Landscape Management System
User's Manual

LMS v. 1.7 – November, 1999

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Manual Organization

The LMS Manual has been divided into seven distinct sections to facilitate navigation of the document. Section titles, starting pages, and descriptions follow:

Introduction	1	introductory information, acknowledgements, general description of the Landscape Management System, and system requirements.
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Introduction

The Landscape Management System (LMS) is an evolving set of software tools designed to aid in landscape level management of forest resources. LMS is being developed as part of the Landscape Management Project at the Silviculture Laboratory, College of Forest Resources, University of Washington.

LMS is a computerized system that integrates landscape level spatial information, stand-level inventory data, and individual tree growth models to project changes through time across forested landscapes. LMS facilitates forest management planning, policy-making, as well as education.

LMS coordinates the execution and information flow between many different computer programs (40+). These programs: format, classify, summarize, and export information; project tree growth and snag decay; manipulate stand inventories; and present stand and landscape level visualization and graphics.

What is the Landscape Management Project?

The Landscape Management Project is a cooperative project between the Silviculture Laboratory, College of Forest Resources, University of Washington and the USDA Forest Service, Pacific Northwest Research Station.

The Landscape Management Project was created to investigate methods and facilitate techniques for the management of forested landscapes. One focus of the project is to emphasize management over broader temporal and spatial scales. Funding for the project was initiated through the efforts of Congressman Norm Dicks. A major effort of the Landscape Management Project is to integrate and/or develop necessary technologies to facilitate landscape level management.

Description of the Landscape Management System

The Landscape Management System (LMS) integrates forest inventory information, geographic information, computerized growth models, decisions support systems, and other applications to facilitate landscape, ecosystem, and watershed management. LMS projects changes in individual stands and landscapes up to 50,000 acres; it can be used on any forested region for which there is a growth model and appropriate inventory information. LMS can be used for management, planning, policy-making, and education. It has been designed with the following features:

- **Modular** – It can incorporate all forms of inventory data, geographic information, growth models, and decision support systems; various parts of the system can be replaced as new information and techniques become available or they can be used as components in other computerized systems.
- **Flexible** – LMS works with a representative tree list. By maintaining the large amount of information about stands contained in a tree list, LMS can incorporate new management objectives and measures that can be linked to the tree list information.
- **Easy to Use** – LMS is a Microsoft Windows© application and operates in a point and click manner.
- **Projects Growth** – LMS projects growth at the stand and landscape levels using existing growth models (of your choice). Changes in stands and landscapes can be projected over time under different management regimes.
- **Presents Visualizations** – LMS, in concert with the Stand Visualization System (SVS) and UVIEW, provides visualizations of the projected stands and landscapes and can be used to provide information on changes in habitats, susceptibilities to fire, etc., along with wood quantity and quality in graphic and tabular forms.

LMS coordinates the activities of various pieces of software that, in combination, can be used for the management, projection, summarization, and visualization of information about stands on the landscape. It is an integrative effort that combines technologies and available software into a comprehensive system that facilitates landscape level planning, management, and analysis.

In LMS, landscapes are composed of stands. These stands are projected through time using available forest projection models (growth and yield or successional). Existing models are incorporated into the system using data filters that translate and reformat data as needed to accommodate the projection and analysis systems. Other attributes of a stand can be projected by providing projection models for those attributes.

The stands in LMS are represented by a tree list for each stand. The tree list include species, diameter, height, trees per acre, and other attributes for trees in the stand. Stand average information can also be used. These tree lists are the basic unit of projection and allow LMS to be flexible because information about individual trees on the landscape is maintained as the stands are projected.

LMS System Requirements

The Landscape Management System runs on most machines capable of running Microsoft Windows in one of its variations. The specific requirements are:

- IBM PC 386 running Windows 3.1x is required, a Pentium 133mHz running Winsows 95/98 recommended. Note that some of the programs (Scenario Editor, Str_clas, and Landvis) will only run on Windows 95/NT machines.
- SVGA video required. A video adapter that supports VESA video bios extensions is required for visualization.
- 4mb of RAM required, 16 or greater recommended.
- 20mb of hard drive space required. The data and intermediate files can use considerably more space.

Typographic Conventions

The following conventions are used in this manual to highlight and emphasize.

File|Open…	Commands are selected from the menu are indicated by the menu name (File) and command (Open) separated by a vertical bar (|). Commands followed by an ellipsis (…) indicate that the command leads to additional steps (usually dialog boxes).
`Courier Font`	Courier font is used to indicate typing by the user (in text) or screen output (courier text surrounded by a box). Courier font is also used to highlight filenames (`filename.ext`) in the text.
Italics	Italics are used in the text to highlight variable names.
Pro-**jekt** (v.) vs **Proj**-ekt (n.)	In LMS the verb project (pro-**jekt**) is used when discussing the estimation of stand conditions at a future time. The noun project (**proj**-ekt) is not used in order to avoid the confusion caused by using both pronunciations. Instead, portfolio is used for the collection of files for a particular landscape (e.g. the Pack Forest portfolio, the Harry Osborne Forest portfolio).

Acknowledgements

We would like to take this opportunity to acknowledge the following people who have provided support or help in the development of LMS:

Concept and Design:

Dave Larsen Professor of Silviculture, University of Missouri	Providing feedback and ideas for LMS.
John Kershaw Professor of Silviculture,	
Melody Steele	
Bob McGaughey Cooperative for Forest System Engineering, USDA Forest Service and University of Washington	Bob McGaughey is the developer of the stand (SVS) and landscape (UVIEW) visualization software used in LMS. He has also played a critical role in many of the design aspects of the system.
Richard Teck USDA Forest Service	Providing FVS details, feedback and ideas for LMS.
Al Vaughan Washington State Department of Natural Resources	Initiation of discussions on landscape management, provided GIS data for the Clallam Bay area of the Olympic Peninsula, and facilitated access to inventory data.
Michael Whimberly Former University of Washington Graduate Student	Conceptual discussions, design, programming, and data summarization and formatting.
Jeremy S. Wilson Former University of Washington Graduate Student	Conceptual discussions, design, programming, and feedback regarding virtually all aspects of LMS.
Michael Scott Zens Former University of Washington Graduate Student	Early conceptual discussions and design.

Programming:

Michael Pederson	Base LMS Programming
Israel Hsu	

Data:

Andy Card Forester, Washington State Department of Natural Resources	Banner Forest data and analysis.
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Alison Hitchcock Forester, Washington State Department of Natural Resources	Harry Osborne Forest data and analysis.
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Using and Providing Feedback:

Nancy Allison Former University of Washington Graduate Student	Testing, using, and providing feedback for LMS.
Justin S. Hall University of Washington Graduate Student	
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Larry Mason University of Washington Graduate Student	
Pil Sun Park University of Washington Graduate Student	
Steve Stinson Former University of Washington Graduate Student	
FM 425 (Ecosystem Management) Students, University of Washington, 1995 - 1999	Use of LMS in a classroom environment and infinite amounts of debugging.
Senior Forest Engineering Students Spring Quarter 1998 and 1999	Use of LMS in creating management plans.
Silviculture Institute and Natural Resource Institute Participants Module S1, 1995, 1996, 1998, 1999.	Presentation of LMS to mid-career professionals and a test of the software in a case-study environment.

Software License

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Getting More Information

More information about LMS is available from a variety of sources. The LMS On-line help file contains information on using the software. The LMS Programmer's Guide is distributed with the software as a text file. The LMS Programmer's Guide provides some additional information on the behind the scenes operation of LMS and ways to customize the behavior of LMS.

For additional information beyond the written documentation, contact the Silviculture Laboratory at the University of Washington.

Contact Information

Please feel free to contact the designers and developers of LMS. We encourage comments and feedback about the system. Written correspondence should be addressed to:

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Additional information and future versions will be available from our anonymous FTP site (silvae.cfr.washington.edu) or our web page (lms.cfr.washington.edu).

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The authors of the FVS growth model can be reached at:

Forest Management Service Center (970)498-1500
3825 E. Mulberry St.
Fort Collins, CO 80524

Email: fmsc/wo_ftcol@fs.fed.us
WWW: www.fs.fed.us/fmsc/fvs.htm

Obtaining and Installing LMS

Obtaining a copy of the Landscape Management System

Copies of the program can be obtained from:

WWW: lms.cfr.washington.edu/lmsdown.html

FTP: silvae.cfr.washington.edu/pub/lms

Or to obtain a CD, contact:

James B. McCarter (206)616-2376
Silviculture Lab Box 352100
College of Forest Resources
University of Washington
Seattle, WA 98195

Installing the Landscape Management System

Windows 95/98/NT

If you are installing from CD, the setup program should automatically begin. If it does not, or if LMS was downloaded follow these instructions.

1. Click **Start|Run…** from within Windows.
2. Click the **Browse** button.
3. Locate the lms16setup.exe file. This file will be placed wherever you chose to download it, or on your CD drive if you are installing from CD-ROM.
4. Select the lms16setup.exe file and click **OK**.
5. Follow the onscreen instructions to install the program.

Windows 3.x

1. Double click on the Main program group.
2. Double click on the File Manager icon.
3. Select **File|Run…** from the File Manager menu.
4. Change to the directory in which the LMS16setup.exe file is stored.
5. Double click LMS16setup.exe and follow the onscreen instructions.

Basic Functions

This section describes how to perform the basic functions of LMS. These functions are broken into three main areas: general functions, treating/projecting stands, and analyzing landscapes. Each section will be discussed with its related functions.

The Landscape Management System comes with three sets of data for use in becoming familiar with the program. This manual will assume that you are using the Example portfolio (`example.lms`) for the following examples. If you are using another data set then substitute it wherever the Example portfolio is mentioned.

Users unfamiliar with the basic parts and functions of Windows programs should see Appendix A for a discussion of these basic features. Prior to embarking on this discussion of LMS functions, we should first get one definition out of the way:

What is a Landscape Management System Portfolio?

A LMS portfolio is the collection of files that LMS uses to simulate and analyze a landscape. It includes the inventory files, spatial files, stand information files, etc. All of this information is stored in the portfolio directory. Often in this manual we will refer to the Portfolio File (`*.lms`), which is a configuration file for the portfolio that tells LMS where all the other files are located. This is just a basic description of the LMS Portfolio, for a more detailed discussion see *File Formats* (page 56) or the LMS Programmer's Guide.

General Functions

This section describes the general functions of LMS that do not involve the projection or analysis of data.

Opening a Portfolio 

When LMS is started no data is loaded and it is necessary to open a portfolio. This initializes the portfolio in LMS and loads all the relevant data into memory.

1. With LMS running, select **File|Open Portfolio…** from the LMS menu to load the Open Portfolio dialog box (Figure 1).

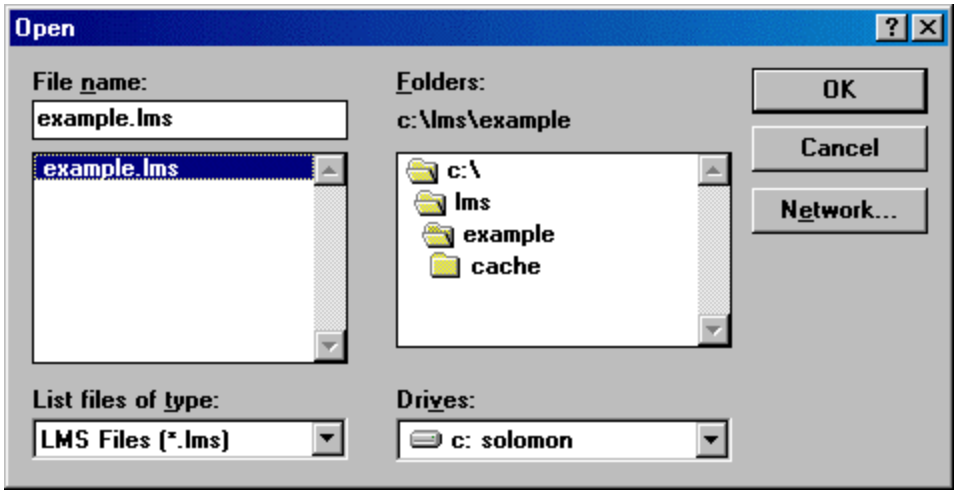


Figure 1. Open Portfolio dialog box.

2. Browse to the portfolio you want to open and select the Portfolio file (`*.lms`) from the left side of the dialog box.
3. Press **OK** to initialize and load the portfolio.

Saving a Portfolio

If any projections have been made to a portfolio then you will want to save those projections. Select **File|Save Portfolio…** from the LMS menu to save the portfolio.

Closing a Portfolio

To close a portfolio without exiting LMS, the **File|Close Portfolio…** option can be used. If the open portfolio has not been saved then the close portfolio option will ask if you want to save it.

Restoring a Portfolio

LMS Portfolios can be stored in an archived format when not in active use (files are stored using the Info-Zip program). This saves hard drive space by compressing the files into a single ZIP file. Archived portfolios can be restored and opened at a later time using the Restore Portfolio command in LMS.

1. With LMS running select **File|Restore Portfolio…** from the LMS menu to load the Restore Portfolio dialog box (Figure 2).

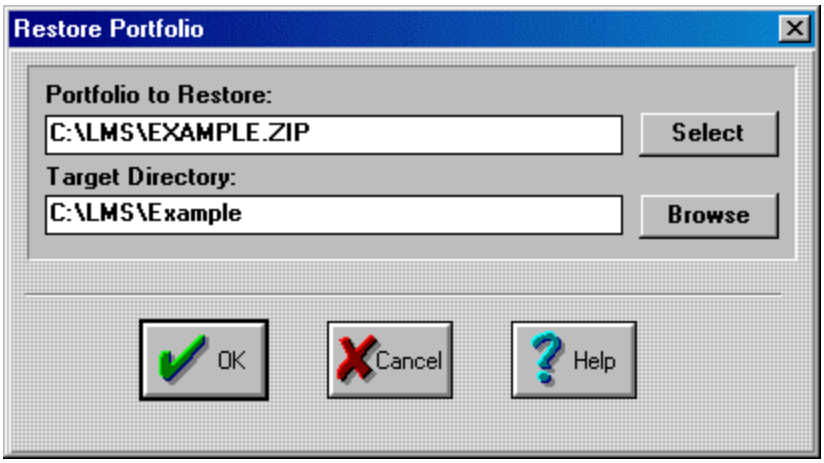


Figure 2. Restore Portfolio dialog box.

2. Press the **Select** button to load the Open File dialog (page 67) and choose a portfolio to restore.
3. Choose which portfolio to restore. This file can be located in any directory, although LMS defaults to the LMS directory. In this case choose the Example portfolio archive (`example.zip`) and press the **OK** button. The path and name of the archive should appear in the "Portfolio to Restore:" line.
4. Press the **Browse** button to choose the directory to restore the portfolio. Many users choose to store the portfolios directly in the LMS directory. This clutters up the LMS directory, so it is recommended to create a new directory off of the root (i.e. `C:\Data` or `D:\Data`) in which to store any portfolios you use (see Appendix A on how to create directories). Regardless, choose the directory in which you would like to store the portfolio and select **OK**.
5. Once you have chosen the source directory in which you want to store portfolios, add the specific target directory for this portfolio to the end of the "Target Directory:" line. Make

sure to include the slash "\" before your target (i.e. `C:\LMS\Example` or `C:\Portfolios\Example`).

6. Select **OK** to restore the portfolio. Once the `LMSCMD.PIF` file finishes running (it will appear on the start bar when it starts running and then disappear when finished) press **OK** on the LMS Status dialog box. LMS will automatically load the restored portfolio when finished.

Backing up a Portfolio

This function compresses all of the files in the portfolio directory into one zip file (`*.zip`). This makes it easy to transfer a portfolio from computer to another, or to save disk space when a portfolio is not in active use.

1. With LMS running and the portfolio you want to backup opened (see *Opening a Portfolio*, page 8), select **File|Backup Portfolio…** from the LMS menu. This will load the Backup Portfolio dialog box (Figure 3).

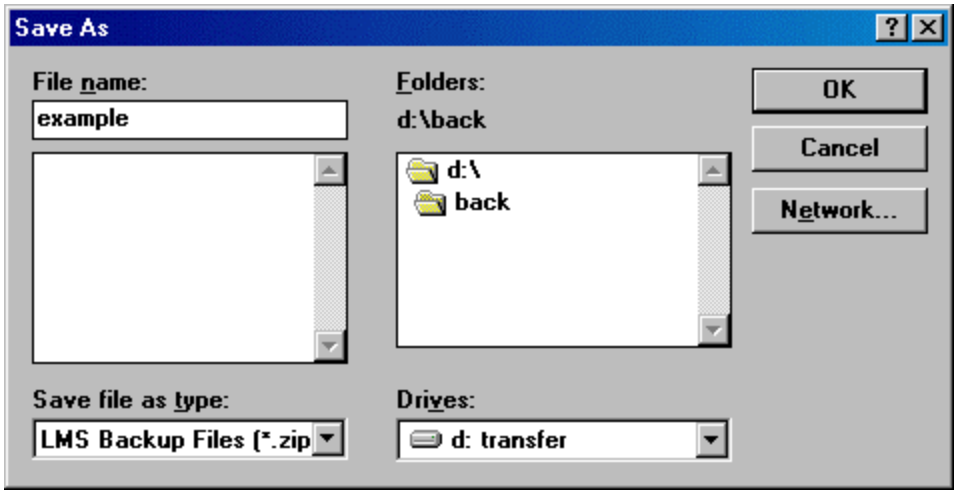


Figure 3. Backup Portfolio dialog box.

2. Browse to the directory you want to save the compressed file. The dialog box defaults to the LMS directory, but it is advised to save the file to another directory to prevent clutter in the LMS directory.
3. Select a name for the compressed file in the "File Name:" line of the dialog box (you do not have to include the `.zip` extension).
4. Press OK to compress the portfolio files. Note that LMS does not close the portfolio, nor does it remove the files from the hard drive. This must be done manually through Windows (see Appendix A).
5. Once the `LMSCMD.PIF` finishes running you must press **OK** on the LMS Status dialog box.

Viewing the Portfolio Log 

As projections and treatments are performed they are recorded in the Portfolio Log. To view the log, use the **View|View Log…** function. This will load the log file into the default text editor (Figure 4). To change the default text editor, see *Configuring the Landscape Management System* (page 48).

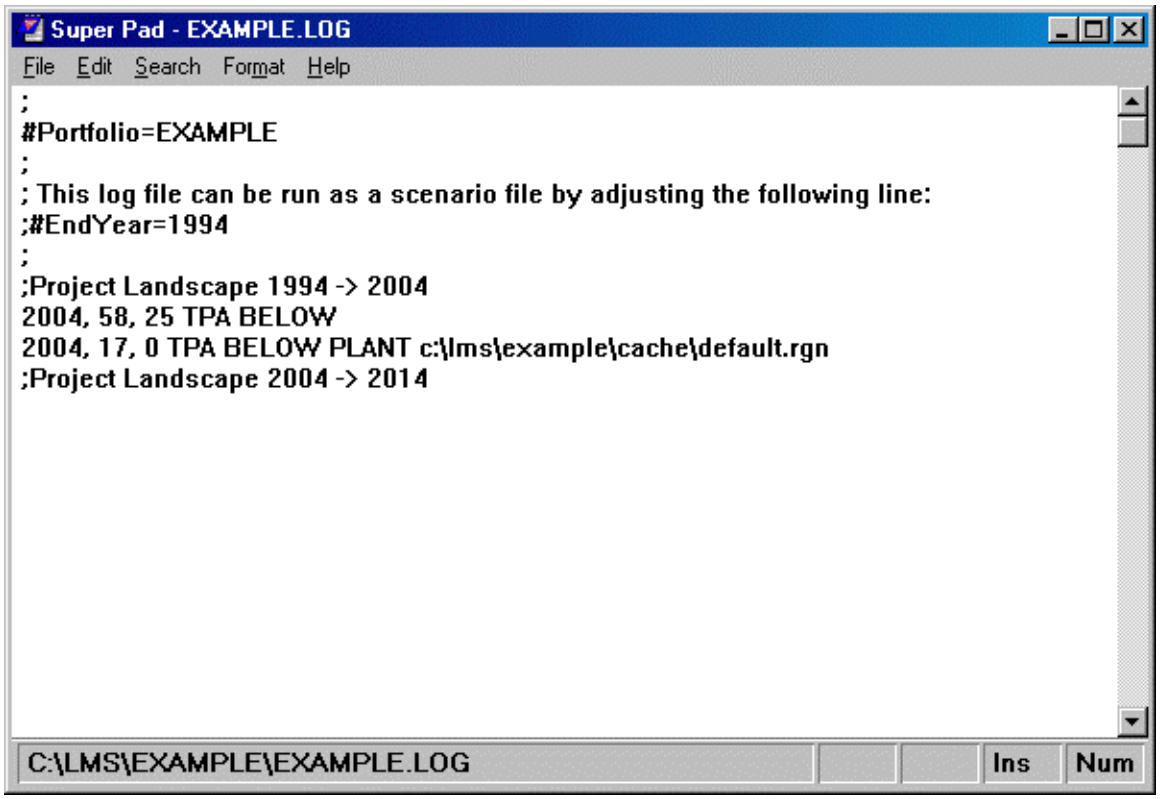


Figure 4. Portfolio Log.

Flushing the Cache

When projection and treatments are performed on a landscape the inventory files are updated to reflect this. To restore the portfolio to its base or original status use the **Utility|Flush Cache** function. Note that this will remove all of the projections and manipulations performed up to that point.

Projecting Stands and Landscapes

This section describes those functions that project stands and landscapes forward in time.

Projecting Stands

Stand projection moves one stand forward one "stepsize" in time. The stepsize is defined when the portfolio is created and is the number of years that projections simulate. When stands are projected forward both the initial information and the simulated information is maintained for analysis purposes.

1. With LMS running, select the **Project|Stand…** command from the LMS menu to load the Stand Selection dialog box (Figure 5).

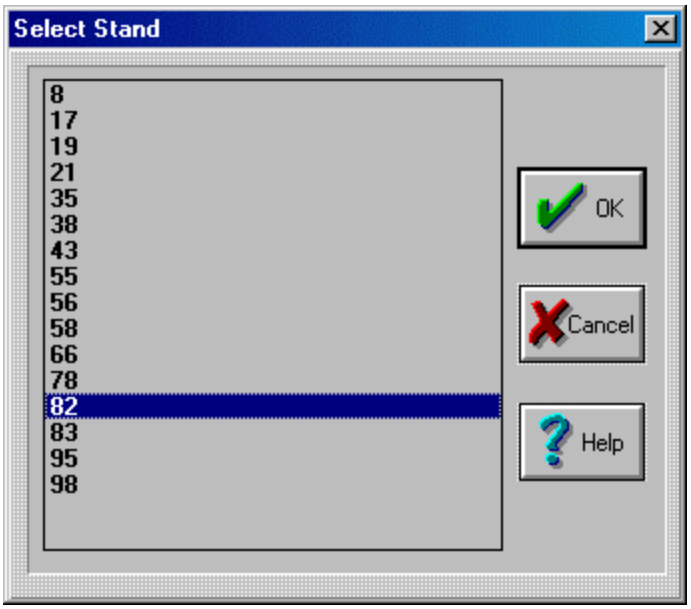


Figure 5. Stand Selection dialog box.

2. Select the stand you wish to project forward in time and press the **OK** button to start the growth model.
3. When the `LMSCMD.PIF` finishes running press the **OK** button on the LMS Status dialog box.
4. Notice that the end year for the data has changed in the LMS Main Window, but because only one stand was projected forward it will be the only data available in the future periods.

Projecting Landscapes

While it is possible to project single stands forward in time, the purpose of the Landscape Management System is to help in managing landscapes. So, it is often necessary and desirable to project the entire landscape simultaneously. As with the stand projections, the original and future data are both preserved for analysis.

1. With LMS running, select the **Project|Landscape…** command from the LMS Menu to start the growth model. Note that if you have just projected a single stand forward in time your current year is sometime in the future where you may not have data for the entire landscape. See the *Changing Current Year* section (see below) on how to select a time period where the data set is complete for the landscape.
2. When the `LMSCMD.PIF` file finishes running press the **OK** button on the LMS Status dialog box.

Changing the Current Year

When performing projections the current year for the portfolio is updated to the end of the last projection. This makes it easy to continue making projections into the future. If however a treatment performed did not have the desired effect it is necessary to go back to that time period and re-project.

1. With LMS running and the Example portfolio open, select **Project|Set Year…** from the menu to open the Select Year dialog box (Figure 6).

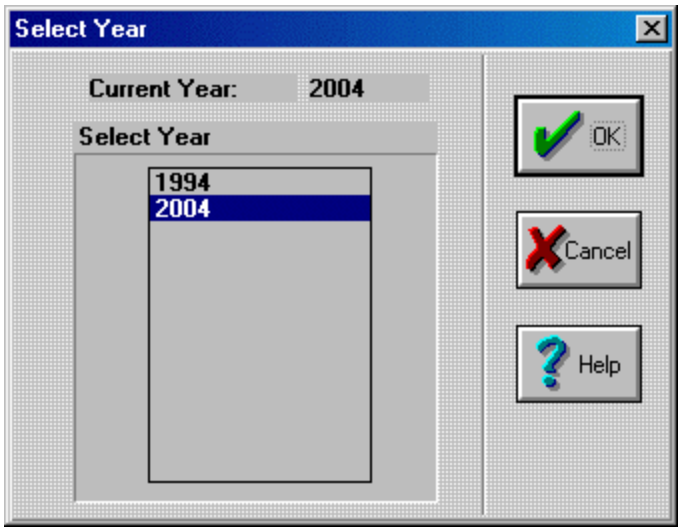


Figure 6. Select Year Dialog Box.

2. Select the year you want to go back too.
3. Press **OK** to change the current year.

Treating Stands and Landscapes

This section discusses those functions used for treating stands. This is a major portion of the Landscape Management System and this section is one that should be examined closely to get an understanding of how to effectively use LMS.

Treatment Dialog Box

Treatments are prototyped using the Treatment dialog box (Figure 7), and may be later included in a scenario file (page 29). All treatments, except for planting, are performed on the current year's data. Regeneration planted in LMS is established in the next time period, so all regeneration files reflect trees that are one time step old.

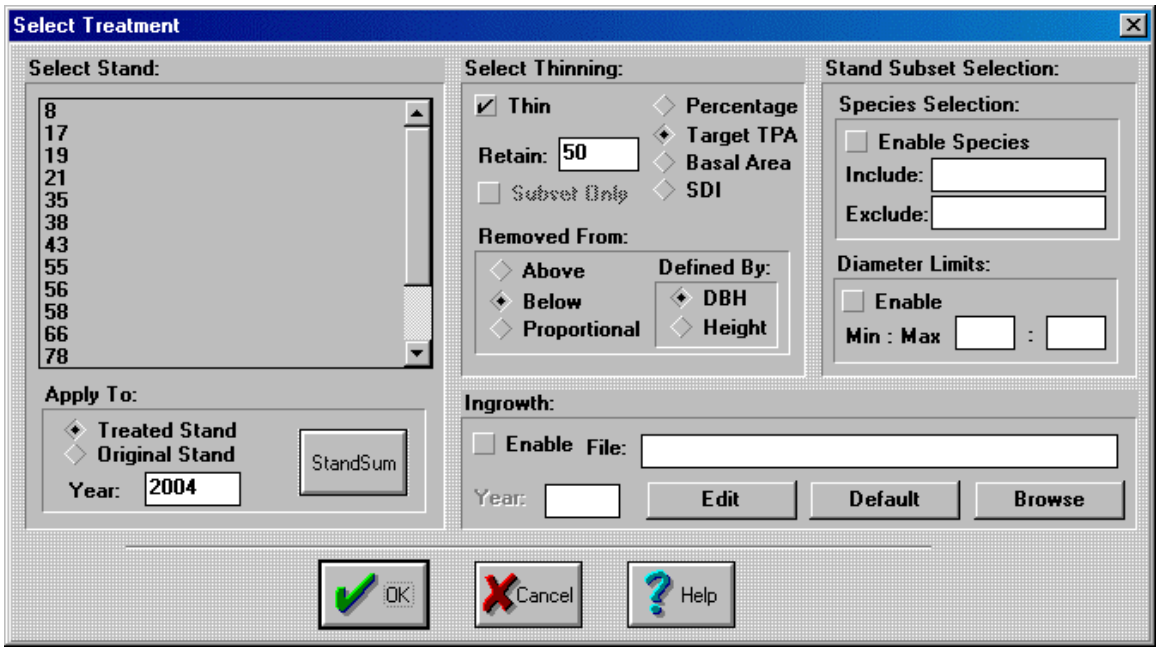


Figure 7. Treatment Dialog

The various parts of the dialog box are:

Select Stand
Highlight (by clicking on them) the stands that should be treated using the treatment you specify in the dialog box. Note that more than one stand can be selected and treated.

Select Thinning
If the thinning option is enabled (by checking the box in the upper left corner) then the stand will be thinned according to the parameters specified in this section.

Retain – This specifies what the remaining inventory will be. It can either be Percentage, Target TPA (Trees per Acre), Basal Area, or SDI (Stand Density Index) depending on what option is selected.

Removed from – These options specify how LMS determines what trees to remove from the stand inventory. Above, below, or proportional can be by either DBH (diameter at breast height) or by tree height depending on which option is selected. Above removes those trees that have a larger DBH or height. Below removes those with a smaller DBH or height. Proportional removes evenly from across the spectrum of DBH's or heights.

Stand Subset Selection
Often it is desirable to treat only one species or range of diameters in a stand. An example would be removing Red Alder from a stand to favor conifers. There are two different ways to subset the stand selected, they can be used independently or in unison. Enable either by checking the box next to the function.

Species Selection – This option allows specific species to be treated or ignored in the treatment. Species to ignore should be added to the "Exclude" area, while those to treat should be added to the "Include" area. If there is a species listed in the "Include" area then that will be the only species on which LMS will perform the operation. Species must be specified using whatever codes the growth model

uses. These must be determined from the documentation for each growth model (FVS uses two letter species codes in upper case).

Diameter Limits – This option allows trees that fall within the specified diameter range to be treated. The diameters should be specified in whatever units the inventory file is using, but usually inches.

