FRDA Report No. 253

STIM User's Manual (for trembling aspen) Version 3.0

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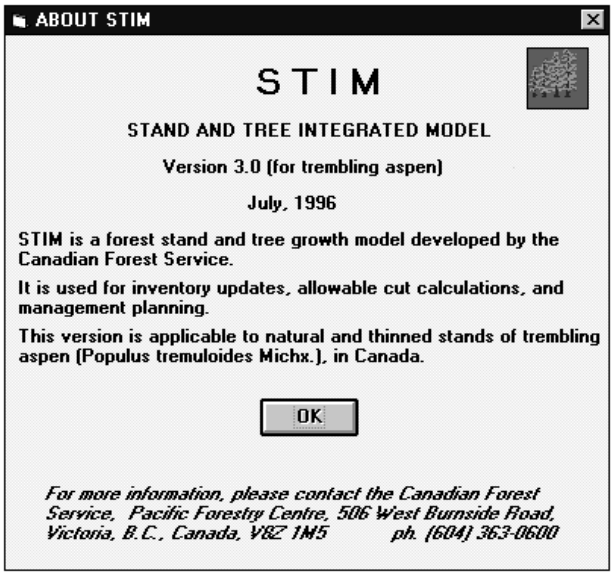
APPENDICES

1 INTRODUCTION

The Windows version of STIM for trembling aspen (WINSTIMA) integrates a graphical user interface with a FORTRAN computational program. The interface, written in Microsoft Visual Basic™, is a true Windows application that is linked to the underlying FORTRAN code. The user controls the model through the Windows interface.

Example displays from WINSTIMA are included throughout this manual. Since some displays may have been taken from different versions of WINSTIMA, the output may not always agree exactly with your display output.

The current version of WINSTIMA has been calibrated for both natural and thinned stands of trembling aspen (*Populus tremuloides* Michx.) in Canada.



Detailed stand descriptions calculated by WINSTIMA are for stands with top heights of 12 m or greater. All data are entered and reported in metric units, and all ages reported are total ages.

2 INSTALLATION

Install WINSTIMA from within Microsoft® Windows 95™ with the setup program provided.

1. Place the WINSTIMA disk into the source floppy disk drive.

2. From the Start menu choose Run, then enter the letter designation of the source drive, and the name of the setup program (SETUP.EXE). Alternatively, you can use the 'Browse' option to select both the source drive and setup program.

```
A:\SETUP.EXE <cr>
```

3. The WINSTIMA setup program will run, and you will be prompted to provide the name of a destination directory where all the files required by WINSTIMA will be placed. If you do not give a name, a default directory named C:\WINSTIMA will be created, and the following files will be copied to it:

Executable program files

WINSTIMA.EXE — WINSTIMA executable program interface
GSW.EXE

Visual basic professional edition files

GAUGE.VBX
THREED.VBX
CMDIALOG.VBX
GRAPH.VBX
GRID.VBX

Dynamic link libraries

VBRUN300.DLL — Visual Basic ver. 3.0 run-time file
(copied to c:\windows\system)
DLLSTIMA.DLL — dynamic link library containing all Fortran code
COMMDLG.DLL
GSWDLL.DLL
V4MDX.DLL

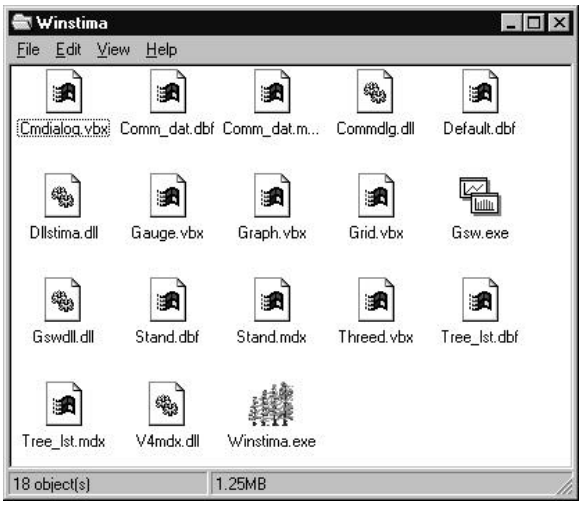
Database files

DEFAULT.DBF — user defined default control options
STAND.DBF — stand-level database
TREE_LST.DBF — tree-level database
COMM_DAT.DBF — key word list database

Database index files

STAND.MDX
TREE_LST.MDX
COMM_DAT.MDX

4. The setup program will create a Winstima folder, which contains all the files listed above. The setup program will also add the Winstima folder to the Programs menu, and a 'shortcut' to Winstima on your desktop.



3 HARDWARE/SOFTWARE REQUIRED

Minimum — 386SX PC with math coprocessor, 4 megabytes RAM, and Microsoft Windows 3.1

Recommended cpu — 486DX

Note: STIM will run approximately 4 times faster on a 486DX than on a 386SX.

