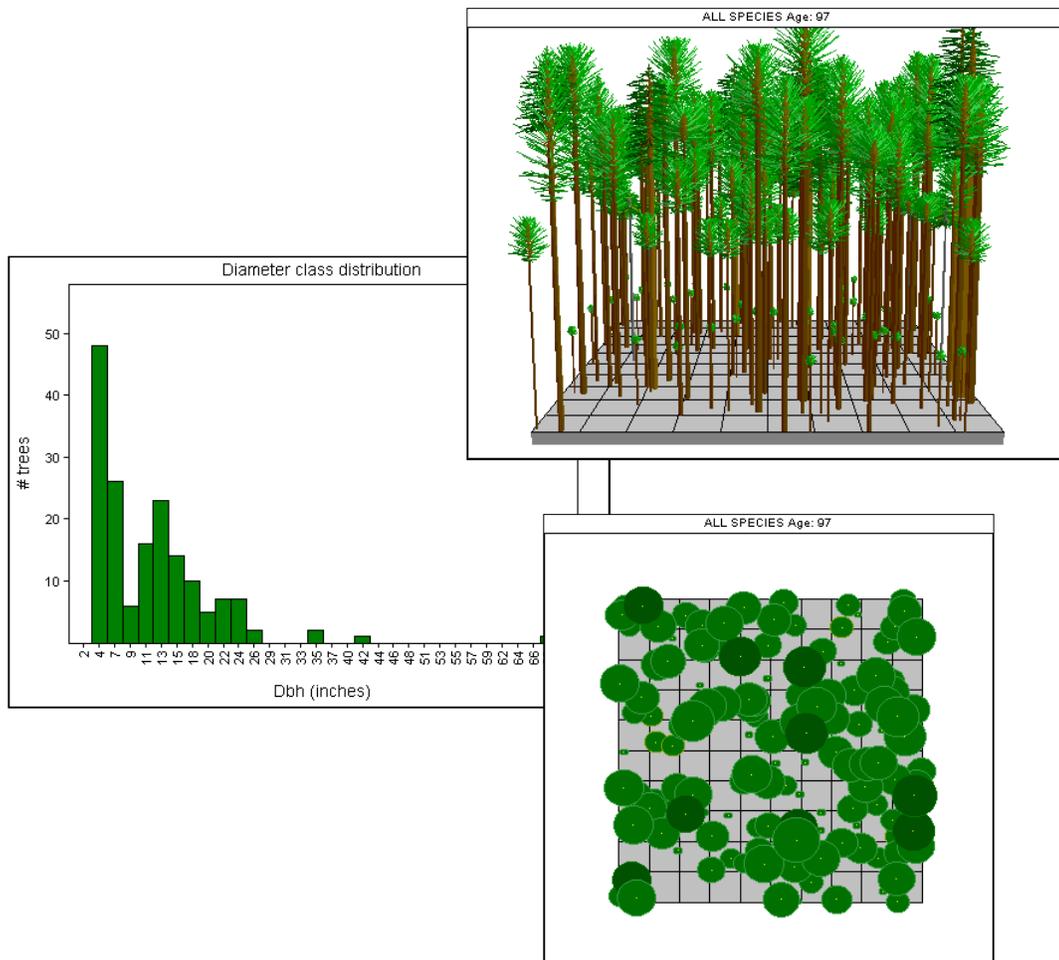


Stand Visualization System



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The Stand Visualization System (SVS) was developed by Robert J. McGaughey, USDA Forest Service, Pacific Northwest Research Station.

SVS is public domain software and can be freely distributed.

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Information describing SVS and the latest version of the software are also available on the World Wide Web at:
<http://forsys.cfr.washington.edu/svs.html>

1 DOCUMENT OVERVIEW

This document outlines a two-day training course to teach the basics of the Stand Visualization System. It was originally developed for a session involving the Bureau of Land Management. For the most part, the document can be used to teach SVS to any audience.

Topics that describe the use of SVS with growth model data were originally developed for the ORGANON growth model. However, a section has been added for the Forest Vegetation Simulator (FVS). Most applications of this document will use only one of the sections (both labeled section 11) that describe using growth model data.

2 TRAINING SCHEDULE

Day 1

Time	Topics covered
8:00am	Introductions, house-keeping, training goals
8:30	SVS Overview
9:00	Installation and set-up
9:15	Menu structure and on-line help
9:30	Basic SVS operations
10:45	Break
11:00	Advanced SVS options Exercise 1
12:00	Lunch
1:00pm	Advanced SVS options (continued) Exercises 2 & 3
2:30	Inputting data into SVS Exercise 4
3:15	Break
3:30	Working with simple stand tables using the TBL2SVS conversion engine Exercise 5
4:00	Questions

Day 2

Time	Topics covered
8:00am	Review and questions
8:30	Working with simple stand tables using the TBL2SVS conversion engine Review Exercise 5 Exercise 6
9:45	Introduction to using SVS with growth model output files
10:15	Working with growth model data: Simple example
10:45	Break
11:00	Working with growth model data: Intermediate examples Exercise 7
12:00	Lunch
1:00pm	Working with growth model data: Complex example Exercises 8 & 9
2:30	SVS Utility programs
3:00	Potential problems in SVS and their solutions
3:30	Summary, wrap-up, and evaluation
4:00	End of session

What you need to know before using this module:

- How to use basic Windows 95 user interface features
- What are stand inventory data, stand exams, and stand tables
- How to use a stand growth model (basic knowledge of either ORGANON or FVS if you plan to use SVS to visualize growth model results)

Computer system requirements for SVS

- Personal computer running Windows 95, Windows 98, or Windows NT (release 4.0 or higher). The current version of SVS will run under Windows 3.1 but the install procedure is not compatible with Windows 3.1. Future versions of SVS will run only on Windows 95, 98, or NT.
- Graphics card capable of displaying at least 256 colors.
- 6Mb free hard disk space for installation. Additional disk space will be needed for data files created by the user.

Goals of this module

This module is designed to provide you with a basic understanding of the Stand Visualization System (SVS). The module covers basic and advanced features of SVS and the use of the data conversion capabilities in SVS. Specific goals of the training include:

- Introduce you to the Stand Visualization System (SVS)
- Provide “hands-on” experience with SVS
- Teach you the basic functions of SVS
- Teach you how to use your stand data with SVS
- Teach you how to be productive with SVS by automating simple tasks
- Teach you how to work with understory data in SVS
- Teach you how to visualize growth and management projections in SVS

Basic SVS capabilities

The Stand Visualization System (SVS) generates images depicting stand conditions represented by a list of individual stand components, e.g., trees, shrubs, and down material, using detailed geometric models. The images produced by SVS, while somewhat abstract, provide a readily understood representation of stand conditions and help communicate silvicultural treatments and forest management alternatives to a variety of audiences.

SVS provides the following capabilities:

- displays individual plant and log components;
- displays stand characteristics to communicate the overall structural diversity present or absent in a stand;
- differentiates between stand components using different plant forms, colors, or other types of marking;
- displays overhead, profile and perspective views of a stand;
- provides a mechanism to define plant forms and colors based on species, growth form, and plant position within the canopy; and
- provides tabular and graphical summaries of stand information.

SVS uses two basic types of data: a tree list and plant form definitions. The tree list describes the species, size and location of each component object (tree, snag, plant, log, or special object) in a stand. Plant form definitions describe the appearance of each species and, optionally, the appearance of individuals exhibiting different growth forms within a species.

SVS version differences (DOS/Windows)

SVS was originally developed as a DOS program. The DOS version (latest and final DOS version is 2.31) included some capabilities that will not be incorporated into the Windows version. Specifically, the DOS version allowed users to change the palette of colors used to draw trees. The color palette cannot be changed in the Windows version.

The Windows version introduces several new capabilities. Major additions include the ability to change the contents of the SVS screen, the ability to print SVS images directly from SVS, and enhanced marking and treatment capabilities.

Both versions of SVS provide a graphical user interface, however the interface style of the DOS version was unique to SVS. Both versions share the same file formats so tree lists, tree form definitions, and ground definition files produced for the DOS version should work in the windows version and vice versa.

Data conversion capabilities in SVS

The primary data used by SVS, called a tree list, consists of a list of individual stand components, their attributes, and their location in the stand. Tree lists are maintained as ASCII text files so they can be created or modified by the user. However, the information that must be included in a tree list places excessive data manipulation demands on most users. SVS provides several utility functions and programs that can convert data from several sources into SVS tree lists. Internal functions are available to convert simple stand tables and ORGANON output files. External programs, distributed with SVS, convert output from the Forest Vegetation Simulator, the FORSEE silvicultural treatment editor. There is also a command line

utility, TBL2SVS.EXE, that converts simple stand tables into SVS tree lists duplicating the capability of SVS internal functions.

Tree form definitions and use

Users define the appearance of each species represented in a tree list using a tree or plant form definitions. Form definitions describe the overall growth form; geometry and number of branches or leaves; and color of the stem, branches and foliage. SVS provides a "tree designer" to help users develop tree form definitions for the species and growth forms in their area. SVS uses the species identifier as the primary link between the component list and the plant form definitions. However, two additional parameters, tree class and crown class, can be used to distinguish individuals within a species. Interpretation and use of these two parameters is under the complete control of the user.

Types of SVS output

SVS produces a variety of stand images, graphs, and tabular summaries. SVS produces three types of stand images: perspective, overhead, and cross sectional views of a stand or plot. SVS can generate graphs showing DBH, height, and species distributions and a graph showing overall crown structure for a stand. SVS also produces a stand summary that provides summary statistics for an entire stand and, optionally, statistics for live, dead, and down material (dead and down material must use specific tree class values that indicate material is dead).

In SVS, the term *layout* is used to describe the arrangement of images, graphs, or tabular summaries on the screen. Users can modify or create layouts to suit their needs. SVS provides several default screen layouts that will meet the needs of most users. For users who need to modify or customize a layout, SVS provides a layout editor.

Basic SVS terminology

The following list of terms used in SVS is provided to help new users get started. It is not a comprehensive list.

Tree list	An SVS data file containing a list of all plant components (trees, shrubs, snags, downed logs, etc) in a stand or plot.
Tree list index	A special type of SVS file that contains a listing of SVS tree list files and a descriptive title for each file. Tree list indexes are usually used to organize a series of related tree lists.
Screen layout	The arrangement of individual SVS images, graphs, or other displays drawn on the SVS screen. A screen layout is made up of individual <i>panels</i> . A <i>panel</i> contains a single image, chart or other display.
Tree or plant form definition	A parameter set that describes the appearance of individual trees or other plants. Tree form definitions are modified using the SVS tree designer.
Ground definition file	A special data file used to control the appearance of the ground surface in an SVS plot. The windows version of SVS can only use a ground definition file that is referenced from within a tree list file.
Tree designer	The dialog used to modify or create SVS tree form definitions.
Rendering	The process of drawing an SVS stand image.
Tree class (also Plant class)	An attribute assigned to an individual SVS tree that can be used to differentiate the appearance of different growth forms or size classes for trees of the same species.
Crown class	An attribute assigned to an individual SVS tree that can be used to differentiate the appearance of different growth forms or size classes for trees of the same species.

Basic procedure to install SVS from diskettes

- Insert SVS disk 1 in your floppy disk drive
- On the Windows Start button, select “Run...”
- Select the “Browse...” button and select the floppy disk drive
- Find and select Setup.exe
- Select the “Ok” button
- Follow the instructions in the install wizard

Installing SVS from the FTP distribution

- Download the latest version of the SVS installation file
- Run the installation file to extract the setup files to a temporary directory
- Run the Setup.exe application in the temporary directory
- Follow the instructions in the install wizard

Installing the training data (optional)

- Insert the training disk in your floppy disk drive
- On the Windows Start button, select “Run...”
- Select the “Browse...” button and select the floppy disk drive
- Find and select Setup.exe
- Select the “Ok” button
- Follow the instructions in the install wizard

Uninstalling SVS and the training data

SVS and the training data can be uninstalled using the same procedure:

- On the Windows Start button, select “Settings...” and “Control Panel”
- Find and double-click the “Add/Remove Programs” icon
- Select the title, either “Stand Visualization System (SVS)” or “SVS training data”, from the list of installed applications
- Select the “Add/Remove” button to start the uninstall process

Do not remove SVS or the training data by simply deleting the directory containing the program and data files. This method could result in system problems or could prevent future re-installation of SVS.

6 MENU STRUCTURE AND ON-LINE HELP

Main menu functions

The SVS main menu provides access to all of the functions available in SVS. Menu options that initiate a dialog box for user interaction end with ellipsis (...). Menu options that directly result in an action have no ellipsis. Users can select menu options using the mouse or keyboard.

File	
New stand...	Create a new SVS tree list from a simple stand table or growth model output file
Open...	Open an SVS tree list or tree list index file
Save image as...	Save an image of the current stand to either the Window's clipboard or an image file
Save scene description	Save a scene description for another rendering system. SVS supports the creation of VRML 1.0 and POV-ray scene files
Print...	Render the current SVS display to a printer
Page setup...	Configure the printed page margins
Printer setup...	Select the current printer and change configuration information for the printer
Preferences...	Specify parameters that control the overall behavior of SVS
Exit	Quit SVS
Recent file list	List of files most recently loaded into SVS
Edit	
Copy screen image to clipboard	Copy the contents of the SVS screen to the Windows clipboard
Display	
Redraw all	Redraw all panels in the current SVS screen layout
Command line options	Display the command line options needed to duplicate the current view in SVS
Tree list info	Display information describing the currently loaded SVS tree list
Canopy cover info	Compute canopy cover estimates for the SVS stand.
SVS error log	Displays error messages describing any problems encountered by SVS
SVS Options	
Perspective view options...	Modify the viewing parameters that control the perspective view of a stand
Overhead view options...	Modify the viewing parameters that control the overhead view of a stand
Profile view options...	Modify the viewing parameters that control the profile view of a stand
Marking and treatment...	Simulate the visual effects of silvicultural operations by marking trees and specifying treatments.
Default parameters...	Modify default parameters for stand visualizations drawn in SVS
Screen layouts	Select or define screen layouts
Tree designer...	Modify or create new tree form definitions
Help	
Contents	Display the SVS help contents
Procedures	Display information describing the basic procedures used in SVS
Using help	Display help for using the Windows help system (help on help)
About...	Display version information for SVS

Right mouse button menu functions

The right mouse button menu, activated by pressing the right mouse button while the cursor is within the SVS window, provides access to some commonly used menu options. The right mouse button menu cannot be accessed using the keyboard. However once the menu is displayed, the keyboard can be used to select menu options.

Redraw all views	Redraw all panels in the current SVS screen layout
Open...	Open an SVS tree list or tree list index file
Perspective view options...	Modify the viewing parameters that control the perspective view of a stand
Overhead view options...	Modify the viewing parameters that control the overhead view of a stand
Profile view options...	Modify the viewing parameters that control the profile view of a stand
Marking and treatment...	Simulate the visual effects of silvicultural operations by marking trees and specifying treatments.
Screen layouts	Select or define screen layouts
Exit	Quit SVS

Help file overview

SVS provides a comprehensive help file system that serves as the SVS manual. The help file system is actually made up of a series of help files structured around the WINSVS program architecture. The menu option Help | Contents launches the primary help file. Other help files in the help system are accessed from the contents of the primary file. Direct access to the help system is useful for learning about the basic features of SVS. Context sensitive help provides information about specific operations in SVS.

