

RMSTAND PROGRAM DOCUMENTATION

The Rocky Mountain Stand (RMSTAND) program is written in ANSI Fortran 77 code. This program is available for Data General Mini Computers, PC clones and AMIGAs. It is relatively easy to move this program to workstations.

The Forest Service implementation of RMSTAND will be on the Data General Mini Computers.

Installation Instructions

Installation instructions for the Data General follow:

Language: F77 ANSI FORTRAN
Blocks: 1508 (Program)
Startup Macro: RMSTAND.CLI
Program File: RMSTAND.PR
Help Files: RMSTAND.H01
RMSTAND.H02
RMSTAND.H03
RMSTAND.H04
RMSTAND.H05
RMSTAND.H06
RMSTAND.H07

System Impact: DG Execution (Medium), Data Storage (R2RIS Oracle)
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Data Files Created by the user when executing RMSTAND:

Sequential Files	Comments
-----	-----
STAND.RIS	Information to be loaded into RMRI This file is deleted each time RMSTAND
STAND.EDT	Edit error messages from the edit routine
STAND.DIR	A dictory used by the PROGNOSIS variant is written to this file, if that option is selected. Also, individual stand files are created in the format needed for PROGNOSIS. An Example name of one of these files is:
T103101.0024	Sample of PROGNOSIS ready data files Note: When entering the name of the data file in PROGNOSIS, the "T" is not entered. Also, each tree's volume is calculated, so plot size and BAF will be 0. Do not change these values in the "T"file.

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STAND.GEN	Input file for GENGYM (Generalized Growth and Yield Model) is written to these files, if the GENGYM option is selected.
STAND.INT	File for loading into the WESTWIDE Database
STAND.LIS	List of locations and sites that were processed
STAND.PRT	The standard PAGE TYPE 1-7 is written to this file each time RMSTAND is run, depending on the selection type by the user. This file should be printed, then deleted.
STAND.RPA	File for loading into the RPA Database
STAND.SP1	Special Reports. Special Summary output, one line of information describing stand attributes is written to this file, if the special option is selected.
STAND.SP2	A stand table (5 lines per stand) summarizing trees and basal area by species and diameter. If the special option is selected.
STAND.SP3 STAND.SP4	
LOCATION.SITE (103101.0024)	Data Files are stored with PERM ON Originate from KEY ENTRY via RMSTAND, FIELD DATA Recorder, or extracted from RMRIS.
RMSTAND.CTL	Control file containing default parameters. This file should be in your working directory, NEVER in your software drawer/folder (e.g. LIBRARY:RMRIS)

GENERAL INFORMATION

RMSTAND is intended to be very flexible, allowing the user to select several options from each menu. Rather than describe a prescribed approach to processing Stand Exam data, the following will explain each menu. Once the user has a basic understanding of the menu options, it should be easy to generate the desired output.

In order to process data in a similar flow as in the past, the following steps should be completed using the various menu options of RMSTAND:

- I) ENTER TREE DATA. Tree data may be entered using RMSTAND or directly into RMRIS via the RMRIS screens. If the RMRIS Stand Exam data entry option is used, extract data through the RMRIS Stand Exam Extract process to create stand data files. Files may contain individual site files or multiple sites. Individual files should be named LOC.SITE (103201.0004). Multiple site files should be named logically to ensure that the data is completely processed. If another means is used to create files, such as a field data recorder, then several stands will generally be accumulated into a single file.

Old tree data must be in RMSTAND format. Refer to the RMRIS User Guide, chapter 1 for information on converting to the RMSTAND format used by your region.
- II) EDIT TREE DATA. If the RMSTAND entry menu was used for creating data files, the data will already have been edited for legal codes. However, the EDIT option will also perform cross field checks and check that the number of POINTS counted matches actual points entered.
- III) PROCESS TREE DATA. Check the RMSTAND defaults to insure that volume merchantability standards are consistent with RMRIS. Select which pages of the Printout are desired (if any) and select the option to generate RMRIS card type 5 information which will write on file STAND.RIS. The STAND.RIS file is deleted each time RMSTAND is executed, ensure that data has been loaded into RMRIS before running RMSTAND again.
- IV) LOAD RMRIS STAND SUMMARY DATA. Use the RMRIS program to load the STAND.RIS file into the RMRIS data base. This can be done either through the RMRIS menus (Stand Exam Menu, Option 4) or by using the RMRISLOAD program.
- V) LOAD RMRIS TREE DATA. The LOC/SITE or multiple site files need to be imported to the RMRIS Data folder for the RMRIS manager to load. Prior to loading, existing TREE DATA information must be deleted from the RMRIS data base. Create a site list of the location/sites to be updated. Use the site list to delete existing TREE DATA information. The SQLLOADER routine LOAD_RMSTAND_DG will load the data.

NOTE: Refer to the RMRIS User's Guide, chapter 1, Stand Exam, for data management.

- VI) SYSTEM MAINTENANCE. Refer to the maintenance section of this document, in order to insure the safe keeping of your valuable information.

SITE Exam data should be MAINTAINED as long as it is still valid and represents what is on the ground. This data has many purposes beyond simply obtaining a SITE PRINTOUT. It also provides basic, raw, uninterpreted data for future resource manager needs.

Growth & Yield tables, which are an essential part of the Forest Planning process, are dependant on this data. It is recommended that only PAGE 5 of the printout be stored in LOCATION/SITE folders; any of the other page types may be regenerated when needed for projects, detailed prescriptions, and other specific needs.

This data should ALWAYS be available to the user and NOT archived in order to insure that standard system backups are made. THE DATA is not safe on a single tape. It is recommended that once a year, after all of the field work is processed, Districts make a tape backup for that year and retain it using standard IS utilities.

RUN THE RMSTAND PROGRAM

The RMSTAND Program may be run through the RMRIS Stand Exam option or independently of RMRIS. Please review Chapter 1 of RMRIS user guide, pages 21-29 to become familiar with RMRIS processing of STAND EXAM.

The macro, RMSTAND.CLI, is stored with the RMSTAND.PR program in the library. When "RMSTAND" is typed on the command line or started from RMRIS several working files are deleted if they exist:

RMSTAND

Deleted: File STAND.PRT
Deleted: File STAND.GEN
Deleted: File STAND.SP1
Deleted: File STAND.SP2
Deleted: File STAND.EDT
Deleted: File STAND.DIR
Deleted: File STAND.RIS
Deleted: File STAND.LIS
Deleted: File RMRIS.OUT
Deleted: File RMSTAND.BAT

If the user desires to retain any of the information on these files they should be renamed to another name. For example:

RENAME STAND.PRT PRINTOUT.KEEP1

RMSTAND uses a file called RMSTAND.CTL to store user defaults on such as volume merchantability standards. The first time RMSTAND is executed the file RMSTAND.CTL will not exist. The program will prompt the user for default values to write the RMSTAND.CTL file, such as:

Enter Region, 2, 3 or 4. 4

Individual Stand Run (Y/N)? Y

Include non-stockable points in Gengym Averages (Y/N) N

Net Volumes (Y/N) N

Once the system creates this file it will use the defaults specified each time RMSTAND is executed. The default values may be changed when running different alternatives. For more information about changing defaults refer to "SETTING DEFAULTS" in this chapter.

After setting defaults the RMSTAND Main Menu will then appear on the screen.

RMSTAND Main Menu

RMSTAND Program - Revision 5.00.00 - DG

				Current DEFAULT Settings		Merchantability Diameters	
Region: 4						Cu Ft	Bd Ft
Run Type: Indv						DBH:	5.0 8.0
Volumes: Net						Top DIB:	4.0 7.0
-----File Options-----				RIS		Load Options-----	
STAND.PRT							Cover
Type: No							
Page 1: Yes	Page 6: Yes	RIS Load File: No	Tree Size: No				
Page 2: Yes	Page 7: No	GENGYM File: No	Year of Origin: No				
Page 3: Yes	Page 8: No	Special File: No	Structure Stage: No				
Page 4: Yes	Page 9: No	Inventory File: No	Elk Cover: No				
Page 5: Yes	Prognosis File: No						

1-Enter 2-Edit 3-Default 4-Run 5-Utility 6-Help 7-Exit ? 3

The main menu of RMSTAND branches the user to sub-menus. Enter 1, 2, 3, 4, 5, 6, or 7 at the prompt. In the above example the user selected 3, Default.

ENTER - Option 1, this is the data entry module. Select this to enter new data for a specific stand (site).

EDIT - Option 2, this routine will edit stand data that has been created by key entry contract, field data recorder or other means. The data to be edited must be stored in a standard ASCII formatted file.

DEFAULT - Option 3, this routine establishes and stores user options (defaults). These options are stored in a file called "RMSTAND.CTL". The user may select individual or combined stand runs, various outputs, and merchantability standards for volume equations.

RUN - Option 4, this routine processes stand data from a single . The file may contain data for a single site or for many sites.

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UTILITY - Option 5, this routine allows the user to JOIN or SPLIT files, or convert PROGNOSIS output to RMSTAND format. The JOIN option copies several individual stand files and groups that information onto a single file named by the user. The user must establish a file called JOIN.LST which contains the 6 digit location number plus the 4 digit site number, separated by a period (e.g. 103101.0024) and determines which individual stands are to be grouped/collected onto a single file. This option is necessary for COMBINE runs (average several stands into a single printout or input file for growth and yield or Prognosis several stand run).

The SPLIT option reads a single file with several stands in it and creates single stand files with the naming convention for permanent storage (LOCATION.SITE - 103102.0102).

The RMTREE option converts the TREELIST output from PROGNOSIS simulation runs back to RMSTAND format. this data can then be run through RMSTAND to generate volumes and diameter tables.

HELP - Option 6, this routine provides on-line explanations of RMSTAND functions.

EXIT - Option 7, this option exits the user from the RMSTAND system.

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Data Entry

Before entering data be certain to turn your ALPHA(CAPS) lock ON.

The following is an example of the data entry routine. A LOC.SITE number is 101301.0005 is specified for the data file to be created.

RMSTAND Data Entry Program

DASH (-) will BACKFIELD

Enter a file name for tree data (LOCATION.SITE): 101301.0005
LOCATION is 6 digits, SITE is 4 digits.

LOCATION	1.	101301
SITE	2.	0005
FOREST-DIST	3.	1202
SURVEY DATE	4.	9006
METHOD	5.	C
ACRES	6.	050
BAF (VP/FP)	7.	75
FPS (VP/FP)	8.	300
LARGE FPS	9.	
SMALL FPS	10.	
POINTS	11.	02
GP	12.	
DEAD BAF	13.	
DEAD FPS	14.	
BRKPT DBH	15.	
BRKPT DRC	16.	

ERROR - ITEM #S

ENTER: ITEM# - CHANGE ITEM; 77 - ENTER TREES; 99 EXIT ? 77

Note: Zero fill all leading zeros. If there are data entry errors that the program checks for, a number for the item in error will be listed. To correct that error or any error perceived by the user, enter the item number listed instead of 77 or 99. For example, the item number for BAF is 7.

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When 77 is selected, Enter Trees, the following screen appears:

POINT	13.	01	LOC/SITE	101301/0005
TREE#	14.	02		
STATUS	15.	L		
SPECIES	16.	PIEN1		
STEM FORM	17.			
DBH	18.	032		
HEIGHT	19.	025		
TALLY	20.	02		
HTG GRO	21.			
10YR RAD	22.			
TREE AGE	23.			
CROWN RATIO	24.	3		
%DEAD	25.			
VEG LAYER	26.			
INSECT	27.			
DAMAGE	28.			
DMR	29.			
CON SER	30.			

ERROR - ITEM #S

ENTER: ITEM# - CHANGE ITEM; 77 - NEXT TREE; 99 EXIT ?

Note: The minus "-" will backfield to the previous field on this form. Type the minus sign then press new line, the cursor will not move backwards, but the previous field item is repeated below the current line. If it is necessary to backfield more than one item number, type the minus sign followed by pressing newline for each item, when positioned on the desired item number, enter the correct data, press newline and proceed.

EXAMPLE: Enter 17 to change the DBH.

WARNING: The user cannot enter additional data to a site through RMSTAND after the program has been exited. The user may get around this limitation the in following ways:

1. Create a "dummy" site file for data to be appended to the original file. Then merge the "dummy" file with the SED editor, delete the 2nd header record (there can be just one card type 'one' for each site). Then delete the "dummy" file from the Command Line.
2. Enter Card type #1 and 2-3 Card type #9 to get the correct spacing for the data. SED the filename and complete data entry for the site with the SED editor. Be sure to include an "E" at the end of each line or the RMSTAND edit will stop at the first line without an "E". See Page 24 for more information on using the SED editor.

When a stand is completed and edited (via RMSTAND) it should be "insured" by using the CLI PERM command. For example, PERM 101301.0005 ON - this prevents accidental deletion. The permanence may be removed with PERM 101301.0005 OFF.

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Data Edit Routine

When option 2, EDIT is selected, each stand is edited for legal codes and cross checked for invalid combinations of codes:

RMSTAND File Edit Routine

Enter a file name for tree data (LOCATION.SITE): 101101.0001

Any errors found are recorded on the file STAND.EDT which may be printed with the command QPR STAND.EDT - the following is a sample of error messages on a STAND.EDT file.

ADMINISTRATIVE FOREST
RANGER DISTRICT ERROR
DATE OF SURVEY (YYMM)
METHOD IS NOT C OR I
AREA/ACRES IS MISSING
BOTH BAF AND BIG FPS ARE ZERO
BOTH FPS AND SMALL FPS ARE BLANK
NUMBER OF POINTS ARE ZERO

LOC-SITE	FOR	DIS	DATE	MET	AREA	BAF	FPS	BFPS	SFPS	PNT	GP	DBA	DFP	BDB	BDR	LINE#
1011011111	0	0	0	0	0	0	0	0	0	0	0	0				1

SPECIES CODE IS INVALID
TALLY IS ZERO
SPECIES CODE IS MISSING
COVER CLASS MISSING

LOC-SITE	PNT	TR#	ST	SPEC	SF	DBH	HGT	TLY	HTG	RG	AGE	CR	CD	CL	IN	DA	DM	SR	LINE#
1011011111	1	0	L	PIPCO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2

In the above example there are 9 items in error on the header record for the site 1011011111 and 4 errors for the single tree entered. These errors should be corrected using the SED editor and then rechecked with the EDIT option.

