

United States
Department of
Agriculture

Forest Service

Pacific Northwest
Research Station

General Technical
Report
PNW-GTR-345

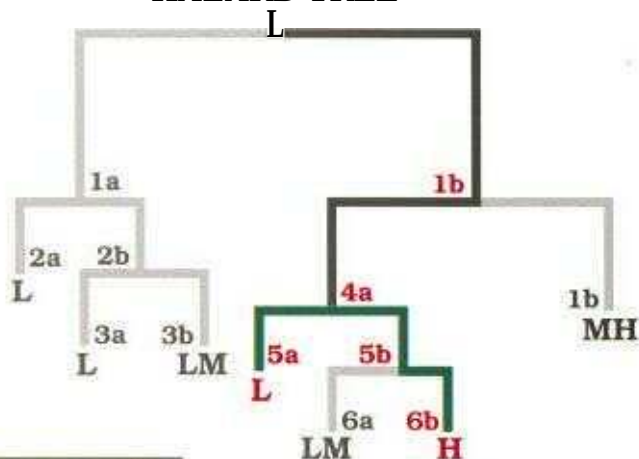


SBexpert Users Guide

(Version 1.0): A Knowledge-Based Decision-Support System for Spruce Beetle Management

Keith M. Reynolds, Edward H. Holsten, and Richard A. Werner

HAZARD TREE



✂

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Abstract

Reynolds, Keith M.; Holsten, Edward H.; Werner, Richard A. 1994. SBexpert users guide (version 1.0); a knowledge-based decision-support system for spruce beetle management. Gen. Tech. Rep. PNW-GTR-345. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 72 p.

SBexpert version 1.0 is a knowledge-based decision-support system for spruce beetle (*Dendroctonus rutipennis* (Kby.)) management developed for use in Microsoft Windows with the KnowledgePro Windows development language. The SBexpert users guide provides detailed instructions on the use of all SBexpert features. SBexpert has four main topics (subprograms): **Introduction, Analysis, Textbook, and Literature**. **Introduction** is the first of five subtopics in the SBexpert help system. **Analysis** is an advisory system for spruce beetle management that provides recommendations for reducing spruce beetle hazard and risk to spruce stands and is the main analytical topic in SBexpert. **Textbook** and **Literature** provide complementary decision support for Analysis. **Textbook** provides background information on the biology, ecology, and management of spruce beetles. **Literature** provides database utilities for retrieving literature citations. A separate utility program, SBlit.CKB, allows users to update the literature database. Basic features of the SBexpert system include an intuitive graphical user interface, efficient presentation and retrieval of information through hypertext and hypergraphics, easy access to an extensive help system for Microsoft Windows system-level help, topic- and window-specific help, a text editor that facilitates preparing standard reports from **Textbook**, and automatic report generation in **Analysis**.

Keywords: Spruce beetle, risk, hazard, decision support, knowledge base, expert system, management.

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Introduction

SBexpert version 1.0 is a knowledge-based decision-support system for spruce beetle (*Dendroctonus rufipennis* (Kby.)) management, developed cooperatively by the Pacific Northwest Research Station and Forest Health Management, USDA Forest Service, Alaska Region. Version 1.0 was developed for south-central Alaska, but later versions easily could extend applicability of SBexpert to spruce beetle management for most of Western North America. The guide provides detailed instructions on the use of all SBexpert features. In addition, it describes procedures for installing the system, and hardware and software requirements (appendix A).

SBexpert is a Microsoft® Windows™ application written in the KnowledgePro® Windows development language.¹ SBexpert has four main topics: **Introduction**, **Analysis**, **Textbook**, and **Literature** (throughout the user guide, SBexpert topics are identified in bold).

- **Introduction** is the first of five subtopics that together make up the SBexpert help system.
- **Analysis** is an advisory system for spruce beetle management that provides recommendations for reducing spruce beetle hazard and risk to spruce stands. **Analysis** is the main analytical topic in SBexpert. The section, "The **Analysis** Topic," consists of two main subsections that describe the **Hazard** and **Risk** topics.
- **Textbook** and **Literature** provide complementary decision support for **Analysis**. **Textbook** provides background information on the biology, ecology, and management of spruce beetles. **Literature** provides database utilities for retrieving literature citations.

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Basic features of the SBexpert system include:

1. An intuitive, graphical user interface.
2. Efficient presentation and retrieval of information through hypertext and hypergraphics.
3. Easy access to an extensive help system for Microsoft (MS) Windows system-level help, topic-specific help, and window-specific help.
4. A text editor that facilitates preparing standard reports from **Textbook**.
5. Automatic report generation in **Analysis**.

SBexpertBasics

If you are already familiar with Microsoft Windows, you know almost everything necessary to run SBexpert. A quick review of this guide is recommended, however, because a few aspects of program operation are unique to SBexpert. If you are new to Microsoft Windows, this guide provides detailed documentation on the use of SBexpert, beginning with the basics covered in this section.

Screen Objects and Manual Conventions

SBexpert uses the graphical user interface of the Microsoft Windows (MS Windows) environment. In MS Windows, software applications gather information from, and provide application control to, the user with screen objects such as *menus*, *buttons*, *radio buttons*, *list boxes*, *etc.*, that are displayed in windows. Throughout this guide, screen objects are indicated in *bold italic* as in the previous sentence. Technically, windows also are screen objects, but these are not highlighted to avoid cluttering the guide with too many highlighted terms. Items displayed in *menus*, *list boxes*, and *radio buttons*, for example, are choices that can be selected and are indicated in *italic*.

Mouse Control

The buttons on a mouse can be programmed for either right- or left-handed use (they come configured for right-hand use). All mouse operations in SBexpert use the left button on a right-handed mouse or the right button on a left-handed mouse. Almost all program control is accomplished by selecting screen objects with the mouse. There are three basic mouse techniques:

- Single click: To select any screen object, except a choice from a **list box**, position the mouse pointer on the object and click on the object.
- Double click: To select a choice from a **list box**, position the mouse pointer on the choice and double click on the choice.
- Dragging: To mark a block of text for deleting, copying, or moving, click the left mouse button at the beginning of the text block and, while holding the button down, drag the mouse to the end of the block.

In general, a screen object is selected by a single click of the mouse on the object; however, some mouse operations (for example, selecting an item in a **list box**) require a double click. The term "select" in all instructions in this guide always means "select the object with a single click." "Double click" will be specifically indicated when necessary.

Keyboard Control

Control of SBexpert is easiest with a mouse, and therefore is recommended. Control of screen objects, however, is explained in terms of both mouse and keyboard procedures. It is assumed that most users will use a mouse, so instructions are given primarily in terms of mouse procedures. Keyboard procedures equivalent to mouse procedures are indicated in parentheses in condensed form, for example,

(Key: ALT+hyphen).

As illustrated in this example, keyboard commands often require a combination of keys. Key-press combinations take one of three basic forms:

- The keyboard notation "key1+key2" means hold down key 1 and press key 2.
- The keyboard notation "key1, key2" means press and release key 1, then press key 2.
- The keyboard notation "key1 +key2, key3" means hold down key 1 and press key 2, release keys 1 and 2, then press key 3.

Keys or key combinations shown in bold as in,

(Key: **Ctrl+F6**, Enter),

indicate that the bold portion of the key-press combination should be pressed repeatedly until the desired screen object is highlighted.

All keyboard controls for navigating in MS Windows and operating on screen objects in SBexpert are summarized in appendix B. There often is more than one alternative keyboard procedure for a single mouse procedure. In the body of this guide, when multiple keyboard alternatives exist, usually only the most efficient method is shown. Keyboard methods for editing text are summarized in appendix C.

Hypertext and Hypergraphics

All text displayed in red letters in SBexpert is **hypertext**. **Hypertext** provides efficient access to cross references and deeper layers of information. When a **hypertext** object in a window is selected, the material it references is displayed in a window. In **Textbook**, for example, **hypertext** is used to provide definitions of terms, expanded explanations of concepts, literature references, and graphic figures illustrating a particular topic. **Hypertext** appears throughout the SBexpert windows, and first-time users are encouraged to make liberal use of **hypertext** objects to become familiar with the system and concepts used in its development.

Installation and Setup

Preparing for Installation

Before proceeding with these instructions, Microsoft Windows must be installed on your system before SBexpert is installed, because the SBexpert installation program modifies the Microsoft Windows configuration file, WIN.INI.

