSCN program (fig. 3) has a relatively simple structure. For each BRU, the program reads from file INVEN, prints, and checks the input data. It then computes inventory totals, writes the data on a random access file called BRURAF, and prints a compact report on file LIST. After all BRU's have been scanned, the program sorts the list of BRU's and their file locations into ascending order and writes the sorted list on BRURAF. The creation date and time, BRU count, and locations of

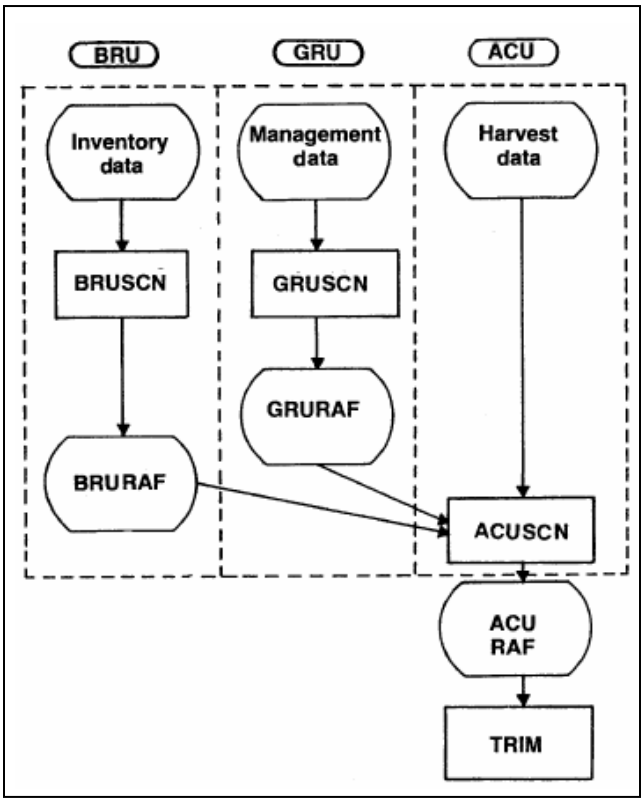

Figure 2—BRU, GRU, and ACU program file processing steps.

the list are written on the BRURAF key record. BRUSCN also prints the sorted BRU list. This output organization permits easy access by other programs. Appendix A contains a detailed synopsis of BRUSCN.

GRUSCN

The GRUSCN program (fig. 4) is quite similar in structure to BRUSCN. GRUSCN reads from file CONTROL, prints, checks input data for each GRU, provides default values, and cross-checks among sets of related data. One particularly convenient feature of GRUSCN is the fill value, a single value used to fill all unspecified entries of a sequence by period or age class. If a constant discount rate, for example, is required for all periods of the simulation, the fill value for the discount rate should be set to the selected value and the program will automatically use that value in the discount rate variable for all periods. A sequence of mortality volumes per acre could similarly be specified for age classes 0 to 4, and the fill value used to provide mortality volumes for all other age classes.

All specified and default values are written to a random access file called GRURAF. A compact report of all specified and default values are also written on a file called LIST that can be printed and inspected for errors. After all GRU's have been scanned, the program sorts the list of GRU's and their file locations, writes the sorted list and the key information on GRURAF, and prints the sorted GRU list. Appendix B contains a detailed synopsis of GRUSCN.

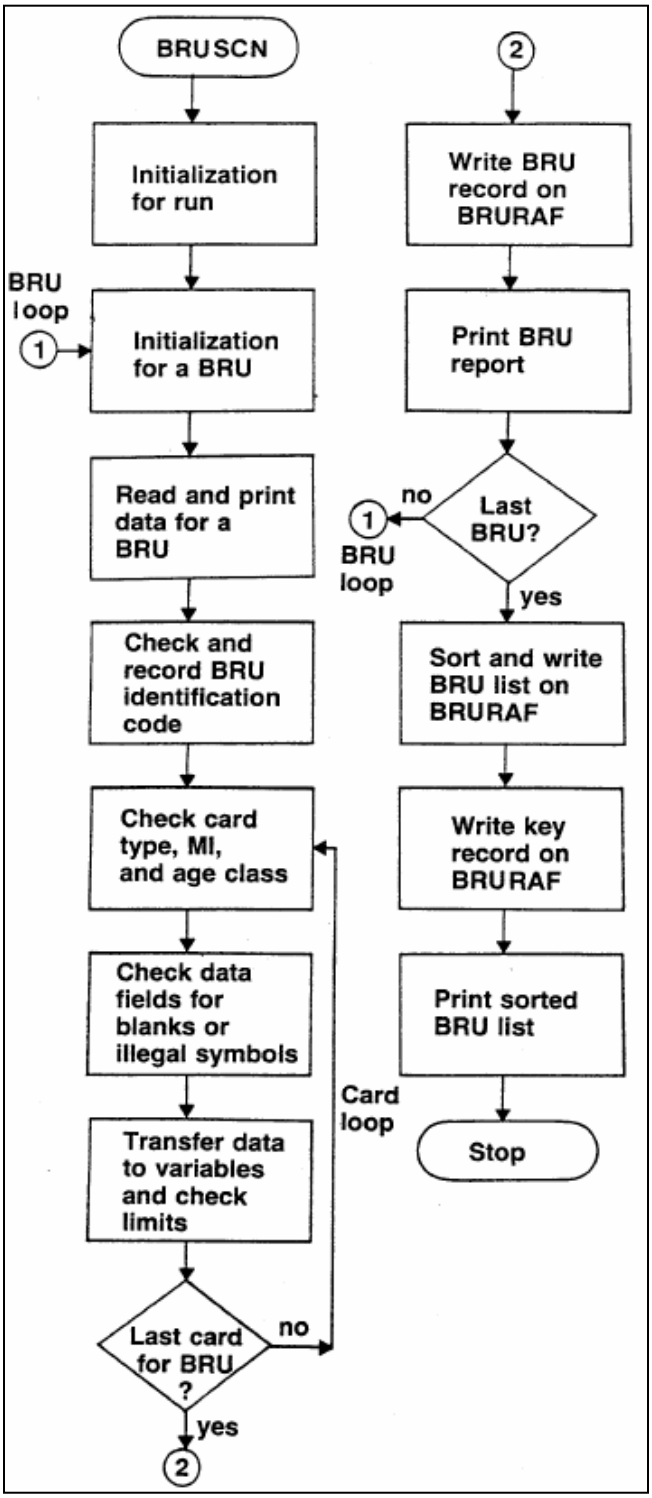

Figure 3—BRUSCN logical flow outline.

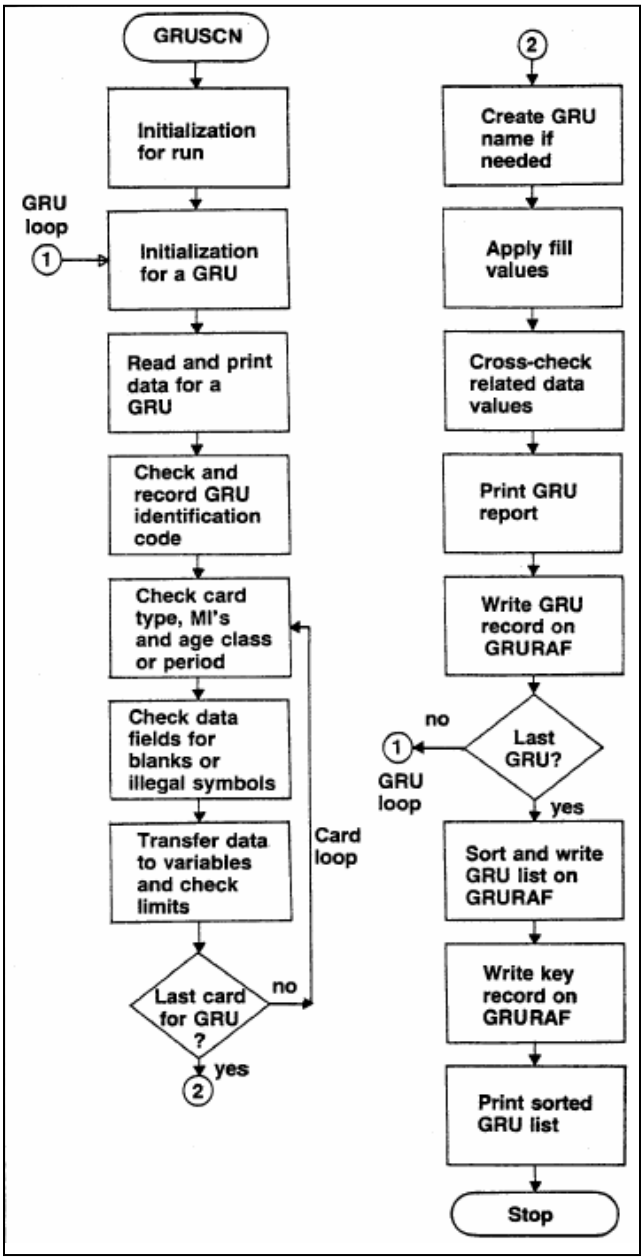

Figure 4—GRUSCN logical flow outline.

ACUSCN

The ACUSCN program (fig. 5) reads from file HEADER, prints, checks the general run information and the data for each ACU, and links the three levels of data. BRURAF and GRURAF must be provided to ACUSCN to accomplish this linkage. When the data for an ACU have been read, printed, and checked, ACUSCN uses the sorted GRU list to find the data for GRU's belonging to the ACU and uses the sorted BRU list to find the data for BRU's belonging to the GRU's. Inventory data are summed for BRU's and reported for each GRU. The GRU growth and management data and the summed inventory are written to a random access file called BIGRAF. After all GRU's in an ACU have been processed, ACUSCN writes the ACU data, which includes the file locations of its GRU's, to BIGRAF. The BIGRAF key record contains the general run information and the file locations of each ACU. ACUSCN prints a tree that shows the relationships of each ACU, GRU, and BRU. Besides the tree report, a report of the BRU's and GRU's and their usage in the simulation is provided. Appendix C contains a detailed synopsis of program ACUSCN.

TRIM

Program TRIM (fig. 6) uses the coordinated data on BIGRAF to perform the simulation requested. The accompanying flowchart shows the triple-loop structure of TRIM. The outer time loop is measured in periods and starts at time zero. The middle ACU loop reads ACU data from BIGRAF and sets summary variables to zero. The inner loop is where GRU's are processed. In period zero, the GRU data are read from BIGRAF, and the summary values, including the harvest from the previous period, are set to zero. This zero harvest is subtracted from the inventory. Cutover and unstocked acres are regenerated and land shifts are made to and from donors and among management intensities. The inventory is summed into report groups. Precommercial thinning and fertilization are done. Volume per acre and total volume are projected for the end of the period by using either the yield table or approach-to-normal-volume-growth methods described in card 30 of the card-by-card description section. Growth is calculated by subtracting volume after harvest and land base shifts from volume at the end of the period. The exogenous harvest (conversion, commercial thinning, and mortality salvage) are taken, the available harvest aggregated, and updated GRU information stored on a binary random access file called CURRAF. After all GRU's for an ACU have been processed in the GRU loop, the harvest proportions are assigned to each GRU and the ACU sums are stored on CURRAF. After all ACU's are processed in the ACU loop, the zero period is complete.

For subsequent periods, GRU data are read from both BIGRAF and CURRAF, and the harvest that was computed at the end of the previous period is subtracted from the inventory. The GRU detailed reports for the previous period are then written. At this point, the GRU loop retraces the path taken in the zero period; that is, land base shifts, inventory summing, precommercial thinning and fertilization, projection of new inventory, calculation of growth, exogenous harvest, available harvest aggregation, and storage of information on CURRAF.

The only added tasks in the ACU loop for subsequent periods are writing ACU detailed reports for the last period and storing ACU summary report information. Because the report writing occurs in the period after the GRU's were processed, the final period must produce two sets of reports and process the GRU's an additional time.

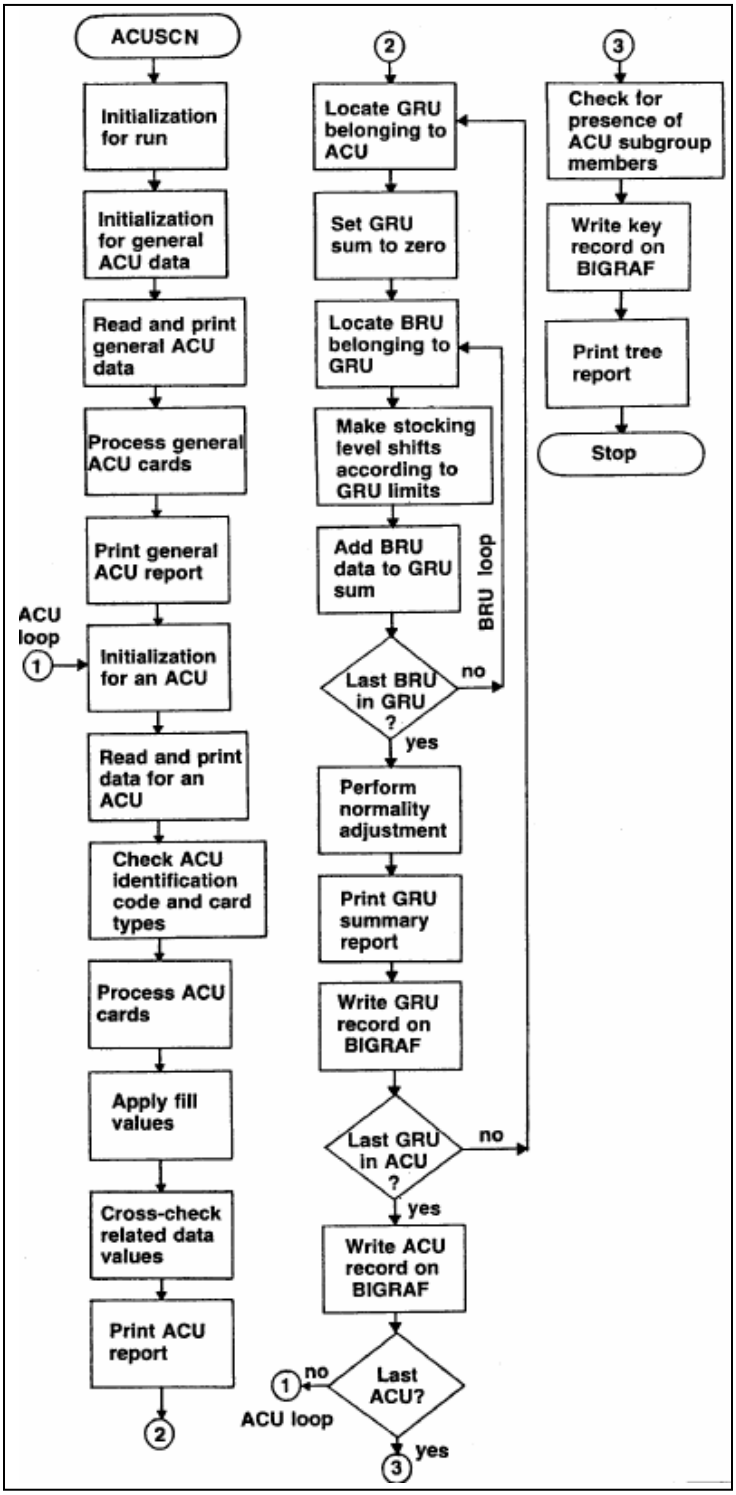

Figure 5—ACUSCN logical flow outline.

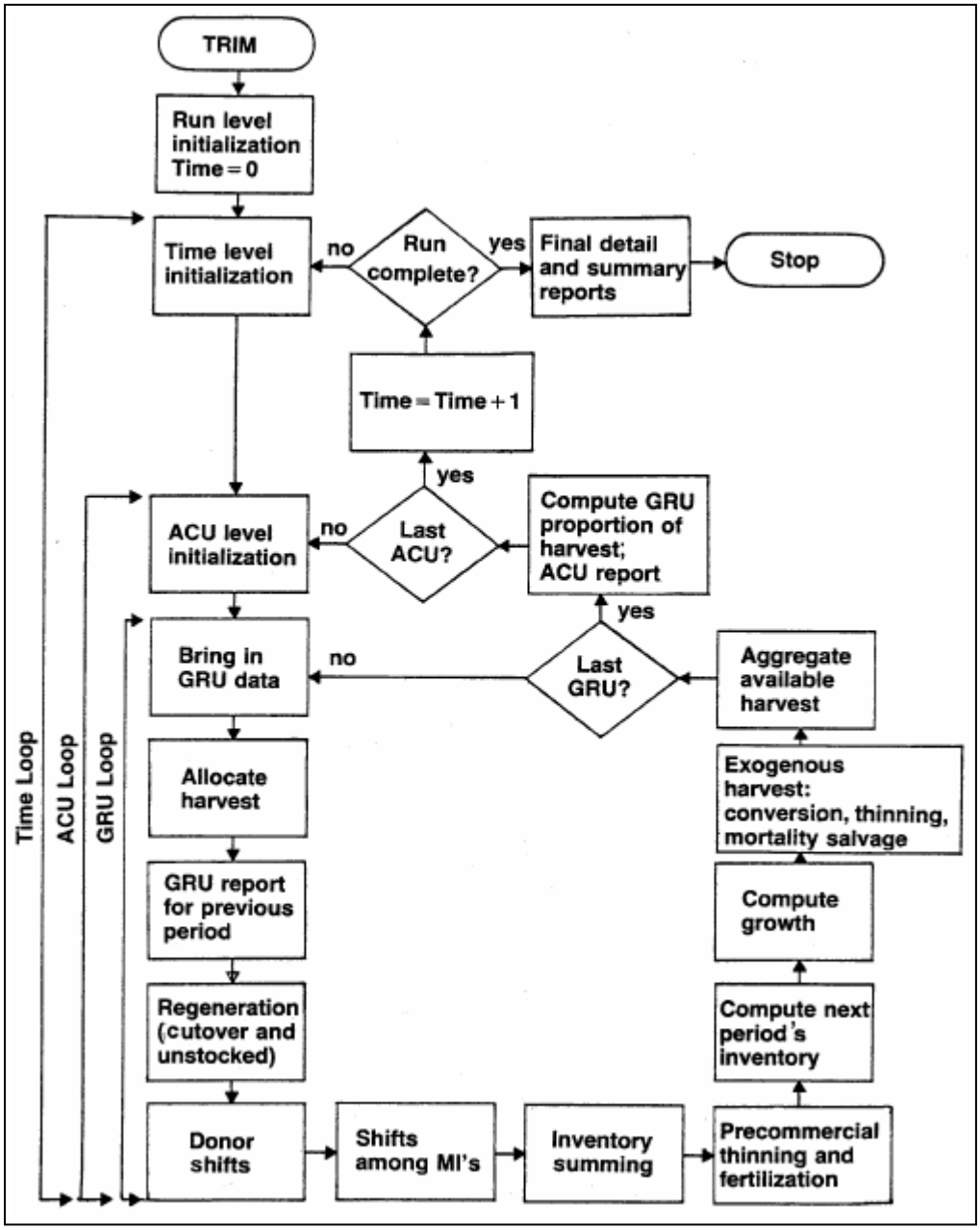

Figure 6—TRIM logical flow outline.

TRIM writes six types of reports with detailed and summary forms for each type.

1. The inventory report provides inventory acres, average diameter of the inventory, standing inventory volume after harvest (before growth), and growth volume. The detailed report breaks this information down by age class report group and management type (management intensity plus stocking level for management intensity 1). All volume is reported in the base volume measure.

2. The harvest report for the base yield provides harvested acres, average diameter of the harvest, and volumes for final harvest, commercial thinning, mortality salvage, and conversion. The detailed report breaks this information down by age class report group and management intensity.