4 ASSISTANCE

For further assistance with STIM, please contact

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and Biometrics
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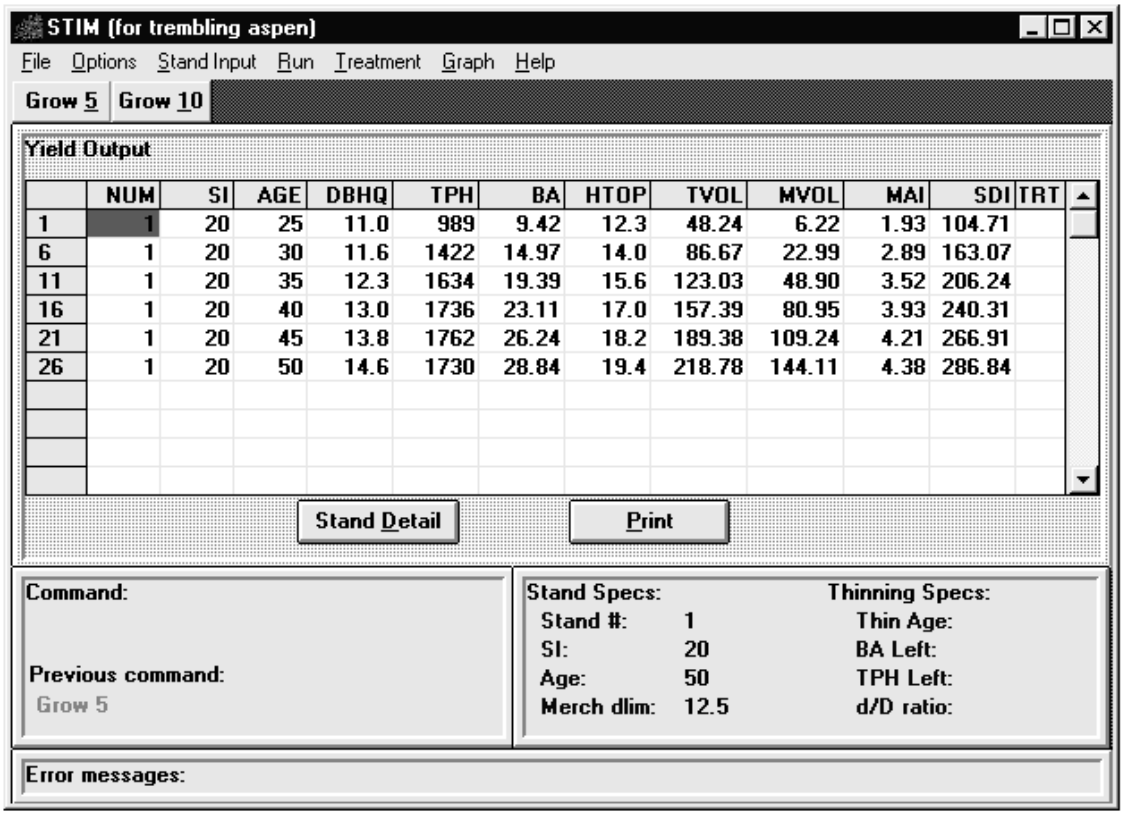
5 MAIN WORKING AREA



	NUM	SI	AGE	DBHQ	TPH	BA	HTOP	TVOL	MVOL	MAI	SDI	TRT
1	1	20	25	11.0	989	9.42	12.3	48.24	6.22	1.93	104.71	
6	1	20	30	11.6	1422	14.97	14.0	86.67	22.99	2.89	163.07	
11	1	20	35	12.3	1634	19.39	15.6	123.03	48.90	3.52	206.24	
16	1	20	40	13.0	1736	23.11	17.0	157.39	80.95	3.93	240.31	
21	1	20	45	13.8	1762	26.24	18.2	189.38	109.24	4.21	266.91	
26	1	20	50	14.6	1730	28.84	19.4	218.78	144.11	4.38	286.84	

The main window of the WINSTIMA interface is composed of 1) pull-down menus, 2) two quick-grow buttons, 3) a continually updating yield window, 4) a stand detail button, 5) a command line window, 6) a stand specifications box, and 7) an error messages box.

1. Pull-down menus – File, Options, Stand Input, Run, Treatment, and Graph (described in detail in subsequent sections).

2. Quick-grow buttons – press a button to grow a stand for a 5- or 10-year period.

3. Yield window – as a stand is updated, grown, or treated, a new record is displayed in the yield window. Yield reports can be saved to an external file with the 'Save As ' option in the 'File' menu, or printed with the 'Print' button (see Reports for a description of this printout).

4. Stand detail button – the stand detail (or tree list) can be observed for a given stand age. To select a stand age, move the mouse cursor over the age of interest from the yield window, then click the 'Stand Detail' button (see Stand Detail Button).

5. Command line window – all valid commands are described in detail in subsequent sections, and are listed in the Command Line Keywords section.

6. Stand specifications box – displays the current stand number, site index (si), current stand age, merchantable volume utilization limit, as well as thinning specifications of the most recent thin.

7. Error messages box – refer to Error Messages section for a list of error messages displayed.

5.1 Using the Mouse and Keyboard

You will probably find it most convenient to use the mouse for moving around the interface, for selecting pull-down menu options, and for moving between program windows. Using the mouse is easy - simply move the mouse cursor over the item you wish to select and press the left mouse button.

Several program windows require data entry. In these windows, you may find it easier to use the 'Tab' key to move quickly from one data entry field or option button to the next, particularly if there are many data to enter. Where data entry windows include a spreadsheet format, select the first cell with the mouse. Enter the data for that cell and press the 'Enter' key. The cursor will automatically move to the next cell (the order is right-to-left, top-to-bottom). This is the preferred method for entering tree lists. You can also use the arrow keys to move between spreadsheet cells.

You can also use the 'Tab' key to move between the main working area option buttons and the command line.

A feature of Windows programs is the use of shortcut keystrokes. These can often be faster and less tiring than repetitive use of the mouse, particularly when you have become familiar with the WINSTIMA interface. Wherever you see an underlined character in a pull-down menu or on a program button, that character is part of a combination of keystrokes that will select that option. In the case of main menu options, the combination includes the underlined letter and the 'Alt' key. For example, to select the 'File' menu from the main menu bar, press `Alt + f`. To select 'Print' from this pull-down menu, press p by itself (on the other hand, to select the 'Print' button, press `Alt + p` — selecting option buttons are like selecting pull-down menus). To grow a stand for 10 years, simultaneously press `Alt + 1`.

6 FILE MENU

a) New – clear the yield window of all runs. Same as initiating WINSTIMA, except that user-defined program control and growth control options are retained.

b) Delete Stand – delete the current stand from the yield window. The previously run stand becomes the current stand.

c) Print – print the yield report. See Reports for a description of printout.

d) Save As – save the yield report to an external ASCII file.

e) Exit – exit WINSTIMA and return to the Windows program manager.

Alternatively, these commands (except 'Save As') can be entered from the command line (see Command Line Keywords).

NEW	*– clears yield window of all runs*
DELETE	*– deletes current stand from yield window*
PRINT	*– prints the yield report*
EXIT	*– exits WINSTIMA, returns to Windows program manager*

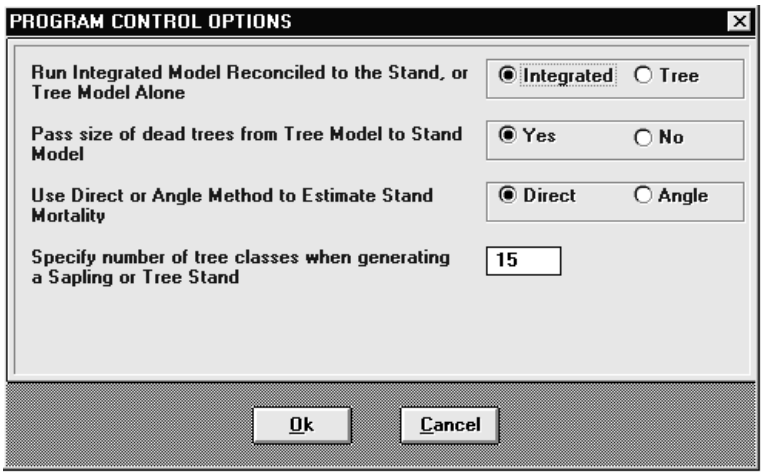
7 OPTIONS MENU

PROGRAM CONTROL
GROWTH CONTROL
DEFAULT PARAMETERS
PRECISION

You can change control options at any time, affecting the current run and all subsequent runs. Changing control options will not affect previous runs.