The installation program creates three subdirectories in addition to the main \SBEXPERT directory containing the executable code for SBexpert and its associated text files. A directory named \SBEXPERT\EDITOR is automatically created as a subdirectory of the main \SBEXPERT directory. Two additional directories, \SBEXPERT\TEXTFIGS and \SBEXPERT\STANDS, contain high-resolution bitmap images used in **Textbook** and **Analysis**, respectively. Because the two directories containing bitmaps are relatively large, the installation program provides the option of locating both bitmap directories on a hard disk drive different from the drive on which the main \SBEXPERT directory is installed.

The full version of SBexpert currently is distributed on a 44-MB Bernoulli disk or QIC80-compatible tape. A smaller version of SBexpert, which includes a limited number of stand bitmap images, also is available on five 1.44-MB floppy disks. Instructions for installing both versions are essentially the same.

Installation

In the following descriptions of installation and setup, commands that you enter at the keyboard are shown in uppercase bold type. Each command is completed by pressing the ENTER key. To begin installation:

1. Insert the SBexpert Bernoulli disk into the Bernoulli drive (or, if you are installing the floppy disk version of SBexpert, insert the SBexpert Programs disk into the floppy drive).
2. Make the disk drive from which SBexpert is being installed the active drive (for example, type **A:** at the DOS prompt to make the A drive active).
3. Type **INSTALL C:** to install the main \SBEXPERT directory to the C drive, for example.

The install command creates the main\SBEXPERT directory and the\SBEXPERT-\EDITOR subdirectory on the designated hard drive, copies several utility files to the main directory, and then displays a message describing the possible drive assignments for the various directories. You then are prompted to type a new install command of the form:

INSTALLS %1 %2 %3 %4 %5 (for installation from a Bernoulli disk),

or

INSTALLF %1 %2 %3 %4 %5 (for installation from a floppy disk),

where %X indicates a replaceable parameter that is passed to the install program (table 1).

For example, to copy the SBexpert system from the A drive, locate the\SBEXPERT directory on drive C:, and locate both figure subdirectories on drive D:, type

INSTALLF A: C: D: D: C:\WINDOWS,

assuming that Microsoft Windows is located in the WINDOWS directory of drive C:. The colons shown in the drive designations are required.

Table 1—Definitions of parameters for the install command

Parameter	Definition
1	Source drive containing the SBexpert distribution disk or disks.
2	Target drive for \SBEXPERT directory.
3	Target drive for \SBEXPERT\TEXTFIGS directory.
4	Target drive for \SBEXPERT\STANDS directory.
5	Drive and directory where Microsoft (MS) Windows is located (for example, C:\WINDOWS if you did not change the location of the MS Windows' directory during the MS Windows installation).

After the new install command is entered (followed by Enter), the installation program copies the executable code to the main \SBEXPERT directory, creates the \SBEXPERT\TEXTFIGS and \SBEXPERT\STANDS subdirectories on the appropriate drives, and copies all the bitmap images.

If you are installing SBexpert from a Bernoulli disk, the installation program copies files to the appropriate target subdirectories without further prompting, and the installation program displays a series of messages on the status of file copying. If you are installing SBexpert from floppy disks, you are prompted by the installation program to remove the SBexpert Programs disk and insert the SBexpert Text Figures disk. Prompting for new disks will continue until all SBexpert files have been copied to their target directories.

Setup Procedures for Microsoft Windows

Part of the SBexpert setup for Microsoft Windows was completed at installation. During SBexpert installation, the install program modified the Microsoft Windows file WIN.INI to associate the SBexpert file extension, .CKB, with the runtime version of KnowledgePro Windows, which was also installed on your system in the VSBEXPERT directory. With the latter modification to WIN.INI, SBexpert can be run from the File Manager of Microsoft Windows by "double clicking" on the file name SBEXPERT.CKB in the \SBEXPERT directory. It is more convenient, however, to start SBexpert, or any other application, from the Microsoft Windows Program Manager.

This section explains how to create a program item for SBexpert in Microsoft Windows Program Manager and assign the SBexpert custom icon. A minimal knowledge of how to work in Microsoft Windows is needed to complete the following steps. If you have no experience with Microsoft Windows, see chapter 2 (Basic Skills) in the "Microsoft Windows User's Guide" for an explanation.

1. Start Microsoft Windows. Skip steps 2-3 if you want to create the SBexpert program item in an existing program group.
2. In Program Manager, select Mew from the File **menu**. Program Manager displays the New Program Object **dialog window**.
3. Select the Program Group option, and then select the OK **button**. The Program Group Properties **dialog window** appears. Type SB EXPERT in the **edit line** labeled Description, then select the OK **button**. An empty **group window** labeled "SB EXPERT" is displayed in Program Manager.
4. Make sure the "SB EXPERT" **group window**, or other **group window** of your choice, is selected (for example, is the active group window) and select Mew from the File **menu**.
5. The New Program Object **dialog window** is displayed again. Select Program Item, then select the OK **button**. The Program Item Properties **dialog window** is now displayed.
6. Type **SB EXPERT** in the **edit line** labeled Description. In the Command Line **edit line**, type **C:\SBEXPERT\SBSTART.CKB**, then select the Change Icon **button**.
7. The Change Icon **dialog window** is now displayed. In the File Name **edit line**, type **C:\SBEXPERT\SBEXPERT.ICO**, and select the OK **button** to display the SBexpert icon, then select the OK **button** again to accept the icon and close the **dialog window**.
8. The Change Icon **dialog window** closes, and the Program Item Properties **dialog window** is displayed again. Select the OK **button**. The SBexpert application is now added to the SBexpert **group window** (or whatever **group window** was selected in step 4), and its **program item icon** is displayed in the **group window**.
9. Installation and setup of the SBexpert application is now complete. Steps 10-13 create a **program item icon** for the utility program SBlit.
10. Select Newhorn the File **menu** to display the New Program Object **dialog window** again. Select Program Item, then select the OK **button**. The Program Item Properties **dialog window** is now displayed.
11. Type **SB LIT** in the **edit line** labeled Description. In the Command Line **edit line**, type **C:\SBEXPERT\SBLIT.CKB**, and then select the Change Icon **button**.

12. The Select Icon **dialog window** is now displayed. In the File Name **edit line**, type **C:\SBEXPERT\SBUT.ICO**, select the View Next **button**, then select the OK **button**.
13. The Select Icon **dialog window** closes, and the Program Item Properties **dialog window** is displayed again. Select the OK **button**. The SBIt application is now added to the SBexpert **group window** (or whatever group window was selected in step 4) and its **program item icon** is displayed in the **group window**.
14. Installation is complete.

Starting SBexpert

MS Windows Program Manager

Start MS Windows by typing "win" at the DOS prompt. SBexpert can be started from either the MS Windows Program Manager or File Manager, but access to programs is easier from Program Manager. Starting SBexpert from the MS Windows File Manager is described in the next section. On most systems, Program Manager is automatically displayed when MS Windows starts (fig. 1). Generally, SBexpert will have been installed either in its own group window labeled SBexpert or in the Windows Applications group window.

To start SBexpert from the Program Manager:

1. If the group window containing SBexpert is not already open, double click on the SBexpert or Windows Applications **program group icon** (fig. 2) to open the group window (Key: **Ctrl+F6**, Enter).
2. Double click on the **SBexpert program item icon** to start SBexpert (Key: **arrow keys**, Enter).

MS Windows File Manager

If MS Windows starts with the File Manager active instead of the Program Manager, you may want to start SBexpert from File Manager. File Manager displays directories on the system disk drives in various views. These instructions cover the case in which the File Manager display uses the combined Tree and Directory view (fig. 3). If the File Manager display does not look like fig. 3, the view can be changed by selecting the View **menu** (Key: **ALT+V**) from the File Manager **menu bar**, and selecting **Tree and Directories** (Key: **R**) from the **menu**.