Context sensitive help

All dialogs in SVS include a "Help" button to access context specific help for the dialog. Once in a specific help topic, you can access the entire help file structure by returning to the "Contents" topic.

Double clicking on an SVS file in the Windows Explorer

During SVS installation, the .SVS extension is associated with the SVS application. This means that Windows knows how to open an SVS tree list from any file window. For example, when using the Windows Explorer, you can double click on an SVS file (designated as “SVS Tree List” in the file listing) to launch SVS to display the specified file.

Loading an SVS tree list

To load a tree list in SVS, select the **File | Open...** menu option. Then use the file dialog to select the desired SVS tree list file or tree list index (both have the .SVS extension). To control the default settings, e.g., drawing quality, for newly opened SVS files, see the **SVS options | Default parameters...** menu choice.

Types of SVS files

SVS supports two types of files: tree lists and tree list indexes. A tree list file contains a listing of individual trees that make up a stand or plot. A tree list index file contains a listing of tree list files and a descriptive title for each file. Tree list indexes are usually used to organize a series of related tree lists but they can also be created, using an ASCII text editor, to organize any set of tree list files. When a tree list index file is opened, SVS displays an index control dialog (Figure 7-1) at the bottom of the SVS window and loads the first tree list in the index. You can use the index control dialog to access other tree list files referenced in the index.



Figure 7-1. The SVS index control dialog is used to access the tree list files referenced in a tree list index.

Manipulating the display and changing the drawing quality

The appearance and viewpoint used to create SVS stand renderings are modified using the **SVS options | Perspective view options...**, **SVS options | Overhead view options...**, and **SVS options | Profile view options...**, dialogs.

The perspective view options dialog (Figure 7-2) allows you to change the viewpoint by positioning the head location (the point you are looking from) and the focus location (the point you are looking towards). You can also modify the lens focal length used to produce the perspective and the drawing quality used to render individual trees.

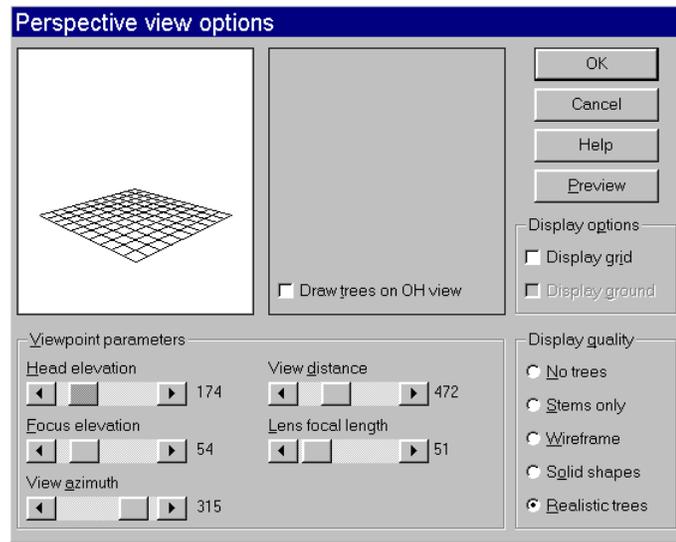


Figure 7-2. The perspective view options dialog controls the viewpoint used to render the SVS perspective view and the appearance of individual trees in a stand.

The overhead view options dialog (Figure 7-3) allows you to change the appearance of the overhead stand view. You can also change the width of the “strip” used to determine which trees are shown in the profile view. The overhead view is always rotated so the bottom of the display corresponds to the closest point shown in the SVS perspective view.

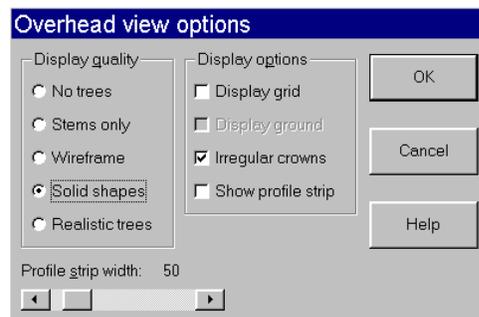


Figure 7-3. The overhead view options dialog controls the appearance of the overhead view.

The profile view options dialog (Figure 7-4) allows you to change the appearance of the profile stand view. You can also change the width of the “strip” used to determine which trees are shown in the profile view. The profile view always shows a cross-sectional view of the SVS stand. The cross section is oriented so it is perpendicular to the line-of-sight defined by the head and focus location specified on the perspective view options dialog.

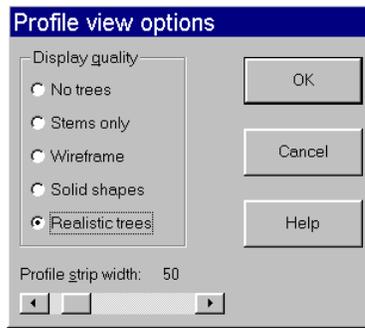


Figure 7-4. The profile view options dialog controls the appearance of the profile view.

Changing image characteristics

The overall appearance of SVS images is controlled using the **SVS options | Default Parameters...** dialog (Figure 7-5). The color of the background, ground base, ground surface, and grid lines can be changed to suit personal preferences or the intended use of captured SVS images. If you intend to print the images, you should select a white background to minimize the amount of ink or toner needed to print the image. If you intend to use the images for slides, a black, or other dark color, background can be used.

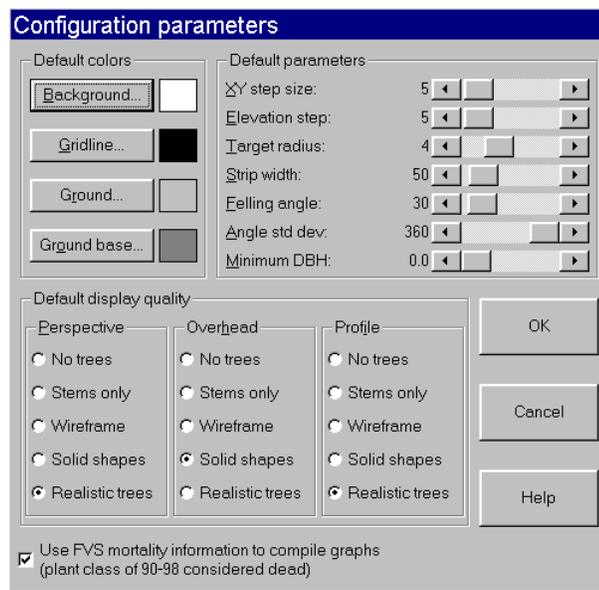


Figure 7-5. The default parameters dialog is used to change the overall appearance of SVS visualizations.

The default parameters: **XY step size** and **Elevation step size** control the sensitivity of the controls used to position the head and focus locations on the perspective view options dialog.

The **Strip width** parameter controls the width of the strip used to determine which trees should be shown in the stand profile view.

The **Minimum DBH** parameter controls the display of trees in all SVS visualizations. Only trees with a DBH larger than the minimum will be drawn. The minimum DBH parameter is especially useful when a plot contains dense regeneration. By setting the minimum DBH to a

small value, e.g., 2.0 inches, the number of trees displayed in the SVS images is greatly reduced thereby increasing the drawing speed.

The default display quality settings control the quality of a newly loaded SVS tree list. These default settings are only applied when a tree list is loaded and do not affect the drawing quality of a tree list that is currently loaded.

The **Use FVS mortality information to compile graphs** option tells SVS to recognize some trees, coded with a tree or plant class value ranging from 90 to 98, as being dead. When this option is enabled, SVS includes a dead tree category when it compiles summary statistics for a stand. The default parameters are saved in the WINSVS.INI file so they will remain in effect for future runs of SVS.

Changing the screen contents

The contents of the SVS screen can be changed by using *screen layouts*. A *screen layout* consists of a series of *panels* that contain various SVS images, graphs, or tabular summaries. *Screen layouts* are changed using the list of available Screen layouts displayed on the **SVS options | Screen layouts** menu. The process of defining or modifying a screen layout will be discussed later.

Each screen layout has an associated aspect ratio (width / height). When the **Use aspect ratio from screen layout** option is enabled, the SVS window size will be adjusted to provide the correct aspect ratio. The aspect ratio also effects the dimensions of images printed from SVS.

Changing the printed page layout

The **File | Page setup...** menu option allows you to change the margin settings used to print SVS images. The Page setup dialog (Figure 7-6) parameters have different effects depending on whether or not the **Maintain aspect ratio** parameter is enabled. The margin settings always specify the minimum margins for the printed page. Actual margins will vary depending on the layout aspect ratio and the state of the **Center image on page** and **Fit to full page** parameters.

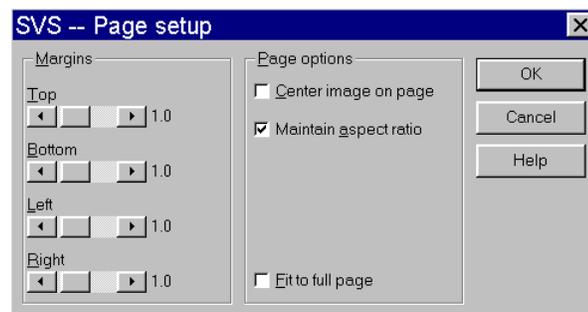


Figure 7-6. The page setup dialog is used to specify the margins and overall layout of printed SVS images.

The printable area of the page is defined by the margin settings. If the **Fit to full page** parameter is enabled, the margin settings are ignored and the printable area of the page is set to the maximum allowed by the printer.

The **Center image on page** parameter causes SVS to center the image on the printed page. If the **Maintain aspect ratio** parameter is disabled, the image will fill the entire printable area of the page. If the **Maintain aspect ratio** parameter is enabled, the image may not fill the entire printable area of the page.

Printing from SVS

SVS supports printing to any printer supported by Windows. This includes both color and black and white printers and large format inkjet plotters. Printing results when using pen plotters may be poor. Printing performance varies depending on the type of printer and the characteristics of the Window's printer driver. SVS images can be quite complex and may be too complicated for some printers, especially older models. In some cases, adding more printer memory can solve printing problems.

Saving an SVS image for use in another application

SVS provides several options for saving stand images for use in reports or for printing from other applications. The simplest method for transferring an image to another application is by "cut and paste" using the Windows clipboard. This option is available using the **Edit | Copy screen image to clipboard** menu option. This option will copy an exact duplicate of the current SVS screen to the clipboard which can later be "pasted" into another application. The biggest disadvantage of this method arises when you have stopped the drawing of an SVS image (by pressing [Esc] or clicking the right mouse button). Because the copy function transfers an exact copy of the current screen to the clipboard, the image will be incomplete. This also causes problems when a portion of the SVS screen is not visible, covered either by another window or off the screen.

SVS provides a more robust method for copying or saving images via the **File | Save image as...** menu option. This option uses the Image save dialog (Figure 7-7) to allow you to save an image to the clipboard or to create an image file for later use. This option also allows you to create images that are larger than your display. Image rendering during image file saves can still be interrupted using the [Esc] key, the right mouse button, or the **Cancel** button on the rendering dialog.

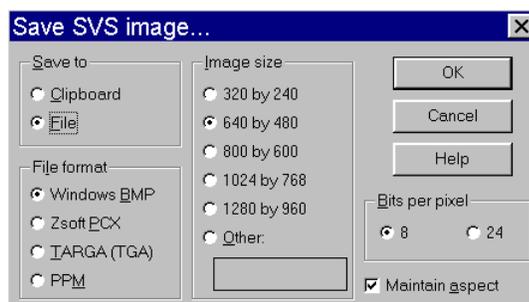


Figure 7-7. The Save SVS image dialog allows you to save an SVS image to the Windows clipboard or create an image file for later use.

When the **Clipboard** option is selected, the **File format** options are disabled. The SVS image will be copied to the clipboard using a device independent format (the image includes palette information). When the **File** option is selected, you can select the image **File format** and the color depth, or **Bits per pixel**, for the saved image. Bits per pixel specifies the amount of data used to represent each pixel in an image. In most cases there is no reason to save 24-bit color images because SVS internally uses only 8-bit color to render stand images.

The Windows BMP image format is the standard image format used by Windows applications. Zsoft's PCX format is also a popular format for personal computer applications. The TARGA and PPM formats are used less commonly on personal computers.

The available image sizes will vary depending on the aspect ratio of the current screen layout and the state of the **Maintain aspect** control. In all cases, the first number, the image width, of the selections will remain the same. Only the image height will change depending on the aspect ratio. If you want to create images using a size that is not available, select the **Other** option to activate a dialog that will allow you to specify an image size up to 2048 * 2048. When saving images, it is important to consider the amount of memory that will be required to produce the image. To determine the amount of memory needed during rendering, you must know the color depth specified in your display properties. Once the color depth is known you can use the formulas in the following table to estimate the memory needs for rendering:

Color depth	Formula
8-bit, 256 colors	$Mb = (\text{width} * \text{height}) / 1024 / 1024$
16-bit, 65,000 colors, also called high color mode	$Mb = (\text{width} * \text{height} * 2) / 1024 / 1024$
24-bit, 16.7 million colors, also called true color	$Mb = (\text{width} * \text{height} * 3) / 1024 / 1024$
32-bit, 16.7 million colors, also called true color	$Mb = (\text{width} * \text{height} * 4) / 1024 / 1024$

You should not attempt to save images that require more than half of your system memory. For example, if your computer has 16 Mbytes of RAM and your display properties indicate a color depth of 32-bits, you should not try to create images larger than 1448 * 1448 pixels. While attempts to create a larger image may be successful, odds are that image rendering will take a long time and may hang your computer.

Changing general SVS preferences

The **File | Preferences...** option on the SVS main menu allows you to set parameters that control the overall behavior of SVS using the Preferences dialog (Figure 7-8).

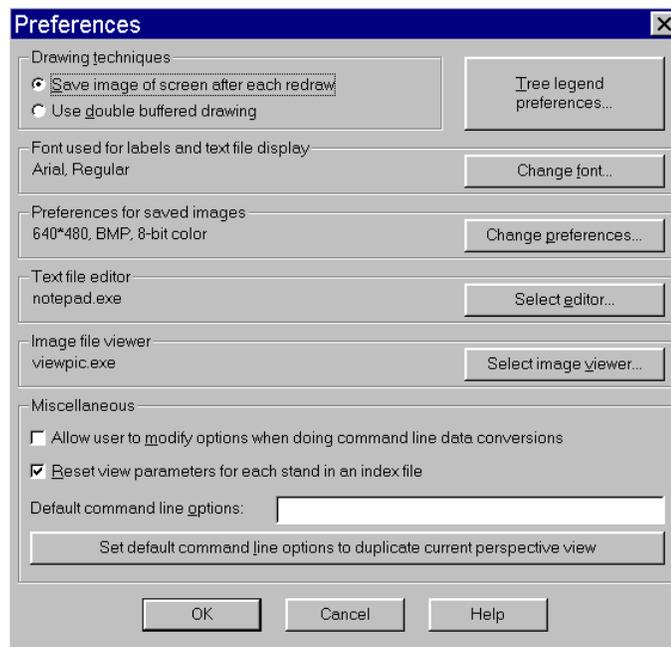


Figure 7-8. The Preferences dialog is used to change parameters that control the overall behavior of SVS.