7.1 Program Control

These options define the architecture of the model.



a) Run Integrated Model... – two models can be run - the integrated stand and tree model, with the results reconciled to the stand model, or the tree model, which may be run on its own.

b) Pass size of dead trees... – passing the size of dead trees from the tree model to the stand model influences the dependency of the two models (i.e., if you choose 'Yes', then the stand model is dependent on the tree model's prediction of the dbhq that die).

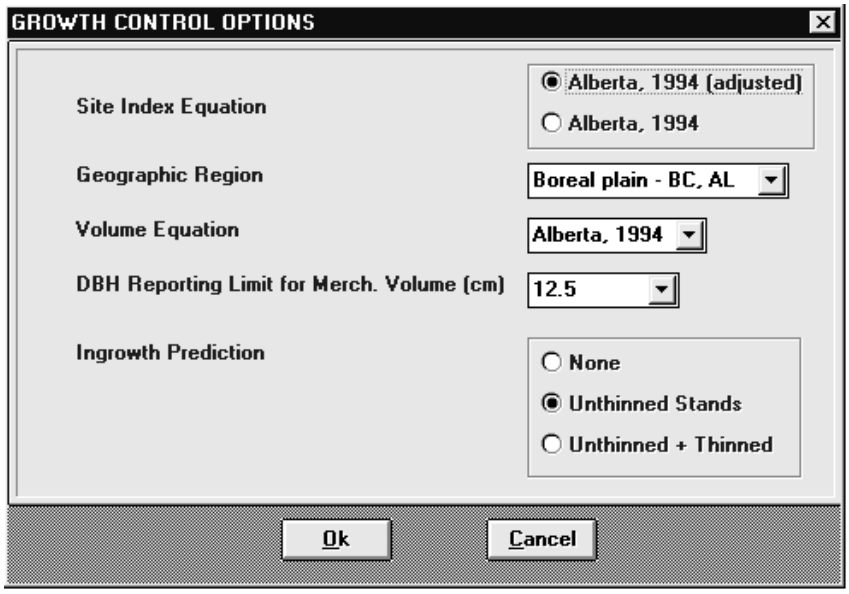
c) Use Direct or Angle Method... – stand mortality can be predicted in two ways; the direct method, which uses an empirical equation to predict the stand basal area mortality; and the angle method, which uses the trajectory angle approach (e.g., similar to Stand Density Management diagrams).

d) Specify number of tree classes... – selecting the number of classes to generate is only applicable when sapling or tree stands are generated. This defines the number of tree classes into which the estimated diameter distribution is split. Note that the more classes specified, the finer the tree detail resolution; however, execution time is slowed,

and memory constraints are reached sooner. The preset (default) choices are recommended for running WINSTIMA.

7.2 Growth Control

These options control the growth of a stand.



a) Site Index Equation – two versions of the equation developed by Alberta Environmental Protection (Alberta Forest Service 1985; Huang *et al.* 1994; Flewelling 1996[1]) are provided. The adjusted version uses the original equation, with site height converted to top height.

b) Geographic Region – the model includes separate prediction equations for various combinations of ecozones (Wiken 1986) and provinces in Canada.

c) Volume Equation – two volume methods (Huang 1994; B.C. Ministry of Forests 1976) are available. All methods estimate total cubic tree volume, based on dbh and height. Huang's is actually a taper equation, which allows for the computation of merchantable volume. Merchantable volume is from a 30-cm stump height to a 10-cm top dib.

d) DBH Reporting Limit for Merch. Volume – you can choose from four dbh utilization limits to report merchantable volumes per hectare: 12.5, 17.5, 22.5, and 27.5 cm. Note that merchantable volumes are not computed for B.C. Ministry of Forests volume equations.

e) Ingrowth Prediction – You can control the model's prediction of ingrowth, whether for

[1] Evaluation of site curves for aspen. Unpubl. Rep. on file. 8 p.

no stands, for unthinned stands only, or for all stands.

7.3 Default Parameters

These basic default parameters are defined every time you run STIM; however, you can save a single set of customized control options that can be retrieved anytime by choosing 'Save User'. The next time you run STIM, you must choose 'Restore User' if the session is to include the user-saved options. Restore STIM to the basic default parameters at any time by choosing 'Restore Basic'.

7.4 Precision

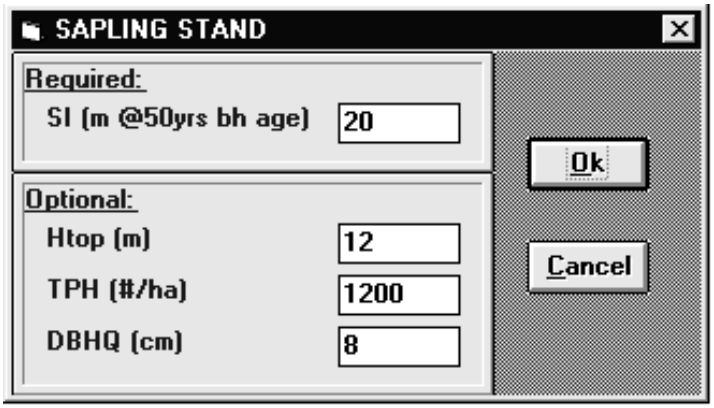
This controls the precision of displayed numbers. The default is short precision (up to 2 digits to the right of the decimal). Long precision provides for up to 6 digits to the right of the decimal.

8 STAND INPUT MENU

GENERATE A SAPLING STAND
GENERATE A TREE STAND
ENTER A TREE LIST

8.1 Generate a Sapling Stand

This is the usual mode for entering a stand from close to bare-ground conditions. The minimum input requirement is for si, with optional entry for top height (htop), tph, and dbhq.