3. Alternate volume measure report for inventory and harvest; if volume conversion factors are specified for GRU's, this report will generate reports 1 and 2 in the volume measure specified.

4. The regeneration/cultural treatment report provides regeneration acres from cut and unstocked sources and acres precommercially thinned, commercially thinned, and fertilized. The detailed report breaks this information down by management intensity, planting stock (regular and genetic), stand entry, and application.

5. The detailed economic report provides soil expectation values by management intensity and age class, regeneration costs by planting stock, and dollar values for cost, revenue, and net value by management intensity and seven treatment categories. The seven categories are regeneration, precommercial thinning, fertilization, commercial thinning, mortality salvage, final harvest, and total. Conversion is considered a final harvest. The summary economic report provides net dollar values for the seven categories.

6. The land shift report lists acres that move to and from donors and among management intensities. The detailed report lists (a) donor acres to and from the timberland inventory and the net change in acres for - donors and management intensities; (b) timberland acres for management intensity source and recipient; and (c) shifting results by management intensity and donor and by five categories. The five categories are starting area, net area change for donors, net area change for management intensities, total net area change, and ending acres. The summary report gives the ending acres for management intensities and donors.

Detailed reports are available for GRU's and ACU's. Summary reports are available for ACU's, ACU subgroups, and totals over all ACU's. Appendix D contains a detailed synopsis of program TRIM.

Procedure for Running the TRIM System

BRUSCN, GRUSCN, ACUSCN, and TRIM must be initially run in the listed order to complete a full simulation with the entire TRIM system. The following represents the procedure to follow.

BRUSCN

1. Ready input file. The formatted data file INVEN contains BRU's that will be used with the GRU's. The BRU identification must be the same as the membership list in the GRU's.

2. Execute BRUSCN.

3. Results of BRUSCN.

   A. Output file, screen display—this informs user of the program's progress and, if there were any errors, where they were detected during execution.

   B. Output file, BRURAF—this binary random access data file contains all processed BRUs. This file will be read by the ACUSCN program.

   C. Output file, LIST—this formatted output file contains the compact BRU-by-BRU reports. All error messages written by the program will appear immediately beneath the card image of each BRU.

   D. Output file, QUIZ—this file is only present if there are no errors detected in the run. This file can be used to communicate to the computer operating system that an error-free run occurred.

4. Analysis of BRUSCN results. The screen display and the QUIZ file will inform the user of the run results. If no errors are detected, the user can proceed to the GRUSCN or ACUSCN program. If errors are reported, the following outline should aid in debugging:

   A. Edit/print the LIST file. At the bottom of the file a compiled list of all BRU's is reported. Any BRU with an error will be flagged by an asterisk.

   B. Record the flagged BRU's and locate them in the upper portion of the file. The BRU's are processed sequentially in the same order as the INVEN file; for every BRU there is a report of the card images, errors (if any), and compiled data.

   C. The error messages will inform the user of the record number in the INVEN file, card type, and data field. Correct the error.

   D. Prior to rerunning BRUSCN, be sure to delete/remove unneeded output files, BRURAF, QUIZ, and LIST. RAF's with errors will cause error messages in the ACUSCN program.

   E. Rerun BRUSCN.

GRUSCN

1. Ready input file. The formatted data file CONTROL, contains GRU's that will be used with the ACU's. The GRU identification must be the same as the membership list in the ACU's.

2. Execute GRUSCN.

3. Results of GRUSCN.

A. Output file, screen display—informs user of the program's progress and, if there were any errors, where they were detected during execution.

B. Output file, GRURAF—binary random access data file contains all processed GRU's. This file will be read by the ACUSCN program.

C. Output file, LIST—formatted output file contains the compact GRU-by-GRU reports. All error messages written by the program will appear immediately beneath the card image of each GRU.

D. Output file, QUIZ—this file is only present if no errors are detected in the run. This file can be used to communicate to the computer operating system that an error free run occurred.

4. Analysis of GRUSCN results. The screen display and the QUIZ file will inform the user of the run results. If no errors are detected, the user can proceed to BRUSCN or ACUSCN. If errors are reported, the following outline should aid in debugging:

A. Edit/print the LIST file. At the bottom of the file, a compiled list of all GRU's is reported. Any GRU with an error will be flagged by an asterisk.

B. Record the flagged GRU's and locate them in the upper portion of the file. The GRU's are processed sequentially in the same order as the CONTROL file, and for every GRU there is a report of the card images, errors (if any), and compiled data.

C. The error messages will inform the user of the record number in the CONTROL file, card type, and data field. Correct the error.

D. Prior to rerunning GRUSCN, be sure to delete/remove unneeded output files, GRURAF, QUIZ, and LIST. RAF's with errors will cause error messages in the ACUSCN program.

E. Rerun GRUSCN.

ACUSCN

1. Ready input file.

   A. HEADER—this formatted data file contains general run data and ACU data.

   B. BRURAF—this binary random access data file contains the BRU data that will be used with the GRU's.

   C. GRURAF—this binary random access data file contains the GRU data that will be used with the ACU's.

2. Execute ACUSCN.

3. Results of ACUSCN.

   A. Output file, screen display—informs user of the program's progress and whether any errors were detected during execution.

   B. Output file, BIGRAF—binary random access data file contains all processed ACU's, GRU's, and BRU's. BIGRAF will be read by the TRIM program.

   C. Output file, LIST—formatted output file contains the compact ACU-by-ACU reports. Within the ACU report there are several reporting types including a report of the card images, a compact listing of the cards, BRU normality, GRU inventory, and GRU normality. All error messages are written under the general and ACU card-image listing.

   D. Output file, QUIZ—file is only present if there are no errors detected in the run. This file can be used to communicate to the computer operating system that an error-free run occurred.

4. Analysis of ACUSCN results. The screen display and the QUIZ file will inform the user of the run results. If no errors are detected,' the user can proceed to the TRIM program. If errors are reported, the following outline should aid in debugging:

   A. Edit/print the LIST file. At the bottom of the ACU HEADER card images and each individual ACU card image, the total number of errors are reported. Besides the general and ACU card error messages, there is error reporting of problems in combining BRU's into GRU's and problems combining GRU's into ACU's.

   B. Record these general and ACU card errors and then locate them in the upper portion of the file. The ACU's are processed sequentially in the same order as the HEADER file.

   C. The error messages will inform the user of record number in the HEADER file, card type, and data field. Correct any error.

   D. Record the errors from combining both BRU's and GRU's. These errors are usually caused by mistakes in the numbering system for BRU's, GRU's, or ACU's. Check the INVEN and CONTROL file and be sure that the correct RAF's are present. Also check the INVEN, CONTROL, and HEADER for the numbering system. Errors in the number system may require rerunning GRUSCN, BRUSCN, ACUSCN, or all three programs.

E. Prior to rerunning ACUSCN or associated programs, be sure to delete/remove unneeded output files, BIGRAF, QUIZ, and LIST. A RAF with errors will cause error messages in the TRIM program.

F. Rerun ACUSCN.

TRIM

1. Ready input file. BIGRAF-this binary random access data file contains the BRU, GRU, and ACU data that will be used in the TRIM simulation.

2. Execute TRIM.

3. Results of TRIM.

A. Output file, screen display—informs user of the program's progress and if any errors were detected during execution.

B. Output file, CALLS—formatted output file contains a detailed reporting of all subroutines entered and any WARNING or CATASTROPHIC error messages. All error messages are written under the subroutine report.

C. Output file, DETAIL—formatted output file contains all reports that were requested in the report matrix in the HEADER general card data.

D. Output file, DUMP—formatted output file contains reports that were requested by the dump flag in the GRU card data. If a TRIM self-detected error (CATASTROPHIC) occurs, the dump flag is automatically turned on and those reports are written.

4. Analysis of TRIM results. The screen display and the STOP statement will inform the user of the results of the run. If no errors are detected, the user can review the reporting in the DETAIL file. If errors are reported, the following outline should aid in debugging:

A. Edit/print the CALLS file. The last error (CATASTROPHIC) message will appear at the bottom of the file.

B. Record the GRU and ACU where the error occurred and review the assumptions within that unit.

C. The error messages will inform the user of the subroutine and type of error that occurred. If insight is not gained from reviewing the assumptions, a programmer and the FORTRAN source code may be needed.

D. Prior to rerunning TRIM, be sure to delete/remove unneeded output files, CALLS, DETAIL, and DUMP.

E. Rerun TRIM.

Card-by-Card Descriptions

The following section is a card-by-card description of each input in the TRIM system. BRU cards are presented first and are followed by GRU cards and ACU cards. Reference to the card-by-card formats located in appendix E may be helpful in reviewing this section.

BRU Card Descriptions

BRU Card Type 1, Unstocked Acres

Item(s): Unstocked acres in BRU.

Simple real variable: UNSBRU.

Default: No acres in the unstocked category.

Limits: Nonnegative and less than 1 billion and only one card.

Description: Initial pool of acres designated unstocked that are not in the productive timberland base. Acres shifted to unstocked acres simulate regeneration failure; acres shifted from unstocked acres simulate planting backlogged acres. Unstocked acres remain unstocked unless they are shifted into the productive timberland base. Unstocked acres are shifted into timberland based on the regeneration distribution by stocking level for M11. Once in MI1 acres, unstocked acres are treated exactly like MI1 acres.

Related card type(s):

GRU 20—Regeneration cost of unstocked acres.

GRU 21—Proportion of unstocked acres restocked.

GRU 22—Proportion of cut acres left unstocked.

GRU 23—Proportion of MI1 acres regenerated in each stocking level 1 to 3.

Program use: Read in BRUSCN; summed in ACUSCN's subroutine SUM; used in TRIM's subroutine SHIFT.

BRU Card Type 2, Donor Acres

Item(s): Donor acres for Donors 1 and 2.
Real array by age class and donor: DONBRU.

Default: No donor acres.

Limits: Nonnegative and less than 1 billion per age class, up to 8 cards possible.

Description: Initial pool of stocked acres that are outside the timberland base. The donor acres are designed to provide a pool of acres that can be shifted into the timberland base or that can represent a pool of acres that receive acres from the timberland base. Increases and decreases in donor acres may simulate sale or purchase, respectively, of timberland. Donor 2 acres may grow older, stay in a fixed

age-class distribution, or be grown exactly as the timberland inventory age class distribution, depending on the ACU donor growth option specification. Donor 1 acres only grow older. Donor acres assume existing volumes per acre when shifted.

Related card type(s):

GRU 25—Stocking level of donor acres.

GRU 26—Proportion of donor acres to shift to timberland base.

GRU 27—Proportion of timberland acres to shift to donors.

GRU 29—Donor exogenous volume proportions.

ACU A4—Donor 2 growth method.

Program use: Read in BRUSCN; summed in ACUSCN's subroutine SUM, reduced in program TRIM's subroutine SHIFT.

BRU Card Type 3, Regular Acres

Item(s): Regular acres and volumes per acre by stocking level.
Real arrays by age class and management intensity: ACBRU, VPABRU.

Default: No acres or volume per acre for a given age class; however, there must be some initial inventory present.

Limits: Nonnegative, normalities with very high values (stocking proportions of standard volume per acre) flagged; maximum normality may be imposed, values greater than 0.0 and less than 1 billion per age class, up to 160 cards may be present (18 age classes by five management intensities).

Description: Initial acres in timberland base with associated volumes per acre by age class, stocking level, and management intensity.

Related card type(s):

GRU 23—Stocking level midpoints and regeneration distribution for MI1.

GRU 24—Stocking level entry proportion for MI1 and midpoints for MI2 to 5.

GRU 33—Standard net volumes per acre.

ACU 02—Time information and normality limits.

Program use: Read in BRUSCN; summed in ACUSCN's subroutine SUM; used in TRIM's subroutines ALOCAT, SHIFT, GROW, EXOGEN, and AGGREG.

GRU Card Descriptions

GRU Card Type 00, GRU Name

Item(s): 15-character alpha name for GRU.
Simple character variable: GRUNAM.

Default: GRU identification code converted to character form.

Limits: 15 characters, only one card.

Description: GRU name is printed on any report at the GRU level.

Related card type(s): None except that the name should correspond to the meaning of the integer identifiers for the BRU's and particular GRU.

Program use: Read in GRUSCN, printed in subroutines INVREP, HARREP, REGREP, ECOREP, LANREP, and SUMREP called by subroutines REPORT and REPACU in program TRIM.

GRU Card Type 01, BRU's Belonging to GRU

Item(s): BRU identification codes and proportions of BRU use. Integer and real arrays by number of BRU's: BRUID and BRUPRO.

Default: None for identification code, 1.0 for proportion of use, at least one BRU identification code must be present.

Limits: 50 BRU's, 17 cards for 50 BRU pairs identification code and proportion, five-digit code for each BRU, use proportion greater than 0.0 and less than or equal to 1.0.

Description: If a BRU identification code is entered without an associated proportion of use, the proportion of use defaults to 1.0; if a BRU identification is followed by a proportion of use, that value is used. BRUSCN designates all values greater than 1 as identification codes and all values greater than 0.0 and less than or equal to 1.0 as proportions *of* use. Identification codes are converted to integer values by truncation. Proportions of use are multiplied by acres and volumes during assignment of BRU's to a GRU.

Related card type(s): None, except all cards in the corresponding BRU must have the same identification code.

Program use: Read in GRUSCN; used in ACUSCN's subroutine SUM.

GRU Card Type 02, GRU Site and Species

Item(s): Site class index, original species and conversion species for GRU; simple integer variables: SITE, ORGSP, CVSP.

Default: None for SITE and ORGSP; no conversion for CVSP (CVSP = 0). Site and original species must be specified.

Limits: Site indices 1 to 3, ORGSP and CVSP species codes 1 to 9, only 1 card type 02 for each GRU.

Description: Site indices 1 to 3 and species codes 1 to 9 correspond to the report labels on card types A7 and A8 in the ACU file. Conversion species missing or 0 means no conversion will occur. Conversion can only occur from MI1 to MI2.

Related card type(s):

ACU A7—ACU site names.

ACU A8—ACU species names and report groups.

Program use: Read in GRUSCN; used in TRIM's subroutines CNVERS, INVREP, HARREP, REGREP, ECOREP, and LANREP.

GRU Card Type 03, GRU Options

Item(s): Rational expectation flag; diagnostic report flag and first and last periods for printing diagnostic reports.
Simple integer variables; PNWRUN, DUMP, IFDUMP, LSDUMP.

Default: All 0.

Limits: PNWRUN = 0 or 1; DUMP = 0 or 1; IFDUMP 0 to MAXSIM (17); LSDUMP 0 to MAXSIM; only one card type 03 for each GRU.

Description: For management-intensity shifts based on rational expectation, PNWRUN is 1; otherwise PNWRUN is omitted or is O. For printing diagnostic reports, DUMP is 1; otherwise DUMP is omitted or is O. Note that DUMP produces voluminous output for checking; it therefore should be used for short simulations and testing of small data sets. If all costs and revenue cards are filled and PNWRUN is not selected, a complete financial accounting is still provided by the program if the economic report is selected.

Related card type(s):

GRU cards 10-19—Must be appropriately supplied for the PNW simulations, PNWRUN = 1.

GRU 09-Rotation age.

Program use: Read in GRUSCN; used in TRIM's subroutine SHIFT.

GRU Card Type 04, Planting Stock Indicator

Item(s): Planting stock indicator for either regular or genetic stock: simple integer array; PLANT(mi).

Default: Regular stock for all MI's.

Limits: Only one card 04; with a single entry, blank or 0, for each MI.

Description: The entry is used to indicate either replanting in regular (blank) or genetic (enter 0) stock by management intensity. The indicator is used in the financial valuations and report sections of the program.

Related card type(s):

GRU 19—Regeneration cost per cut acre for MI and period.

GRU all card 30's—That relate to the use of genetic or regular stock.

ACU cards AS and A6—Treatment and management-intensity names.

Program use: Read in GRUSCN; used in TRIM's subroutines SHIFT and CNVERS.

GRU Card Type 05, Precommercial Thinning Age Class for Each MI, 1 to 5

Item(s): Precommercial thinning age class for each management intensity; zero or blank indicates no PCT for the appropriate MI; integer array by MI; PCTAGE(mi).

Default: No precommercial thinning for all MI's

Limits: Only one card, nonnegative entries.

Description: The age indicated for each MI is used in the soil expectation calculations. If PCT is not desired but some other cost is incurred during the duration of the stand, then this card can be used to reflect the occurrence of that treatment.

Related card type(s):

GRU 18—Precommercial thinning cost per acre for period.

ACU cards AS and A6—Treatment and management-intensity name.

Program use: Read in GRUSCN; used in TRIM's subroutines PNW, GROW, SHIFT, and LANREP.

GRU Card Type 06, Fertilization Age Class for Each MI, 1 to 5, and Applications 1 and 2

Item(s): Fertilization age class by management intensity; interger array by MI and application; FTAGES (mi,1); FTAGES (mi,2).

Default: No fertilization for all MI's.

Limits: Two application ages at most for each MI. Up to five cards may be present.

Description: The age classes entered by each MI indicate the age at which fertilization will occur. The age is used in the soil expectation calculations and to report the treatments and financial sections. For the MI's present, fertilization will occur up to two times. The following provides an example showing two fertilzation ages for MI3 at ages 2 and 4 and one fertilization for MI4 at age 3; no fertilization occurs for MI's 1, 2, and 5:

Card	MI	Age 1	Age 2
06	3	2	4
06	4	3	

Related card type(s):

GRU 17—Fertilization cost per acre for period.

GRU all card 30's—To reflect fertilization treatment for appropriate MI.

ACU cards A5 and A6—Treatment and management-intensity names.

Program use: Read in GRUSCN; used in TRIM's subroutines PNW, GROW, SHIFT, and LANREP.

GRU Card Type 07, Age Limits for Shifting

Item(s): Oldest age class for shifts to occur among MI's; integer array by MI-from and MI-to; HISHIF (mi-from, mi-to).

Default: Shifting at time of regeneration only.

Limits: Pairs must be presented in ascending order. Up to 10 card type 07's permitted.

Description: Shifting into higher management classes usually occurs at regeneration. The option presented here allows for shifting acres from lower to higher MI's as long as there has been no exclusive treatment that would make this unreasonable. For example, acres held in MI1 may have no treatment associated with them, and acres in MI2 may have a commercial thinning age class 4. The associated yield tables and thinning tables would reflect these actions. This card allows the shifting limits to be set such that acres could be shifted from MI1 to MI2

up to the age class before the thinning occurs. In this example, the HISHIF value would be set at 3 for a transfer of acres from MI1 to M12. This transfer limit also plays a part in the soil expectation calculations in that if the analysis shows that it is economical to shift acres from MI1 to M12, then as long as the limit had not been exceeded, shifting would occur. The following represents the range of possible entries with "X" representing the age class before the treatment occurs:

Card	MIfrom	MIto	HISHIF
07	1	2	X
07	1	3	X
07	1	4	X
07	1	5	X
07	2	3	X
07	2	4	X
07	2	5	X
07	3	4	X
07	3	5	X
07	4	5	X

Related card type(s):

GRU 33—Standard net volume per acre for MI and age class.

GRU 34—Thinning volume per acre for MI and age class.

All GRU and ACU cards connected with MI naming and values or volumes attributed to each MI along with all cards indicating the timing of any treatment.

Program use: Read in GRUSCN; used in TRIM's subroutines SHIFT, CNVERS, and PNW.

GRU Card Type 08, Minimum Harvest Age Class for Each MI, 1 to 5

Item(s): Minimum harvest age class for each MI; integer array by MI; MINHAR(mi).

Default: Minimum harvest age class for each MI set to 0.

Limits: Only one card with a maximum of five nonnegative entries.

Description: MINHAR(mi) is used to set the minimum age class that can be harvested from each MI. The age is also used when calculating the volume available for harvest. No volume below the minimum age class is included in the volume available for harvest in any time period.