Setting Defaults

If option 3 DEFAULT is selected, the following questions will be displayed:

Stand Exam Data Options

Enter Region 2, 3, or 4? 4

Individual Stand Run (Y/N)? Y

Net Volumes (Y/N)? Y

Enter Decimal, Separate with Commas

CFM, BFM, CFT, BFT (Min.CF dbh, Min.BF dbh, CF dib, BF dib)

5.0, 7.0, 4.0, 6.0 (Current Default) OK (Y/N)? N

5.0, 9.0, 4.0, 6.0

5.0,9.0,4.0,6.0 (Revised Default) OK (Y/N)? Y

Select Summary Desired:

1 - 9 = Page Types 1-9 (Pages 7 - 9 Currently Not Used)
L = RMRIS Card Type 5 (STAND.RIS)
G = Input File for GENGYM (STAND.GEN)
S = Special Output File (STAND.SP1, SP2, SP3 & SP4)
R = Load File for RPA (STAND.RPA)
F = Forest Inventory Summary File (STAND.INT)
P = Prognosis Ready Stand Files (Tfiles & STAND.DIR)

Enter 0 (Do Not Create) or 1 (Create) Separate with commas

1,2,3,4,5,6,7,8,9,L,G,S,R,F,P

1,1,1,1,1,0,0,0,0,1,0,0,0,0,0 OK (Y/N)? N

0,0,0,0,1,0,0,0,0,0,0,0,0,0,0

0,0,0,0,1,0,0,0,0,0,0,0,0,0,0 OK (Y/N)? Y

NOTE: If this program was called from the RMSTAND
menu of RMRIS ORACLE, then:

TO UPDATE RIS SPECIFY THE STAND.RIS OUTPUT
&
ENTER RMSTAND INPUT FOR THE TREE DATA FILE

Select NO Batch for RMRIS Option 3
Select YES Batch for RMRIS Option 4

Do you want to process in batch (Y/N)? N

Are your DEFAULT options OK (Y/N)? Y

NOTES:

- 1) If the answer was N (no) to the Individual Stand question, the program would prompt the user for what type of combined run was desired.
- 2) Check with the RMRIS coordinator regarding loading NET or GROSS volume to RMRIS.
- 3) The DEFAULT information is stored in a file called RMSTAND.CTL.
- 4) For the merchantability standards, a value with a decimal must be filled in for every field, with commas in between. Standard default is 5.0,7.0,4.0,6.0
- 5) For the printout options, a 0 or 1 must be filled in for every field, with a comma separating fields. The '0' is signaling the program to leave that option "OFF" where the '1' is a signal to turn that option 'ON' (another way to think of it is '0' = 'NO' and '1' = 'YES').
- 6) Batch runs may be made either from within ORACLE or from the RMSTAND program. The program will ask for the name of the data file, if the answer was Y to the batch run. If the user is running RMRIS Stand Exam Option 3, batch runs cannot be made; however, when running Option 4, batch runs are required. If running RMSTAND alone, NOT through RMRIS answer N, when asked to submit a BATCH run.

RMSTAND Production Run

When selecting option 4, RUN, the following is displayed (this may vary depending on the default options):

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Current DEFAULT Settings				Merchantability Diameters	
				Cu Ft	Bd Ft
Region: 4				DBH:	5.0 8.0
Run Type: Indv				Top DIB:	4.0 7.0
Volumes: Net					
-----File Options-----				RIS	Load Options-----
STAND.PRT					Cover Type: No
Page 1: Yes	Page 6: Yes	RIS Load File: No		Tree Size: No	
Page 2: Yes	Page 7: No	GENGYM File: No		Year of Origin: No	
Page 3: Yes	Page 8: No	Special File: No		Structure Stage: No	
Page 4: Yes	Page 9: No	Inventory File: No		Elk Cover: No	
Page 5: Yes		Prognosis File: No			

1-Enter 2-Edit 3-Default 4-Run 5-Utility 6-Help 7-Exit ? 4

END OF PROGRAM

That's all there is to it, whether processing a single or many stands. Enter the file name (25 characters or less) when prompted for LOCATION.SITE; that file may have multiple stands in it if desired. The standard printout is written to the file STAND.PRT and may be printed with QPR STAND.PRT. Note: be sure to print the file before running another LOCATION.SITE because every time the program is run this file is deleted. The RMRIS summary will accumulate on STAND.RIS and may be loaded into RMRIS via the instructions in the RIS user guide.

A slightly different set of messages will be generated when processing a combined stand run. Run time will vary considerably depending on how busy the DG is at that time. Runs have been tested with 500 stands at one time without any apparent problems, but it is best to do large runs at night batch mode.

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RMSTAND System Utility Routine

The following menu is displayed when selecting option 5, UTILITY from the RMSTAND Main Menu:

UTILITY - Miscellaneous User Routines

JOIN - Joins the data for sites stored in individual files into one large file

SPLIT - splits the data in a large file into individual files each containing data for one site

RMTREE - Converts PROGNOSIS treelist output to RMSTAND formatted tree data

Enter Option:

0 = EXIT, 1 = JOIN, 2 = SPLIT, 3 = RMTREE ? 1

If option 1 is selected, JOIN, it is useful for combining runs or transferring data to other computers. Compile a list of the stands desired to be grouped together onto one file. This list must be in a file with a specific name:

JOIN.LST

This file may be created by querying the RMRIS data base or SED editor. In either case the format of the file must be as follows:

JOIN.LST example:

```
070305.0023
070402.0020
070703.0048
071103.0016
081444.0018
081503.0015
081510.0041
081702.0055
081707.0024
082202.0022
082202.0038
860302.0339
860302.0349
870302.0319
```

The file simply contains a list of the 10-digit loc/site numbers used to identify stands. The RMSTAND program writes copies of these specific sites into the file specified. Remarks may be entered to the right of the filenames

When you select JOIN, the following menu will be displayed:

JOIN sites onto a SINGLE file for TEMPORARY storage

List of stands to join is on File JOIN.LST

Enter a file name for grouped RMSTAND tree data: COMBINE.01

Option 2, SPLIT, is the opposite of JOIN. SPLIT reads a file with several sites and create individual LOC.SITE files for permanent storage. This option is for use with downloaded files from FCCC, other computers, or key entry contracts.

When SPLIT is selected, the following menu will be displayed:

SPLIT sites onto INDIVIDUAL files for PERMANENT storage

Enter a file name for grouped RMSTAND tree data: COMBINE.01

In the above example the grouped file must exist because the program reads from it and creates an individual LOC.SITE file for every different stand in the file. If the LOC.SITE file already exists, the program will generate an error message for that site and then continue on with the next site on the JOIN.LST file. Some of these files are so large that they cannot be edited with the SED editor. When editing large file, use SED/NO_FORM_FEED "file name". There may not be blank lines in the file (page breaks) when RMSTAND reads it.

Option 3, RMTREE will read a prognosis "TREELIST" Option 1 file and convert it to RMSTAND input data. This conversion is not perfect since some standard RMSTAND data items are missing. For example, it is possible to simulate stand data 30 years into the future with PROGNOSIS and display the results on a standard RMSTAND printout.

System Management

Refer to the installation instructions for maintenance of system files (page 8). The following is specific to maintenance of files in the folder where the data is processed. System files such as RMSTAND.PR should NOT be in this folder. It is recommend that the DRAWER be named RMRIS and that the FOLDER be named RMSTAND.

The folder where DATA is processed, should only contain:

- LOC.SITE (103201.0004) files or grouped stand files
- STAND.CTL file for default options
- STAND.XXX files for printouts
- OTHER temporary files such as those created by the RMSTAND_FS macro

It is critical that the LOC.SITE files have the PERM option set when not storing data in RMRIS. Establish PERMANANCY for all files in the folder by:

PERM + ON

Or, establish PERM for all stands starting with "1" by:

PERM 1+ ON

Remove PERM from some files via:

PERM filename OFF

The importance of this cannot be over-emphasized. The STAND DATA is valuable and MUST be safely stored on the computer until loaded onto the RMRIS Data Base. The data is kept available on DISK so that the regular system backups are made. Note: it is not necessary to keep FILES of PRINTOUTS because these files may be regenerated anytime they are needed. If RMSTAND data is stored in RMRIS, then stand data is simply extracted when needed and backed up with the RMRIS system.

All of the files

STAND.XXX

are generated by the program and only STAND.RIS should not be deleted until after RMRIS is loaded. ALL OTHER STAND.XXX files are automatically DELETED when the RMSTAND program is run.

Simple operating system commands may be used to view your data. For example:

LIST of stands:	FS
LIST of stands is a specific location:	FS 103201+
DELETE stand from system:	PERM loc.site OFF DELETE loc.site or PDEL loc.site

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A combination of "tricks" may be used to create a "JOIN.LST" file for combined runs or multiple stand runs. For example, SELECT LOC.SITE numbers via an RMRIS QUERY and then edit that file with the SED EDITOR, or use FS/L=filename.

Sometimes it will be necessary to transfer data between different DG computers. Transferring data between DG systems may be accomplished using the standard DUMP command:

```
DUMP_II/V/NACL filename LOCATION##+ LOCATION##+ LOCATION##+ etc.
```

The DUMP file will then contain all of the individual sites in the locations specified. Then the user on the other end will only need to retrieve a single file instead of many individual stand files. The /V switch verifies the filename to the user; /NACL dumps the files without the current default ACL's.

Sending Files To the Printer (DG System)

The standard Stand Printout (STAND.PRT) is 80 columns wide and 61 lines per page. It may be printed to laser or draft printers on standard 8.5 x 11 inch paper.

DRAFT PRINTER

To send a printout to the DRAFT (non-laser) printer, enter the command:

```
QPR filename (usually STAND.PRT)
```

DG LASER PRINTER

To send a printout to the DG Laser printer, enter the command:

```
QPR/QUE=printer filename
```

'printer' is the name of the DG Laser printer
'filename' is the file to be printed

The following command may also be used, for specific print layout specifications:

```
PLASER filename
```

Correcting Errors with SED

After running the RMSTAND edit, corrections may be made using the SYSTEM EDITOR (SED). To access the data file, enter the following command then hit a N/L:

SED 101302.0003 (Location.Site)

This command will open a data file for editing. The SED ruler will be displayed:

* page 1 line 1

The cursor will be positioned next to the asterisk (*), and the contents of the data file will be displayed below the ruler. The user may enter commands to edit the data file. Some of the commands that will be helpful for the user to edit the data file are (WARNING: THE CURSOR MUST BE POSITIONED AFTER THE ASTERISK BEFORE ENTERING ANY COMMAND):

F6 (Modify Current) This command puts the cursor on the line highlighted.

SHIFT F6 (Insert Current) This command inserts data into the file at the line above where the cursor is positioned. By using the arrow keys (-->) the data from the line above is copied onto the present line.

CTRL F5 (Append) This command adds data to the end of the data file. By using the arrow keys (-->) the data from the line above is copied on the present line.

CTRL E space CTRL E This command enters a space in a line. Basically the first CTRL E opens a window and the second CTRL E closes the window.

MOD LINE NUMBER (i.e. MOD 45) - Then hit a N/L. This command moves the cursor to the line number specified and allows the line to be edited. Use the arrow keys (-->,<--) to position the cursor on the line. Make the necessary correction(s), then hit a N/L. If there are other corrections to be made a few lines below the first correction, just N/L down to the line. Make the correction, then hit a N/L. Now hit the BREAK ESC key. This will move the cursor back next to the asterisk. Continue this process until all modifications have been made. Note: the modification(s) will not be made if the N/L key is not hit before the BREAK ESC key.

DEL LINE NUMBER (i.e. DEL 45) - Then hit a N/L. This command deletes the line number specified and automatically renumbers the lines. The cursor will still be positioned after the asterisk after the line is deleted. Consecutive lines can be deleted by specifying the beginning and ending line numbers after typing DEL (i.e. DEL 15 TO 25).

INSERT LINE NUMBER (i.e. INSERT 45) - Then hit a N/L. This command allows insertion of complete line(s) of data. The editor positions the cursor on the number specified. Insert as many lines of data as necessary. The N/L key must be hit after each complete line is inserted. When all the data has been inserted, hit the N/L key, then hit the BREAK ESC key. The data will be inserted and the lines will be automatically renumbered. The cursor moves back next to the asterisk after the BREAK ESC key is hit.

POS LINE NUMBER (i.e. POS 45) - Then hit a N/L. This command will display the particular line specified and the line will be highlighted. Use this command to move around in the data file. The cursor will stay positioned after the asterisk once the command is entered.

MOVE LINE NUMBER AFTER (i.e. MOVE 47 AFTER 52) - Then hit a N/L. This maybe used to reposition lines that are out of order.

DUPLICATE LINE NUMBER AFTER (i.e. DUP 47 AFTER 52) - Then hit a N/L. This may be used to duplicate lines. Sometimes it is easier to duplicate a line that already has most of the data and then modify it.

When all corrections have been made, leave SED by typing BYE, then hit a N/L (REMEMBER, THE CURSOR MUST BE POSITIONED AFTER THE ASTERISK). The screen will ask you if you want save the original file as a backup. Answer NO or N, then hit a N/L. Then you will end up back at the following command line:

Some Notes for PC or AMIGA Users

GENERIC tools are used such as system editors and directory commands. On the PC & AMIGA versions there are two major differences:

- 1) Different GENERIC tools are used - for example DIR
- 2) On the IBM CLONE version running PC-DOS the LOC.SITE file names may only use 3 digits for the site name - 101301.002 due to limitations of the old operating system. If the split option is used in MSDOS, the format for individual stands will be 7.3. For example, stand ID converts to PC filename 103201.1004 converts to PC filename 1032011.004. There are not any file naming limitations on the AMIGA operating system.

The recommended system editor for PC CLONES is CEO WRITE executed with the E option (for EDIT):

CEOWRITE/E filename

BE sure you use the E option, otherwise you will insert TEXT ATTRIBUTES into the file that will cause RMSTAND to error. The recommended text editor for the AMIGA is MEMACS which is supplied on the extras disk. Edit works fine for MSDOS 5.0

File backup is VERY CRITICAL for PC versions. Recommended backup systems are dual Bernouli Boxes, or equivalent with 40 megabytes of storage. Then you can EASILY make a backup copy of your entire set of DATA. If you use floppies, then you must have a backup for every floppy. If you have the data on a hard drive, then you MUST have a backup on floppies, bernouli cartridge, streaming tape, or equivalent.

How often you make backups is dependant on how MUCH work you want to lose. YOU WILL have system failures where you lose data and must go to a backup. If more than one are using a PC system, then there will be accidental human errors that also cause data loss.

If a PC system is used to store STAND data (Non Forest Service Only), then there is a responsibility to append the USER GUIDE with specific maintenance requirements. Keep in mind that this data is Corporate and will be needed for Forest Wide inventories as well as for District use. RO-TFPCFM will be glad to review your PC maintenance document prior to implementation.

Forest Services users may opt to store data on the DG but process it on a PC. If data is stored on a DG, then information to be processed will need to be transferred to the PC or AMIGA for processing. Then you will need a DG communication program:

CEO CONNECT is recommended for the PC or KERMIT
KERMIT is recommended for the AMIGA

KERMIT is available for the DG and workstations.

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DATA PROCESSING AND INTERPRETATION

When data is transferred regardless from the PC or AMIGA, it should first be grouped onto a single file using the JOIN option.

Equivalent Commands

Data General -----	Amiga -----	PC Compatible -----	
PERM + ON	PROTECT #? R	ATTRIB+R *.*	Protect all
PERM + OFF	PROTECT #? RWED	ATTRIB-R *.*	Un-protect
PERM 103201.0002 ON	PROTECT 103201.0002 R	ATTRIB+R 103201.0002	Protect file
DELETE 101102.0001	DELETE 101102.0001	DEL 1011020.001	Delete file
FS 103201+	DIR 103201#?	DIR 103201??.*	List files
FS/L=JOIN.LST	DIR >JOIN.LST	DIR >JOIN.LST	List on file
RENAME FILE1 FILE2	RENAME FILE1 FILE2	REN FILE1 FILE2	Rename files

DATA PRESENTATION AND INTERPRETATION

Because stand exam information is integrated into the RMRIS ORACLE system, most needed summaries could be a simple oracle query. However, there are still some instances when stand printouts are useful, and they may be looked at as additional reports available to the RMRIS user. This section will explain the various page types and information on the standard RMSTAND printout.