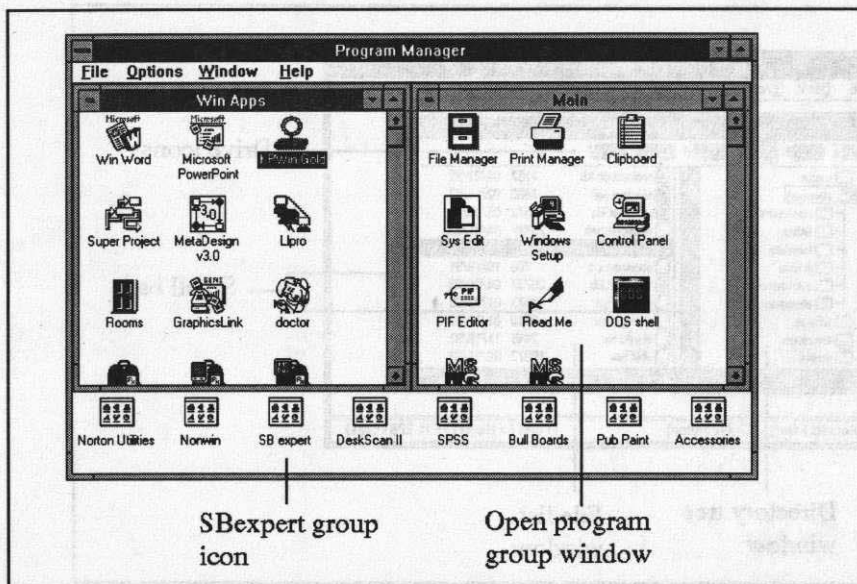


Figure 1—Microsoft Windows Program Manager with SBexpert *program group window* closed.

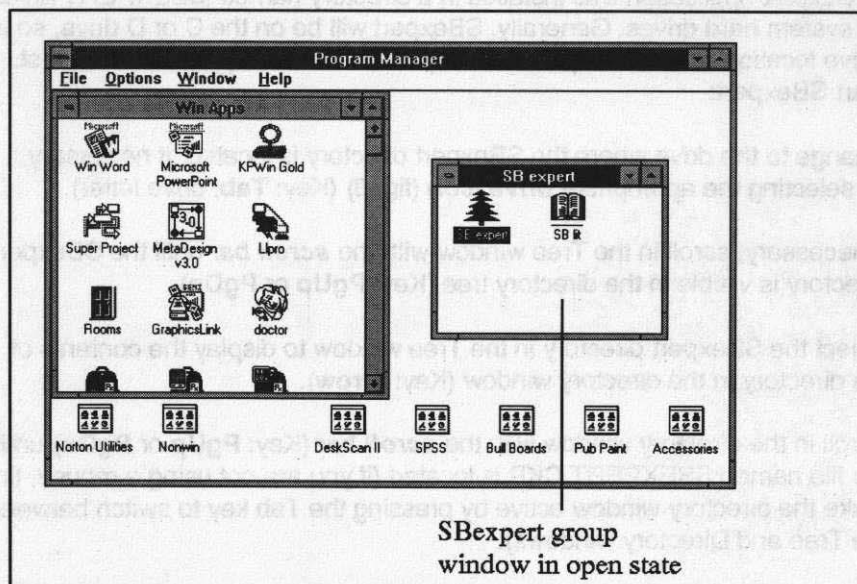


Figure 2—The *program group window* for SBexpert in an open state.

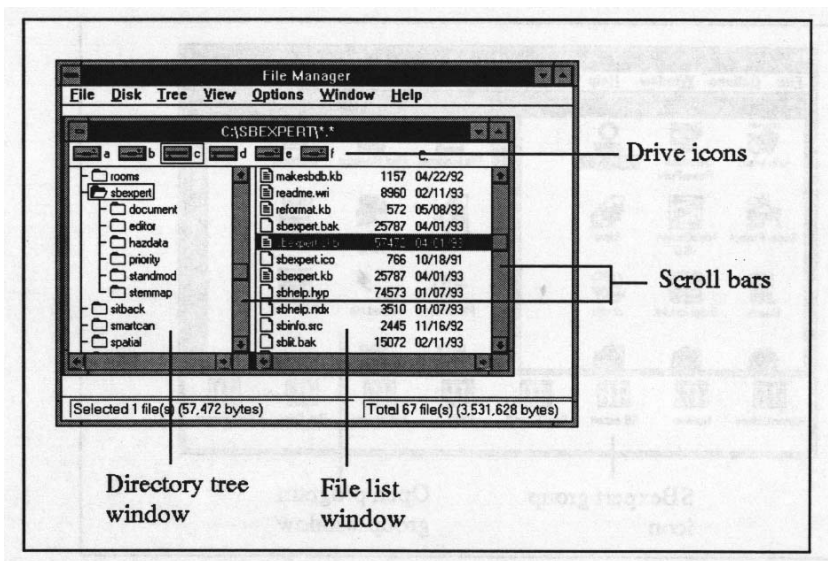


Figure 3—Using Microsoft Windows File Manager to start SBExpert.

The SBExpert application was installed in a directory named \SBEXPERT on one of the system hard drives. Generally, SBExpert will be on the C or D drive, so if the drive location of the SBExpert directory is not known, try these drives first. To start SBExpert:

1. Change to the drive where the SBExpert directory is located, if necessary, by selecting the appropriate **drive icon** (fig. 3) (Key: **Tab**, drive letter).
2. If necessary, scroll in the Tree window with the **scroll bar** until the SBExpert directory is visible in the directory tree (Key: **PgUp** or **PgDn**).
3. Select the SBExpert directory in the Tree window to display the contents of the directory in the directory window (Key: arrow).
4. Scroll in the directory window with the **scroll bar** (Key: **PgUp** or **PgDn**) until the file named SBEXPERT.CKB is located (if you are not using a mouse, first make the directory window active by pressing the Tab key to switch between the Tree and Directory windows).
5. Double click on the SBEXPERT.CKB file name in the directory file listing to start SBExpert (Key: **arrow**, Enter).

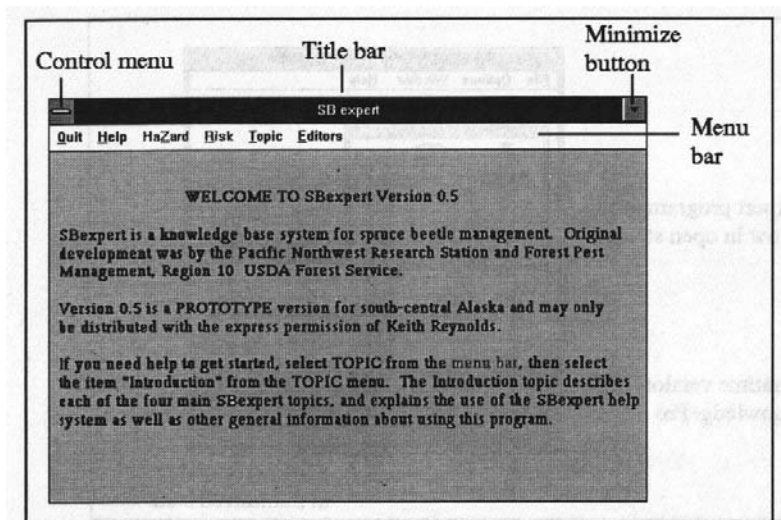


Figure 4—Main window of the SBexpert application.

The Main Window of SBexpert

The logo for SBexpert is displayed as soon as the application is started. Press any key to clear the screen and display the main SBexpert window. Screen objects that appear in the main window are the **title bar**, **minimize button**, **menu bar**, and the **control menu** (fig. 4). The **title bar** displays the name of the application. To temporarily exit SBexpert without terminating the application, select the **minimize button** to reduce SBexpert to a **program item icon** that is displayed at the bottom of the MS Windows desktop (fig. 5). You can then easily access the MS Windows Program Manager or other MS Windows applications that also may be running. For further information on navigating among running MS Windows applications, see the section "Switching Among Running Applications."

The Menu Bar

Many of the basic operations of SBexpert are controlled by selecting options from the menus displayed on the **menu bar**. To select an option from a menu:

1. Select the menu to open it (Key: ALT+H, for example, to open the Help menu)
2. Select the option on the **menu** (Key: underlined letter in option).

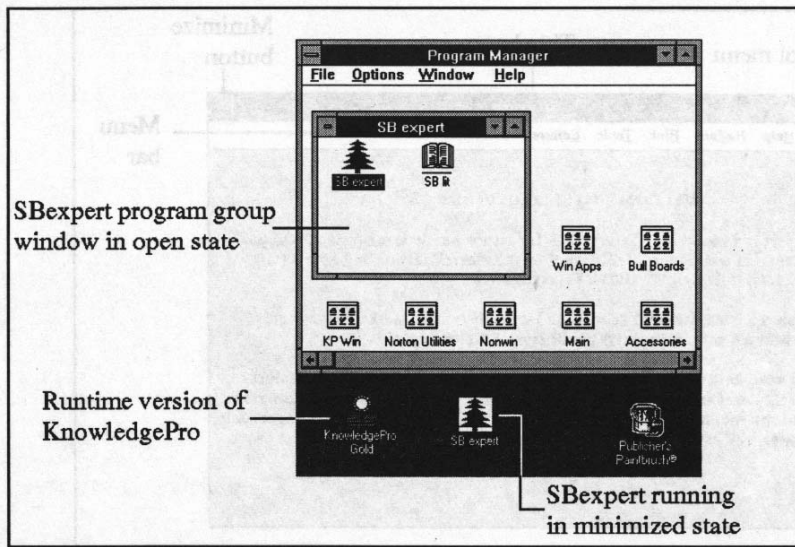


Figure 5—Example of a minimized program icon.