Related card type(s):

GRU 33—Standard net volume per acre for MI and age class.

GRU 38—Preferred harvest proportion for age class.

Program use: Read in GRUSCN subroutine GRUSCH; MINHAR is used in TRIM's subroutines ALOCAT and AGGREG.

GRU Card Type 09, Rotation Age for Each MI, 1 to 5 (age in years)

Item(s): Rotation age for each MI for financial calculations; integer array by MI; ROT(mi).

Default: Rotation age is set equal to 0 and no soil expectation calculations are possible.

Limits: Only one card may be present.

Description: The rotation age is used in the soil expectation calculations. The age presented is presumed to be the actual financial rotation age for the MI indicated. The age listed here is not used to set the actual age of harvest. The rotation age is used solely to calculate soil expectation values for each MI.

Related card type(s):

GRU 03—GRU Options (PNWRUN).

GRU cards 10-20—All financial cards.

GRU 33—Standard Net Volume per Acre for MI and Age Class.

Program use: Read in GRUSCN; used in TRIM's subroutine PNW.

GRU Card Type 10, Discount Rate for Period

Item(s): Discount rate for each period for financial calculations; real array by period; DISCO(pd).

Default: Discount rate set equal to 0 and no soil expectation calculations.

Limits: Up to four card 10's may be present. The rate is entered as a decimal.

Description: The discount rate is utilized in the PNWRUN option of the program and used for each MI. The calculation of the soil expectation value utilizes the current rotation's prices, costs, and volumes and the second rotation's prices, costs, and volumes, which are assumed to be perpetual. An example of the soil expectation calculation follows:

Period	= 0; age class = 0;
Regeneration cost per acre	= $100 present rotation
	= $115 second rotation
PCT age class 1 cost per acre	= $101 present rotation
	= $109 second rotation
Annual cost per acre	= $2
Rotation age	= 80 years
Final harvest volume per acre	= 18,020 cubic feet
Price per unit	= $3.24 present rotation
	= $3.39 second rotation
Periodic discount rate for all periods	= 0.04

Soil expectation value is calculated as follows:

Present value of revenues:

$$2{,}653.17 = \frac{18{,}020(3.24)}{(1.04)^{80}} + \frac{18{,}020(3.39)}{\frac{(1.04)^{80}-1}{(1.04)^{80}}}$$

Present value of costs:

$$226.79 = \frac{2.00}{0.04} + 100 + \frac{101}{(1.04)^{10}} + \frac{115}{(1.04)^{80}-1} + \frac{115}{(1.04)^{80}-1} + \frac{109}{\frac{(1.04)^{10}}{(1.04)^{80}-1}}$$

SE = present value of revenues - present value of costs
2,426.39 = 2,653.18 - 226.79

Related card type(s):

GRU 03—GRU options (PNWRUN flag).

All GRU cards having to do with rotation age, age of treatment, associated costs and revenues, and appropriate volume yields by treatment.

Program use: Read in GRUSCN; used in TRIM's subroutine PNW.

GRU Card Type 11, Price per Unit for Period

Item(s): Price per unit of harvest for each period; real array by period; PRICE(pd).

Default: PRICE is set equal to 0.

Limits: Up to 4 card 11's may be present.

Description: The price values are used in the soil expectation calculations. The prices may be adjusted by period to reflect some real price trend. The prices must be based on the unit of measurement used in the yield tables. Remember, when using stumpage prices, to not include the harvest costs. When using log prices, harvest costs should be included.

Related card type(s):

GRU 03—GRU options.

GRU cards 10-20—All cards with financial information.

GRU cards 33 and 34—Standard net volume per acre for MI and age class and thinning volume per acre for MI and age class.

Program use: Read in GRUSCN; used in TRIM's subroutines ALOCAT, CNVERS, THIN, MORTAL, and PNW.

GRU Card Type 12, Annual Cost per Acre for Period

Item(s): Annual cost per acre for period in soil expectation calculations; real array by period; ANNCO(pd).

Default: ANNCO(pd) is set equal to O.

Limits: Up to four card 12's may be present.

Description: The annual cost is used in the soil expectation calculations. It is designed to represent an annual, recurring cost. The value is amortized with the current period's discount rate in the soil expectation calculations only.

Related card type(s):

GRU 03—GRU options.

GRU 10—Discount rate for period.

Program use: Read in GRUSCN; used in TRIM's subroutines PNW.

GRU Card Type 13, Final Harvest Cost per Unit for Period

Item (s): Final harvest cost per unit of harvest for each period (variable cost); real array by period; HARUNT(pd).

Default: HARUNT(pd) is set equal to O.

Limits: Up to four card 13's may be present.

Description: The final harvest cost per unit of harvest must be in the same units as the base yield tables. If you are calculating stumpage values, then HARUNT should be set equal to 0. Costs may be changed by period to represent increases or decreases in real costs over time. This cost is multiplied by all harvest volume and is used in the soil expectation calculations (assuming that log prices are used) and financial accounting methods.

Related card type(s):

GRU 03—GRU options.

GRU cards 10-20—Financial cards.

GRU cards 33-34—Standard net volume and thinning volume per acre by age class.

Program use: Read in GRUSCN; used in TRIM's subroutines ALOCAT and PNW.

GRU Card Type 14, Final Harvest Cost per Acre for Period

Item(s): Final harvest cost per acre for each period (fixed cost); real array by period; HARCO(pd).

Default: HARCO is set equal to O.

Limits: Up to four card 14's may be present.

Description: The final harvest per acre is multiplied by the total number of acres harvested each period. The value should be used when log prices are used and not stumpage values. The costs are used in the soil expectation calculations.

Related card type(s):

GRU 03—GRU options.

GRU cards 10-20—Financial cards.

Program use: Read in GRUSCN; used in TRIM's subroutines ALOCAT and PNW.

GRU Card Type 15, Commercial Thinning Cost per Unit for Period

Item (s): Commercial thinning cost per unit for each period (variable cost); real array by period; CTUNIT(pd).

Default: CTUNIT is set equal to O.

Limits: Up to four card 15's may be present.

Description: The commercial thinning cost per unit for each period is used in conjunction with the thinning volume table. The cost per unit is multiplied by the total volume harvested from the thinning table. These costs are used in the soil expectation calculations.

Related card type(s):

GRU 03—GRU options.

GRU cards 10-20—Financial cards.

GRU 34—Thinning volume per acre for MI and age class.

ACU A5—ACU treatment name.

Program use: Read in GRUSCN; used in TRIM's subroutines THIN and PNW.

GRU Card Type 16, Commercial Thinning Cost per Acre for Period

Item(s): Commercial thinning cost per acre for each period (fixed cost); real array by period; CTCO(pd).

Default: CTCO(pd) is set equal to 0.

Limits: Up to four card 16's may be present.

Description: The commercial thinning cost per acre is multiplied by the total number of acres thinned in each time period. These costs are used in the calculation of the soil expectation values.

Related card type(s):

GRU 03—GRU options.

GRU cards 10-20—Financial cards.

ACU A5—ACU treatment name.

Program use: Read in GRUSCN; used in TRIM's subroutines THIN and PNW.

GRU Card Type 17, Fertilization Cost per Acre for Period

Item(s): Fertilization cost per acre for each period (fixed cost); real array by period; FERTCO(pd).

Default: FERTCO(pd) is set equal to 0.

Limits: Up to four card 17's may be present.

Description: The fertilization cost per acre is applied to all acres fertilized in each period. It is used in conjunction with FTAGES (GRU 06). The costs are used in the soil expectation calculations.

Related card type(s):

GRU 03—GRU options.

GRU 06—Fertilization age class for each MI, 1 to 5, and applications 1 and 2.

GRU 33—Standard net volume per acre for MI and age class.

Program use: Read in GRUSCN; used in TRIM's subroutines GROW and PNW.

GRU Card Type 18, Precommercial Thinning Cost per Acre for Period

Item(s): Precommercial thinning cost per acre for each period (fixed cost); real array by period; PCTCO(pd).

Default: PCTCO is set equal to 0.

Limits: Up to four card 18's may be present.

Description: The precommercial thinning cost per acre is used in conjunction with PCTAGE (GRU 05) in the soil expectation calculations and is applied to all eligible acres by period. No revenue is attributed to the PCT section of the model; therefore, any other cost used in this card should not have any revenue associated with it that can not be netted out of this entry.

Related card type(s):

GRU 03—GRU options.

GRU 05—Precommercial thinning age class for each MI, 1 to 5.

ACU A5—ACU treatment name.

Program use: Read in GRUSCN; used in TRIM's subroutines GROW and PNW.

GRU Card Type 19, Regeneration Cost per Cut AcrefoJ MI and Period

Item(s): Regeneration cost per cutover acre for each MI and each period; real array by period and MI; REGCO(pd,mi).

Default: REGCO is set equal to 0.

Limits: Up to 20 card 19's may be present.

Description: The regeneration cost per acre by management intensity is the cost associated with an acre that has just been harvested. This cost is by MI to allow different regeneration cost associated with site preparation and planting genetically improved stock, for example. This cost is used in the soil expectation calculations.

Related card type(s):

GRU 03—GRU options.

GRU cards 10-20—Financial cards.

ACU A5—ACU treatment name.

Program use: Read in GRUSCN; used in TRIM's subroutine SHIFT, CNVERS, and PNW.

GRU Card Type 20, Regeneration Cost per Unstocked Acre for MI and Period

Item(s): Regeneration cost for each unstocked acre brought into the productive timberland base; real array by period and MI.

Default: UNSTCO is set equal to 0.

Limits: Up to 20 card 20's may be present.

Description: The regeneration cost per unstocked acre is multiplied by those acres that are brought into the timberland base each period from the unstocked category.

Related card type(s):

GRU 21—Proportion of unstocked acres restocked for period.

BRU 01—Unstocked acres.

Program use: Read in GRUSCN; used in TRIM's subroutine SHIFT.

GRU Card Type 21, Proportion of Unstocked Acres Restocked for Period

Item(s): Proportion of unstocked acres to be restocked for each period; real array by period; UNSTRE(pd).

Default: UNSTRE is set equal to o.

Limits: Up to four card 21's may be present.

Description: The proportion of unstocked acres to be restocked each period is multiplied by the total number of acres in the unstocked category for that period before any shifting takes place. These acres are regenerated into MI1 according to the regeneration distribution for SL 1, 2, and 3. These acres can subsequently move to a higher management intensity. Acres can intially enter the unstocked category from the INVEN file or may be moved, there from harvested acres during the simulation.

Related card type(s):

GRU 22—Percent of cut acres to unstocked.

BRU 01—Unstocked acres.

Program use: Read in GRUSCN; used in TRIM's subroutine SHIFT.

GRU Card Type 22, Proportion of Cut Acres to Unstocked for Period

Item(s): Proportion of cut acres to be shifted to the unstocked category for each period; real array by period between 0.0 and 1.0; CUTUNS(pd).

Default: CUTUNS(pd) is set equal to 0, and no acres are shifted to the unstocked category.

Limits: Up to four card 22's may be present.

Description: The proportion of acres per period that move to unstocked acres from harvested acres. The proportion indicated is applied across all MIs; that is, acres leaving the timberland base leave in proportion to the total acres harvested by MI.

Related card type(s):

GRU 21—Proportion of unstocked acres restocked for period.

Program use: Read in GRUSCN; used in TRIM's SHIFT.

GRU Card Type 23, Stocking Level Midpoint for MI1, Stocking Levels 1 to 3; Proportion of MI1 Acres Regenerated in Each Stocking Level, 1 to 3

Item(s): Stocking level (SL) midpoints for M11; real number between 0.0 and 4.0; SLMID(sl); proportion of MI1 acres regenerated into stocking level 1; real number between 0.0 and 1.0, all three entries must sum to 1.0 however; SLDIST(sl).

Default: For SLMID(sl), SL1 = 1.0, SL 2 and 3 = 0.0; for SLDIST(sl), all acres will be regenerated into SL 1.

Limits: Only one card 23 may be present.

Description: Stocking level midpoints allow for adjusting the normal volumes (GRU 33) by a percentage reduction or increase. As MI1 has three stocking levels, three entries are available. The normal volumes are multiplied by the percentages to adjust the actual volumes allocated to the three stocking levels. Even though the allocation takes place at the SL midpoint, the stands can still be grown using approach-to-normality (GRU 30, assuming that option is selected); therefore, stands may acquire more volume per acre in each stocking level than is actually indicated in the appropriate entry. The usual procedure to calculate these values is to multiply all volumes per acre of the initial inventory by the number of acres for each age class, and all volumes are summed to a total actual volume. The same acres are then multiplied by the appropriate age class entry in the yield table or standard volumes and summed to obtain total normal volume. Total actual volume is then divided by total normal volume. The quotient is the midpoint stocking level for the MI and stocking level. The stocking level distribution of acres regenerated in MI1, SL 1, 2, and 3 are indicated. The three entries must sum to 1.0. These entries indicate how: cutover acres are distributed among the three stocking levels in MI1. These values are usually calculated by summing all acres for the last 30 to 50 years and dividing that value into the sum of acres by stocking level.

Related card type(s):

GRU 33—Standard net volume per acre for MI and age class.

GRU 24—Minimum stocking proportion to enter stocking levels 1 and 2.

Program use: Read in GRUSCN; SLMID is used in TRIM's subroutines SHIFT, GROW, and PNW.

GRU Card Type 24, Minimum Stocking Proportion to Enter Stocking Levels 1 and 2; Stocking Level Midpoint for Stocking Level 1 of MI 2 to 5 (MT 5 to 8)

Item(s): Minimum stocking proportion to enter stocking levels 1 and 2; real array by stocking levels 1 and 2 between 0.0 and 4.0; SLMIN: Stocking level midpoint for stocking level 1 of MI2 to MI5; integer between 0.0 and 4.0; SLMID.

Default: For SLMIN 2 and 3, they are set to 0.0: for SLMID 2 through 5, they are set to 1.0.

Limits: Only one card 24 may be present.

Description: The minimum stocking proportion to enter stocking levels 1 and 2 represent thresholds for volumes per acre. Once- the threshold is surpassed, the acres are shifted from the lower stocking level to the next higher one. After an acre is grown under approach-to-normality, the new volume per acre is compared to the standard volume. If the proportion is higher than the minimum proportion, the acre is shifted to the higher stocking level. This only applies to MI1 because it is the only MI with more than one stocking level. MI's 2 through 5 have only one stocking level. The entries represent the proportion applied to the normal volumes (GRU 33) in order to establish the standard volumes per acre for each of the higher MI's. These values are also used in INVEN to reallocate acres of the initial Inventory based on the given volumes per acre relative to the standard volume per acre as adjusted by these entries.

Related card type(s):

GRU 23—Stocking level midpoint for MI 1, stocking levels 1 to 3;

GRU 30—Growth type and approach-to-normality

GRU 33—Standard net volume per acre for MI and age class.

Program use: Read in GRUSCN; used in ACUSCN's subroutine SUM and program TRIM's subroutine GROW.

GRU Card Type 25, Stocking Level of Each Donor 1 and 2

Item(s): Stocking level for each donor category upon entry into the timberland base; integer array by donor; ODSTOC.

Default: All acres will be restocked in SL 1.

Limits: Only one card 25 may be present.

Description: When acres are shifted to the timberland base from either of the donor categories, they must be placed in a prespecified stocking level. If stocking level 2 or 3 (SL2 or SL3) is specified, it applies only to MI1.

Related card type(s):

BRU 2—Donor acres for each donor 1 and 2, and age class.

GRU 23—Stocking level midpoint for M11, stocking levels 1 to 3; proportion of MI1 acres regenerated in each stocking level 1 to 3.

GRU 24—Minimum proportion to enter stocking levels 1 and 2; stocking level midpoint for stocking level 1 of MI2 to 5.

GRU 26—Proportion of donor acres to shift to MI for period.

ACU A4—ACU shift specification.

Program use: Read in GRUSCN; used in TRIM's subroutine SHIFT.

GRU Card Type 26, Proportion of Donor Acres to Shift to MI for Period

Item(s): The proportion of donor acres to shift to the receiving MI's for each period; real array by period, donor and MI; DONOR (pd,od,mito).

Default: Default is no donor shifting.

Limits: Up to 40 card 26's may be present.

Description: The proportion of acres shifted each period from each outside donor to each MI. The proportion of acres shifted is by period and is applied to the total number of acres in the donor each period. The stocking level of each donor is specified on GRU 25. The shifts are subscripted first by period, second by donor (1,2), and third by MI (1-5).

Related card type(s):

BRU 2 —Donor acres for each donor 1 and 2, and age class.

GRU 25 —Stocking level of each donor 1 and 2.

GRU 29 —Donor exogenous volume proportions.

ACU A4 —ACU shift specification.

Program use: Read in GRUSCN; used in TRIM's subroutine SHIFT.

GRU Card Type 27, Proportion of MI Acres to Shift to Donor for Period

Item(s): Proportion of timberland MI acres to shift to each donor for each period; real array by period; values between 0.0 and 1.0; MIOUT(pd,mifr,od).

Default: No MI to donor shifting occurs.

Limits: Up to 40 card 27's may be present.

Description: The proportion indicated is used to determine how many acres in the designated MI are to be shifted from the total acres to the designated donor for the current period. Only acres in stocking level 1 shift out. The proportion is multiplied by the total acres in the MI and that amount is shifted to the donor. The acres, once shifted, assume the stocking level designated for the receiving donor. The proportions are first subscripted by period, second by the MI losing acres, and third by the donor that will be gaining acres.

Related card type(s):

GRU 25—Stocking level of each donor 1 and 2.

GRU 29—Donor exogenous volume proportions.

Program use: Read in GRUSCN; used in TRIM's SHIFT.

GRU Card Type 28, Preselected Proportion to Shift Among MI's for Period

Item(s): The proportion of each MI to be shifted to the other MI's for each period; real array by period, MI from, MI to; between 0.0 and 1.0; MISHIF(pd,mifr,mito).

Default: No preselected shifts will occur.

Limits: Up to 100 card 28's may be present.

Description: The proportions indicated are used to determine the amount of acres out of the total number of acres in the designated donating MI that will be shifted each period to the designated receiving MI. The proportions are subscripted first by the sending MI and then by the receiving MI. Shifts in both directions at the same time are possible. The proportion is applied to the total number of acres in

each MI at the start of the period. In MI1, only acres in stocking level 1 are available to be shifted. If the soil expectation flag is set, these entries are ignored. Conversion is assumed to take place between MI1 and MI2.

Related card type(s):

GRU 07—Age limits for shifting.

Program use: Read in GRUSCN; used in ACUSCN and TRIM's subroutines SHIFT and CNVERS.

GRU Card Type 29, Exogenous Volume Proportion Recovered From Donor Acres for Period

Item(s): The proportion of volume from acres shifted to the donor category, which will be added to exogenous harvest; real array by period and donor; values between 0.0 and 1.0; DONCAP (pd,od).

Default: No exogenous volume will be recovered if shifting to a donor occurs.

Limits: Up to eight card 29's may be present.

Description: The proportion indicated is used to determine the amount of exogenous harvest volume from acres shifted from the timberland base to a donor category. The proportion is designed to represent a one-time harvest from acres shifted from the base and can be used to simulate no removal or total removal of the volume of the acres shifted.

Related card type(s):

GRU 27—Proportion of MI acres to shift to donor for period.

GRU 33—Standard net volume per acre for MI and age class.

Program use: Read in GRUSCN; used in TRIM's subroutine SHIFT.

GRU Card Type 30, Growth Type and Approach-to-Normality

Item(s): Indicators for the type of growth for the GRU; GROTYP either 0 or 1; FULLAP integer; HALFAP integer; INTAP real; COEFAP real.

Default: GROTYP equals 0 and no approach-to-normality.