Explanation of Stand Exam Printouts (RMSTAND)

RMSTAND will produce a standard printout up to six pages long for each stand. The printout is designed to print on 80 columns or 8 1/2" x 11" paper. The information is summary data compiled by the RMSTAND program from individual tree data tallied in the field. The summary data is segregated into page types according to type of data and what it will be used for. The RMSTAND Default options allow the user to select ONLY the desired page types for printout.

RMSTAND converts all sample trees to a per acre basis by one of two methods. If they were tallied on the fixed-plot, the number of trees represented per acre equals the reciprocal of the fixed-plot size divided by the number of sample points. For example, if the fixed-plot size is 1/300-acre and 10 points were sampled in the stand, the fixed-plot tree blowup would be 300/10 or 30.

If tallied on the variable plot, the blowup factor for each tally tree equals the basal area factor divided by the number of sample points divided by the actual basal area of the tree. Volumes and other measurements can be determined for tally trees and expanded to per acre values using the calculated blowup factors.

Explanation of PAGE TYPE 1

Refer to Exhibit 1 displaying Page Type 1. This page type displays information on productivity, mortality, and damages.

Standard Header Line

The top line on the page is a header line, which is repeated on all Page Types.

1. LOC - SITE

This is the 10-digit Location/Site number. This number must be unique within a Forest. It is a locator used to locate the stand in the data base, the tree data support file, and the stand map.

2. REG This is the Region Code.

3. DISTRICT

This four-digit code is the administrative Forest and Ranger District Code. This is the same as the districts RMRIS database code.

4. SURVEY DATE

Survey date is the year and month the field data was collected.

EXHIBIT 1

Loc-Site 001021-0007 Reg 4 District 1301 Survey Date 9209 Acres 26 PAGE 1

S I T E I N D E X & P R O D U C T I V I T Y

Species	DBH AGE	HGT	Product- ivity	----- SITE ----- -----INDEX-----			Reference
				BASE 100	BASE 80	BASE 50	
PICO	87	32	13	32	0	21	INT-75
PICO	93	49	23	47	0	31	INT-75
PICO	98	31	12	29	0	19	INT-75

PICO - LODGEPOLE 16 36 0 24 Average (3 TREES)

* Site Productivity is Based on Brickell, INT-75

Total Age is Estimated by adding 4 years for
Hardwoods, 15 for Softwoods & 30 for Spruce

F O R E S T T Y P E S T A N D S S I Z E V E G S I Z E
LODGEPOLE PINE SAWTIMBER LARGE

Forest type based on BASAL AREA size class 5.0"+ <- R4 specific message.

A N N U A L M O R T A L I T Y X C A U S E

MEASURE	INSECT	DISEASE	FIRE	ANIMAL	WEATHER	SUPPRESSED	OTHER
Stems(1-4.9)	.00	.00	.00	.00	.00	.00	.00
Stems(5IN+)	.00	.00	.00	.00	.00	.00	.00
Cubic(5IN+)	.00	.00	.00	.00	.00	.00	.00
Scrib(7IN+)	.00	.00	.00	.00	.00	.00	.00

L I V E T R E E S P E R A C R E X D A M A G E

DAMAGE	0-4.9IN	5-8.9IN	9IN+
1- NONE	2100.0	64.6	76.0
72- FORK TOP	.0	19.1	.0

NET Cubic Volume of Growing Stock = 1563. (Min. DBH = 5.0 Min. DIB = 4.0)

NET Scrib Volume of Growing Stock = 6007. (Min. DBH = 7.0 Min. DIB = 6.0)

% Nonstocked = .0 % Nonstockable = .0

MET C SAM 3 LIN 27 BA20 FP300 LFP 0 SFP 0 GP 0 DBA 0 DFP 0 BDB50 BDR30

END OF PAGE - INDIVIDUAL STAND RUN 6- 4-1993

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DATA PROCESSING AND INTERPRETATION

- 5. **ACRES** This is the stand acreage.
- 6. **PAGE** Identifies the page type.

The next section on Page Type 1 reports the Site Index and Site Productivity Information. Site information comes directly from the recorded Site Trees (Current Status equals "I"). This table calculates the growth potential for a stand. Since POTENTIAL is the emphasis of recording Site Trees, it is wise to measure and record data on the best trees available in the stand.

7. **SPECIES**

The species of each measured Site Tree is reported here. The species code used here is the four-character Genera/Species abbreviation. The example given is "PIPO" which is Pinus Pongerosa or Ponderosa pine.

- 8. **DBHAGE** This is the measured age at d.b.h. of the site tree.
- 9. **HEIGHT** Height is the actual height tallied for the site tree.

10. **SITE PRODUCTIVITY**

Site Productivity is the mean cubic foot annual increment of growing stock in a fully-stocked natural stand at the age of culmination of mean annual increment (CMAI). CMAI is the point of intersection of periodic annual increment (PAI) and mean annual increment (MAI). Site Productivity represents the GROWTH POTENTIAL of a stand. The existing stand may or may not be able to achieve that growth potential. The potential stand is usually a later seral or climax type based on selection of the more valued or shade-tolerant species for Site Trees.

Discussion of periodic annual increment, mean annual increment, and CMAI is included in the section about Page Type 5.

Total age of sample trees is used to calculate the Site Productivity and Site Index. To convert from the measured DBH AGE to Total Age, 15 years is added for softwoods, 4 years for hardwoods, and 30 years for Spruce.

Site Productivity is different than the growth shown in the accretion (Item 18, Page Type 2) column. The accretion is the annual growth the stand is presently producing. It is calculated from the growth trees.

Site Productivity is calculated from equations in "Equations and Computer Subroutines for Estimating Site Quality of Eight Rocky Mountain Species" by James Brickell, Research Paper INT-75, 1970. Further information maybe found in the Silvicultural Practices Handbook (FSH 2409.26) and in the Standard Specifications For Stand Examinations. These equations are used as they have a common base for most species.

11. **SITE INDEX.**

Site Index is the expected height of trees at the base age. For most conifers, a base age of 100 years is used. See the reference papers and Item 12 for the base ages and sources.

12. REFERENCE

This is the source reference for the Site Index equation used by RMSTAND for this printout. Each of the references are explained below.

Brickell -- These are site indices based on Research Paper INT-75, "Equations and Computer Subroutines for Estimating Site Quality of Eight Rocky Mountain Species" by James Brickell, 1970. Site equations are based on 50 years for all species except aspen which is 80.

Alexander -- For lodgepole pine only. Site indices are from "Site Indexes for Lodgepole Pine with Corrections for Stand Density" by Robert Alexander, RM-24, 1966. Base age is 100 years.

Hornibrook -- This site index applies only to ponderosa pine in the Black Hills and Nebraska. They are adjusted for tree ages less than 70 years. The information is from a RMFRES paper by Carl Edminster dated 10/26/88. Base age is 100 years.

Alexander -- Applies only to Engelmann spruce. Site indices are from "Site Indexes for Engelmann Spruce" by Robert Alexander, Research Paper RM-32, 1967. Base age is 100 years.

Minor -- This applies to young growth ponderosa pine in Region 3 and is used by the San Juan National Forest. Equations are from "Site Index Curves for Young Growth Ponderosa Pine in Northern Arizona" by Charles Minor, Research Note RM-37, 1964. Base age is 100 years.

Edminster -- This applies only to Douglas-fir. Site indices are from "Site Index Curves for Douglas-fir in New Mexico" by Carl Edminster, Research Note RM-326, 1976. Base age is 100 years.

Smith -- This applies only to Pinyon. Site indices are from "Site Quality and Growth of Pinyon-juniper Woodlands in the Southwest" by F.W. Smith and T. Schuler, unpublished paper on file at: USDA, Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. Base age is 200 years.

13. AVERAGE LINE

This is an average of the site trees selected. Site tree species are not mixed. The average site tree is based on the species corresponding to the calculated type. If no species corresponds to the calculated type, the average will be based on the site tree species recorded most frequently.

14. FOREST TYPE and STAND-SIZE

Forest cover type and stand-size computations are based on plurality of stocking. Stand-size computations take into account the Gingrich Stocking Curves. For these computations, all trees per acre and basal area per acre values are adjusted to compensate for nonstockable portions of the stand.

Region 2

Step 1--Determine Forest Cover Type

- a. If the total basal area of all live trees 5 inches d.b.h. and larger is at least 20 sq. feet (average minimum stocking for all types), determine cover type based on plurality of all live tree basal area by the species groups displayed below.
- b. If the total basal area of all live trees 5 inches d.b.h. and larger is less than 20 sq. feet, determine cover type based on plurality of all live tree numbers per acre by the species groups displayed below.
- c. If there are not enough trees to calculate a cover type (i.e. nonstocked), the type will be set to UNCLASSIFIED. A forest type should be determined and entered into the Data Base by photointerpretation or on-the-ground inspection. Note that if the forest cover type is set to UNCLASSIFIED, the Stand Age is set to zero years old.

Forest Type	Included Tree Species
Spruce/fir	PIEN, ABLA, ABAR
White spruce	PIGL
Ponderosa pine	PIPO
Douglas-fir/WF	PSME, PIPU, ABCO
Jack pine	PIBA
Pinyon/Juniper	PIED, JUSC plus others
Lodgepole pine	PICO
Whitebark pine	PIAL
Bristlecone pine	PIAR
Limber pine	PIFL
Other Softwoods	----
Aspen	POTR
Cottonwood	POFR
Oak	QUGA or QUMA
Other Hardwoods	----

Region 3

Step 1--Determine Forest Cover Type

- a. If the total basal area of all live trees 5 inches d.b.h. and larger is at least 20 sq. feet (average minimum stocking for all types), determine cover type based on plurality of all live tree basal area by the species groups displayed below.
- b. If the total basal area of all live trees 5 inches d.b.h. and larger is less than 20 sq. feet, determine cover type based on plurality of all live tree numbers per acre by the species groups displayed below.

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c. If there are not enough trees to calculate a cover type (i.e. nonstocked), the type will be set to UNCLASSIFIED. A forest type should be determined and entered into the Data Base by photointerpretation or on-the-ground inspection. Note that if the forest cover type is set to UNCLASSIFIED, the Stand Age is set to zero years old.

Forest Type	Included Tree Species
Spruce/fir	PIEN,ABLA
Engelmann spruce	PIEN
Douglas fir	PSME
White fir	ABCO
Blue spruce	PIPU
Bristlecone pine	PIAR
Ponderosa pine	PIPO
Limber pine	PIFL
SW white pine	PIST
Other softwoods	----
Aspen	POTR
Cottonwood	POFR
Pinyon-Juniper	PIED,JUOS,JUMO
Oak woodlands	QUGA,QUAR,QUEM
Other Hardwoods	----
Arizona cypress	CUAR
Juniper	JUOS,JUMO,JUSC
Mesquite	PRGL
Rocky Mt juniper	JUSC

Region 4

Step 1--Determine Forest Cover Type

- a. If the total basal area of all live trees 5 inches d.b.h. and larger is at least 20 sq. feet (average minimum stocking for all types), determine cover type based on plurality of all live tree basal area by the species groups displayed below.
- b. If the total basal area of all live trees 5 inches d.b.h. and larger is less than 20 sq. feet, determine cover type based on plurality of all live tree numbers per acre by the species groups displayed below.
- c. If there are not enough trees to calculate a cover type (i.e. nonstocked), the type will be set to UNCLASSIFIED. A forest type should be determined and entered into the Data Base by photointerpretation or on-the-ground inspection. Note that if the forest cover type is set to UNCLASSIFIED, the Stand Age is set to zero years old.

Forest Type	Included Tree Species
Blue Spruce	PIPU
Red Fir	ABMA
Whitebark Pine	PIAL
White Fir	ABCO
Western Larch	LAOC,LALY
Aspen	POTR5
Limber Pine	PIFL2
Bristlecone	PILO,PIAR
Jeffrey Pine	PIJE
E.Spruce/S.A.Fir	PIEN,ABLA
Douglas Fir	PSME
Grand Fir	ABGR
Lodgepole Pine	PICO
E.Spruce	PIEN
Ponderosa Pine	PIPO
Pinyon/Juniper	PIED,PIMO,JUOC,JUOS,JUSC2
Ca.MX S.Alpine	PSME,LIDE,PILA
Sierra Mx Conf	TSME, ABLA
Subalpine Fir	ABLA
Juniper	JUOC,JUOS,JUSC2
Pinyon Pine	PIED,PIMO
Other Softwoods	-----
Other Hardwoods	-----

Step 2--Determine Stand-Size Class

Region 2

a. Qualified Trees here = Growing Stock Trees (Current Status = "L") for Timber Types and All Live Trees for Woodland Types (Current Status = "W"). Minimum height for softwood seedlings is 3-inches. Minimum height for hardwood seedlings is 12-inches.

b. Does the stand have 10% of Basal Area Average Maximum Density (BA AMD) from the Gingrich Stocking Curves (actually from the equations used to build the tables) in Qualified Trees 5.0-inches and larger?

If so, then the stand is SAWTIMBER, POLETIMBER, or WOODLAND

If the Forest Type is a woodland type, then WOODLAND stand-size is assigned.

If the Basal Area of Qualified Trees 9.0-inches and larger is greater than the Basal Area of Trees 5.0 to 8.9-inches, then the stand is MATURE.

If the Basal Area of Qualified Trees 5.0 to 8.9-inches is greater than the Basal Area of Trees 9.0-inches and larger, then the stand is POLES.

If the stand DOES NOT have 10% of the BA AMD for the calculated Forest Type, then it is either SEEDLING/SAPLING or NONSTOCKED. Calculations are based on STOCKABLE points (Not Status X) only.

Does the stand have 120 softwood trees per acre or 300 hardwood trees per acre? If so, then the stand-size class is SEEDLING/SAPLING.

If minimum stocking standards are not met, then the site is NONSTOCKED.

If 30% of the of the Stockable portion of the stand is nonstocked (STATUS N), the stand is considered nonstocked.

Region 3

Calculate the basal area of all live trees = 5.0" DBH and larger for timber species (spruce, fir, pine, and aspen) or = 3.0" and larger DRC for woodland species. The basal area must meet or exceed minimum stocking levels by productivity classes for the forest cover type.

If the minimum basal area standards are met or exceeded, the following classes are assigned.

If the Forest Cover Type is spruce, fir, pine, or aspen and the Basal Area of Trees 9.0-inches and larger is greater than the Basal Area of Trees 5.0 to 8.9-inches, then the stand is MATURE

If the Forest Cover Type is spruce, fir, pine, or aspen and the Basal Area of Trees 5.0 to 8.9-inches is greater than the Basal Area of Trees 9.0-inches and larger, then the stand is IMMATURE

If the Forest Cover Type is woodland and the Basal Area of Trees 9.0-inches and larger is greater than the Basal Area of Trees 3.0 to 8.9-inches, then the stand is WDLD 9"+ DRC.

If the Forest Cover Type is woodland and the Basal Area of Trees 3.0 to 8.9-inches is greater than the Basal Area of Trees 9.0-inches and larger, then the stand is WDLD 3-8" DRC

If minimum basal area standards are not met for the calculated Forest Type, then it is either SEED/SAPS or NONSTOCKED. Calculations are based on STOCKABLE points (Not Status X) only.

Does the stand meet minimum stocking levels (trees per acre) by productivity classes for the forest cover type (FSH _____)? If so, then the stand-size class is SEED/SAPS or WDLD SEED/SAPS depending on forest cover type.

If minimum stocking standards are not met, then the site is NONSTOCKED.