An SBexpert session can be terminated at any time by selecting the **Quit menu** from the **menu bar** (Key: ALT+Q). When Quit is selected, SBexpert displays a **dialog window** with a **list box** containing the choices **YES** and **NO**.

- Double click on **YES** to confirm that you want to terminate the program (Key: spacebar, Enter), or
- Double click on **No** to cancel the Quit operation (Key: arrow, spacebar, Enter).

The **Quit menu** is unique in that when it is selected, a **dialog window** is immediately displayed. When all other menus on the **menu bar** are selected, however, a list of choices is displayed. For example, when the **Topic menu** is selected, the **menu** opens and displays choices for the four major SBexpert topics: *introduction*, *Analysis*, *Textbook*, and *Literature*. Selecting one of the latter four choices opens the associated topic.

To close a menu without selecting an option:

- Click the mouse anywhere outside the open menu (Key: ESC), or
- Select a different menu.

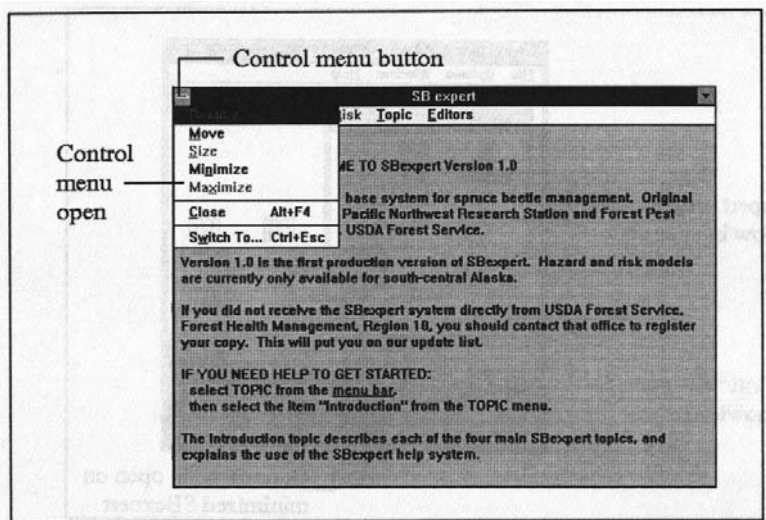


Figure 6—SBexpert **control menu**.

The *Quit menu* is the one exception to the general procedure for operating on a menu because selecting *Quit* automatically displays a *dialog window* that cannot be closed until a selection has been made. Selecting the *No* choice in the *list box*, however, effectively cancels the selection.

When SBexpert is first started, the Hazard and Risk menus appear dim (gray instead of black). Whenever a menu or option in a menu appears dimmed, the menu or option is currently inactive and cannot be selected. The Hazard and Risk *menus* both change to black, thereby indicating that these menus are now available, after an initial hazard analysis has been completed in Analysis (see the section "The Analysis Topic" for further discussion of these *menus*).

The Control Menu

To open the **control menu** of the SBexpert main window in normal view (fig. 6), select the **button** (Key: ALT+spacebar). To open the **control menu** in minimized view (fig. 7), select the SBexpert **icon** displayed at the bottom of the MS Windows desktop (Key: ALT+ESC, Enter).

Menu items on the application **control menu** are *Restore*, *Move*, *Size*, *Minimize*, *Maximize*, *Close* and *Switch to* (fig. 6 and 7). *Size* and *Maximize* are always dim in SBexpert and therefore unavailable (that is, not selectable) because the main SBexpert window is not resizable. The *Close* and *Move* options are always

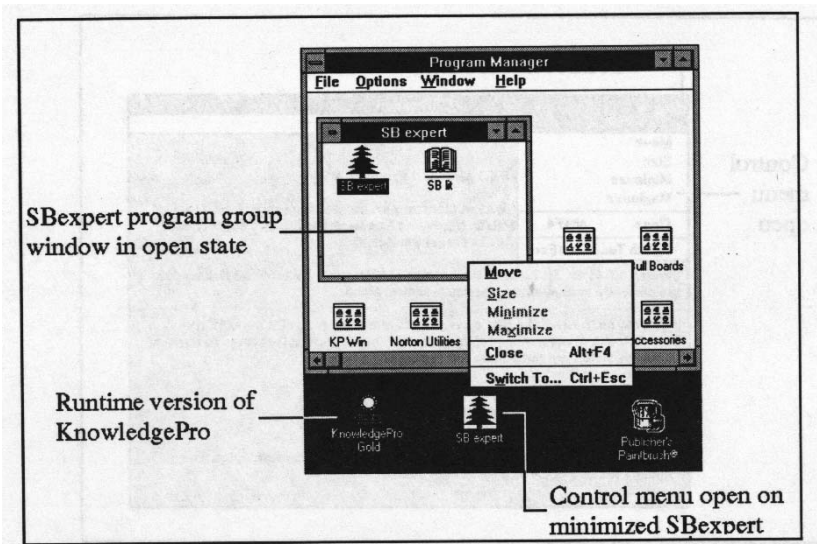


Figure 7—Opening the **control menu** on a minimized program icon.

selectable regardless of whether the SBexpert application is currently displayed in normal view (fig. 4) or minimized view (fig. 5). When the **control menu** is open:

- Select Close (Key: C) as an alternative to using the Quit menu to terminate SBexpert. In normal view, double click on the **control menu** to close SBexpert without opening the **control menu**.
- Select Move (Key: M) to relocate the SBexpert application window on the MS Windows desktop. After selecting Move, the cursor changes to a four-headed arrow. Use the arrow keys to reposition the window, and press the ENTER key when done. The **title** bar also can be dragged with a mouse to position the SBexpert application window on the screen.
- Select Minimize (Key: N) to reduce SBexpert to a **program item icon** displayed at the bottom of the MS Windows desktop (fig. 5). Minimize is available only when the main SBexpert window is displayed in normal view (fig. 4) (that is, not minimized). Selecting Minimize from the **control menu** is equivalent to selecting the **minimize button** and is the only keyboard method for minimizing an application.
- Select Restore (Key: R) to return the SBexpert application window to full size (fig. 4) after it has been minimized (fig. 5). Restore is available only when SBexpert has been minimized (that is, reduced to a **program item icon**), in

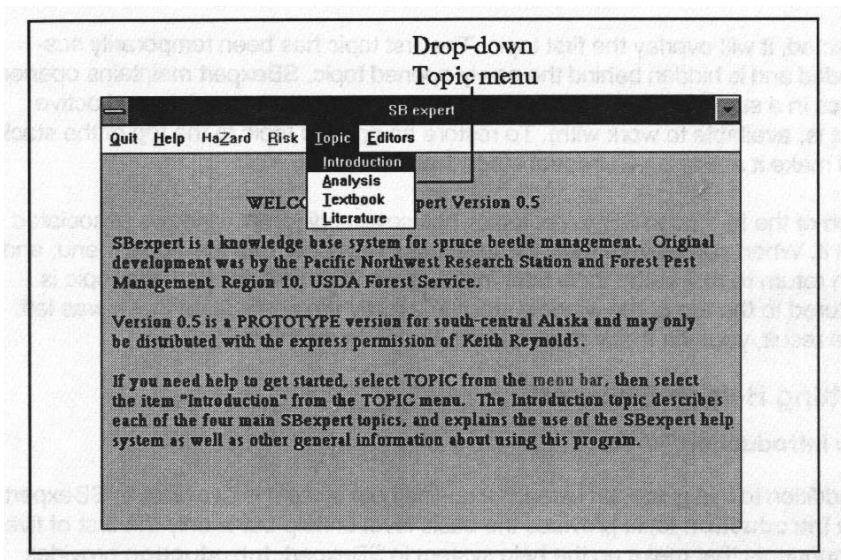


Figure 8—Opening the Topic *menu* on the main SBexpert *menu bar*

which case the SBexpert *icon* is displayed near the bottom of the MS Windows desktop (fig. 7). To use *Restore*, first select the SBexpert *icon* (Key: ALT+ESC, Enter) to open the *control menu*, then select *Restore* (Key: R). In minimized view, double click on the minimized *program item icon* to restore SBexpert without displaying the *control menu* (Key: ALT+Tab).