The input data are used to generate a sapling stand with an htop of approximately 12.0 m, which is also the start of a tree stand and the starting point for projections made by the tree- and stand-growth models. All optional stand parameters must be representative of the stand at the time it reaches the 'tree stand' status. 'Generate a Sapling Stand' can actually be considered a stand completion phase for the start of a tree stand.

You may find it quicker to move between fields using the 'Tab' key. Press the 'Ok' button to summarize the stand in the yield window.

Alternatively, a sapling stand can be specified from the command line. The first value (required) is si, followed by optional values for htop, tph, and dbhq.

SAPLING 20 – *generate a sapling stand with si=20. The generated stand will be a tree stand, with an approximate htop=12.0 m.*

SAPLING 20 12.0 1200 8.0 – *generate a sapling stand with si=20, and specify stand parameters reflective of when it becomes a tree stand (htop=12.0 m, tph=1200, and dbhq=8.0 cm)*

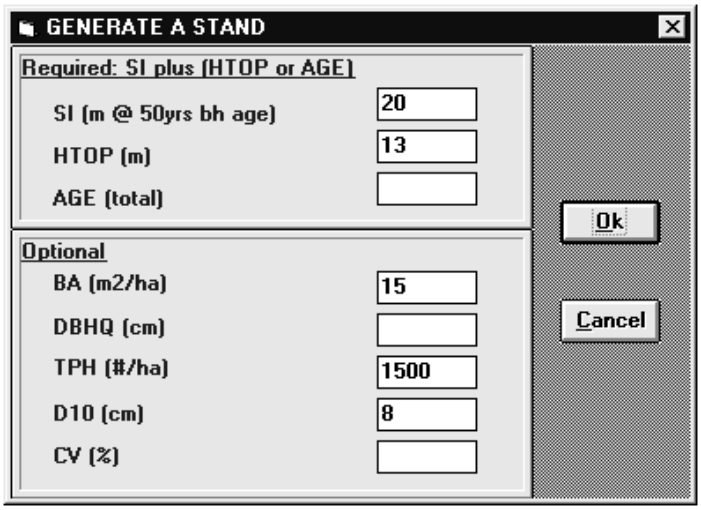
8.2 Generate a Tree Stand

Use this to estimate stand attributes based on incomplete information. This is the usual generating option for stands greater than 12.0 m, where the complete tree list is not available. The minimum input requirements are site index (si), plus a choice of either htop or age. If all three are input, then age has no effect on si and htop.

Optional inputs include ba, dbhq, and tph. You may specify any one or two of these parameters, but not all three.

You can only enter d10 and cv if two of the preceding optional parameters (ba, dbhq, and tph) have been specified.

Press the 'Ok' button to summarize the stand on the yield window.



You may find it quicker to move between fields using the 'Tab' key.

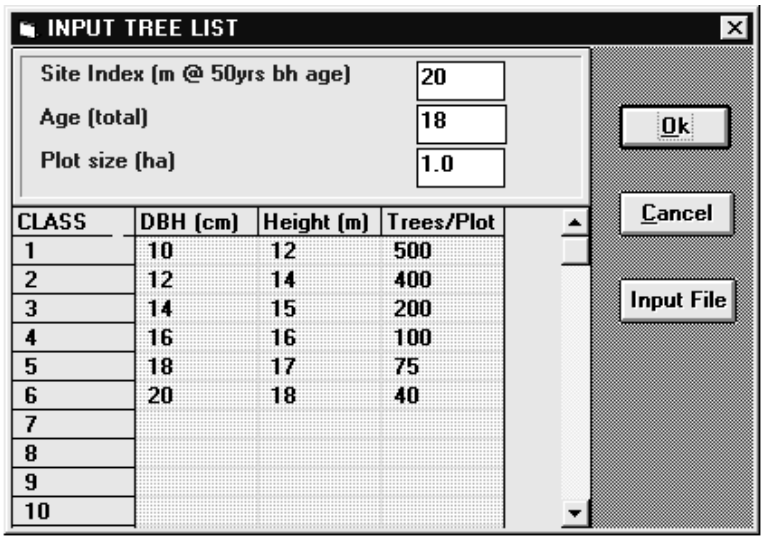
Alternatively, a tree stand can be generated from the command line. Following the key word, the first value is si, followed by htop, and optionally by ba, tph, d10, and cv. Note: age and dbhq cannot be entered from the command line.

GENERATE 20 13 – *generate a stand with si=20, htop=13 m*

GENERATE 20 13 15 1500 8.0 250
– *generate a stand with si=20, htop=13 m, ba=15 m²/ha, tph=1500, d10=8.0 cm, cv=250%*

8.3 Enter a Tree List

Choose this when a tree list is available for data entry. After inputting the stand-level parameters (plot size, si, and age), enter the list into the tree list spreadsheet. This list can include individual trees or groups of trees, by dbh class. There must be a value for every dbh, height, and tph record entered.



When the list is complete, press the 'Ok' button to summarize the current stand. Press the 'Cancel' button to abort the tree stand entry.

You can also enter an external ASCII file by choosing the 'Input File' button. This file must be in the following free format (Tree ID, dbh, height, tph), with each variable delimited by a comma (,). A tree list can be up to 500 records in length.

Note: Although you can move between fields using the mouse, you may find it more convenient to use the 'Tab' key. In the tree list spreadsheet you can move between fields using the arrow keys. The 'enter' key automatically selects the next field to the right.

Alternatively, you can enter a tree stand from the command line. Enter the plot area first, followed by si, total age, and the name of the external file containing the tree list.

TREELIST 0.04 20 15 TEST1.DAT – specify a stand with plot size=0.04 ha, si=20, total age=15 yrs, and external input file containing a tree list=test1.dat

9 RUN MENU

GROW A STAND
BATCH

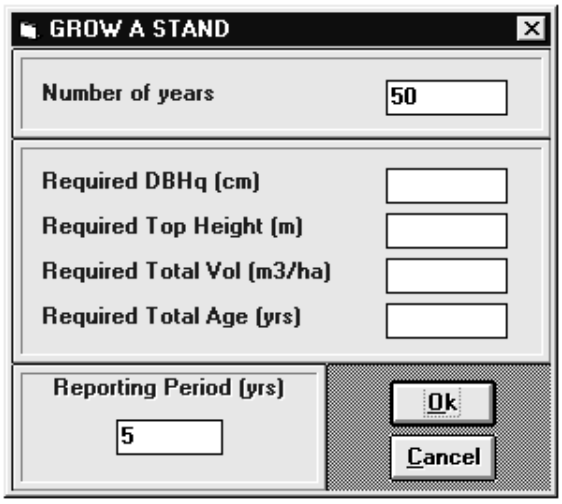
9.1 Grow a Stand

This is a multi-purpose menu that enables you to grow the stand in a number of ways, while specifying the reporting period.

a) Number of years – grow the stand forward for the number of years specified, from the current stand age. Specify the reporting period for periodic reporting (minimum 1 yr, up to the length of growth projection).

b) Required DBHq, Top Height, or Total Vol – grow the stand forward until the specified dbhq, htop, or volume is reached. Specify the reporting period for periodic yield reporting.

c) Required total age – use this specification to grow the current stand forward to the specified age, with yield reported once at the end of the growth projection.