Ingrowth

The ingrowth section allows stands to be replanted using a specified regeneration file (`*.RGN`). The format of this file is discussed in the File Formats section (page 56). Note that any file specified here will be added to the inventory in the following decade (i.e. if a stand is planted in 1994 and the step size is 10 years, the regeneration will appear in 2004). So the regeneration must reflect 10 year old trees. There should be at least 10 lines in any regeneration file, but the more present the better.

```
DF, 1.0, 10.0, .90, 30.0, 0.0
DF, 1.2, 11.0, .85, 30.0, 0.0
WH, 0.8, 10.0, .80, 30.0, 0.0
DF, 1.5, 12.0, .80, 30.0, 0.0
DF, 0.8, 10.0, .75, 30.0, 0.0
WH, 1.0,  9.0, .80, 30.0, 0.0
DF, 1.5, 12.0, .85, 30.0, 0.0
RA, 1.0, 12.0, .90, 30.0, 0.0
RA, 1.1, 13.0, .87, 30.0, 0.0
WH, 1.0, 10.0, .88, 30.0, 0.0
```

Figure 8. Regeneration File.

Edit – opens the specified regeneration file in the default text editor. If a file is not currently specified then the default regeneration file is loaded. To change the default regeneration file see the *Configuring the Landscape Management System* (page 48).

Default – sets the regeneration file to the default.

Browse – opens the Open File dialog box (page 67) to locate a regeneration file stored on the hard drive.

Apply To

This section contains four miscellaneous functions simplifying the use of the treatment dialog. Most users will rarely use most of these functions, but for completeness they are discussed here.

Treated/Original Stand – This allows treatments to be made sequentially to a stand (treated stand option), or to throw out the previous set of treatments and use the original stand data (original stand option).

Year – Specifies the year on which the treatment will be performed. Note that the stand you select must be projected to the year you wish to perform the treatment. If you select a previous year on which to perform the treatment, then you must re-project that stand forward in time. Performing the treatment will modify only the specified year's data.

Stand Sum – Creates the stand summary table for the selected stands. This table is a good source of information about the stands' current conditions.

Specific Examples of Treating Stands

While the previous section explained the pieces of the treatment dialog, true understanding of how to use the dialog box comes through use. This section gives very specific examples of how to use the treatment dialog box to perform treatments to stands. Simulate natural disturbances using thinnings.

Note: When performing these examples, flush the cache between them. For information on flushing the cache see *Flushing the Cache* (page 11).

Thinning a Stand

The main function of the Treatment dialog box is to perform thinnings on stands, while many of the other functions allow users to specify which trees to thin. In this example we will be thinning stand 82 of the example portfolio to 75 trees per acre from below by DBH.

1. With LMS running and the Example portfolio open, select **Project|Treat Stands…** to open the Treatment dialog box (Figure 7).
2. Select stand 82 in the stand selection section. Change the retain value to 75, and verify that the "Target TPA" option is selected (Figure 9).

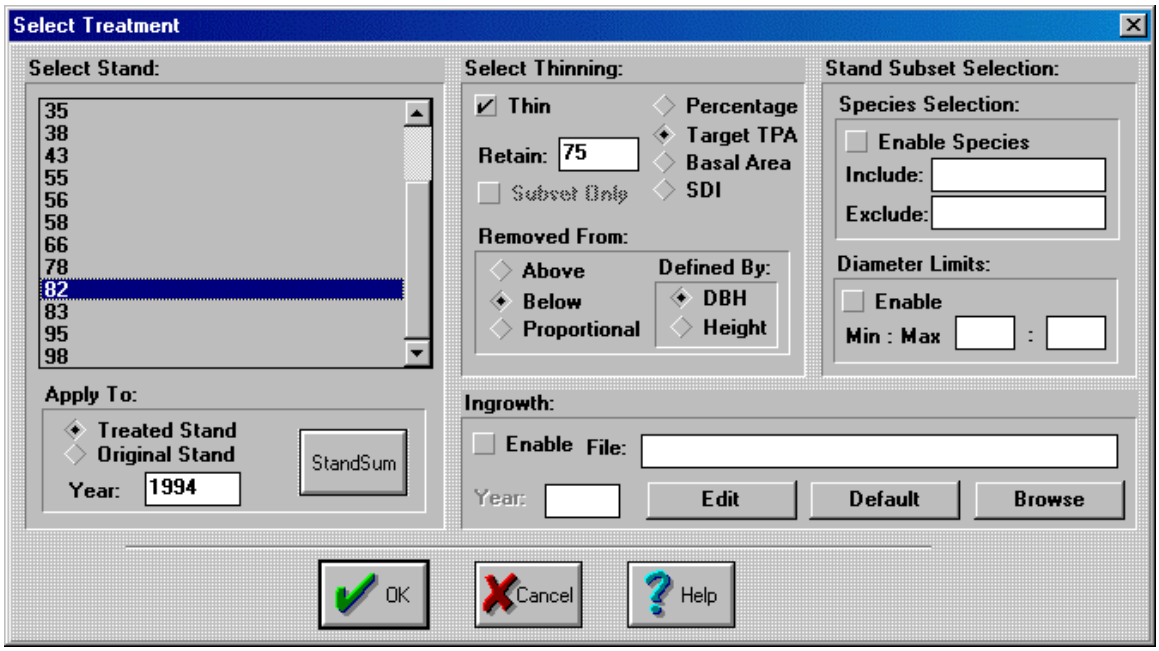


Figure 9. Thinning a stand.

3. Click **OK**. When the `LMSCMD.PIF` file finishes running the treatment is complete.

Vegetation Control

Stands managed for merchantable timber are often thinned to remove any unwanted species. In western Washington, this typically involves removing Red Alder, Big Leaf Maple, and possibly Western Hemlock depending on the density. In this example we will remove 90% of the Red Alder and Big Leaf Maple from stand 82 of the Example portfolio.

1. With LMS running and the Example portfolio open, select **Project|Treat Stands…** to open the Treatment dialog box (Figure 7).
2. Select stand 82 in the stand selection section. Change the retain value to 10 and select the **Percentage** treatment option (Figure 10).

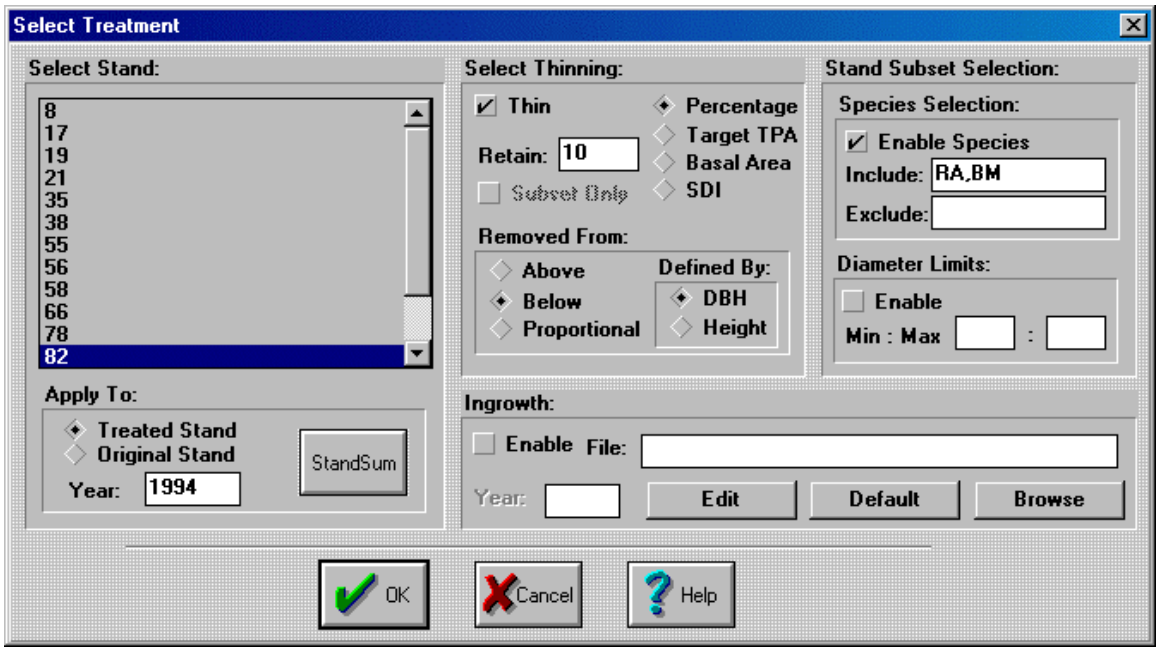


Figure 10. Vegetation Removal.

3. Click the check box next the **Enable Species** stand subset option.
4. Enter the species codes for Red Alder (RA) and Big Leaf Maple (BM) into the **Include** edit box.
5. Click **OK**. When the `LMSCMD.PIF` file finishes running the treatment is complete.

Regenerating a Stand

In order for a stand to regenerated it must be specified as a treatment. This can done as part of the treatment which thins the stand or as a separate treatement. In this example we will first remove all of the trees from stand 83 and regenerate using the default regenration file.

1. With LMS running and the Example portfolio open, select **Project**|**Treat Stands…** to open the Treatment dialog box (Figure 7).
2. Select stand 83 from the Stand Selection list box. Change the **Retain** value to 0 and verify that the **Target TPA** thinning option is selected ().

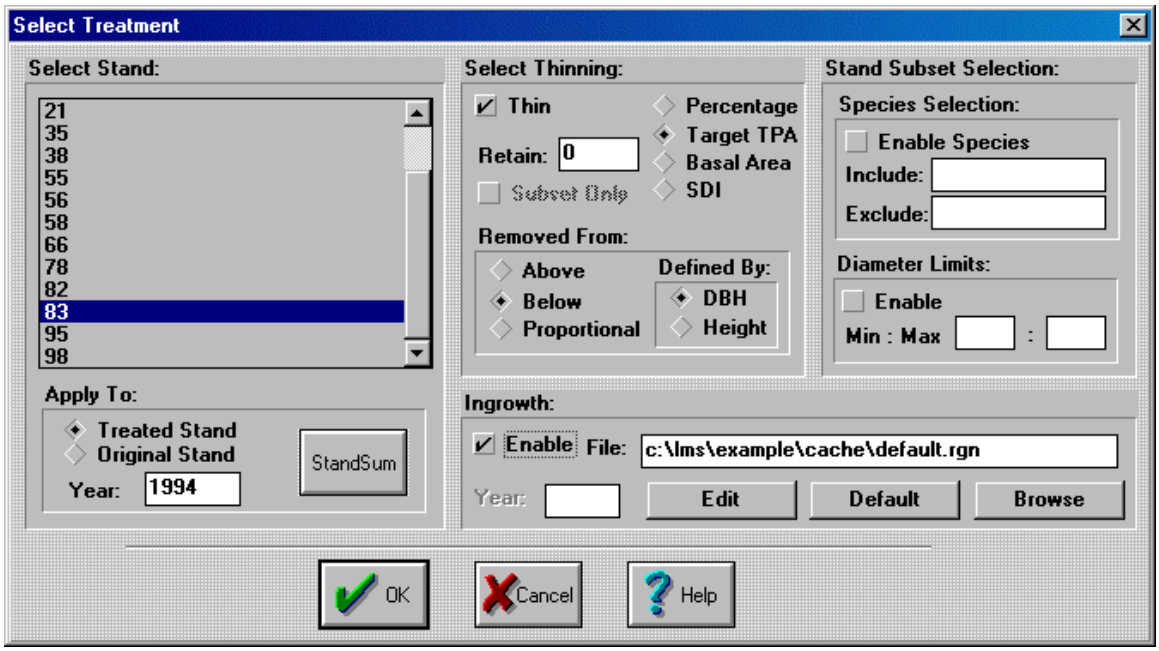


Figure 11. Regenerating a Stand.

3. Enable ingrowth by clicking the check box next to **Enable** in the Ingrowth section.
4. Click the Default button in the Ingrowth section to specify the default regeneration file.
5. Press **OK**. When the `LMSCMD.PIF` file finishes running the treatment is complete.

Simulating Ingrowth and Regeneration

LMS does not automatically add ingrowth to stands as projections are performed. This must be specified as a treatment. In this example we will add ingrowth to stand 83.

1. With LMS running and the Example portfolio open, select **Project**|**Treat Stands…** to open the treatment dialog (Figure 7).
2. Select stand 83 from the Stand Selection list box (Figure 12).
3. Disable the Thinning section by clicking the check box next to **Thin**.

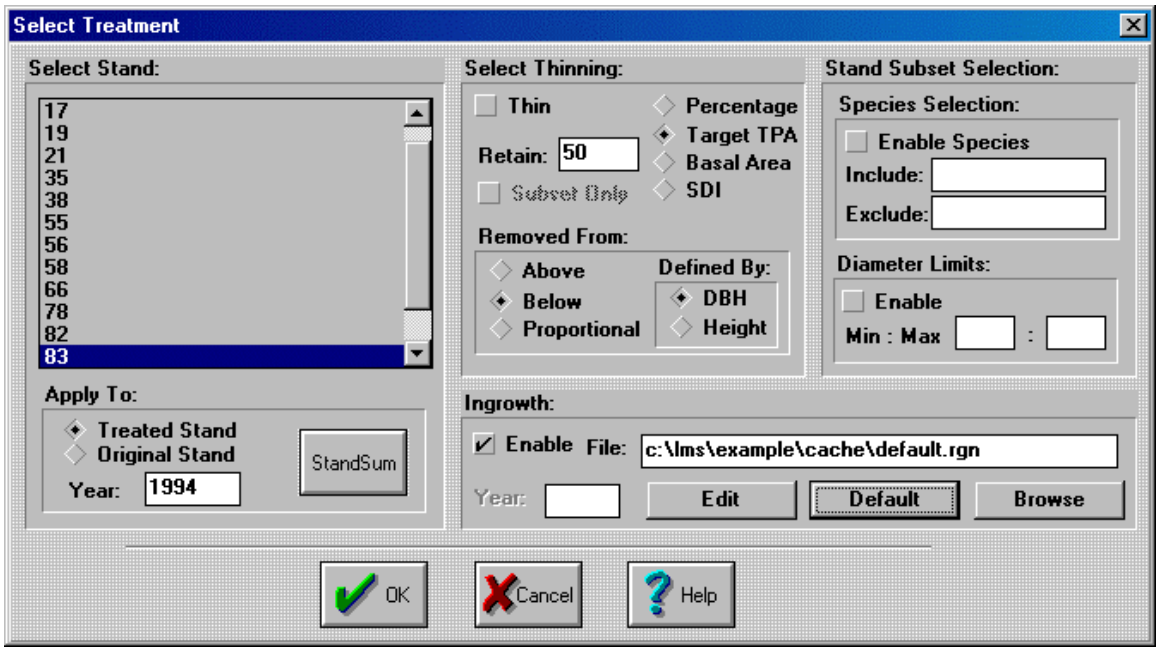


Figure 12. Ingrowth.

4. Enable ingrowth option by clicking the check box next to **Enable** in the Ingrowth section.
5. Press the Default button in the Ingrowth section to select the default ingrowth file. In this example we will use the default file, but in other cases it is probably desirable to edit the file to reflect the landscape being treated.
6. Click **OK**. When the `LMSCMD.PIF` file finishes running the treatment is complete.

Analyzing Stands and Landscapes

This section deals with those functions that analyze both the current and projected stand information in a portfolio. The ability of LMS to perform various analysis functions allows users to determine the result of various treatments made to the portfolio.

There are three main types of analysis that LMS can perform. The first is to summarize and display data in a tabular format. These tables can be viewed internally within LMS or exported to another program (such as Microsoft Excel or Access) for further analysis. The second type of analysis is a set of charts. These charts run internally within LMS, displaying and summarizing data. The final type of analysis is the visualization functions: stand, stand comparison, and landscape visualizations. These visualizations show a large number of parameters inherent to each stand in a very easy to understand way.

Tables

Tables are analysis tools that provide data summarized in textual form. The tables present in LMS have been designed to provide basic forestry statistics. It is also possible for users to add specific, customized tables to LMS; for information on this see The LMS Programmers Guide. Tables allow users to look at stand and landscape statistics to both determine necessary treatments and to see the results of those treatments. The data is delimited when output and can be viewed using a text editor or spreadsheet, or it can be saved as a file.

Table Dialog Box

The Table dialog box (Figure 13) is the interface to access all tables available in LMS. Figure 13 is the default table dialog present in LMS. If LMS has been customized, it is possible that this dialog will show other tables not present here.

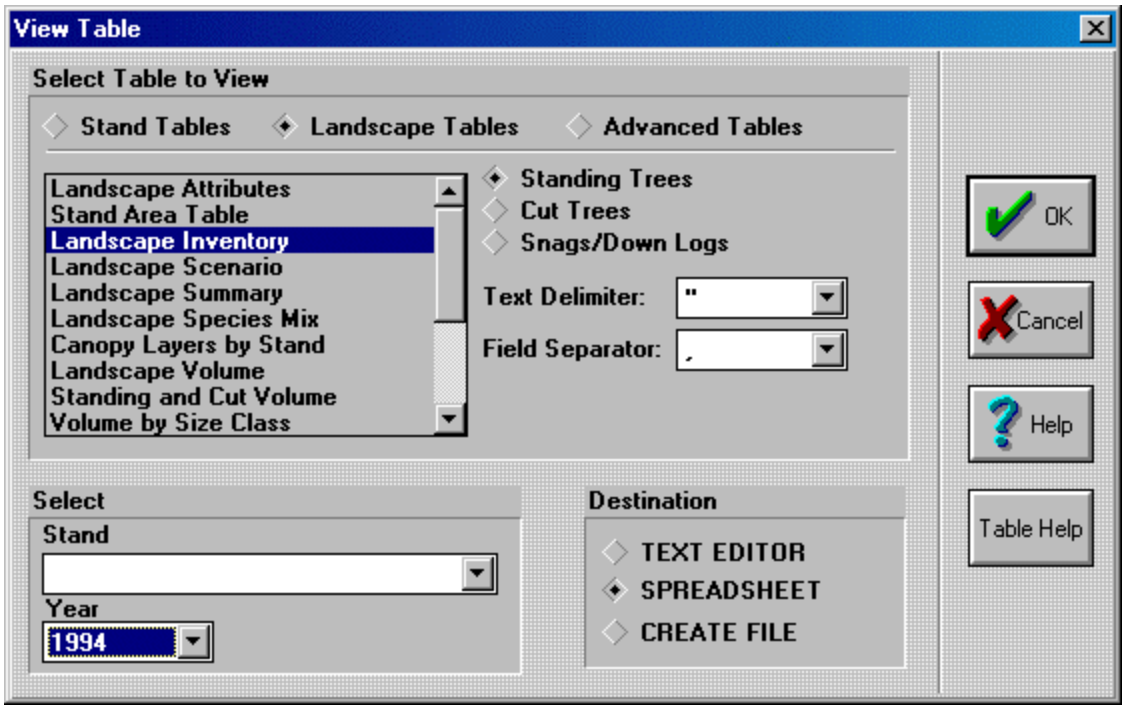


Figure 13. Table Dialog Box.

Table Type
The **Stand Tables, Landscape Tables, Advanced Tables** options define which of type of table will be run. Stand tables will analyze only the selected stand, while landscape tables look at the entire landscape. Advanced tables are those that do not comform with either of the other groups.

Table Selection Box
This box contains a list of all the tables available. The list will be different for stand, landscape, and advanced tables.

Data Type
The **Standing Trees, Cut Trees, Snags/Down Logs** options specify what type of data will be analyzed. The Landscape Management System keeps track of standing and cut trees and can keep track of snags/down logs as well. For further information on using snags and down logs see the *Snag Model Documentation* (page 71).

Text Delimiter
This specifies what syntax will be used to specify text fields in the output tables. The possible options are none, double quotation mark or single quotation mark.

Field Separator
This option specifies what type of field delimiter will be used in the table. The possible options are space, tab, or comma.

Select Section
The two options in this section specify on which stand or year the analysis will be performed. Not all tables use these values when they run.

Destination
These options specify where the table will be saved or displayed. The **Text Editor** option will send it to the default text editor, while the **Spreadsheet** option will send it to

the default spreadsheet (see Configuring the Landscape Management System, page 48). The **Create File** option opens the File Save dialog box and saves the output as a text file.

Table Help Button
Opens a file that contains descriptions of each table.

Sending a Table to a Spreadsheet
In this example we will output a Landscape Inventory table for 1994 to a spreadsheet.

1. With LMS running and the Example portfolio open, select **View|Tables…** to open the Table dialog box (Figure 13).
2. Select the **Landscape Tables** option and the **Landscape Inventory** table from the Table Selection box (Figure 13).
3. Select 1994 from the Year Selection drop down box.
4. Select the Spreadsheet option from the Destination section.
5. Press **OK**. When the `LMSCMD.PIF` file finishes running press **OK** on the LMS Status dialog box. The output should be similar to Figure 14.

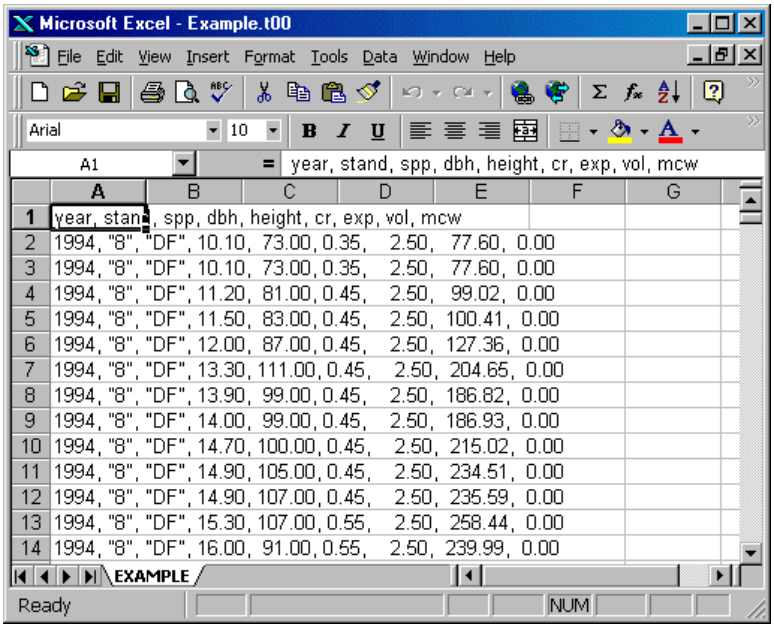


Figure 14. Landscape Inventory table.

Charts

Charts are analysis tools that summarize data in a graphical format. Charts provide an excellent way to summarize data over time and show trends. Like the tables in LMS, Charts can be added and customized to reflect specific needs, see The LMS Programmers Guide.

Chart Dialog Box 
The Chart dialog box (Figure 15) is the user interface to all the charts available in the Landscape Management System. This is the default chart dialog box used in LMS, the actual dialog may be different.

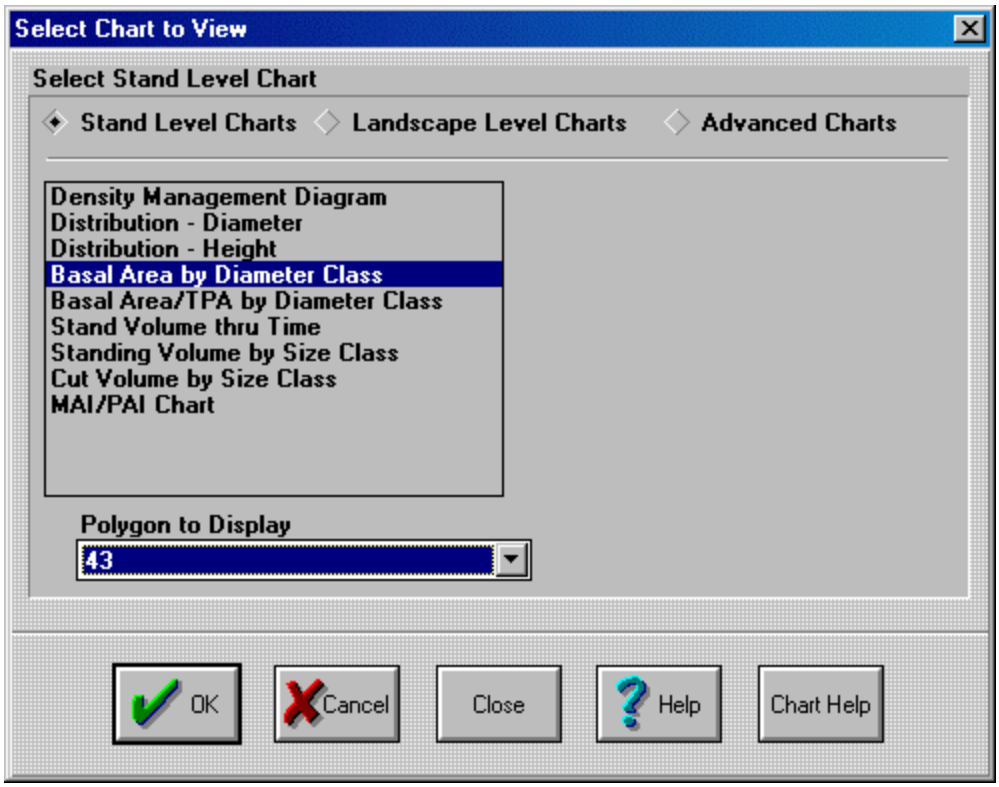


Figure 15. Chart Dialog Box.

Chart Type
The **Stand Chart**, **Landscape Chart**, and **Advanced Chart** options specify what type of chart LMS will run. Like the Table dialog box (page 19), stand level charts summarize information for one selected stand, while landscape level charts summarize the entire landscape.

Chart Selection
This list box shows all of the charts of a specific type available in your version of LMS. Only one chart can be selected at a time.

Polygon Selection
The **Polygon to Display** drop box specify which stand will be summarized when running a stand level chart.

Close Button
The Close button closes any open chart windows in LMS.

Chart Help Button
Opens a file that explains the function of each chart available in your version of LMS.

Displaying a Chart
In this example a Basal Area by Diameter Class chart will be run on stand 43 of the Example portfolio.

1. With LMS running and the Example portfolio open, select **View|Charts…** to open the Chart dialog box (Figure 1).
2. Verify that the **Stand Charts** option is currently selected (Figure 15).
3. Select the **Basal Area by Diameter Class** chart from the Chart Selection list box.

4. Select stand 43 from the Polygon Selection drop box.
5. Press **OK**. When the `LMSCMD.PIF` file finishes running press **OK** on the LMS Status dialog box. The results should be similar to those in Figure 16.

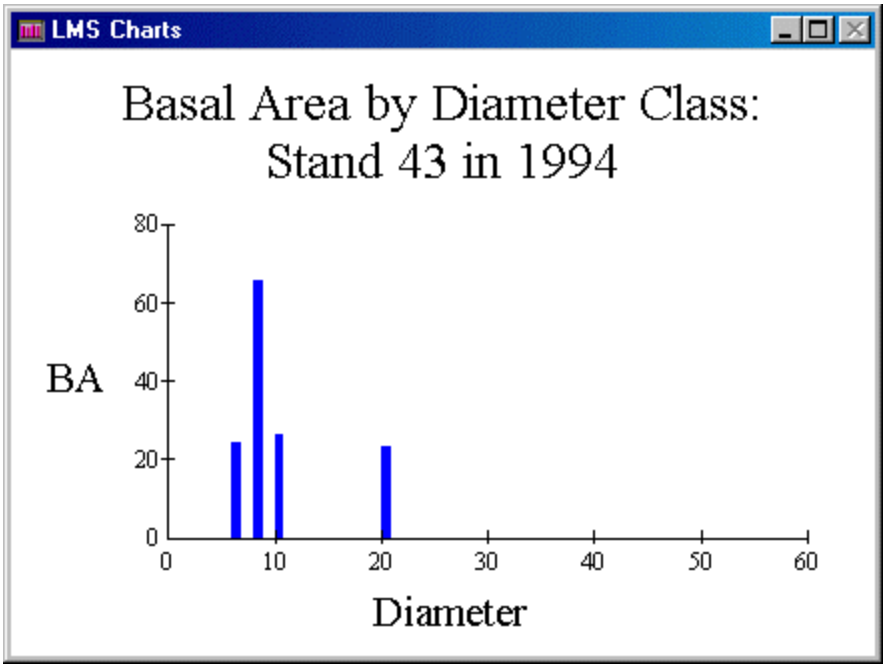


Figure 16. Basal Area by Diameter Class chart for stand 43.

Closing Charts 

When charts are open in LMS you must use the **Close Chart Window** function in LMS. With LMS running and a chart window open, select **View|Close Chart** to automatically close the window.

Visualizations

Visualizations are a second way to summarize data graphically, by creating an image of the stand or landscape. Visualizations summarize a large number of parameters in a very easy to understand format. This makes visualizations very helpful in showing the results of various treatments to stands and landscapes.

There are three different types of visualization: stand, stand comparison, and landscape visualizations. Stand visualizations are performed by two versions of the same program, both of which are distributed with LMS. SVS is a DOS version of the stand visualization program which runs slightly faster on most machines, but will not work on Windows NT. WinSVS works on all Windows 95/98/NT machines and is a Windows version of the stand visualization program. Landscape visualization is performed by UVIEW, a DOS program distributed with LMS.

Stand/Stand Comparison Visualization Note: If the trees are rendered using unrealistic colors then one of three things have occurred. The first possible explanation is that the species of tree you are attempting to visualize is not a known species to SVS (this should not happen using the Example portfolio). To fix this problem see the *SVSLib Help File*. The second possible explanation is that you are using Windows NT© which cannot use the standard SVS program to visualize stands. However this can be fixed by changing the stand visualization program from

SVS to WinSVS. To change this options see *Configuring the Landscape Management System* (page 48).

Landscape Visualization Note: There are several possible problems in performing landscape visualizations. The simplest is if LMS is being run on Windows NT, landscape visualization will not perform correctly (it will run in 640x480 – 16 color resolution). Another possible problem is that the size of the inventory may be too large for UVIEW to display. There are a number of options that can be changed to correct this problem. See *Changing the Visualizations Display Options* (page 49).

Stand Visualization 

A stand visualization creates a flat, one-acre representation of a stand based on the inventory data. Stand visualizations are helpful in showing differences in tree species compositions, sizes, and spatial characteristics as treatments are performed. One important consideration is that the position of the trees across the acre is random, and will change each time the visualization is run. In this example we will perform a stand visualization on stand 82 in 1994.

1. With LMS running and the Example portfolio open, select **View|Stands…** to open the Stand Selection dialog box (Figure 17).