If 30% of the of the Stockable portion of the stand is nonstocked (STATUS N), the stand is considered nonstocked.

Region 4

Calculate the basal area of all live trees = 5.0" DBH and larger. The basal area must meet or exceed minimum stocking levels by productivity classes for the forest cover type.

If the minimum basal area standards are met or exceeded, the following classes are assigned.

If the Forest Cover Type is spruce, fir, pine, or aspen and the Basal Area of Trees 9.0-inches and larger is greater than the Basal Area of Trees 5.0 to 8.9-inches, then the stand is SAWTIMBER

If the Forest Cover Type is spruce, fir, pine, or aspen and the Basal Area of Trees 5.0 to 8.9-inches is greater than the Basal Area of Trees 9.0-inches and larger, then the stand is POLETIMBER

If the Forest Cover Type is woodland and the Basal Area of Trees 9.0-inches and larger is greater than the Basal Area of Trees 3.0 to 8.9-inches, then the stand is WDL 9"+ DRC.

If the Forest Cover Type is woodland and the Basal Area of Trees 3.0 to 8.9-inches is greater than the Basal Area of Trees 9.0-inches and larger, then the stand is WDL 3-8" DRC

If minimum basal area standards are not met for the calculated Forest Type, then it is either SEED/SAPS or NONSTOCKED. Calculations are based on STOCKABLE points (Not Status X) only.

Does the stand meet minimum stocking levels (trees per acre) by productivity classes for the forest cover type (FSH _____)? If so, then the stand-size class is SEED/SAPS or WDL SEED/SAPS depending on forest cover type.

If minimum stocking standards are not met, then the site is NONSTOCKED.

If 30% of the of the Stockable portion of the stand is nonstocked (STATUS N), the stand is considered nonstocked.

15. ANNUAL MORTALITY X CAUSE

The next table displays annual mortality by cause. Cause is determined by type of death coded on the tally sheet. Checking this table can reveal problems or trends such as mortality from insect infestations.

The MEASURE column to the left includes a line for Seedlings/Sapling STEMS, Poletimber/Sawtimber STEMS, Cubic Foot Mortality in trees 5.0-inches and larger d.b.h., and Scribner Board Foot losses in tree larger than 9.0-inches. The minimum diameter standard is displayed in parentheses.

16. LIVE TREES PER ACRE X DAMAGE

This table is a summary of coded damages by number of stems and by d.b.h. group. The tally sheet damage code is displayed with a decoded description.

Standard Footer Lines

Each page, regardless of Page Type, will have this summary set of footer lines. If a processing option of RMSTAND which provides only one or two Page Types is used, the following information will still be provided.

17. NET or GROSS CUBIC

The volumes shown on the stand printout can be either gross or net, depending on the processing option selected. If net volumes were computed, then "NET" as in this example would be printed. If gross factors were used, then "GROSS" would be printed. Net volumes are computed by applying the net merchantability factors to gross volumes.

In Region 2, the net merchantability factors were derived from Forest-wide inventories for a National Forest. The merchantability factors are applied on an administrative forest wide scale. The one exception is Sulphur Ranger District which uses the old Arapahoe National Forest merchantability factors.

The first line in the footer gives the Cubic Foot Volume Per Acre for the stand. The minimum standards for d.b.h. and top d.i.b. used in the Regional Taper Volume Equations specified by the user in RMSTAND are listed on the right.

18. NET or GROSS SCRIB

This line is much the same as line 16 above, except it is for Scribner board foot volumes.

19. NONSTOCKED% NONSTOCKABLE%

These percentages are based on the Current Status coded for a nonstocked point (code = "N") or a non-stockable point (code = "X"). In the example shown in Exhibit 1, one point out of 22 points has a Current Status coded "N", so 4.5 percent of the stand area is considered to be in the nonstocked condition.

20. **METHOD**

Is the level of intensity of the survey. "I" = Intensive and "C" = Compressed. Intensive surveys have measurements taken on individual trees. A Compressed survey will allow groups of similar trees to be recorded on the same tally line. This field reflects the coding included on the tree tally sheet.

21. **SAMP**

Is the number of sample points tallied in the stand as calculated by the computer program.

22. **LINES**

Is the number of lines of sample data tallied for the stand. This would be any line entry on the tree tally sheet. This includes variable plot trees, seedlings, saplings, and site trees.

23. **BAF**

Is the basal area factor selected to sample the stand. This field is filled when the sample design calls for a variable plot over a fixed-radius plot (VP/FP).

24. **FPS**

Is the reciprocal of the fixed-plot size, such as 300. This field is filled when the sample design calls for a variable point over a fixed-radius plot (VP/FP). This field is used for single fixed-radius plot sample designs (FP).

25. **LFPS**

Is the reciprocal of the large fixed-plot size used in fixed-radius plot over fixed-radius plot sample designs (FP/FP). The code for a 1/10th-acre plot would be "10".

26. **SFPS**

Is the reciprocal of the small fixed-plot size used in fixed-radius plot over fixed-radius plot sample designs (FP/FP).

27. **GP**

Is the growth period, the interval between surveys in growing seasons or years, and is used in Remeasurement Surveys.

28. **INDIVIDUAL STAND RUN**

This indicates whether the printout is for an "Individual Stand" or for "Combined Stands".

29. The **date** the printout was processed is listed on the last line.

30. The current **revision number** of RMSTAND is the last item on the page.

Explanation of PAGE TYPE 2

Page Type 2 provides stand tables by species and diameter class. These tables include all live trees, but no dead. The tables are in the same format as those required for input to GENGYM. GENGYM is the Generalized Growth and Yield Model being developed by the Rocky Mountain Forest and Range Experiment Station. Certain versions are ready for use now. Depending on the number of species and diameter classes found in the sample stand, the information on Page Type 2 may take more than one page of paper to printout on. At the bottom of Page Type 2 is a table summarizing Growth and Mortality per Acre.

If an electronic copy of Page Type 2 is available, the user may take that copy, edit it via the Screen Text Editor (SED), and prepare the data for input to GENGYM. RMSTAND can also prepare data input tables for GENGYM.

Exhibit 2 displays Page Type 2. This example has four species of trees included in the stand data.

EXHIBIT 2

Loc-Site 001021-0007 Reg 4 District 1301 Survey Date 9209 Acres 26 PAGE 2

T R E E S X S P E C I E S & D B H C L A S S
Nonstockable Points Included in Average

A L L		L I V E		T R E E S			D E A D		A L L		L I V E		T R E E S	
DIA	LIVE	AVG		AVG	AV	AVG	MORTALTY		DIA	HGT	TOTAL	MERCH	MERCH	
CLS	TREES	DBH	BA	HGT	CR	DMR	TREES	AGE	GRO	GRO	CUBIC	CUBIC	SCRIB	
SUBALPINE FIR														
0	300.0	.1	.0	2	0	.0	.0	0	.0	.0	0	0	0	
1"+	.0	.0	.0			.0					0	0	0	
WHITEBARK PINE														
0	600.0	.1	.0	2	0	.0	.0	0	.0	.0	0	0	0	
2	300.0	2.0	6.5	10	0	.0	.0	0	.0	.0	22	0	0	
10	23.7	10.1	13.3	43	6	.0	.0	134	.6	.0	263	236	950	
1"+	323.7	3.4	19.9			.0					286	236	950	
W.WHITE PINE														
0	300.0	.1	13.3	2	0	.0	.0	0	.0	.0	0	0	0	
1"+	.0	.0	.0			.0					0	0	0	
LODGEPOLE PINE														
0	500.0	.1	13.3	2	0	.0	.0	0	.0	.0	0	0	0	
2	100.0	2.0	2.2	10	0	.0	.0	0	.0	.0	10	0	0	
6	30.8	6.3	6.7	49	7	.0	.0	93	.7	.0	151	116	0	
8	52.9	8.3	20.0	50	3	.0	.0	153	.6	.0	464	425	1736	
9	27.1	9.5	13.3	53	5	.0	.0	0	.0	.0	322	302	1084	
10	22.0	10.5	13.3	51	7	.0	.0	197	.5	.0	312	300	1293	
19	3.1	19.7	6.7	64	6	.0	.0	219	.4	.0	185	182	945	
1"+	236.0	6.9	62.1			.0					1444	1326	5058	
STAND TOTAL														
1"+	559.8	5.2	82.0								1730	1563	6007	
G R O W T H & M O R T A L I T Y / A C R E														
INGROWTH		ACCRETION		GROSS-GROWTH		MORTALITY		NET						
CUBIC		.0		29.9		29.9		.0		29.9				
SCRIBNER		.0		90.9		90.9		.0		90.9				
Based on 5 tallied growth trees out of 21 live growing stock trees														

EXHIBIT 2-2

NET Cubic Volume of Growing Stock = 1563. (Min. DBH = 5.0 Min. DIB = 4.0)

NET Scrib Volume of Growing Stock = 6007. (Min. DBH = 7.0 Min. DIB = 6.0)

% Nonstocked = .0 % Nonstockable = .0

MET C SAM 3 LIN 27 BA20 FP300 LFP 0 SFP 0 GP 0 DBA 0 DFP 0 BDB50 BDR30

END OF PAGE - INDIVIDUAL STAND RUN 6- 4-1993

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A warning is listed at the top of the stand table about whether nonstockable points were Included or Excluded. Which option for nonstockable points was used in RMSTAND will effect the information in the stand table. The option will effect how the information was calculated and expanded from single tree data to per acre data.

The stand tables are split out by species and diameter classes. Diameter classes in which no trees were tallied are zero and not included here. The table is further split into data about "All Live Tree" and "Calibration Data". Data in the "All Live Tree" area is the basic trees per acre, diameter, and height information found in the inventory. The "Calibration Data" is used by GENGYM to adjust its internal formulas for the observed ages, growth rates, and volumes found in the subject stand.

Calculations are made for separate species by diameter class.

1. DIA CLS

Observed diameter classes found in the stand data. Note that tables on this page use one-inch wide diameter classes.

- "0" is used for seedlings less than 4.5-feet tall.
- "-1" seedlings 4.5-feet tall or more but less than 1.0-inch d.b.h.
- "1" saplings 1.0 to 1.9-inches d.b.h.
- "2" saplings 2.0 to 2.9-inches d.b.h.

2. LIVE TREES

Number of live trees per acre in the diameter class. Includes growing stock and cull stems.

3. AVG DBH

Average diameter of trees measured within the diameter class.

4. BA

Basal Area per Acre of trees in that diameter class. Basal area is measured in square feet per acre.

5. AVG HT Average height of trees measured within the diameter class.

6. AV CR

Average Crown Ratio of trees measured within the diameter class. Crown ratio is defined as that portion of the tree bole which supports green, live, healthy foliage as expressed as a percent of the total tree height. Crown ratio is not measured on seedlings, so the code equals "0". The code used is defined as:

- "1" is 1 thru 10 percent.
- "2" is 11 thru 20 percent.
- "9" is 81 thru 100 percent.

7. **AVG DMR**

Average Dwarf Mistletoe Rating for the diameter class. The standard 6-point rating system is used. Code 0 indicates no mistletoe is present. Codes 1 to 6 are for increasing infestation levels.

8. **MORTALITY TREES**

Number of mortality trees per acre for that diameter class. Information is derived from those trees 1.0-inches and larger included in the data which have died within the past five years and are coded "M" or "F" in Current Status. Used for calibrating the GENGYM mortality prediction function.

9. **AGE**

Average age of trees measured in the diameter class. Total age is used for trees less than 2.9-inches d.b.h.

10. **DIA GRO**

Ten-year diameter growth in inches derived from Radial Growth measurements of trees in the diameter class. Diameter growth is at d.b.h. for trees larger than 3.0-inches d.b.h. and ground level for stems 1.0 to 2.9-inches d.b.h.

11. **HGT GRO**

Five-year terminal height growth in feet calculated for the diameter class from radial growth measurements. For seedlings, this figure is from terminal five-year height growth measurements. If a Remeasurement Survey data is being presented, the height growth is from measured data.

12. **TOTAL CUBIC**

Total gross cubic foot volume per acre calculated for the diameter class. This measure includes the volume of all fiber in the tree. Includes all diameter classes 1.0-inches and larger.

13. **MERCH CUBIC**

Gross merchantable cubic foot volume per acre calculated for those stems in the diameter class. Merchantable volume is calculated from the regional taper equations. The minimum d.b.h. and top d.i.b. specifications are listed in the Standard Footer lines at the bottom of the page type.

Region 3 - The volumes for all timber species are calculated by using Hahn and Bare equations, "Comprehensive Tree Volume Equations for Major Species of New Mexico and Arizona", David W. Hahn and B. Bruce Bare, 1978. The volume equations for woodland species are based on "Pinyon-Juniper Volume Equations for the Central Rocky Mountain States", David C. Chojnacky, 1985.

14. **MERCH SCRIB**

Gross merchantable scribner board foot volume per acre is calculated for the diameter class. Regions 2 and 4: merchantable volume is calculated from the regional taper equations. The minimum d.b.h. and top d.i.b. specifications are listed in the Standard Footer lines at the bottom of the page type.

15. **1"+**

For all trees 1 inch in diameter and larger, a summary line is found at the bottom of each species stand table. The sum of trees, average diameter, basal area, and volumes found in the inventoried stand for that species is listed.

16. **STAND TOTAL**

A final summary line which adds up all the trees per acre, average diameters, basal areas, and volumes from the species tables above. This summary line includes all live trees except site trees.

The next section provides annual per-acre information on growth and mortality. The growth data is calculated from all the growth trees tallied in the stand (trees for which Height Growth, Radial Growth, and Tree Age were measured). Mortality comes from all trees coded "M" or "F" in Current Status. Volumes in the table are gross merchantable cubic foot volumes and gross merchantable scribner board foot volumes. Minimum diameter class standards are found in the Standard Footer.

Current annual growth is based on radial growth measurements, height growth calculations, and tree ages. If a tree (growing stock) does not have a recorded radial growth, a growth rate is assigned by averaging growth rates by species and one-inch d.b.h. classes.

Once a radial growth rate is assigned, a height growth rate is calculated based on the current tree height and the radial growth rate. If terminal height growth data is available, such as from seedlings or Remeasurement Surveys, then the measured height growth is used.

Each growing stock tree larger than the minimum d.b.h. listed in the volume lines at the foot of the page is assigned a growth rate. After radial and height growth rates are assigned, each tree is "grown backwards" one year.

Growth is calibrated by the ten-year radial growth measurements except when a Growth Period is entered into the data from Remeasurement Surveys. Mortality is based on the five-year standard for mortality trees.

17. **INGROWTH**

For those trees less than the minimum merchantable diameter (from the footer) one year ago and now are larger than the minimum diameter threshold, the volume of the tree is assigned as INGROWTH. See the example of Exhibit 2-2 for the minimum diameter thresholds of ingrowth for cubic and scribner. If there are few sample points, ingrowth may be unrealistic since it represents size class movement measured for one year only.

18. ACCRETION

For those trees greater than the minimum d.b.h. one year ago, present and past volumes may be compared for ACCRETION estimates. The difference in volumes is the accretion.

19. GROSS-GROWTH Is the sum of ingrowth and accretion.

20. MORTALITY

Mortality trees are those trees which have died within the last five years. Annual mortality is calculated by dividing the gross merchantable volume of mortality trees by five.

21. NET

As displayed here equals annual gross growth minus natural mortality losses.

22. GROWTH TREES

A line below the Growth and Mortality Table discloses the number of Growth Trees measured in the stand.