Note: Although you can move between fields using the mouse, you may find it quicker to use the 'Tab' key. Only one type of growth command can be specified.

Alternatively, you can grow a stand with a quick-grow button, or from the command line. When using the command line, the first value to enter is the year or size, followed by the reporting period.

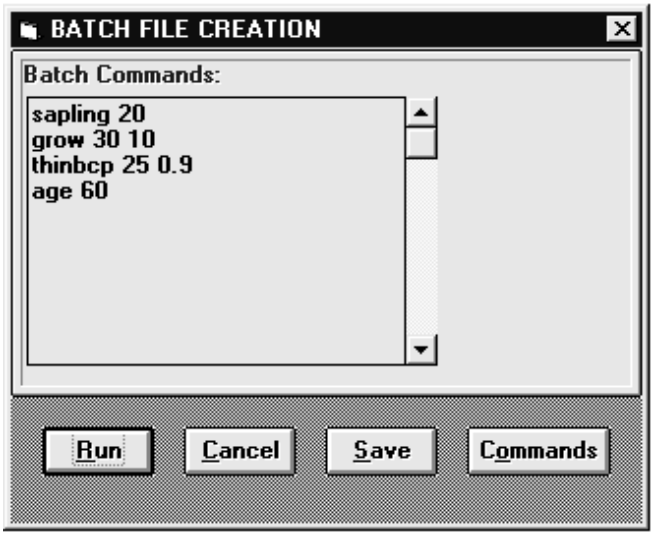
GROW 20 10	– grow a stand for 20 yrs, reporting every 10 yrs
GROW 20	– grow a stand for 20 yrs, report once at 20 yrs
GROWD 25 2	– grow a stand until dbhq = 25 cm, reporting every 2 yrs
GROWH 30 2	– grow a stand until htop = 30 m, reporting every 2 yrs
GROWV 1000 10	– grow a stand until volume = 1000 m^3/ha, report every 10 yrs
AGE 100	– grow a stand forward until age = 100

9.2 Batch

Batch mode is an alternative to running an interactive session. You can specify a series of commands that describe a stand's complete growth cycle before actually running the stand. Any number of stands can be specified from within the batch option.

a) New – enter a new series of batch commands.

b) Open – read in an external ASCII file that contains all commands.



Once in the batch-file creation window, you can type in keywords and values as if from the command line. It is important that you enter the carriage return after the final command, otherwise that command will not be executed. The following options are available from within this window:

a) Run – execute the series of batch commands.

b) Cancel – abort the batch session.

c) Save – save the current batch commands to an external ASCII file.

d) Commands – display the list of available key-word commands.

10 TREATMENT MENU

THIN A STAND

This option performs a thinning at the current age of the current stand. You can specify a thin in a variety of ways.

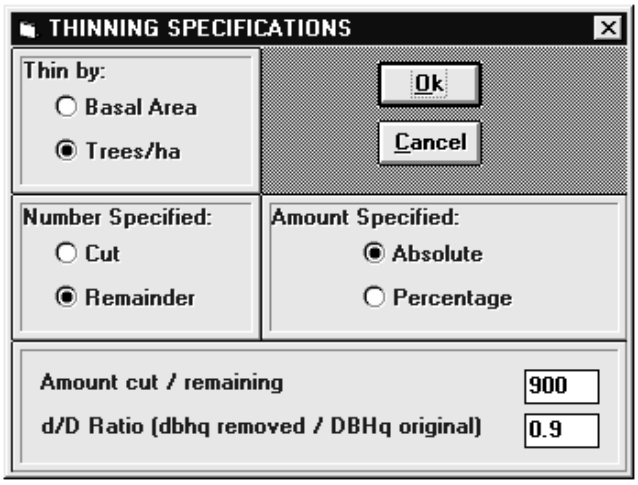
a) Thin by: Basal Area or Trees/ha – thin by basal area or number of trees.

b) Number Specified: Cut or Remainder – specify by the amount to cut, or by the amount remaining.

c) Amount Specified: Absolute or Percentage – choose whether the units are absolute (m^2/ha, tph), or a percentage of the total stand.

d) Amount cut / remaining – the amount to thin is specific to the above three choices (e.g., a value of 1000 implies thinning to a residual tph of 1000).

e) d/D ratio (dbhq removed / dbhq original) – a value <1 implies thinning from below, >1 implies thinning from above, and =1 implies uniform thinning.



Once you press the 'Ok' button, the stand is thinned, and the 'post thinning' stand is displayed as a new record, with the 'TRT' column including a 'T' for a thin. In addition, the 'stand specifications' box stores and updates the thinning specifications of the most recent thin.

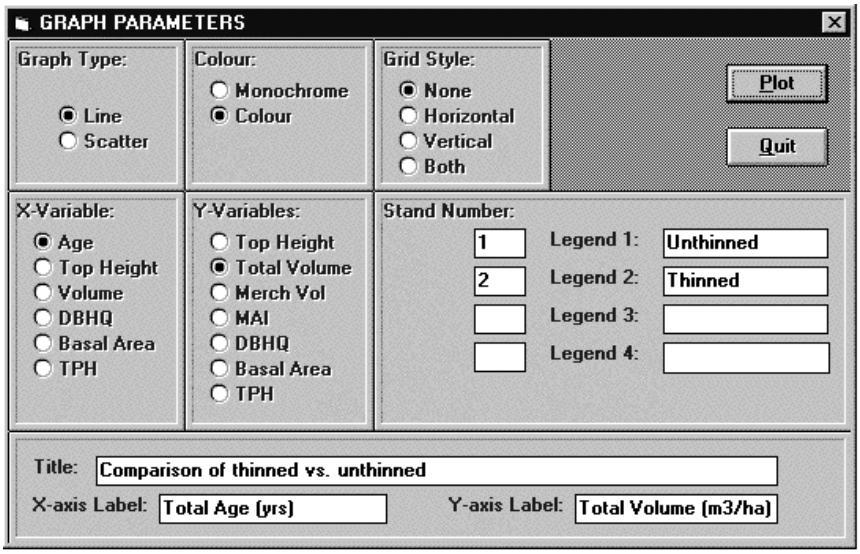
Alternatively, you can enter thinning specifications from the command line. The first value is the amount to thin, followed by the d/D ratio.