Opening and Moving Among SBexpert Topics

There are four main topics in SBexpert that are accessed from the Topic *menu* of the main window: **Introduction**, **Analysis**, **Textbook**, and **Literature** (fig. 8). In general, a topic is opened by:

1. Selecting the Topic *menu* from the *menu bar* of the main window (Key: ALT+T).
2. Selecting a choice from the *menu* (Key: underlined letter in the option).

The four topics are program objects that essentially run independently of one another. Several topics can be running at the same time, although only one topic is visible at a time.

After starting any of the four topics from the Topic *menu*, select the Topic *menu* again to display the list of topics. Note that the topic just selected has a check mark next to it to indicate that the topic is currently running. If a new topic is

selected, it will overlay the first topic. The first topic has been temporarily suspended and is hidden behind the newly opened topic. SBexpert maintains opened topics in a stack, but only the topic on the top of the stack is visible and active (that is, available to work with). To restore an opened topic to the top of the stack and make it active again, repeat steps 1 and 2 above.

Each of the four main SBexpert topics has several different windows associated with it. When you leave a topic by selecting a new one from the Topic menu, and then return to that same topic later in the same SBexpert session, the topic is restored to the top of the window stack in exactly the same state that it was left. As a result, you can freely move among the various topics.

Getting Help in SBexpert

The Introduction Topic

In addition to this guide, an extensive on-line help system is available in SBexpert. The **Introduction** topic provides the basic level of help but is only the first of five components that make up the help system in SBexpert. **Introduction** provides complete step-by-step instructions on use of not only **Introduction** itself and components of the help system but also **Analysis**, **Textbook**, and **Literature**.

Using Introduction

To open **Introduction** (fig. 8):

1. Select Topic from the SBexpert **menu bar** (Key: ALT+T).
2. Select *Introduction* from the list of choices on the Topic **menu** (Key: I).

The first window of **Introduction** displays a set of **radio buttons** labeled with the available topics and two **buttons** labeled OK and CLOSE (fig. 9). Select a topic to view by:

1. Selecting its corresponding *radio button* (Key: arrow).
2. Selecting the OK **button** (Key: Tab, Enter).

The Tab key cycles through the screen objects in a window. Each time the Tab key is pressed, the highlighting bar moves to the next object on the screen, thereby indicating that the screen object is active and ready to accept input. Note, however, that a set of *radio buttons* is treated as a single screen object:

- Use Tab to move the highlight to a set of **radio buttons**.
- But use the arrow keys to move the highlight within a set of **radio buttons**.

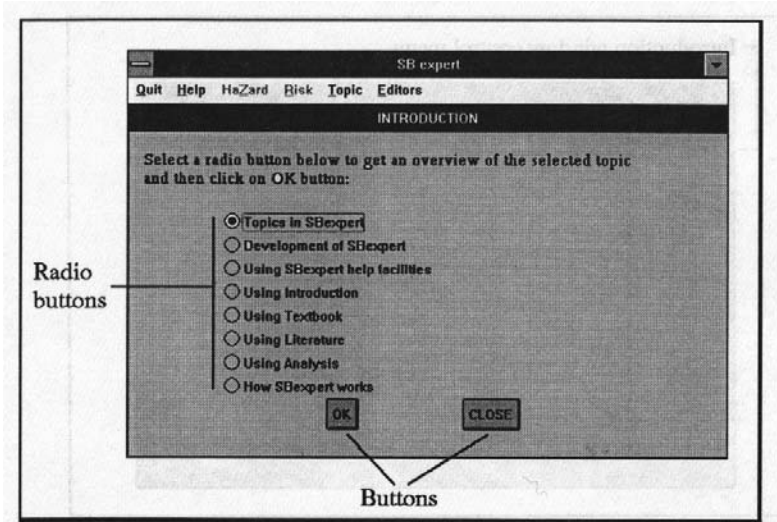


Figure 9—The first window of the **Introduction** topic.

When the highlight is on the last screen object, pressing Tab moves the highlight back to the first screen object. Press SHIFT+Tab to move backwards through the set of screen objects.

When the OK **button** is selected, a new display window overlays the first **Introduction** window and displays detailed instructions for using the selected topic (fig. 10). In this new display window;

- Select the **control menu** to open it (Key: ALT+hyphen), and then select Close from the **menu** (Key: C) to close the window and return to the first **Introduction** window (as a shortcut, double click on the **control menu** of the window to close the window without opening the **control menu**),
- Use the **scroll bar** (Key: **arrow**, PgUp or PgDn) on the right side of the display window to scroll through text in the window if text extends beyond the bottom of the window.
- Select **hypertext** (Key: **Tab**, Enter). See the section, "Using the Help Windows," below.

Introduction window control menu

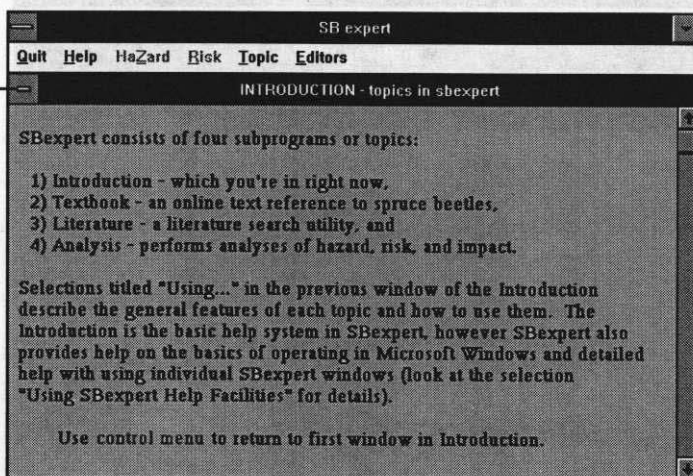


Figure 10—Location of the **control menu** in the main text windows of Introduction.

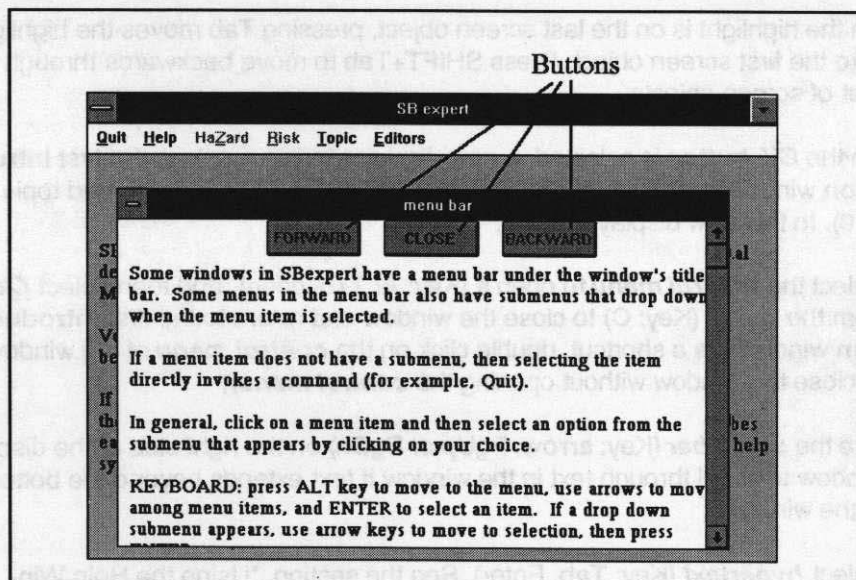


Figure 11—Example of a **hypertext** window in Introduction.

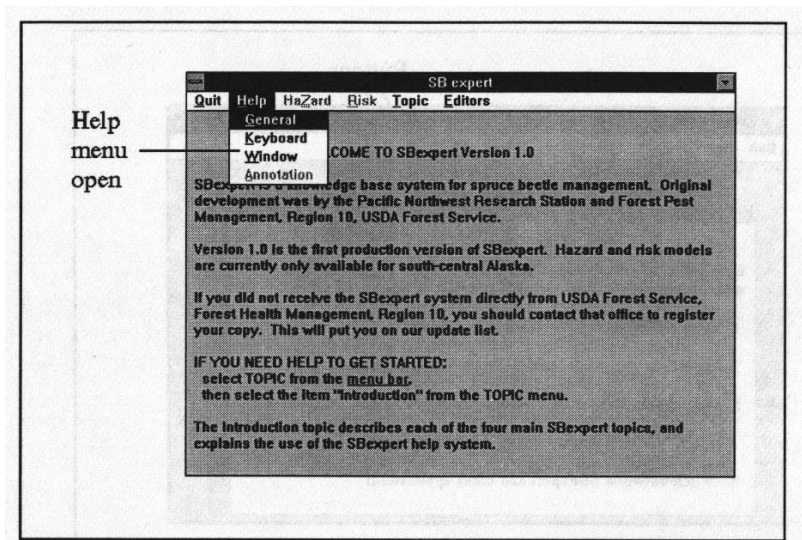


Figure 12—Select (general) from the Help **menu** to display a window that provides general help on performing Microsoft Windows procedures in SBexpert, such as closing windows and scrolling in windows.