The Growth and Mortality Table displays information about the stands health and condition. High growth rates are associated with stands which are young, thrifty, free of competition, and free of pests. Low growth rates are associated with older and slower growing stems, disease and insect infestations, and competition. Decadence and stand breakup usually are apparent in increased mortality, particularly when the NET GROWTH is a negative number.

Be sure to also check the amount of Sound Dead basal area or volume compared to the Live basal area or volume. This information is easily found on Page Type 4 in the Statistical Summary. If there are higher than usual amounts of dead in the stand, then the stand may be decadent or pest-infested and in need of treatment.

Explanation of Page Type 3

Page Type 3, displayed in Exhibit 3, provides separate stand tables for All Live Trees and All Dead Trees. Each table is broken down into two-inch wide diameter classes from 0" to 32". Here diameter classes which had no stems tallied for are included with zeros. The live stand table is the best source of data for understanding and graphing stand structures.

1. DIA CLS

The midpoint diameter is the label used for each two-inch diameter class included in the stand table.

"0" is used for seedlings less than 1.0-inch d.b.h.

"2" is for saplings 1.0 to 2.9-inches d.b.h.

"4" IS FOR SAPLINGS 3.0 TO 4.9-INCHES D.B.H.

2. LIVE TREES

Number of all live trees per acre in the diameter class. Includes growing stock and cull stems (Current Status = "L", "C", and "R").

3. AVG DBH

The AVG DBH column is the weighted average d.b.h. of measured trees within the diameter range. It is weighted by the number of trees. This allows for more accurate initial volume calculations when used as input to a growth simulator. This logic also applies to the Average Height column.

4. BASAL AREA Per acre of trees in that diameter class.

5. AVG HGT

Weighted average height of trees measured in the diameter class.

6. GROWING STOCK

Sums the stems per acre by diameter class of those trees tallied with a Current Status of "L".

7. SOUND CULL

Sums the stems per acre by diameter class of those trees tallied with a Current Status of "C".

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8. ROTTEN CULL

Sums the stems per acre by diameter class of those trees tallied with a Current Status of "R".

- 9. DBA Dead Basal Area factor
- 10. DFP Dead Fixed Plot
- 11. BDB Breakpoint D.B.H.
- 12. BDC Breakpoint diameter root Collar

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DATA PROCESSING AND INTERPRETATION

EXHIBIT 3-1

Loc-Site 001021-0007 Reg 4 District 1301 Survey Date 9209 Acres 26 PAGE 3

A L L L I V E T R E E S

DIA	LIVE	AVG	BASAL	AVG	GROWING	SOUND	ROTTEN	%	TOTAL	MERCH	MERCH
CLS	TREES	DBH	AREA	HGT	STOCK	CULL	CULL	SOFTWD	CUBIC	CUBIC	SCRIB
0	1700.0	.1	.1	2	1700.0	.0	.0	100	0	0	0
2	400.0	2.0	8.7	10	400.0	.0	.0	100	33	0	0
4	.0	.0	.0	0	.0	.0	.0	0	0	0	0
6	30.8	6.3	6.7	49	30.8	.0	.0	100	151	116	0
8	52.9	8.3	20.0	50	52.9	.0	.0	100	464	425	1736
10	72.9	10.0	39.9	49	72.9	.0	.0	100	897	839	3327
12	.0	.0	.0	0	.0	.0	.0	0	0	0	0
14	.0	.0	.0	0	.0	.0	.0	0	0	0	0
16	.0	.0	.0	0	.0	.0	.0	0	0	0	0
18	.0	.0	.0	0	.0	.0	.0	0	0	0	0
20	3.1	19.7	6.7	64	3.1	.0	.0	100	185	182	945
22	.0	.0	.0	0	.0	.0	.0	0	0	0	0
24	.0	.0	.0	0	.0	.0	.0	0	0	0	0
26	.0	.0	.0	0	.0	.0	.0	0	0	0	0
28	.0	.0	.0	0	.0	.0	.0	0	0	0	0
30	.0	.0	.0	0	.0	.0	.0	0	0	0	0

1"+ 559.8 5.2 81.9 559.8 .0 .0 100 1730 1563 6007

A L L D E A D T R E E S

DIA	DEAD	AVG		AVG	SALVABLE	DEAD	NON SOUND	%	TOTAL	MERCH	MERCH
CLS	TREES	DBH	BA	HGT	DEAD	MORTALITY	DEAD	SOFTWD	CUBIC	CUBIC	SCRIB
0	.0	.0	.0	0	.0	.0	.0	0	0	0	0
2	.0	.0	.0	0	.0	.0	.0	0	0	0	0
4	.0	.0	.0	0	.0	.0	.0	0	0	0	0
6	.0	.0	.0	0	.0	.0	.0	0	0	0	0
8	.0	.0	.0	0	.0	.0	.0	0	0	0	0
10	.0	.0	.0	0	.0	.0	.0	0	0	0	0
12	.0	.0	.0	0	.0	.0	.0	0	0	0	0
14	11.7	14.5	13.3	62	11.7	.0	.0	100	369	345	1680
16	.0	.0	.0	0	.0	.0	.0	0	0	0	0
18	.0	.0	.0	0	.0	.0	.0	0	0	0	0
20	.0	.0	.0	0	.0	.0	.0	0	0	0	0
22	.0	.0	.0	0	.0	.0	.0	0	0	0	0
24	.0	.0	.0	0	.0	.0	.0	0	0	0	0
26	.0	.0	.0	0	.0	.0	.0	0	0	0	0
28	.0	.0	.0	0	.0	.0	.0	0	0	0	0
30	.0	.0	.0	0	.0	.0	.0	0	0	0	0

1"+ 11.7 14.5 13.3 11.7 .0 .0 100 369 345 1680

S T A N D T O T A L

1"+ 571.4 5.5 95.3 571.4 .0 .0 100 2099 1908 7688

EXHIBIT 3-2

NET Cubic Volume of Growing Stock = 1563. (Min. DBH = 5.0 Min. DIB = 4.0)

NET Scrib Volume of Growing Stock = 6007. (Min. DBH = 7.0 Min. DIB = 6.0)

% Nonstocked = .0 % Nonstockable = .0

MET C SAM 3 LIN 27 BA20 FP300 LFP 0 SFP 0 GP 0 DBA 0 DFP 0 BDB50 BDR30

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9. % SOFTWD

Percent of the total stems within the diameter class which are softwoods.

10. GROSS CUBIC

Total gross cubic foot volume per acre calculated for the diameter class. This measure includes the volume of all bole fiber in the tree. Volumes are calculated for all stems 1.0-inches and larger.

11. MERCH CUBIC

Gross merchantable cubic foot volume per acre is calculated for those stems in the diameter class. Regions 2 and 4: merchantable volume is calculated from the regional taper equations. The minimum d.b.h. and top d.i.b. specifications are listed in the Standard Footer lines at the bottom of the page type.

Region 3

The volumes for all species are calculated by using either Hahn and Bare equations or Chojnacky equations (see Page Type 2 notes #13 for references).

12. MERCH SCRIB

Gross merchantable scribner board foot volume per acre calculated for the diameter class. Regions 2 and 4: merchantable volume is calculated from the regional taper equations. The minimum d.b.h. and top d.i.b. specifications are listed in the Standard Footer lines at the bottom of the page type.

13. LIVE

A Summary Line at the bottom of the stand table shows the trees per acre, average diameter, basal area, percents, and volumes for all of the LIVE trees in the stand.

Many of the columns defined above for the ALL LIVE TREES stand table carry on to the ALL DEAD TREES stand table. Column differences are defined below:

14. DEAD TREES

Number of all dead trees per acre in the diameter class. Includes sound and salvable dead, mortality trees, and nonsound dead stems (Current Status = "S", "M", "F", "G", and "D").

15. SALVABLE DEAD

Sums the stems per acre by diameter class of those trees tallied with a Current Status of "S" or "G".

16. MORTALITY

Sums the stems per acre by diameter class of those trees tallied with a Current Status of "M" or "F".

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17. **NONSOUND DEAD** Sums the stems per acre by diameter class of those trees tallied with a Current Status of "D".

18. **DEAD**

A Summary Line at the bottom the All Dead Table displays the trees per acre, average diameter, basal area, percents, and volumes for all of the DEAD trees in the stand.

19. **STAND TOTAL**

A summary line for all live and dead stems found in the stand data which are greater than 1.0-inch d.b.h. Includes the trees per acre, average diameter, basal area, merchantable and unmerchantable trees per acre, percent of conifers, and volumes.

Explanation of Page Type 4

Page Type 4 includes statistical information about the sampled stand. Two tables are provided as shown in Exhibit 4. The upper table is a point-by-point summary of the tallied stems and basal areas. The second table summarizes the Current Status classes of sampled trees and displays statistical data.

The Per Acre Point Summary Of Stems and BA is useful for determining variability in the stand. Portions of a sample stand maybe well-stocked with seedlings while other portions are devoid of small trees. Comparing the data presented in the table with a stand map can show which areas have lots of trees and which areas have fewer stems.

The table includes information about LIVE TALLY TREES only.

The table has three general fields -- trees per acre, basal area per acre, and mistletoe information.

1. POINT# Point number.

2. 0-5

Live trees per acre in the seedling-sapling size class of 0.0 to 4.9-inches DBH.

3. 5-9

Live trees per acre in the poletimber size class of 5.0 to 8.9-inches DBH.

4. 9-12

Live trees per acre in a small sawtimber size class of 9.0 to 11.9-inches DBH.

5. 12-99

Live trees per acre in a large sawtimber size class of trees 12.0-inches DBH and larger.

6. ALL

Sum of all live trees per acre as represented by data on that point.

7. SWD Softwood or conifer trees per acre.

8. LIVE Live basal area per acre represented by the sampled data.

9. SWD The softwood or conifer basal area per acre on the point.

10. TREES The number of mistletoe-infested trees per acre determined from the plot data.

EXHIBIT 4

Loc-Site 001021-0007 Reg 4 District 1301 Survey Date 9209 Acres 26 PAGE 4

PER ACRE POINT SUMMARY OF STEMS & B A

POINT#	LIVE TREES				ALL	SWD	LIVE BASAL AREA		UNDERSTORY MISTLETOE		OVERSTORY MISTLETOE	
	0-5	5-9	9-12	12-99			LIVE	SWD	TREES	DMR	TREES	DMR
1	1800.0	50.	72.	0.	1922.	1922.	67.	67.	.0	.0	.0	.0
2	1500.0	144.	74.	9.	1728.	1728.	120.	120.	.0	.0	.0	.0
3	3000.0	57.	72.	0.	3129.	3129.	60.	60.	.0	.0	.0	.0

STATISTICAL SUMMARIES OF TOTALS

	TREES	BASAL AREA	CUBIC	SCRIBNER
L Growing Stock	2260.	82.	1563.	6007.
C Sound Cull	0.	0.	0.	0.
R Rotten Cull	0.	0.	0.	0.
M Mort Standing	0.	0.	0.	0.
F Mort Down	0.	0.	0.	0.
S SND D. Stand.	12.	13.	345.	1680.
G SND Dead Down	0.	0.	0.	0.
D Nonsound Dead	0.	0.	0.	0.
TOTAL	2271.	95.	1908.	7688.
CV% (Total)	33.	58.	61.	61.
SE% (Total)	18.	32.	33.	33.
70%CI (Total)	562.	42.	879.	3505.

NET Cubic Volume of Growing Stock = 1563. (Min. DBH = 5.0 Min. DIB = 4.0)

NET Scrib Volume of Growing Stock = 6007. (Min. DBH = 7.0 Min. DIB = 6.0)

% Nonstocked = .0 % Nonstockable = .0

MET C SAM 3 LIN 27 BA20 FP300 LFP 0 SFP 0 GP 0 DBA 0 DFP 0 BDB50 BDR30

END OF PAGE - INDIVIDUAL STAND RUN 6- 4-1993

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11. DMR

The average dwarf mistletoe rating for stems included in the point data.

The Dwarf Mistletoe information included in the last two columns is useful for mapping out the extent of infestation found in the stand. The point data is set against a copy of the stand map which shows the location of the sample points. The table and map are the keys to a successful MISTLETOE SURVEY.

Using the stand map and the per point data is useful in REGENERATION SURVEYS in mapping out understocked areas of the stand. The mapped areas can then be rapidly relocated on the ground for follow-up reforestation treatments. This saves the field workers having to go out and walk entire units.

The STATISTICAL SUMMARIES OF TOTALS table shows various per-acre values for the stand as a whole by Current Status class. All trees tallied, except site trees, are represented in one tree class or another. Site trees (Current Status = "I") are not included in any of these calculations. Statistical analysis by the different units of measure are included.

12. CURRENT STATUS

The line headings are the Current Status of the tallied trees. A clear set of definitions of each of the Current Status classes is found on Pages 32 to 38 of the 1990 issue of the "Standard Specifications For Stand Exam" and in the section on Data Interpretation later in this User Guide.

13. TREES

The average number of trees per acre included in each Current Status class. Includes all size classes.

14. BASAL AREA

The square foot basal area per acre of trees 1.0-inches d.b.h. and above tallied in each Current Status class.

15. CUBIC

The gross merchantable cubic volume of trees within each Current Status class. Cubic volume calculations are from the regional taper volume equations and use the minimum diameter standards listed in the standard footer lines.

16. SCRIBNER

The gross merchantable Scribner board foot volume of trees within each Current Status class. Board foot volume calculations are from the regional taper volume equations and use the minimum diameter standards listed in the standard footer lines.

17. TOTAL

This is the sum of all trees sampled. The following error statistics are based on this total. It represents the average of the individual sample points.

18. CV%

The Coefficient of Variation is the ratio of the Standard Deviation to the Mean and here is expressed as a percentage value.

Coefficient of Variation (CV) is an estimate of the variance between the sample points. The higher the value, the greater the variance between the mean of the points and the individual points. The lower the value, the less variance. A high variance could mean a very mixed or more heterogeneous stand. A lower value indicates a more homogeneous stand. A more heterogeneous stand would require more sample points to obtain a better estimate of the stand. A more homogeneous stand would require fewer points. Good type delineations can significantly reduce the variance.

EXAMPLE: Assume a 40-acre stand with 4 points. What is the coefficient of variation of the basal area of these four points sampled?

Point 1 -- 50 sq. ft. BA/acre
2 -- 60
3 -- 40
4 -- 50

Step 1. Determine the stand mean (\bar{x}) - an estimate of the basal area for the stand. It is the average of the 4 sample points.

$$\bar{x} = \frac{\sum_{i=1}^n x_i}{n} = \frac{(50 + 60 + 40 + 50)}{4} = 200/4 = 50$$

Where E is Sigma

Step 2. Determine the standard deviation (s) - a measure of the dispersion of individual observations about their mean (\bar{x}).

$$s = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n-1}}$$

$$s = 8.16$$

Step 3. Calculate the coefficient of variation (CV).

$$CV = \frac{s}{\bar{x}} = \frac{8.16}{50} * 100 = 16\%$$

19. SE%

The Standard Error of the Mean is a measure of the variation among sample means, i.e., individual points. In comparison, the standard deviation is a measure of the variation of individual observations, i.e., trees that determine a sample mean. Standard error is used to establish confidence intervals (see next section) or a range about the sample mean (\bar{x}) in which the true mean falls.