SVS provides two drawing strategies: rendering directly to the screen and rendering to an image held in memory that is copied to the screen after drawing is complete. The first strategy, selected using **the Save image of screen after each redraw** control, works well when the SVS window is completely visible. That is, it is not covered by another window or positioned so a portion of the window is off the screen. The first strategy also allows the user to watch the drawing process. The second strategy, selected using the **Use double buffered drawing** control, always works but does not allow the user to watch the drawing process. Drawing can be interrupted by pressing the [Esc] key or the right mouse button regardless of the strategy selected. When the first strategy is selected, it is possible for the SVS screen to be corrupted. If the SVS window is partially obscured by another window and the other window is moved or closed, the exposed portion of the SVS window will most likely contain garbage. Similar results occur when part of the SVS window is off the screen and the window is repositioned so more of the window is visible. In both cases, the problem is fixed by simply redrawing all views using the **Display | Redraw all** menu choice.

The font used for all text in the SVS window, except for the labels on SVS graphs, can be changed using the **Change font...** button. Only the face name and the font style need be specified. SVS will set the font size as needed. The font used for SVS graphs cannot be changed.

The preferences for saved images can be changed using the **Change preferences...** button. These preferences affect the initial settings for the Save image as dialog and image saves that result from command line parameters.

The program used to edit ASCII text files can be changed using the **Select editor...** button. The default editor, NOTEPAD, is available on most computers running a version of Windows. The editor specified must be able to produce ASCII text files and must accept a file name on its command line. If you use WORDPAD as your editor, make sure you save files as text only.

The program used to view image files from within SVS can be changed using the **Select image viewer...** button. This program will be launched to view image files when the `-I` command line option is specified. The viewer specified should be able to display BMP and PCX file formats and should accept an image file name on the command line. If you routinely use the TARGA and PPM formats, you should specify a viewer that can display these formats as well. The default viewer, VIEWPIC, is distributed as part of SVS and can display all image files produced by SVS.

The miscellaneous parameters provide access to two useful features in SVS. First, the **Reset view parameters for each stand in an index file** option tells SVS to reset to the default viewpoint each time a new file in a tree list index is loaded. When this option is disabled, the viewpoint is not reset. Most users will want this option disabled if they use tree list indexes to organize their SVS tree lists or if they are using the output from a growth projection system such as ORGANON or the Forest Vegetation Simulator (FVS). The second miscellaneous parameter specifies default command line options for SVS. These options allow you to control the initial viewpoint, drawing quality and to automate SVS image production. The default command line options are prepended to the options specified on the actual SVS command line so they can be overridden by parameters on the actual command line. For additional information regarding command line options available in SVS, see the SVS help file.

Accessing and using help

SVS provides extensive help for most of its features. Help can be accessed using the option on the **Help** menu or by pressing the **Help** button on an SVS dialog. The context sensitive help for dialogs is especially useful when trying to remember specific information about the controls on a dialog or the effect of parameter settings.

8 ADVANCED SVS OPTIONS

Command line operations

SVS provides several command line options that can be used to control its behavior. Command line options can be specified in three ways:

- Added to command line entered in DOS window
- Added to the properties for a shortcut to the WINSVS program
- Specified in the **File | Preferences...** dialog

For a complete discussion of SVS command line options, refer to the SVS help.

Changing the initial viewpoint using SVS command line options

SVS provides several command line options that help you specify an initial viewpoint for the perspective view of a stand or plot. The following table summarizes the command line options useful when changing the viewpoint position:

Command line option	Description
<i>-Angle</i>	Azimuth from the center of the SVS plot to the viewpoint location. Changing the azimuth allows you to change the initial viewpoint used in SVS. The <i>angle</i> parameter can range from 0.0 to 360.0.
<i>-Ddistance</i>	Distance from the viewpoint to the center of the stand. The <i>distance</i> parameter can be any distance greater than zero so long as the resulting viewpoint location does not end up within the plot represented in SVS.
<i>-Eelevation</i>	Initial viewpoint elevation for the perspective view. The <i>elevation</i> parameter can be any value greater than zero.
<i>-Lfocal length</i>	Focal length for the lens used to generate the perspective view. Changing the focal length allows you to zoom in (larger picture) or out (smaller picture). Valid values for <i>focal length</i> range from 20 to 400 millimeters.
<i>-Selevation</i>	Initial focus point elevation for the perspective view. Changing the elevation of the focus point simulates tilting your head up and down. The <i>elevation</i> parameter can be any value greater than zero.
<i>-Vviewpoint</i>	Initial viewpoint location for the perspective view. Valid <i>viewpoint</i> locations are shown in Figure 8-1. The <i>-V</i> option is intended to provide an easy method of specifying an initial viewpoint. It should not be used with the other options described above.

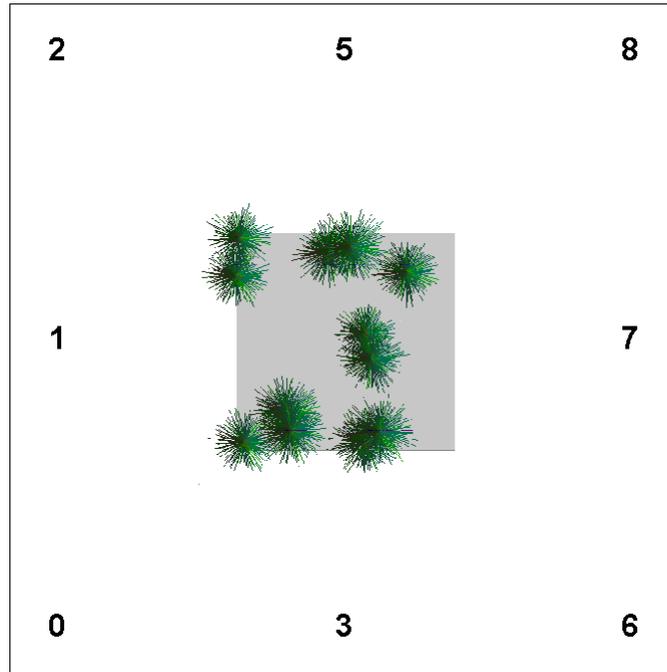


Figure 8-1. Viewpoint numbers are used with the `-V` command line option to specify a startup viewpoint.

The easiest way to determine appropriate settings for use with the above options is by manipulating the perspective view options to produce a view that is satisfactory. Then use the **Display | Command line options** menu option to show you the command line parameters needed to duplicate the current view. Figure 8-2 shows a sample perspective view and the Command line options dialog that displays the command line parameters needed to duplicate the view.

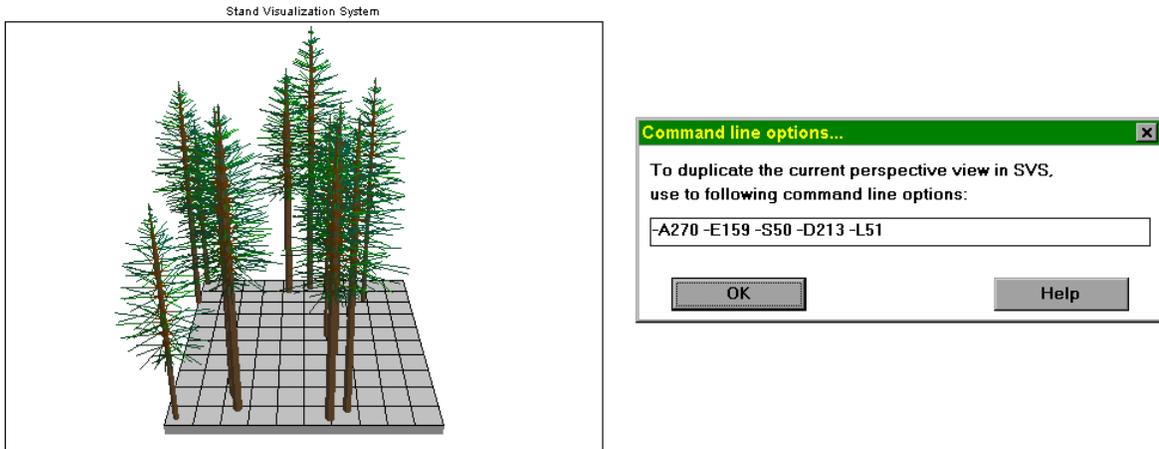


Figure 8-2. A sample SVS perspective view and the command line options needed to duplicate the view.

Automating image creation using SVS command line options

SVS provides command line options that can be used to automate the creation of SVS images. The following table summarizes the command line options used when automating image capture:

Command line option	Description
-C <i>image file</i>	Capture screen to a file named <i>image file</i> and exit. If the tree list given on the command line for SVS is a tree list index, each individual tree list specified in the index will be loaded and drawn. The resulting image files will be named <i>image file.l###</i> where <i>###</i> corresponds to the image number in the sequence of images. When capturing a series of files, drawing of an individual stand can be stopped by pressing the right mouse button while the mouse cursor is located within the status dialog. When the Cancel button becomes active, clicking it will stop capture of all stands. The default format for image captures can be changed using the File Preferences... menu option.
-1	Set the screen layout to the layout identified as "dossvs1". By default this layout provides the perspective stand view and the SVS tree list file title.
-3	Set the screen layout to the layout identified as "dossvs1". By default this layout provides the perspective, overhead, and profile stand views and the SVS tree list file title.
-Q <i>quality</i>	Set the drawing quality for SVS stand views. The <i>quality</i> parameter can be one of the following values: 0 -- no trees 1 -- stems only 2 -- wireframe trees 3 -- solid trees 4 -- realistic trees
-l	Tells SVS to launch the image viewer specified in the SVS preferences to view a captured image file. The -l option is only effective when used with the -C option to capture an image file.

The following command line would result in the automatic generation of an image file named SAMPLE.PCX containing the perspective stand view of a file named SAMPLE.SVS:

```
WINSVS -1 -Q4 -Csample.pcx SAMPLE.SVS
```

The above example assumes that the SVS preferences for saved images (specified using the **File | Preferences...** menu option) specifies that the PCX format will be used for saved images. Inclusion of the -l option in the above command line would launch to image viewer to display the captured image.

Defining screen layouts

Screen layouts are used to define the contents of the SVS screen. The Screen layout definition dialog (Figure 8-3) is accessed using the **SVS options | Screen layouts|Define screen layouts...** menu option.

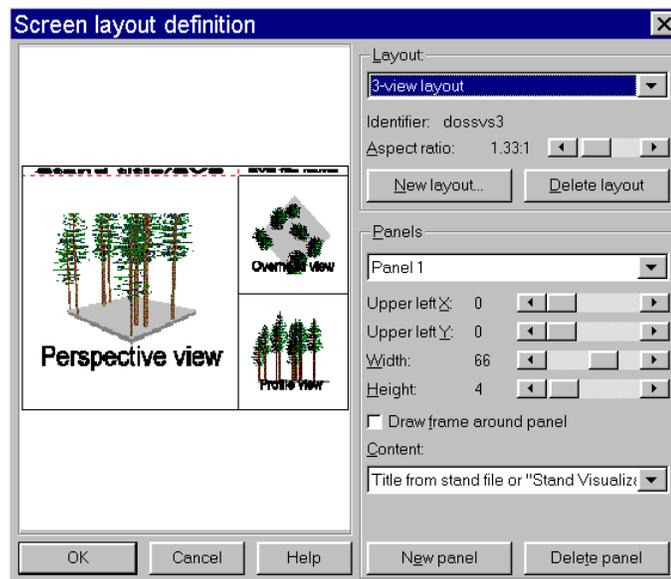


Figure 8-3. The screen layout definition dialog is used to control the contents of the SVS screen.

SVS screen layouts are identified by the layout name and the layout identifier. The layout name is generally used any time the user selects a screen layout. The layout identifier is generally used internally in SVS to identify layouts. A screen layout is made up of one or more *panels*. Panels contain a single SVS stand image, graph, report, or other display object.

Screen layouts are defined using a “page” that is always 100 units wide and 100 units tall. The page origin is in the upper left corner. The aspect ratio (width/height) changes the overall shape of the page. An aspect ratio of 1.0 results in a layout that is square and an aspect ratio of 2.0 results in a layout that is twice as wide as it is tall.

Individual panels are positioned on the page by the location of their upper left corner and their width and height. It is possible, although not recommended, to position panels so part, or all, of the panel is off the page. Panels can be surrounded by a frame by checking the **Draw frame around panel** control. A panel’s content is selected from the **Content** list. For a description of all available panel contents, see the SVS help. Some panel contents can use extra parameters, called auxiliary data, to modify the contents. For a description of the auxiliary data see the SVS help.

Panel order is important in that panels are drawn in order. This means that higher numbered panels can cover up lower numbered panels. The current version of SVS does not let you change the panel order without deleting and recreating panels. Future versions of SVS will provide a **panel order** option.

Modifying and creating tree form definitions

The appearance of individual trees, logs, and plants in SVS is controlled by tree form definitions. Users can create or change tree form definitions using the SVS tree designer (Figure 8-4) accessed using the **SVS options | tree designer...** menu option.

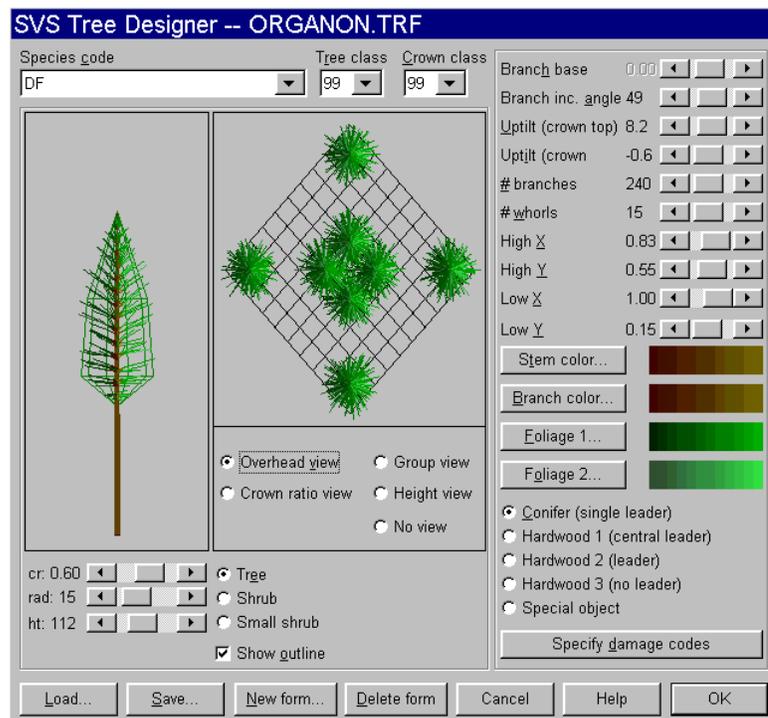


Figure 8-4. Tree form definitions are modified using the SVS tree designer.

Design tree window and controls

The *design tree* window, the window containing a single tree in Figure 8-4, and its associated controls are used to view and control the attributes of a typical tree represented by the form being manipulated. The controls affect only the appearance of the tree displayed in the tree designer. When rendering stand images, SVS will use tree attributes from the tree list to determine the size of an individual tree. SVS uses special logic to scale the number of branches and leaves drawn for small trees. This logic is based on an individual tree's height relative to the *design tree* height so you should make sure the *design tree* height is reasonable for the species.