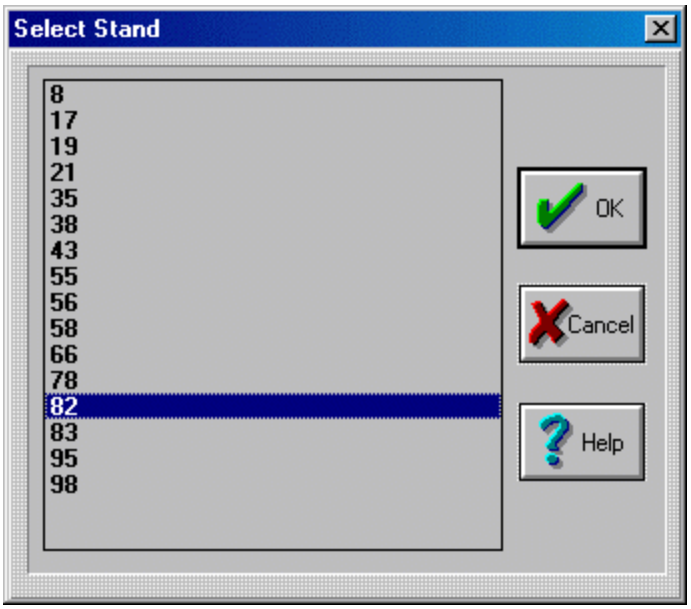


Figure 17. Stand Selection dialog box.

2. Select stand 82 and press **OK** (Figure 17).
3. If the selected stand has been projected forward LMS will load the Year Selection dialog box (Figure 18). Select the year you wish to visualize and press **OK**.

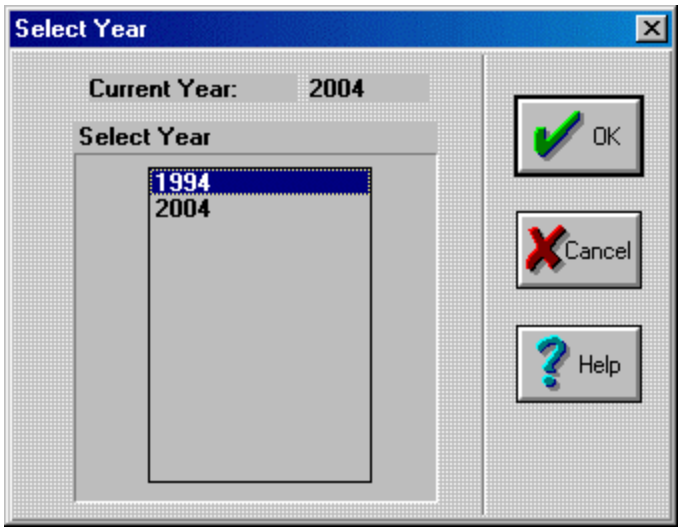


Figure 18. Year Selection dialog box.

4. The Stand Visualization System will load and display an image of the stand (Figure 19).

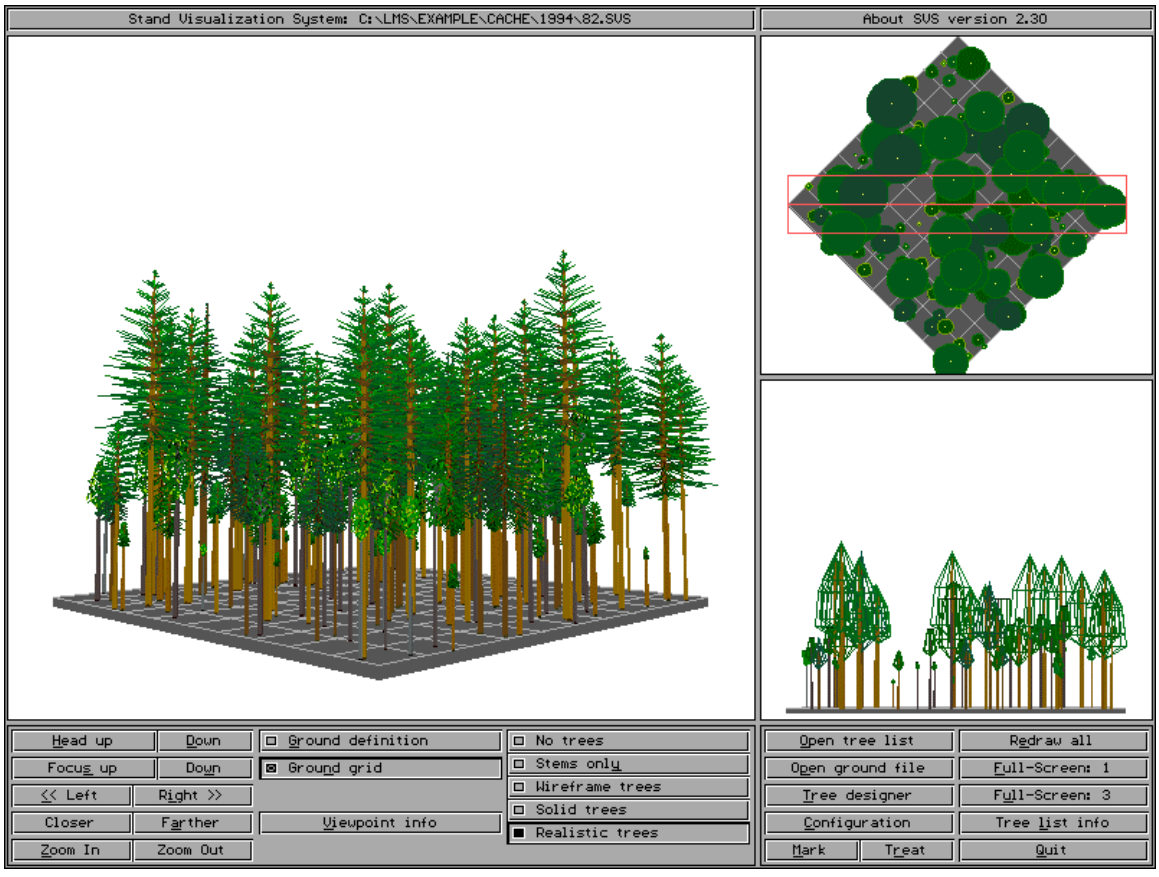


Figure 19. Stand Visualization of stand 82.

5. When finished viewing the image press **QUIT** to exit the program. For information on how to save images see *Saving Images from SVS* (page 55).

Stand Comparison Visualization 

This type of visualization can compare stands by either showing two time periods side by side, or by merging two stands together. These two types of visualizations allow visual comparisons to be drawn between the different stands. This makes differences readily apparent.

Stand Comparison Dialog Box

The Stand Comparison dialog box (Figure 20) is the interface for performing these visualizations.

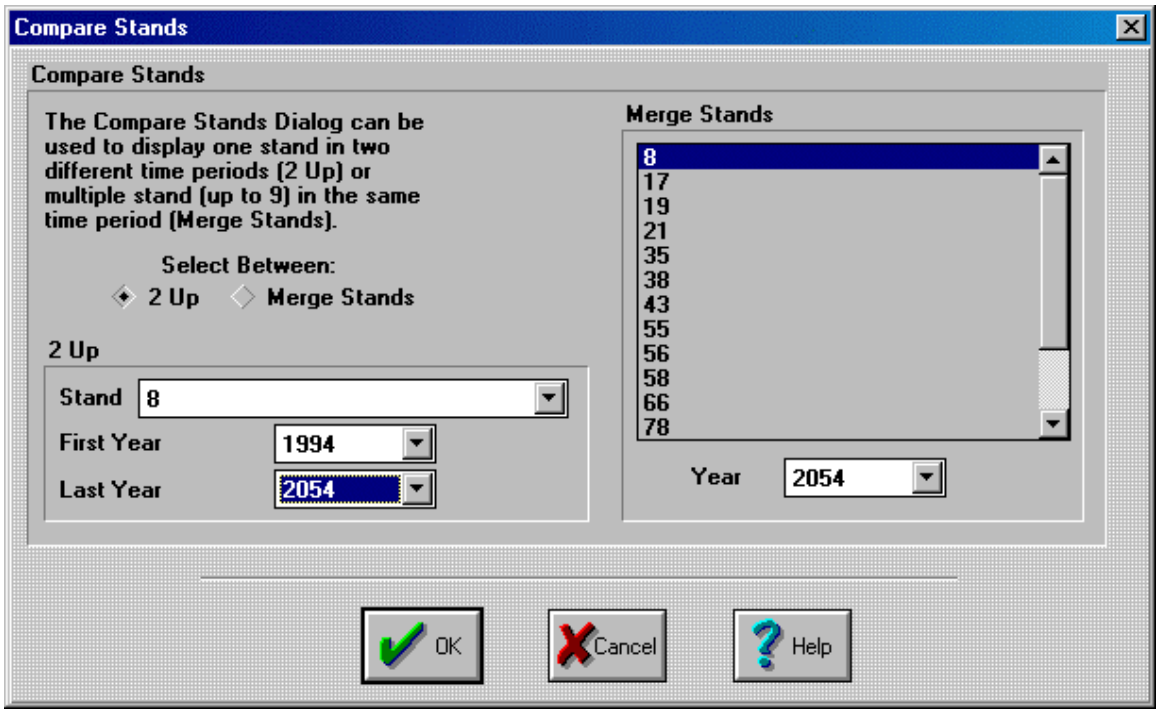


Figure 20. Stand Comparison Dialog Box.

Visualization Type

The **2 Up** and **Merge Stands** options select between the two types of visualization.

2 Up

These three options setup the visualization. The Stand Selection drop box selects which stand will be visualized. First Year and Last Year are wildcard values that LMS will lookup and use when performing the visualization.

Merge Stands

The Merge Stands list box allows up to nine stands to be selected for merging. The Year Select determines which year will be used for the visualization.

Showing the Same Stand in Two Time Periods

Displaying the same stand in two different time periods allows users to draw visual comparisons for before and after treatments and growth projections. Again the visual nature of this type of analysis makes it extremely useful. In this example we will compare stand 8 in 1994 and in 2054. For this example stand 8 must be projected forward to 2054.

1. With LMS running and the Example portfolio open, select **View|Compare Stands…** to open the Compare Stands dialog box (Figure 20).
2. Verify that the **2 Up** option is selected (Figure 20).
3. Select stand 8 from the Stand Selection drop box.
4. Select 1994 as the first year and 2054 as the last year.
5. Press **OK**.
6. SVS will display an image of the stand in each time period separated by an opening. The first year will be on the left, the last on the right (Figure 21).
7. When you are finished viewing the image press **QUIT** to exit SVS.

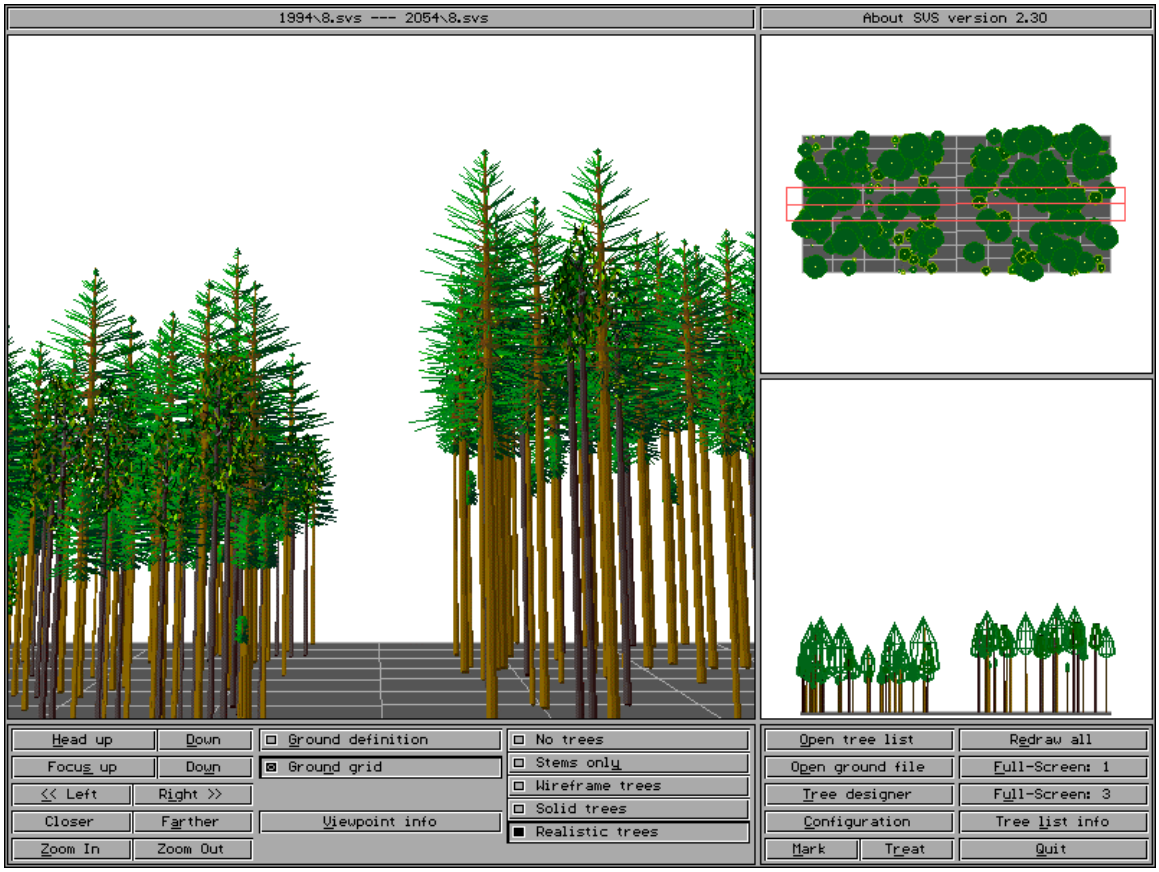


Figure 21. 2 Up Visualization.

Merging Stands

This type of visualization allows stands which border each other to be compared side by side. This is useful in showing edge effects, and riparian zones. In this example we will merge stands 17 and 82 in 1994.

1. With LMS running and the Example portfolio open, select **View|Compare Stands…** to open the Stand Comparison dialog box (Figure 20).
2. Select the **Merge Stands** option (Figure 20).
3. Select both stand 17 and stand 82.
4. Verify that 1994 is selected.
5. Press **OK**.
6. SVS will display an image of the merged stand (Figure 22). The different stands will be displayed in strips across the represented acre. Stands with similar inventories will of course be difficult to differentiate.

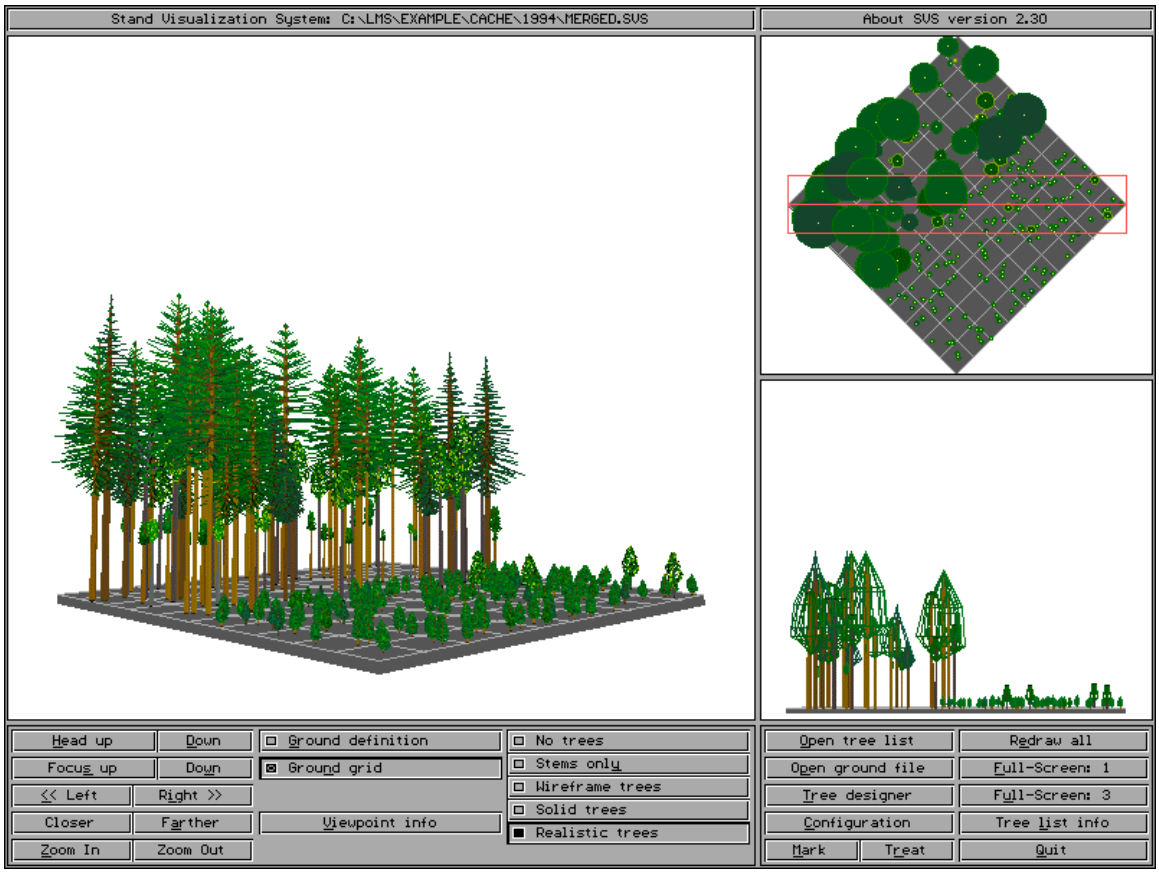


Figure 22. Merged Stand Visualization.

Landscape Visualization

This type of visualization displays an image of the entire landscape with a representation of the tree cover. Landscape visualizations are helpful is showing how a landscape changes over time as treatments create openings and species compositions change. In this example we will create a visualization of the landscape for 1994.

1. With LMS running and the Example portfolio open, select **View|Landscape…** to run a landscape visualization.
2. UVIEW will display a three dimensional representation of the landscape (Figure 23). When finished press **QUIT** to exit the program.

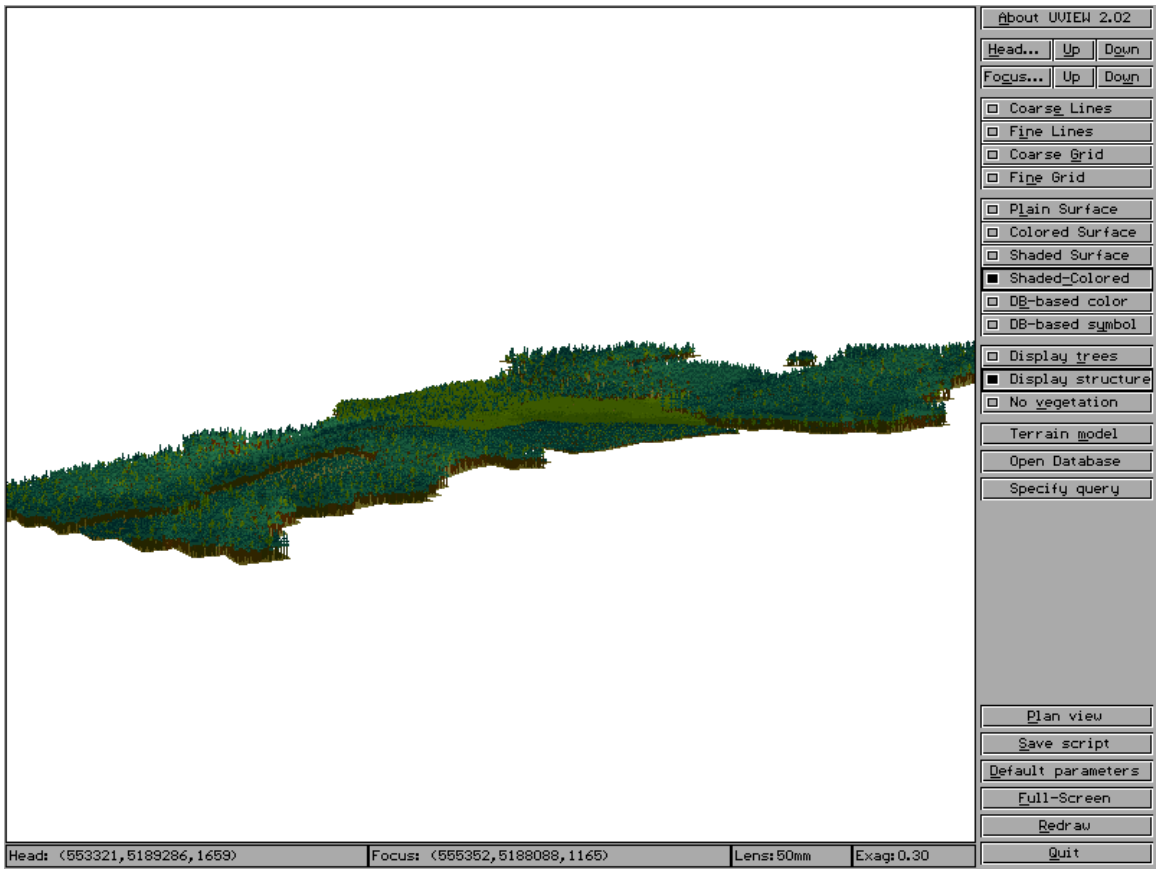


Figure 23. Landscape Visualization.

Using Scenarios Files

Scenario files provide an easy way to treat all of the stands in a landscape simultaneously through time. The basic format of the file is a list of treatments for the stands in specific years (Figure 24). These treatments use a keyword language shown below. Typically the treatments contained within the file are prototyped using the Treatment Filter (page 13) and then combined for a final analysis of the effects on the landscape. It is not necessary for a treatment to be defined for every stand in every year, only in those years where you want to do an operation.

There are advantages of using a scenario file for the final analysis of the landscape. The first is that LMS will perform the treatment automatically before it makes each growth projection, eliminating much of the effort. The second is that it makes the projections reproducible. The scenario file can be re-run on the data to get the same results. The final reason is that it is very simple to make slight changes to the scenario file's treatment for a stand and re-run the projection.

```
;
; Scenario file for Example Portfolio
;
#Portfolio=EXAMPLE
#EndYear=2014

; Year, Stand, Treatment and modifiers

1994, 17, 0 TPA INCLUDE RA
1994, 43, 35 PERCENT ABOVE EXCLUDE DF
1994, 58, 50 BA 5:10
1994, 78, 15 TPA BELOW PLANT DF.RGN
1994, 82, 150 SDI BELOW INCLUDE DF,WH
1994, 82, 5 % INCLUDE BM,RA
```

Figure 24. Scenario File Format.

Scenario File Format

The scenario file contains a header that must follow a specific format. Any comment lines are preceded by a ";" and will not be read by LMS. The two lines preceded by a "#" are variables that LMS uses to run the portfolio. The `EndYear` parameter specifies the last year of the simulation. The `Portfolio` is for the user's information only and is not currently used by LMS.

The second section of the file lists the treatments for the landscape. The first column is the year the treatment will be performed in. The second is that stand that will be treated. The last column is the actual treatment description. The treatment description first has the retain value (identical to the Treatment dialog box, page 13) and then the treatment options specified using keywords. These keywords are described below.

Note: The log file generated by LMS (page 10) can also be used as a scenario file, or treatments within the log can be copied into the scenario file. In order to use the LMS Log file as a scenario file you must un-comment the EndYear line (delete the ";" from the beginning of the line).

Scenario File Keywords

LMS recognizes a set of keywords in the scenario file to specify treatments. These keywords must be spelled exactly, and must be in capital letters for LMS to recognize them. The keywords correspond with options in the Treatment dialog box (page 13).

Thinning Type

PERCENT or %	- Specifies a thinning using retain percentage.
TPA	- Specifies a thinning using Target TPA (Trees per Acre).
BA	- Specifies a thinning using Basal Area
SDI	- Specifies a thinning using SDI (Stand Density Index).

Thinning Modifiers

ABOVE	- Specifies that the thinning will be from above.
BELOW	- Specifies that the thinning will be from below.
BYDBH	- Specifies that DBH will be used for the ABOVE/BELOW modifiers.
BYHEIGHT	- Specifies that height will be used for the ABOVE/BELOW modifiers.

Subset Options

INCLUDE	- Specifies which species will be included in the operation. The species must follow after the keyword.
EXCLUDE	- Specifies which species will be excluded from the operation. The species must follow after the keyword.
:	- Specifies a diameter range for the operation. The minumum diameter is entered before the ":" and the maximum diameter after it.

In LMS there are two ways to edit scenario files. The first is to use the default text editor (or any text editor) to edit the file directly. The second method is to use the LMS Scenario Editor (see below).

Scenario Editor

The LMS Scenario Editor provides users with an easy to use interface for creating and editing LMS Scenario Files. The Scenario Editor has been designed to be very similar to the Treatment dialog box, so users familiar with using that should have little problem using the Scenario Editor. The functions that will be discussed in this section are those that are unique to the Scenario Editor, for explanations on those functions that the two share see the *Treating Stands and Landscapes* (page 13).

Scenario files provide users with a way to project and treat an entire landscape at once. A scenario file specifies the treatment for each stand in each year a treatment is made. For a further discussion of the uses and format of scenario files see *Scenario Files* (page 29).

Scenario Editor Dialog Box 

The Scenario Editor utilizes a graphical interface (Figure 25). This section will describe the use of each section of the dialog.

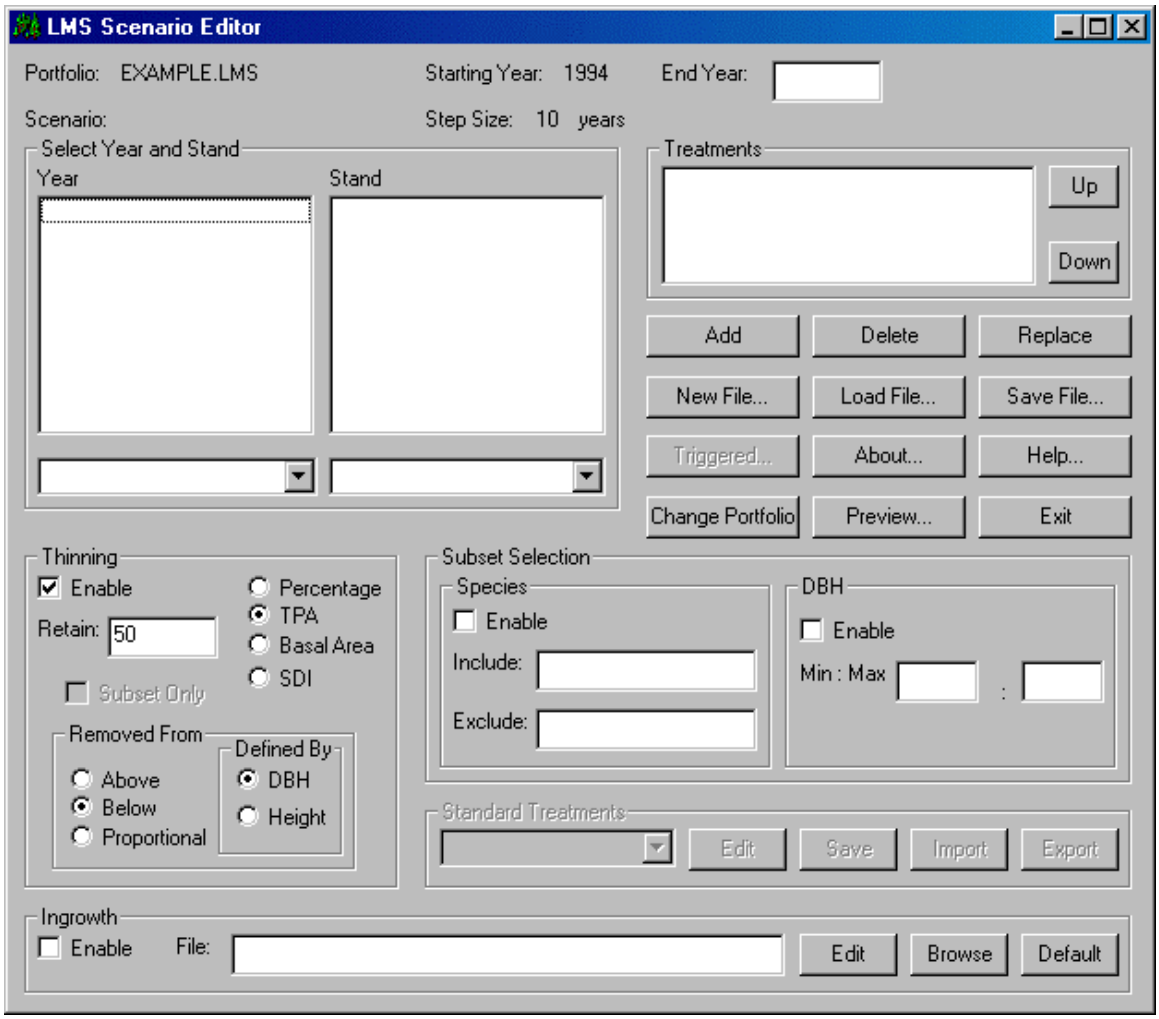


Figure 25. LMS Scenario Editor.

Scenario File Information

The top of the Scenario Editor dialog box contains information about the current scenario file and portfolio. The only option that can be changed by the user is the **End Year** list box. The end year is the year that the landscape will be projected when running the scenario file. The other options shown in this section change with the portfolio (Portfolio, Starting Year, and Step Size) or with the loaded scenario (Scenario).

Year and Stand Selection

This section contains two list boxes and two drop boxes that allow users to select the year and stand they wish to add a treatment. If a Scenario file is loaded that already contains treatments then the year list box shows all the years which contain treatments, and the stand list box shows which stands have treatments in the selected year. The year drop box contains entries for each valid year from the starting year to the end year (specified by the user). The stand drop box lists each stand in the current portfolio.

Treatment Selection
The treatment list box displays all the treatments defined for the selected stand in the selected year. These treatments are displayed using the treatment keywords used by LMS, for further information on these keywords see *Using Scenario Files* (page 29). Note that is possible for more than one treatment to be defined for each year and stand combination. The treatments will be executed from the top of the list down. The **Up** and **Down** buttons in this section change a treatments position within the list.

Control Buttons
The block of buttons in the Scenario Editor perform all the functions necessary for creating, modifying, and managing scenario files in LMS. Their functions are described below.

Add
The Add button appends the currently defined treatment to the selected stand and year.

Delete
This button removes the selected treatment from the scenario file.

Replace
The replace function replaces the selected treatment with the a new one, defined in the dialog box.