Limits: Only one card 30 may be present.

Description: GROTYP is the indicator of whether approach-to-normality (enter 1) will be used to determine growth from one period to the next or whether the growth will be determined from the yield tables (enter 0) only. If the yield table option is selected, then the yields indicated in GRU 33 will take the place of the yields indicated in the initial inventory after the first time period. If approach-to-normality is chosen, the yields indicated in the initial inventory are maintained but are grown relative to the yields indicated in GRU 33.

FULLAP indicates the last age class to receive the full increase in growth calculated in the approach-to-normality. The full increase in volume proportion obtained from the approach-to-normality function is used for all age classes up to and including this age class.

HALFAP indicates the last age class to receive one half of the increase in growth calculated in the approach-to-normality. One-half of the increase in volume proportion will be used for all age classes greater than FULLAP and less than or equal to HALFAP age class. No increase in volume proportion is used for those age classes greater than HALFAP.

INTAP is the intercept of the linear approach-to-normality function.

COEFAP is the slope coefficient of the linear approach-to-normality function. COEFAP is multiplied by the current volume proportion and then added to INTAP to equal volume proportion after growth. The following provides an example of the approach-to-normality concept:

normal volume = yield table volume (GRU 33) = 3000 cubic feet,

actual volume = INVEN file or regular volume = 1500 cubic feet,

$$\text{current volume proportion} = \frac{\text{actual volume}}{\text{normal volume}} = \frac{1500}{3000} = 0.50$$

where: INTAP = 0.11 and COEFAP = 0.90

Volume proportion = 0.11 + 0.9 * (current volume proportion) after growth,

0.56 = 0.11 + 0.9 * (0.5).

If the age class that the actual and normal volumes were obtained from is equal to or less than FULLAP, then the acres associated with that age class (which are currently 50-percent stocked) will be 56-percent stocked next time period. If the age class is greater than FULLAP and equal to or less than HALFAP, the acres associated with the age class will be 53-percent stocked next time period. If the age class is greater than HALFAP, then the acres will remain 50-percent stocked the next time period.

Related card type(s):

BRU 3—Regular acres and volumes per acre (at the GRU aggregation level).

GRU 33—Standard net volume per acre for MI and age class.

Program use: Read in GRUSCN; used in TRIM's subroutine GROW.

GRU Card Type 31, Mortality Salvage

Item(s): Indicator of desire to salvage mortality and the amount salvable; MORSAL either 0 (off) or 1 (on); MORPRP real between 0.0 and 1.0; MORVOL real.

Default: No mortality salvage is taken.

Limits: Only one card 31 may be present.

Description: MORSAL indicates whether mortality salvage is desirable. If the mortality salvage flag is activated (an entry of 1) then the amount of salvage volume available for each age class is found on GRU 35.

MORPRP indicates the proportion of the salvage volume indicated on GRU 35 that can be salvaged.

MORVOL indicates a minimum amount of volume that must be present before the salvage volume can be added to the harvest. If the salvable proportion of mortality volume multiplied by the mortality volume per acre is less than minimum salvable volume per acre, mortality salvage will not occur. If mortality salvage is selected, it is conducted across all MIs, and the volume calculated is an exogenous volume and is calculated before the actual harvest is taken.

Related card type(s):

GRU 35—Mortality volume per acre for MI and age class.

Program use: Read in GRUSCN; used in TRIM's subroutines EXOGEN and MORTAL.

GRU Card Type 32, Average Diameter for MI and Age Class

Item(s): Average diameter for each MI by age class; real array by age class and MI AVDIAM(ac,mi).

Default: No diameter reporting will occur.

Limits: Up to 20 card 32's may be present.

Description: The average diameter of all trees included in the specific MI and age class for each age class. AVDIAM should correspond to the base yield table utilization standard and is used for reporting purposes.

Related card type(s):

GRU 33—Standard net volume per acre for MI and age class.

ACU 03—Age class report groups.

Program use: Read in GRUSCN; used in TRIM's subroutines ALOCAT, SHIFT, GROW, and INVENT.

GRU Card Type 33, Standard Net Volume per Acre for MI and Age Class

Item(s): Standard net volume per acre for each MI and each age class; real array by age class and MI; VOLPA(ac,mi).

Default: No default.

Limits: Up to 20 card 33's may be present.

Description: The standard volume per acre in the base volume measure by age class and MI. These yields are the actual yields if no approach-to-normality is chosen or, if chosen, the yields provide the standard volumes for the approach-to-normality calculations. The standard volumes per acre are adjusted for each MI (and stocking level) by use of the parameters included on GRU 23 and 24 (stocking level midpoints).

Related card type(s): All cards indicated in the BRU and GRU file are related to the normal volume. yield tables.

Program use: Read in GRUSCN; used in TRIM's subroutine SHIFT, GROW, CNVERS, and PNW.

GRU Card Type 34, Thinning Volume per Acre for MI and Age Class

Item(s): Thinning volumes for each MI and age class; real array by age class and MI; THINPA(ac,mi).

Default: No thinning occurs.

Limits: Up to 15 cards may be present.

Description: Thinning volume per acre in the base volume measure by age class and MI. If a thinning volume per acre is indicated for any MI, then that MI will have a thinning in the age class indicated by the placement of the thinning volume. In an age class where thinning occurs, VOLPA should equal total volume per acre before harvest. THINPA should equal the thinning volume that can be removed from VOLPA. THINPA is adjusted by the stocking level midpoint and the growth on harvest. No thinning can occur in SL2 and 3 of MI1.

Related card type(s):

GRU 15 and 16—Fixed and variable cost of thinning.

Program use: Read in GRUSCN; used in TRIM's subroutine GROW, THIN, and PNW.

GRU Card Type 35, Mortality Volume per Acre for MI and Age Class

Item(s): Mortality volume per acre for each MI and age class; real array by period; MORTPA(ac,mi).

Default: No mortality salvage.

Limits: Up to 20 card 35's may be present.

Description: The mortality volume per acre in the base utilization standard by age class and MI. The mortality volume is used in the mortality salvage option.

Related card type(s):

GRU 31—Mortality salvage.

Program use: Read in GRUSCN; used in TRIM's subroutine MORTAL.

GRU Card Type 36, Softwood Proportion of Volume per Acre for MI and Age Class

Item(s): The proportion of softwood volume per acre for each MI and age class; real array by age class and MI; 0.0 and 1.0; SOFTPA(ac,mi).

Default: SOFTPA is set equal to 1.0.

Limits: Up to 20 card 36's may be present.

Description: The softwood proportion of total volume by age class by MI. The proportion is multiplied by the volume per acre to determine the actual amount of softwood that can be removed by age class and MI. Totals are maintained for softwood, hardwood, and total volume and are applied depending on the harvest request (softwood, hardwood, or combined).

Related card type(s):

ACU A3—ACU harvest volume for period.

GRU 33—Standard net volume per acre for Mi and age class.

Program use: Read in GRUSCN: used in TRIM's subroutine ALOCAT, SHIFT, GROW, INVENT, AGGREG, CNVERS, THIN, and MORTAL.

GRU Card Type 37, Adjustment Factor for Growth on Harvest for MI and Age Class

Item(s): Growth adjustment factor for growth on available volume for harvest each MI and age class; real array by age class and MI; HARGRO(ac,mi).

Default: No growth on harvest is calculated.

Limits: Up to 20 card 37's may be present.

Description: The growth adjustment factor provides an option for including the growth on the available volume targeted to be harvested in each GRU for each period. Assume that the standard volumes per acre (GRU 33) are midperiod values, that trees are harvested within any age class on an oldest first basis, and that the trees within any age class are evenly distributed across the age class. The first year's harvest would be trees 99 years old (assuming age class 9 with a midpoint volume and age of 95), but a volume associated with age class 95 would be removed. A value is therefore entered that will adjust the volume per acre of the harvested acres upward to reflect growth for one-half of a period for the given age class. For the 10-year-period problem, the value entered is the ratio of the volume entered in the normal yield tables for trees aged 95, divided into the normal volume per acre for trees aged 100. For example, if the normal volumes indicated that the yield for age class 9 (aged 95) was 2,500 cubic feet per acre and the yield for age class 10 (age 105) was 3,500 cubic feet per acre, then the yield at age 100 would be about 3,000 cubic feet per acre. The adjustment factor for age class 9 would be 1.2, which will adjust 2,500 cubic feet per acre up to 3,000 cubic feet per acre. The growth adjustment calculated is applied only to acres that are being harvested, and the adjusted growth is not reported. These calculations must take place outside the model.

Related card type(s):

GRU 33—Standard net volume per acre for MI and age class.

ACU 02—Time information.

Program use: Read in GRUSCN; used in TRIM's subroutine ALOCAT, AGGREG, CNVERS, and THIN.

GRU Card Type 38, Preferred Harvest Proportion for Age Class

Item(s): The preferred harvest proportion for each age class to be harvested; real array by age class; all entry values must accumulate to 1.0; HVPROP(ac).

Default: HVPROP for age class 17 equals 1.0 (oldest first).

Limits: Up to four card 38's may be present.

Description: The proportion of harvest volume requested by each age class. If an oldest first priority is desired, enter 1.0 for age class 17. If a proportion is to be harvested from several age classes, enter that proportion for each age class. Proportions must total to 1.0. When volume is exhausted in the designated age classes, the program reverts to an oldest first harvest priority. If volume is not exhausted, it is removed relative to the amount of volume available in each class to the harvest proportion for that age class. The proportions must be entered in age classes equal to or greater than MINHAR and equal to or less than age class 17.

Related card type(s):

GRU 08—Minimum harvest ages.

Program use: Read in GRUSCN; used in TRIM's subroutine ALOCAT.

GRU Card Type 39, Volume Conversion Factor for Age Class (to convert from base volume unit to alternate volume unit)

Item(s): Volume conversion factors for each age class; real array by age class; CONFAC(ac).

Default: CONFAC is set equal to 1.0.

Limits: Up to four card 39's may be present.

Description: Age class conversion factors used to convert inventory and harvest volume to the alternate volume measure. CONFAC is used for report purposes only when the alternate volume measure harvest report is requested.

Related card type(s):

GRU 33—Standard net volume per acre for MI and age class.

ACU 04—Unit conversion specifications.

ACU OS—Report matrix.

Program use: Read in GRUSCN; used in subroutine ALOCAT, SHIFT, GROW, INVENT, CNVERS, THIN, and MORTAL.

ACU Card Descriptions

HEADER Card Type 01, Run Header

Item(s): Run header label RHEAD. A simple A60 character variable.

Default: None; must be present.

Limits: None; only one card.

Description: A title for all reports. RHEAD appears at the top of all report. output.

Related card type(s): None.

Program use: Read in ACUSCN, and used in all report routines.

HEADER Card Type 02, Time Information

Item(s): Beginning year of simulation, STYEAR. Length of period and age class in years, LENPD. Ending period of analysis, MAXPD. Maximum proportion of stocking allowed, APLIM. Minimum proportion of stocking for warning, APMIN. Maximum proportion of stocking for warning, APMAX.

Default: STYEAR equals 0. LENPD equals 10. MAXPD equals 0. APLIM equals 100.0. APMIN equals 0. APMIN equals APLIM. One card must be present.

Limits: STYEAR and LENPD have none. MAXPD less than or equal to 17. APLIM less than or equal to 100.0. APMIN greater than or equal to 0.0. APMAX less than or equal to 100.0.

Description: STYEAR, the starting year is used to label the year interval on the reports. LENPD is the increment for the age class and period and is the overall time base for the model. MAXPD is the sole control over how many periods the simulation is run. APLIM is the maximum proportion of stocking allowed. Volume in excess of APLIM times standard volume per acre is shifted to older age classes. APMIN and APMAX are used to flag extreme values for stocking proportions so that some kind of external checking can be done. Very high stocking proportions are reduced gradually by the approach-to-normality equation, implying spurious growth.

Related card type(s):

GRU 33—Normal net volume per acre.

BRU 03—Regular inventory volume per acre.

Program use: Read in ACUSCN, and used in TRIM.

HEADER Card Type 03, Age Class Report Groups

Item(s): Age class report group indicator, ACGRP(ac). There are eight groups for the 18 age classes.

Default: None; the. card must be present.

Limits: None; 18 cards must be present.

Description: There are 18 age classes (0-17) that must be combined into no more than eight (1-8) report groups. They may be grouped in any fashion that the user desires. Each age class is listed and the appropriate group (1-8) is listed next to it.

Related card type(s): None.

Program use: Read in ACUSCN, and used in all report routines.

HEADER Card Type 04, Unit Conversion Specifications

Item(s): The alternate volume measure label, ALTUNT. The minimum diameter for conversion, DIAMIN.

Default: No conversion reports.

Limits: ALTUNT must be an A15 character. DIAMIN must be nonnegative and less than 100.0

Description: ALTUNT is the alternate volume measure label and is used on all reports when the alternate base unit is requested. DIAMIN is the minimum diameter for which volume conversion is done. When the volume is converted from the base to the alternate base, only the age classes where the diameter is greater than or equal DIAMIN are converted.

Related card type(s):

ACU—05 Report matrix.

Program use: Read in ACUSCN, and used in all report routines.

HEADER Card Type 05, Report Matrix

Item(s): REPMAT is a matrix of reports requested. It is subscripted by the five levels and the six types.

Default: Only ACU total report for inventory and harvest.

Limits: Nonnegative and less than or equal to 1.

Description: There are five levels of reports; (1) GRU detail, (2) ACU detail, (3) ACU summary, (4) ACU subgroup summary, and (5) ACU totals summary. The first two levels (1,2) are detailed reports printed every period. Levels three through five are summary reports that report all periods in one report. Detail reports provide the age class report groups and summary reports only summarized period values. There are six types of reports: inventory, harvest, alternative volume measure for inventory and harvest, regeneration and treatment, economic, and land shift. To request a report enter a 1 in the appropriate level and type a blank or 0 to omit a report. Columns 8-20 are reserved for comments if needed.

Related card type(s):

ACU—04 Alternative volume measure label and diameter minimum.

ACU—06 Subgroups lists.

GRU—39 Volume conversion factors.

Program use: Read in ACUSCN, and used in all report routines.

HEADER Card Type 06, ACU Subgroups

Item(s): SUBGR is a list of ACU's that are to be combined into a collective report. There are a maximum of 12 ACU subgroups.

Default: No subgroup reports.

Limits: ACU numbers that are in the current run. ACU numbers are between 1 and 50, and any ACU requested that is not in the run is flagged and omitted. A maximum of four cards can be used.

Description: ACU subgroups are unique groups of ACU's from which users would like summary reports. ACU subgroups are level four of the report matrix. There are three 20-column fields per card for input of subgroups. The ACU numbers can be entered separated by commas or, if the numbers are in a series, the first and last number separated by a dash can be entered; for example:

06	1,2,5,8,13	2-7	3,10
06	1-5,8-13	3,9	10-13

Related card type(s):

ACU—05 Report matrix

Program use: Read in ACUSCN, and used in all report routines.

ACU Card Type A1, ACU Name

Item(s): ACUNAM is the A15 character name associated with the ACU identification number.

Default: None.

Limits: Card must be present.

Description: ACUNAM is the character label printed with all ACU reports and is only used for identification.

Related card type(s): None.

Program use: Read in ACUSCN, and used in all ACU report routines.

ACU Card Type A2, GRU Membership List

Item(s): GRUID is a list of up to 50 GRU identification numbers to be combined into an allowable cut unit.

Default: None; at least one GRU must be present.

Limits: GRU's in the list must be present in the GRU RAF for the run.

Description: GRUID is the list of GRU's to be included in the allowable cut unit; these GRU's are maintained as individual inventories in the model. The ACU harvest is allocated to GRU's proportional to the available volume in the GRU. Available volume is computed by summing volume in age classes from MINHAR to the maximum. Available volume for each GRU is added to the total available volume for the ACU.

Related card type(s): GRU cards and appropriate identifier.

Program use: Read in ACUSCN; used throughout TRIM.

ACU Card Type A3, ACU Harvest Request

Item(s): HARTYP is the fiber type flag for the request. Fiber type entries are 1 = softwood, 2= hardwood, and 3=combined. HRVACU is the by-period harvest volume request for this ACU. The volume is removed proportional to the volume available in the GRU's and according to the fiber type request.

Default: None; at least one harvest request is required.

Limits: Nonnegative, and less than or equal to 1.0E+12.

Description: HARTYP is used to specify the type of fiber used to fill the harvest request. If softwood or hardwood fiber is chosen, the other type of fiber is also cut and reported; if combined fiber type is chosen, both softwood and hardwood fiber is used to fill the harvest request. HRVACU is the volume request in the base volume measure. This request is by period and is allocated proportional to available volume in each GRU.

Related card type(s):

GRU 33—Net volume per acre.

GRU 36—Softwood proportion.

Program use: Read in ACUSCN; used in TRIM's subroutine PROPRT.

ACU Card Type A4, ACU Donor Shift Specification

Item(s): DONTOP is the shift method flag for Donor 2 acres only. Entries are: 1=normal method (grow older), 2=frozen in initial distribution, and 3=pool of acres which move in relative to existing acre base.

Default: Normal method, DONTOP=1.

Limits: Nonnegative, and less than or equal to 3.

Description: DONTOP allows three different types of acre movement into the land base from acres in donor 2 category only. Option one is the normal method where the initial acres grow older each period. Option two freezes the acres in the initial distribution; this can be used to shift specific-aged acres in at any time. Option three considers the donor acres as a pool of acres that has the same acreage distribution as the target MI.

Related card type(s):

BRU 2—Donor acres.

GRU 25—Donor stocking level.

GRU 26—Donor shift proportion.

Program use: Read in ACUSCN, used in TRIM's subroutine SHIFT.

ACU Card Type AS, ACU Treatment Labels

Item(s): TRNAME is an array of seven A15 character labels. The seven labels represent the cultural treatments for the ACu.

Default: None; there must be seven card A5's present.

Limits: None; A15 character.

Description: TRNAME is the label associated with the seven cultural treatments. Present usage is, 1 =REGULAR STOCK, 2=GENETIC STOCK, 3=CONVERSION, 4=PRECOMM THIN, 5=FERTILIZATION, 6=COMM THIN, and 7=FINAL HARVEST. These labels are used to describe the treatments in the reports and should be right justified in the data fields.

Related card type(s): None.

Program use: Read in ACUSCN; used in all report routines.

ACU Card Type A6, ACU Management Intensity Labels

Item(s): MINAME is an A15 character label indexed from 1 to 5 and represents the management intensities for the ACU.

Default: None; there must be five card A6's present.

Limits: None; A15 character.

Description: MINAME is the label associated with the five management intensities. These labels are used to describe each MI in the reports and should be right justified in the data fields.

Related card type(s): All cards associated with MI's.

Program use: Read in ACUSCN, used in all reporting routines.

ACU Card Type A7, ACU Site Labels

Item(s): SITNAM is an array of three A15 character labels and represents the site group for the ACU.

Default: None; there must be three card A7's present.

Limits: None; A15 character.

Description: SITNAM is the label associated with the three site groups. These labels are used to describe each site group in the reports and should be right justified in the data fields.

Related card type(s): Related site cards.

Program use: Read in ACUSCN, used in all reporting routines.

ACU Card Type A8, ACU Species Labels and Fiber Type Indicator

Item(s): SPNAME is an array of nine A15 character labels and represents the species groups for the ACU. SPGRP is the fiber type indicator; it must be either 1 or 2.

Default: None; there must be one card A8 present.

Limits: None; A15 character.

Description: SPNAME is the label associated with the nine species groups. These labels are used to describe each species group in the reports. The fiber type indicator, 1 or 2, is used to indicate the general fiber type grouping for each species group.

Related card type(s): None.

Program use: Read in ACUSCN, used in all reporting routines.