The control labeled "cr" represents the crown ratio. The control labeled "rad" represents the crown radius. The control labeled "ht" represents the height. The radio buttons labeled "Tree", "Shrub", and "Small shrub" can be used to change the scaling of the design tree window. The "Tree" scale works best when the height of the design tree is set to a value larger than 50. The "Shrub" and "Small shrub" scales work best when designing small trees and herbaceous plants (generally less than 50 feet or 50 meters tall). The "Show outline" checkbox controls the display of the overall crown shape. If the number of branches is set to 0, the wireframe shape will not be displayed regardless of the setting of this checkbox.

Auxiliary view window and controls

The auxiliary view, the window containing the overhead view of eight trees in Figure 8-4, is used to display trees and other plants as they appear in an SVS image. The overhead view shows a group of eight plants as seen from overhead. This view can be used to make sure that the setting of the branch increment angle results in the desired crown shape and density when viewed from above. The crown ratio view shows a group of trees drawn with varying crown ratios. This view can be used to make sure the plant form represents a variety of crown sizes correctly. The group view shows a group of trees drawn with varying heights and, to

some extent, crown ratios. This view can be used to make sure different size trees are represented correctly and to evaluate the apparent crown density when tree crowns overlap. The height view displays a group of trees with varying heights. This view differs from the group view in that the trees are regularly spaced. The height view shows the effect of the height-based scaling of the number of branches or leaves.

Species code

The species code control lists all species currently represented in the set of tree forms. Making a selection from this list displays the first tree form defined for the species and allows you to make changes to the form definition parameters.

Tree class

The tree class list lists all tree class values currently represented for the current species. Making a selection from this list displays the associated form and allows you to make changes to the form definition parameters.

Crown class

The crown class list lists all crown class values currently represented for the current species and current tree class. Making a selection from this list displays the associated form and allows you to make changes to the form definition parameters.

Branch base

Location of branching point relative to base of live crown. The branch base normally ranges from 0.0 to 1.0 but it can be less than 0.0 to move the branches below the crown. Applies to multiple leader plant forms only.

Branch increment angle

Angular increment between branches and leaf structures. The increment angle controls the appearance of tree crowns in overhead views. To maintain full crowns, the increment angle should not divide evenly into 360.0.

Uptilt of branches at the top of the crown

Branch insertion angle for branches located near the top of the crown. To determine the actual insertion angle, a value is interpolated between the branch angle at the base and top of the crown.

Uptilt of branches at the base of the crown

Branch insertion angle for branches located near the base of the crown. To determine the actual insertion angle, a value is interpolated between the branch angle at the base and top of the crown.

Number of branches/leaves

For single leader plant forms, "# branches" refers to the number of branches. For multiple leader plant forms, "leaves" refers to the number of leaf structures.

Number of whorls/branches

For single leader plant forms, "# whorls" refers to the number of branch whorls. If 0, limbs are distributed uniformly along the stem. For multiple leader plant forms, "# branches" refers to the number of heavy branches in the canopy. Multiple leader plants are always drawn with at least three heavy branches regardless of the value of this parameter.

High X

X value of the point defining the high point of the crown (see Figure 8-4). Either the high or low point x should be 1.0 to prevent scaling of crown widths. See the discussion of crown shape later in this manual for additional information.

High Y

Y value of the point defining the high point of the crown (see Figure 8-4). See the discussion of crown shape later in this manual for additional information.

Low X

X value of the point defining the low point of the crown (see Figure 8-4). Either the high or low point x should be 1.0 to prevent scaling of crown widths. See the discussion of crown shape later in this manual for additional information.

Low Y

Y value of the point defining the low point of the crown (see Figure 8-4). See the discussion of crown shape later in this manual for additional information.

Stem color

Color used for the stem of the plant.

Branch color

Color used for branch portion of a limb. For single leader plant forms, 25 percent of each limb is considered branch and is colored using the branch color. For multiple leader plant forms, the entire heavy branch structure is colored using the branch color.

Foliage color 1

Color used for 75 percent of the crown foliage.

Foliage color 2

Color used for 25 percent of the crown foliage.

Overall plant form

Specify the overall growth form for the current tree form. The overall growth form controls the type of plant, the general branching characteristics, and the presence of individual leaves. Some labels on the dialog change depending on the overall plant form selected.

SVS represents four plant forms, one single and three multiple leader forms, and a special object form. The single leader form (A in Figure 8-5), intended to represent coniferous species, consists of a single, central stem with branches projecting from the stem center. Branches may be arranged in whorls or evenly distributed along the stem. The multiple leader forms (B, C, D in Figure 8-5), intended to represent deciduous species, consists of a stem base below the crown, a central leader within the crown, branches, and leaves. The three different multiple leader forms represent growth forms that have a strong central leader with branches uniformly distributed throughout the live crown (B in Figure 8-5), growth forms that have a central bole in the live crown but most of the branches are located in the lower portion of the live crown (C in Figure 8-5), and growth forms that have no central bole in the live crown (D in Figure 8-5). For all multiple leader plant forms, the height of the base stem (below the first branch) relative to the total plant height can be controlled along with the distribution,

number and insertion angle of the branches. Leaves are represented as a cloud of triangles positioned around the perimeter of the crown.

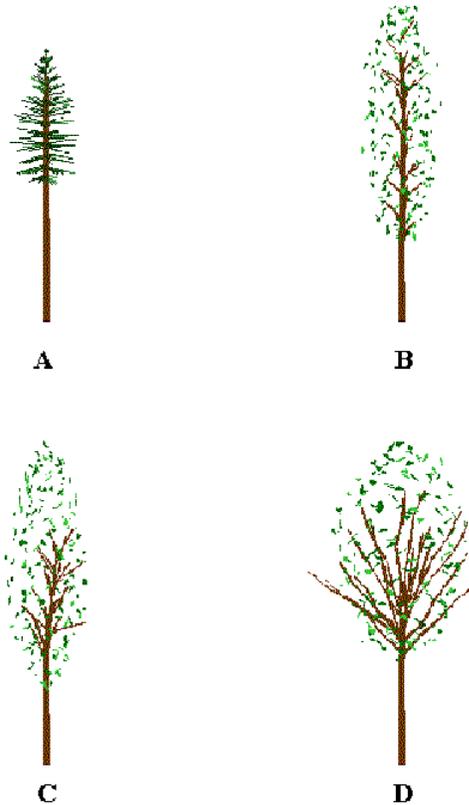


Figure 8-5. SVS represents one single (A) and three multiple (B, C, D) leader plant forms.

Damage codes

Initiate the Damage codes dialog (Figure 8-6) to specify damaged foliage or dead branches for a particular tree form.

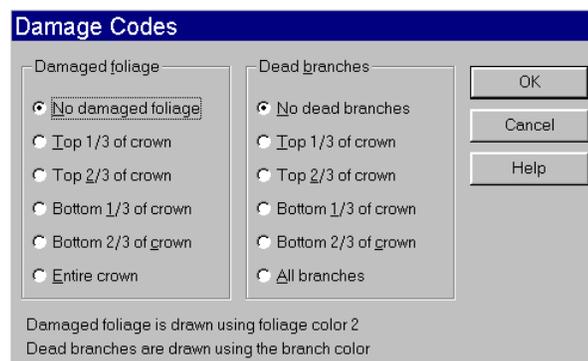


Figure 8-6. The Damage codes dialog is used to specify crown damage for a tree form.

Crown shape

Crown shape for both single and multiple leader growth forms is defined by two points as shown in Figure 8-7, called the high and low crown points. These points define the extent and

overall shape of a plant crown. The branches on single leader forms will closely follow the crown shape defined by the high and low points. The heavy branches on multiple leader forms can be located independent of the high and low points. The leaves on multiple leader forms are arranged to produce a rounded crown, the outline of which is controlled by the high and low points.

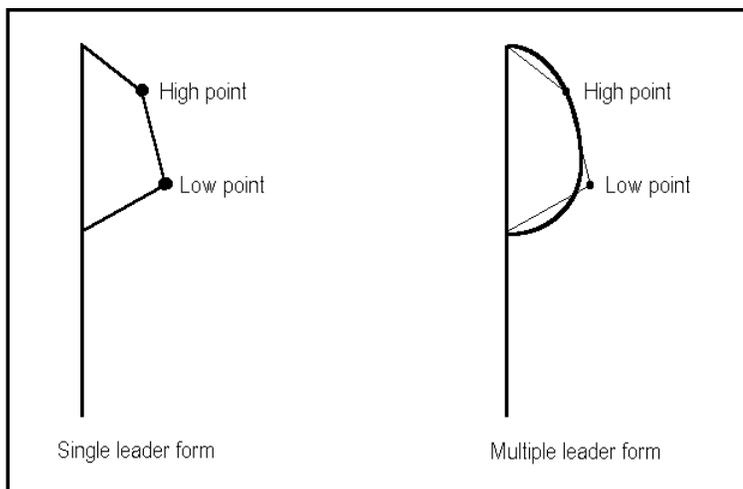


Figure 8-7. Two points define crown shape for plant forms.

The meaning of some parameters changes depending on the overall plant form. The following table shows the parameters that have different meanings for single and multiple leader plant forms. In some cases, the parameter label changes when the plant form is changed.

Parameter	Single leader form	Multiple leader form
Branch base	Not used	Defines the lower limit for branch placement and the relative height of the base stem
# branches/leaves	Total number of branches	Total number of leaves
# whorls/branches	Number of whorls	Number of branches

Load...

Load a new set of tree form definitions for modification and use in SVS. The newly loaded forms will be used to draw tree lists in SVS provided the tree lists do not specify a tree form definition file using the #TREEFORM command.

Save...

Save the current set of tree form definitions.

New form...

Create a new tree form from scratch or based on an existing tree form.

Delete form

Delete the current tree form as defined by its species code, tree class, and crown class. Forms are not fully deleted until the tree form definition file is saved.

Species code

Species codes in SVS can be any combination of letters and numbers and can contain spaces. Species codes can be up to 15 characters long.

Tree and crown class values

Tree and crown class values can range from 0 to 32,767. Values of 99 serve as a "wild card" as explained below. Tree and crown class codes are generally used to differentiate individuals of a species that exhibit different growth form characteristics as they mature and eventually die or different types of damage. For example, a different tree class might be used to distinguish between a seedling and a mature tree while different crown class values might represent diseased and healthy trees. The use of the tree and crown class parameters is completely up to users. SVS only recognizes the values of 99 to have special meaning.

When defining several plant forms for the same species, you should use the tree class and crown class to control the use of a specific form for a component in the stand component list. SVS searches through all form definitions as it draws each stand component. If it finds an exact match for the species, tree class, and crown class, it will use the corresponding form definition to draw the plant. If no exact match is found, SVS looks for a species match and either a tree class match and a crown class value of 99 or a tree class value of 99 and a crown class match. In this way, the value of 99 serves as a "wild-card" and will match any other value for tree or crown class. Finally, SVS uses plant form definitions with a tree and crown class of 99 to draw individuals of a given species with no better match in the current set of form definitions. If SVS cannot find a species match for a component, it will use an internal default plant form definition that uses color 0 of the palette. This results in a bright orange plant.

Specifying colors for SVS tree forms

Colors for plant parts are selected from the SVS color shades dialog (Figure 8-8). The SVS color palette provides 20 colors for use when rendering plants. The colors cannot be changed in the Windows version of SVS.



Figure 8-8. The SVS color shades dialog is used to select colors for tree parts.

Changing the appearance of the ground surface

The ground surface definition capability in the Windows version of SVS can only be accessed when the ground surface definition file is specified within a tree list file. Future versions of SVS will allow specification of a ground surface definition file from the **File** menu.

SVS can "drape" a simple raster map over the ground surface. Using this feature, you can delineate specific features such as sample plot locations, roads, and streams on the ground surface. Ground surface definitions are stored in "Ground definition files", ASCII text files

containing an array of single character attribute data with one character representing one grid cell. Ground surface information is independent of stand component information.

A ground definition file contains of the following information:

- Header containing the number of rows and columns in the array
- Translation table containing all possible array attributes and the color used to represent the attribute in SVS displays. Color values can range from 0 to 255.
- Table showing the attribute assigned to each cell in the array. The attribute table can include up to 256 rows and 256 columns.

The translation table must end with a line containing an asterisk (*) and the color used to represent all attribute values not explicitly listed in the translation table. SVS orients the attribute table so that the first entry in the table corresponds to the upper left corner (northwest) of the stand. The following ground definition file produces the ground pattern shown in Figure 8-9.

```
10 12
A 0
B 3
C 14
* 0
CCCCCCCCCCCC
CAAAAAAAAAAAC
CAAAAAAAAAAAC
CAAABBAAAAC
CAAABBBBAAAC
CAAABBBBAAAC
CAAABBAAAAC
CAAAAAAAAAAAC
CAAAAAAAAAAAC
CCCCCCCCCCCC
```

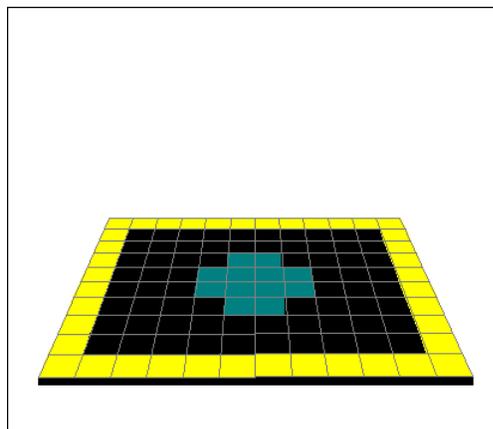


Figure 8-9. The ground surface can be colored using a ground definition file.

Overview of supported data formats

SVS provides conversion utilities and functions to convert data from a variety of sources. The supported data formats include a simple stand table, output from the Forest Vegetation Simulator (FVS) and the ORGANON stand projection system. While it is possible to create an SVS tree list directly, most users should find the conversion capabilities adequate for most needs. Advanced users can use a spreadsheet program to manually enter individual tree data but it can be difficult to get the columns correctly aligned when producing a text file from the spreadsheet. The TBL2SVS conversion engine can be used with stem-mapped data, so there should be no need to create an SVS tree list file by hand.

Processing output from the Forest Vegetation Simulator (FVS)

SVS includes internal conversion functions, called the FVS2SVS conversion engine, to convert tree lists produced by FVS into SVS tree lists for display. This capability is accessed using the **File | New stand...** menu option. For more information about FVS2SVS, see the SVS help file or later sections in this manual. A command line utility program, named FVS2SVS, can also be used to convert FVS tree lists into SVS files. For specific information about the FVS2SVS utility, refer to the SVS help file.

Using a simple stand table to create a new SVS stand

SVS includes internal conversion functions, called the TBL2SVS conversion engine, to convert simple stand tables into SVS tree lists for display. The capability is accessed using *the* **File | New stand...** menu option. For more information about TBL2SVS, see the SVS help file or later sections in this manual.

Processing output from ORGANON

SVS includes internal conversion functions, called the ORG2SVS conversion engine, to convert tree lists stored in an ORGANON output file into SVS tree lists for display. This capability is accessed using the **File | New stand...** menu option. For more information about ORG2SVS, see the SVS help file or later sections in this manual.

Overview of TBL2SVS conversion engine

The TBL2SVS conversion engine is designed to convert simple stand tables into tree lists for use with the SVS. In operation, the TBL2SVS engine scans an input stand table and expands the records into a list of individual trees for use in SVS and, if the stand table does not already contain spatial locations, generates locations for each tree. The TBL2SVS engine can be used with stand tables representing the live-tree component of a stand or it can be used to spatially distribute down material. When distributing down material, the engine simulates the "jack straw" appearance caused by logs falling, or being placed, on top of other logs.