Other Ways To Get Help

Many display windows in SBexpert are annotated with instructions for using the current window. Instructions often include **hypertext that**, when selected (Key: **Tab**, Enter), displays a new window with additional information related to the **hypertext topic** (fig. 11).

When the **Help menu** is selected from the SBexpert **menu bar** (Key: ALT+H), the **menu** displays the choices: *General*, *Keyboard*, and *Window* (fig. 12).

- Select *General* (Key: G) to open or restore a window displaying a list of basic MS Windows procedures used in SBexpert to control the program (fig. 13). All items in the list are **hypertext**.
- Select *Keyboard* (Key: K) to open or restore a window displaying a list of commands that can be executed from the keyboard as an alternative to using a mouse device.
- Select *Window* (Key: W) to open or restore a window displaying context-sensitive help for the current display window.

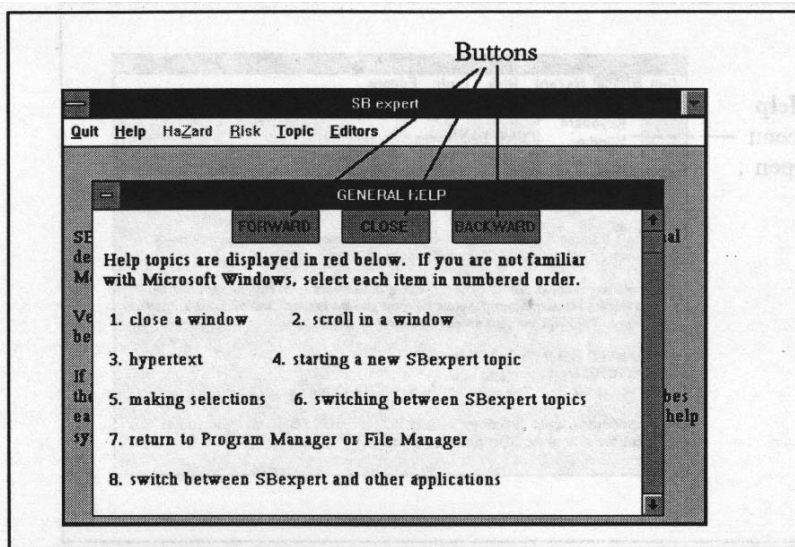


Figure 13—*Hypertext* window for general help.

Using the Help Windows

To close all three types of help window (fig. 14):

1. Select the **control menu** (Key: ALT+hyphen).
2. Select Close from the menu (Key: C).

All help windows also display a **button** labeled "Close" at the top of the window (fig. 13). The Close **button** also can be selected as an alternative way to close a help window.

Besides the Close **button**, the windows displayed by selecting *General*, and *Window* have **buttons** labeled "Forward" and "Backward" for moving through lists of help topics. When these three help windows are first opened, there is only a single help topic. The first time **hypertext** is selected in one of these help windows, however, that hypertext topic is added to the list of help topics, the contents of the window are replaced with the text of the hypertext topic, and the Backward **button** becomes active. Every time another hypertext object is selected, it is added to the list of help topics. In general (fig. 13):

- Select the Backward **button** to move backward through the list of help topics.
- Select the Forward **button** to move forward through the list of help topics.
- Select the Close **button** to close the help window.

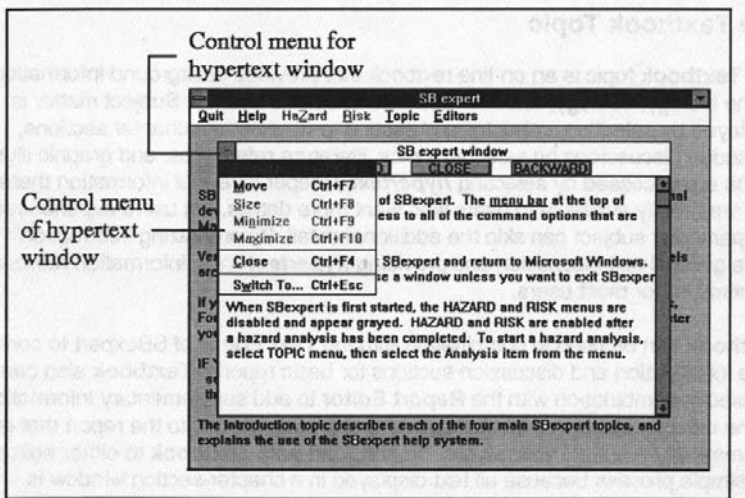


Figure 14—*Control menu* of a *hypertext* window in an open state.

The keyboard procedure for accessing a *hypertext* item in a help window is as follows:

1. Press Ctrl+F6 **twice** to make the text display area active.
2. Press Tab until the correct *hypertext* is highlighted.
3. Press Enter key to select the *hypertext*.

The keyboard procedure for accessing the *button bar* in a help window is as follows:

1. Press Ctrl+F6 to make the *button bar* active.
2. Press Tab until the correct *button* is highlighted.
3. Press Enter key to select the *button*.

Help windows displayed by selecting General and Keyboard can be left in an open state and referred to later in a session without having to rebuild a list of help topics. To leave the contents of one of these help windows available for later reference, select the window that is visible in the background, behind the help window (Key: Ctrl+F6). The background window moves to the top of the window stack and hides the help window. When the same help topic is reselected from the Help *menu*, the help window is returned to the top of the window stack, restored to the state in which it was left.

The Textbook Topic

The **Textbook** topic is an on-line textbook that provides background information on the biology, ecology, and management of spruce beetles. Subject matter is displayed by selecting a chapter and section to view. Within chapter sections, expanded discussions on selected topics, literature references, and graphic illustration are accessed by selecting **hypertext**. Deeper layers of information therefore are readily available to users who want more details, but users experienced in a particular subject can skip the additional detail. By organizing information into a general text discussion and providing **hypertext** links, information retrieval is optimized for most users.

Textbook can be used in combination with the Text Editor of SBexpert to compose introduction and discussion sections for basic reports. Textbook also can be used in combination with the Report Editor to add supplementary information on the biology, ecology, and management of spruce beetles to the report that is automatically created by Analysis. Copying text from Textbook to either editor is a simple process because all text displayed in a chapter-section window is copied automatically to a temporary MS Windows file called the CLIPBOARD when a chapter section is displayed in Textbook.

Opening and Closing Textbook

To open **Textbook** (fig. 8):

1. Select the Topic menu from the *menu bar* of SBexpert (Key: ALT+T).
2. Select *Textbook* from the list of choices (Key: T).

The first Textbook window displays two *list boxes*, one for chapters and one for the sections within each chapter (fig. 15). In addition, a Close *button* is located near the bottom of the window. Select the Close button to close Textbook (Key: **Tab**, Enter).

Selecting a Chapter Section to View

1. Choose a chapter by double clicking on one of the choices in the chapter **list** box (fig. 15) (Key: **arrow**, spacebar, Enter).
2. Choose a section within the chapter by double clicking on one of the choices in the section **list box** (Key: **Tab**, **arrow**, spacebar, Enter).