New File
Creates a new, blank scenario file. If the current file has been modified the Scenario Editor will prompt to save the changes.

Load File
This function loads a new scenario file into memory. If the current file has been modified the user will be prompted to save the changes.

Save File
The save file function opens the File Save As… dialog, allowing the user to specify a location and name to save the current file. If the name and location have already been specified during an earlier save, then those options are the default.

About
This function loads the Scenario Editor About dialog, that displays information on the editor.

Help
The help button loads the LMS help file for the Scenario Editor.

Change Portfolio
This function allows users to modify scenario files for other portfolios than the one currently loaded. Note that scenario files can only be used with the portfolio they are attached too, they are not transferable.

Preview
The preview function loads the current scenario file into the default text editor to let a user view what the file will look like when saved. The scenario file can also be printed from the text editor.

Exit
The exit button exits the Scenario Editor. If the current file has been modified the user will be prompted to save the changes.

Treatment Specification Section
The remaining section of the Scenario Editor is shared with the Treatment dialog box. See the section explaining that dialog for an explanation of this section.

Using the Scenario Editor

The following examples are provided in an attempt to further explain how to use the Scenario Editor. The examples begin with a few basic functions and progress to the more advanced features.

Adding a Treatment
This example shows how to add a treatment to a specific stand and year. In this example we will add a treatment to thin stand 82 to 10 TPA from below by height, and then plant the default regeneration file in 2004.

1. With LMS running and the Example portfolio open, select the **Scenario|Scenario Editor…** option to load the Scenario Editor.
2. The Scenario Editor will prompt to open an existing scenario file, press **No** to open the program with a blank scenario file (Figure 25).
3. Change the **End Year** to 2014 (Figure 26).

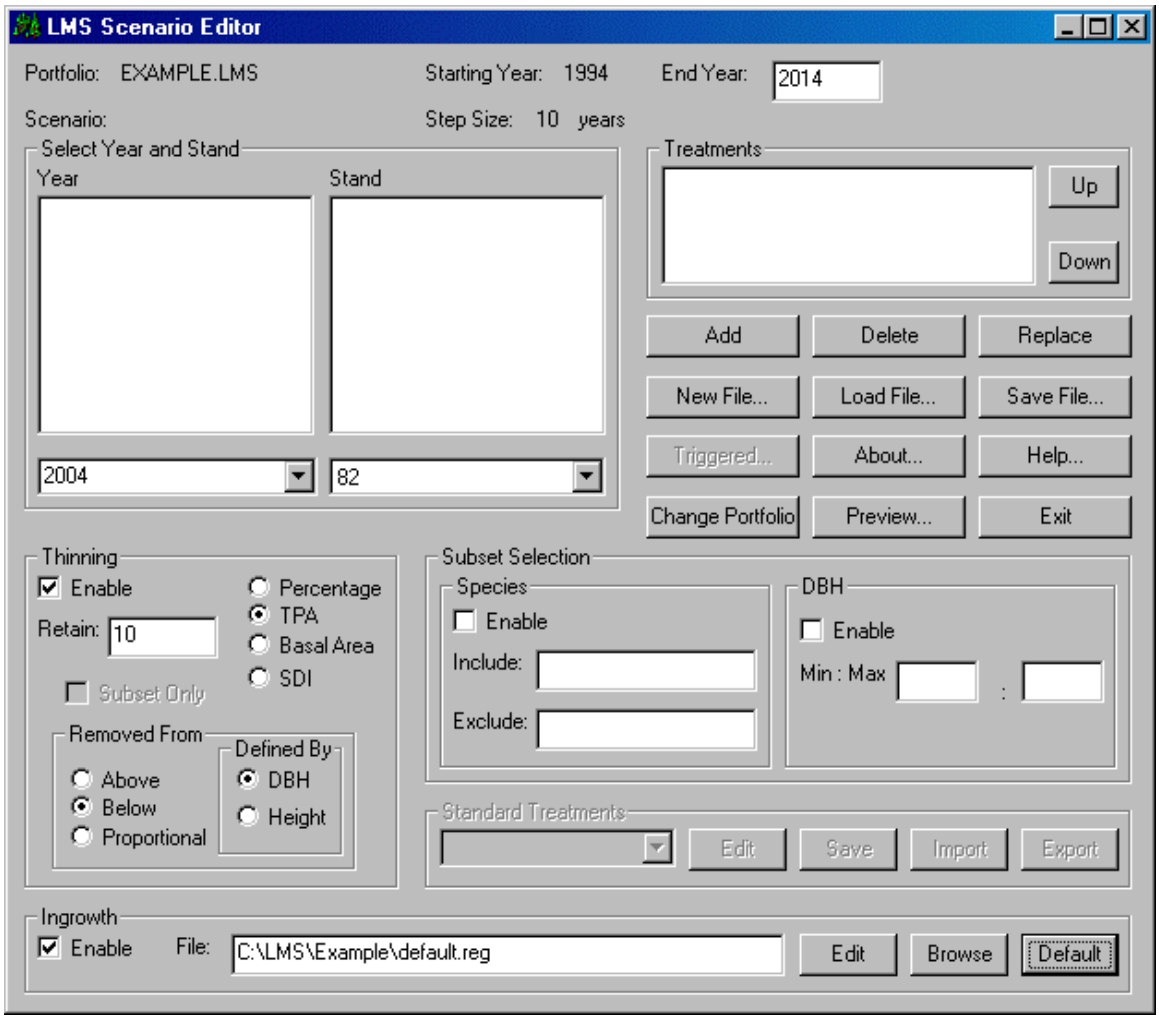


Figure 26. Adding a Treatment

4. Using the year drop box, select 2004.
5. Using the stand drop box, select stand 82.
6. Verify that thinning is enabled (the box in the upper left corner is checked) and set the retain value at 10 TPA.
7. Enable ingrowth by clicking on the box in the upper left corner of the ingrowth section, and press the **Default** button to use the default regeneration file.
8. Press the **Add** button to add the defined treatment to the scenario file.
9. Press the **Preview**button to see the scenario file. The program will prompt to save the file, give it a name and press **OK**. The text editor then opens, it should be similar to Figure 27.

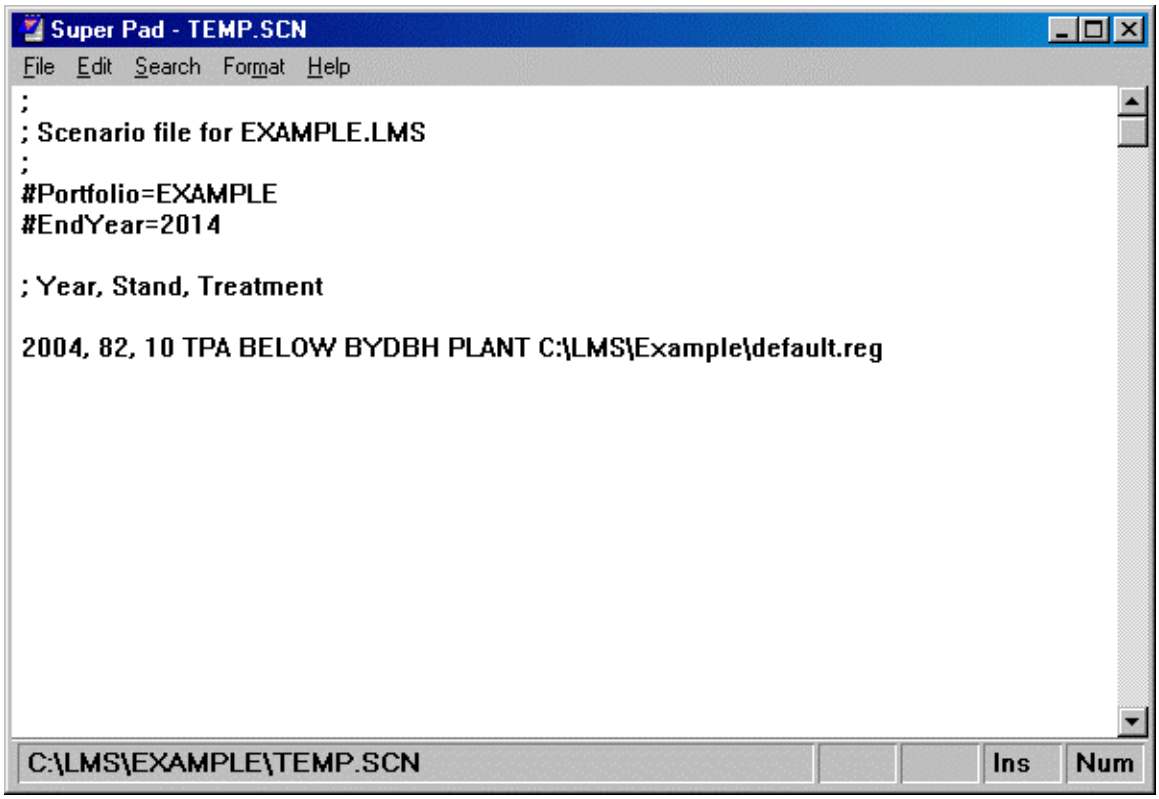


Figure 27. Adding a Treatment Scenario File

Removing a Treatment

It is often necessary to remove a treatment from the scenario file. The **Delete** button is designed for just that task. In this example we will remove a treatment from the `Example.scn`.

1. With LMS running and the Example portfolio open, select the **Scenario|Scenario Editor…** option to load the LMS Scenario Editor.
2. The program will prompt to load an existing scenario file, press **Yes** to open the File dialog box.
3. The `example.scn` file should be available, assuming the default location for the File dialog was correct. If the file is not present, then browse to the directory where the Example portfolio is stored. Select the `example.scn` file and press **OK** to load the file into the Scenario Editor (Figure 28).
4. Select 1994 from the Year list box.
5. Select stand 78 from the Stand list box.

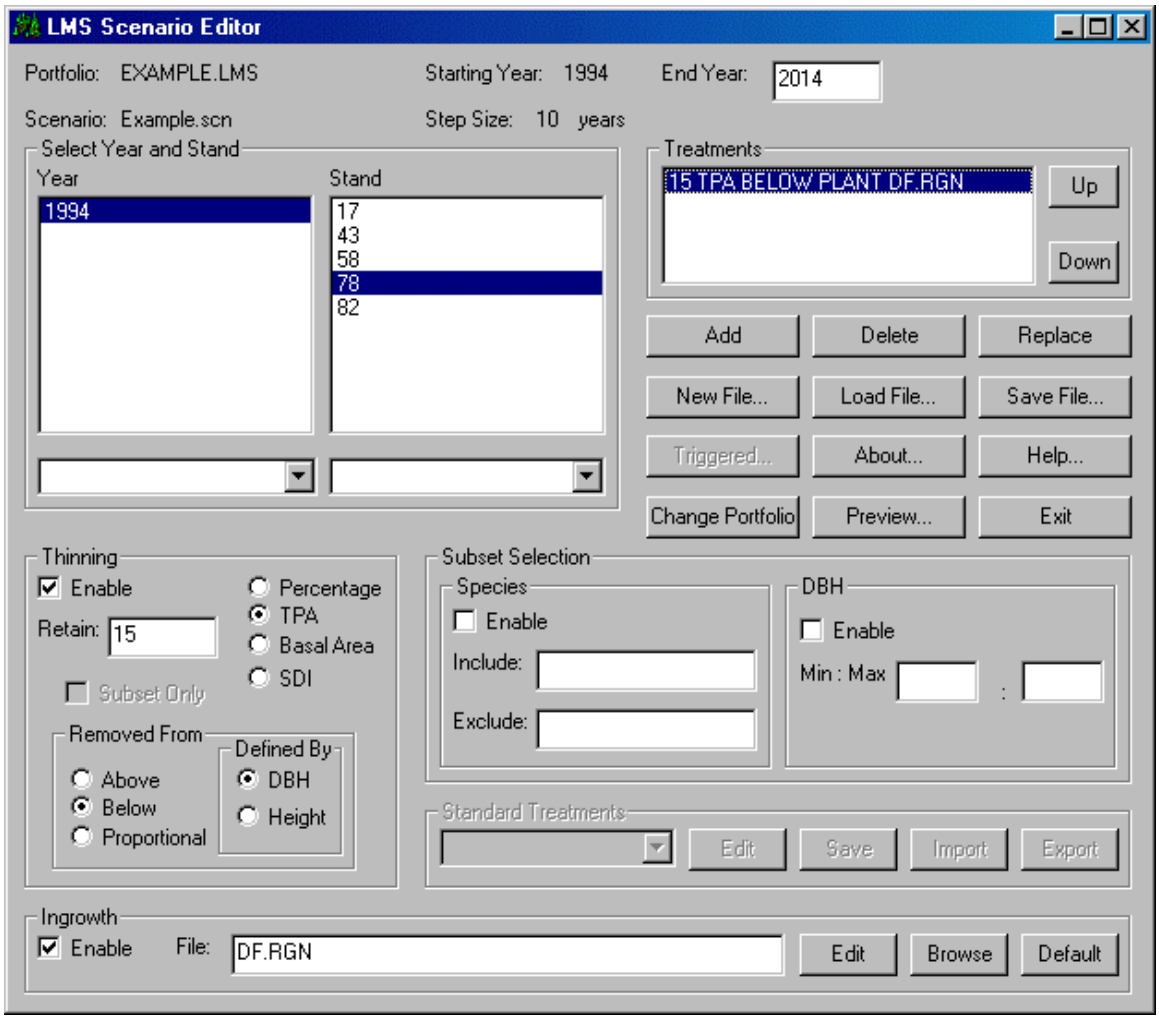


Figure 28. Removing a Treatment.

6. Select the only listed treatment in the Treatment list box.
7. Click on the **Delete** button to remove the treatment. Note that because this is the only treatment for stand 78 in 1994, the stand is removed from the Stand list box.

Replacing a Treatment

When a treatment does not have the desired effect on a stand, it is often easier to change the existing treatment than to delete it and add another. In this example we will replace the second treatment for stand 82 in 1994 with one that removes all but 10% of the Red Alder (RA) and Big Leaf Maple (BM).

1. With LMS running and the Example portfolio open, select the **Scenario|Scenario Editor…** option to load the Scenario Editor.
2. The program will prompt to load an existing scenario file, select **Yes** to open the File dialog.
3. Browse to the directory containing the `Example.scn` file and press **OK** to load the scenario file.
4. Select 1994 from the Year list box (Figure 29).

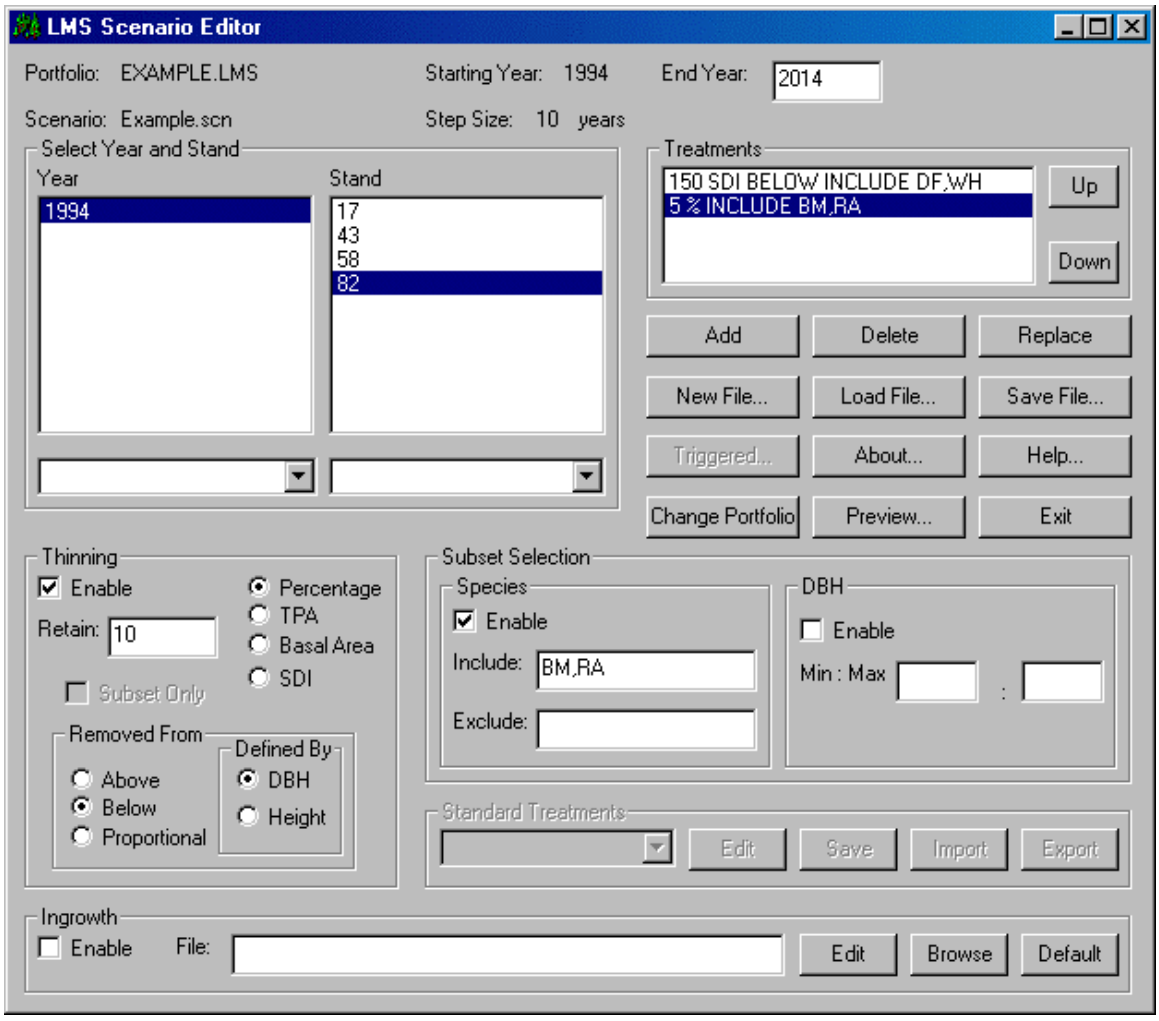


Figure 29. Replacing a Treatment.

5. Select stand 82 from the Stand list box.
6. Select the second treatment from the Treatment list box.
7. Enable the thinning option and set the retain value to 10%.
8. Enable Species Sub-selection and include Red Alder (RA) and Big Leaf Maple (BM).
9. Press the **Replace** button to replace the second treatment with the new one.

Portfolio Editor

The LMS Portfolio Editor is designed to simplify the task of managing portfolios. It allows users to copy stands, remove stands, and edit the files used by the portfolio. In addition to the management of existing portfolios, the editor is used to create new portfolios in LMS.

This section will deal with those functions used for managing existing portfolios. Information about importing new data into LMS is available in the LMS Case Studies document.

Portfolio Editor Window

The Portfolio Editor is a typical Windows program (Figure 30). For general information on how to use these types of programs, see *Appendix A* (page 65).

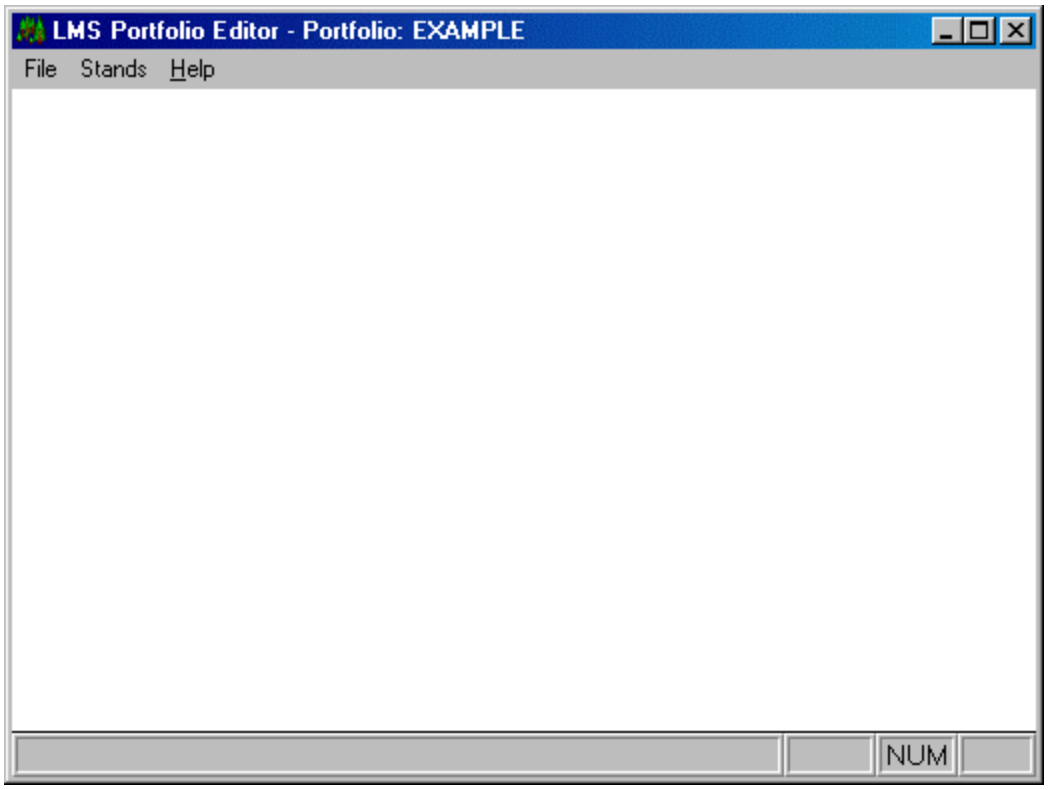


Figure 30. Portfolio Editor Main Window

Changing the Projection Step Size

Time steps for growth projections are defined by the Portfolio Step Size variable. Most growth models are capable of projecting tree data forward using a variety of time steps. For specific information and limitations see the documentation for the growth model being used. In this example we will change the step size of the Example portfolio from 10 to 5 years.

1. With the Example portfolio open, select **File|LMS Portfolio Editor** to open the editor (Figure 30).
2. From the LMS Portfolio Editor's menu select **File|Modify Portfolio…** to access the Modify Portfolio dialog box (Figure 31).

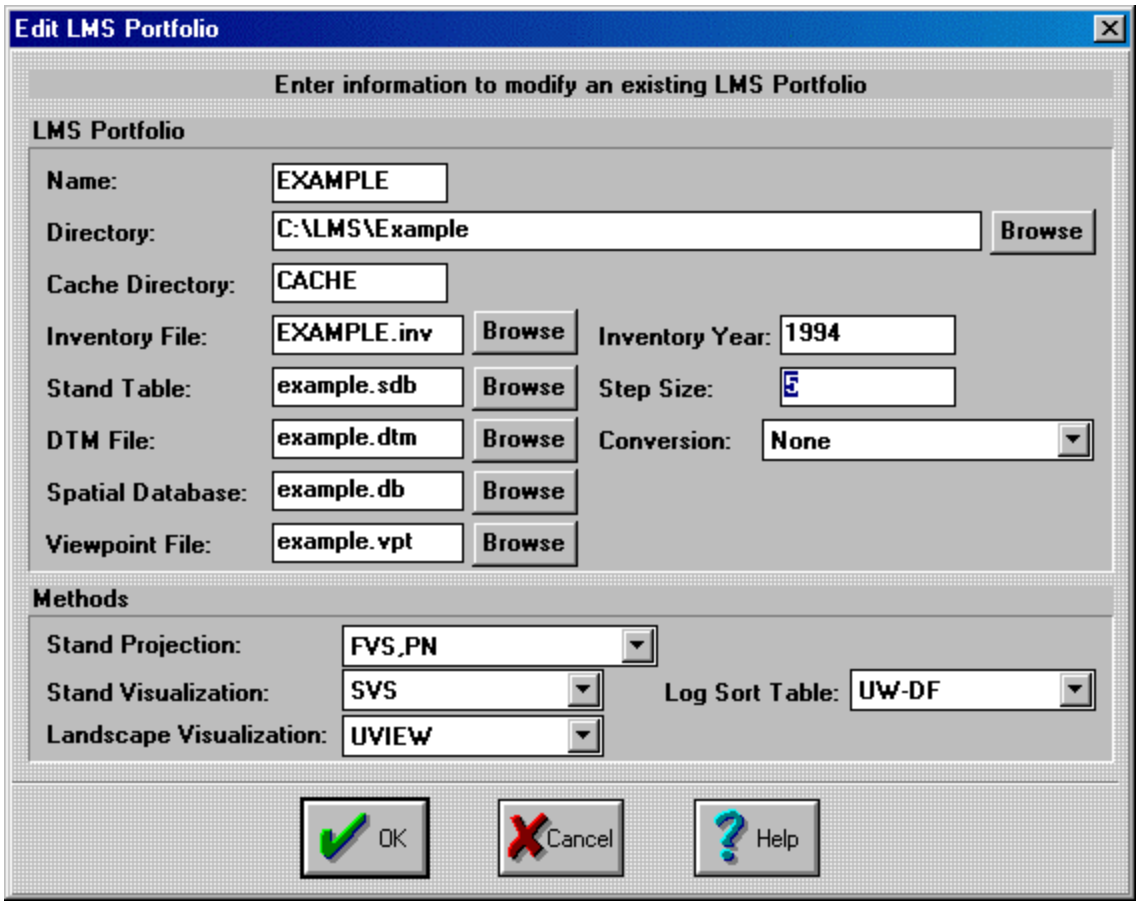


Figure 31. Modify Portfolio Dialog Box.

3. Change the **Step Size** to 5 years and press **OK.**
4. When you exit the editor LMS will reload the portfolio into memory and the step size should change to reflect the new value.

Copying a Portfolio

When complex management plans are being prototyped and analyzed, it is easier to have multiple copies of the same portfolio available for each sequence of scenarios. This allows the projections to be saved and compared to another. In this example we will copy all the Example portfolio file to a new directory and call it Example2.

1. With the Example portfolio open, select **File|LMS Portfolio Editor** to open the Portfolio Editor.
2. From the LMS Portfolio Editor's menu, select **File|Copy Portfolio…** to open the Copy Portfolio dialog box (Figure 32). This dialog has a number of options, allowing some or all of the files in a portfolio to be copied. The choice of which file to copy is dependent on what the objective is.

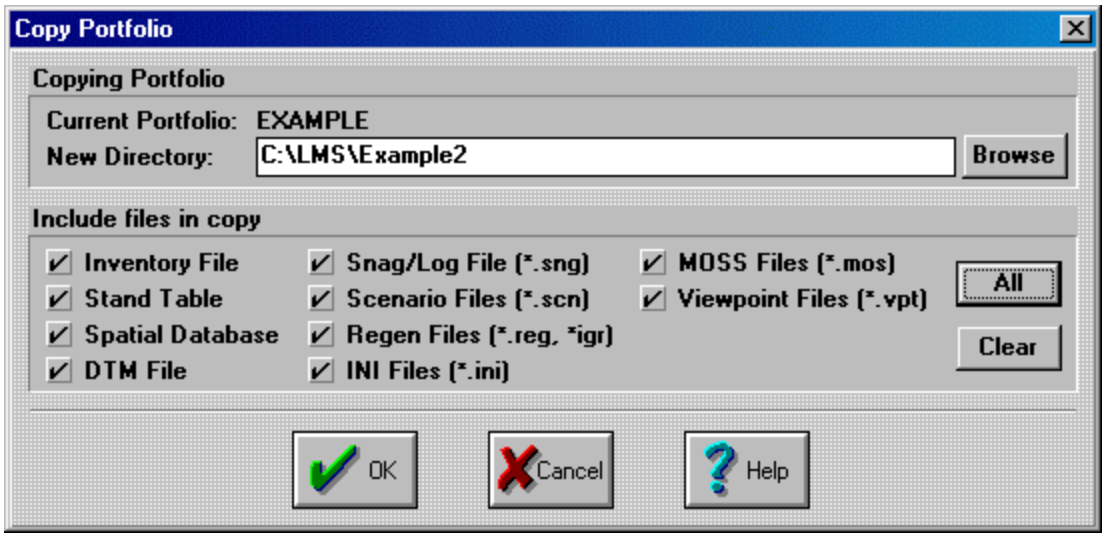


Figure 32. Copy Portfolio Dialog Box.

3. Press the **Browse** button to open the Select Directory dialog box (Figure 33) to choose the directory for the portfolio to be copied. For this example, choose a temporary directory to store the new portfolio as you will probably not use it again.

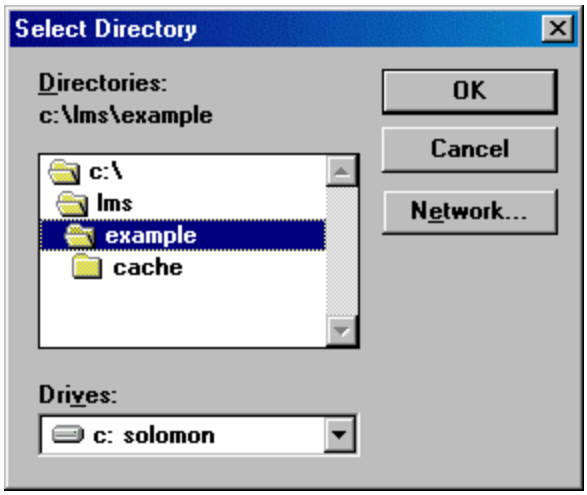


Figure 33. Select Directory Dialog Box.

4. Choose which files should be copied by checking the box next to the type of file. Note that the **All** and **Clear** buttons will either select all or none of the options respectively. Press the **All** button.
5. Once the files have been selected and the directory specified press **OK**. The Portfolio Editor will then copy the specified files to the new directory.

Copying Stands to a New Portfolio

The Copying Stands function allows users to copy specified stands from an existing portfolio to a new one. The stand attribute and inventory information are copied for the stands, providing a way to create portfolios that are subsets of an existing portfolio. This can be used to analyze a set of special stands separately from the rest of the portfolio (reserves for example). In this example we will copy stand 82 of the Example portfolio to a new portfolio.

1. With the Example portfolio open, select **File|LMS Portfolio Editor** to open the editor.
2. From the Portfolio Editor's menu, select **Stand|Copy Stands…** to open the Copy Stand dialog box (Figure 34). This dialog has a list of stands on the left side and a search tool on the right. You can search for stands either based a set of character in the beginning or contained within the stand name. Alternatively you can select a stand that is contained in another file.