The TBL2SVS engine is responsible for the following tasks:

- expand stand table records into the appropriate number of tree records for SVS
- generate spatial coordinates for the trees in a stand using a variety of spatial patterns
- provide an estimate of canopy closure for the "stand" as it is converted into an SVS tree list
- estimate crown widths when they are missing from or equal to 0 in the input stand table
- optionally delete stand table files as they are converted to SVS tree lists
- optionally accept percent cover estimates for understory plants and expand these estimates into an appropriate number of tree (plant) records for SVS

Stand table data format

Input to the TBL2SVS engine is a simple stand table containing the following information:

- species identifier
- dbh
- total height
- crown ratio
- crown radius
- status
- plant class
- crown class
- expansion factor (number of trees per unit area) or percent cover estimate (when preceded by a "%" symbol)

The status, plant class, and crown class are parameters specific to SVS. Valid status values are:

Value of status	Interpretation in SVS
0 or 10	indicates the plant is cut, has branches, and is lying on the ground
1 or 11	indicates the plant is standing and has branches
2 or 12	indicates the plant is no longer present and only a stump remains
3 or 13	indicates the plant is cut, has no branches, and is lying on the ground

Status values 10, 11, 12, and 13 are used to designate trees that cannot have their status changed using the mark and treat options in the DOS version of SVS.

The expansion factor typically represents the number of trees (or plants) per unit area, e.g., 120.6 trees per acre. When preceded by a "%" symbol, the expansion factor is treated as a percent cover estimate. The TBL2SVS engine will employ special logic to generate enough plants, using the size parameters in the record, to achieve the specified percent cover. Percent cover estimates should range from 0.0 to 100.0. When generating SVS files with very small herbaceous plants that occupy a large portion of the stand, it is best to create a "pseudo-plant" that is short with a large spreading crown. This will give the desired effect of ground cover without generating thousands of tree records for SVS.

Stand tables, or individual records within a stand table, can optionally contain these additional parameters (must include all five parameters although engine options can cause all but the small end diameter to be ignored):

- X coordinate
- Y coordinate
- marking status
- felling angle
- small end diameter

The marking status is an integer used to indicate that the tree is "marked" for an SVS marking scenario. This integer can range from 0 to 255. Individual bits in the integer correspond to the eight possible marking scenarios with the least significant bit corresponding to scenario 1. Thus a value of 1 indicates the tree is marked for scenario 1, a value of 2 indicates the tree is marked for scenario 2, a value of 4 indicates the tree is marked for scenario 3, a value of 8 indicates the tree is marked for scenario 4, etc. A tree can be marked for more than one scenario. For example, a marking status value of 12 indicates the tree is marked for scenarios 3 and 4. The Windows version of SVS does not use the marking status information.

The optional parameters are most often used to include a known population of trees or other plants in a larger, less well described stand. For example, inventoried and mapped down, dead material within a mature stand represented by a stand table. In most cases, the expansion factor for a tree record that includes the optional parameters will be 1.0 as it doesn't make sense to have more than one tree located at the same spatial position.

Comments can be included in a stand table by placing a ";" in the first character position of the comment line. Individual fields in the stand table must be separated by at least one space. The species identifier can be up to 15 characters long and cannot contain embedded spaces.

Example Input Files

The following example shows a simple stand table for use with the TBL2SVS engine (notice that the optional comments define column headings):

```
;species dbh height crown crown status plant crown expansion
; ratio radius class class factor
DF      8.0   69    0.6   6.3    1     0     0    37.1
DF     12.0   98    0.5   7.6    1     0     0    23.8
DF     16.0  110    0.45  9.4    1     0     0    31.3
DF     20.0  119    0.51 12.3    1     0     0     5.2
DF     24.0  134    0.47 15.2    1     0     0    12.9
DF     28.0  152    0.41 19.6    1     0     0     6.3
```

The following example shows a stand table that lists individual trees and down logs using the optional parameters:

```

;sp dbh ht   crn crown stat plt crn exp   X     Y   mark fell end
;          rat rad           cls cls           stat angle dia
DF 28 152 .41 19.6  1   0 0   1.0 26.4 57.9 0   0   0.0
RA 14  72 .58  9.6  1   0 0   1.0 98.1 121.5 0  0   0.0
DF 42  53 .00  0.0  0   0 0   1.0 174.8 21.4 0  72 28.0
DF 78 197 .39 26.4  1   0 0   1.0 142.4 171.9 0  0   0.0
RC 62 162 .71 17.5  1   0 0   1.0  48.2 157.1 0  0   0.0

```

The following example shows a stand table that combines records using the basic parameters and records listing individual trees and down logs:

```

;sp dbh ht   crn crown stat plt crn exp   X     Y   mark fell end
;          rat rad           cls cls           stat angle dia
DF 28 152 .41 19.6  1   0 0   1.0 26.4 57.9 0   0   0.0
RA 14  72 .58  9.6  1   0 0   1.0 98.1 121.5 0  0   0.0
DF 42  53 .00  0.0  0   0 0   1.0 174.8 21.4 0  72 28.0
DF 78 197 .39 26.4  1   0 0   1.0 142.4 171.9 0  0   0.0
RC 62 162 .71 17.5  1   0 0   1.0  48.2 157.1 0  0   0.0
DF  8  69 .60  6.3  1   0 0   37.1
DF 12  98 .50  7.6  1   0 0   23.8
DF 16 110 .45  9.4  1   0 0   31.3
DF 20 119 .51 12.3  1   0 0    5.2
DF 24 134 .47 15.2  1   0 0   12.9
DF 28 152 .41 19.6  1   0 0    6.3

```

The following example shows records that use percent cover estimates instead of expansion factors to create shrub and herbaceous plants in SVS:

```

;species dbh height crown crown  status plant crown expansion
;          ratio radius           class class  factor
SHRUB    1.0  4     0.9  1.5    1     0     0     %5.0
HERB     1.0  1     1.0  8.0    1     0     0     %20.0

```

TBL2SVS parameters

The TBL2SVS conversion engine uses the TBL2SVS options dialog (Figure 10-1) to collect required and optional parameters.

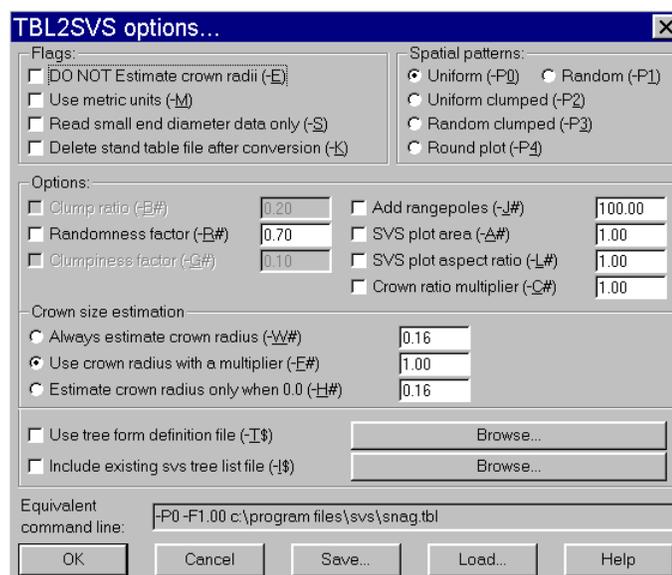


Figure 10-1. The TBL2SVS options dialog controls the behavior of the TBL2SVS conversion engine.

Flags

Flag parameters act as ON-OFF switches enabling or disabling TBL2SVS behaviors.

DO NOT Estimate crown radii: By default, TBL2SVS estimates crown radii whenever the input radius is 0.0. Selecting this option suppresses this behavior allowing the input of trees with no crowns, e.g., stand snags.

Use metric units: Instructs TBL2SVS to interpret input data using metric unit conventions. Metric unit input should specify tree diameters in centimeters and tree heights and crown radii in meters. The expansion factor should represent the number of tree per hectare. When metric units are enabled, the stand area should be specified in hectares.

Read small end diameter data only: Tells TBL2SVS to read the small end diameter field from the input file but ignore the X, Y, marking status, and felling angle fields. This allows specification of down logs without requiring positional information for each log.

Delete stand table file after conversion: Causes TBL2SVS to delete the stand table data file after a successful conversion. If any errors occur during the conversion process, the file will not be deleted.

Options

TBL2SVS options include the pattern parameters used to modify the overall spatial pattern of tree locations generated by TBL2SVS. The following table shows which parameters are applicable to each spatial pattern:

Spatial pattern	Applicable pattern parameters
Uniform	Randomness and Clumpiness factors
Random	None
Clumped patterns with uniform clump centers	Randomness and Clumpiness factors and Clump ratio
Clumped patterns with random clump centers	Clumpiness factor and Clump ratio
Round plot	None

The **Randomness factor** controls the magnitude of the offset from a perfect lattice pattern for individual tree locations or clump centers. A value of 0.0 results in tree locations aligned in perfect rows and columns. Values of 0.4 to 0.8 result in patterns approximating planted stands. Values greater than 0.8 may result in patterns with some clumping. The randomness factor does not affect random spatial patterns.

The **Clumpiness factor** controls the size of individual clumps of tree locations. It affects only clumped patterns. Small values of the clumpiness factor result in large clumps (to the point where the appearance of clumps is lost with a clumpiness factor of 0.0). Large values result in very tight, widely spaced clumps. The clump spacing is based on the number of trees per acre in the stand and the value of the Clump ratio parameter.

The **Clump ratio** specifies the number of clump centers generated by the spatial pattern algorithm as a function of the number of individual trees in the stand. The numeric parameter, ranging from 0.01 to 0.5, is multiplied by the number of individual trees to compute the number of clump centers. The number of trees located around each clump center is inversely proportional to the clump ratio. As a simple example, consider a stand with 250 trees per acre and a clump ratio value of 0.1. If TBL2SVS is creating a 1 acre plot, there will be $(250 * 0.1 = 25)$ clump centers and $(250 / 25 = 10)$ trees per clump.

Add rangepoles: Causes TBL2SVS to insert rangepoles at the plot corners in the case of square plots or at the plot center for round plots. Rangepole height is controlled by the numeric parameter.

SVS plot area: Specifies the area of the SVS plot. The plot area is normally expressed in acres. If you are using metric units, express the plot area in hectares.

SVS plot aspect ratio: Specifies the aspect ratio (width / height) of the SVS plot. The default value of 1.0 results in a square plot. A value of 2.0 would produce a plot that is half as tall as it is wide. Aspect ratio does not affect round plots.

Crown ratio multiplier: Specifies a multiplier for crown ratio values in the input data.

Crown size estimation

TBL2SVS provides several options to estimate or modify crown radius values. If you have data that includes measured crown radius, selecting the **Crown radius multiplier** option with a value of 1.0 will leave the crown radius value from the input file intact. If you do not have crown radius measurements, set the value in the input file to 0.0 and select **the Always estimate crown radius** option using an appropriate multiplier for tree height (0.08 provides aesthetically pleasing crowns). If you have crown radius measurements for some trees in your input data but not others, set the crown radius values for the unmeasured trees to 0.0 and use the **Estimate crown radius only when 0.0** option with an appropriate multiplier for tree height.

Always estimate crown radius: Causes TBL2SVS to estimate crown radii using a multiplier for tree height. Selecting this option will replace all crown size data in the input file.

Crown radius multiplier: Causes TBL2SVS to use the crown radius from the input file but apply a multiplier to the values. Specifying a multiplier of 1.0 leaves the input data unchanged.

Estimate crown radius only when 0.0: Causes TBL2SVS to use the crown radius input from the input data unless it is 0.0 in which case the height multiplier is applied to estimate crown radii.

Use tree form definition file

SVS provides default tree form definitions for many common tree species. However, users from regions outside the Pacific Northwest may find that their species are not represented. By including a tree form definition file in the SVS tree list, SVS can locate and display tree forms appropriate for the stand data. Selecting this option causes TBL2SVS to insert a #TREEFORM command into the SVS tree list specifying the name of the selected tree form definition file. When the option is first selected, an Open file dialog will be presented so you can select the tree form definition file. If you would later like to change the file, simply select the button labeled with the current tree form file name.

Include existing SVS tree list file

TBL2SVS can include an existing SVS tree list file prior to generating new tree locations for plants in the input data file. This feature makes it possible to build stands one layer at a time or to add an understory component to existing stand data files. When the option is first selected, an Open file dialog will be presented so you can select the SVS tree list to include. When a file is included, its trees are added prior to the generation of tree locations for data in the stand table file. Plant locations within the included SVS file are not changed.

Equivalent command line

The equivalent command line represents the options that could be used with the command line version of TBL2SVS. You can copy the text from the display but cannot edit the command line directly.

NOTE: The current version of SVS provides the TBL2SVS command line version as a DOS executable. Future versions will upgrade TBL2SVS to a Windows version.

Save...

This button allows you to save the current set of TBL2SVS options for later use. The default extension for TBL2SVS options is .TOP.

Load...

This button allows you to load a previously saved set of TBL2SVS options.

Spatial patterns

One of the primary tasks during the conversion process is the generation of spatial locations for the trees. TBL2SVS generates a variety of spatial patterns:

- uniformly distributed tree locations
- randomly distributed tree locations
- clumped pattern of tree locations with uniformly distributed clump centers
- clumped pattern of tree locations with randomly distributed clump centers
- randomly distributed tree locations on a round plot

For all patterns, a map of individual stem locations is maintained and used to prevent trees from being placed on top of one another.

Uniformly Distributed Tree Locations

In this method, a grid is superimposed on the plot. The grid spacing is equal to the average spacing between trees calculated as:

$$\text{grid spacing} = \text{SQRT}(43560 / \text{total stems per acre})$$

The center of each grid cell is calculated and used as the initial location. Two random variates from -0.5 to 0.5 are then generated and multiplied by the grid spacing to serve as maximum offsets in the X and Y directions. The maximum offsets are multiplied by the Randomness factor ranging from 0.0 to 1.0, to determine the actual offset from the grid center. Locations generated using values of the Randomness factor from 0.0 to 0.5 yield a pattern that clearly resembles a grid with 0.4 to 0.5 giving a good approximation of hand planted tree locations. Locations generated using values of the Randomness factor from 0.5 to 1.0 have a uniform appearance and the grid structure is not obvious.

Randomly Distributed Tree Locations

This method simply generates uniformly distributed random variates ranging from 0.0 to the width of the plot for the X value and from 0.0 to the height of the plot for the Y value.

Clumped Patterns with Uniformly Distributed Clump Centers

This method generates "clump centers" using the same technique used to generate uniformly distributed tree locations and then generates the individual locations within the clump. The number of clumps can be controlled using the Clump ratio parameter. The clump spacing is calculated as follows:

$$\text{clump spacing} = \text{SQRT}(435460 / (\text{stems per acre} * \text{clump ratio}))$$

Individual locations in a clump are created by generating a random angle ranging from 0.0 to 360.0 degrees and a magnitude calculated as follows:

$$\text{magnitude} = (\text{random number from 0.0 to 1.0}) * \text{clump radius}$$

where clump radius is computed using the following equation:

$$\text{clump radius} = (1.5 - 1.4 * \text{Clumpiness factor}) * \text{clump spacing}$$

The angle and the magnitude are used to offset the location from the clump center.

Clumped Patterns with Randomly Distributed Clump Centers

The random-clump method generates clump center locations using the same method used for randomly distributed tree locations and then generates individual locations within each clump using the same technique used for clumped patterns with uniformly distributed clump centers.