To continue the example in the previous section, the standard error (SE) is calculated as follows:

$$\begin{aligned}
 SE &= \sqrt{\frac{s^2}{n} (1-n/N)} \\
 &= \sqrt{\frac{(8.16)^2}{4} (1-\frac{4}{40})} \\
 &= \sqrt{\frac{66.6}{4} (1.1)} \\
 &= \sqrt{14.98} \\
 &= 3.87
 \end{aligned}$$

N = total number possible samples.
Each point samples 1 acre,
hence 40 points possible.

The standard error expressed as a percent of the mean equals the standard error of the mean divided by the mean multiplied by 100.

$$SE \% = \frac{SE}{\bar{x}} * 100 = \frac{3.87}{50} * 100 = 7.74 \%$$

20. 70%CI

Sample means vary about the true mean of the population (stand). The establishment of confidence limits provides a method of estimating what the probability is that a given sample mean (\bar{x}) might be more than some specified distance from the true mean. The 70 percent confidence interval of the total establishes a range in which the true stand mean would fall with a 70 percent probability. The standard error of the mean (SE) and a table of t values are used for setting up confidence limits. The t value represents a correction factor based on the number of sample points in the stand. The more points, the lower the correction factor.

Using the example in the past two sections with four sample points, the t value at a 70 percent probability level would be 1.25.

The confidence limits are for the average basal area as follows:

$$\bar{x} + t (SE)$$

$$50 + 1.25 (3.87)$$

$$50 + 4.84 \text{ sq. ft}$$

So it is 70 percent probable that the true mean of the stand lies between 45.16 and 54.84 square feet of basal area. This assumes that all measurements made at the point are 100 percent accurate.

Explanation of Page Type 5

Page Type 5 consists of summary data about the stand. The data on this page is what will be input to the District RMRIS data base (Refer to FSH 6609.21). This page type has two functions: first, to show what data will be entered into the data base, and second to provide one place to locate all the data needed to write a diagnosis. Refer to Exhibit 5 for data elements to be described on this page of the stand printout.

This page type should be reviewed. Any illogical or unsatisfactory data should be changed by updating the District RMRIS data base.

It is possible, as an option in the RMSTAND data entry program on the Data General computer system, to order copies of this Page Type 5 alone without all the rest of the printout.

A diagnosis for the stand should be written on this page at the bottom of the printout. This page then should be inserted into the proper location or site folder.

1. TIM PRODUCTIVITY

The potential cubic foot volume growth per year at culmination of mean annual increment for a fully-stocked, natural stand. See Site Productivity, Item 9 on Page Type 1 for a more involved explanation.

2. SITE INDEX

The average Site Index and Site Index Species is repeated from Page Type 1, Item 12.

3. TREE SURVEY TYPE

This code refers to the method or intensity of the stand examination. In older surveys and in RMRIS, this code is either Level 3 or Level 4. In later versions this code will be a "C" or "I" for Compressed and Intensive surveys.

4. TREE SURVEY DATE The year and month the data was collected.

EXHIBIT 11

Loc-Site 001021-0007 Reg 4 District 1301 Survey Date 9209 Acres 26 PAGE 5

R M R I S D A T A

TIM PRODUCTIVITY:	16	SITE INDEX	PICO	24
TREE SURVEY METHOD:	C	BF SW:		6007
TREE SURVEY DATE:	9209	CUBIC SAW SW:		1021
DOMINANT SPECIES:	LP	CUBIC SAW HW:		0
VEG SIZE CLASS:	L	CUBIC POLE SW:		542
PCT NON STOCKED:	0	CUBIC POLE HW:		0
ORIGIN DATE:	1810	CUBIC CULL/WOODLAND:		0
QMD X 10:	52 (92-5+)	CUBIC SOUND DEAD:		345
STAND HEIGHT:	50	PCT DOWN SOUND DEAD:		0
BASAL AREA 1"+	82 (73-5+)	HARD (SOUND) SNAGS:		12
TOTAL TREES 0"+:	2260 (560-1+)	SOFT(ROTTEN) SNAGS:		0
LARGE TREES 5"+:	160	GROSS CUBIC GROWTH:		30
CONE SEROTINY:	0	CUBIC MORTALITY:		0
FREQUENT DAMAGE:	0 (NONE)			
MISTLETOE (DMR):	.0	BEETLE RISK:		0

L I V E T R E E B A S A L & T R E E S X S P E C I E S & D B H																			
	FIR	SPR	PP	OP	LP	DF	AS	OH	OS	FIR	SPR	PP	OP	LP	DF	AS	OH	OS	
DBH	BAA									TREES									
0	0	0	0	0	0	0	0	0	0	300	0	0	0	600	500	0	0	0	300
1-4	0	0	0	7	2	0	0	0	0	0	0	0	300	100	0	0	0	0	
5-8	0	0	0	0	27	0	0	0	0	0	0	0	0	84	0	0	0	0	
9-15	0	0	0	13	27	0	0	0	0	0	0	0	24	49	0	0	0	0	
16-20	0	0	0	0	7	0	0	0	0	0	0	0	0	3	0	0	0	0	
21+	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1+	0	0	0	20	62	0	0	0	0	0	0	0	324	236	0	0	0	0	

SDI	AGE	MAI	PAI	AMD 100%	40%	60%	%AMD	STRUCTURE	STAGE	ELK
196	182	9	30	254	101	152	32%	4A	Mature	MB

W R I T E I N D I A G N O S I S - Stand Condition

Habitat Type:	Growth Comment:	Density:
Structure:	Composition:	Condition:
Arrangment:	Fuel Loading:	Other:

NET Cubic Volume of Growing Stock = 1563. (Min. DBH = 5.0 Min. DIB = 4.0)
NET Scrib Volume of Growing Stock = 6007. (Min. DBH = 7.0 Min. DIB = 6.0)

% Nonstocked = .0 % Nonstockable = .0

MET C SAM 3 LIN 27 BA20 FP300 LFP 0 SFP 0 GP 0 DBA 0 DFP 0 BDB50 BDR30

END OF PAGE - INDIVIDUAL STAND RUN 6- 4-1993

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CHAPTER 60
DATA PROCESSING AND INTERPRETATION

5. FOREST TYPE

The computed Forest Type from Page Type 1, Item 13, is converted to a two-digit alpha code from the following code list for input to RMRIS.

Region 2

Valid Codes	Forest Cover Types
WS	White Spruce (Black Hills and Nebraska only)
SF	Engelmann Spruce - Subalpine Fir
DF	Douglas-Fir/White Fir
AA	Aspen
LP	Lodgepole Pine
PP	Ponderosa Pine
PJ	Pinyon-Juniper
JP	Jack Pine (Nebraska only)
ER	Eastern Red Cedar (Nebraska only)

The cover type for other softwood types, and other hardwood types, is left blank. Corrections or blank cover types should be entered into District data bases using form R2-6600-1.

Region 3

Valid Codes	Forest Cover Types
SF	Spruce/Fir
ES	Engelmann Spruce
DF	Douglas Fir
WF	White Fir
BS	Blue Spruce
BC	Bristlecone Pine
PP	Ponderosa Pine
LI	Limber Pine
WP	Southwestern White Pine
OS	Other Softwoods
AA	Aspen
CW	Cottonwood
PJ	Pinyon-Juniper
OW	Oak Woodlands
OH	Other Hardwoods
AZ	Arizona Cypress
JW	Juniper
MQ	Mesquite
RJ	Rocky Mountain Juniper

CHAPTER 60
DATA PROCESSING AND INTERPRETATION

Region 4

Valid Codes	Forest Cover Types
BS	Blue Spruce
RF	California Red Fir
WB	Whitebark Pine
WF	White Fir
WL	Western Larch
AA	Aspen
LM	Limber Pine
BP	Bristlecone Pine
JP	Jeffrey Pine
SF	Subalpine Fir
DF	Douglas Fir
GF	Grand Fir
LP	Lodgepole Pine
ES	Englemann Spruce
PP	Ponderosa Pine
PJ	Pinyon/Juniper
MS	Sierra Mixed Conifer
MC	California Mixed Subalpine
AF	Subalpine Fir
JU	Juniper
PI	Pinyon Pine
OS	Other Softwoods
OH	Other Hardwoods

6. STAND-SIZE CLASS

The computed Stand-Size Class from Page Type 1, Item 13, is converted to a one-digit code for input to RMRIS.

Regions 2, Region 3, and Region 4

Refer to the Standard Specifications for Stand Exam (RMSTAND Chapter 30) pages 19 & 20 for a list of valid codes for STAND-SIZE CLASS.

7. PCT NON STOCKED

The percentage is based on the Current Status STOCKED coded for non-stocked points (code = "N") and non-stockable points (code = "X"). This information is repeated from the Standard Footer Lines at the bottom of each Page Type.

Example Code

17 17 percent nonstocked

8. ORIGIN DATE

Year that approximates the date of origin of the stand. It is the year of survey (Item 4 above) minus the average age of the stand. The average age of the stand is calculated as follows.

If the stand has more than 20 square feet of basal area of sawtimber, then the average age of the sawtimber stems over 9.0-inches d.b.h. is used. If the stand-size is Poletimber and less than 20 square feet basal area of sawtimber sized trees are present, then the average age of trees over 5.0-inches d.b.h. is used. For stands classified as Seedling/Saplings, the average age of the stems 1.0 to 4.9-inches d.b.h. is used. If less than 120 saplings per acre are present then the seedling ages are used. If a stand has a Forest Cover Type of "UNCLASSIFIED", then the stand age is set to zero.

Since age is measured at d.b.h., 30 years is added to spruce, 15 years is added to other softwoods and 4 years is added to hardwoods to estimate Total Tree Age. No correction is necessary for seedling and saplings to 2.9-inches since they are recorded as Total Age on the tally sheets.

Example Code

1848 The year 1848

9. QMD x 10.

This is the Quadratic Mean Diameter, at breast height, for all live trees over 1.0 inches d.b.h. The diameter is multiplied by 10 to eliminate the decimal point. Quadratic Mean Diameter is defined as the diameter of the tree of average basal area. Thus:

$$QMD = \sqrt{\frac{(BAA / TREES(1+))}{.005454}}$$

Example Code

63 6.3 inches Quadratic Mean Diameter (DBH)

10. STAND HEIGHT. The average height in feet of all live trees based on stand-size class.

Example Code

58 58 feet average height

11. BASAL AREA 1". The average Basal Area in whole square feet per acre. All live trees over 1.0 inches in diameter are included.

Example Code

174 174 square feet of basal area

12. TOTAL TREES 0"+

The number of live trees per acre for all size classes. In parentheses to the right is the number of live trees per acre which are larger than 1.0-inch d.b.h. In Exhibit 5 this is "(807-1+)".

13. LARGE TREES 5"+

The number of live trees per acre 5.0 inches d.b.h. and larger.

14. CONE SEROTINY

A summation of cone serotiny coding for lodgepole pine (growing stock trees only) 5.0 inches d.b.h. and larger. The code is for that percent of closed cone observations recorded on the tally sheet as "2". One-digit code is used here. Code 0 is interpreted as 0-5% closed, code 1 as 6-15% closed, etc.

15. FREQUENT DAMAGE

The most common damage recorded for trees in the calculated Stand-Size Class for the stand. The damage code is given followed by a decoded name for the damage.

Further explanation of each damage code is found on in Chapter 30 of the Standard Specifications for for Stand Exam.

Valid
Codes

00	No serious damage
11	Bark beetle
12	Defoliators
13	Ips beetle
14	Terminal weevil
21	Stem and top rusts
22	Butt rot
23	Cankers
24	Dwarf mistletoe
25	Stem rot
26	Western gall rust
27	Broom rust
28	Root rot
29	Foliage disease
31	Fire damage
41	Domestic livestock
42	Porcupines
43	Other wildlife
44	Big game
45	Hares and rabbits
46	Small rodents

Valid
Codes

51	Wind
52	Lightning
53	Snow break or bend
54	Frost crack
55	Mechanical damage
56	Sunscald
61	Suppression
71	Lean over 15%
72	Forked below merch top
73	Broken top
74	Dead top
75	Excessively limby or wolf tree
76	Unhealthy foliage
77	Rough tree
78	Forked above merch. top
79	Crook or severe sweep
81	Logging damage
82	TSI damage
83	Land clearing damage

16. MISTLETOE (DMR)

The Dwarf Mistletoe Rating for susceptible species. A "0" indicates mistletoe is absent. "1" - "6" indicates a standard mistletoe infection rating for the stand. A code "7" indicates that mistletoe infection was present, but not rated. Presence or absence code on old data sheets is converted to the new coding when it is input.

17. BF SW.

NET Scribner volume per acre of the merchantable portion of growing stock softwood trees 7.0 inches d.b.h. and larger. Volumes here are always net unless a gross specification is made through RMSTAND.

Region 3 - trees 9.0" DBH and larger

18. CUBIC SAW SW

NET softwood cubic volume per acre to a 4-inch top d.i.b. of growing stock trees 9.0 inches d.b.h. and larger. Volumes here are always net unless a gross specification is made through RMSTAND.

19. CUBIC SAW HW

NET hardwood cubic volume per acre to a 4-inch top d.i.b. of growing stock trees 9.0 inches d.b.h. and larger. Volumes here are always net unless a gross specification is made through RMSTAND.

20. CUBIC POLE SW

NET softwood cubic volume per acre to a 4-inch top d.i.b. of growing stock trees 5.0 - 8.9 inches d.i.b. Volumes here are always net unless a gross specification is made through RMSTAND.

21. CUBIC POLE HW

NET hardwood cubic volume per acre to a 4-inch top d.i.b. of growing stock trees 5.0 - 8.9 inches d.b.h. Volumes here are always net unless a gross specification is made through RMSTAND.

22. CUBIC CULL

NET cubic volume per acre in live sound and rotten cull trees 5.0 inches d.b.h. and larger (based on Current Status codes "C" and "R").

23. CUBIC SOUND DEAD

NET cubic volume per acre in salvable dead and mortality trees to a 4.0 inch top d.i.b. for trees 5.0 inches d.b.h. and larger (based on Current Status codes "M", "F", "S", and "G").

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DATA PROCESSING AND INTERPRETATION

24. PCT DOWN SOUND DEAD

Percent of the Cubic Sound Dead volume which is down (based on Current Status codes "F" and "G").

25. HARD (SOUND) SNAGS

Number of standing sound dead trees 5.0 inches d.b.h. and larger (based on Current Status code "S"). Code of 99 indicates 99 or more per acre.

26. SOFT (ROTTEN) SNAGS

Number of standing nonsound dead trees 5.0 inches d.b.h. and larger (based on Current Status code "D"). Code of 99 indicates 99 or more per acre.

27. GROSS CUBIC GROWTH

Current cubic foot Ingrowth and Accretion repeated from Item 19, Page Type 2.

28. CUBIC MORTALITY

Current annual cubic feet mortality rate repeated from Item 20, Page Type 2.

29. BEETLE RISK

Numeric rating for spruce according to research publication "A Computer Program to Calculate the Susceptibility of Spruce-Fir Stands to Spruce Beetle Outbreaks" by J. A. Logan, Research Note RM-393, 1980, and "Stand Ratings for Spruce Beetles" by J. M. Schmid, Research Note RM-309, 1976.

Valid Codes

0	Not Computed
1	Low
2	Low - Medium
3	Medium
4	Medium - High
5	High

The next table displays the live tree basal area per acre and trees per acre by species group for six diameter classes. The table gives a quick summary look at the presence of tree species in the stand and of the general stand structure or composition. THIS INFORMATION IS NOT LOADED INTO RMRIS.