THINBCA 10 0.9	– cut 10 m^2/ha,thin from below
THINBCP 30 0.9	– cut 30% of the ba, thin from below
THINBRA 40 1.0	– 40 m^2/ha remaining, uniform thin
THINBRP 75 1.0	– 75% of the ba remaining, uniform thin
THINTCA 500 1.1	– cut 500 tph, thin from above
THINTCP 30 1.1	– cut 30% of the tph, thin from above

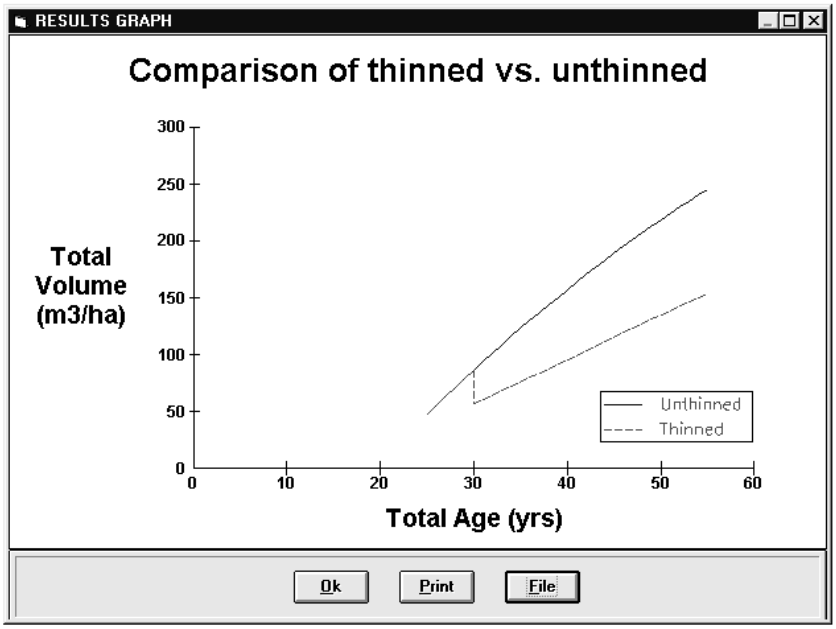
THINTRA 1000 1.1 – 1000 tph remaining, thin from above
THINTRP 50 1.1 – 50% of the tph remaining, thin from above

11 GRAPH MENU

PARAMETERS



You can select a variety of stand-level variables from the graph parameters window and plot them against each other. WINSTIMA can plot up to four stands simultaneously. You must input a stand number to plot the data. You can move between fields using the 'Tab' key or the mouse. Press the 'Plot' button to plot the selected stand(s) on the screen.



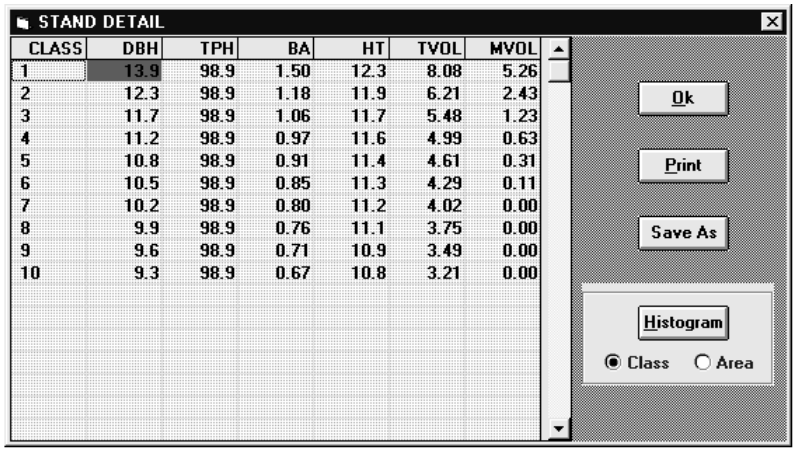
Once plotted, you can print a graph or store it to a file. You can import this file into other Windows applications that support Windows metafiles (.WMF extension).

12 STAND DETAIL BUTTON

To view the stand detail at the current age, click the 'Stand Detail' button in the main working area window. To view any other age of any stand run, move the mouse to the desired stand and age on the yield window, and click the mouse once. The selected age will be highlighted. Subsequently clicking the 'Stand Detail' button displays the tree list at that point.

For a printout of the stand detail, press the 'Print' button. Refer to the 'Reports' section for a description of this printout. To save the stand detail report to an external ASCII file, press the 'Save As' button.

Note: merchantable volumes are shown for all dbh's, even those not included in the per hectare summaries (section 7.2d).



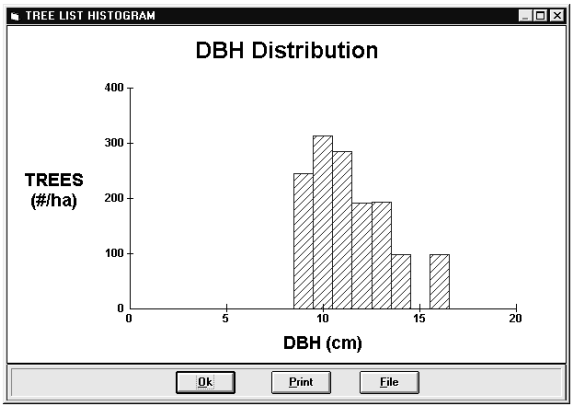
12.1 Histogram

Press the 'Histogram' button to view the diameter distribution. Two display methods are provided, a dbh class display and an area-based display.