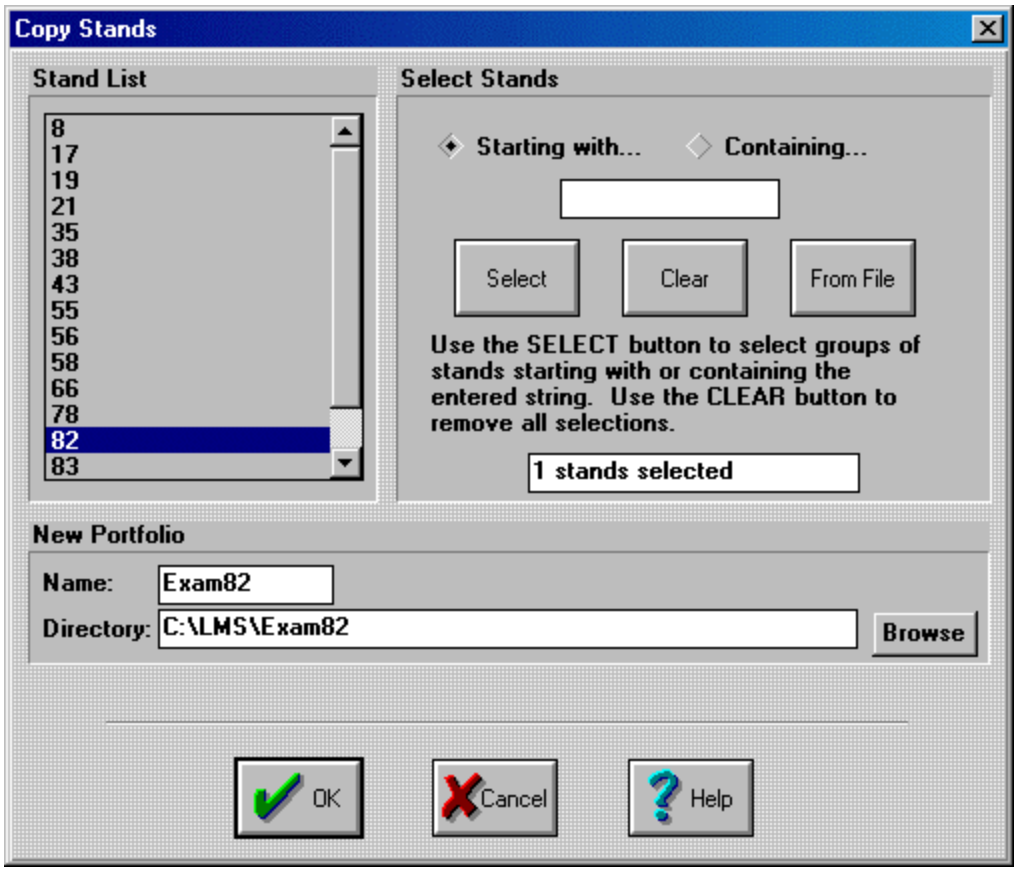


Figure 34. Copy Stand Dialog Box.

3. Select stand 82 from the list of stands on the left (Figure 34).
4. Enter Exam82 for the name of the new portfolio.
5. Select an appropriate directory for the new portfolio.
6. When all the information is entered press **OK**. LMS will now copy the selected stand(s) to the new portfolio.

Making Multiple Copies of a Stand

While prototyping treatments on a set of stands it is easier to run all the treatments at once rather than separately. This requires that a portfolio contain multiple copies of the stands being treated. The Portfolio Editor has a function to perform this task. In this example we will make 2 copies of stand 17 from the Example portfolio.

1. With LMS running and the Example portfolio open, select **File|LMS Portfolio Editor** from the menu to open the editor.
2. From the editor's menu select **Stands|Edit Stands…** to open the Edit Stand dialog box (Figure 35).

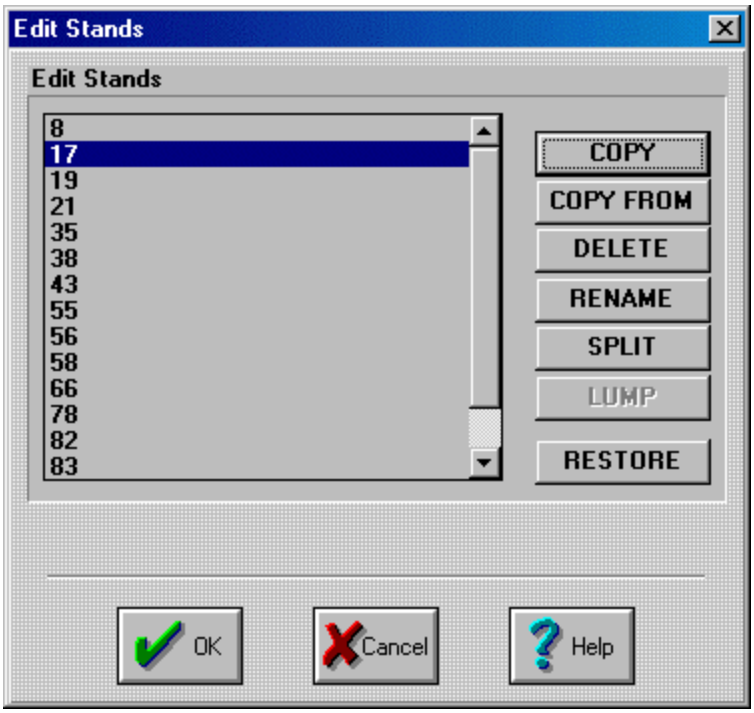


Figure 35. Edit Stand Dialog Box.

3. Select stand 17 from the list box (Figure 35).
4. Press the **Copy** button. This will open the Rename Stand dialog box (Figure 36).

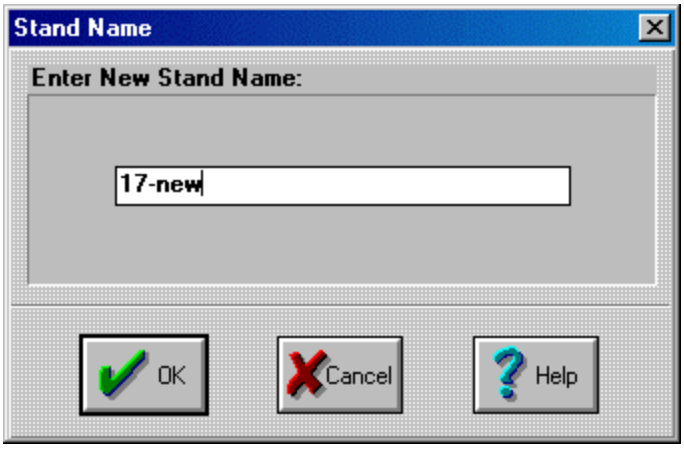


Figure 36. Rename Stand Dialog Box.

5. Enter 17-new as the copied stand's name (Figure 36).
6. When finished press **OK.** The copy of the stand should appear in the list box.

Copying a Stand from another Portfolio

Another useful function is the Copy From function which is part of the Edit Stand dialog box. This function allows users to combine two portfolios or to copy a stand from another portfolio.

1. With the Portfolio Editor running and the Example portfolio select **Stands|Edit Stands…** to open the Edit Stand dialog box (Figure 35).
2. Press the **Copy From…** button to open the Copy From dialog box ().

3. In this dialog you must browse to the portfolio you wish to copy a stand from. This portfolio can be located anywhere on the current computer. Press the **Browse** button to access the File Open dialog (page 67).

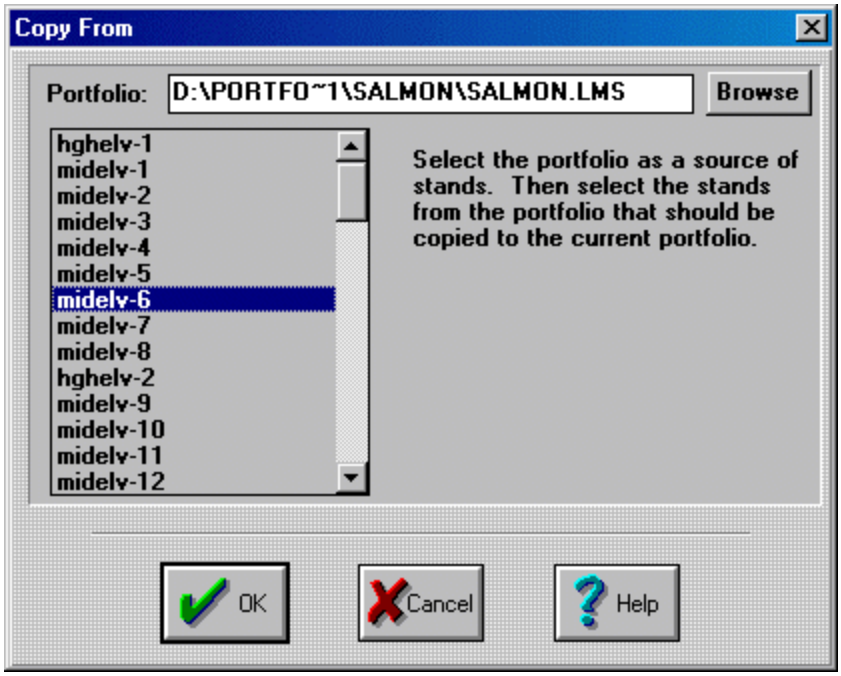


Figure 37. Copy From Dialog Box.

4. When you have chosen a portfolio the stands in that portfolio will appear in the list box. Chose which stand to copy and press **OK.**
5. The stand will be copied to the current portfolio.

Deleting Stands from a Portfolio

Any projection of a landscape requires that every stand in the landscape be "grown." In large portfolios this can take a long time. To limit this time it is useful to eliminate those stands that are not going to be part of the analysis from the portfolio. The Delete function in the LMS Portfolio Editor removes unwanted stands. Stands can be deleted and then restored at a later date to the portfolio. In this example we will delete stand 43 from the Example portfolio.

1. With the Portfolio Editor running and the Example portfolio open, select **Stands|Edit Stands…** from the menu to open the Edit Stand dialog box (Figure 35).
2. Select stand 43 from the list box (Figure 38).

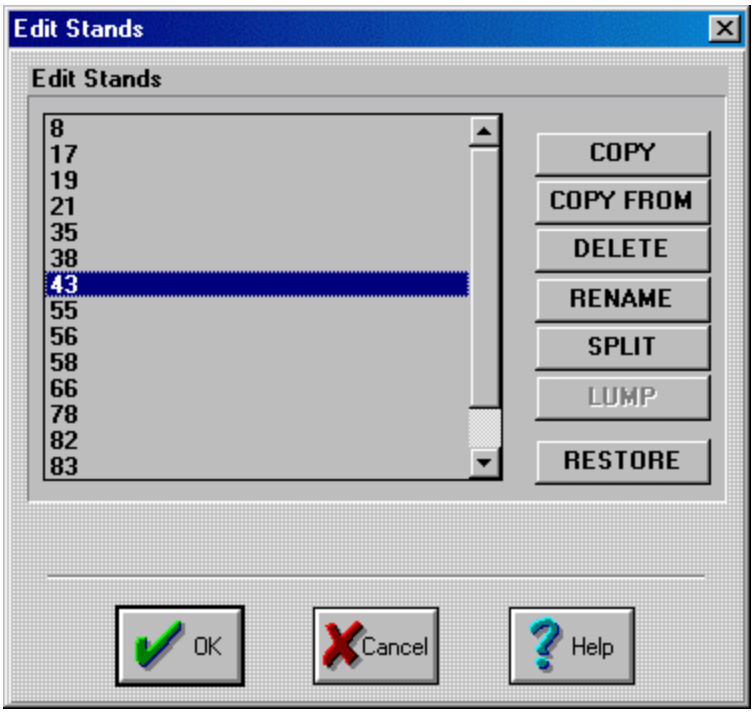


Figure 38. Deleting a stand.

3. Press the **Delete** button.

Renaming Stands in a Portfolio

To change the name of stand in LMS use the Rename function in the LMS Portfolio Editor. Note that if the spatial information is not updated to reflect the name change, the renamed stand will NOT appear in Landscape Visualizations. See the *LMS Case Studies* for information on importing spatial information into LMS. In this example we will rename stand 8 to stand 888 (and then rename it back to 8 to eliminate any problems with Landscape Visualization).

1. With the Portfolio Editor running and the Example portfolio open, select **Stands|Edit Stands…** from the menu to open the Edit Stand dialog box (Figure 35).
2. Select stand 8 from the list box (Figure 39).

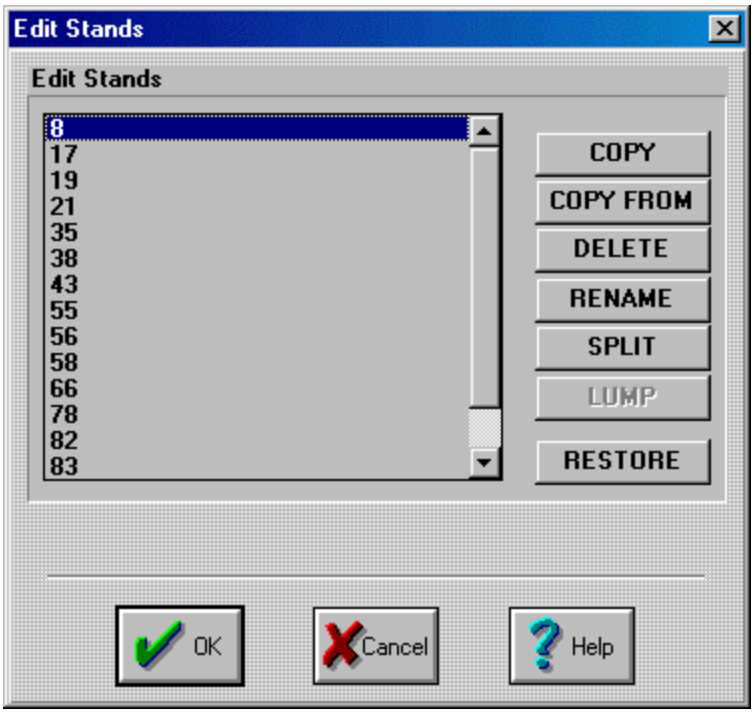


Figure 39. Renaming a stand.

3. Press the **Rename** button to open the Rename Stand dialog box (Figure 36).
4. Enter 888 as the new name for stand 8.
5. Press **OK**.
6. The list box will be updated to reflect this name change. Remember to change the stand name back to 8 to eliminate any problems performing visualizations.

Splitting Stands

It may be necessary to split the stand inventory and stand attribute information for riparian reserves. The Portfolio Editor's Split function allows users to specify the area they wish to split from the original stand into a new one. The stand attribute information is copied directly to the new stand. In this example we will split stand 17 into a 20 acre piece and a 6 acre piece. Note that the stand that is split from the original will not be shown in a Landscape Visualization. To split a stand and have it appear in landscape visualizations the original GIS coverages must be modified and re-imported into LMS.

1. With the Portfolio Editor running and the Example portfolio open, select **Stand|Edit Stands…** from the menu to open the Edit Stand dialog box (Figure 35).
2. Select stand 17 from the list box and press the **Split** button to open the Split Stand dialog box (Figure 40).
3. Rename the stand you wish to split from the original and define its acreage (Figure 40).

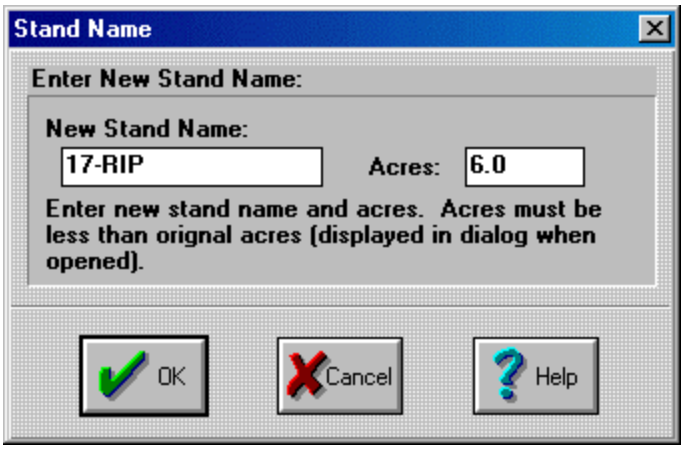


Figure 40. Split Stand Dialog Box.

4. Press **OK**.

Restoring the Portfolio to its Original State

After modifying the stand included in a portfolio it is easy to restore the portfolio to its original state by using the Restore function.

1. With the Portfolio Editor running and the Example portfolio open, select **Stands|Edit Stands…** from the menu to open the Edit Stand dialog box (Figure 35).
2. Press the **Restore** button.

Reconstructing an Inventory File

When the only inventory information available for a landscape is tree species and diameter it is possible to reconstruct the height, crown ratio, and volume values. This is done when importing data into LMS or when the inventory file has been modified. The Reconstruct Inventory function is explained in the LMS Case Studies document.

Advanced Topics

This section deals with configuring LMS, the formats of the various LMS files, and information about using scenarios to manage landscapes.

Configuring the Landscape Management System

Many of the default behaviors in LMS can be modified from the LMS Configuration dialog box (Figure 41). Each of the configurable options will be discussed separately.

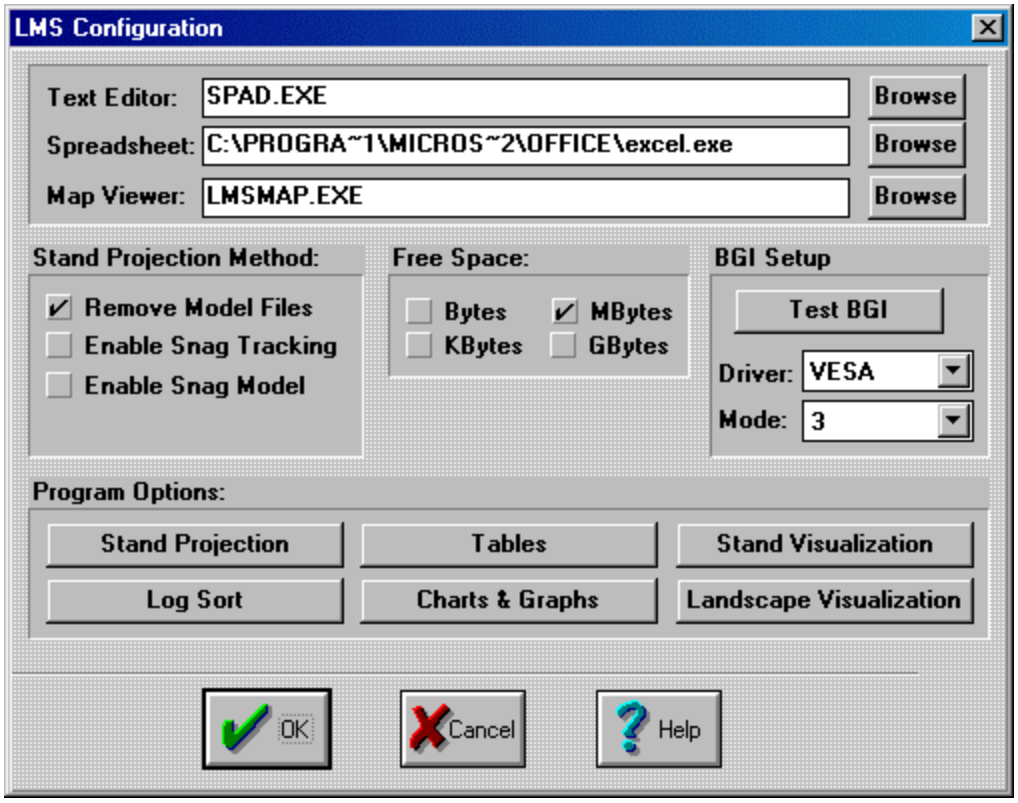


Figure 41. Configuration Dialog Box.

Changing the Default Text Editor

LMS by default uses the Super Pad Text editor to edit or examine ASCII files. This can be changed to any other text editor that accepts a filename on the command line (e.g. WordPad, or NotePad).

1. With LMS running, select **Options|LMS Configuration…** to open the LMS Configuration dialog box (Figure 41).
2. Press the **Browse** button to the right of the Text Editor edit box to access the File Open dialog box (page 67).
3. Find the text editor that you wish to use for editing ASCII file in LMS.
4. Press **OK** on the Configuration dialog. This will open the Configuration Update dialog box (Figure 42).

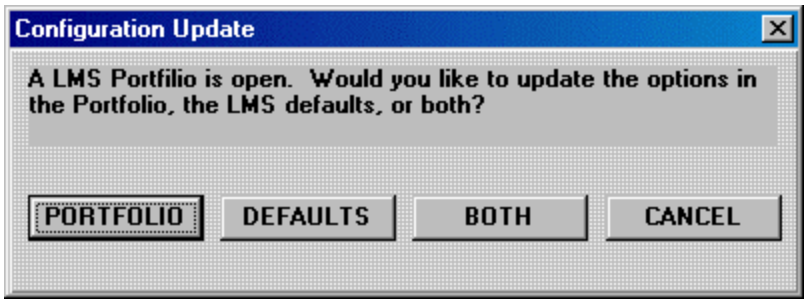


Figure 42. Configuration Update Dialog Box.

5. The Configuration Update dialog box allows users to specify where they want the changes in configuration to be stored. Portfolio will only affect the current portfolio. Defaults will change the LMS configuration file, affecting all portfolios. Both will change both

Changing the Default Spreadsheet and Map Viewer

These two programs can be changed in the same method as the default text editor.

Displaying Snags and Logs in Visualizations

It is possible to show those trees which died in the previous projection in the visualizations. These snags and logs will not remain on the landscape in the future unless the Snag Model is also enabled (the next option).

1. With LMS running, select **Options|LMS Configuration…** from the menu to open the LMS Configuration dialog box (Figure 41).
2. Check the box beside the **Enable Snag Tracking** option.
3. Press **OK** and choose where to update the configuration.

Enabling the Snag Model

LMS includes a model to model the presence of snags and downed logs on the landscape. It is not necessary to have current information on snags or logs, but some tables included with LMS will not work correctly without that information. For information on how the snag model functions, or how to modify its behavior see the *Snag Model Documentation* (page 71).

1. With LMS running, select **Options|LMS Configuration…** from the menu to open the LMS Configuration dialog box (Figure 41).
2. Check the box beside the **Enable Snag Model** option.
3. Press **OK** and choose where to update the configuration.

Note: The snag model will start operating during the next stand or landscape projection, any projections previously performed will not be updated.

Changing the Visualization Display Options

Normally the display options supplied with LMS are sufficient for performing visualizations. These values should only be changed when trees are drawn in unrealistic colors when using SVS, or to increase/decrease the screen resolution. For an explanation of what the different modes are for each driver, see the *UVIEW Documentation* (page 87).

1. With LMS running, select **Options|LMS Configuration…** from the menu to open the LMS Configuration dialog box (Figure 41).

2. Press the down arrow next to the **Driver** option to change the BGI driver being used by LMS.
3. Press the down arrow next to the **Mode** option to change the driver mode being used by LMS.
4. Press the **Test BGI** button to test the selected mode and driver are valid.
5. When finished press **OK** and choose where to make the configuration changes.

Changing the Way Projections are Performed

The units used when performing projections, and often the behavior of the growth model can be modified in LMS.

Changing the Units of Volume Used when Projecting

The volume in LMS can be in either Board Feet, Cubic Feet, or Merchantable Cubic Feet. The default is to use Board Feet.

1. With LMS running, select **Options|LMS Configuration…** from the menu to open the Configuration dialog box (Figure 41).
2. Press the **Stand Projection** button to open the Stand Projection Configuration dialog box (Figure 43).

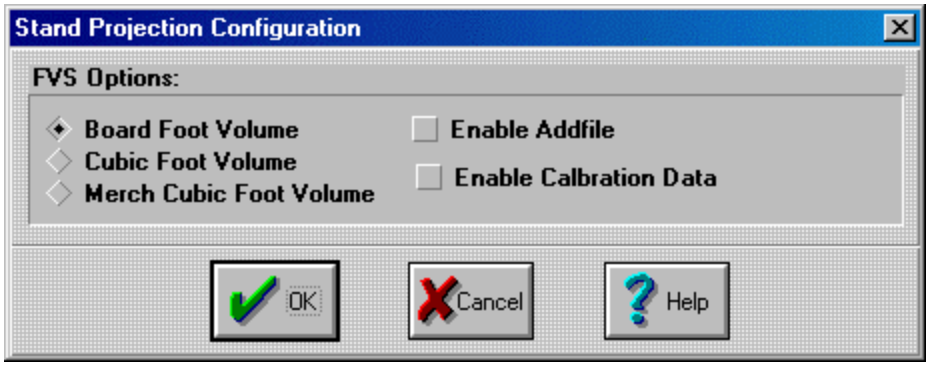


Figure 43. Stand Projection Configuration Dialog Box.

3. Choose what units you want the volume to be in.
4. Press **OK**.

Note: Not every growth model can support the different volume units. For information on whether the growth model you are using supports different volume units, see the model's documentation. Also, changing the units used for projection does not change the units of any projection already performed.

Using FVS Keyfiles in LMS

LMS has the ability to use the FVS keywords and keyfiles to modify the behavior of the FVS growth model. An explanation of the available keywords and how to implement them in a keyfile can be found in the FVS model documentation. These keywords can be included in the `<portfolio_name>.key` file in the portfolios directory. This file may not exist and may have to be created.

1. With LMS running, select **Options|LMS Configuration…** from the menu to open the Configuration dialog box (Figure 41).
2. Press the **Stand Projection** button to open the Stand Projection Configuration dialog box (Figure 43).

3. Check the box next to the **Enable Addfile** option to cause LMS to read the `<portfolio_name>.key` when performing projections.

Note: The keyfiles are used only by FVS, they will not work with any other growth model. Like all other configuration changes, any changes made will not affect any projection performed prior to the configuration change.

Changing the way Logs are Bucked

The LMS bucking algorithm bucks trees into logs and assigns a grade to the resulting log. The length, top diameter, and other variables used can be updated in LMS. Any of the parameters can be changed using the same method. For that reason only one parameter will be changed in this example. For further information on how these parameters are used by the algorithm see the *LMS LOGVAL Documentation* (page).

1. With LMS running, select **Options|LMS Configuration…** from the menu to open the Configuration dialog box (Figure 41).
2. Press the **Log Sort** button to open the LOGVAL Configuration dialog box (Figure 44).

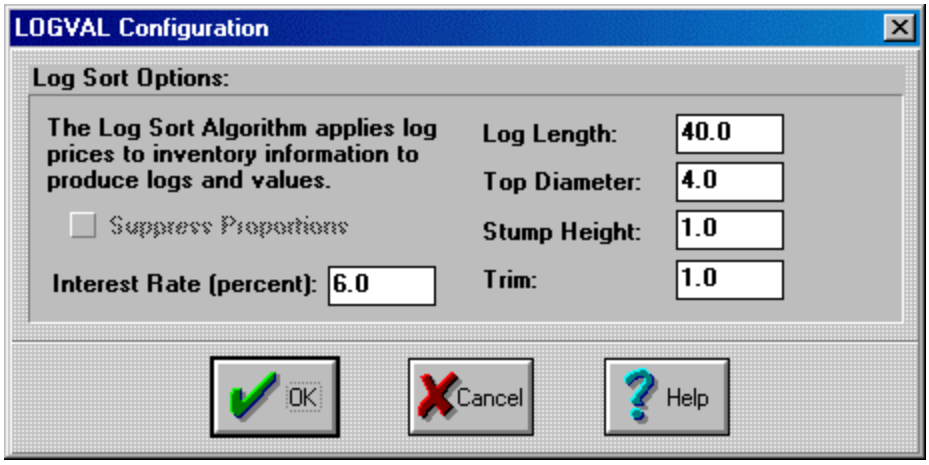


Figure 44. LOGVAL Configuration Dialog Box.

3. Change the desired parameters and press **OK**.
4. Press **OK** on the Configuration dialog box and choose where you want to update the configuration.

Adding Tree Record Numbers to Table Outputs

In order to track a tree through time it is possible to add a record number to the table outputs. These record numbers will remain the same for the record through all time periods. This also makes it possible to track which tree certain logs were cut from when they are bucked using the bucking algorithm.

1. With LMS running, select **Options|LMS Configuration…** from the menu to open the Configuration dialog box (Figure 41).
2. Press the **Tables** button to open the Table Configuration dialog box (Figure 45).

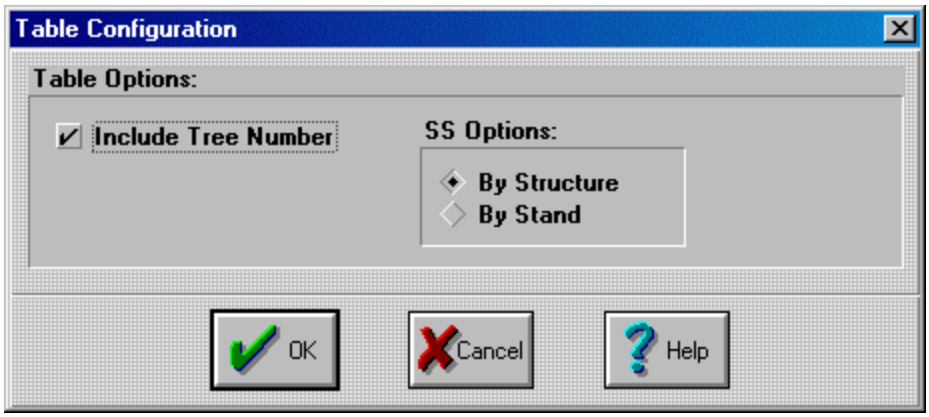


Figure 45. Table Configuration Dialog Box.

3. Enable the record number addition by checking the box next to the **Include Tree Number** option.
4. Press **OK**.
5. When finished making configuration changes press **OK** and choose where you wish to save the configuration changes.

Note: Unlike many other functions, it is not necessary to re-project the landscape in order to make this change, it will happen immediately.

Changing How Stand Structure Classification Summarizations are Performed

When a stand structural classification is performed in LMS using the Windows 3.1x classifications there are two options for how the information will be summarized. The first, and default, is to summarize by stand structure. In this type of summarization the total acreage that each stand structure covers on the landscape is output for each year. The second type of summarization is by stand. Here each stand and its current structure are output to the table for each year.

1. With LMS running, select **Options|LMS Configuration…** from the menu to open the LMS Configuration dialog box (Figure 41).
2. Press the **Tables** button to open the Tables Configuration dialog box (Figure 45).
3. Change the type of summarization used by selecting the desired type from the **SS Options** area of the dialog box (Figure 46).