Randomly Distributed Tree Location on a Round Plot

This method creates a round SVS plot and places trees using random locations within the plot area. The plot area corresponds to the stand area specified using the SVS stand area parameter. Individual plant locations are created by sampling a random distance from the plot center and a random angle around the plot. Round plots are not affected by the SVS plot aspect ratio parameter. Round plots are recognized by DOS SVS versions 2.20 and newer and all Windows versions.

Spatial Distribution of Down Material

TBL2SVS provides a specialized algorithm for locating and positioning down material. When down material (status codes 0, 10, 3, or 13) is encountered in an input stand table with no location information, TBL2SVS first generates random locations for the large end of each log. Then TBL2SVS simulates the "jack-straw" effect created by logs falling on top of one another. To do this, TBL2SVS maintains a map of the down material and tests each log being placed to see if it lies on top of another log or several logs. The center of gravity, c.g., is computed for the log being placed, assuming that the log is a conic solid, and the highest point-of-contact with logs on either side of the c.g. is determined. Given the location of the contact points, the height at each end of the log is calculated. If the projected height of either end is below the ground surface or if there is only one contact point, that end is assumed to be supported by the ground. The elevations of the log ends are then used to compute a "lean angle" that SVS will interpret as the angle from vertical for a down stem. The log placement algorithm has some limitations but it results in stands that display well in SVS and that are free of visual inconsistencies such as logs "floating" in the air without any visible support. In most cases, the algorithm exhibits conservative behavior in that it can sometimes generate locations and orientations that result in logs that intersect in the same plane but rarely is an orientation computed that results in an unsupported, or floating, log.

Building a multi-layer stand

Multi-layer stand containing understory plants, seedlings, saplings, and larger trees can be easily created using simple stand tables. Data describing the species, or species group, size, and density for each layer can be intermixed within the stand table. By using the ***Include existing SVS tree list file*** option, you can even add understory plants or other trees to an existing SVS stand. This ability is especially useful for adding an understory component to growth model data because most stand growth models do not consider the understory and do not provide understory data in their output.

Showing treatment effects using cut/leave tables

The TBL2SVS engine can be used to show the effect of simple stand treatments. Simple modifications to the input data file can show the effect of several thinning prescriptions. Consider the following stand table record:

```

;species dbh height crown crown status plant crown expansion
;          ratio radius          class class factor
DF      16.0 110   0.45 9.4    1     0    0    31.3

```

If you duplicate this record and halve the expansion factor you will still be able to produce the same stand using the TBL2SVS engine. By changing the status code for one of the duplicate records to indicate that the trees should be represented as stumps (set the status value to 2), you can simulated a 50% removal of the trees in the diameter class.

```

;species dbh height crown crown status plant crown expansion
;          ratio radius          class class factor
DF      16.0 110   0.45 9.4    1     0    0    15.65
DF      16.0 110   0.45 9.4    2     0    0    15.65

```

By repeating this action using other tree records in the table, you can show the effect of simple thinning or harvest treatments. If you would like to show a treatment that does not remove the cut trees, simply use a status code that indicated cut trees instead of stumps (set the status value to 0).

```

;species dbh height crown crown status plant crown expansion
;          ratio radius          class class factor
DF      16.0 110   0.45 9.4    1     0    0    15.65
DF      16.0 110   0.45 9.4    0     0    0    15.65

```

Overview

The ORG2SVS conversion engine is designed to convert output files from into tree lists compatible with the Stand Visualization System (SVS). In operation, ORG2SVS scans an ORGANON output file looking for valid tree lists and then produces an SVS tree list for each tree list encountered in the ORGANON output file. User-defined parameters control the size and shape of the resulting SVS plot, the technique used to generate spatial locations for trees, the addition of range poles into the SVS tree list to help indicate scale, and the relationship between tree height and crown width. The ORG2SVS conversion engine provides a simple mechanism to visualize the output of the ORGANON projection model.

ORGANON procedures

There are a few basic rules that you must follow to use the ORG2SVS conversion engine successfully on the ORGANON output file.

Request that a tree list be sent to the output file anytime you would like to see a picture of the stand conditions.

In general, you probably want to request a tree list that shows the initial stand conditions before any growth projections or management activity and tree lists immediately prior to and after management activities. You may want to generate a tree list after each growth period to show predicted stand development. By generating tree lists before and after management activities, you can later create an image of the stand conditions before and after a treatment. To ensure that tree lists match management actions, you should only ask for a tree list from the ORGANON master menu. Tree lists produced from the management menu while "experimenting" with stand treatments (designated as TRIAL lists) are not used for subsequent growth projections unless the management activities are applied to the stand data using the "PM" option on the management menu.

Keep track of management activities on paper or through a copy of the run history so you can match activities to the SVS stand images.

After conversion to SVS format, each tree list will be identified by the project name and stand age. You should take notes describing your stand treatments or keep a copy of the ORGANON run history so you can later match management actions to SVS stand images. You can also have ORG2SVS extract run history information and save it in a special file that can be added to an SVS screen layout

When you product a tree list in ORGANON, list all tree records. Do not skip any tree records.

Tree lists in the ORGANON output file that have a skip value of anything other than 1 will be ignored during the conversion process. This only makes sense because such tree lists do not represent the stand. Even when using tripling, make sure you include all tree records in the output tree list.

When producing tree lists, include all species.

ORG2SVS will convert tree lists containing a single species and will indicate the species in the SVS plot title. However, images produced that show only a single species could misrepresent stand conditions.

ORG2SVS parameters

The ORG2SVS conversion engine uses the ORG2SVS options dialog (Figure 11-1) to collect the parameters that control the conversion process.

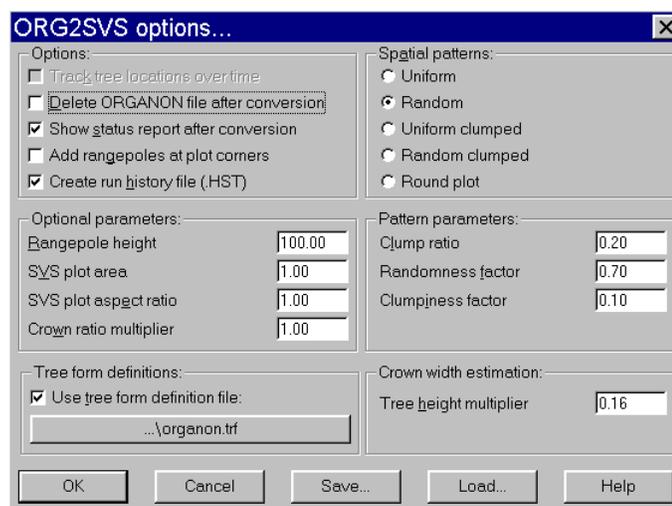


Figure 11-1. The ORG2SVS options dialog controls the behavior of the ORG2SVS conversion engine.

Options

ORG2SVS uses a variety of on-off options to control its behavior.

Track tree locations over time: This option is disabled in this version of ORG2SVS.

Delete ORGANON file after conversion: Causes the ORG2SVS conversion engine to delete the ORGANON output file after a successful conversion. You should use this option only if you do not need the ORGANON output file for another purpose, e.g., maintaining a copy of the run history so you know what treatments your new SVS images represent.

Show status report after conversion: Causes ORG2SVS to display a conversion summary after conversion is complete. The status report is not saved in a file but you can cut-and-paste the text from the status display into another file or text editor such as NOTEPAD.

Add rangepoles at plot corners: Causes ORG2SVS to insert a rangepole at each corner of a square plot. For round plot patterns, a single rangepole will be inserted at the center of the plot.

Create run history file (.HST): Causes ORG2SVS to extract run history information from the ORGANON output file and save it in a file named using the base file name (SVS file name with no extension) and the extension ".HST". This file can be used to provide run history information on the SVS screen by creating a layout panel that displays a text file with the auxiliary panel information set to \$SVSFULLFILENAME.hst

Optional parameters

Optional parameters further define the behavior of the ORG2SVS conversion engine.

Rangepole height: Specifies the height of the rangepoles added to an SVS plot. Heights are assumed to be in the same units as used in the tree data

SVS plot area: Specifies the area of the SVS plot.

SVS plot aspect ratio: Specifies the aspect ratio (width / height) of the SVS plot. The default value of 1.0 results in a square plot. A value of 2.0 would produce a plot that is half as tall as it is wide. Aspect ratio does not affect round plots.

Crown ratio multiplier: Specifies a multiplier for ORGANON crown ratio values. For most users, a value other than 1.0 is not recommended. If you find that ORGANON consistently produces crowns that are too short or long, use this multiplier to modify all crown ratios for all trees.

Tree form definitions

During the conversion process ORG2SVS can link a specific set of tree form definitions to the SVS tree lists it produces. This linkage is accomplished using the #TREEFORM command in the SVS tree list file. A set of tree form definitions, ORGANON.TRF, suitable for use with ORGANON output files is distributed with SVS. If you would like to link a different set of tree form definitions to the SVS tree lists, select the button below "Use tree form definition file:" and select the desired file. When designing tree forms for ORGANON output, use the two-letter species codes recognized by ORGANON and tree and crown class values of 99 to represent live trees. Future version of ORG2SVS may use definitions with tree class set to 99 and crown class set to 98 to indicate a dead tree.

Spatial patterns

ORG2SVS can generate tree locations using the same spatial patterns available in the TBL2SVS conversion engine. Refer to the description of the TBL2SVS engine for more information.

Pattern parameters

Pattern parameters are used to modify the overall spatial pattern of tree locations generated by ORG2SVS. The following table shows which parameters are applicable to each spatial pattern:

Spatial pattern	Applicable pattern parameters
Uniform	Randomness and Clumpiness factors
Random	None
Clumped patterns with uniform clump centers	Randomness and Clumpiness factors and Clump ratio
Clumped patterns with random clump centers	Clumpiness factor and Clump ratio
Round plot	none

The **Randomness factor** controls the magnitude of the offset from a perfect lattice pattern for individual tree locations or clump centers. A value of 0.0 results in tree locations aligned in perfect rows and columns. Values of 0.4 to 0.8 result in patterns approximating planted stands. Values greater than 0.8 result in patterns with some clumps of two or three trees. The randomness factor does not affect random spatial patterns.

The **Clumpiness factor** controls the size of individual clumps of tree locations. It affects only clumped patterns. Small values of the clumpiness factor result in large clumps (to the point

where the appearance of clumps is lost with a clumpiness factor of 0.0). Large values result in very tight, widely spaced clumps. The clump spacing is based on the number of trees per acre in the stand and the value of the Clump ratio parameter.

The **Clump ratio** specifies the number of clump centers generated by the spatial pattern algorithm as a function of the number of individual trees in the stand. The numeric parameter, ranging from 0.01 to 0.5, is multiplied by the number of individual trees to compute the number of clump centers. The number of trees located around each clump center is inversely proportional to the clump ratio. As a simple example, consider a stand with 250 trees per acre and a clump ratio value of 0.1. If ORG2SVS is creating a 1 acre plot, there will be $(250 * 0.1 = 25)$ clump centers and $(250 / 25 = 10)$ trees per clump.

Crown width estimation

ORGANON does not provide crown width information for sample trees. ORG2SVS estimates crown widths using a simple linear relationship with total tree height. A tree's height is multiplied by the tree height multiplier to estimate the crown width for the tree. Studies of tree physiology have produced very detailed models capable of producing more accurate crown width estimates. Unfortunately, such models are not available for all tree species or all regions of interest. The simple approach used by ORG2SVS provides trees that "look right" in SVS displays. Users who need more accurate predictions should use a different technique to produce SVS tree list files.

Save...

Allows you to save a set of ORG2SVS options for later use. The default (and recommended) extension for the option files is .OOP. Option files can be loaded at any time using the Load... button.

Load...

Allows you to load a saved set of ORG2SVS options.

Processing ORGANON output files

ORGANON output files contain all information requested by the user (and some information not specifically requested) during a model run. The output file format is somewhat variable because it is generated in response to user inputs. During processing, ORG2SVS first scans the entire output file to locate all tree lists. Location is accomplished by searching each line of the file for the phrase "TREE LIST TOTAL". Upon finding this phrase, ORG2SVS extracts values from the header to determine if the section of the file represents a newly encountered tree list or simply a new page in a previously encountered tree list. The result of this initial scan is a list of all tree lists in the output file, the species present in the list (from the list header), the stand age, the skip factor, and flag indicating if the tree list is a CUT list or a TRIAL list.

Tree Record Expansion

In an ORGANON tree record, the following information is available (excerpt from an output file):

```
*****  
TREE  SP  DBH   HT   HTCB  CR   EXP   +HT   +D   UC  
*****  
1     DF   7.8   43.3  11.7  .73  14.32  .0    .00  0
```

The expansion factor provides the number of trees per acre represented by the tree record. In most cases, the expansion factor will not be a whole number. In SVS, it is difficult to draw fractional trees so some sampling logic is needed to produce a stand that statistically represents the ORGANON tree list. ORG2SVS uses a simple sampling algorithm to expand the expansion factor into an appropriate number of trees for the SVS plot. Using the above expansion factor of 14.32 as an example, ORG2SVS would always create 14 trees. To make up for the fractional tree (0.32 per acre), ORG2SVS would include an additional tree in 32 out of 100 conversion runs. This approach does a good job of representing the data in the ORGANON tree list but can lead to some interesting side effects. If our original stand contains a small number of very large trees, e.g., 0.03 42-inch Douglas-fir per acre, ORG2SVS will not include such a tree in every plot it generates. When viewing the resulting SVS images, the appearance and disappearance of such a large tree in different time periods may cause concern among viewers. This problem is further complicated by ORGANON's tripling logic. Tripling serves to break up input tree records to better represent stochastic grow and mortality processes. Unfortunately, tripling creates tree records with very small expansion factors...just the situation that leads to disappearing trees.

When considering this problem it is best to remember that the SVS images are intended to be a representation of the stand data, not an exact replication of the original stand. While it may be confusing to have a large tree or trees appear and disappear over time, it misrepresents the original data if the large trees are always included or excluded.

Adding an understory component

When working with ORGANON output, one thing is missing: an understory. ORGANON does not consider non-tree understory vegetation. When showing the effects of growth or management activities, the lack of understory vegetation can focus more attention on what is missing in the image than what is present. Fortunately, you can use the TBL2SVS conversion engine to add an understory component to an SVS tree list produced by ORG2SVS (see Figure 11-2 for an example). To add an understory, you will need to build a stand table data file that contains records for the understory plants. There is a tree form definition for a generic understory species called “SHRUB”. The percent cover capabilities of TBL2SVS are especially useful when creating shrub layers. Then you can use the File | New stand... menu option to access the TBL2SVS conversion engine. Select the understory stand table as you input file and use the **Include existing SVS tree list file** option to specify the name of the SVS tree list produced by ORG2SVS. When the new stand is created, the trees from the ORGANON stand will remain in the same location. For the example shown in Figure 11-2, the following stand table was added to an ORGANON stand:

;Species	DBH	Height	Crown	Crown	Status	Tree	Crown	Expansion
;code			ratio	radius	code	class	class	
DF	2	8.0	.9	2.0	1	0	0	120.0
R6SHRUB	1	4.0	1	4.0	1	0	0	%20.0



Figure 11-2. TBL2SVS can be used to add an understory to a stand produced from ORGANON output.