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Metric Equivalents

1 hectare = 2.47 acres
1 cubic meter = 35.3 cubic feet

Appendix A
Synopsis of BRUSCN

The synopsis of BRUSCN is designed to provide the logical flow of the program. Indention reflects logical routine divisions.

Initialization for run.

Set creation date and time.

Zero BRU count and record count.

For each BRU:

1. Initialization for a BRu.

   Zero counts of active (data) and comment records.

   Zero count by card type.

   Zero acres and volumes per acre.

2. Read in character form and print input for a BRu.

   Subroutine CHECK controls paging.

   Comments at the beginning are printed immediately.

   Comments between active records are stored temporarily and then printed.

   Active cards are printed and stored.

3. Check and record BRU identification code.

   Search for illegal characters in code.

   Transform good character sets into numeric form for BRU list.

   Set indicator value for bad character sets and write message.

4. For each active card:

   a. Subroutine SET provides error count and record identification for errors.

   b. Check card type, MI, and age class.

      Transform character sets into numeric form.

      Write message if illegal characters encountered.

c. Check data fields.

Transform character sets into numeric form.

For blank fields, set missing values.

For illegal characters or illegal character order, set special indicator value, locate column(s) of illegal characters, and write message.

d. Transfer data to variables and check limits.

Screen illegal MI, age class, or MI-age class combinations and write message. Screen illegal data values and write message. For good MI, age class, or MI-age class combinations, put data in acres and volumes per acre variables.

5. Compute MI1 totals and average volumes per acre.

6. Write BRU record on BRURAF.

7. Print BRU report.

Subroutine BRUREP computes totals over age classes, changes volumes from cubic feet to thousand cubic feet and writes nonzero values in tables, omitting sections that are all zero.

Sort and write BRU list on BRURAF.

Subroutine SHELL sorts BRU list into ascending order of BRU identifying codes, keeping the BRU error count and BRURAF location with the associated identifying code. Illegal BRU identifying codes sort to the end of the list.

Write key record on BRURAF.

Print sorted BRU list.

Subroutine PRNLST prints the BRU list with associated BRURAF location and flags nonzero error counts.

Appendix B
Synopsis of GRUSCN

The synopsis of GRUSCN is designed to provide the logical flow of the program. Indention reflects logical routine divisions.

Initialization for run.

Set creation date and time.

Zero GRU count and record count.

For each GRU:

1. Initialization for a GRu.

   Zero counts of active (data) and comment records.

   Zero count by card type.

   Subroutine INIT sets variables to their default values.

2. Read in character form and print input for a GRU.

   Subroutine CHECK controls paging.

   Comments at the beginning are printed immediately.

   Comments among active records are stored temporarily and then printed.

   Active cards are printed and stored.

3. Check and record GRU identification code.

   Search for illegal characters in code.

   Transform good character sets into numeric form for GRU list.

   Set indicator value for bad character sets and write message.

4. For each active card:

   a. Subroutine SET provides error count and record identification for errors.

   b. Check card type, MI, and age class or period.

      Transform character sets into numeric form.

      Write message if illegal characters encountered.

c. Check data fields.

   Transform character sets into numeric form.

   For blank fields, set missing values.

   For illegal characters or illegal character order, set special indicator value, locate column(s) of illegal characters, and write message.

d. Transfer data to variables and check limits.

   Subroutine SINGLE handles one-dimensional arrays, subroutine DOUBLE handles two-dimensional arrays, and subroutine TRIPLE handles three-dimensional arrays for screening. Formal parameters provide array dimensions, array name, and lower and upper limits to these subroutines.

   Screen illegal MI, age class, or period, or combination of MI-age class or MI-period and write message.

   Screen illegal data values and write message.

   For good MI, age class or period, or combination of MI-age class or MI-period, put data in variables.

5. Create GRU name if needed.

6. Apply fill values to arrays, substituting the value stored in the -1 position for age class or period for any missing values. Subroutine FILONE handles one-dimensional arrays, FILTWO handles two-dimensional arrays, and FILTHR handles three-dimensional arrays. If the -1 position has not been set, use the appropriate default value as the fill value.

7. Cross-check related data values.

   Write message if total proportions shifted from MI acres or donor acres exceeds 1, if mortality salvage is requested when no mortality volumes per acre are provided, if more than three commercial thinnings are specified, if the preferred harvest proportions sum to more than 1, or if required card types are missing.

   Report optional card types that are missing, indicating use of default values.

8. Print GRU report.

   Subroutine GRUREP writes a complete report for the GRU, including all default values invoked. Sample values for the approach-to-normality equation are printed.

   Blanks are printed for zero values.

9. Write GRU record on GRURAF.

   Sort and write GRU list on GRURAF.

   Subroutine SHELL sorts GRU list into ascending order of GRU identifying codes, keeping the GRU error count and GRURAF location with the associated identifying code. Illegal GRU identifying codes sort to the end of the list.

Write key record on GRURAF.

Print sorted GRU list.

Subroutine PRNLST prints the GRU list with associated GRURAF location and flags nonzero error counts.

Appendix C
Synopsis of ACUSCN

The synopsis of ACUSCN is designed to provide the logical flow of the program. Indention reflects logical routine divisions.

Initialization for run.

Set creation date and time.

Zero ACU count and record count.

Initialization for general ACU data.

Zero counts of active (data) and comment records.

Set general ACU data variables to default values.

Read in character form and print general ACU input.

Subroutine CHECK controls paging.

Comments at the beginning are printed immediately.

Comments between active records are stored temporarily and then printed.

Active cards are printed and stored.

Process general ACU cards.

The general ACU cards have very different formats, so each card type is handled separately. Illegal characters, illegal values, and missing required card types cause error messages.

Subroutine EXPAND converts 20 character lists of ACU's to numeric representations.

Print general ACU report.

Subroutine GENREP reports the general ACU data.

Subroutine ACULOP processes data for each individual ACU:

1. Subroutine SET provides error count and record identification for errors.
2. Initialization for a ACU.

   Zero counts of active and comment records.

   Zero counts by card type.

   Set individual ACU data variables to their default values.

3. Read in character form and print input for an ACU.

   Subroutine CHECK controls paging.

   Comments between active records are stored temporarily and then printed.

   Active cards are printed and stored.

4. Check ACU identification code and card type.

   Transform character sets into numeric code and card type.

   Write message if illegal characters are encountered.

5. For each active ACU card:

6. Apply fill values to harvest request, using FILONE to substitute the value stored in the -1 position for age class for any missing values.

7. Cross-check related data values.

   Missing required card types causes error messages.

8. Print ACU report.

   Subroutine ACUREP reports the individual ACU data.

9. Subroutine SUM processes each GRU belonging to the ACU and subroutine TREACU records the ACU tree information.

   a. For the first ACU, the BRU list is read from BRURAF and the GRU list from GRURAF.

   b. Set GRU sum to zero.

   c. Locate GRU using subroutine BINSRC and read GRU data.

   d. For each BRU belonging to the GRU:

      Locate BRU using subroutine BINSRC and read BRU data.

      Flag normalities outside expected limits.

      Add BRU date to GRU sum, making stocking level shifts according to GRU limits.

      Subroutine TREBRU records the BRU tree information.

e. Redistribute summed GRU volumes to improve normality values, if requested.

f. Subroutine TREGRU records GRU tree information.

g. Write GRU record on BIGRAF, which includes GRU summed data.

h. Subroutine GRUCMB reports GRU summed data, changing volumes from cubic feet to thousand cubic feet. Blanks are printed for zeroes.

10. Write ACU record on ACURAF.

Check for presence of ACU subgroup members.

Write key record on BIGRAF.

Subroutine TRELST prints tree report and lists of BRU's and GRU's with their proportions of use.

Appendix D
Synopsis of TRIM

The synopsis of TRIM is designed to provide the logical flow of the program. Indention reflects logical routine divisions.

Initialization for run

Set date and time and write titles on output units.

Subroutine RUNINT blanks character arrays, sets various maximum values and page limits, reads the key record from BIGRAF, and writes the key record on CURRAF.

For each period:

Compute and display year.

For each ACU:

Subroutine ACUINT sets up the ACU information.

The ACU record is read from BIGRAF.

For period 0, summary variables in common SUBSUM are zeroed; otherwise, CURRAF information for the ACU are read.

ACU totals in common ACUDET are zeroed.

Display ACU number and name.

For each GRU in the ACU:

Subroutine GRUINT sets up the ACU information.

The GRU record is read from BIGRAF.

Acres and volumes per acre for regeneration use are zeroed. Commercial thinning and harvest volumes are zeroed.

For period 0, GRU values in common GRUDET are zeroed and net values for MI's are set; otherwise, GRU values are read from CURRAF.

Subroutine ALOCAT assigns the harvest volume for last period to MI's and age classes, computes GRU harvest summary variables in common GRUDET, and adds GRU values to all ACU summary variables in common ACUDET. (Note: Harvest volume is zero for period zero.)

If period is greater than zero, subroutine REPORT writes GRU detail reports, using information in common GRUDET, for last period.

Subroutine SHIFT zeroes all GRU summary variables in common GRUDET, regenerates cut and previously unstocked acres, shifts acres and volumes to and from donors and among Ml's, and stores acres and volumes before growth. Conversion harvest volume from acres shifted to donors is computed by SHIFT. Subroutine PNW is called by SHIFT for the rational expectation option.

Subroutine INVENT sums inventory variables in common GRUDET.

Subroutine GROW records acres that are precommercially thinned or fertilized, projects volumes per acre and total volumes after growth, moves acres to the next age class, computes growth as the difference between volumes before and after growth, stores growth in common GRUDET, and shifts acres to correct stocking levels.

Subroutine EXOGEN calls subroutines CNVERS to compute harvest volume from converted acres and add it to conversion harvest volume, THIN to compute commercial thinning volume, and MORTAL to compute mortality salvage volume. EXOGEN sums these volumes to compute the total exogenous harvest for the GRU.

Subroutine AGGREG writes GRU values on CURRAF, computes volume available for harvest for the GRU, adds it to ACU total volume available, and adds the exogenous harvest for the GRU to the ACU total exogenous harvest.

Subroutine PROPRT uses the ACU and GRU available volumes, exogenous harvest volumes, and harvest request to assign harvest values to each GRU and calls subroutine GRUHAR to report the results. PROPRT calls subroutines REPACU to write the ACU detail reports for last period and SUMPD to store last period's summary variables in common SUBSUM. For the last period of the simulation, PROPRT zeroes the ACU summary variables in common ACUDET, calls subroutines GRULAS, ALOCAT, and REPORT to allocate the final period's harvest and write the final period's GRU detail report. PROPRT again calls subroutines REPACU to write the final period's ACU detail reports and SUMPD to store the final period's summary variables in common SUBSUM.

For each ACU, subroutine FINAL reads ACU summary variables in common SUBSUM from CURRAF, calls subroutine SUBREP to write the ACU summary report, and adds the ACU summary variables to the grand total variables. When all ACU's have been processed, FINAL calls subroutine SUBREP to write the grand total summary report. For each ACU subgroup, FINAL recalls ACU summary data fO'r all ACU's belonging to the subgroup, forms the subgroup totals, and calls subroutine SUBREP to write the subgroup summary reports.

Subroutine ALOCAT

The first attempt to assign the harvest volume from the previous period to age classes uses the preferred harvest proportion. If the harvest volume is not exhausted, the second attempt allocates additional volume above the preferred proportion starting with oldest age class.

If the harvest volume is still not exhausted when all available volume has been assigned, the available amount is harvested and a warning message is written to output file CALLS.

Harvest volume in an age class is distributed to all MI's in equal proportions.

Final harvest is summed by fiber type and age class report group in GRU harvest summary variables in common GRUDET.

MI1 total acres and volumes are summed from MI1 stocking levels 1 to 3, and MI1 average volume per acre is computed.

Acres in all MI's are checked. Negative values and very small positive values from 1.0E-8 to 1.0E-20 are written in a warning message to output file CALLS and reset to zero; positive values less than 1.0E-20 are considered rounding errors and are reset to zero with no warning message. The volumes per acre and volumes corresponding to the acres reset are also set to zero.

Total and average GRU harvest summary variables in common GRUDET are computed.

GRU summary variables in common GRUDET are added to ACU summary variables in common ACUDET.

Subroutine SHIFT

Unstocked acres and harvested acres for the previous period are stored.

GRU summary variables in common GRUDET are zeroed.

Simple regeneration places cut acres that will be restocked into the MI's from which they were cut.

Cut acres that will remain unstocked are put into the newly unstocked categories by M I.

Previously unstocked acres that will be regenerated are assigned to MI1 for GRU's without conversion or to MI2 for GRU's with conversion selected.

Acres regenerated into MI1 are assigned to stocking levels according to the requested distribution for both cut acres and previously unstocked acres.

Regular acre totals and volumes per acre are computed.

Regular acres before shifting are stored.

Donor 2 acres are redistributed according to the proportions by age class of regular acres.

Donor acres before shifting are stored.

Acres are shifted to and from donors from and to the timberland base.

The number of acres shifted is the proportion to shift this period times the acres before shifting in each age class belonging to the donor or the MI from which shifting originates.

Volume from acres shifted to donors is captured as conversion volume, a component of exogenous harvest volume.

Acres moved from MI1 to donors are taken from stocking levels according to their proportions in the inventory.

Acres moved to MI1 from donors are assigned to the stocking level specified for the donor.

If an age class for a management type has no acres before shifting, the volume per acre is computed as the standard volume per acre multiplied by the stocking level midpoint for that management type; otherwise, the volume per acre for the existing acres is used.

For the rational expectation option of MI shifts:

Subroutine PNW is called to compute soil expectation values for each MI and all age classes up to the highest age for which shifting is permitted.

For each age class, eligible acres and their volumes in each MI are shifted to the MI with the highest soil expectation value, subject to the age class limitations specified. For GRU's with conversion selected, shifts from MI1 are not permitted in this subroutine.

For preselected MI shifts:

For each pair of MI's and for each age class, eligible acres and their volumes are shifted between the two MI's, subject to the age class limitations specified. For GRU's with conversion specified, shifts to or from MI1 are not permitted in this subroutine.

The number of acres shifted is the proportion shifted this period times the acres before shifting in each age class belonging to the MI from which shifting originates.

MI 1 total acres and volumes and average volumes per acre are recomputed from MI 1 stocking levels 1 to 3.

Acres in all MI's are checked. Negative values cause a catastrophic error that stops the program; very small positive values from 1.0E-8 to 1.0E-20 are written in a warning message to output file CALLS and are reset to zero; values smaller than 1.0E-20 are considered rounding error and are reset to zero with no warning message.

GRU regeneration summary variables and land base summary variables in common GRUDET are computed.

Regular and donor acres, volumes, and volumes per acre after shifting are stored. Regular and donor acre totals are computed.

Subroutine GROW

Precommercially thinned acres and fertilized acres are recorded.

For growth using yield tables:

For stocking levels 1 to 3 of MI 1 and MI's 2 to 5:

Acres in the next to the highest age class are added to acres in the highest age class.

Volume per acre for the highest age class is the product of standard volume for that age class times the stocking level midpoint for that MI and stocking level.

Volume for the highest age class is the product of acres and volume per acre.

For each age class from the next to highest down to the first:

Acres are moved from the age class below to that age class.

Volume per acre is the product of standard volume for that age class times the stocking level midpoint.

Volume is the product of acres times volume per acre.

Acres in the newly regenerated age class are set to zero.

For growth using the approach-to-normality equation:

Current normality is the stocking proportion before growth based on the values for the previous age class.

For any age class with zero standard volume, current normality is set to the stocking level midpoint for that MI and stocking level.

For all other age classes, current normality is the ratio of the sum of current volume per acre plus thinning volume per acre times the stocking level midpoint divided by standard volume.

Projected normality is the stocking proportion after growth computed for each age class.

For any age class with no existing acres, projected normality is set to zero.

For aU other age classes less than or equal to the limit for full approach to normality, projected normality is the intercept of the approach-to-normality equation plus the slope of the equation times the current normality.

For all. other age classes greater than the limit for full approach to normality and less than or equal to the limit for one-half the full approach-to-normality, projected normality is one-half the sum of the current normality plus the intercept of the equation plus the slope of the equation times the current normality.

For all other age classes greater than the limit for one-half the full approach to normality, projected normality is equal to current normality.

For stocking levels 1 to 3 of MI1 and MI's 2 to 5:

Acres in the next to highest age class are added to acres in the highest age class.

The acre-weighted average of projected normality for the highest age class and projected normality for the next to highest age class are computed.

For average projected normality less than or equal to the normality limit, volume per acre after growth for the highest age class is the product of the average projected normality times the standard volume for that age class, and volume after growth is the product of acres times volume per acre after growth.

For average projected normality greater than the normality limit, volume after growth is equal to volume before growth, and volume per acre after growth is the ratio of volume after growth divided by acres.

For age classes from the next to highest down to the first:

Acres are moved from the age class below to that age class.

For projected normality less than or equal to the normality limit, volume per acre after growth is the product of projected normality times the standard volume for that age class, and volume after growth is the product of acres times volume per acre after growth.

For projected normality greater than the normality limit, volume after growth is equal to volume before growth, and volume per acre after growth is the ratio of volume after growth divided by acres.

Acres in the newly regenerated age class are set to zero.

For donor acres that grow older, the acres in the next to highest age class are added to acres in the highest age class, and acres in all other age classes are moved up one age class.

Growth for stocking levels 1 to 3 of MI1 and MI's 2 to 5 is computed as the volume after growth less the volume before growth.

Growth summary variables in common GRUDET are computed.

Donor acre totals are recomputed.

Acres and volumes in stocking levels 1 to 3 of MI1 are shifted to the correct stocking level, depending on the stocking level entry points, and volumes per acre are recomputed.

MI1 total acres and volumes and average volumes per acre are recomputed.

Regular acre totals are recomputed.