Once a chapter has been selected, the contents of the *list box* displaying chapter sections change to reflect the sections available in the chosen chapter. To select a new section in the same chapter, it is not necessary to select the chapter item

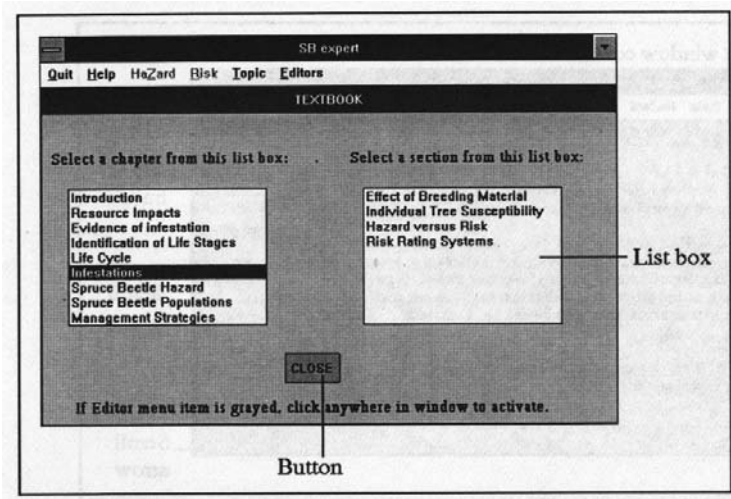


Figure 15—Main window of the **Textbook** topic.

again. Once a chapter section is chosen, the first **Textbook** window is overlaid by the chapter-section window displaying the text of the section. Within the chapter-section window (fig. 16):

- Use the **scroll bar** (Key: **arrow** or PgUp or PgDn) located on the right side of the chapter-section window to scroll through text in the window.
- Select **hypertext** (Key: **Tab**, Enter) to view expanded discussions, literature citations, and graphic illustrations.
- Close the section window by selecting its **control menu** and selecting Close (Key: ALT+hyphen, C).

Note that chapter-section windows (fig. 16) and hypertext windows (fig. 17) displayed from section windows do not have a Close **button** as does the first **Textbook** window. Chapter-section windows and their hypertext windows are closed only by selecting their respective **control menus** as described above. Alternatively, double click the **control menu** to close these windows without first opening the **control menu**.

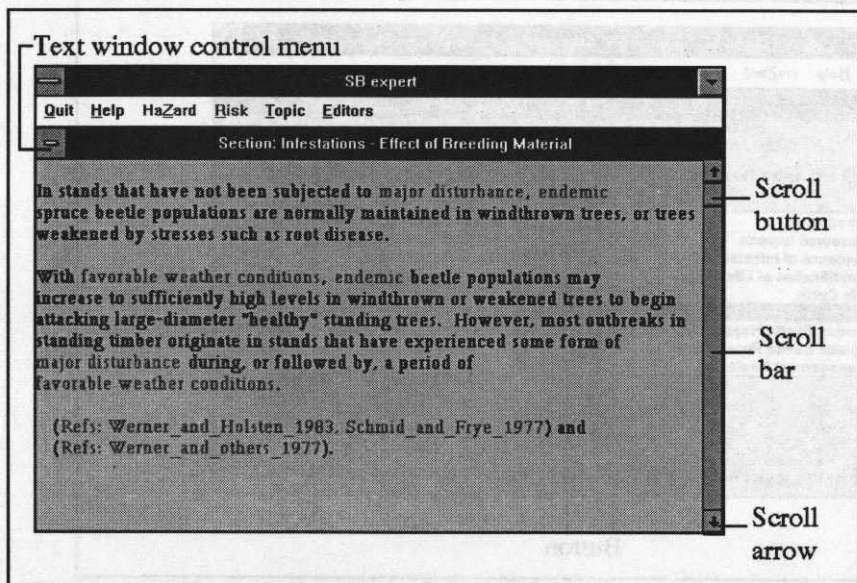


Figure 16—Control menu for a chapter section in *Textbook*.

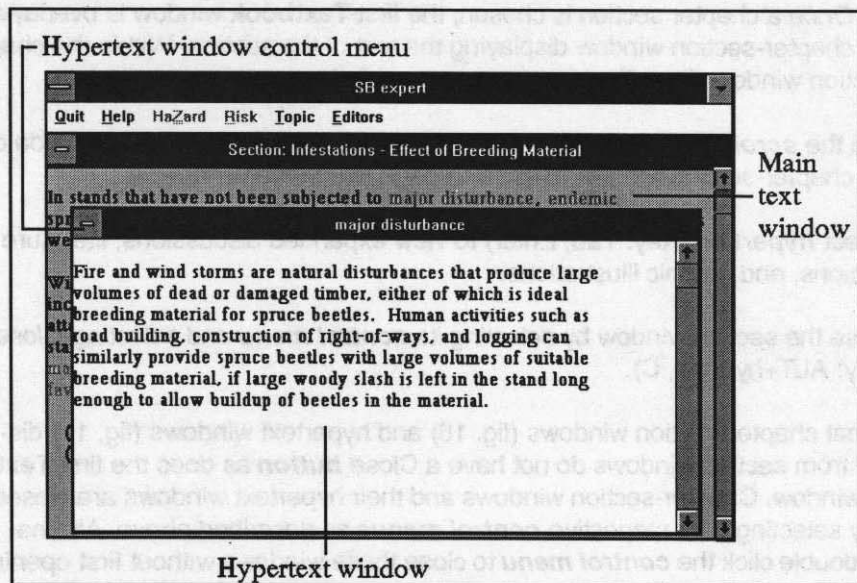


Figure 17—Viewing a *hypertext* window in a chapter section in *Textbook*.

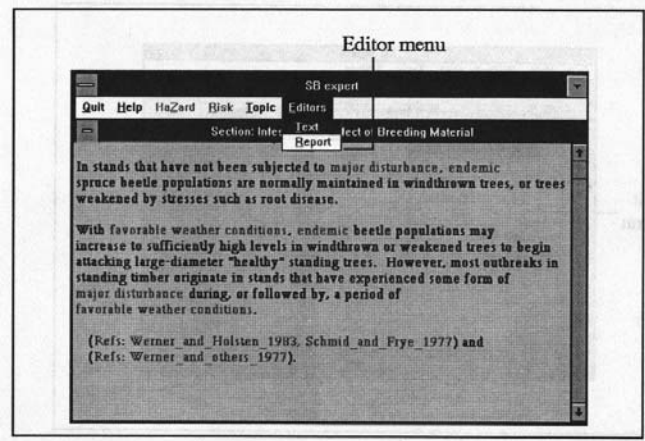


Figure 18—Opening the Editors **menu** on the main SBexpert **menu bar**.

Copying Text from Textbook to an SBexpert Editor

To copy the contents of a chapter section in **Textbook** to either SBexpert editor, first display the desired chapter section in **Textbook**.

Next, to open the appropriate editor (fig. 18):

1. Select the Editors **menu** (Key: ALT+E) from the SBexpert **menu bar**.
2. Select either *Text* (Key: T) or *Report* (Key: R) from the **menu**.

If **Analysis** has not already been opened in the current SBexpert session, the *Report* option on the Editors **menu** will appear dim, thereby indicating that **Report Editor** is not available. Assuming, however, that **Analysis** had been opened previously in the current session, the **Report Editor** window would open after the Report option is selected. Similarly, if **Text Editor** has already been opened in the current SBexpert session, its editor window will also open immediately. If **Text Editor** has not been opened previously in the current SBexpert session, the *Text* option will still be available, but instead of **Text Editor** opening immediately, a **dialog window** is displayed first, requesting a file name for the edit file (see the section "The SBexpert Editors—Opening the SBexpert Editors for the First Time").

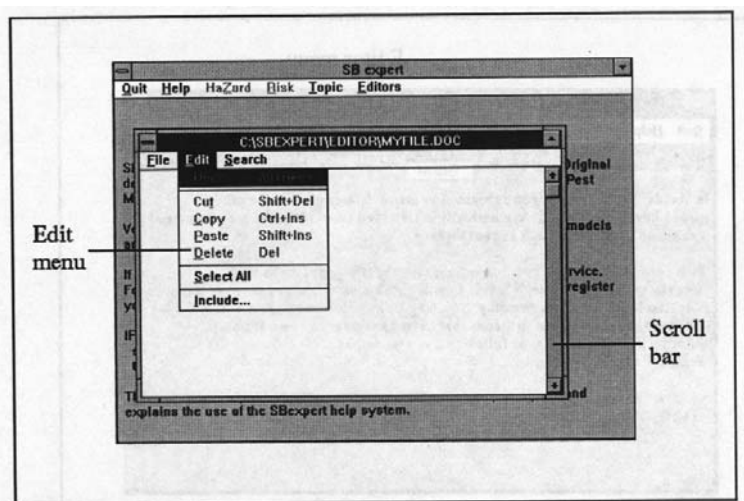


Figure 19—Opening the Edit *menu* in one of the SBExpert editors.

To copy the contents of the MS Windows CLIPBOARD into either SBExpert editor (fig. 19);

1. Position the cursor with the editing keys (appendix C) or by clicking the mouse so that the cursor is positioned in the editor window where the text is to be inserted.
2. Select the Edit *menu* from the editor's *menu bar* (Key: ALT+E).
3. Select the Paste option from the Edit *menu* (Key: P).