Overview

SVS can convert tree list files produced by current variants of the Forest Vegetation Simulator into tree lists for display in SVS. SVS reads FVS tree lists produced by versions 6.1 and 6.2. Tree lists can be in either the old or the new formats and can contain multi-line headers or single line (machine readable) headers. Tree lists can contain a single stand and multiple projection cycles or multiple stands and multiple projection cycles. In operation, cycles in an FVS tree list are converted into separate SVS tree lists and a tree list index file is created. When the resulting tree list index file is loaded into SVS, you can easily step forward and backward through the cycles. The conversion process uses the FVS2SVS conversion engine. The engine is used by the command line version of FVS2SVS and when the **File | New stand** menu options is selected.

The FVS2SVS conversion engine is designed to convert output files from into tree lists compatible with the Stand Visualization System (SVS). In operation, FVS2SVS scans an FVS tree list file looking for valid stands and then produces an SVS tree list for each stand encountered in the FVS tree list file. User-defined parameters control the size and shape of the resulting SVS plot, the technique used to generate spatial locations for trees, the addition of range poles into the SVS tree list to help indicate scale, and the relationship between tree height and crown width.

FVS2SVS parameters

The FVS2SVS conversion engine uses the FVS2SVS options dialog (Figure 11-1) to collect the parameters that control the conversion process.

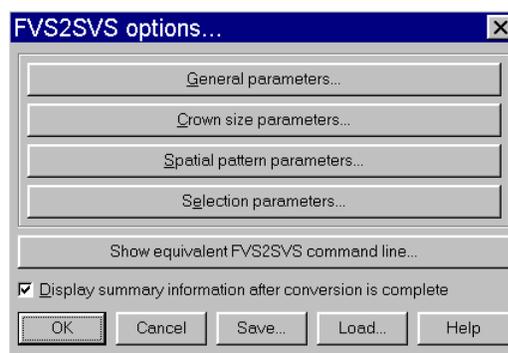


Figure 11-1. The FVS2SVS options dialog controls the behavior of the FVS2SVS conversion engine.

FVS2SVS parameters are divided into four categories: general, crown size, spatial pattern, and selection parameters. General parameters, shown in Figure 11-2, control overall behavior during the conversion. Crown size parameters, shown in Figure 11-3, control adjustments to crown widths and crown ratios. Spatial pattern parameters, shown in Figure 11-4, control the pattern of tree locations within the SVS stands. Selection parameters, shown in Figure 11-5, specify the stands and cycles that should be converted. Most parameters correspond to command line options in the original, DOS version of FVS2SVS.

Users interested in using the command line version of FVS2SVS can use the button labeled “Show equivalent FVS2SVS command line” to help them determine appropriate command line options for use in single or batch file conversions.

General parameters

General parameters, shown in Figure 11-2, control overall behavior during the conversion.

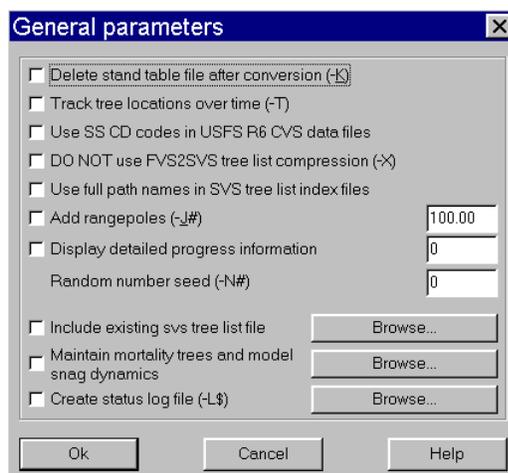


Figure 11-2. The general parameters dialog controls the overall behavior of the FVS2SVS conversion engine.

Delete stand table file after conversion

Deletes the FVS tree list file after a successful conversion. You should select this option only if you no longer need the FVS tree list file.

Track tree locations over time

Initiates logic that attempts to maintain individual tree locations from one cycle to the next. In general, this logic works best with tree lists that have been created with FVS tripling turned off. In stands that contain tree records with very small expansion factors, some problems will occur. Especially when small SVS stands are created. FVS2SVS attempts to generate independent, statistically valid samples of trees for each cycle. When small expansion factors are encountered, the sample generation logic can produce stands that while they are statistically similar, look very different. Most often problems with location tracking show up as large trees that occur infrequently appearing and disappearing from one cycle to the next.

Use SS CD codes in USFS R6 CVS data files

Tells the conversion engine to recognize special status codes in the SS CD column of the FVS tree list and interpret them according to the USFS Region 6 CVS protocols (cycle 0 tree lists only). The condition class codes are:

- 21 recently dead snag
- 22 snag with loose bark
- 23 snag with no bark
- 24 soft snag
- 25 decomposed snag
- 26 recently cut stump
- 27 stump with some decay
- 28 decomposed stump
- 40 indicator species clump (trees per acre interpreted as percent cover)
- 60 hardwood clump (trees per acre interpreted as percent cover)
- 71 downed log (sound)
- 72 downed log (some decay)

73 downed log (decomposed)

For each code, a special plant form is used to represent the condition of the plant and the diameter and height are used to specify the plant size. For codes 40 and 60, the expansion factor (trees per acre) is interpreted as a percent cover (0 to 100). FVS2SVS will generate enough plants using size values specified in the dbh and height fields to achieve the desired cover.

DO NOT use FVS2SVS tree list compression

Toggles the use of tree list compression. The default behavior of FVS2SVS is to compress the entries in an FVS tree list prior to generating the SVS tree list. If tree records are encountered that have the same species and plot number and similar diameters and heights, the records will be combined into a single record and the expansion factors will be summed. The compression is necessary to help maintain sampling integrity when a tree list contains many trees with small expansion factors. When compression is disabled, FVS2SVS attempts to expand each individual tree record in the FVS tree list. For records with expansion factors less than one, random sampling is used to determine whether or not a tree should be included in the SVS tree list.

Use full path names in SVS tree list index files

Use full path names for individual SVS tree list files when creating a tree list index file for SVS. This option allows you to access SVS tree list index files and individual tree lists across directories on your hard disk. When this option is turned off, you can only load the individual tree lists specified in a tree list index from the directory containing SVS.

Add range poles

Add range poles at each corner of the SVS plot. The numeric parameter specifies the height of the range pole. Range poles consists of a cylinder that is two feet in diameter. Range poles are marked with ten stripes. Valid heights can range from 0.1 to 250.0 feet.

Display detailed progress information

Output debugging information about a specific portion of the conversion process to the status file. The numeric parameter specifies the type of debugging information displayed. Valid values and the resulting types of information are:

- 1 display information while compressing FVS tree list records
- 2 display information while expanding FVS tree list records
- 3 display information while scanning the FVS tree list file
- 4 display information while reading individual FVS tree list records
- 5 display general information while generating tree locations
- 6 display detailed information while generating tree locations
- 7 display information regarding the use of the stand and canopy map
- 99 display all debugging information

Random number seed

Initialize the random number stream used for the conversion process. If the numeric argument is 0, a seed will be generated based on the current time. Valid seeds range from 1 to 32768.

Include existing SVS tree list file

FVS2SVS can include an existing SVS tree list file prior to generating new tree locations for trees in the FVS tree list. This feature makes it possible to add down logs or an understory component to existing stand data files. When the option is first selected, an Open file dialog will be presented so you can select the SVS tree list to include. When a file is included, its trees are added prior to the generation of tree locations for data in the stand table file. Plant locations within the included SVS file are not changed.

Maintain mortality trees and model snag dynamics

Enable mortality tracking and snag dynamics modeling. When this option is first selected, an Open file dialog will be presented so you can select the file containing parameters for the snag and down log dynamics model in FVS2SVS. FVS reports mortality occurring during the current projection cycle. By default, FVS2SVS only includes the reported mortality in SVS tree lists. When this option is turned on, FVS2SVS maintains a separate list of dead trees as a stand is projected over several cycles. As each cycle for a stand is converted, the dead tree information from previous cycles is added to the SVS tree list. Dead trees are maintained in the same location over time. FVS2SVS can also model snag and down log decomposition using a simplistic model controlled by user-specified parameters. The snag model and its parameters are described in the SVS help.

Create status log file

Create a log file to record conversion results. When this option is first selected, an Open file dialog will be presented so you can specify the name of the log file. The log file option is particularly useful if you want to retain a record of the canopy closure results reported by FVS2SVS. The log file is an ASCII text file that can be viewed with most editors and word processors.

Crown size parameters

Crown size parameters, shown in Figure 11-3, control adjustments to crown widths and crown ratios.

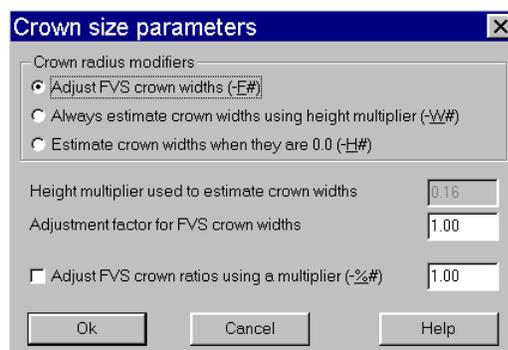


Figure 11-3. The crown size parameters dialog controls adjustments to crown widths and ratios.

Crown radius modifiers

There are three methods by which FVS crown radii can be modified. The first, *Adjust FVS crown widths*, uses a simple multiplier to increase or decrease crown radii. The second, *Always estimate crown widths using height multiplier*, calculates a new crown radius using a simple multiplier for tree height for all trees in the FVS tree list. The third, *Estimate crown widths when they are 0.0*, uses the FVS crown widths unless they are 0.0. When the FVS

width is 0.0 or when converting an old format FVS tree list that does not contain crown widths, crown widths are computed using the height multiplier.

Height multiplier used to estimate crown widths

This value is multiplied by a tree's height to estimate the crown width. Use of this parameter is controlled by the crown radius modifier method. Valid values range from 0.0 to 1.0. A value of 0.16 results in well proportioned crowns.

Adjustment factor for FVS crown widths

This value is used to adjust the FVS crown widths. To use FVS widths as is, enter a value of 1.0 for this parameter.

Adjust FVS crown ratios using a multiplier

This option and the related numeric parameter are used to adjust FVS crown ratios. In general, the live crown ratios reported by FVS represent the portion of the live crown that contributes to the growth potential of a tree. Often times, such a ratio produces crowns that look too short. The default behavior of FVS2SVS is to use the crown ratio reported in the FVS tree list. The numeric parameter can range from 0.01 to 5.0.

Spatial pattern parameters

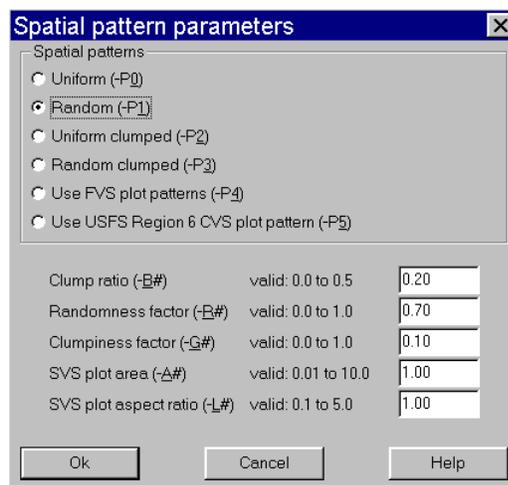


Figure 11-4. The spatial pattern parameters dialog controls the pattern of tree locations generated during the conversion process.

Spatial patterns

FVS2SVS provides several methods to control the spatial pattern logic used to generate tree locations:

- uniform pattern
- random pattern
- clumped pattern with clump centers generated using the uniform pattern logic
- clumped pattern with clump centers generated using the random pattern logic
- generate tree locations using FVS plot information
- generate tree locations for USFS Region 6 CVS data using a circular plot

The default behavior of FVS2SVS is to generate tree locations using the uniform spatial pattern. Pattern generation methods are discussed in the SVS help.

Clump ratio

Clump ratio for clumped spatial patterns. The clump ratio specifies the number of clump centers generated by the spatial pattern algorithm as a function of the number of individual trees in the stand. The numeric parameter, ranging from 0.01 to 0.5, is multiplied by the number of trees in the SVS stand to compute the number of clump centers. The number of trees located around each clump center is equal to the reciprocal of the clump ratio times the number of trees in the SVS stand.

Randomness factor

Randomness factor for spatial pattern control. The randomness factor controls the magnitude of the offset from a perfect lattice pattern for individual tree locations or clump centers. A value of 0.0 results in tree locations aligned in perfect rows and columns. Values of 0.4 to 0.8 result in patterns approximating planted stands. Values greater than 0.8 result in patterns with some clumps of two or three trees. The randomness factor does not affect random spatial patterns.

Clumpiness factor

Clumpiness factor for spatial pattern control. The clumpiness factor controls the size of individual clumps of tree locations. It affects only clumped patterns. The following formula is used to compute the clump radius:

$$\text{clump radius} = (1.5 - 1.4 * \text{clumpiness factor}) * \text{clump spacing}$$

Small values of the clumpiness factor result in large clumps (to the point where the appearance of clumps is lost with a clumpiness factor of 0.0). Large values result in very tight, widely spaced clumps.

The clump spacing is based on the number of trees per acre and the value of the clump ratio parameter.

SVS plot area

Area for the SVS stand plot created during the conversion process. FVS2SVS generates a one acre stand by default. Smaller plots may be specified to reduce the number of trees drawn in SVS, thereby reducing the drawing time.

In stands containing tree records with very small expansion factors, producing larger SVS plots may help provide a more statistically correct sample of the stand

SVS plot aspect ratio

Aspect ratio for the SVS plot. The default aspect ratio is 1.0 resulting in square plots. Aspect values greater than 1.0 result in plots that are wider than they are tall and values less than 1.0 result in plots that are taller than they are wide.

Selection parameters

Selection parameters, shown in Figure 11-5, specify the stands and cycles that should be converted.

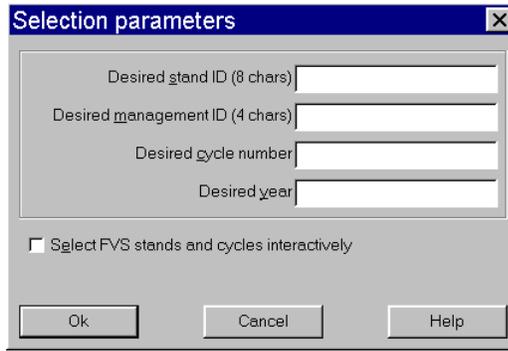


Figure 11-5. The selection parameters dialog controls which stands and cycles are converted.

Desired stand ID

Stand ID for the stand(s) to be converted. The stand ID will be compared to stand identifiers found in the FVS tree list file. Stands with a matching ID will be marked for conversion. Valid stand IDs can be up to 8 characters long (future versions will allow up to 26 characters).

Desired management ID

Management identifier for the stand(s) to be converted. The management ID will be compared to management identifiers found in the FVS tree list. Stands with a matching management ID will be marked for conversion. Valid management IDs can be up to 4 characters long.

Desired cycle number

Cycle number for the stand(s) to be converted. The cycle number will be compared to cycle numbers found in the FVS tree list. Stands with a matching cycle number will be selected for conversion. Cycle number must be zero or greater.

Desired year

Year for the stand(s) to be converted. The year will be compared to years found in the FVS tree list. Stands with a matching year will be marked for conversion.