Appendix E

Card-by-Card Input Formats

Columns:									
1-5	7	9	11-12	21-30	31-40	41-50	51-60	61-70	71-80
BRU ID	Card type	mi	ac	Data field 1	Data field 2	Data field 3	Data field 4	Data field 5	Data field 6
				Unstocked acres					
	1			UNSBRU					
				Donor acres for each donor, 1 and 2, and age class					
	2		ac	DONBRU (ac,1)	DONBRU (ac,2)				
				Regular acres and volumes per acre for MI 1, each stocking level, 1 to 3, and age class					
	3	1	ac	ACBRU (ac,1) stocking level 1	VPABRU(ac,1)	ACBRU(ac,2) stocking level 2	VPABRU(ac,2)	ACBRU(ac,3) stocking level 3	VPABRU(ac,3)
				Regular acres and volume per acre for MI's 2 to 5, stocking level 1, and age class					
	3	mi	ac	ACBRU(ac,mi+3)	VPABRU(ac,mi+3)				

Columns:									
1-10	11-12	14	16	18-19	21-30	31-40	41-50	51-60	61-70	71-80
GRU ID	Card type	mi			Data field 1	Data field 2	Data field 3	Data field 4	Data field 5	Data field 6
					GRU name: 15 character name					
	00				GRUNAM(to column 35)					
					BRU's belonging to GRU: BRU identification code and proportion of BRU included, if not = 1.0 (maximum = 50)					
	01				BRUID(i)	BRUID(j) or BRUPRO(i)	BRUID(k) or BRUPRO(j)	BRUID(l) or BRUPRO(k)	BRUID(m) or BRUPRO(l)	BRUID(n) or BRUPRO(m)
					GRU site and species					
	02				SITE Site	ORGSP Original Species	CVSP Conversion Species			
					GRU options					
	03				PNWRUN Rational expectation flag 0=off, 1=on	DUMP Diagnostic output flag 0=off, 1=on	IFDUMP First period for diagnostic output	LSDUMP Last period for diagnostic output		
					Planting stock for each MI, 1 to 5: blank for regular stock, 0 for genetic stock					
	04				PLANT(1)	PLANT(2)	PLANT(3)	PLANT(4)	PLANT(5)	
	05				Precommercial thinning age class for each MI, 1 to 5					
					PCTAGE(1)	PCTAGE(2)	PCTAGE(3)	PCTAGE(4)	PCTAGE(5)	
					Fertilization age class for each MI, 1 to 5, and applications, 1 and 2					
	06	mi			FTAGES(mi,1)	FTAGES(mi,2)				

Columns:

1-10	11-12	14	16	18-19	21-30	31-40	41-50	51-60	61-70	71-80
GRU ID	Card type	mifr	mito	pd	Data field 1	Data field 2	Data field 3	Data field 4	Data field 5	Data field 6
					Age class limit for shifting among MI's					
	07	mifr	mito		HISHIF(mifr, mito)					
					Minimum harvest age class for each MI, 1 to 5					
	08				MINHAR(1)	MINHAR(2)	MINHAR(3)	MINHAR(4)	MINHAR(5)	
					Rotation age for each MI, 1 to 5 (age in years)					
	09				ROT(1)	ROT(2)	ROT(3)	ROT(4)	ROT(5)	
					Discount rate for period					
	10				DISCO(-1) Fill value					
	10			pd	DISCO(pd)	DISCO(pd+1)	DISCO(pd+2)	DISCO(pd+3)	DISCO(pd+4)	DISCO(pd+5)
					Price per unit for period					
	11				PRICE(-1) Fill value					
	11			pd	PRICE(pd)	PRICE(pd+1)	PRICE(pd+2)	PRICE(pd+3)	PRICE(pd+4)	PRICE(pd+5)
	12				Annual cost per acre for period					
	12				ANNCO(-1) Fill value					
	12			pd	ANNCO(pd)	ANNCO(pd+1)	ANNCO(pd+2)	ANNCO(pd+3)	ANNCO(pd+4)	ANNCO(pd+5)

Columns										
1-10	11-12	14	16	18-19	21-30	31-40	41-50	51-60	61-70	71-80
GRU ID	Card type			pd	Data field 1	Data field 2	Data field 3	Data field 4	Data field 5	Data field 6
					Final harvest cost per unit for period					
	13				HARUNT(-1) Fill value					
	13			pd	HARUNT (pd)	HARUNT(pd+1)	HARUNT(pd+2)	HARUNT(pd+3)	HARUNT(pd+4)	HARUNT(pd+5)
					Final harvest cost per acre for period					
	14			pd	HARCO(-1) Fill value					
	14			pd	HARCO(pd)	HARCO(pd+1)	HARCO(pd+2)	HARCO(pd+3)	HARCO(pd+4)	HARCO(pd+5)
					Commercial thinning cost per unit for period					
	15				CTUNIT(-1) Fill value					
	15			pd	CTUNIT(pd)	CTUNIT(pd+1)	CTUNIT(pd+2)	CTUNIT(pd+3)	CTUNIT(pd+4)	CTUNIT(pd+5)
					Commercial thinning cost per acre for period					
	16				CTCO(-1) Fill value					
	16			pd	CTCO(pd)	CTCO(pd+1)	CTCO(pd+2)	CTCO(pd+3)	CTCO(pd+4)	CTCO(pd+5)
					Fertilization cost per acre for period					
	17				FERTCO(-1) Fill value					
	17			pd	FERTCO(pd)	FERTCO(pd+1)	FERTCO(pd+2)	FERTCO(pd+3)	FERTCO(pd+4)	FERTCO(pd+5)

Columns:										
1-10	11-12	14	16	18-19	21-30	31-40	41-50	51-60	61-70	71-80
GRU ID	Card type	mi		pd	Data field 1	Data field 2	Data field 3	Data field 4	Data field 5	Data field 6
					Precommercial thinning cost per acre for period					
	18				PCTCO(-1) Fill value					
	18			pd	PCTCO(pd)	PCTCO(pd+1)	PCTCO(pd+2)	PCTCO(pd+3)	PCTCO(pd+4)	PCTCO(pd+5)
					Regeneration cost per cut acre for MI and period					
	19	mi			REGECO(-1,mi) Fill value					
	19	mi		pd	REGECO(pd,mi)	REGECO(pd+1,mi)	REGECO(pd+2,mi)	REGECO(pd+3,mi)	REGECO(pd+4,mi)	REGECO(pd+5,mi)
					Regeneration cost per unstocked acre for MI and period					
	20	mi			UNSTCO(-1,mi) Fill value					
	20	mi		pd	UNSTCO(pd,mi)	UNSTCO(pd+1,mi)	UNSTCO(pd+2,mi)	UNSTCO(pd+3,mi)	UNSTCO(pd+4,mi)	UNSTCO(pd+5,mi)
					Proportion of unstocked acres restocked for period					
	21				UNSTRE(-1) Fill value					
	21			pd	UNSTRE(pd)	UNSTRE(pd+1)	UNSTRE(pd+2)	UNSTRE(pd+3)	UNSTRE(pd+4)	UNSTRE(pd+5)
					Proportion of cut acres to unstocked for period					
	22				CUTUNS(-1) Fill value					
	22			pd	CUTUNS(pd)	CUTUNS(pd+1)	CUTUNS(pd+2)	CUTUNS(pd+3)	CUTUNS(pd+4)	CUTUNS(pd+5)

Columns:

1-10	11-12	14	16	18-19	21-30	31-40	41-50	51-60	61-70	71-80
GRU ID	Card type	od mifr	mito od	pd	Data field 1	Data field 2	Data field 3	Data field 4	Data field 5	Data field 6
					Stocking level midpoint for MI 1, stocking levels 1 to 3; proportion of MI 1 acres regenerated in each stocking level, 1 to 3					
	23				SLMID(1)	SLMID(2)	SLMID(3)	SLDIST(1)	SLDIST(2)	SLDIST(3)
					Minimum stocking proportion to enter stocking levels 1 and 2; stocking level midpoint for stocking level 1 of MI 2 to 5 (MT 5 to 8)					
	24				SLMIN(1)	SLMIN(2)	SLMID(5)	SLMID(6)	SLMID(7)	SLMID(8)
					Stocking level of each donor, 1 and 2					
	25				ODSTOC(1)	ODSTOC(2)				
					Proportion of donor acres to shift to MI for period					
	26	od	mito		DONOR(-1,od,mito) Fill value					
	26	od	mito	pd	DONOR(pd,od, mito)	DONOR(pd+1, od,mito)	DONOR(pd+2, od,mito)	DONOR(pd+3, od,mito)	DONOR(pd+4, od,mito)	DONOR(pd+5, od,mito)
					Proportion of MI acres to shift to donor for period					
	27	mifr	od		MIOUT(-1, mifr,od) Fill value					
	27	mifr	od	pd	MIOUT(pd, mifr,od)	MIOUT(pd+1, mifr,od)	MIOUT(pd+2, mifr,od)	MIOUT(pd+3, mifr,od)	MIOUT(pd+4, mifr,od)	MIOUT(pd+5, mifr,od)
					Preselected proportion to shift among MI's for period					
	28	mifr	mito		MISHIF(-1, mifr, mito) Fill value					
	28	mifr	mito	pd	MISHIF(pd, mifr,mito)	MISHIF(pd+1, mifr,mito)	MISHIF(pd+2, mifr,mito)	MISHIF(pd+3, mifr,mito)	MISHIF(pd+4, mifr,mito)	MISHIF(pd+5) mifr,mito)

Columns:

1-10	11-12	14	16	18-19	21-30	31-40	41-50	51-60	61-70	71-80
GRU ID	Card type	od, mi		pd, ac	Data field 1	Data field 2	Data field 3	Data field 4	Data field 5	Data field 6
					Exogenous volume proportion recovered from donor acres for period					
	29	od			DONCAP(-1,od) Fill value					
	29	od		pd	DONCAP(pd,od)	DONCAP(pd+1,od)	DONCAP(pd+2,od)	DONCAP(pd+3,od)	DONCAP(pd+4,od)	DONCAP(pd+5,od)
					Growth type and approach to normality					
	30				GROTYP Growth type 0=yield table 1=approach-to normality	FULLAP Last age class for full approach-to-normality	HALFAP Last age class for one half the full approach-to-normality	INTAP Intercept of approach-to-normality function	COEFAP Coefficient of approach-to-normality function	
					Mortality salvage					
	31				MORSAL Mortality salvage flag 0=off, 1=on	MORPRP Salvable proportion of mortality volume	MORVOL Minimum salvable volume per acre			
					Average diameter for MI and age class					
	32	mi			AVDIAM(-1,mi) Fill value					
	32	mi		ac	AVDIAM(ac,mi)	AVDIAM(ac+1,mi)	AVDIAM(ac+2,mi)	AVDIAM(ac+3,mi)	AVDIAM(ac+4,mi)	AVDIAM(ac+5,mi)
					Standard net volume per acre for MI and age class					
	33	mi			VOLPA(-1,mi) Fill value					
	33	mi		ac	VOLPA(ac,mi)	VOLPA(ac+1,mi)	VOLPA(ac+2,mi)	VOLPA(ac+3,mi)	VOLPA(ac+4,mi)	VOLPA(ac+5,mi)

Columns:

1-10	11-12	14	16	18-19	21-30	31-40	41-50	51-60	61-70	71-80
GRU ID	Card type	mi		ac	Data field 1	Data field 2	Data field 3	Data field 4	Data field 5	Data field 6
					Thinning volume per acre for MI and age class					
	34	mi			THINPA(-1,mi) Fill value					
	34	mi		ac	THINPA(ac,mi)	THINPA(ac+1,mi)	THINPA(ac+2,mi)	THINPA(ac+3,mi)	THINPA(ac+4,mi)	THINPA(ac+5,mi)
					Mortality volume per acre for MI and age class					
	35	mi			MORTPA(-1,mi) Fill value					
	35	mi		ac	MORTPA(ac,mi)	MORTPA(ac+1,mi)	MORTPA(ac+2,mi)	MORTPA(ac+3,mi)	MORTPA(ac+4,mi)	MORTPA(ac+5,mi)
					Softwood proportion of volume per acre for MI and age class					
	36	mi			SOFTPA(-1,mi) Fill value					
	36	mi		ac	SOFTPA(ac,mi)	SOFTPA(ac+1,mi)	SOFTPA(ac+2,mi)	SOFTPA(ac+3,mi)	SOFTPA(ac+4,mi)	SOFTPA(ac+5,mi)
					Adjustment factor for growth on harvest for MI and age class					
	37	mi			HARGRO(-1,mi) Fill value					
	37	mi		ac	HARGRO(ac,mi)	HARGRO(ac+1,mi)	HARGRO(ac+2,mi)	HARGRO(ac+3,mi)	HARGRO(ac+4,mi)	HARGRO(ac+5,mi)
					Preferred harvest proportion for age class					
	38				HVPROP(-1) Fill value					
	38			ac	HVPROP(ac)	HVPROP(ac+1)	HVPROP(ac+2)	HVPROP(ac+3)	HVPROP(ac+4)	HVPROP(ac+5)
					Volume conversion factor for age class (to convert from base volume unit to alternate volume unit)					
	39				CONFAC(-1) Fill value					
	39			ac	CONFAC(ac)	CONFAC(ac+1)	CONFAC(ac+2)	CONFAC(ac+3)	CONFAC(ac+4)	CONFAC(ac+5)

Columns:															
1-2	3-5	7	10-11	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	61-65	66-70	71-75	76-80
Card type	ac, rt	ht	pd												
				Run header											
01				RHEAD 60 characters run description											
				Time information											
02				STYEAR Starting Year		LENPD Number of years per period		MAXPD Last period of run		APLIM Normality limit for changing		APMIN Normality minimum for warning		APMAX Normality maximum for warning	
				Age class report groups: 8 groups possible											
03	ac			ACGRP(ac) Age class report group											
				Unit conversion specifications (for alternate inventory and/or harvest report)											
04				ALTUNT 15 character label for the units after conversion				DIAMIN Minimum diameter for conversion							
				Report Matrix: 0=no, 1=yes; rt=1 for GRU detail, =2 for ACU detail, = 3 for ACU summary, =4 for ACU subgroup summary, =5 for summary totals											
05	rt	(report name optional in 8-20)		REPMAT(rt,1) Inventory		REPMAT(rt,2) Harvest		REPMAT(rt,3) Alternate unit inventory and/or harvest		REPMAT(rt,4) Regeneration and treatment		REPMAT(rt,5) Economic		REPMAT(rt,6) Land shift	
				ACU subgroups: (maximum=12)											
06				Subgroup n				Subgroup n+1				Subgroup n+2			

Columns:

1-2	3-5	7	10-11	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	61-65	66-70	71-75	76-80
Card type	ACU	ht, ct	pd												
				ACU name											
A1				ACUNAM 15 character label for ACU											
				GRU's belonging to ACU (maximum is 50)											
A2				GRUID(n)	GRUID(n+1)	GRUID(n+2)	GRUID(n+3)	GRUID(n+4)	GRUID(n+5)						
				ACU harvest volume for period: ht=1 for softwood, =2 for hardwood, =3 for combined											
A3		ht	pd	HRVACU(pd)	HRVACU(pd+1)	HRVACU(pd+2)	HRVACU(pd+3)								
				ACU shift specification											
A4				DONTOP Donor 2 shift method 1=acres grow older 2=acres frozen in age 3=acres in pool, existing distribution											
				ACU treatment name: one card for each ct, 1 to 7, required											
A5		ct		TRNAME(ct) 15-character label for treatment											
				ACU management intensity name: one card for each ct, 1 to 5, required											
A6		ct		MINAME(ct) 15-character label for management intensity											

Columns:

1-2	3-5	7	10-11	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	61-65	66-70	71-75	76-80
Card type	ACU	ct	ac												
				ACU site name: one card for each ct, 1 to 3, required											
A7		ct		SITNAM(ct) 15-character label for site											
				ACU species name and report group: one card for each species, ct may be 1 to 9											
A8		ct		SPNAME(ct) 15-character label for species				SPGRP(ct) Species report group 1=softwood, 2=hardwood							

Appendix F

Example : TRIM Inputs and Results

The minimum data—It is possible to make a TRIM system run with a minimum level of data. The minimum data option is very helpful when debugging input values or when a particular report is needed to check inventory totals, etc. Default values are provided for most of the data required for a TRIM run. The minimum information is an inventory, an appropriate volume table, harvest amounts requested, label information, and a few other parameters.

The TRIM user must start with the initial inventory to be used and prepare that inventory in the proper format by following the instructions and formats for the BRU. Each BRU must be assigned an identification code (up to five digits). Figure 7 illustrates BRU number 41001 (comment cards are indicated by a double asterisk and are not necessary). The BRU has no unstocked acres, no donor acres, and acres and volume from age class 0 to age class 7. Age class 6 has 37,754.4 acres with an average volume per acre of 6022.92 cubic feet. There are no acres in stocking levels 2 or 3.

When the BRU inventory is properly coded, the GRU must be constructed. The GRU contains the normal volume tables and management instructions for current and future management of the BRU's belonging to the GRu. Again, each GRU must have an identification code (up to 10 digits). Figure 8 illustrates the minimum requirements for a GRU. The first card indicates the BRU number, the second indicates site and species code, and the final 3 cards are the normal volumes per acre. As there is no approach-to-normality in this GRU, the acres in the BRU will grow and be assigned the yield table values after the 0 period.

```
*** INVENTORY EXAMPLE FOR ALL FOREST INDUSTRY HIGH
*** CARD TYPE 3   : REGULAR ACRES, VOLUMES PER ACRE
41001 3 1  0          190946.1      24.03
41001 3 1  1          115739.7     459.42
41001 3 1  2          156021.0    2014.75
41001 3 1  3          276580.5    4086.52
41001 3 1  4          132144.2    5138.45
41001 3 1  5           28743.4    4130.53
41001 3 1  6           37754.4    6022.92
41001 3 1  7           54736.9    5821.25
41001 3 1  8            6323.3    3875.80
41001 3 1  9           11678.6   10590.00
41001 3 1 10            9181.3    1583.40
```

Figure 7—Minimum data BRU file.

```
*** CONTROL FILE FOR MINIMUM DATA EXAMPLE
*** CARD TYPE 00 : GRU NAME
40110000  00          ALL FOR IND HI
*** CARD TYPE 01 : BRUS BELONGING TO GRU
40110000  01             41001
*** CARD TYPE 02 : GRU SITE AND SPECIES
40110000  02               1          1
*** CARD TYPE 33 : GRU STANDARD VOLUME PER ACRE BY MI BY AC
40110000  33 1    0        5.0       12.0     1163.0     4288.0     7744.0    11092.0
40110000  33 1    6    13867.0    16110.0    18020.0    19676.0    21117.0    22377.0
40110000  33 1   12    23486.0    23486.0    23486.0    23486.0    23486.0    23486.0
```

Figure 8—Minimum data GRU file.

Run header parameters are the next requirements. A run header, the starting year of the simulation, the number of years in a period, and the length of the simulation in periods must be supplied as well as age-class report groups. The top portion of figure 9 illustrates the run header information. The first card is the title of the simulation. The second card indicates the starting time period (1983), the length of each period (10 years), and the number of periods in this simulation (3). The second series of cards (card 03) group the 18 age classes into 8 report groups. For example, those acres in age classes 0 and 1 will be reported together in age class report group 1.

```
*** CARD TYPE 01 : RUN HEADER
01                ALL FOREST INDUSTRY MINIMUM EXAMPLE
*** CARD TYPE 02 : TIME INFORMATION
02                      1983        10          3
*** CARD TYPE 03 : AGE CLASS REPORT GROUPS
03  0                   1
03  1                   1
03  2                   2
03  3                   2
03  4                   3
03  5                   3
03  6                   4
03  7                   4
03  8                   5
03  9                   5
03 10                   6
03 11                   6
03 12                   7
03 13                   7
03 14                   8
03 15                   8
03 16                   8
03 17                   8
*** CARD TYPE A1 : ACU NAME
A101                 ALL FOR. IND.
*** CARD TYPE A2 : GRUS BELONGING TO ACU
A201                 40110000
*** CARD TYPE A3 : ACU HARVEST VOLUME BY PERIOD
A301  1  00            1.2012E+9   1.3858E+9    1.2332E+9    1.2087E+9
*** CARD TYPE A5 : ACU TREATMENT NAMES
A501  1               REGULAR STOCK
A501  2               GENETIC STOCK
A501  3                  CONVERSION
A501  4                PRECOMM THIN
A501  5               FERTILIZATION
A501  6                   COMM THIN
A501  7               FINAL HARVEST
*** CARD TYPE A6 : ACU MANAGEMENT INTENSITY NAMES
A601  1                MGNT PRESENT
A601  2                   MGNT-THIN
A601  3                    MGNT-TRT
A601  4               MGNT-GEN-THIN
A601  5                MGNT-GEN-TRT
*** CARD TYPE A7 : ACU SITE NAMES
A701  1               AVE SITE 175
A701  2               AVE SITE 140
A701  3               AVE SITE  87
*** CARD TYPE A8 : ACU SPECIES NAMES
A801  1                DOUGLAS-FIR              1
```

Figure 9—Minimum data ACU file.

The ACU must now be specified. Various labels must be supplied for each ACU. The ACU name, the list of GRU's belonging to the ACU, and harvest fiber type and amount must be identified. Names for treatments, management intensities, and sites are also required. Species name and species report group must match the species code in the GRU information. Figure 9 illustrates the ACU file. Card A 101 lists the name of the ACU (ALL FOR. IND.) and card A201 lists the GRU's belonging to this ACU (there is only one, 4011000). Card A301 lists the harvest fiber type 1 (softwood) and the amount of harvest volume to be taken for each period. There are four entries because period 0 is a removal period and the run length is 3 periods. The final four card types (A501, A601, A701, and A801) represent the labels and names required by the reports. These should match data inputs for the treatments, management intensities, and site and species names.