30. SPECIES GROUPS Species codes are as follows:

FIR	Subalpine, corkbark, or white fir
SPR	Englemann, blue, or white spruce.
PP	Ponderosa pine
OP	Other pines
LP	Lodgepole pine
DF	Douglas-fir
AS	Aspen
OH	Other hardwoods
OS	Other species

31. DBH

Six diameter classes (d.b.h.) are set up here for live trees. Classes include seedlings, saplings, poletimber, sawtimber, large sawtimber, and all live stems larger than 1.0" d.b.h. The diameter range is listed in the column.

32. BAA

Basal area per acre in square feet for all live trees by diameter class and species group.

33. TREES Live trees per acre by diameter class and species group.

The next section on Page Type 5 is a final summary of calculated stand parameters. These parameters are NOT LOADED into the RMRIS data base.

34. SDI

Stand Density Index (Reinecke's) of all live trees over 1.0 inch d.b.h. Stand Density Index is calculated as follows:

$$SDI = TREES(1+) \times (QMD / 10)^{1.6}$$

35. AGE Average age of the stand based on Origin Age, Item 8 above.

36. MAI

Mean Annual Increment here is based on the NET CUBIC volume of the stand divided by the stand AGE. It is a measure of the average annual cubic foot growth that this particular stand has achieved through its life. The cubic foot volume standards used to determine MAI do vary (5.0 inches and larger here), so be aware. The NET CUBIC foot volume is displayed below in the Standard Footer lines along with the minimum size specifications. Thus:

$$MAI = NET\ CUBIC / AGE$$

37. PAI

Periodic Annual Increment is the yearly cubic foot growth rate the stand is now experiencing based on Radial Growth measurements. It is a net value here. PAI here can be calculated by subtracting Cubic Mortality, Item 28 from Gross Cubic Growth, Item 27. The calculation is also repeated from Item 21 in Page Type 2. The calculation is based on trees over 5.0-inches in d.b.h. in the example of Exhibit 5 as this is the minimum d.b.h. standard listed in the footer line.

In order to smooth out year-to-year variations in growth due to climatic conditions, Periodic Annual Increment is usually calculated as the average over a short period of time, usually 10 years. Thus:

$$PAI = (Cubic\ Feet,\ Year\ 10 - Cubic\ Feet,\ Year\ 0) / 10\ Years$$

In general, if PAI is greater than MAI, then the stand has not reached culmination of mean annual increment (CMAI) and is thus immature. Regeneration harvests should not be planned until a stand has passed CMAI.

If PAI is a negative number, then it is an indication that mortality is truly rampant in the stand. This type of stand should be a primary candidate for some sort of management treatment.

When the present growth rate of the stand equals the mean annual increment of the stand, then it will have reached CMAI.

Timber Productivity (Item 1 above) is different than the growth shown in the Gross-Growth (Item 19, Page Type 2), MAI, and PAI calculations. Growth here is calculated from the growth trees measured in the stand. This growth represents what THIS STAND IS DOING. Timber Productivity is calculated from Site Tree data and therefore represents what the SITE has the POTENTIAL OF GROWING. Be aware of the difference.

38. AMD 100%

This is the Average Maximum Density projected for this stand based on the Regional Gingrich Stocking Curves. The figure is the average maximum density reported in square feet of Basal Area per Acre.

39. 40%

This is the Basal Area at 40% of Average Maximum Density from above. This 40% AMD is typically considered to be the "Lower Limit of Management Zone", or LLMZ, for a fully-stocked site. If stand basal area is below this LLMZ, then site occupancy by the stand is lost and regeneration will occur or invasion by competing vegetation will result. In reality, the specific site conditions (aspect, elevation, species, ect.) control what level of stocking is the LLMZ.

40. 60%

This is the Basal Area at 60% of Average Maximum Density from above. This 60% AMD is typically considered to be the "Upper Limit of Management Zone", or ULMZ, for a fully-stocked site. If stand basal area is above this ULMZ, the stand is overstocked. Overstocking results in increased mortality and suppression. In reality, the specific site conditions (aspect, elevation, species, ect.) control what level of stocking is the ULMZ.

41. %AMD

This is the current stands percentage of Average Maximum Density. It is simply the Basal Area 1" from Item 11 divided by the AMD 100% basal area listed in Item 38. The percent tells the user relatively how dense the stand is.

Ideally, the manager should be controlling the stocking of his stands through commercial or precommercial thinnings. The site should have enough trees or basal area to fully occupy the site. Too many trees results in excessive competition. Stocking ideally should be maintained between 40% and 60% of AMD.

This concept is also used in Stand Density Index (SDI, Item 34). The theory is based on Langsaeter's Curves of tree population interactions. Both SDI and Gingrich Curves are intended to measure the RELATIVE DENSITY of the stand.

42. STRUCTURE STAGE

Wildlife Structural Stage partly describes the vegetation which makes up the wildlife habitat. The code assigned is a two-digit alphanumeric such as "2" or "3a". This value is input to the RMRIS database. Structural stage is usually defined by the stand-size class, stand age, crown cover percent, and old growth score.

Region 2 Calculations

In order to calculate the structural stage class automatically, RMSTAND uses Stand-Size Class (Item 6) and Percent of Average Maximum Density (Item 41) to assign a code. If the Stand-Size class is sawtimber, then a "4 Mature" is assigned. If the stand is poletimber sized, then a "3 Sapling/Pole" is assigned. If the stand-size class is seedling/sapling and more than 200 saplings per acre are found, then the class "3 Sapling/Pole" is assigned. If 200 saplings per acre are not present, then RMSTAND assigns "2 Seedling/Shrub". Finally, if the stand-size class is nonstocked, a "1 Grass/Forb" class is assigned.

Classes 3-Sapling/Pole and 4-Mature are each broken down into three crown closure classes denoted by letters "a", "b", and "c". Percent of AMD is used as a substitute for crown closure percent. Thus:

% AMD	Stage Letter
0 to 39%	A
40 to 59%	B
60% +	C

A "5-Old Growth" structural stage is not calculated by RMSTAND at the time of writing. Further research is ongoing into the definition of Old Growth in Region 2. To assign the old growth classification, use an Old Growth Scorecard and input to code into RMRIS as part of the Header Sheet, R2-2410-7a.

The structure stage code determined on the Header Sheet, R2-2410-7a, will override the automatic calculation if necessary for accuracy. The user should refer to Page 21 of the "Standard Specifications For Stand Exam" and to the publication "Managing Forested Land For Wildlife" for further and detailed information concerning wildlife structural stages.

Region 3 Calculations

See Appendix A

The final portion of the Page Type 5 printout is a workspace for preparing a stand diagnosis. The headings will provide for a somewhat consistent format for the diagnosis.

Explanation of Page Type 6

Page Type 6 presents another view of stand conditions. See Exhibit 6 for an example. Stand data is grouped by the following age classes; SEED/SAPS, YOUNG FOREST, MID-AGE FOREST, MATURE FOREST, AND OLD-GROWTH. This page introduces MAX SDI FOR TYPE. Appendix ____ further explains both MAX SDI FOR TYPE and Page Type 6.

Explanation of Page Type 7

Revision 5.0 of RMSTAND includes new optional basal area factors of fixed plot sizes for dead wood, optional diameter breakpoints and the capability to integrate information on all plant species using the new "V" status code. Page type 7 has been included to display this added capability when using the Fortran 77 analysis program.

Calculated Dead Trees/Pieces Per Acre

This routine calculates the number of trees (or pieces in the case of down nonsound dead wood) per acre by general diameter class for the 6 dead status codes.

Calculated Cover Percents From Tree Data

This routine calculates summaries of tree crown cover percent and average height by layer code (1,2 & 3 for trees and 1,2, & 3 for shrubs). Calculations are based on:

Crown Width and Foliage Weight of Northern Rocky Mountain Conifers
Research Paper INT-283, August 1981, Melinda Moeur and
COVER: A User's Guide to the CANOPY and SHRUBS Extension of the Stand
Prognosis Model
General Technical Report INT-190, October 1985, Melinda Moeur

Currently equations in this routine are not available for some softwood species and all hardwood species so estimates of crown cover are very rough for stands with a high percentage of hardwoods.

The equations use crown length (interpreted from crown ratio and height), diameter, height and stand basal area to predict crown width. Canopy closure is then calculated by comparing areas of crowns to the area of 1 acre. Predictions should be more accurate if data is recorded by layer to avoid overlapping crowns. Users may edit older data based on major height breaks to add the layer code.

Cover Percents Based on Occular Estimates

These percentages are based on the new "V" (for vegetation) status code. Cover percent is entered in the tally field. The program simply adds cover percents by species and layer and averages the information based on the total number of points with a "V" status code entered.

For example, the sample printout was based on 10 sample points for tree data, but occular estimates of vegetation were taken on only two of the ten points. When the combined run option is selected (regardless of which one), cover percents are simply averaged over all of the points in all of the stands.

This information may also be easily queried from the Oracle data base since only simple calculations to average information by the number of vegetation points are necessary.

EXHIBIT 7

Loc-Site 124502-0023 Reg 2 District 0811 Survey Date 8207 Acres 66 PAGE 7

ECOLOGICAL SUMMARY OF VEGETATION

Calculated Dead Trees/Pieces Per Acre

	SIZE:	0-1	1-3	3-5	5-7	7-9	9-12	12-16	16-21	21+
Recent Dead Standing		.0	.0	.0	.0	.0	.0	9.8	.0	.0
Recent Dead Down		.0	.0	.0	.0	.0	.0	.0	.0	.0
Older Dead Standing		.0	.0	.0	.0	.0	.0	.0	.0	.0
Older Dead Down		.0	.0	.0	.0	.0	.0	.0	.0	.0
Rotten Dead Standing		.0	60.0	.0	.0	11.2	8.7	.0	.0	.0
Rotten Dead Down		.0	.0	.0	.0	.0	.0	.0	.0	.0

Calculated Cover Percents from Tree Data

SPECIES	LAYER	COVER%	HEIGHT
PSME	1	13.1	51.2
PIPO	1	1.7	48.0
POTR5	1	3.1	72.2
PSME	2	48.6	37.2
PIPO	2	19.9	30.2
QUGA	2	1.4	29.0
PSME	3	.3	2.0
POTR5	3	.6	2.0

Cover Percents Based on Occular Estimate

SPECIES	LAYER	COVER%	HEIGHT
JUSC	1	22.5	2.3
ARCO		1.0	.0
CAGE		1.5	.0

SAMPLE OCCULAR POINTS = 2

END OF PAGE - INDIVIDUAL STAND RUN 3- 7-1993

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General Information About Stand Printout Computations.

The following applies to various portions of the printout and is applicable to correct interpretation of the data.

Live Tree Class or Current Status. This part provides a short definition of tree class or current status. A tree class is assigned for all trees including seedlings. Tree Class is synonymous with Current Status. More exact definitions are found in the "Standard Specifications For Stand Exam", pages 32 to 38.

Growing Stock (L) These are live trees usually favored in management. They have at least one 8-foot merchantable log (trees over 9.0-inches DBH) or one bolt (trees between 5.0 and 8.9-inches DBH) available now. Growing Stock saplings and seedlings are those relatively free of defect and capable of growing a merchantable piece. To qualify as a Growing Stock Tree, total defect must be less than 67 percent.

Rotten Cull (R) Live trees whose defect is greater than 67 percent or which will not produce a merchantable piece (saplings and seedlings). The major damage is some form of rot.

Sound Cull (C) Live trees whose defect is greater than 67 percent or which will not produce a merchantable piece (seedlings and saplings). The major damages are roughness or other form defects.

Mortality (M or F) Trees which have died within the past five years and which would have qualified as Growing Stock at the time of death. Code M is for standing mortality trees while Code F is used for mortality tree which are down.

Sound Dead (S or G) Dead trees over 5.0-inches DBH which are not classified as Mortality and have at least 50 percent sound wood. Code S is for standing sound dead trees and Code G is for down sound dead trees.

Nonsound Dead (D) Standing dead trees of timber species over 5.0-inches DBH with more than 50 percent defect.

Vegetation (V) Status code is used to record trees, gross, shrub, or form species by crown cover percent.

Site Trees (I) Sample trees measured to determine site productivity and site index. These sampled trees should be the best in the stand since they are to represent the POTENTIAL of a site to produce fiber. Site Trees may or may not be tally trees in the survey. Data for Site Trees is recorded separately and not included in stand average calculations.

Volume Equations.

Region 2

Volumes in the RMSTAND computer program are determined by the Regional Taper Volume Equations developed by the Rocky Mountain Forest and Range Experiment Station. These are the same taper equations as are used for timber cruising purposes.

The Taper Volume Equations will give volumes in Scribner board feet and in cubic feet. The minimum specifications for what portions of a tree to include in the volume calculation maybe adjusted in the RMSTAND program control menu. The user is able to assign the minimum d.b.h and minimum top d.i.b. for cubic foot and board foot volume calculations.

Net volumes are determined by applying the Administrative Forest Merchantability Factors to the gross volumes calculated from the Regional Taper Volume Equations.

Region 3

Region 3 - The volumes for all timber species are calculated by using Hahn and Bare equations, "Comprehensive Tree Volume Equations for Major Species of New Mexico and Arizona", David W. Hahn and B.Bruce Bare, 1978. The volume equations for woodland species are based on "Pinyon-Juniper Volume Equations for the Central Rocky Mountain States", David C. Chojnacky, 1985.

Region 4

Region 4 - Taper volume equations are developed from Krishna Rustagi's tree form based on height to two thirds of DBH. These are the same equations used for Timber Cruising.

Basal Area Per Acre. The stand basal area says there is 115 square feet of basal area per acre.

This means that the best estimate for basal area is 115 square feet per acre on the average. How good that estimate is depends on the confidence interval and any possible point layout bias.

Both stocked and nonstocked sample points are considered in this average. Therefore, if 20 percent of the stand is nonstocked, the best estimate of Basal Area Per Acre on the stocked points is $1.20 \times 115 = 138$ square feet per acre.

Capability to Grow Timber. It is often difficult to determine if the stand is capable of producing 20 cubic feet of wood per acre per year over time. The "Site Productivity" based on measured site trees, Item 12, Page Type 1, is the first place to look. However, this value may not be realistic due to the following two reasons:

1. Poor site tree selection.
2. Inaccuracy of equations predicting cubic yield capability from site index.

Secondly, look at the current cubic volume of live trees 5 inches d.b.h. and larger (footer lines on Page Type 5) in comparison to the stand age. To see what the stand has produced to date, divide the age into the volume. This is the Mean Annual Increment and is calculated for you in Item 36, Page Type 5. If the stand is at or near culmination of mean annual increment this is a good way to determine productivity.

Thirdly, consider the current gross cubic growth per acre, Item 19, Page Type 2. Remember, that if a stand has culminated and is currently growing only 10 cubic feet per acre, this does not indicate that the stand is incapable of growing 20+ cubic feet mean annual increment at the point of culmination.

Lastly, consider the percent of nonstockable points, found in the Standard Foot Lines at the bottom of each Page Type. If the stand is 50 percent rock outcrops and can grow 20 cubic feet between the outcrops, it can grow only a 10 cubic feet per acre per year average over the entire stand.

Note that most of the data above is summarized or repeated on Page Type 5.