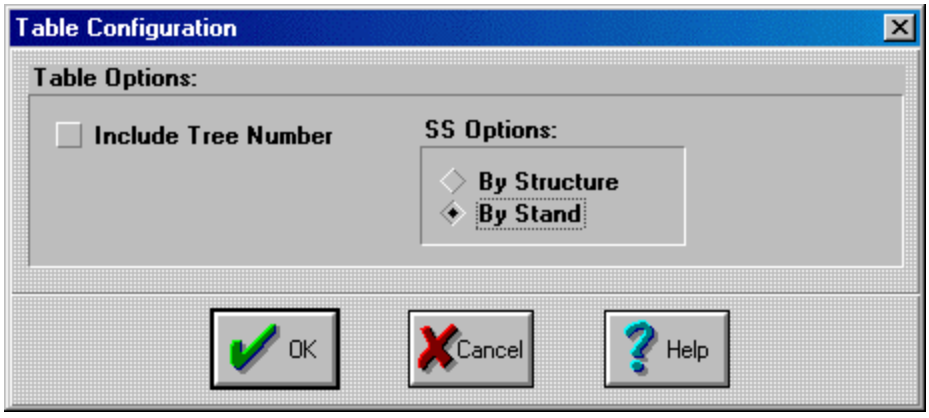


Figure 46. Changing the Summarization Method.

4. Press **OK** to exit the dialog box.
5. If there are no other configuration changes you want to make, select **OK** from the Configuration dialog box as well.

Why the Charts & Graphs Configuration Button does not Work

This option is disabled in the LMS Configuration dialog. There are no options available at this time.

Including Range Poles in Stand Visualizations

When viewing a stand visualization it is difficult to determine the appropriate scale of the image because there are no objects of reference. Adding range poles in the visualization is one remedy. The poles can be set to any height and will appear at the four corners of the visualization. In this example we will add poles that are 75 feet in height and visualize stand 82 from the Example portfolio.

1. With LMS running and the Example portfolio open, select **Options|LMS Configuration…** to open the LMS Configuration dialog box (Figure 41).
2. Press the **Stand Visualization** button to open the Stand Visualization Configuration dialog box (Figure 47).

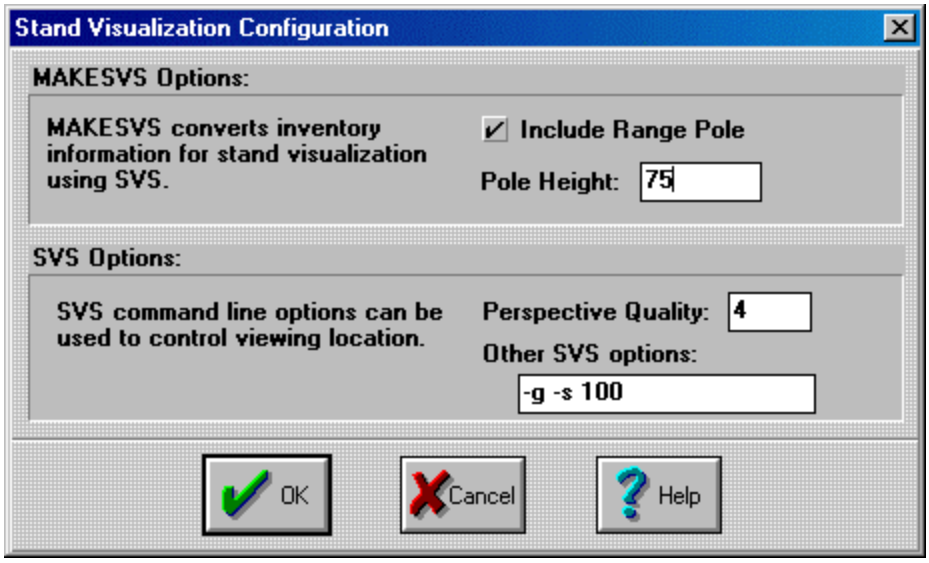


Figure 47. Stand Visualization Configuration Dialog Box.

3. Enable the range pole option by checking the box next to **Include Range Pole**.
4. Change the **Pole Height** to 75 feet.
5. Press **OK** to exit the dialog box.
6. If there are no other configuration changes, press **OK** and choose where you wish the changes to be made. If you perform a visualization on stand 82 the range poles should now be present (Figure 48).

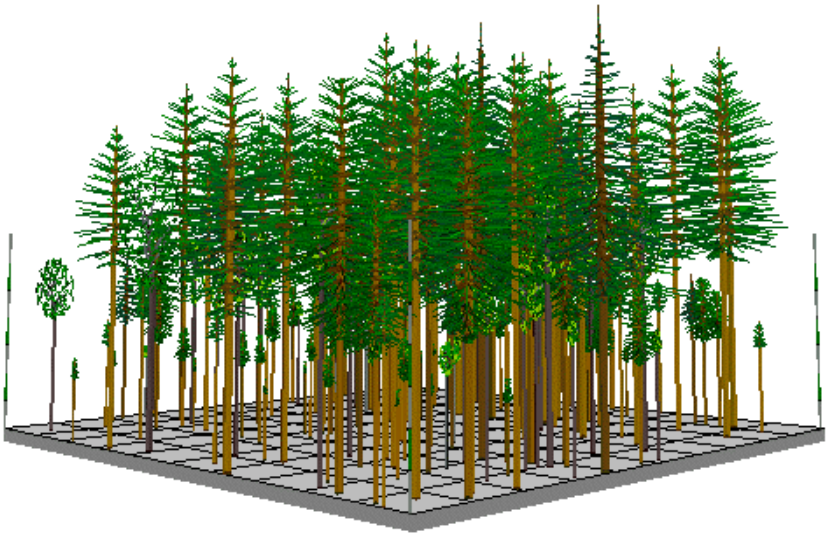


Figure 48. Stand Visualizations With Range Poles.

Changing The Look Of Stand Visualizations

Many of the options used in generating the stand visualizations can be changed. This includes items like the viewing angle for the perspective view among others. The full list of options that can be sent to either SVS or WinSVS can be found in the *LMS Help File*.

1. With LMS running, select **Options|LMS Configuration…** to open the LMS Configuration dialog box (Figure 41).
2. Press the **Stand Visualization** button to open the Stand Visualization Configuration dialog box (Figure 47).
3. Change the desired settings and flags in the **SVS Options** section.
4. Press **OK** to exit the dialog box.
5. If there are no other configuration changes to be made press **OK** and choose where to save the changes.

Defining a New Viewpoint in UVIEW

The viewpoint used to create the default Landscape Visualization can be set. This allows the exact same point to be used for visualization each time it is performed. In this example we will create a new viewpoint for the Example portfolio.

1. With LMS running and the Example portfolio open, select **View|Landscape…** to create the Landscape Visualization.
2. Adjust the view to the desired point. See the *UVIEW Documentation* (page 87) for instructions on how to change the view.
3. Once the desired view is set, press the **Save Script** button When the confirmation dialog box appears, press **Save Script** again.
4. Select a filename for the script and press the Enter key. Press **OK**.
5. The file will be saved into the LMS Directory. Copy the file into your Portfolio Directory and rename it to `<portfolio>.vpt`.
6. Open the renamed file in a text editor (Figure 49).

```
;Script file for UVIEW
;Created using the "Save script" command
;Created: Wed Jun 02 19:54:38 1999

#DTMFILE C:\LMS\EXAMPLE\example.dtm
#DBFILE C:\LMS\EXAMPLE\EXAMPLE.DB
#STRUCTURE2 2 C:\LMS\EXAMPLE\CACHE\1994\ALL1994
#LENS 50.000000
#VERTSCALE 1.000000
#QUALITY 8
       1  553321.12 5189286.39    1659.00  555351.63 5188088.31    1165.12
```

Figure 49. Script File from UVIEW.

7. Delete every line except the last one. Save the changes to the file.
8. Edit the portfolio settings to include the new viewpoint file, see *Using the Portfolio Editor* (page 38).

Removing the Cache

This function is similar to flushing the cache (page 11) but instead of just deleting the projections, this function deletes the entire cache directory. Typically this function is used when you want to backup a portfolio for storage and you don't want to have to waste the extra space associated with the projection files.

1. With LMS running and the Example portfolio open, select **Utility|Remove Cache…** to remove the cache.
2. LMS will display a dialog box asking if you are absolutely sure. If you are press **OK**. LMS will remove the cache and close the portfolio

Capturing Images from Visualizations

The images created when performing Landscape and Stand Visualizations can be saved to a file for later editing or import into a document or presentation. UVIEW and the DOS version of SVS have identical methods for saving the images, while the Windows version of SVS is slightly different.

Saving Images Using SVS and Uview

In this example we will save a Landscape Visualization of the Example portfolio in 1994 to the LMS program directory.

1. Create a Landscape Visualization (page 28).
2. When you have the image manipulated to the desired view (see the *Uview* or *SVS Documentation* for further instruction on doing this) hold the "Ctrl" key and press the "Backspace" key. This will open the Screen Capture dialog box in either program.
3. Select to save the file as a `.PCX` file. Experience has shown that the `.PCX` format is the simplest to use.
4. Enter `testimg` as the file you want to create. In the future you can also specify the drive and directory you wish to save the file by using a DOS style command line (i.e. `C:\Temp\Donttch.pcx` would save the file to drive C: in the Temp directory and name it `Donttch.pcx`). If you do not specify a drive and directory then the file will be saved to the LMS program directory.
5. Press **OK** to save the image.

Saving Images using WinSVS

In this example we will save a Stand Visualization image of stand 82 of the Example portfolio as 800x600 `.PCX` file.

1. Create a stand visualization (page 24) using WinSVS of stand 82.
2. Select **File|Save image as…** to open the WinSVS Save Image dialog box (Figure 50).

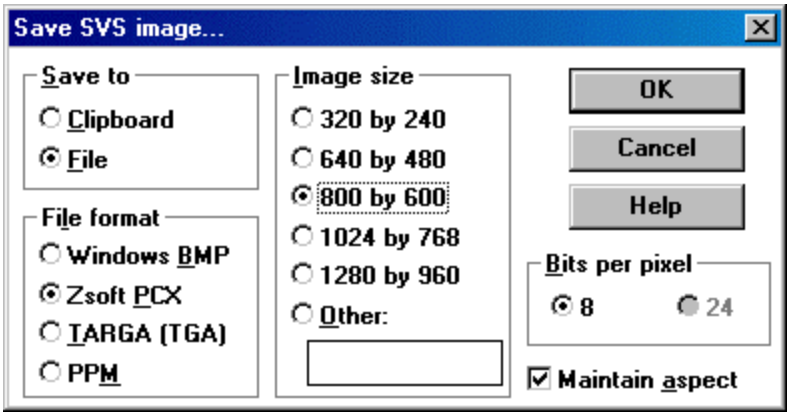


Figure 50. WinSVS Save Image Dialog Box.

3. Select the "Save to" **File** option. Choosing to the clipboard will allow you to paste the image directly into a document or graphics editing program. Choosing to a file will save it to the disk.
4. Select the **Zsoft PCX** file format.
5. Choose a **800 by 600** image size.
6. Press **OK** to open the File dialog box (page 67).
7. Choose a name and directory to save the image and press **OK** when done to save the image.

LMS File Formats

Most of the files used by LMS are in an ASCII format, so are editable by the user. This section describes the format of the commonly edited files. There are a few files that are not described here, they are however described in the LMS Programmer's Guide. For examples of how to get raw inventory data into these formats see the LMS Case Studies document. In all of these files, comments are specified using a ";" in front of the line in question.

Portfolio Files (.LMS)*

The portfolio file contains information on all the files and options that are part of the portfolio. The format is show below.

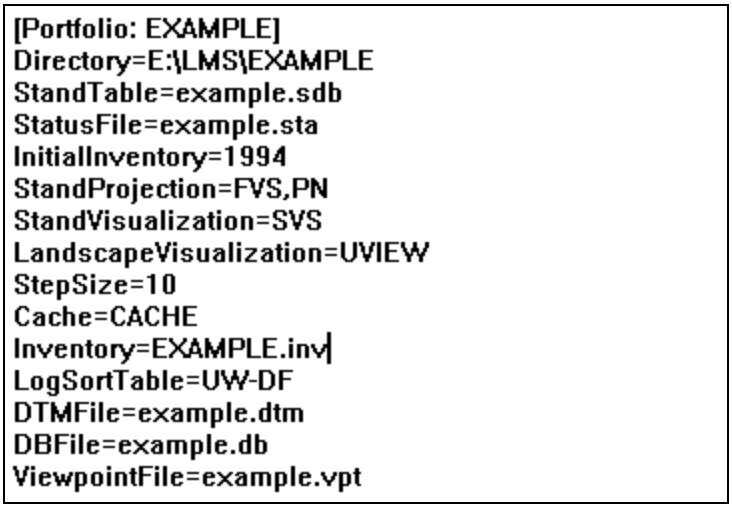


Figure 51. Portfolio File

The lines in this file specify:

Directory	- the portfolio directory where all the files are stored.
StandTable	- the Stand Database File (see below).
StatusFile	- the Status File (see LMS Programmers Guide).
InitialInventory	- the first year of the inventory information.
StandProjection	- the growth model being used in the portfolio.
StandVisualization	- the stand visualization method.
LandscapeVisualization	- the landscape visualization method.
StepSize	- the number of years between projection steps.
Cache	- the directory where the cache is stored.
Inventory	- the Inventory File (see below).
LogSortTable	- the table being used for sorting logs.
DTMFile	- the digital terrain model (see LMS Case Studies).
DBFile	- the paradox spatial database (see LMS Case Studies).
ViewpointFile	- the viewpoint for landscape visualization.
UW-DF	- the University of Washington Douglas-fir log sort table.
FVS,PN	- Forest Vegetation Simulator, Pacific Northwest variant.
SVS	- Stand Visualization System.
UVIEW	- Landscape visualization tool.

Stand Database Files (.SDB)*

Stand database files contain the static inventory information in an ASCII format. The format of this file is shown below.

```
;stand plots loc- site  hab-  age slope aspect eleva- lati- acres
;           ation index itat                    tion   tude
  8       1    0   105.   0    59.   18.0  135.0   897.   0     93.
 17       1    0   120.   0     4.   45.0  135.0   900.   0     26.
 19       1    0   100.   0     4.   45.0  135.0   900.   0      5.
 21       1    0   100.   0    18.   15.0  225.0  1006.   0     15.
 35       1    0   107.   0    15.    5.0  360.0  1090.   0     11.
 38       1    0   100.   0    19.   45.0  270.0  1320.   0     31.
 43       1    0   107.   0    15.   22.0   90.0  1255.   0     75.
 55       1    0   100.   0    19.   65.0  225.0  1340.   0      6.
 56       1    0   100.   0    19.   48.0  135.0  1481.   0     17
 58       1    0   100.   0    15.   25.0  180.0  1255.   0      5.
 66       1    0   107.   0    15.   12.0   45.0  1245.   0     41
 78       1    0   105.   0    64.   23.0  225.0  1476.   0     80.
 82       1    0   120.   0    64.   22.0   45.0  1336.   0     53.
 83       1    0   105.   0    64.   15.0  360.0  1450.   0      6.
 95       1    0   120.   0    64.   25.0  180.0  1470.   0     25.
 98       1    0   120.   0    64.   15.0  360.0  1370.   0     10.
```

Figure 52. Stand Database File.

The Stand Database file consists of 11 columns of data. The first column is the LMS stand name, corresponding the stand elsewhere in the program. The second is the number of plots taken to gather the inventory information for the stand. This information is for users only, it is not used by LMS. The third column is the location of the stand, corresponding to the location codes used by FVS. The fourth column is the site index. This column can either be a numeric value or an "*" which specifies that the site index values are being stored in an alternative file. The fifth column is the habitat code, again a FVS code. The sixth is the age of stand at the initial inventory (beginning) year. The seventh, eighth, and ninth columns are the stands slope, aspect, and elevation respectively. The tenth column is the latitidude of the stand which is used by some growth models to calibrate the simulations. The final column is the stand's acreage.

Site Index File (.SI)*

Several of the growth models used by LMS (including FVS and Organon) can use species specific site index values. LMS incorporates this functionality by using a separate file to list each stand's specific site index values. An example of this file is shown below:

```
;Site Index file for Example Portfolio
8,  DF, 114.
82, DF, 120.
82, WH, 100.
82, RA,  59.
98, DF, 115.
```

Figure 53. Site Index File.

This file has three columns. The first is the stand, the second the species, and the final column is the site index value. The naming convention used is <portfolio>.si and the file is used automatically whenever it is present in the Portfolio Directory. If there is not a value defined in this file for a species, or a stand, then the default value listed in the Stand Database File will be used.

Inventory Files (.INV)*

The dynamic inventory information for LMS portfolios is stored in an ASCII file. An example of this file is shown below.

```
polygon=8
1, DF,  10.10,  73.0,  0.350,  2.50, 77.60
2, DF,  10.10,  73.0,  0.350,  2.50, 77.60
3, DF,  11.20,  81.0,  0.450,  2.50, 99.02
4, DF,  11.50,  83.0,  0.450,  2.50, 100.41
5, DF,  12.00,  87.0,  0.450,  2.50, 127.36
6, DF,  13.30, 111.0,  0.450,  2.50, 204.65
7, DF,  13.90,  99.0,  0.450,  2.50, 186.82
8, DF,  14.00,  99.0,  0.450,  2.50, 186.93
9, DF,  14.70, 100.0,  0.450,  2.50, 215.02
...
polygon=17
1, DF,   1.0,    8.5,  0.900, 45.00, 000.00
2, DF,   1.2,    9.0,  0.850, 50.00, 000.00
3, DF,   1.4,    9.5,  0.800, 50.00, 000.00
4, DF,   1.6,   10.0,  0.800, 40.00, 000.00
5, DF,   0.8,    8.0,  0.850, 40.00, 000.00
6, WH,   1.0,    8.5,  0.850, 15.00, 000.00
7, WH,   1.5,    9.0,  0.800, 15.00, 000.00
8, RC,   1.0,    7.5,  0.900, 20.00, 000.00
9, RC,   1.1,    8.0,  0.870, 20.00, 000.00
```

Figure 54. Inventory File.

Note: The ellipsis ("…") indicates that lines have been removed from the file for display purposes only.

The first line shown in the example is the polygon identifier. This corresponds with the stand names in LMS. The lines between the two polygon identifiers are the individual tree records for the first polygon.

The individual tree records can have either 7 or 8 columns of information. The first column is the tree record, which is not used by LMS. The second column is the species code. This code is whatever the growth model being used has for species codes. The third column is the DBH of the tree record. The fourth is the height. The fifth is the crown ratio. The sixth is the expansion factor, or how many trees per acre this record represents in the current stand. The seventh column is the volume of the tree record. This is on a per tree basis and is in whatever units that LMS is using. The eigth column, not shown here, is the maximum crown width. This is used by some of the analysis tools for calculating canopy closure, but it is not a required variable.

Snag Files (.SNG)*

Initial snags present on the landscape are specified in the LMS snag file. The format of this file is similar to that of the inventory file, see below.

```
; SP, DBH, HT, TPA, LOG/SNAG, AGE, DECAY CLASS
polygon=8
1, DF, 34.5, 88.0,  6.8, 1, 1, 1
2, DF, 21.5, 73.0, 10.2, 1, 3, 1
3, WH, 10.5, 66.0,  2.4, 0, 1, 1
4, RA,  8.5, 51.0,  6.6, 1, 5, 1
5, DF, 12.3, 74.0,  3.1, 0, 5, 1
polygon=17
1, DF, 34.5, 88.0,  6.8, 1, 1, 1
2, DF, 21.5, 73.0, 10.2, 1, 3, 1
polygon=19
1, DF, 34.5, 88.0,  6.8, 1, 1, 1
2, DF, 21.5, 73.0, 10.2, 1, 3, 1
```

Figure 55. Snag File.

The "polygon=" line specifies what stand the following records represent. This specifier must be identical to the LMS stand name. The records have 8 columns of data. The first is the tree record, and is not presently utilized by LMS. The second is the species of the snag, again these codes must correspond with those of the growth model in use. The third, fourth, and fifth represent the snag's diameter, height, and trees per acre respectively. The seventh column specifies whether this record represents a standing snag, or a downed log (1 is a snag, 0 is a log). The eighth column is the number of years since the snag was created, or the age of the snag. The final column is the decay class the snag is in currently.

Regeneration and Ingrowth Files (.RGN)*

The regeneration files are edited by hand using a text editor (such as Notepad or Superpad). The format is similar to the inventory files, without any values entered for the volume.

```
DF, 1.0, 10.0, .90, 30.0, 0.0
DF, 1.2, 11.0, .85, 30.0, 0.0
WH, 0.8, 10.0, .80, 30.0, 0.0
DF, 1.5, 12.0, .80, 30.0, 0.0
DF, 0.8, 10.0, .75, 30.0, 0.0
WH, 1.0,  9.0, .80, 30.0, 0.0
DF, 1.5, 12.0, .85, 30.0, 0.0
RA, 1.0, 12.0, .90, 30.0, 0.0
RA, 1.1, 13.0, .87, 30.0, 0.0
WH, 1.0, 10.0, .88, 30.0, 0.0
```

Figure 56. Regeneration File Format.

The file is divided into seven columns of information. The first column is the species code for whatever model is being used to project the landscape. The second is the diameters of the trees being planted. The third column is the heights of the trees, while the fourth is the crown ratios. The final column with any values is the expansion factor for that record, or the number of trees per acre it represents.
Notice that these values are larger those of newly planted trees. This is because the regeneration file represents 10 year old trees, they are planted into the site at the end of the growth cycle.

Scenario Files (.SCN) and Log Files (*.LOG)*

```
;
; Scenario file for Example Portfolio
;
#Portfolio=EXAMPLE
#EndYear=2014

; Year, Stand, Treatment and modifiers

1994, 17, 0 TPA INCLUDE RA
1994, 43, 35 PERCENT ABOVE EXCLUDE DF
1994, 58, 50 BA 5:10
1994, 78, 15 TPA BELOW PLANT DF.RGN
1994, 82, 150 SDI BELOW INCLUDE DF,WH
1994, 82, 5 % INCLUDE BM,RA
```

Figure 57. Scenario File Format.

The scenario file contains a header that must follow a specific format. Any comment lines are preceded by a ";" and will not be read by LMS. The two lines preceded by a "#" are variables that LMS uses to run the portfolio. The `EndYear` parameter specifies the last year of the simulation. The `Portfolio` is for the user's information only and is not currently used by LMS.

The second section of the file lists the treatments for the landscape. The first column is the year the treatment will be performed in. The second is that stand that will be treated. The last column is the actual treatment description. The treatment description first has the retain value (identical to the Treatment dialog box, page 13) and then the treatment options specified using keywords. For more information see *Scenario File Keywords* (page 30).

Glossary

ASCII ASCII is the name of one of the character sets used on computers. The ASCII character set was standardized by the American National Standards Institute in 1968 and revised in 1983 (ANSI X3.4-1968, ANSI X3.110-1983). When we refer to ASCII files we are talking about text files with no special formatting characters (other than TAB or NEWLINE). These are also known as text files.

Backup Portfolio A Backup Portfolio in LMS consists of an archive file containing all the files included in the portfolio directory. They are usually created using the LMS **File|Backup Portfolio...** command. LMS currently uses ZIP to create the Backup Portfolios. The example datasets are distributed as Backup Portfolio files.

BGI Borland Graphics Interface. BGI drivers are a graphics hardware interface developed by Borland International that allow the programmer to develop to a software specification instead of having to deal with video hardware directly.

CACHE In general, "cache" is a term used in computing as a place where frequently used information is stored. A cache is often used to speed up access to information. In LMS, cache is used in a similar way. All the projected inventory files and temporary files used for growth projection and visualization are stored in the CACHE directory tree. The name CACHE is used to indicate the temporary nature of the files. Anything under the CACHE directory tree is transient in nature and can be deleted at any time. Permanent information about a portfolio should be stored in the portfolio directory.

DEM Digital Elevation Model

DTM Digital Terrain Model

Filters LMS uses many auxiliary programs to perform specific format translation tasks and to provide unknown information. All of these programs are defined as "filters" in LMS. In general, a filter is a program that performs the task of converting one packet of information (a stand inventory for example) into another packet of information (maybe a stand visualization input file). Filter is the generic term used collectively for all these programs.

FVS Forest Vegetation Simulator is an individual tree, distance independent growth model (formerly known as Prognosis). It is developed by the USDA Forest Service and has a variant for all of the areas of the United States where there are National Forests.

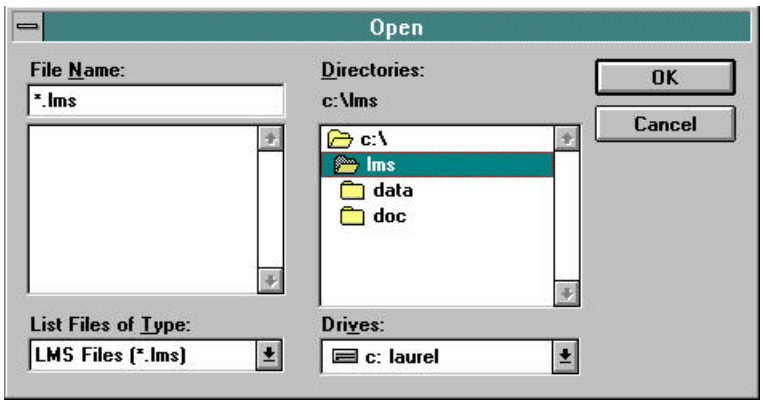
GIS Geographic Information Systems

Landscape **land· scape** (**land** skayp) *n*. 1. the scenery of an inland area. 2. a picture of this. Landscape is used to refer to a land area of interest. In the LMS context the landscape is the elevation model that can be viewed by the landscape visualization software.

LMS The Landscape Management System.

MS-DOS Microsoft Disk Operating System. A commonly used operating system for Intel-based (and compatible) personal computers.

Open File Dialog



The Open File Dialog is used by many Windows programs to locate various types of files. The Dialog consists of several regions, each designed to select different types of information. To change the disk drive being examined, use the **Drives** region to pick from the available disk drives. Use the Directories: region to select the desired directory. Double click a folder to access the directories in that folder. After the proper Drive and Directory have been selected, select the desired file in the **File Name** region. The filename can be double clicked, which is the same as highlighting the name and pressing the **OK** button.

ORGANON ORGANON is an individual-tree distance-independent growth and yield model developed at Oregon State University. It was originally developed for Southwest Oregon and has subsequently been calibrated for other areas.

PATH Operating systems execute programs from a variety of locations. Under MS-DOS, this is controlled by an environment variable named PATH. The PATH is set using the MS-DOS PATH command. When the user types the name of a program, MS-DOS looks in the current directory for a match of the name. If no match is found, MS-DOS then looks in each of the directories indicated in the PATH and executes the first match found.

Portfolio Information in LMS is contained in a number of related files that represent a land area. These files, along with applied projections and treatments, are collectively called a portfolio. A portfolio includes all of the spatial and inventory files necessary for LMS to project and visualize stands and landscapes. These files are arrayed across a series of subdirectories contained within the home directory for the portfolio.

Polygon also polygon identifier

Project pro-**jekt** (*v.*) versus **proj**-ekt (*n.*): In LMS the verb project (pro-**jekt**) is used when discussing estimating stand conditions at a future time. The noun project (**proj**-ekt) is not used in order to avoid the confusion caused by using both pronunciations. Instead, portfolio is used for the collection of files for a particular landscape.

Scenario Combination of growth and treatments for a stand or multiple stands.

Radio Button Toggles between two or more options in a dialog box.

Raster Same as pixel. As opposed to vector.

Stand Operational unit for LMS, also called polygon.

SVS Stand Visualization System.

Tables List of information.

Text Editor Any program that allows user to read and edit ASCII files.

Treatment Any manipulation of a stand or polygon inventory, typically executed in the **Project**|**Treat Stands...** dialog. Can include thinning, planting, and harvesting.

UTOOLS	Watershed analysis and visualization software package developed by the U.S. Forest Service.
UVIEW	Landscape visualization module within the UTOOLS software package.
Vector	A set of connected coordinate points describing polygonal boundaries.
VESA	A video interface specification for IBM compatible computers.
***.ZIP**	Any file that has been compressed using Zip, WinZip or PKZip. This is a mechanism for efficiently transferring large files or collections of files.

Bibliography

McCarter, James B., Christopher E. Nelson, LMS Case Studies . Silviculture Laboratory, College of Forest Resources, University of Washington.

McCarter, James B, 1999. LMS Programmer's Guide. Silviculture Laboratory, College of Forest Resources, University of Washington.

Appendix A – Using Windows Programs

It is true that every program is unique in its functions and how it works, but there are many pieces of programs designed for Windows that are similar. Users familiar with using these types of programs will not have to read this section, but those who have not used Windows programs may want too.

This section will discuss the basic parts of the LMS program, and how to use those them. It will not go into any depth on how to use the functions, that is contained in the earlier sections of the manual.

LMS Main Window

The main window of LMS (Figure 58) is the interface for users to perform the various functions contained within LMS. It is made up of five basic parts which will be discussed in turn.

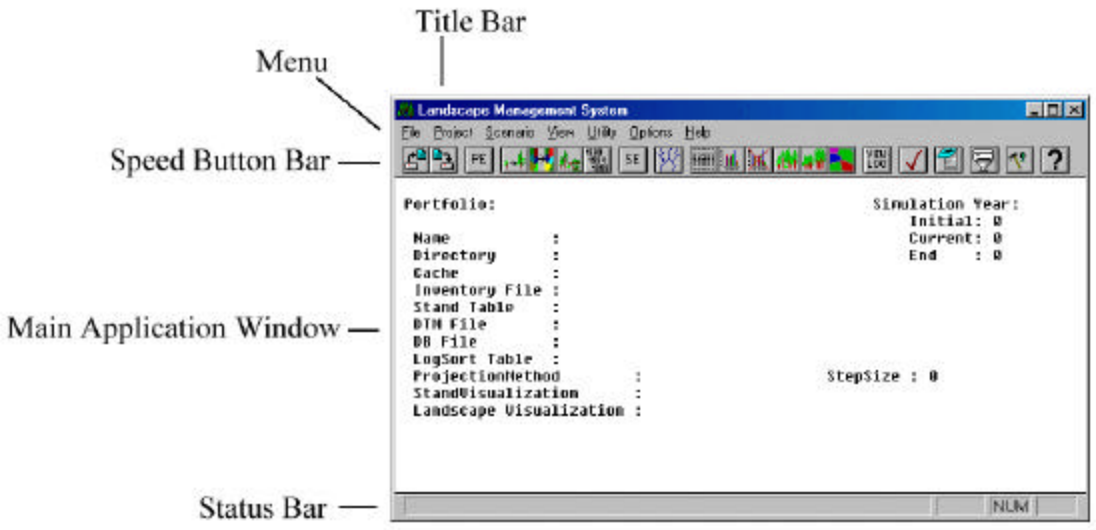


Figure 58. LMS Main Window.