Figure 10 represents the minimum level of output or the summary report for all sites and species. The date and time of the TRIM run and the RAF creation can be located in the upper right corner. The output lists the inventory, growth, and harvest for both softwood and hardwood, and the totals. Because there was no softwood proportion of total volume in this run the hardwood reports are blank.

ACU TOTAL'S

RUN 87/05/20. 08.07.37. PAGE 1 SUMMARY REPORTS
RAF 87/05/20. 08.07.34.

ALL FOREST INDUSTRY MINIMUM EXAMPLE

SUMMARY REPORT
ALL SPECIES
ALL SITES

INVENTORY- CUBIC FEET

YEAR	TOTAL AREA	NET GROWING STOCK VOLUME SOFTWOOD	HARDWOOD	COMBINED	GROWTH VOLUME ON NET GROWING STOCK SOFTWOOD	HARDWOOD	COMBINED
1983	1019848.	3008843442.		3008843442.	3978875750.		3978875750.
1993	1019848.	5781930758.		5781930758.	2583922918.		2583922918.
2003	1019848.	6980053675.		6980053675.	2673161707.		2673161707.
2013	1019848.	8420015382.		8420015382.	2510074259.		2510074259.

HARVEST- CUBIC FEET SOFTWOOD

YEAR	TOTAL AREA	MORTAL SALV VOLUME	CONVERSION VOLUME	COMM THIN VOLUME	FINAL HARVEST VOLUME	TOTAL VOLUME	REQUESTED VOLUME
1983	61851.				1201200000.	1201200000.	1201200000.
1993	77103.				1385800000.	1385800000.	1385800000.
2003	75427.				1233200000.	1233200000.	1233200000.
2013	67182.				1208700000.	1208700000.	1208700000.

HARVEST- CUBIC FEET HARDWOOD

YEAR	TOTAL AREA	MORTAL SALV VOLUME	CONVERSION VOLUME	COMM THIN VOLUME	FINAL HARVEST VOLUME	TOTAL VOLUME	REQUESTED VOLUME
1983	61851.						
1993	77103.						
2003	75427.						
2013	67182.						

HARVEST- CUBIC FEET COMBINED

YEAR	TOTAL AREA	MORTAL SALV VOLUME	CONVERSION VOLUME	COMM THIN VOLUME	FINAL HARVEST VOLUME	TOTAL VOLUME	REQUESTED VOLUME
1983	61851.				1201200000.	1201200000.	
1993	77103.				1385800000.	1385800000.	
2003	75427.				1233200000.	1233200000.	
2013	67182.				1208700000.	1208700000.	

Figure 10—Minimum data summary output.

Detailed input. —The final example illustrates a TRIM system input and simulation that is more complex in terms of input. this example includes only one GRU however. Figure 11 illustrates the five BRU's in this simulation: BRU's numbered 41111 to 41131. There are unstocked acres in BRU 41221. and there are no donor acres in any of the BRU's. The acres are distributed among the three different stocking levels.

```
*** CARD TYPE 1   : UNSTOCKED ACRES
41111 1 1              0.0
*** CARD TYPE 3   : REGULAR ACRES, VOLUMES PER ACRE
41111 3 1  0       11428.7        0.0   10877.3        0.0
41111 3 1  1        6673.4      203.0    6673.4      113.7
41111 3 1  2                             6323.3     4418.9
41111 3 1  3       44200.7     6288.4   30032.6     3858.5     5703.9     7191.2
41111 3 1  4        6323.3     8992.9    6323.3     7411.7
41111 3 1  6                             15855.5     9260.0     6323.3     4308.2
41111 3 1  7                             15855.6     5912.1
*** CARD TYPE 1   : UNSTOCKED ACRES
41211 1 1              0.0
*** CARD TYPE 3   : REGULAR ACRES, VOLUMES PER ACRE
41211 3 1  4                                                   5703.9     2460.5
41211 3 1  7                                                   6323.3     6379.1
*** CARD TYPE 1   : UNSTOCKED ACRES
41121 1 1              0.0
*** CARD TYPE 3   : REGULAR ACRES, VOLUMES PER ACRE
41121 3 1  0       45151.5       56.3   89716.8       16.2     9982.8        0.0
41121 3 1  1       18293.1      464.5   50580.7      584.0    12871.5      584.0
41121 3 1  2       24721.6     2216.0   51204.1     2216.0    31188.9     1990.6
41121 3 1  3       30840.3     5519.1   78282.2     3835.2    68499.1     2532.5
41121 3 1  4                             80894.7     5979.5    30250.5     3519.6
41121 3 1  5       11062.6     5788.3    6323.3     8080.4
41121 3 1  6                                                   15575.6     3423.8
41121 3 1  7        5703.9    13437.8   10573.6     6337.4     6323.3     4688.3
41121 3 1  8                                                   6323.3     3875.8
41121 3 1  9                             11878.6    10590.0
*** CARD TYPE 1   : UNSTOCKED ACRES
41221 1 1          10466.2
*** CARD TYPE 3   : REGULAR ACRES, VOLUMES PER ACRE
41221 3 1  0                                                   23789.0       24.9
41221 3 1  1                                                   14849.0      324.0
41221 3 1  2                                                   42583.1     1316.6
41221 3 1  3                                                   12776.8     2807.1
41221 3 1  4                                                    7072.9     4051.5
41221 3 1  5                                                   11357.5      316.7
41221 3 1  7                                                    9956.3     1130.2
41221 3 1 10                                                    9181.3     1583.4
*** CARD TYPE 1   : UNSTOCKED ACRES
41131 1 1              0.0
*** CARD TYPE 3   : REGULAR ACRES, VOLUMES PER ACRE
41131 3 1  1                                                    5798.6      120.0
41131 3 1  3                             6244.9     2501.9
41131 3 1  4                            15575.6     3980.9
```

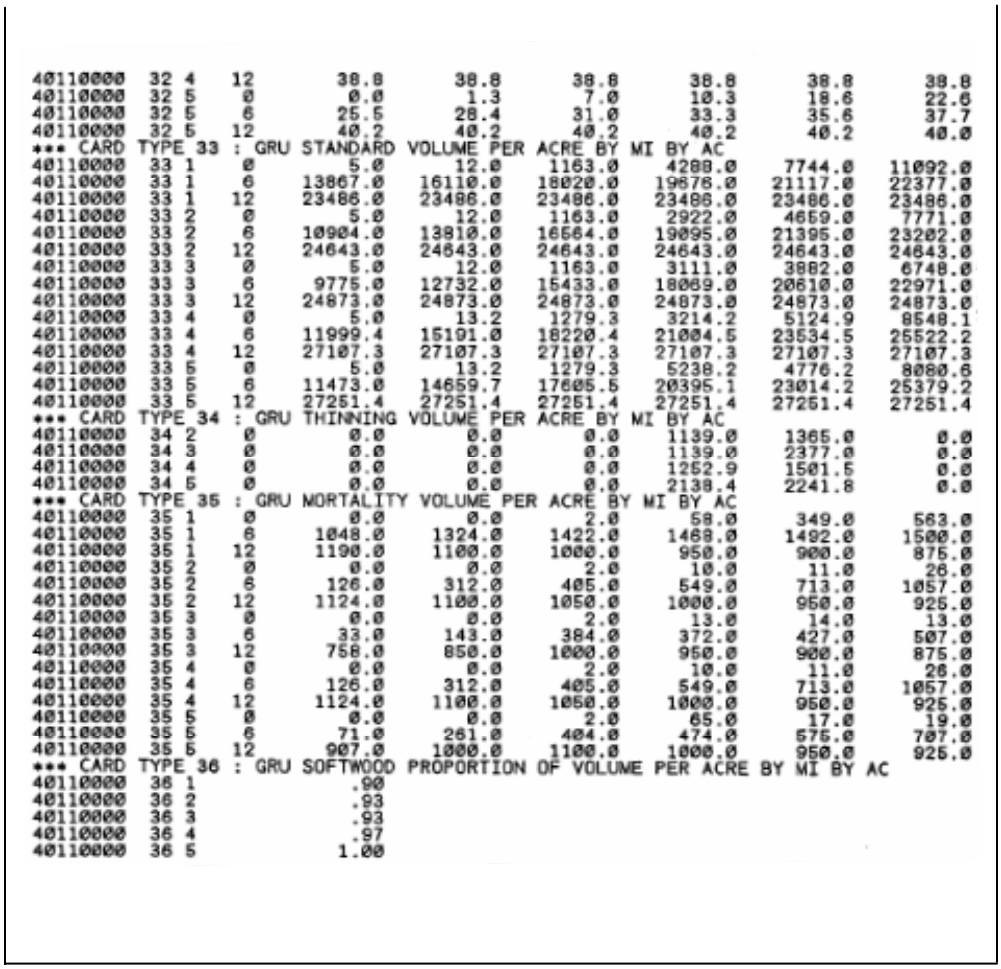
Figure 11—Detailed data BRU file.

The GRU Input is presented in figure 12.[1/] This GRU is entitled “Forest IND. HIGH" and has five BRU's in it as can be seen from the first two card entries. GRU card 2 indicates the site and species, and cards 5, 7, and 8 set up precommercial thinning ages, age limit for shifts to higher Ml's, and minimum harvest ages. The block of economic cards, GRU cards 11 through 20, indicate the different costs of treatment and harvests along with the price per unit harvested. The next set of cards, GRU cards 21 through 28, represents current and future levels of stocking, how the acres are to be shifted between the unstocked acres, and how they will shift between the two different management intensities. In this example, card 28 indicates that acres will move between MI1 and MI2 at rates of 33 percent, 5O percent, and 100 percent for the first three periods. If all acres in MI1 were in stocking level 1 and all acres were harvested during the simulation, then all acres could conceivably end up in M12. The final set of cards indicates the type of growth, approach-to-normality, the diameter and yield tables for both management intensities, thinning yields for M12, mortality volume, and softwood proportions. The default is harvest the oldest first and there win be no conversion reports because there are no card 39's.

[1/] The input data and example output in figures 12 through 14 are for illustrative purposes only.

```
*** CONTROL FILE FOR DETAILED EXAMPLE
*** CARD TYPE 00 : GRU NAME
40110000  00        FOR. IND.  HIGH
*** CARD TYPE 01 : BRUS BELONGING TO GRU
40110000  01             41111     41211     41121     41131     41221
*** CARD TYPE 02 : GRU SITE AND SPECIES
40110000  02              1         1
*** CARD TYPE 04 : GRU PLANTING TYPES BY MI
40110000  04                                                  0         0
*** CARD TYPE 05 : GRU PRECOMMERCIAL THINNING AGES BY MI
40110000  05              1         1         1         1         1
*** CARD TYPE 06 : GRU FERTILIZATION AGES BY MI
40110000  06 3            3
40110000  06 5            2         3
*** CARD TYPE 07 : GRU AGE LIMITS FOR SHIFTING BY MI
40110000  07 1 2           3
40110000  07 1 3           3
40110000  07 1 4           0
40110000  07 1 5           0
40110000  07 2 3           3
40110000  07 2 4           0
40110000  07 2 5           0
40110000  07 3 4           0
40110000  07 3 5           0
40110000  07 4 5           2
*** CARD TYPE 08 : GRU MINIMUM HARVEST AGES BY MI
40110000  08              4         4         4         4         4
*** CARD TYPE 09 : GRU ROTATION AGES BY MI
40110000  09             80        80        80        80        80
*** CARD TYPE 10 : GRU DISCOUNT RATES BY PERIOD
40110000  10           .04
*** CARD TYPE 11 : GRU PRICES PER UNIT BY PERIOD
40110000  11    00      3.00      3.09      3.18      3.28
*** CARD TYPE 12 : GRU ANNUAL COSTS PER ACRE BY PERIOD
40110000  12    00      3.00      3.06      3.12      3.18
*** CARD TYPE 15 : GRU COMMERCIAL THINNING COST PER UNIT BY PERIOD
40110000  15    00     .4160     .4280     .4413     .4545
*** CARD TYPE 16 : GRU COMMERCIAL THINNING COST PER ACRE BY PERIOD
40110000  16    00     290.0     298.7     307.6     316.9
*** CARD TYPE 17 : GRU FERTILIZATION COST PER ACRE BY PERIOD
40110000  17    00      33.0      33.9      35.0      36.0
*** CARD TYPE 18 : GRU PERCOMMERCIAL THINNING COST PER ACRE BY PERIOD
40110000  18    00      77.0      79.3      81.7      84.14
*** CARD TYPE 19 : GRU REGENERATION COST PER CUT ACRE BY MI BY PERIOD
40110000  19 1  00     114.0     117.4     120.9     124.6
40110000  19 2  00     114.0     117.4     120.9     124.6
40110000  19 3  00     114.0     117.4     120.9     124.6
40110000  19 4  00     134.0     138.0     142.2     146.4
40110000  19 5  00     134.0     138.0     142.2     146.4
*** CARD TYPE 20 : GRU REGENERATION COST PER UNSTOCKED ACRE BY MI BY PERIOD
40110000  20 1  00     186.0     191.6     197.3     203.2
40110000  20 2  00     186.0     191.6     197.3     203.2
40110000  20 3  00     186.0     191.6     197.3     203.2
40110000  20 4  00     206.0     212.2     218.5     225.1
40110000  20 5  00     206.0     212.2     218.5     225.1
*** CARD TYPE 23 : GRU MI 1 STOCKING LEVEL MIDPOINTS, DISTRIBUTION
40110000  23           .78       .54       .32       .23       .60       .17
*** CARD TYPE 24 : GRU MI 1 ENTRY LEVELS, MI 2 - 5 STOCKING LEVEL MIDPOINTS
40110000  24           .70       .40      1.00      1.00      1.00      1.00
*** CARD TYPE 28 : GRU PRESELECTED SHIFTS AMONG MIS BY PERIOD
40110000  28 1 2 00     .33       .50      1.0       0.0
*** CARD TYPE 30 : GRU GROWTH TYPE , APPROACH TO NORMAL
40110000  30            1         8        17 5.315E-02  9.28E-01
*** CARD TYPE 31 : GRU MORTALITY SALVAGE
40110000  31            1        .60      800.
*** CARD TYPE 32 : GRU AVERAGE DIAMETER BY MI BY AC
40110000  32 1   0       0.0       1.2       6.4       9.9      12.8      15.2
40110000  32 1   6      17.2      19.3      21.1      22.7      24.3      25.8
40110000  32 1  12      27.4      27.4      27.4      27.4      27.4      27.4
40110000  32 2   0       0.0       1.2       6.4      11.9      16.8      20.1
40110000  32 2   6      22.7      25.2      27.4      29.4      31.4      33.3
40110000  32 2  12      35.3      35.3      35.3      35.3      35.3      35.3
40110000  32 3   0       0.0       1.2       6.4      12.3      19.1      23.4
40110000  32 3   6      26.8      29.9      32.9      35.6      38.0      40.4
40110000  32 3  12      42.8      42.8      42.8      42.8      42.8      42.8
40110000  32 4   0       0.0       1.3       7.0      13.1      18.5      22.1
40110000  32 4   6      25.0      27.7      30.1      32.3      34.5      36.6
```

Figure 12—Detailed data GRU file.



```
40110000  32 4   12       38.8      38.8      38.8      38.8      38.8      38.8
40110000  32 5    0        0.0       1.3       7.0      10.3      18.6      22.6
40110000  32 5    6       25.5      28.4      31.0      33.3      35.6      37.7
40110000  32 5   12       40.2      40.2      40.2      40.2      40.2      40.0
*** CARD TYPE 33 : GRU STANDARD VOLUME PER ACRE BY MI BY AC
40110000  33 1    0        5.0      12.0    1163.0    4288.0    7744.0   11092.0
40110000  33 1    6    13867.0   16110.0   18020.0   19676.0   21117.0   22377.0
40110000  33 1   12    23486.0   23486.0   23486.0   23486.0   23486.0   23486.0
40110000  33 2    0        5.0      12.0    1163.0    2922.0    4659.0    7771.0
40110000  33 2    6    10904.0   13810.0   16564.0   19095.0   21395.0   23202.0
40110000  33 2   12    24643.0   24643.0   24643.0   24643.0   24643.0   24643.0
40110000  33 3    0        5.0      12.0    1163.0    3111.0    3882.0    6748.0
40110000  33 3    6     9775.0   12732.0   15433.0   18069.0   20610.0   22971.0
40110000  33 3   12    24873.0   24873.0   24873.0   24873.0   24873.0   24873.0
40110000  33 4    0        5.0      13.2    1279.3    3214.2    5124.9    8548.1
40110000  33 4    6    11999.4   15101.0   18220.4   21004.5   23534.5   25522.2
40110000  33 4   12    27107.3   27107.3   27107.3   27107.3   27107.3   27107.3
40110000  33 5    0        5.0      13.2    1279.3    5238.2    4776.2    8080.6
40110000  33 5    6    11473.0   14659.7   17605.5   20395.1   23014.2   25379.2
40110000  33 5   12    27251.4   27251.4   27251.4   27251.4   27251.4   27251.4
*** CARD TYPE 34 : GRU THINNING VOLUME PER ACRE BY MI BY AC
40110000  34 2    0        0.0       0.0       0.0    1139.0    1365.0       0.0
40110000  34 3    0        0.0       0.0       0.0    1139.0    2377.0       0.0
40110000  34 4    0        0.0       0.0       0.0    1252.9    1501.5       0.0
40110000  34 5    0        0.0       0.0       0.0    2138.4    2241.8       0.0
*** CARD TYPE 35 : GRU MORTALITY VOLUME PER ACRE BY MI BY AC
40110000  35 1    0        0.0       0.0       2.0      58.0     349.0     563.0
40110000  35 1    6     1048.0    1324.0    1422.0    1468.0    1492.0    1500.0
40110000  35 1   12     1190.0    1100.0    1000.0     950.0     900.0     875.0
40110000  35 2    0        0.0       0.0       2.0      10.0      11.0      26.0
40110000  35 2    6      126.0     312.0     405.0     549.0     713.0    1057.0
40110000  35 2   12     1124.0    1100.0    1050.0    1000.0     950.0     925.0
40110000  35 3    0        0.0       0.0       2.0      13.0      14.0      13.0
40110000  35 3    6       33.0     143.0     384.0     372.0     427.0     507.0
40110000  35 3   12      758.0     850.0    1000.0     950.0     900.0     875.0
40110000  35 4    0        0.0       0.0       2.0      10.0      11.0      26.0
40110000  35 4    6      126.0     312.0     405.0     549.0     713.0    1057.0
40110000  35 4   12     1124.0    1100.0    1050.0    1000.0     950.0     925.0
40110000  35 5    0        0.0       0.0       2.0      65.0      17.0      19.0
40110000  35 5    6       71.0     261.0     404.0     474.0     575.0     707.0
40110000  35 5   12      907.0    1000.0    1100.0    1000.0     950.0     925.0
*** CARD TYPE 36 : GRU SOFTWOOD PROPORTION OF VOLUME PER ACRE BY MI BY AC
40110000  36 1             .90
40110000  36 2             .93
40110000  36 3             .93
40110000  36 4             .97
40110000  36 5            1.00
```

Figure 12—Detailed data GRU file (continued).