Stand Structure. The stand tables for all live trees and by species on Page Types 2 and 3 are useful for determining stand structure. Compare the number of stems by diameter classes with ages. Also look closely to the Basal Area column. A good rule of thumb is that there is not a significant overstory unless 30 to 40 square feet of basal area exists or 1500 board feet Scribner per acre is present.

If there is a substantial overstory, a manageable understory may also exist. A Region 2 rule-of-thumb is that 600-1000 seed/saps per acre are needed for a manageable understory due to logging losses which will occur when removing the overstory. Of course this is dependent on the stocking density.

Check the age and species of the understory trees to determine if they would release. If all of the seedlings are classified as cull, then it is a good indication that they will not release or be worth anything in the future.

It is often useful to graph the stand structure, particularly if you are dealing with multi-storied or uneven-aged stands. The Graphics Section will explain a method for producing graphs.

Board Feet Per Acre. Look at the board feet per acre softwood totals on Page Type 5. These figures maybe gross or net volumes depending on which field is used. Merchantability standards or minimum diameters will vary depending on the option selected in processing the data. Check the definitions for each Item in the sections above in order to determine the limits of the data.

Consider the percent of nonstocked sample points when making volume judgments about a portion of the stand.

Dead board foot volume may be approximated from the All Dead Trees stand table on Page Type 3.

Decadence. Decadence is a term applied to older, overmature stands which exhibit high mortality rates and lots of damage. Decadent stands are prone to insect and disease infestations. Windthrow is increased. Sites may or may not be as productive as younger, even-aged stands. Stand decadence can be beneficial to wildlife habitat and habitat diversity. Many old growth characteristics are associated with decadence.

Look at the Annual Mortality and Stems By Damage Code tables on Page Type 1 to estimate decadence. Compare the growth and mortality rates displayed on Page Type 2. Tree Ages are displayed in the Species Stand Tables, also on Page Type 2. Consider the portion of Dead Tree basal area and volumes against the total live and dead stand totals (Items 18 and 19 of Page Type 3). Finally, examine the values found in AGE, MAI, and PAI on Page Type 5.

Once you have looked at all of these parameters, a judgement of how decadent a particular stand is can be made. Typically, decadent stands have increased mortality, decreased growth rates, lots of damage, increasing amounts of dead timber, old trees, and PAI's greater than MAI's.

Part of natural stand breakup is a thinning of the overstory. As the overstory trees die and blowdown, openings are created which fill-in with seedlings to develop an understory. Decadence is usually associated with multi-storied stands.

Reliability of Estimate. Confidence intervals are the best determination of reliability from the printout since the confidence interval considers both the standard error estimate and the sample size. Statistical summary data is presented on Page Type 4 of the printout.

Generally look at the Basal Area Standard Error Percent for poletimber and sawtimber size stands. Plus or minus 20 percent or less is probably pretty good for these stands for prescription purposes.

Look at the number of trees estimated for nonstocked or seed/sap stands.

APPENDIX A

VEGETATIVE STRUCTURAL STAGES
DESCRIPTION AND CALCULATIONS
U.S.D.A. FOREST SERVICE
SOUTHWESTERN REGION

April 1, 1992

Abstract:

The Southwestern Region uses a six-class vegetation scheme to describe the developmental stages of a forest ecosystem. The purpose of the classification method is to provide a common language between and with the publics and Forest Service employees whereby each can visualize the forest developmental stages. The stages can also be easily inventoried and classified by the Rocky Mountain Stand Program and displayed on a printout for resource managers.

The six stages are grass-forb/shrub (0 - 1" dbh); seedling-sapling (1 - 5" dbh); young forest (5 - 12" dbh); mid-age forest (12 - 18" dbh); mature forest (18" dbh and larger); and old-growth (meets Regional minimum dbh, age, and number of tree required standards). Stand density index (SDI) is calculated for each forest stage and the stage with the highest density is selected for the classification. SDI is also used to determine the canopy closure class (open; moderately closed; or closed) and whether a stand is single or multiple storied. The classification system is most useful for even-aged stands with single or multiple stories, but loses its utility when applied to either a uniform or groupy uneven-aged (all-aged) stand.

VEGETATIVE STRUCTURAL STAGE TABLE

The following tables illustrate the stem diameter for each structural stage by forest cover type.

Ponderosa Pine, Southwestern White Pine, Miscellaneous Soft Woods

	GRASS FORB/SHURB 1 SINGLE STORY	SEEDLING/ SAPPLINGS 2 SINGLE STORY	YOUNG FOREST 3 SINGLE & MULTIPLE	MID-AGED FOREST 4 SINGLE & MULTIPLE	MATURE FOREST 5 SINGLE & MULTIPLE	OLD- GROWTH 6 SINGLE & MULTIPLE
CANOPY		A B C	A B C	A B C	A B C	B C
DBH	0 - 0.9"	1.0"-4.9"	5.0"-11.9"	12"-17.9"	18"+	Low Hig
A = 0 - 39% B = 40 - 59% C = 60%+					DBH	14" 18
					Trees/ac.	20 20

Blue Spruce, Douglas-fir, White Fir, Limber Pine, Bristlecone Pine.

	GRASS FORB/SHURB 1 SINGLE STORY	SEEDLING/ SAPPLINGS 2 SINGLE STORY	YOUNG FOREST 3 SINGLE & MULTIPLE	MID-AGED FOREST 4 SINGLE & MULTIPLE	MATURE FOREST 5 SINGLE & MULTIPLE	OLD- GROWTH 6 SINGLE & MULTIPLE
CANOPY		A B C	A B C	A B C	A B C	B C
DBH	0 - 0.9"	1.0"-4.9"	5.0"-11.9"	12"-17.9"	18"+	Low Hig
A = 0 - 39% B = 40 - 59% C = 60%+					DBH	18" 20
					Trees/ac.	12 16

Engelmann Spruce-Subalpine Fir, Engelmann spruce.

	GRASS FORB/SHURB 1 SINGLE STORY	SEEDLING/ SAPPLINGS 2 SINGLE STORY	YOUNG FOREST 3 SINGLE & MULTIPLE	MID-AGED FOREST 4 SINGLE & MULTIPLE	MATURE FOREST 5 SINGLE & MULTIPLE	OLD- GROWTH 6 SINGLE & MULTIPLE
CANOPY		A B C	A B C	A B C	A B C	B C
DBH	0 - 0.9"	1.0"-4.9"	5.0"-11.9"	12"-17.9"	18"+	Low Hig
A = 0 - 39% B = 40 - 59% C = 60%+					DBH	10" 14
					Trees/ac.	20 30

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Aspen*, Cottonwood*, Willow**, Miscellaneous Hardwoods**.

	GRASS FORB/SHURB 1 SINGLE STORY	SEEDLING/ SAPLINGS 2 SINGLE STORY	YOUNG FOREST 3 SINGLE & MULTIPLE	MID-AGED FOREST 4 SINGLE & MULTIPLE	MATURE FOREST 5 SINGLE & MULTIPLE	OLD- GROWTH 6 SINGLE & MULTIPLE
CANOPY		A B C	A B C	A B C	A B C	B C
DBH*	0 - 0.9"	1.0"-2.9"	3.0"- 7.9"	8"-11.9"	12"+	Low Hig
DRC**						NOT DEFINED

A = 0 - 39% B = 40 - 59% C = 60%+

Pinyon-juniper, Juniper, Rocky Mountain Juniper, Arizona Cypress.

	GRASS FORB/SHURB 1 SINGLE STORY	SEEDLING/ SAPLINGS 2 SINGLE STORY	YOUNG FOREST 3 SINGLE & MULTIPLE	MID-AGED FOREST 4 SINGLE & MULTIPLE	MATURE FOREST 5 SINGLE & MULTIPLE	OLD- GROWTH 6 SINGLE & MULTIPLE
CANOPY		A B C	A B C	A B C	A B C	B C
DRC	0 - 0.19"	0.2"-2.9"	3.0"- 5.9"	6.0"-8.9"	9"+	Low Hig
					DBH	9" 12
					Trees/ac.	12 30

A = 0 - 39% B = 40 - 59% C = 60%+

Gambel Oak, Mesquite.

	GRASS FORB/SHURB 1 SINGLE STORY	SEEDLING/ SAPLINGS 2 SINGLE STORY	YOUNG FOREST 3 SINGLE & MULTIPLE	MID-AGED FOREST 4 SINGLE & MULTIPLE	MATURE FOREST 5 SINGLE & MULTIPLE	OLD- GROWTH 6 SINGLE & MULTIPLE
CANOPY		A B C	A B C	A B C	A B C	B C
DRC	0 - 0.19"	0.2"-2.9"	3.0"- 4.9"	5.0"-6.9"	7"+	Low Hig
						NOT DEFINED

A = 0 - 39% B = 40 - 59% C = 60%+

VEGETATIVE STRUCTURAL STAGE DESCRIPTION

The vegetative structural stage describes the forest successional stage, canopy cover, and stories.

<u>CODE</u>	<u>DESCRIPTION</u>
1	Grass-forb/shrub
2A	Seedling/sapling, open canopy
2B	Seedling/sapling, moderately closed canopy
2C	Seedling/sapling, closed canopy
3ASS	Young forest, open canopy, single story
3AMS	Young forest, open canopy, multiple story
3BSS	Young forest, moderately closed canopy, single story
3BMS	Young forest, moderately closed canopy, multiple story
3CSS	Young forest, closed canopy, single story
3CMS	Young forest, closed canopy, multiple story
4ASS	Mid-aged forest, open canopy, single story
4AMS	Mid-aged forest, open canopy, multiple story
4BSS	Mid-aged forest, moderately closed canopy, single story
4BMS	Mid-aged forest, moderately closed canopy, multiple story
4CSS	Mid-aged forest, closed canopy, single story
4CMS	Mid-aged forest, closed canopy, multiple story
5ASS	Mature forest, open canopy, single story
5AMS	Mature forest, open canopy, multiple story
5BSS	Mature forest, moderately closed canopy, single story
5BMS	Mature forest, moderately closed canopy, multiple story
5CSS	Mature forest, closed canopy, single story
5CMS	Mature forest, closed canopy, multiple story
6BSS	Old-growth, moderately closed canopy, single story
6BMS	Old-growth, moderately closed canopy, multiple story
6CSS	Old-growth, closed canopy, single story
6CMS	Old-growth, closed canopy, multiple story

LEGEND

Structural Stage:

- | | |
|---|------------------|
| 1 | Grass-Forb/Shrub |
| 2 | Seedling/Sapling |
| 3 | Young Forest |
| 4 | Mid-aged Forest |
| 5 | Mature Forest |
| 6 | Old-growth |

Canopy Closure:

- | | |
|---|----------------------------------|
| A | 0-39 Percent, Open |
| B | 40-59 Percent, Moderately Closed |
| C | 60+ Percent, Closed |

Stories:

- | | |
|----|----------------|
| SS | Single Story |
| MS | Multiple Story |

VEGETATIVE STRUCTURAL STAGE CALCULATIONS

STRUCTURAL STAGES

VSS 1 is determined:

when $\frac{\text{Total Stand SDI}}{\text{Maximum SDI for Forest Type}} \times 100 = <10\%$ or Basal Area is < 20 . (Forest type is not set if BA is less than 20)

VSS 6 is determined:

when The number of trees and stem diameter are equal to or greater than the stated number for the forest type. The stated stem size and number of trees are the Regional old-growth minimums.

VSSs 2, 3, 4, and 5 are determined:

when $\frac{\text{Total Stand SDI}}{\text{Maximum SDI for Forest Type}} \times 100$ is $\geq 10\%$ and VSS 6 number of tree and stem diameters are $<$ the numbers stated; the class with the highest calculated square foot basal area is the assigned structural stage. The calculated basal area for each VSS includes all tree species.

CANOPY COVER

Canopy cover is determined:

when $\frac{\text{Total Stand SDI}}{\text{Maximum SDI for Forest Type}} \times 100 = 10$ to $\leq 30\%$ then A is assigned meaning Open, 0 to 39% canopy cover

when $\frac{\text{Total Stand SDI}}{\text{Maximum SDI for Forest Type}} \times 100 = >30$ to $\leq 47\%$ then B is assigned meaning Moderately Closed, 40 to 59 % cover

when $\frac{\text{Total Stand SDI}}{\text{Maximum SDI for Forest Type}} \times 100 = >47\%$ then C is assigned meaning Closed, 60+% canopy cover

STORIES

Stories is determined:

when $\frac{\text{SDI for Selected VSS}}{\text{Total Stand SDI}} \times 100 = \geq 60\%$ then SS is assigned meaning Single Story

when $\frac{\text{SDI for Selected VSS}}{\text{Total Stand SDI}} \times 100 = < 60\%$ then MS is assigned meaning Multiple Story

AN EXAMPLE OF THE STAND EXAMINATION PRINT OUT - PAGE 6

***** VEGETATIVE STRUCTURAL STAGE *****

Note: SDI for STRUCTURE STAGE is a summation of SDI by 1" diameter classes

SDI shown on PAGE 5 is based on tree of avg diameter (QMD) for stand

SDI is based on all live trees 1"+ dbh in all calculations

FOREST COVER TYPE = PP

MAX SDI FOR TYPE = 450.0

STAND SITE INDEX = 25.

$$\text{STAND SDI} = 254.8$$
$$\% \text{ SDI OF MAX SDI} = 56.63$$

***** STRUCTURAL CLASSES *****

(1)	(2)	(3)	(4)	(5)	(6)
GRASS	SEED/	YOUNG	MID-AGE	MATURE	OLD
FORBS	SAPS	FOREST	FOREST	FOREST	GROWTH

BEGIN CLASS DBH	.0	1.0	5.0	12.0	18.0	14.0
-----------------	----	-----	-----	------	------	------

REQUIRED TREES	20.0
----------------	------

# TREES IN CLASS	114.3	170.5	61.2	6.1	.0
------------------	-------	-------	------	-----	----

BA FOR CLASS	1.5	61.9	68.6	15.2
--------------	-----	------	------	------

QMD OF CLASS	1.5	8.2	14.3	21.4
--------------	-----	-----	------	------

SDI IN CLASS	5.3	120.6	108.4	20.5
--------------	-----	-------	-------	------

% SDI IN CLASS	2.09	47.33	42.55	8.03
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STRUCTURE STAGE = 1

MAXIMUM SDI FOR VARIOUS FOREST COVER TYPES

Spruce-fir	670
Engelmann Spruce	670
Douglas-fir	595
White fir	830
Blue Spruce	670

Bristle Cone Pine	700
Ponderosa Pine	450
Limber Pine	700
Southwestern White Pine	450
Miscell Softwoods	450

Aspen	600
Cottonwood	420
Pinyon-juniper	465
Oak Woodland	460
Miscell Hardwoods	400

Arizona Cypress	400
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Juniper Woodland	344
Mesquite	344
Rocky Mountain Juniper	344

FORMULAS USEFUL FOR STAND DENSITY

$$SDI = N \left[\frac{\bar{D}}{10} \right]^{1.6}$$

$$N = \frac{SDI}{\left[\frac{\bar{D}}{10} \right]^{1.6}}$$

$$\bar{D} = 10 \left[SDI / N \right]^{0.625}$$

$$SDI = \left[\frac{\frac{BA}{0.395}}{\bar{D}} \right]^{4.55282}$$

LEGEND

SDI = Reineke's Stand Density Index

N = Number of Trees Per Acre

\bar{D} = Quadratic Mean Diameter Breast Height in Inches

BA = Square Feet Basal Area at Diameter Breast Height in Inches

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