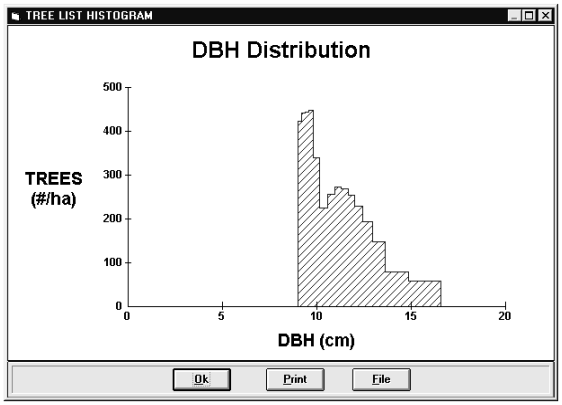
The dbh class histogram displays frequency of trees by fixed dbh classes. These classes are at 1-, 2-, or 5-cm widths, depending on the range of diameters present.

The area-based histogram displays the current tree list so that each tree group is plotted as (#trees/ha/cm dbh). Therefore, the total area represented under the graph corresponds to the total number of trees per hectare.

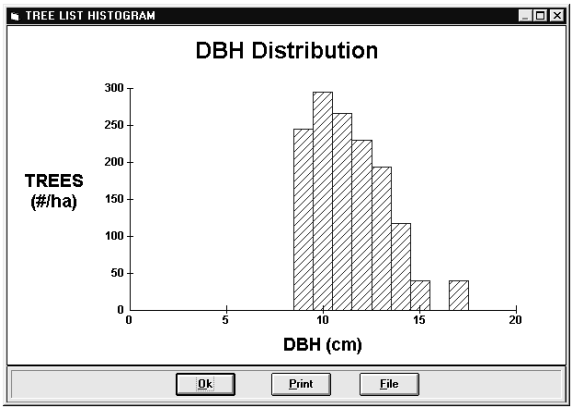
Although the traditional method of display is the dbh class, the area-based method is useful when the number of tree groups being projected is small. In these cases, the area-based display approximates the shape of the dbh distribution better. When the number of tree groups is large, the methods produce similar displays.



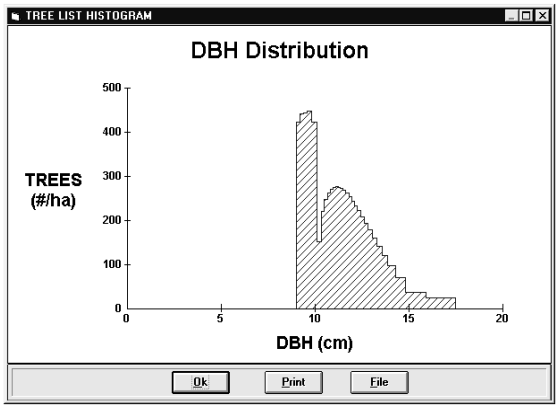
DBH Class (10 tree groups)



Area (10 tree groups)



DBH Class (25 tree groups)



Area (25 tree groups)

13 REPORTS (PRINT BUTTON)

Reports are available on both a stand- and a tree-level basis.

1. Stand-level report – displays all present yield window information in a tabular report. This option is available by selecting the 'Print' button in the main working window.

WINSTIMA - STAND LEVEL YIELD REPORT
Date: 06-19-1996

STAND #	SI (m)	AGE (yrs)	DBHQ (cm)	TPH (#/ha)	BA (m2/ha)	HTOP (m)	TVOL (m3/ha)	MVOL (m3/ha)	MAI (m3/ha/yr)	SDI	TRT
1	20	25	011.0	0989.0	009.42	012.3	0048.24	0006.22	01.93	104.71	
1	20	35	012.3	1634.0	019.39	015.6	0123.03	0048.90	03.52	206.24	
1	20	45	013.8	1762.0	026.24	018.2	0189.38	0109.24	04.21	266.91	
1	20	55	015.4	1658.0	030.99	020.4	0245.77	0177.53	04.47	301.35	
1	20	65	017.3	1455.0	034.29	022.2	0293.39	0236.41	04.51	318.56	
1	20	75	019.4	1236.0	036.63	023.7	0333.35	0288.74	04.44	325.23	

2. Tree-level report – displays tree-level information in a tabular report. This option is available by pressing the 'Print' button in the 'Stand Detail' window.

WINSTIMA - TREE LIST REPORT
Date: 06-19-1996

STAND #	SI (m)	AGE (yrs)	CLASS #	DBH (cm)	TPH (#/ha)	BA (m2/ha)	HT (m)	TVOL (m3/ha)	MVOL (m3/ha)
1	20	25	1	014.3	0066.0	001.06	012.4	0005.75	0003.97
1	20	25	2	012.8	0066.0	000.85	012.1	0004.52	0002.25
1	20	25	3	012.2	0066.0	000.77	011.9	0004.04	0001.44
1	20	25	4	011.8	0066.0	000.72	011.8	0003.72	0000.91
1	20	25	5	011.4	0066.0	000.68	011.7	0003.48	0000.59
1	20	25	6	011.1	0066.0	000.64	011.6	0003.29	0000.38
1	20	25	7	010.9	0066.0	000.61	011.5	0003.12	0000.23
1	20	25	8	010.6	0066.0	000.59	011.4	0002.97	0000.13
1	20	25	9	010.4	0066.0	000.56	011.3	0002.84	0000.06
1	20	25	10	010.2	0066.0	000.54	011.2	0002.71	0000.01
1	20	25	11	010.0	0066.0	000.52	011.1	0002.59	0000.00
1	20	25	12	009.8	0066.0	000.50	011.1	0002.48	0000.00
1	20	25	13	009.6	0066.0	000.48	011.0	0002.36	0000.00
1	20	25	14	009.4	0066.0	000.46	010.9	0002.25	0000.00
1	20	25	15	009.2	0066.0	000.44	010.8	0002.11	0000.00

14 LITERATURE CITED

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APPENDIX 1 Error Messages

Whenever a warning or error occurs, a message (listed below) is displayed in red at the bottom of the yield window. (Also, an error log file, "ERROR.LOG" is created in the WINSTIMA subdirectory, which helps identify the source of errors—this external file is for program debugging.)

We are interested in new errors that cause STIM to abort prematurely! Please inform the Forest Inventory Group at the Pacific Forestry Centre when these occur, so that we may make corrections to future versions. You can contact us at (604) 363-0600.

Enter a Tree List

** Both Site Index and Age must be entered!*
> self explanatory

** Enter SI between 13 m and 30 m!*
> self explanatory

** You must enter a tree list!*
> self explanatory

** Invalid plot size!*
> self explanatory

** You must enter more than one record of data!*
> self explanatory

** Number of tree classes exceeds program capacity!*
> WINSTIMA can handle a tree list of up to 500 records only.Close the WINSTIMA window and restart.