The run header and ACU data are presented in figure 13. Little has changed from the minimum data requirement here except card 05 has been added to request a more detailed set of output.

```
** HEADER FILE FOR DETAILED EXAMPLE
*** CARD TYPE Ø1 : RUN HEADER
Ø1                 MANAGEMENT INTENSIFICATION
*** CARD TYPE Ø2 : TIME INFORMATION
Ø2                    1983          1Ø          3    1.299
*** CARD TYPE Ø3 : AGE CLASS REPORT GROUPS
Ø3  Ø                            1
Ø3  1                            1
Ø3  2                            2
Ø3  3                            2
Ø3  4                            3
Ø3  5                            3
Ø3  6                            4
Ø3  7                            4
Ø3  8                            5
Ø3  9                            5
Ø3 1Ø                            6
Ø3 11                            6
Ø3 12                            7
Ø3 13                            7
Ø3 14                            8
Ø3 15                            8
Ø3 16                            8
Ø3 17                            8
*** CARD TYPE Ø5 : REPORT MATRIX
Ø5  2  ACU                       1          1          Ø          1          1          1
Ø5  3  ACU SUM                   1          1          Ø          1          1          1
*** CARD TYPE A1 : ACU NAME
A1Ø1                    DOUGLAS-FIR
*** CARD TYPE A2 : GRUS BELONGING TO ACU
A2Ø1                    4Ø11ØØØØ
*** CARD TYPE A3 : ACU HARVEST VOLUME BY PERIOD
A3Ø1  1  ØØ                1.2Ø12E+9      1.3858E+9      1.2332E+9      1.2Ø87E+9
*** CARD TYPE A5 : ACU TREATMENT NAMES
A5Ø1  1                 REGULAR STOCK
A5Ø1  2                 GENETIC STOCK
A5Ø1  3                   CONVERSION
A5Ø1  4                  PRECOMM THIN
A5Ø1  5                 FERTILIZATION
A5Ø1  6                    COMM THIN
A5Ø1  7                 FINAL HARVEST
*** CARD TYPE A6 : ACU MANAGEMENT INTENSITY NAMES
A6Ø1  1                  MGNT PRESENT
A6Ø1  2                     MGNT-THIN
A6Ø1  3                      MGNT-TRT
A6Ø1  4                 MGNT-GEN-THIN
A6Ø1  5                  MGNT-GEN-TRT
*** CARD TYPE A7 : ACU SITE NAMES
A7Ø1  1                  AVE SITE 175
A7Ø1  2                  AVE SITE 14Ø
A7Ø1  3                  AVE SITE  87
*** CARD TYPE A8 : ACU SPECIES NAMES
A8Ø1  1                   DOUGLAS-FIR              1
```

Figure 13—Detailed data ACU file.

The final set of output, figure 14, represents a sample of each level of output from the TRIM results.

Figure 14—Detailed summary output.

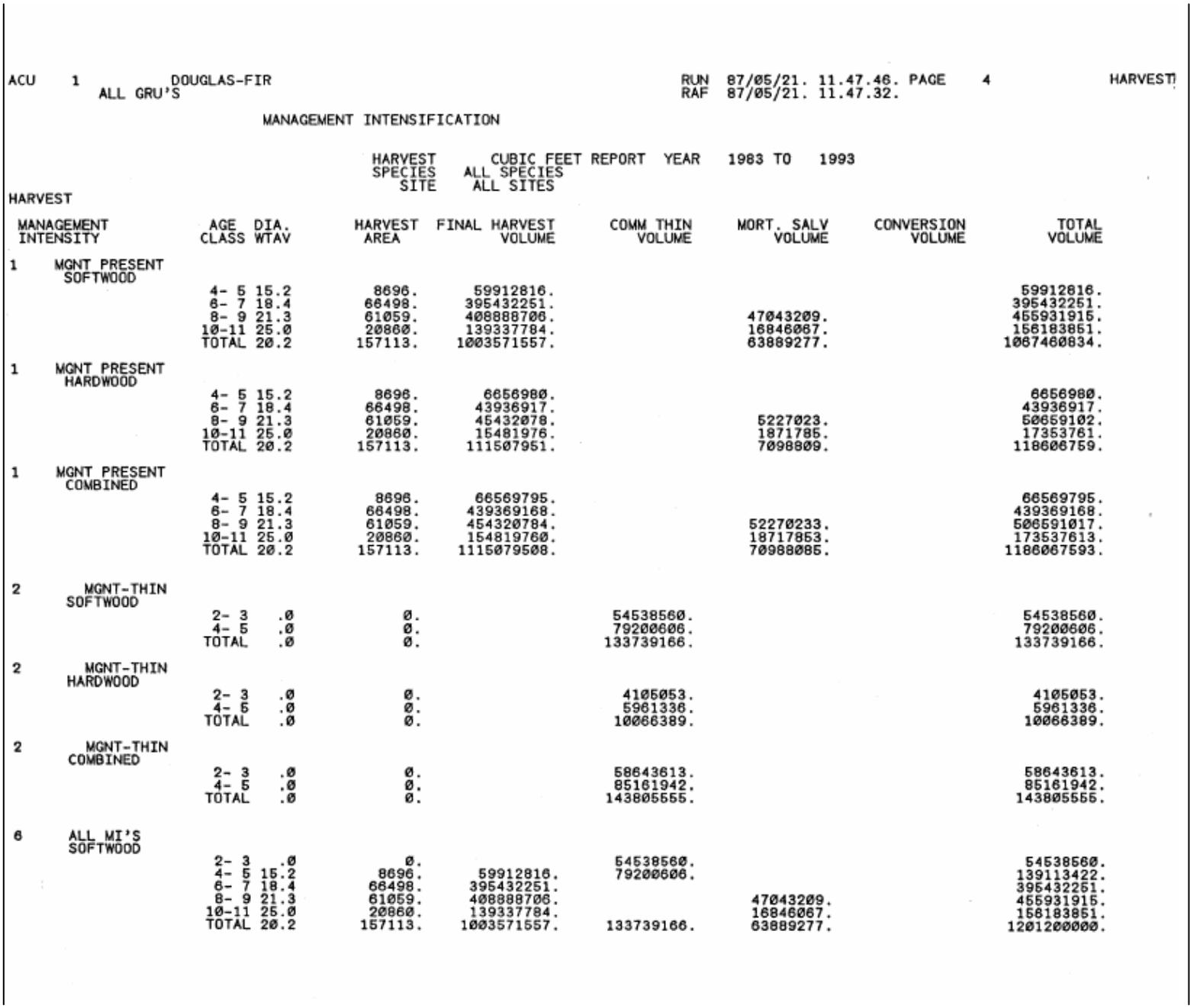
ACU 1 DOUGLAS-FIR RUN 87/05/21. 11.47.46. PAGE 3 INVENTORY
ALL GRU'S RAF 87/05/21. 11.47.32.

MANAGEMENT INTENSIFICATION

INVENTORY SPECIES ALL SPECIES CUBIC FEET REPORT YEAR 1983
SITE ALL SITES

INVENTORY

MANAGEMENT INTENSITY	S L	AGE CLASS	DIA. WTAV	TOTAL AREA	NET GROWING STOCK VOLUME SOFTWOOD	HARDWOOD	COMBINED	GROWTH VOLUME ON NET GROWING STOCK SOFTWOOD	HARDWOOD	COMBINED
1 MGNT PRESENT	1									
		0- 1	.5	183846.	1794746.	199416.	1994162.	652448.	72494.	724942.
		2- 3	8.3	231204.	722421393.	80269044.	802690436.			
		4- 5	13.0	79865.	490403837.	54489315.	544893152.	618929418.	68769935.	687699353.
		6- 7	19.3	5704.	114364836.	12707204.	127072040.	11928034.	1325337.	13253371.
		TOTAL	6.3	500619.	1328984812.	147664979.	1476649791.	631509899.	70167767.	701677666.
1 MGNT PRESENT	2									
		2- 3	9.9	87521.	202467457.	22496384.	224963841.			
		4- 5	13.2	63962.	235047661.	26116407.	261164068.	255751048.	28416783.	284167831.
		6- 7	17.2	15856.	132139737.	14682193.	146821930.	39107970.	4345330.	43453300.
		8- 9	22.7	11679.	111308737.	12367637.	123676374.			
		10-11	.0	0.				9749735.	1083304.	10833039.
		TOTAL	12.6	179017.	680963592.	75662621.	756626213.	304608753.	33845417.	338454170.
1 MGNT PRESENT	3									
		0- 1	.0	32289.				18534.	2059.	20594.
		4- 5	14.4	17061.	15868230.	1763137.	17631366.	7184618.	798291.	7982908.
		6- 7	18.7	70931.	290297984.	32255332.	322553315.	30591618.	3399069.	33990687.
		8- 9	21.1	6323.	22057062.	2450785.	24507846.	54681627.	6075736.	60757363.
		10-11	24.3	9181.	13083903.	1453767.	14537670.	5195409.	577268.	5772676.
		TOTAL	14.2	135786.	341307178.	37923020.	379230198.	97871805.	10852423.	108524228.
1 MGNT PRESENT	ALL									
		0- 1	.4	216135.	1794746.	199416.	1994162.	670982.	74554.	745536.
		2- 3	8.8	318725.	924888850.	102765428.	1027654278.			
		4- 5	13.2	160888.	741319727.	82368859.	823688586.	881865083.	97985009.	979850092.
		6- 7	18.4	92490.	536802557.	59644729.	596447285.	81627621.	9069736.	90697357.
		8- 9	22.1	18002.	133365798.	14818422.	148184220.	54681627.	6075736.	60757363.
		10-11	24.3	9181.	13083903.	1453767.	14537670.	14945144.	1660572.	16605715.
		TOTAL	9.0	815421.	2351265582.	261250620.	2612506202.	1033790457.	114865606.	1148656064.
2 MGNT-THIN	ALL									
		0- 1	.5	90551.	913445.	68754.	982199.	332067.	24994.	357061.
		2- 3	9.4	113877.	367680142.	27674849.	395354991.			
		TOTAL	5.5	204428.	368593587.	27743603.	396337190.	332067.	24994.	357061.
6 ALL MI'S	ALL									
		0- 1	.5	306686.	2708191.	268170.	2976361.	1003049.	99548.	1102597.
		2- 3	8.9	432602.	1292568992.	130440277.	1423009269.			
		4- 5	13.2	160888.	741319727.	82368859.	823688586.	881865083.	97985009.	979850092.
		6- 7	18.4	92490.	536802557.	59644729.	596447285.	81627621.	9069736.	90697357.
		8- 9	22.1	18002.	133365798.	14818422.	148184220.	54681627.	6075736.	60757363.
		10-11	24.3	9181.	13083903.	1453767.	14537670.	14945144.	1660572.	16605715.
		TOTAL	8.3	1019848.	2719849189.	288994224.	3008843392.	1034122524.	114890601.	1149013125.



ACU 1 DOUGLAS-FIR RUN 87/05/21. 11.47.46. PAGE 4 HARVEST
ALL GRU'S RAF 87/05/21. 11.47.32.

MANAGEMENT INTENSIFICATION

HARVEST SPECIES ALL SPECIES CUBIC FEET REPORT YEAR 1983 TO 1993
HARVEST SITE ALL SITES

MANAGEMENT INTENSITY	AGE CLASS	DIA. WTAV	HARVEST AREA	FINAL HARVEST VOLUME	COMM THIN VOLUME	MORT. SALV VOLUME	CONVERSION VOLUME	TOTAL VOLUME
1 MGNT PRESENT SOFTWOOD								
	4- 5	15.2	8696.	59912816.				59912816.
	6- 7	18.4	66498.	395432251.				395432251.
	8- 9	21.3	61059.	408888706.		47043209.		455931915.
	10-11	25.0	20860.	139337784.		16846067.		156183851.
	TOTAL	20.2	157113.	1003571557.		63889277.		1067460834.
1 MGNT PRESENT HARDWOOD								
	4- 5	15.2	8696.	6656980.				6656980.
	6- 7	18.4	66498.	43936917.				43936917.
	8- 9	21.3	61059.	45432078.		5227023.		50659102.
	10-11	25.0	20860.	15481976.		1871785.		17353761.
	TOTAL	20.2	157113.	111507951.		7098809.		118606759.
1 MGNT PRESENT COMBINED								
	4- 5	15.2	8696.	66569795.				66569795.
	6- 7	18.4	66498.	439369168.				439369168.
	8- 9	21.3	61059.	454320784.		52270233.		506591017.
	10-11	25.0	20860.	154819760.		18717853.		173537613.
	TOTAL	20.2	157113.	1115079508.		70988085.		1186067593.
2 MGNT-THIN SOFTWOOD								
	2- 3	.0	0.		54538560.			54538560.
	4- 5	.0	0.		79200606.			79200606.
	TOTAL	.0	0.		133739166.			133739166.
2 MGNT-THIN HARDWOOD								
	2- 3	.0	0.		4105053.			4105053.
	4- 5	.0	0.		5961336.			5961336.
	TOTAL	.0	0.		10066389.			10066389.
2 MGNT-THIN COMBINED								
	2- 3	.0	0.		58643613.			58643613.
	4- 5	.0	0.		85161942.			85161942.
	TOTAL	.0	0.		143805555.			143805555.
6 ALL MI'S SOFTWOOD								
	2- 3	.0	0.		54538560.			54538560.
	4- 5	15.2	8696.	59912816.	79200606.			139113422.
	6- 7	18.4	66498.	395432251.				395432251.
	8- 9	21.3	61059.	408888706.		47043209.		455931915.
	10-11	25.0	20860.	139337784.		16846067.		156183851.
	TOTAL	20.2	157113.	1003571557.	133739166.	63889277.		1201200000.

Figure 14—Detailed summary output (continued).

Figure 14—Detailed summary output (continued).

ACU 1 DOUGLAS-FIR RUN 87/05/21. 11.47.46. PAGE 29 SUMMARY REPORTS
RAF 87/05/21. 11.47.32.

MANAGEMENT INTENSIFICATION

SUMMARY REPORT
ALL SPECIES
ALL SITES

INVENTORY- CUBIC FEET

YEAR	TOTAL AREA	NET GROWING STOCK SOFTWOOD	HARDWOOD	VOLUME COMBINED	GROWTH VOLUME ON NET GROWING STOCK SOFTWOOD	HARDWOOD	COMBINED
1983	1019848.	2719849169.	288994224.	3008843392.	1034122524.	114890601.	1149013125.
1993	1019848.	2615676455.	282212996.	2897889451.	1416223403.	142854102.	1559077506.
2003	1019848.	2646099858.	276369330.	2922469188.	1236047677.	122251367.	1358299045.
2013	1019848.	2648947535.	273976657.	2922924192.	1065038998.	105146071.	1170185069.

REGENERATION

YEAR	TOTAL AREA	UNSTOCKED AREA START	FINAL HARVEST AREA	REGENERATION AREA	UNSTOCKED AREA ENDING
1983	1019848.	10466.	157113.		10466.
1993	1019848.	10466.	147583.	157113.	10466.
2003	1019848.	10466.	102278.	147583.	10466.
2013	1019848.	10466.	87172.	102278.	10466.

TREATMENT

YEAR	TOTAL AREA	PRECOMM THIN AREA	COMM THIN AREA	FERTILIZATION AREA	CONVERSION AREA
1983	1019848.	115740.	113877.		
1993	1019848.	190946.	89681.		
2003	1019848.	157113.	90551.		
2013	1019848.	147583.	70425.		

HARVEST- CUBIC FEET SOFTWOOD

YEAR	TOTAL AREA	MORTAL SALV VOLUME	CONVERSION VOLUME	COMM THIN VOLUME	FINAL HARVEST VOLUME	TOTAL VOLUME	REQUESTED VOLUME
1983	157113.	63889277.		133739166.	1003571657.	1201200000.	1201200000.
1993	147583.			105817949.	1279982051.	1385800000.	1385800000.
2003	102278.			103945605.	1129254395.	1233200000.	1233200000.
2013	87172.			85603396.	1123096604.	1208700000.	1208700000.

HARVEST- CUBIC FEET HARDWOOD

YEAR	TOTAL AREA	MORTAL SALV VOLUME	CONVERSION VOLUME	COMM THIN VOLUME	FINAL HARVEST VOLUME	TOTAL VOLUME	REQUESTED VOLUME
1983	157113.	7098809.		10066389.	111507951.	128673148.	
1993	147583.			7964792.	140732977.	148697769.	
2003	102278.			7823863.	116820177.	124644040.	
2013	87172.			6443266.	115639849.	122083116.	

HARVEST- CUBIC FEET COMBINED

YEAR	TOTAL AREA	MORTAL SALV VOLUME	CONVERSION VOLUME	COMM THIN VOLUME	FINAL HARVEST VOLUME	TOTAL VOLUME	REQUESTED VOLUME
1983	157113.	70988085.		143805555.	1115079508.	1329873148.	
1993	147583.			113782740.	1420715028.	1534497769.	
2003	102278.			111769467.	1246074573.	1357844040.	
2013	87172.			92046662.	1238736454.	1330783116.	

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ACU     1          DOUGLAS-FIR                                          RUN  87/05/21. 11.47.46. PAGE    5              HARVEST
          ALL GRU'S                                                      RAF  87/05/21. 11.47.32.

6       ALL MI'S
        HARDWOOD
                      2- 3   .0          0.                 4105053.                                        4105053.
                      4- 5  15.2       8696.      6656980.  5961336.                                       12618315.
                      6- 7  18.4      66498.     43936917.                                                  43936917.
                      8- 9  21.3      61059.     45432078.                  5227023.                        50659102.
                     10-11  25.0      20860.     15481976.                  1871785.                        17353761.
                     TOTAL  20.2     157113.    111507951.  10066389.      7098809.                       128673148.

6       ALL MI'S
        COMBINED
                      2- 3   .0          0.                 58643613.                                       58643613.
                      4- 5  15.2       8696.      66569795. 85161942.                                      151731737.
                      6- 7  18.4      66498.     439369168.                                                 439369168.
                      8- 9  21.3      61059.     454320784.                 52270233.                       506591017.
                     10-11  25.0      20860.     154819760.                 18717853.                       173537613.
                     TOTAL  20.2     157113.    1115079508. 143805555.     70988085.                      1329873148.
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Figure 14—Detailed summary output (continued).

Figure 14—Detailed summary output (continued).

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ACU          1     DOUGLAS-FIR                                          RUN  87/05/21. 11.47.46. PAGE   30   SUMMARY REPORTS
                                                                        RAF  87/05/21. 11.47.32.

ECONOMIC

     YEAR        REGENERATION   PRECOMM THIN  FERTILIZATION     COMM THIN      MORT SALV  FINAL HARVEST          TOTAL
                  NET REVENUE    NET REVENUE    NET REVENUE    NET REVENUE    NET REVENUE    NET REVENUE    NET REVENUE
     1983                          -8911957.                    308370165.                   3101036111.    3400494319.
     1993        -18445098.     -15142026.                    251490724.                   4070342923.    4288246524.
     2003        -17842757.     -12836154.                    253369666.                   3703954417.    3926645172.
     2013        -12743795.     -12417614.                    216626268.                   3683756862.    3875221721.

LAND SHIFT

     YEAR          MI 1  AREA     MI 2  AREA     MI 3  AREA     MI 4  AREA     MI 5  AREA  DONOR 1  AREA  DONOR 2  AREA
                  MGNT PRESENT     MGNT-THIN       MGNT-TRT  MGNT-GEN-THIN  MGNT-GEN-TRT
     1983             815421.        204428.
     1993             797353.        222496.
     2003             764661.        255188.
     2013             764661.        255188.
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Tedder, P. L.; La Mont, Richard N.; Kincaid, Jonna C. 1987. The timber resource inventory model (TRIM): a projection model for timber supply and policy analysis. Gen. Tech. Rep. PNW-GTR-202. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 82 p.

TRIM (Timber Resource Inventory Model) is a yield table projection system developed for timber supply projections and policy analysis. TRIM simulates timber growth, inventories, management and area changes, and removals over the projection period. Programs in the TRIM system, card-by-card descriptions of required inputs, table formats, and sample results are presented. The programs are available from the Pacific Northwest Research Station.

Keywords: Computer programs/programing, models, timber inventory, timber supply, projections (supply/demand), simulation.

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