Title Bar

The title bar gives the name of the program being used. You can close the program by clicking on the "X" in the upper left corner (assuming you are using Windows 95/98/NT).
Also on this bar are the buttons to minimize or maximize the program. Minimizing shrinks the program into an icon allowing the desktop to be used for other programs. This program can be brought back by clicking on the icon. The same is true of maximizing, which blows the window up to fill the entire screen. Neither of these functions will close the program or cause you to lose any data.
The last item of interest is the icon in the upper right corner. This icon also provides additional functions when clicked on with the mouse. The LMS Main Window does not place any special functions within this icon's menu, but other programs such as the Chart Windows (page 22) does.

LMS Menu

The menu is an easy to use straight forward way to access the functions within LMS. The examples contained in this manual tell you where to find each of the functions within the LMS menu. To access a menu option, just click on the word and the menu will do the rest.

Speed Button Bar

The speed button bar provides a quick way to access the commonly used functions within LMS. Throughout the manual there are pictures of the buttons contained on this bar, and the functions that they access. Another way to determine what the button access is to hover the mouse pointer over the button and look in the status bar for a description of the button.

Main Application Window

The large white space in the window contains all the information for the currently open portfolio. Notice that if there is no portfolio open, then there will be no information listed.

Status Bar

The status bar at the bottom of the main window provides users with information regarding the various buttons in LMS, and other information as the program is run. At times text will appear in the status bar to keep the user informed of what LMS is doing.

Open and Save File Dialogs

The dialog boxes used for saving and opening portfolios and all other files in LMS are fairly general to Windows programs as a whole. There are however differences between the 32-bit dialogs (Figure 59, Windows 95/98/NT programs) and the 16-bit (Figure 60, Windows 3.1x and early Windows 95). These two types will be discussed separately.

32-bit File Dialogs

The 32-bit file dialog box (Figure 59) is used primarily only in the Scenario Editor (page 29) and any other program that did not come with LMS. Despite looking different than the 16-bit dialog, it operates very similarly.

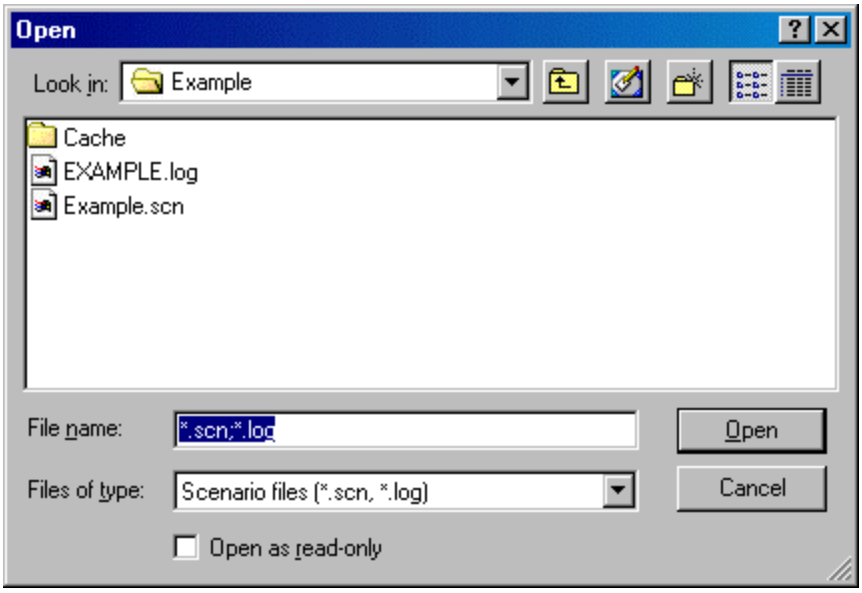


Figure 59. 32-bit File Dialog.

Control Bar

The control bar along the top of the dialog allows users to specify an existing directory by pressing the down arrow in the drop box. This will show a tree of available files and directory on the computer being used. The other functions will not be used much in LMS, but you can find out what they are by holding the mouse over the button and waiting for the balloon to appear.

File Selection Box
The main box in the center of the dialog allows users to select files or directories by clicking on them with the mouse. Clicking once on a file will highlight it and copy its name to the **File Name** line in the dialog. Double clicking will allow you to rename the file (not recommended). Double clicking on directories will allow you to descend into the directory.

File Name
Put simply this is the name of the file that will be used when exiting the dialog box (may be saving or opening). You can type a name here if you want, but typically it will have to exist to be used.

Files of Type
Specifies what type of files will be shown in the **File Selection Box**. The contents of this drop down box will change depending on what dialog is being used.

Open and Cancel Buttons
These two buttons are fairly obvious.

16-bit File Dialogs

The 16-bit dialogs (Figure 60) are used throughout most of LMS. The are very similar to the 32-bit dialogs, but lack some of the functionality that the 32-bit contain.

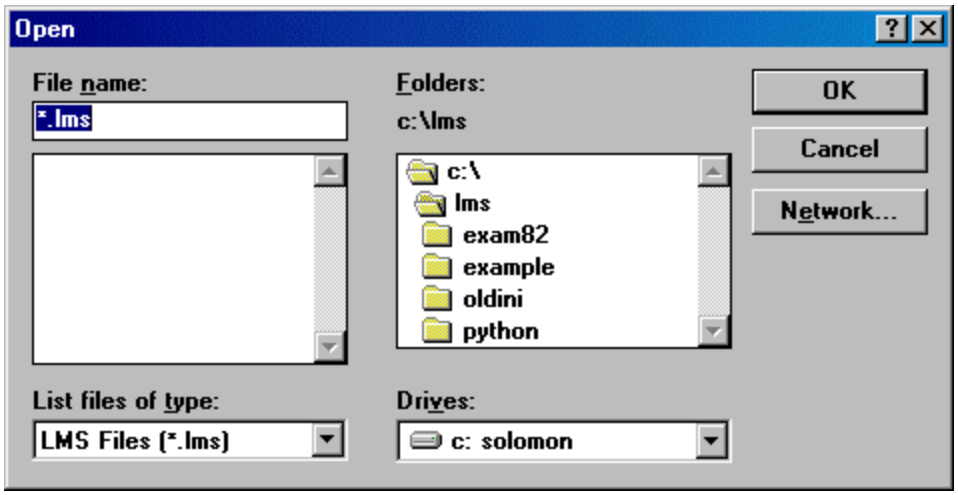


Figure 60. 16-bit File Dialog.

File Name
This line specifies what file will be used when the dialog box is exited.

File Selection Box
This box allows users to select the file name they wish to use by clicking on the file with the mouse pointer.

Folders Selection Box
This box allows users to browse through the various folders contained on the computer. To descend into a directory double click on its name. To close a folder do the same.

List files of type
Specifies what type of files will be displayed in the file selection box. The contents of this drop down box will change depending on where the dialog was created.

Drives
This drop box is how to change drives when trying to find a file. Press on the down arrow to get a list of available drives.

Creating Directories

Some functions in LMS require a directory to be created manually. The method used depends on the type of operating system.

Windows 95/98/NT

In Windows 95/98/NT it is easiest to use Windows Explorer to create directories.

1. Start Windows Explorer (it is usually available from the **Start|Programs…** menu from the Windows Start Bar).
2. Browse to the location you want to create a new directory on the left hand pane.
3. Select the **File|New|Folder** option.
4. Rename the folder.

Windows 3.1x

1. Start File Manager (located in the Main folder).
2. Select the **File|Create New Directory** option.
3. Name the directory and press **OK**.

Appendix B – Documentation and Credits for LMS Support Programs

LMS is a tool that integrates many others. Some of the programs it integrates were written expressly for LMS, but not all. LMS also incorporates many programs that were designed for other purposes by other people. This section provides the documentation and credits that are due to these authors.

ADDELEV

Author: Bob McGaughey

Contact Information: mcgoy@u.washington.edu

NOTE: ADDELEV is distributed as part of the UTOOLS package.

ADDELEV is used in the conversion of spatial information for use with LMS. ADDELEV adds elevation values to a Paradox spatial database, obtaining the values from a Digital Terrain Model. ADDELEV is part of the UTOOLS Watershed Analysis and Visualization software.

```
ADDELEV version 1.0 – Syntax:
   ADDELEV database DTMfile xyfld elevfld [/X# /R /C]
      database     name of Paradox database file...no extension
      DTMfile      file name for PLANS format DTM...include extension
      xyfld        field number for field containing XY data
      elevfld      field number for field to receive elevation data
      /X#          number of digits in X value within XY field (default = 7)
      /R           replace the elevation in the database with a new elevation
      /C           do not ask for confirmation of database fields

Example:     ADDELEV udemo quad27.dtm 1 12
-Add elevation to the database named UDEMO.DB where XY value is
located in field 1 and elevation should be put in field 12.  Use the DTM file
named quad27.dtm as the source of elevation data.
```

Figure 61. ADDELEV Help Screen.

ASC2DB

Author: Bob McGaughey

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For landscape visualization, LMS needs to create a Paradox "structure" database to be used by UVIEW. This structure database tells UVIEW how to draw trees in each cell of the spatial database. Getting the tree inventory information into the structure database is a multi-step process that ends with the conversion of an ASCII file into a Paradox database. ASC2DB is the program that converts the ASCII file into a Paradox database. ASC2DB is an MS-DOS program with the following options:

```
ASC2DB -- Revision: 1.4  --syntax:
   ASC2DB ASCII_file db_file [-K -Q -H -S### -F###]
   ASCII_file  name of ASCII file to convert to a PARADOX table
   db_file     name of PARADOX table to be created
   -K          add a key on field 1 of the PARADOX table...duplicate values in
               field 1 will cause a key violation and ASC2DB will abort
   -Q          suppress all screen output
   -S###       use decimal character ### to delimit string...default: "
   -F###       use decimal character ### to delimit fields...default: ,
   -H          display this help information

File format:
   The ASCII file must conform to loosely structured format.  The first
   line must contain the field names enclosed in quotation marks and separated
   by commas.  The second line contains the field types enclosed in quotation
   marks and separated by commas (A,N,S,$).  The following lines contain the
   data.  String fields must be enclosed in quotation marks and all fields are
   separated by commas.

Sample file...line 1:"Name","Phone number","Age"
              line 2:"A20","A11","N"
              line 3:"Sam","555-3212",25
              line 4:"Ralph","555-3412",35
```

Figure 62. ASC2DB Help Screen.

BUCKTREE

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Seattle, WA 98195

BUCKTREE examines the trees cut in each time period and bucks them into logs.

```
Usage: BUCKTREE [-l #] [-x #] [-m #] [-s #] [-t #] [-v] treelist.tre [treeval.lgl]

Divide tree records into a series of log records.

       -l #   : log length (default 16')
       -x #   : exclude logs shorter than (default 0')
       -m #   : minimum (top) diameter (default 4")
       -s #   : stump height diameter (default 1')
       -t #   : trim on each log (default 1.0')
       -v     : verbose output

BUCKTREE: Version 1.3 (Apr 13 1999 – 10:27:47), Copyright 1995, J.B. McCarter,
Univ. of Washington, College of For. Res., Box 352100, Seattle, WA 98195
```

Figure 63. BUCKTREE Help Screen.

CWDSIM

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CWDSIM is designed to project changes in the distribution of coarse woody debris (snags and down logs) over time. Projections are based on rates of removal (how many snags fall over in a given time period), and rates of decay (how long a snag remains in a particular decay class). The program is designed to have optimum flexibility. Falling rates and decay rates are read from an external data table that the user can easily modify. All user-selected options are either specified in this data table or passed to the program from the command line. This allows CSDWIM to easily be integrated with forest growth models in an automated system.

CWDSIM was adapted from work by Bruce Marcot (PNW Research Station-Portland). Michael Wimberly adapted the basic modeling framework and transition matrices from a spreadsheet-based model into a C program. The program was modified to fit into the structure of LMS and subsequently re-written by James McCarter.

Neitro, W.A., V.W. Binkley, S.P. Cline, R.W. Mannan, B.G. Marcot, D. Taylor, and F.F. Wagner. 1985. Snags (wildlife trees). Pages 129-169 in E. R. Brown, ed. Management of wildlife and fish habitats in forests of western Oregon and Washington. Part 1 - chapter narratives.

Projection Method

The main variables in the snag and down log projections are species, age and diameter. "Age" of a snag or down log is the time since mortality. The decay class of snags and down logs increases with age, and older snags generally have a higher probability of falling over. Falling and decay rates are available from several published sources, or they can be obtained through monitoring or retrospective analysis.

CWDSIM.INI

The transition matrices are stored in the CWDSIM.INI configuration file. They may be edited my the user to achieve snag and log retension that are more realistic. The configuration file consist of 4 sections:

Snag Section

```
[SNAG]
interval=5
default=DF
```

The [SNAG] section specifies the interval for the following transition tables as well as the table to use for unknown species (default).

Down Section

```
[DOWN]
interval=5
default=PP
```

The [DOWN] sections serves the same functions [SNAG], except that it is for down logs.

Snag Species Section

```
[SNAG: PP]dclass=3, 9.84, 19.29, 999.9
age0= 1.00, 1, 1.00, 1, 1.00, 1
age5= 0.57, 2, 0.83, 2, 0.98, 2
age10=0.29, 3, 0.59, 2, 0.82, 2
age15=0.25, 4, 0.50, 3, 0.67, 3
age20=0.25, 5, 0.47, 3, 0.60, 3
age25=0.00, 5, 0.46, 3, 0.56, 3
age30=0.00, 5, 0.45, 4, 0.54, 4
age35=0.00, 5, 0.45, 4, 0.53, 4
age40=0.00, 5, 0.00, 4, 0.53, 4
age45=0.00, 5, 0.00, 4, 0.52, 4
age50=0.00, 5, 0.00, 4, 0.52, 4
age55=0.00, 5, 0.00, 4, 0.00, 4
```

The [SNAG: *spp*] sections specifies transition table for the specified species. The above example if for PP (Ponderosa pine). The table contains 3 diameter classes: <= 9.84"; 9.83" > n <= 19.29"; > 19.29". The remainder of the table specifies the transition probabilities and decay classes for the combination of diameter and age. For a 20 year old PP tree less than 9.84 inches in diameter the number of snags currently standing would be multiplied by 0.25 to reflect that 25% of the snags of this size remain standing. The remainder would be moved into the down log inventory.

Translation Table

```
[SNAG: RC]
use=DF
```

A special format of the translation table allows an existing table to be used for a new species. In the above example the RC species will use the same table as DF.

Down Species Section

```
[DOWN: PP]dclas=3, 9.84, 19.29, 999.9
age0= 1.00, 1, 1.00, 1, 1.00, 1
age5= 1.00, 2, 1.00, 2, 1.00, 2
age10=1.00, 3, 1.00, 2, 1.00, 2
age15=1.00, 4, 1.00, 3, 1.00, 3
age20=1.00, 5, 1.00, 3, 1.00, 3
age25=0.75, 5, 1.00, 3, 1.00, 3
age30=0.50, 5, 1.00, 3, 1.00, 3
age35=0.25, 5, 1.00, 4, 1.00, 4
age40=0.00, 5, 1.00, 4, 1.00, 4
age45=0.00, 5, 1.00, 4, 1.00, 4
age50=0.00, 5, 1.00, 4, 1.00, 4
age55=0.00, 5, 1.00, 4, 1.00, 4
```

The [DOWN: *spp*] sections work the same way, except that the trees that don't remain as logs disappear from the simulation.

Limitations

There can be any number of species defined in the CWDSIM.INI file. Each transition table can have up to 10 diameter classes and any number of age classes.

Inventory File Formats

The snag and down log inventory files must conform with the LMS Inventory and Snag File formats (pages 59 & 59).

Running CWDSIM

Generally CWDSIM is run in the context of LMS. It can also be run independently. Several command line options are useful for debugging problems with the model. Running CWDSIM with no command line options will produce the following usage screen. The –c option is used to check and validate the format of the CWDSIM.INI file. The program will give feedback on what it finds in error in the file. This is useful when making additions or developing new transition tables. The –i option is used to check the format of the snag and log inventory file. It will return an error message listing the line of the file that it doesn't understand.

```
Usage: CWDSIM [options] infile.sng outfile.sng

Project course woody debris decomposition.  Options include:

       -c     : Check/Validate format of CWDSIM.INI file and exit
       -i     : Check snag inventory file for valid format and exit
       -s #   : step size (default 5)
       -v     : verbose output

CWDSIM: Version 2.0 (May 4 1999 16:08:50), Copyright 1999, J. B. McCarter & M. Wimberly.
Univ. of Washington, College of For. Res., Box 352100, Seattle, WA 98195-2100
```

Figure 64. CWDSIM Help Screen.

EXTELEV

Author: Bob McGaughey

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NOTE: EXTELEV is distributed as part of the UTOOLS package.

EXTELEV is used in the conversion of spatial information for use with LMS. EXTELEV reads elevation values in a Paradox spatial database and creates a Digital Terrain Model.

```
EXTELEV version 1.1 -- Syntax:
   EXTELEV database xyfld elevfld DTMfile [/Sxy /Dxy /X#]
      database   name of Paradox database file...no extension
      xyfld      field number for field containing XY data
      elevfld    field number for field containing elevations
      DTMfile    file name for PLANS format DTM...include extension
      /Sxz       specify units for XY and elevation (z) in database
      /Dxz       specify units for XY and elevation (z) in DTM file
                    options for "x" and "z" are: F for FEET
                       M for METERS, and O for OTHER units
      /X#        number of digits in X value within XY field

Example:     EXTELEV udemo 1 12 udemo.DTM /SMM /DMF
-Extract elevation from a database named UDEMO.DB where XY value is
 located in field 1 and elevation in field 12.  Save the DTM in UDEMO.DTM
-XY units in the database are METERS, elevation units are METERS
-XY units in the DTM will be METERS, elevation units will be FEET

-You should specify the same XY units for the DTM as in the database or else
 queries using the database in UVIEW will not work.
-If units for XY and elevation are different in the DTM, a vertical
 exaggeration of 1.00 will not result in equal XY and elevation scaling.
-Default database units for XY and elevation are METERS.
-Default DTM units are the database units (either default or specified).
```

Figure 65. EXTELEV Help Screen.

Forest Vegetation Simulator (FVS)

Author: Various Authors – see FVS Documentation

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3825 E. Mulberry St.
Fort Collins, CO 80524

The Forest Vegetation Simulator (FVS) is an individual tree-distance independent growth and yield model developed by the USDA Forest Service. The model was previously known as Prognosis (Stage 1973, Wycoff et al. 1982). For further information on how to use FVS, see the *FVS Documentation*.

FVS2TRE

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Note: FVS2TRE was written as part of the Landscape Management Project.

FVS2TRE is the program that LMS uses to read and convert FVS tree list information into LMS tree list format. FVS2TRE is an MS-DOS program with the following options:

```
Usage: FVS2TRE [options] fvsfile.out standtable.SDB newlist.TRE
Usage: FVS2TRE [options] -e fvsfile.out newlist.TRE
Usage: FVS2TRE [options] -i [-c #] wildname newlist.INV

Converts FVS TREELIST output into the LMS tree list format (.TRE). The -i form
reads all filenames specified by "wildname", creating a combined inventory
file. Wildname is a wildcard filename that can contain * and ? wildcard
characters. Optional arguments are:

   -b               :  read Board Foot Volume from FVS output (default)
   -t               :  read Total Cubic Foot Volume from FVS output
   -r               :  remove temporary files created by model
   -e               :  extract treelist only
   -I               :  build LMS .INV file
   -c #             :  use growth cycle #
   -l portfolio.LMS :  Use LMS Portfilio for filename information
   -m               :  read Merchantable Cubic Foot Volume from FVS output
   -s               :  copy mortality to snaglist.SNG
   -v               :  verbose output

FVS2TRE: Version 1.8 (Oct  2 1996 13:13:52), Copyright 1995, J. B. McCarter,
Univ. of Washington, College of For. Res., Box 352100, Seattle, WA 98195-2100
```

Figure 66. FVS2TRE Help Screen.

FVS2TRE has three operating modes. The first mode is used by LMS to run FVS2TRE:

FVS2TRE [options] fvsfile.out standtable.SDB newlist.TRE

When used this way FVS2TRE extracts the tree records from a file created using the FVS TREELIST keyword. The tree records are reformatted to the LMS .TRE file format. The Stand Table also has the current stand age updated.

The second mode was created to facilitate extraction of inventory information from FVS TREELIST tables. This used the -e option to bypass the update of the LMS Stand Table (standtable.SDB).

The third mode (-i) is used to process multiple TREELIST output files and combine them into an LMS combined inventory file. This mode is used by LMSPE to reconstruct the combined inventory file.

FVSSETUP

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Note: FVSSETUP was written as part of the Landscape Management Project.

FVSSETUP is the program used by LMS to convert LMS tree list files and stand level information into the input files necessary to run FVS. FVSSETUP is a MS-DOS program with the following options:

```
Usage: FVSSETUP [options] sdbfile trefile

Converts LMS treelist into files needed for input to FVS. Options are:

    -a filename : add keywords in 'filename' to generated keyword file
    -c #        : cycle length in years (default 5)
    -n #        : number of cycles (default 1)
    -s standid  : stand name to pass through to keyword file
    -v          : echo progress as FVSSETUP runs
    -y #        : inventory year

FVSSETUP: Version Version 1.6 (Oct  2 1996 13:14:17), Copyright 1996, J. B.
McCarter,
Univ. of Washington, College of For. Res., Box 352100, Seattle, WA 98195-2100
```

Figure 67. FVSSETUP Help Screen.

IMPRTDEM

Author: Bob McGaughey

Contact Information: mcgoy@u.washington.edu

Note: IMPRTDEM is distributed as part of the UTOOLS software package.

IMPRTDEM converts USGS Level 1 7.5-minute DEM format files to PC-PLANS Binary format. The PC-PLANS Binary format is used by UVIEW to represent the digital elevation information for the ground surface. Digital elevation data is available in many formats, one of which is the USGS Level 1 7.5-minute DEM format. This format can also be created using various GIS software (for example by using the LATTICEDEM command in Arc/Info).

```
USGS DEM Import Utility—Special Release—Version 1.10


IMPRTDEM usage:
   IMPRTDEM source dest [/Xunits] [/Zunits] [/Q]

   source   name of source USGS DEM data file
   dest     name of reformatted DTM data file
   /Xunits  desired units of measurement for planimetric (XY) data
            - choices are FEET or METERS
   /Zunits  desired units of measurement for elevation (Z) data
            - choices are FEET or METERS
   /Q       suppress all output to the screen

Notes:
   - source and destination file names must be different
   - existing destination file will be overwritten
```

Figure 68. IMPRTDEM Help Screen.

Graphics Server for Windows

Developed by: Pinnacle Publishing
Integrated into LMS by: James B. McCarter

Graphics Server for Windows (GSW) is a graphical plug-in used by LMS to produce various graphs and charts.

Landvis

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Landvis is a 32-bit version of the MAKEUVDB program. It was rewritten to be more robust for Windows 95/98/NT. The commands are identical between the two versions.

LMSMAP

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Note: LMSMAP was written as part of the Landscape Management Project.

LMSMAP loads a .`bmp` ("`portfolio`".`bmp`) file for displaying a planimetric map of stands on the landscape.

LOGVAL

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LOGVAL analyzes the output from the BUCKTRE program and assigns values to the output.

```
Usage:  LOGVAL loglist.lgl [loglist.val]

Sort log records and assign values.  Options include:

       -i filename   :  ini filename
       -t sorttable  :  sort table to use
       -v            :  verbose output


LOGVAL: Version 1.4 (Mar 26 1998 – 15:15:27), Copyright 1996, J.B. McCarter,
University of Washington, College of For. Res., Box 352100, Seattle, WA 98195.
```

Figure 69. LOGVAL Help Screen.

MAKESVS

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Note: MAKESVS was written as part of the Landscape Management Project.

MAKESVS is the program that LMS uses to convert LMS tree list files into input files for SVS. MAKESVS does file format conversion, adds crown width information, and generates spatial coordinates. The valid command line options for MAKESVS are:

```
Usage: MAKESVS [-a#][-x#][-y#] [-g[u[#]|c[#][-n#]]] [-i#] [-r[#]] [-4mv]
              [-w#] [-h[f|g|m|o|p|s|z]] [-f|o|p|s|z] oldfile newfile.SVS

Converts text files to input file for use by SVS. See documentation for
examples and explanation of options. Options include:

  -h [?] : help on (G)enerate,(F)VS,(M)AKETLS,(O)RGANON,(P)DAS,(S)PS,(Z)elig
  -4     : read 4 sided crowns from MAKESVS format file
  -a #   : set plot area (default=1 acre)
  -x#|y# : set plot depth (y) or width (x) (default=208.71 ft)
  -g     : generate tree location coordinates (default=random)
  -i #   : initilize random number seed, integer (default=random start)
  -fopsz : read FVS|ORGANON|PDAS|SPS|Zelig file format (default=MAKESVS)
  -r [#] : include range poles at corners (# tall, default=20 feet)
  -v     : verbose (default=off)
  -w #   : crown height/width ratio (default=crown length*0.5)

MAKESVS: Version 0.98 - 1995/07/09 04:52:08, Copyright 1995, James B. McCarter,
Univ. of Washington, College of For. Res., Box 352100, Seattle, WA 98195-2100
```

Figure 70. MAKESVS Help Screen.

MAKEUVDB

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Note: MAKEUVDB was written as part of the Landscape Management Project.

MAKEUVDB.EXE is used to convert LMS treelist information into a summarized file format that can be converted to a UVIEW structure database using ASC2DB.EXE. A UVIEW structure database defines the numbers, species, and sizes of trees to display in the landscape visualizations. UVIEW is a DOS program and is, therefore, subject to memory limitations. Large structure databases resulting from either many polygons or detailed lists of tree sizes and species within polygons can cause errors from lack of memory. MAKEUVDB has been designed to allow for a variety of classification resolutions, resulting in many records per polygon or just one. This makes it possible to see fine details of tree size or species variation in smaller landscapes while still being able to visualize large landscapes at much lower resolutions.

Usage:

MAKEUVDB [options] treelist outfile

Program Options:

- -1 all trees grouped(default)
  -c trees grouped as conifers or hardwoods
  -s trees grouped by species
-

There are two basic attributes of the MAKEUVDB classification that the user controls. These are how a polygon's list of tree records is summarized by species and by size (height). There are three options for

summarization by species: -1 all trees combined (default), -c trees grouped as either conifers or hardwoods, -s trees grouped by each individual species. In order to use the -c or -s option, it is necessary to specify a configuration file that describes which species in your landscape are hardwoods or conifers. Specifics of the configuration file are described under Ini File.

(default) no layer detection
-l polygon separated into layers
-o [*factor*] layer detection overlap factor

If no option is specified for summarization by height, the default is for the trees in each group specified by the species classification to be averaged into a single layer. The -l option allows trees to be grouped by height. The detection of layers requires the user to supply an overlap factor -o [factor] where (-1<=factor<=10). The higher the factor the more layers will be found in a stand. The overlap factor will generally be between -.5 and +.5. The default overlap is 0. Details of crown layering can be found in Layer Detection. The reason for layer detection is so that multi-layered stands (such as shelterwoods) can be detected and visualized.

- brief mode
  -v verbose mode (default)
  -r output changes to report of layer boundaries and number detected
  -d enables processing of the snag and down log database records
  -i ini_file specify the MAKEUVDB ini file to be used
  -h help
  -? help

A configuration file should be used when the -c or -s option is used with MAKEUVDB. The configuration file allows MAKEUVDB to determine if tree species are conifers or hardwoods. If the -i option is not specified the default name for the configuration file is MAKEUVDB.INI. An example configuration file is shown below:

INI File:

```
! specify conifer/hardwood group for each species
[MAKEUVDB]
SINGLE=0
CONIFER=0
HARDWOOD=4
SP1=WH,C,0
SP2=263,C,0
SP3=DF,C,0
SP4=BM,H,4
DEFAULT=H
```

Lines beginning with exclamation points are comment lines and are ignored by the program. [MAKEUVDB] is a marker telling MAKEUVDB which section of the configuration file to read. SINGLE=0 is the plant type to display when all trees in a polygon are grouped into 1 record. 0 is the best plant type in UVIEW for conifers while 4 is the best for Hardwoods. The listing of SP1-SPn must be in order and contiguous. After an SPn= the first column is for matches to species codes in your inventory. The second column defines whether this species should be grouped as a conifer © or hardwood (H) if option -c is specified. The third column defines what plant type the species is associated with if option -s is specified. For a list of available plant types see the UVIEW documentation. The DEFAULT line specifies how species not specified in the ini file should be grouped. An configuration file is not required for MAKEUVDB to work; however, its use will greatly improve the flexibility and accuracy of MAKEUVDB operation.

Layer Detection:

MAKEUVDB detects layers by:

1. Reading all tree and crown heights of a polygon into memory.
2. Sorting the data from tallest to shortest, first by height then by base of the live crown (blc) height.
3. Beginning with the first tree, a running average of crown height in the layer is maintained.
4. If the next tree is shorter than the *Test Height*, a new layer and running average is begun.

Where:

Test Height=(1+*factor*)*(average crown height of the current layer)

Factor is defined with the -o option. Positive factors mean that layers can be detected when the top of a shorter tree is above the average blc of taller trees. A factor of zero means that layers are detected whenever the shorter tree's top height is equal to or less than the average blc of taller trees. Negative factors mean there must be a gap between a shorter tree's top height and the average blc of taller trees for a layer to be detected.

File Formats:

Treelist (input file)

The first line of the input file is the polygon specifier:

polygon=string

The remaining lines describe the trees in the polygon and has the format:
record number,species,dbh,height,crown ratio,acre expansion factor, volume

Where:

record_number	record number of data (ignored by MAKEUVDB)
species	species code of the tree record
dbh	diameter of the tree stem
height	tree height
crown_ratio	ratio of blc height to tree height
exp_factor	trees of this type per acre
volume	volume of the tree (ignored by MAKEUVDB)

The MAKEUVDB output file is an ASCII file with the following format:

polygon,layer,plant_type,height,cr_diameter,cr_ration,variability,exp_factor

where:

polygon	polygon name
layer	layer (always 1)
plant_type	designation for visualization
dbh	average diameter of trees summarized in this record
height	average tree height in this record
cr_diameter	average crown diameter in this record
cr_ratio	average ratio of blc to tree height in this record
variability	std. ht/average ht
exp_factor	density of trees per cell

MERGESVS

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MERGESVS is an additional utility that can be used to construct a new SVS file from multiple SVS files. It is used for Merge Stand in the *Stand Comparison Visualization* (page 26).