Thin a Stand

** You must enter an amount to thin!*
> based on the choice of ba/tph, cut/leave, actual/percent, enter the amount of thin in the appropriate units.

** You must enter a desired d/D ratio!*
> d/D = 1.0 for uniform thin, < 1.0 for thin from below, > 1.0 for thin from above

** There is no stand to thin!*
> self explanatory

Generate a Sapling Stand

** You must enter a value for site index!*
> self explanatory

** Enter SI between 13 m and 30 m*
> self explanatory

** Error! could not recover (error code -2)*
> WINSTIMA could not estimate the diameter distribution. If you supplied a dbhq, consider removing or changing that value.

* *You must enter a value for top height*
    > self explanatory
* *Invalid value for number of trees!*
    > self explanatory
* *Invalid value for dbhq*
    > self explanatory
* *SI and top height lead to extreme age*
    > Check to ensure that your combination of si and htop is reasonable.

Generate a Tree Stand

* *Both SI and top height must be entered*
    > self explanatory
* *Invalid value for site index*
    > self explanatory
* *Invalid value for top height*
    > self explanatory
* *Invalid value for basal area*
    > self explanatory
* *Invalid value for number of trees*
    > self explanatory
* *Invalid value for CV*
    > self explanatory
* *Note: Solution either marginally acceptable, or default equation for D10 changed*
    > this is not an error. A tree list is still generated. However, either a solution was found but not within a certain level of tolerance, or the value for d10 from the default equation had to be changed.
* *SI and top height lead to extreme age! Respecify stand!*
    > check to ensure that your combination of si and htop is reasonable
* *Unacceptable combination of (tph, ba, cv, d10). No solution!*
    > WINSTIMA was unable to solve for a diameter distribution with the specified parameters. Try using a larger value for cv and/or d10 (or leave blank for default).

Grow a Stand

* *You cannot enter more than one growth command!*
    > choose only one method of growth control (i.e., number of years, or a given size)
* *Invalid value for reporting period*
    > must be greater than zero, and less than number of years to grow
* *Invalid value for number of years*
    > must be greater than zero, and less than number of years to grow
* *Invalid value for specified top height!*
    > self explanatory
* *Invalid value for specified volume!*
    > self explanatory
* *Invalid value for specified dbhq!*
    > self explanatory

* *Reporting period greater than number of years to grow!*
    > a previous reporting period used is greater than the current growth command. Redefine the reporting period, either in the grow menu, or on the command line. Each time reporting period is specified it remains constant for all subsequent commands, until redefined.
* *There is no stand to grow!*
    > you must create a stand before you can grow it
* *Tree list is too long!*
    > The entered tree list (which may include additional ingrowth records) has exceeded 500 records.
* *Warning! either stand will not reach desired size, or memory constraints exceeded*
    > You may have tried to grow to a dbhq, htop, or volume that the stand will never attain, or the memory constraints of the model have been reached. If the former, then respecify growth limits. If the latter, then it is recommended that you not continue with projection, but clear memory by using either the DELETE or NEW commands.

* *Warning! Less than 10% of stand (tree) array left! Continuing is not recommended! You must delete existing stands to free up space! Continue?*
    > You have almost reached the memory constraints of the model. A 10% free space allows you to continue with the existing projection if you know it will finish soon; otherwise, information will be lost. It is recommended that you not continue, but clear memory by using either the DELETE or NEW commands.

Graph

* *First (second, third, fourth) stand not found!*
    > the stand to be plotted does not exist in memory
* *You must specify at least one stand!*
    > self explanatory

APPENDIX 2 Definition of Terms

age : Total age of a stand (yrs)

ba : Basal area of a stand, tree, or group of trees per ha (m^2/ha)

cv : Coefficient of variation, defined as the standard deviation divided by the mean(%). Used here for the variable $(dbh)^2$

dbhq : Quadratic mean dbh of a stand, or group of trees (cm)

d10 : dbh at the tenth percentile, or minimum dbh class (cm)

Geographic
Region : combines ecozone (Wiken 1986) and province

htop : Top height of a stand, defined as the average height (m) of the 100 largest diameter trees per ha.

mai : Mean annual increment, calculated as ({TVOL + THINNED VOL} / TOTAL AGE)

mvol : Merchantable volume of a stand, tree, or group of trees (m^3/ha). Merchantable limits are fixed at a 30 cm stump height, and a 10 cm top dib.

sdi : Reineke's Stand Density Index, defined as (tph/2.471) * (dbhq/25.4)**1.605

si : Site index, based on a breast-height index age of 50 years.

tph : trees per hectare.

tvol : Total stem volume of a stand, tree, or group of trees, inside bark, including stump and top (m^3/ha).

APPENDIX 3 Command Line Keywords

TREELIST 1.0 30 15 TEST1.DAT	specify a stand with plot size=1.0 ha, si=30, age total=15, and external tree list file=test1.dat
SAPLING 30	generate a sapling stand with si=30
SAPLING 30 13 2500 7.5	generate a sapling stand with si=30, htop=13.0 m, tph=2500, and dbhq=7.5 cm
GENERATE 30 16	generate a stand with si=30, htop=16 m
GENERATE 30 16 25 2500 6.5 250	generate a stand with si=30, htop=16 m, ba=25 m^2/ha, tph=2500, d10=6.5 cm, and cv=250%
GROW 50	grow a stand for 50 yrs.
GROWD 25 2	grow a stand to dbhq=25 cm, report every 2 yrs
GROWH 30 2	grow a stand to htop=30 m, report every 2 yrs
GROWV 1000 10	grow a stand to volume=1000 m^3/ha, report every 10 yrs
AGE 100	grow a stand to age=100 yrs
THINBCA 25 0.9	cut 25 m^2/ha, thin from below
THINBCP 30 0.9	cut 30% of ba, thin from below
THINBRA 40 0.9	40 m^2/ha remaining, thin from below
THINBRP 75 1.0	75% of ba remaining, uniform thin
THINTCA 1000 1.0	cut 1000 tph, uniform thin
THINTCP 30 1.0	cut 30% of tph, uniform thin
THINTRA 750 1.1	750 tph remaining, thin from above
THINTRP 75 1.1	75% of tph remaining, thin from above
DELETE	delete current stand from yield window and database
NEW	delete all stands from yield window and database
EXIT	exit STIM