Select FVS stands and cycles interactively

When selecting the stand and cycles interactively, you can select stands and cycles to be converted from a list similar to the list shown in Figure 11-6. This dialog allows you to select an individual stand/cycle or several stands/cycles.

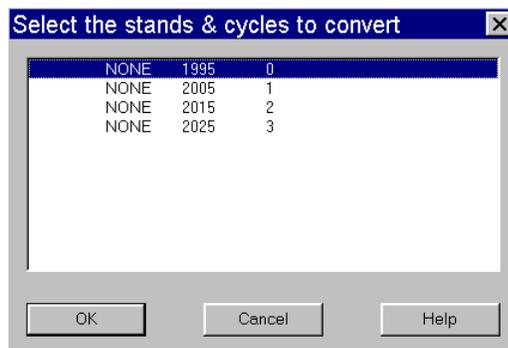


Figure 11-6. Interactive selection allows you to convert specific stands and cycles.

Tree Location Tracking

The default behavior of FVS2SVS is to generate a new, independent set of tree locations for each stand/cycle combination converted. The location tracking option causes FVS2SVS to generate a set of locations for the first stand/cycle converted. As subsequent cycles are converted, FVS2SVS tries to maintain the locations for individual trees. When new trees are introduced, e.g., regeneration or planting, FVS2SVS generates new locations for use in subsequent stands.

To facilitate location tracking, FVS2SVS generates a unique identifier for each tree placed in an SVS tree list. The identifier consists of the eight-character tree number from the FVS tree list, a one-character code indicating whether or not the tree list live (L) or dead (D), a three-digit number representing the sequential number for trees generated by expanding a single FVS tree record into multiple SVS tree records, and a three-digit number representing the FVS plot number. The resulting fifteen-character identifier is used to identify an individual tree. When FVS2SVS generates tree locations for the first stand/cycle combination converted, it also produces a list of identifiers and locations for use in subsequent conversions. When the next stand/cycle is converted, FVS2SVS searches the stored list of identifiers and locations. If a tree is present in the list from previous cycles, the location in the list is used. If a tree is not present in the list, it is assumed to be a new tree in the stand and a new location is generated.

The location tracking algorithm maintains tree locations consistently from cycle to cycle. However, sampling issues that arise when a single FVS tree record is expanded into multiple SVS tree records can cause trees to appear and disappear throughout a multi-cycle projection. Fractional trees, created when a tree record in the FVS tree list represents less than one tree per acre or when the FVS record represents several trees per acre but still contains a fractional tree, e.g., a record represents 0.27 or 5.35 trees per acre may or may not be included in the SVS tree list. When they are included, a location is generated and stored. On subsequent cycles where the fractional tree is not included, the tree location is maintained but not used. On subsequent cycles where the fractional tree is once again included, the old location will be used. The most objectionable behavior of the location tracking algorithm and sampling algorithm occurs when trees appear in early cycles when they are small and then don't reappear until several cycles later when they are much larger. When using SVS to generate animation sequences showing stand through conditions through time, the appearance of large trees seemingly "from nowhere" can be somewhat disconcerting.

Dead Tree Accumulation and Modeling

FVS reports mortality in the cycle in which it occurs. Once a tree is dead, FVS drops it from its tree list. The mortality tracking option in FVS2SVS causes FVS2SVS to accumulate dead trees over time. This means that trees that die in cycle five will still be present in the SVS tree list, and visualizations in SVS, for cycle eight.

FVS2SVS also provides a simple snag and down log decay model to "age" dead trees over time. The model is controlled by user defined annual rates for the following changes in the condition of snags and down logs:

Parameter	Keyword	Description
fall rate	FALLRATE	proportion of standing dead trees that fall each year
reduction in standing tree height	HTREDUCE	annual proportional height reduction for standing dead trees
reduction in crown width	CWREDUCE	annual proportional crown width decrease for standing or down, dead trees
reduction in crown ratio	CRREDUCE	annual proportional crown ratio decrease for standing or down, dead trees
reduction in log length for down logs	LENREDUCE	annual proportional length reduction for down logs
reduction in large-end log diameter for down logs	DBHREDUCE	annual proportional diameter (large end) reduction for down logs
minimum snag/log diameter	DBHREMOVE	minimum diameter (dbh) snag or log to retain in SVS tree list

Parameters for the snag model are specified using a simple ASCII text file containing one of the model keywords followed by the rate or value. All proportions are expressed as a decimal percentage, e.g., 0.20 for twenty percent.

The following is a sample parameter file:

```
;snag dynamics parameter file for FVS2SVS
;
;all rates are per year
;
FALLRATE .01
CWREDUCE .007
CRREDUCE .001
HTREDUCE .005
LENREDUCE .002
DBHREDUCE .008
DBHREMOVE 2.0
```

Any line in a snag parameter file that begins with a ";" is considered a comment.

To use the mortality tracking feature of FVS2SVS without the snag decay model, you must create a parameter file with all rates and the minimum diameter set to 0.0 as follows:

```
;snag dynamics parameter file for FVS2SVS
;
;no snag/down log modeling will occur if all rates are 0.0
;
FALLRATE 0
CWREDUCE 0
CRREDUCE 0
HTREDUCE 0
LENREDUCE 0
```

DBHREDUCE 0

DBHREMOVE 0

When using the mortality tracking feature and snag dynamics model, it is important that appropriate rates be used for the various parameters. Very few models exist that model snag and down material decomposition over large, regional areas. Results from the simple model implemented in FVS2SVS must be evaluated to make sure they represent "feasible" solutions.

File Naming Strategies

FVS2SVS uses a variety of strategies to generate file names for SVS tree list files created during the conversion process. The strategy selected depends on whether or not the command line contained a name for the SVS file and how many SVS files are created. The file naming strategies are summarized as follows:

Command line parameters	Number of SVS tree list files created during the conversion process	File naming strategy
SVS file name is specified	1	Use the specified name
	More than one	Use the specified name for the tree list index file and generate file names for the individual SVS tree list file names of the form name.###
SVS file name is NOT specified	1	Create a file name using the name of the FVS tree list file and the extension ".SVS"
	More than 1	Create a name for the tree list index file using the name of the FVS tree list file and the extension ".SVS" and generate individual SVS tree list file names of the form name.###

When FVS2SVS generates file names for individual SVS tree list files, the tree list index filename is used and a zero-padded, three-digit extension is built using the SVS tree list number.

The default behavior of FVS2SVS is to include only the file name and extension for individual tree list files in a tree list index. In the general parameters you can tell FVS2SVS to use fully qualified file names (including the drive, directory, file name, and extension) within the tree list index. If you plan to store your SVS tree lists in a location other than the directory where SVS is installed, you should use this option. However, if you use this option, you cannot move the individual SVS tree list files from the directory where they were stored by FVS2SVS without modifying the tree list index file to point to the new file locations.

Adding an understory component

When working with FVS output, one thing is missing: an understory. FVS does not consider non-tree understory vegetation. When showing the effects of growth or management activities,

the lack of understory vegetation can focus more attention on what is missing in the image than what is present. Fortunately, you can use the TBL2SVS conversion engine to add an understory component to an SVS tree list produced by FVS2SVS (see Figure 11-7 for an example). To add an understory, you will need to build a stand table data file that contains records for the understory plants. There is a tree form definition for a generic understory species called “SHRUB”. The percent cover capabilities of TBL2SVS are especially useful when creating shrub layers. Then you can use the File | New stand... menu option to access the TBL2SVS conversion engine. Select the understory stand table as you input file and use the ***Include existing SVS tree list file*** option to specify the name of the SVS tree list produced by FVS2SVS. When the new stand is created, the trees from the FVS stand will remain in the same location. For the example shown in Figure 11-7, the following stand table was added to an FVS stand:

;Species ;code	DBH	Height	Crown ratio	Crown radius	Status code	Tree class	Crown class	Expansion
DF	2	8.0	.9	2.0	1	0	0	120.0
R6SHRUB	1	4.0	1	4.0	1	0	0	%20.0



Figure 11-7. TBL2SVS can be used to add an understory to a stand produced from FVS output.

VIEWPIC image viewer

Included with SVS is a general-purpose image display program called VIEWPIC (some versions of SVS also include a 32-bit version of VIEWPIC called VIEWPIC32). VIEWPIC is designed to display the image files produced by SVS and other programs. It supports the following image formats:

- Windows device independent bitmap (BMP)
- JPEG
- Zsoft PC-Paintbrush (PCX)
- Truevision TARGA (TGA)
- Portable bitmap (PPM)

In addition to displaying individual image files, VIEWPIC can display a series of image files in rapid succession, i.e. animation. To view a series of images, you must create an ASCII text file containing the name of each image file. The names should be arranged with one name per line in the file. For ease of selection in VIEWPIC's file dialog, you should name the list file with a .LST extension. When you use the `-C` command line option in SVS to capture images representing the files in a tree list index, the list file is automatically created. When you combine the `-C` and `-I` options in SVS, image files and a list file will be created. Then VIEWPIC will be launched to display the images (provided you have not changed the default image viewer in the SVS preferences).

TBL2SVS command line version

The TBL2SVS program converts simple stand tables into SVS tree lists. Most of the features available in TBL2SVS have been included in the TBL2SVS conversion engine that is part of SVS. The command line version is included to facilitate batch conversion of stand table files. See the SVS help file for more information describing TBL2SVS and its use.

The current version of SVS includes the TBL2SVS program as a DOS command line program. Future versions of SVS will include a windows version of TBL2SVS.

FVS2SVS command line version

The FVS2SVS program converts output from the Forest Vegetation Simulator into tree lists for display in SVS. FVS2SVS is a DOS command line program. See the SVS help file for more information describing FVS2SVS and its use.

Tree colors and missing tree forms

SVS uses tree form definitions to determine how to draw individual trees. If SVS encounters any problems when trying to match an individual tree with a tree form, it uses orange to draw all tree parts (stem, branches, and foliage). When you encounter orange trees, it is important to verify that all tree parts are orange because SVS uses orange to identify dead trees of some species. Dead trees generally have orange crowns but brown or gray stems and branches. Most often, orange trees are the result of a missing species definition. If a stand contains scattered orange trees, there is probably a single species code that was left out of the tree form definitions or a species code was mistyped while creating the tree form. If all trees in a stand are orange, the form definition file is either missing or in a directory not searched by SVS. SVS looks for tree form definition files in the directory containing a tree list file, the current directory, and the directory where SVS is installed. If you linked a set of tree form definitions to a tree list file and later moved the tree list file, SVS may have trouble locating the form definition file.

To solve problems with missing tree forms, first see if the SVS tree list requires a special set of tree form definitions. Use the ***Display | Tree list info*** menu option to see if there is a tree form definition file associated with the stand or plot. If the tree list specifies a set of form definitions, see if the specified file exists in the directory containing the tree list file. Next see if the form definition file exists in the directory where SVS is installed. If you cannot find the form definition file, search for the file using the Windows file manager or another similar utility. When you have located the form definition file, copy or move it to the same directory containing the SVS tree list file. If you cannot find the form definition file, you may need to create a new set of tree forms.

SVS errors and the error log

When errors occur during rendering or data conversion, error messages are saved in the SVS *error log* and the SVS window title is modified to indicate there are errors. You can view the error log using the ***Display | SVS error log*** menu option. When an error first occurs, the error log is automatically displayed.

Future versions of SVS will make more extensive use of the error log to report potential problems during all SVS operations.

Portions of the SVS screen appear “scrambled”

Sometimes the SVS screen can become corrupted. This usually happens when another window partially obscures the SVS window or the SVS window is positioned so part of the window is off the visible screen area. The problem arises when the SVS window is moved so the previously obscured portion is exposed. This problem should only occur when the drawing method is set to draw directly to the display. See ***File | Preferences...*** to determine the drawing method. To “clean up” the screen simply select the ***Display | Redraw all*** menu option (or the ***Redraw all*** option on the right mouse button menu) to redraw all SVS display information. If you frequently encounter this problem, you might want to change the SVS preferences so the double buffered drawing method is used.

Uninstalling SVS and the Training Data

SVS and the training data can be uninstalled using the same procedure:

- On the Windows Start button, select “Settings...” and “Control Panel”
- Find and double-click the “Add/Remove Programs” icon
- Select the title, either “Stand Visualization System (SVS)” or “SVS training data”, from the list of installed applications
- Select the “Add/Remove” button to start the uninstall process

Do not remove SVS by simply deleting the directory containing the program and example data files. Doing so could result in system problems or could prevent future re-installation of SVS.

After completing the uninstall procedure, you might find that the SVS directory remains along with data files created during the training. You can delete the directory and all files after uninstalling SVS.

15 EXERCISES

Exercise 1: Viewpoint modification

Modify the viewing parameters to produce a desirable perspective view and then determine the command line options needed to duplicate the view when SVS starts.

Exercise 2: Screen layouts

Design a new screen layout containing one or more views of a stand, one or more stand graphs, stand file name, current date, and a logo.

Exercise 3: Tree form modification

Change the appearance of one or more tree species and produce images showing the different appearances.

Exercise 4: Entering a simple stand table

Use the example stand table to enter input data for the TBL2SVS conversion engine and build an SVS stand.

Exercise 5: Using simple stand tables

Develop simple stand table data files that contain standing, live and dead trees; down, dead trees (logs), and regeneration. Use these data files and the **File...New stand** menu option (TBL2SVS conversion engine) to produce SVS tree list(s). Produce images showing the resulting stand conditions.

Exercise 6: Visualizing stand treatments

Use the data from **Exercise 5** to show a treatment involving removal of 50% of the standing, live trees. Produce images that show the pre- and post-treatment stand conditions.

Exercise 7: Converting growth model data

Produce an growth model output file that corresponds to a desired treatment and at least 30 years of growth. Convert the file using the File...New stand menu option. Experiment with different view of the data (visuals, graphs, stand summary).

Exercise 8: Using your own growth model data

Use some of your own inventory data your growth model to produce an output file describing the development and treatment of your stand. Convert the output file using the **File...New stand** menu option. Experiment with different views of the data including the use of the extracted run history information.

Exercise 9: Free exercise

Free time to further explore SVS options and to ask questions.

16 EVALUATION

Please take a few minutes to complete the following course evaluation. Your comments are very important and will be used to modify the training materials and possibly the SVS software.

Please rate the following items and course topics with 1 being a low score and 4 being a high score:

- | | | | | |
|---|---|---|---|----------------------------------------------------------------------|
| 1 | 2 | 3 | 4 | Overall rating of course |
| 1 | 2 | 3 | 4 | SVS overview |
| 1 | 2 | 3 | 4 | installation and set-up |
| 1 | 2 | 3 | 4 | Menu structure and on-line help |
| 1 | 2 | 3 | 4 | Basic SVS operations |
| 1 | 2 | 3 | 4 | Advanced SVS operations |
| 1 | 2 | 3 | 4 | Inputting data into SVS |
| 1 | 2 | 3 | 4 | Working with simple stand tables using the TBL2SVS conversion engine |
| 1 | 2 | 3 | 4 | Working with growth model output files |
| 1 | 2 | 3 | 4 | SVS utility programs |
| 1 | 2 | 3 | 4 | Potential problems in SVS and their solutions |
| 1 | 2 | 3 | 4 | Overall rating of the exercises |

Were your expectations for the course met? If not, please note what could be added or removed.

What features or additional programs would you like to see added to SVS?

Please feel free to write any additional comments below.