ORGANON

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ORGANON is an individual tree growth model developed at Oregon State University for Southwest Oregon.

ORG2TRE

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Note: ORG2TRE was written as part of the Landscape Management Project.

ORG2TRE is the filter used by LMS to convert ORGANON tree list information into LMS tree list formats.

Usage: ORG2TRE polyid.out oldpolyid.TRE newpolyid.TRE

Converts Organon Outfile with a tree list into an ASCII file of the same format that is exported by LMSDB.

ORG2TRE: Version 1.0 - 1995/07/09 04:47:04, Copyright 1995, James B. McCarter, Univ. of Washington, College of For. Res., Box 352100, Seattle, WA 98195-2100

Figure 71. ORG2TRE Help Screen.

ORGSETUP

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Note: ORGSETUP was written as part of the Landscape Management Project.

ORGSETUP is the filter used by LMS to convert LMS tree list information into the input files necessary for running ORGANON.

```
Usage: ORGSETUP [-i] standtable polyid.TRE

Converts ASCII file of tree records exported by LMSDB to Organon input file
format.  This program runs START.EXE to generate the original .INP file, then
modifies the .INP file adjusting the plot specifications.  Options are:

      -o file    : create input script for ORGNON.EXE
      -O program : path and program name for ORGNON.EXE
      -s file    : create input script and run START.EXE
      -S program : path and program name for START.EXE
      -v         : echo progress as ORGSETUP runs

ORGSETUP: Version 1.1 - 1995/07/09 04:47:04, Copyright 1995, James B. McCarter,
Univ. of Washington, College of For. Res., Box 352100, Seattle, WA 98195-2100
```

Figure 72. ORGSETUP Help Screen.

Scenario Editor (scn_edit)

Author: Christopher E. Nelson

Contact Information:
email: cnelson@silvae.cfr.washington.edu
Phone #: (206)543-5772
Address: College of Forest Resources, Box 352100
University of Washington
Seattle, WA 98195

The Scenario Editor is a dialog based graphical interface for creating and managing LMS Scenario Files. For further information see *Scenario Editor* (page 31).

Str_clas

Author: Christopher E. Nelson

Contact Information:
email: cnelson@silvae.cfr.washington.edu
Phone #: (206)543-5772
Address: College of Forest Resources, Box 352100

University of Washington
Seattle, WA 98195

Str_clas is a 32-bit program that runs all the structural stage classifications present in LMS. These include: Oliver 1981, Oliver 5 class, Oliver East-side, South East, Carey, and HCSSPT.

```
Str_clas v1.0.1 Copyright 1999, Christopher E. Nelson, University of Washington
  Usage: structure.exe -[options] -[class] [files]
                Options:
                        -i              Use alternative coeff. from file
                        -s              Use snag file
                        -p              Use proportional output
                        -g              Use graphing output
                Class:
                        -o8             Oliver's 81 Classification
                        -o9             Oliver's 98 Classification
                        -ca             Carey's Classification
                        -e8             Oliver's 81 East Classification
                        -e9             Oliver's 98 East Classificaiton
                        -hc             HCSSPT Classification
                        -o5       Oliver 5c Classifcation
                        -ps       Oliver 5c Class. (P. S. Park Variant)

                        -al       Use All Classifications
                Files:
                        <folioname>.tre   Trefile generated by LMS
                        <folioname>.sdb   SDBFile (required for -p)
                        <folioname>.sng   SNGFile (required for -s)
                        outfile                   output file
```

Figure 73. Str_clas Help Screen.

SVS (Stand Visualization System)

Author: Bob McGaughey

Contact Information: mcgoy@u.washington.edu

SVS is the stand visualization software that LMS uses to depict stand level pictures. This section is a short review of some useful features of SVS. A more detailed discussion of saving and printing images can be found in *Capturing Images from Visualizations* (page 55). More information about SVS is in the help file (available by pressing F1 while SVS is running) or by contacting Bob McGaughey.

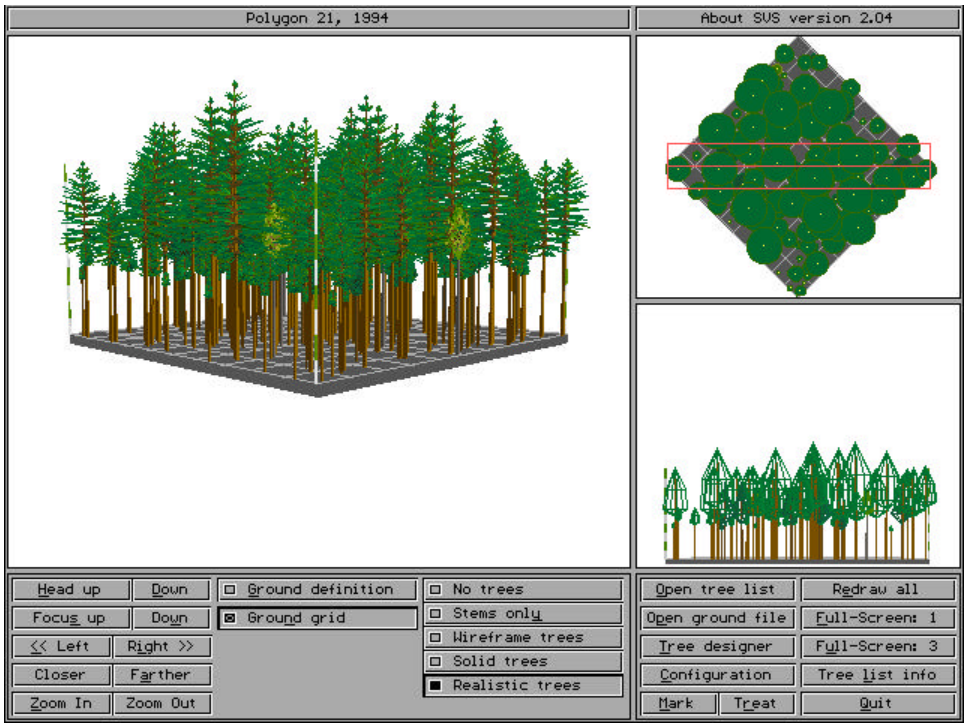

Figure 74. Stand Visualization System (SVS) main screen.

View Windows - The main SVS screen has three windows displaying views of a stand from different perspectives. The large central window (1) displays a 3-D perspective. The upper right window (2) displays an overhead view, and the bottom right window (3) displays a profile view of the trees within the designated rectangle on the overhead view. Above window 1 is a title bar that reports the stand and year being displayed. The escape key (**ESC**) will stop drawing in any of the windows. Pressing the escape key while window 1 is drawing will make SVS skip to window 2 and begin drawing.

Below the screens are buttons for customizing the view and display.

Bottom Left Buttons - The buttons in the lower left determine attributes of the three views. These are:

Head (up/down)	Determines the position of the viewers head relative to the stand. To look down on the stand press head up.
Focus (up/down)	Determines the focus point in the stand. To focus on the base of the trees press focus down.
(Left/Right)	Spins the stand around its center to the left or right.
(Closer/Farther)	Small steps to make the image larger or smaller.
(Zoom In/Out)	Large steps to make the image larger or smaller.

Bottom Center Buttons - In the center bottom are buttons that determine the kinds of tree displays being used. Stems only just shows stems with no branches. Wireframe trees have wire representations of crown shapes (default for profile view). Solid trees depict crown shapes with solid colors (default for overhead view). Realistic trees show crown shapes and branching patterns (default for perspective view).

Bottom Right Buttons - The Tree Designer button in the lower right corner can be used to modify existing species formats or create new ones. The Configuration button allows the user to specify preferred defaults for many features and modify the color palette used by SVS. The Full screen buttons display a full screen view of the specified window (**ESC** or **RETURN** to return to the main window). If you would like a full screen image of window 2, set the mouse arrow over the overhead image and click. The overhead view

will now be switched to window 1. The Tree list info button displays some summary statistics about the stand and a choice of graphs to display. The Quit button returns a user to the main LMS window.

SVS2UP

Author: James B. McCarter

Contact Information:

email: jmac@silvae.cfr.washington.edu

Phone #: (206)616-2376

Address: College of Forest Resources, Box 352100
University of Washington
Seattle, WA 98195

SVS2UP is the program that LMS uses to display two stands side-by-side. It takes two .SVS files and combines them, adjusting the coordinates in the second stand so that it is displayed to the right of the first stand.

Usage: SVS2UP plotone[.SVS] plottwo[.SVS] outfile[.SVS]

Combine two SVS files for side by side display in SVS. The #TITLE is created by appending the #TITLEs found in each of the .SVS files. If not titles are found filenames are used.

Use "SVS -v1 filename" for the proper orientation (plotone <--> plottwo).

SVS2UP: Version 1.4 (Feb 20 1997 - 14:13:23), Copyright 1997, J. B. McCarter,
Univ. of Washington, College of For. Res., Box 352100, Seattle, WA 98195-2100

Figure 75. SVS2UP Help Screen.

TRTSTAND

Author: James B. McCarter and Michael Pederson

Contact Information:

email: jmac@silvae.cfr.washington.edu

Phone #: (206)616-2376

Address: College of Forest Resources, Box 352100
University of Washington
Seattle, WA 98195

TRTSTAND is used by LMS to perform thinning and planting treatments to tree lists. This program is designed as a service program for the Treatment... dialog box (Figure 7) in LMS. TRTSTAND is an MS-DOS program with the following options:

```
TRTSTAND: Version 2.0 (Oct  8 1996 20:43:29)

Usage:  TRTSTAND [options] input.TRE [output.TRE]
Performs treatment/harvests of treelist information.  Command options are:

option         description
 -p percent     Retain a percent of orginal trees (0 <= percent <= 100)
 -t tpa         Retain a minimum total TPA (0 <= tpa)
 -r sdi         Retain a minimum Reineke SDI (0 <= sdi)
 -g barea       Retain a minimum total basal area (0 <= barea)
 -w             Target only selected trees
 -a|b           Thin from Above | Below (default is proportional)
 -e             Thin from above/below using height (default is DBH)
 -s sp1[,sp2]   Specify species included for treatment
 -x sp1[,sp2]   Specify species excluded from treatment
 -d min:max     Specify min and/or max diameter (DBH) for treatment
 -+              Use to separate multiple treatments
 -v|q           Verbose mode (default) | Quiet mode
 -i ini_file    Specify initialization file
 -@rspfile      Specify response file
 -h|?           Show this help screen

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UW College of Forest Resources, Box 352100, Seattle, WA  98195-2100
```

Figure 76. TRTSTAND Help Screen.

UCELL5

Author: Alan Ager

Contact Information: Bob McGaughey (mcgoy@u.washington.edu)

Note: UCELL5 is distributed as part of the UTOOLS software package.

UCELL is software included in the UTOOLS Watershed Analysis and Visualization software. UCELL is used to "rasterize" GIS polygon coverages into a raster based Paradox database. This database is used by UVIEW to display spatial information on the landscape. We use UCELL5.EXE and UWCELL.EXE for this rasterization process. UWCELL is a special version of UCELL that handles UTM coordinates with 7 digits in the X value.

UVIEW

Author: Bob McGaughey

Contact Information: mcgoy@u.washington.edu

Note: UVIEW is distributed as part of the UTOOLS software package.

UVIEW is the landscape visualization software that LMS uses for displaying landscape with vegetation.

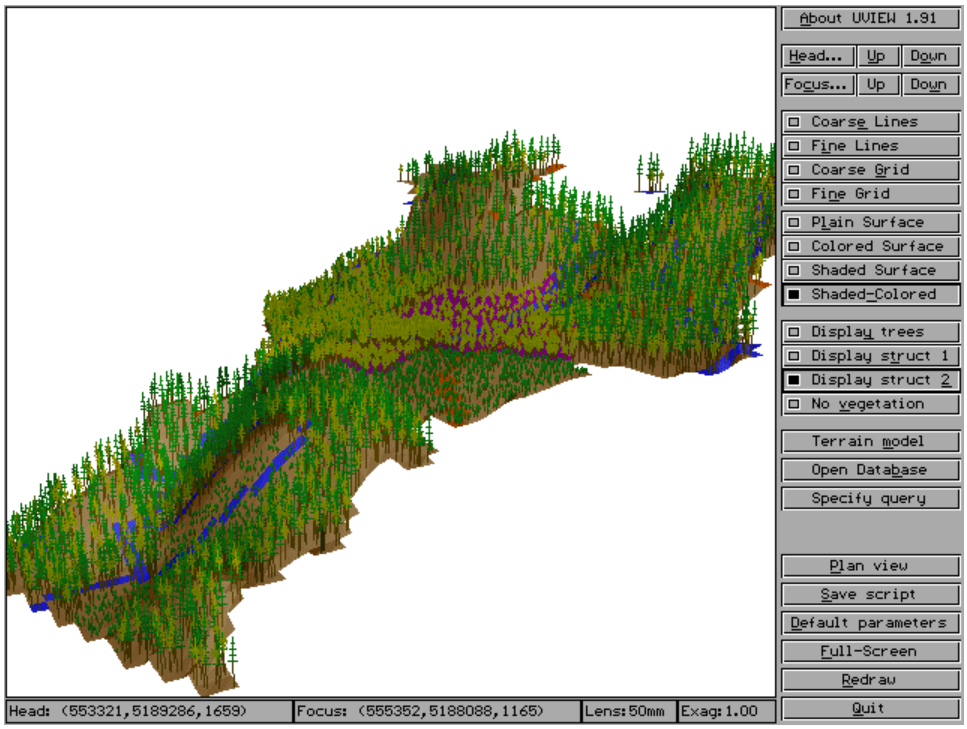

Figure 77. UVIEW Main Screen.

UVIEW uses a camera lens model for 3D representations. The camera has a focal length (lens) along with the location where the camera is positioned and where the camera is pointed. The position from which the scene is viewed is the "head", while the location pointed to is the "focus". The **Head...** and **Focus...** buttons can be used to change the location of the viewers eye and the location toward which they are looking.

LMS uses the script capabilities of UVIEW to display the landscape. The script file, created automatically by LMS, tells UVIEW what DTM to load, what spatial database to open, how to display the surface (Shaded-Colored), how to display vegetation (Display Struct 2), and provides the default viewing location. The user can change the viewing location by using the **Head.../Focus...** buttons. They can also display the landscape in a map view by using the Plan View button. Default Parameters can be used to change various colors (background and queries) and change the color palette. Save script can be used to save a new default viewing location. Full-Screen can be used to "zoom" to the landscape image (removes the buttons) for image captures.

WGNUPlot

Author: Thomas Willams, Colin Kelley, and many others.

Contact Information: info-gnuplot@dartmouth.edu

WGNUPlot is used to create several of the analysis charts in LMS.

WinSVS

Author: Bob McGaughey

Contact Information: mcgoy@u.washington.edu

WinSVS is a windows version of the SVS program. For information on the commands see the SVS section.

ZIP

Author: Mark Adler, Richard B. Wales, Jean-loup Gailly, Onno van der Linden, Christian Spieler and Kai Uwe Rommel

Contact Information: N/A

ZIP is used in the restore and backup portfolio functions to compress and decompress the portfolio files.

Appendix C

The tables and charts in this section are generated by scripted programs in the Python scripting language. This makes these tables and charts modifable, but care should be taken. Some of the more advanced tables and charts rely on the simpler to generate their output. If these base scripts are modified there could be an adverse effect on the advanced tables.

Tables

Stand Tables

Stand Inventory

Author: James B. McCarter

Note: This table cannot be modified

The Stand Inventory Table provides a list of inventory records for one stand in one time period.

Stand Scenario

Author: James B. McCarter

Note: This table cannot be modified.

The Stand Scenario Table provides a list of inventory records for one stand in all periods in the simulation.

Stand Summary

Author: James B. McCarter

Script: standsum.py

The Stand Summary Table provides typical stand level statistics summarized by species: Quadratic Mean Diameter (DBHq), Average Diameter (AveDBH), Trees Per Acre, Average Height, Total Basal Area (TBA), Reinike Stand Density Index (SDI), Curtis Relative Density, Total Volume per acre.

Stand Species Mix

Author: Jeremy S. Wilson

Script: sppmix.py

The Stand Species Mix Table provides a list of proportions of species in the stand. The proportions are presented based on TPA, Basal Area, and Volume.

Stand Volume

Author: Jeremy S. Wilson

Script: volume.py

The Stand Volume Table provides a volume summary for the stand in MBF.

Standing and Cut Volume

Author: Jeremy S. Wilson

Script: volumeb.py

The Stand Standing and Cut Volume Table provides a volume summary for the stand in MBF.

Volume by Size Class

Author: Jeremy S. Wilson

Script: volumesd.py

Summary of volume by size class (pole, sawtimber, large sawtimber).

Volume by Spp. & Size

Author: Jeremy S. Wilson

Script: volumesd.py

The Volume by Spp. & Size Table provides a breakdown of volume by species and size class (pole, sawtimber, large sawtimber).

Basal Area by Diameter Class

Author: Jeremy S. Wilson

Script: badclass.py

Basal area and number of trees by (2 inch) diameter classes for one stand.

Trees Per Acre by Dia and Height

Author: James B. McCarter

Script: tpabydh.py

Count of number of trees by diamter class (2 inch) and height class (10 feet). Diameter classes are across the top, height classes down the left side of the table.

MAI/PAI Table

Author: Justin S. Hall

Script: maipai.py

Table used as base for MAI/PAI chart. Includes stand, year, MAI, and PAI. MAI and PAI are computed using volume on the inventory records.

Canopy Layers in Stands

Author: Jeremy S. Wilson

Script: layers3.py

The Canopy Layers in Stands Table applies a layer detection algorithm to determine the number of canopy layers in the stand.

Stand Value Table

Author: James B. McCarter

Note: This table cannot be modified.

The Stand Value Table applies the bucking and log sort algorithm to convert inventory records into log records with prices and values applied.

Stand Value Summary

Author: Jeremy S. Wilson

Script: valsum.py

Calculates the present value of a stand for each time period. This calculation is based on the standing volume of the stand. The interest rate used can be changed in the LMS Configuration under the Log Sort option (page 51).

Stand Sort Summary

Author: Jeremy S. Wilson

Script: sortsum.py

Summarizes the output from BUCKTREE and LOGVAL by stand, species, and sort.

Stand Wind Hazard Variables

Author: Jeremy S. Wilson

Script: wind.py

Calculates the height to diameter ratio of the stand.

Extract CutList to run in FEEMA

Author: Christopher E. Nelson

Script: feema.py

Extracts the harvested tree information from the LMS files and converts it into the format for FEEMA (Finanical Evaluation of Ecosystem Management Activities, USDA Forest Service) to import.

Landscape Tables

Landscape Attributes

Author: James B. McCarter

Note: This table cannot be modified.

The Landscape Attributes Table provides stand level information from the .SDB file.

Stand Area Table

Author: Jeremy S. Wilson

Script: acres.py

The Stand Area Table provides acres and proportion of landscape for each stand.

Landscape Inventory

Author: James B. McCarter

Note: This table cannot be modified.

The Landscape Inventory Table provides inventory records for all stands in one time period.

Landscape Scenario

Author: James B. McCarter

Note: This table cannot be modified.

The Landscape Scenario Table provides inventory records for all stands in all cycles of the simulation.

Landscape Summary

Author: James B. McCarter

Script: standsum.py

The Landscape Summary Table provides typical stand level summary statistics by stand, by year, by species.

Landscape Species Mix

Author: Jeremy S. Wilson

Script: sppmix.py

The Landscape Species Mix Table provides proportion by species for each year in the simulation. Proportion by TPA, Basal Area, and Volume are provided.

Canopy Layers by Stand

Author: Jeremy S. Wilson

Script: layers3.py

The Canopy Layers by Stand Table uses the layer detection algorithm to determine the number of layers in each stand.

Landscape Volume

Author: Jeremy S. Wilson

Script: volume.py

The Landscape Volume Table summarizes the total volume on the landscape.

Standing and Cut Volume

Author: Jeremy S. Wilson

Script: volumeb.py

The Standing and Cut Volume Table summarizes the total volume on the landscape.

Volume by Size Class

Author: Jeremy S. Wilson

Script: volbydbh.py

The Volume by Size Class Table provides a summary of volume by size class (pole, sawtimber, large sawtimber) for the landscape.

Volume by Spp. & Size

Author: Jeremy S. Wilson

Script: volumesd.py

The Volume by Spp. & Size Table provides a summary of volume by species and size class for the landscape.

Basal Area By Diameter Class

Author: James B. McCarter

Script: badclass.py

Basal area and number of trees by (2 inch) diameter classes for all stands.

Landscape Value Table

Author: James B. McCarter

Note: This table cannot be modified.

The Landscape Value Table takes inventory records and applies a log bucking and sorting algorithm to assing prices and values to logs. The results of this table can then be used for finaicial analyses.

Landscape Value Summary

Author: Jeremy S. Wilson

Script: valsum.py

Calculates the present value of the stands in each time period. This calculation is based on the standing volume of the stand. The interest rate used can be changed in the LMS Configuration under the Log Sort option (page 51).

Landscape Sort Summary

Author: Jeremy S. Wilson

Script: sortsum.py

Summarizes the output from BUCKTREE and LOGVAL by stand, species, and sort.

Landscape Wind Hazard Variables

Author: Jeremy S. Wilson

Script: wind.py

Calculates the height to diameter ratio of the stand.

Extract CutList to run in FEEMA

Author: Christopher E. Nelson

Script: feema.py

Extracts the harvested tree information from the LMS files and converts it into the format for FEEMA (Finanical Evaluation of Ecosystem Management Activities, USDA Forest Service) to import.

Advanced Tables:

Struct. Stage Classifications

Author: Christopher E. Nelson and James B. McCarter

Note: This table cannot be modified.

New stuctural stage classification program. Select amoung the available classifications. Output can be displayed by stand or by class. Only runs in Win95 or above.

Oliver Struct. Stage Class (Win3.x)

Author: Jeremy S. Wilson

Script: olivers.py

Applied logic for Oliver's structural stage classification (SI, SE, UR, OG). Quantitative rules were derived by discussion with Oliver. See oliver.py for details.

Carey Struct. Stage Class (Win3.x)

Author: Jeremy S. Wilson

Script: careys.py

Applies the classification designed by Andrew Carey. The quantitative rules were derived by extrapolation. See careys.py for details.

East Cascade S.S. Class (Win3.x)

Author: Michael Wimberly, Jeremy S. Wilson, and Christopher E. Nelson

Script: eastss.py

Applies the logic for Oliver's east side structural stage classification (SI, SE, UR, OG). Quantitative rules were derived by discussion with Oliver. See eastss.py for details.

Puget Trough S.S. Class (Win3.x)

Author: Christopher E. Nelson and Jeremy S. Wilson

Script: hcsspt.py

Applies the classification designed by Steve Stinson, based off of Andrew Carey's classification. The quantitative rules developed by Steve Stinson. See the hcsspt.py for details.

Adjacency Conflicts (Washington)

Author: Jeremy S. Wilson

Script: greenup.py

Evaluates current and projected landscape inventory information to determine if any harvesting violates the size and timing of even-aged harvesting specified in the Washington Forest Practices Board Manual (Based on 1993 rules). A neighborhood table residing in the portfolio directory is required. The output from this table shows stands that violate the green-up rules. The table details year, stand, proportion of the perimeter surrounded by >=30 year-old stands, >=15 year-old stands, and >=5 year-old stand, and the total acreage of all contiguous clearcuts less than 5 years old. Average stand height is used as a surrogate for age. Height age cutoffs can be altered by editing the greenup.py file in the lms/python directory. Change ht5, ht15, and ht30 to correspond to local conditions. This analysis is not intended to be defensible, rather it provides a "red flag" for areas that may need to be investigated further.

Example output:

```
year, stand,        age30,  age15,   age5, acres
Wash. regs,          0.30,   0.60,   0.90, 120.00
1994, MR_NON_FOR, 0.0000, 0.4938, 0.8810, 30.60
```

NPVAL Summary

Author: Christopher E. Nelson

Script: npval.py

Calculates the present value of a set of treatment and projections for the landscape. The assumptions built into the script (such as prices and costs) can be modified. See npval.py for details.

Value Summary

Author: James B. McCarter

Script: valsum.py

The Value Summary Table takes as input a saved Stand or Landscape Value Table and performs total value and discounted value for each stand in each time period. The discount rate used can be set in LMS Configuration|Log Sort.

Owl Habitat

Author: James B. McCarter

Script: owlhab.py

Calculates Spotted Owl dispersal habitat and Marbel Murlett habitat based off of the rules specified in the Washington State Department of Natural Resources Habitat Conservation Plan.

Extract Treelist for FVS Raw Run

Author: James B. McCarter

Script: fvsraw.py

Contiguous Analysis

Author: Jeremy S. Wilson

Script: contig2.py

Generates a table that shows contiguous blocks of the stands with the same rating (typically forest structural stage). A neighborhood table residing in the portfolio directory is required. Output details the year, rating, contiguous acres, stands that make up the contiguous block. In addition, ratings for stands adjacent to the contiguous block are shown along with the respective shared border length with the contiguous block. In the example below, the stand BR_1300_Road has been rated 1_SI (stand initiation) in 1994. There are no adjacent stands with the same rating so this contiguous block of stand initiation is made up of a single stand representing 15.2 acres. The block is surrounded by a 3_UR (understory reinitiation for 219 meters of the perimeter) and 2_SE (stem exclusion for 1,544 meters of the perimeter). The default input rating is Olivers' 4 classes. To change this contact that Silviculture Lab.

Example output:

year, stand, acres, cont. ac., adj. struct, adj. prop., adj. ac.
1994, 1_SI, 15.2, ['BR_1300_ROAD'] {'2_SE': 1544.0, '3_UR': 219.0}
1994, 2_SE, 191.8, ['BR_B&T_NORTH', 'SE_B&T', 'SE_B&T_SOUTH',
'SE_TALMADGE', 'SE_NOVELLI', 'SE_KELLY'] {'1_SI': 2004.0}
1994, 2_SE, 12.5, ['BR_BETH_1300'] {'3_UR': 392.0, '1_SI': 843.0}
1994, 1_SI, 201.9, ['BR_EBETH_RID', 'BR_MIDWAY'] {'2_SE': 3903.0, '3_UR': 43.0}

If this output file is exported to excel or other spreadsheet programs a summary table of these results can be created using a pivot table. An example summarization follows.

Table 3: Number of patches (average size of patch [ha]) in different forest structure classes across the Pack Forest Landscape.

	1998	2008	2018	2028	2038	2048
SI	30(22)	26(9)	13(6)	13(6)	12(6)	12(6)
SV	5(3)	2(4)	2(4)	2(4)	2(3)	2(3
SE	14(62)	7(174)	8(153)	10(112)	15(65)	17(47)
UR	3(38)	4(45)	7(39)	8(44)	13(39)	13(50)
CO	2(26)	5(21)	10(13)	11(15)	12(13)	13(14)

Ruffed Grouse Habitat Suitability

Author: James B. McCarter

Script: grouse.py

Determines the available Ruffed Grouse habitat on the landscape.

Barred Owl Habitat Suitability

Author: James B. McCarter

Script: barowl.py

Determines the available Barred Owl habitat on the landscape.

Charts

Stand Charts

Density Management Diagram

Author: James B. McCarter

Script: sdi.py

Density Management Diagram for one stand.

Distribution – Diameter

Author: James B. McCarter

Note: This chart cannot be modified.

Diameter distribution for one stand.

Distribution – Height

Author: James B. McCarter

Note: This chart cannot be modified.

Height distribution for one stand.

Basal Area by Diameter Class

Author: James B. McCarter and Jeremy S. Wilson

Script: badclass.py

Bar chart displaying basal area in (2 inch) diameter class for one stand.

Basal Area and TPA by Diameter Class

Author: James B. McCarter and Jeremy S. Wilson

Script: badclass.py

Line chart displaying basal area and number of trees by (2 inch) diameter class for one stand.

Stand Volume thru Time

Author: Jeremy S. Wilson

Script: volumec.py

Change in Stand Volume for one stand.

Standing Volume by Size Class

Author: Jeremy S. Wilson

Script: volbydbh.py

Change in Stand Volume for one stand divided into size classes.

Cut Volume by Size Class

Author: Jeremy S. Wilson

Script: volbydbh.py

Cut Volumes for one stand divided into size classes.

MAI/PAI Chart

Author: Justin S. Hall

Script: maipai.py

Plot of a single stands MAI (mean annual increment) and PAI (periodic annual increment).

Landscape Charts

Density Management Diagram

Author: James B. McCarter

Script: sdi.py

Density Management Diagram for all stands on the landscape.

Landscape Volume thru Time

Author: Jeremy S. Wilson

Script: volumec.py

Change Volume for the landscape.

Volume by Size Class

Author: Jeremy S. Wilson

Script: volbydbh.py

Change in volume for the landscape divided by size class.

Cut Volume by Size Class

Author: Jeremy S. Wilson

Script: volbydbh.py

Cut volume for the landscape divided by size class.

Advanced Charts

Struct. Stage Classification

Author: Christopher E. Nelson and James B. McCarter

Note: This chart cannot be modified.

New structural stage classification program. Use dialog to select amoung available classification. Only one may be charted at a time. Only run in Win95 or above.

Oliver Struc. Stage Class. (Win3.x)

Author: Jeremy S. Wilson

Script: oliversc.py

Proportion of landscape in Oliver's structural stages.

Carey Struc. S. Class. (Win3.x)

Author: Jeremy S. Wilson

Script: careysc.py

Proportion of landscape in Carey's structural stages.

East Cascade S.S. Class (Win3.x)

Author: Jeremy S. Wilson

Script: eastssc.py

Proportion of landscape in Oliver's East Cascade structural stages.

Puget Trough S.S. Class (Win3.x)

Author: Christopher E. Nelson

Script: hcspptc.py

Proportion of landscape in Stinson's Puget Trough structural stages.

Height/Diamter Plot

Author: James B. McCarter

Script: hd.py

Plot of the height/diameter ratio of all trees in the inventory compared to HD 100 line.