The Literature Topic

Literature searching is performed by the **Literature** topic. The present database of spruce beetle literature contains over 400 references and is current through 1990. Up to three authors and keywords and a range of years can be specified as search criteria. After matching records have been retrieved from the database, the selected references can be reviewed in a display window one record at a time. When the display window is closed, the retrieved references are automatically copied to the MS Windows CLIPBOARD, a temporary file managed by MS Windows. The contents of the CLIPBOARD can be copied to either **Text Editor** or **Report Editor**.

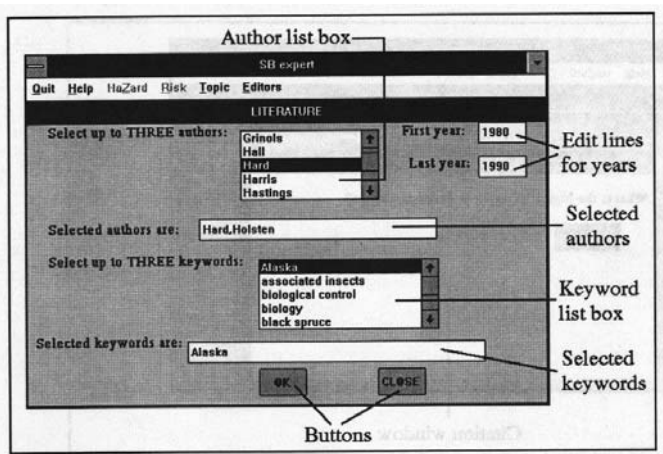


Figure 20—The main window of the **Literature** topic.

To start **Literature** (fig. 8):

1. Select **Topic** from the SBExpert **menu bar** (Key: ALT+T).
2. Select the *Literature* option (Key: L) from the **Topic menu**.

Choosing Criteria to Define a Search

The first **Literature** window displays **list boxes** for selecting authors and keywords and **edit lines** for entering the first and last years of a search (fig. 20). The combination of choices or entries made in these four fields specify the criteria for a literature search. Any field can be left blank, in which case the blank field is treated as a wildcard (that is, all literature records in the database match a blank field). In searching the database, a record is only retrieved if it matches all selected search criteria.

Up to three authors and keywords can be selected. The process for selecting authors and keywords is identical. To select authors, for example (fig. 20);

1. Select the author list box to make it the active screen object (Key: Tab).
2. Use the scroll bar on the right side of the *list box* to scroll through the list of authors (Key: PgUp or PgDn or arrows).

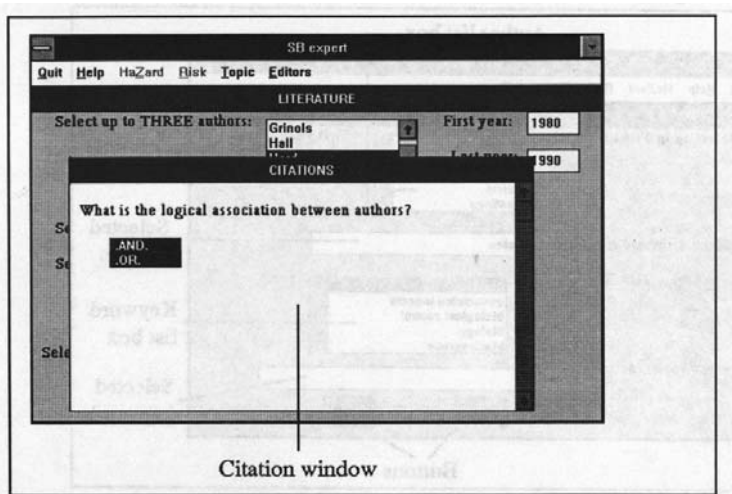


Figure 21—Selecting the logical relation in a literature search.

3. Double click on an author (Key: Spacebar) to add the name to the list of selected authors (reselecting an author that is already selected removes the author from the list of selected authors).
4. Repeat steps 2 and 3 to select up to three authors (Key: Enter to conclude selection).

As authors are selected, the names are added to the *edit line* labeled "Selected authors" to assist in keeping track of selections (fig. 20). Author names also can be typed directly into the selected authors *edit line*, with names separated by a blank space.

To limit a search to a specific range of years (fig. 20):

1. Select the first year or last year **edit line** to make it the active screen object (Key: Tab).
2. Type the year (for example, 1980).

When an **edit line** is the active screen object:

- Click with the mouse or use the Home, End, and left and right arrow keys to position the edit cursor within the line.
- Use the Del and BkSp keys for deleting text.

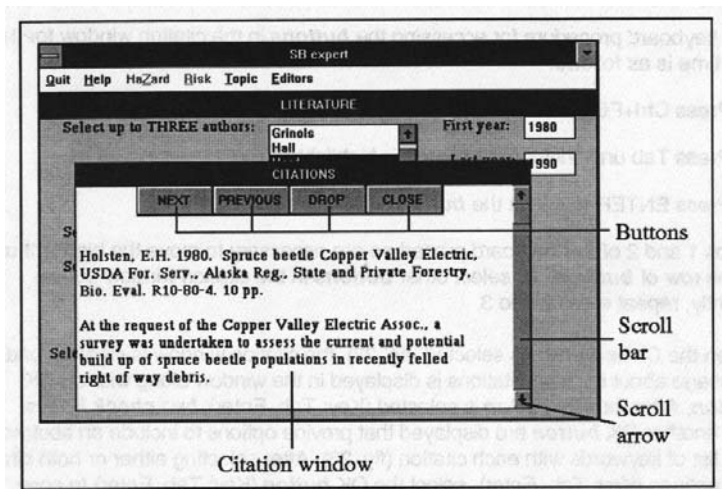


Figure 22—View citations obtained from a literature search.

- Click and drag to select a block of text for editing or deletion (press the Del key to delete selected text or begin typing to replace selected text).

After all search criteria have been specified, select the OK **button** to proceed (fig. 20) (Key: **Tab**, Enter). If multiple authors or keywords were selected, a window opens, asking for the logical relation between the selections (fig. 21) (AND or OR). AND means select a citation only if all author criteria are met. OR means select a citation if any author criteria are met. Select the appropriate logical relation by double clicking the selection (Key: **arrow**, spacebar, Enter), and then select the OK **button** (Key: Tab, Enter).

After a brief delay, the selected citations are displayed (fig. 22). Only one citation is displayed in the citation window at a time. Select **buttons** at the top of the citation window to:

- Move to the NEXT citation.
- Move to the PREVIOUS citation.
- Delete (DROP) the current citation (from the retrieved list but not from the permanent database).

Close the citation window.

The keyboard procedure for accessing the **buttons** in the citation window for the first time is as follows:

1. Press Ctrl+F6 **seven times**.
2. Press Tab until the correct **button** is highlighted.
3. Press ENTER to select the **button**.

Steps 1 and 2 of the keyboard procedure are necessary to move the highlight up to the row of **buttons**. To select other **buttons** in the citation window subsequently, repeat steps 2 and 3.

When the Close **button** is selected (fig. 22), the citation window is cleared, and a message about copying citations is displayed in the window along with an OK **button**. After the OK **button** is selected (Key: Tab, Enter), two **check boxes** and another OK **button** are displayed that provide options to include an abstract and list of keywords with each citation (fig. 23). After selecting either or both citation options (Key: Tab, Enter), select the OK **button** (Key: Tab, Enter) to copy the retrieved citations to the CLIPBOARD, which is a temporary MS Windows file. The CLIPBOARD contents can then be pasted into either **Textbook Editor** or **Report Editor**.

To terminate **Literature**, select the CLOSE **button** located near the bottom of the main **Literature** window (fig. 20).

Copying Literature Citations to an SBexpert Editor

Literature citations can be copied to either SBexpert editor any time after the citations window has been closed. Note, however, that it is not necessary to close Literature. Because the list of citations is stored in the MS Windows CUPBOARD, the list should be copied into the appropriate editor before further cutting or copying is performed and before a new chapter section in Textbook is displayed. Cut and copy procedures as well as the display procedure in Textbook also use the CLIPBOARD and always overwrite the current contents of the CLIPBOARD. To copy the list of citations into one of the editors (fig. 18):

1. Select the Editors **menu** (Key: ALT+E) from the SBexpert **menu bar**.
2. Select either *Text* (Key: T) or *Report* (Key: R) from the **menu**.

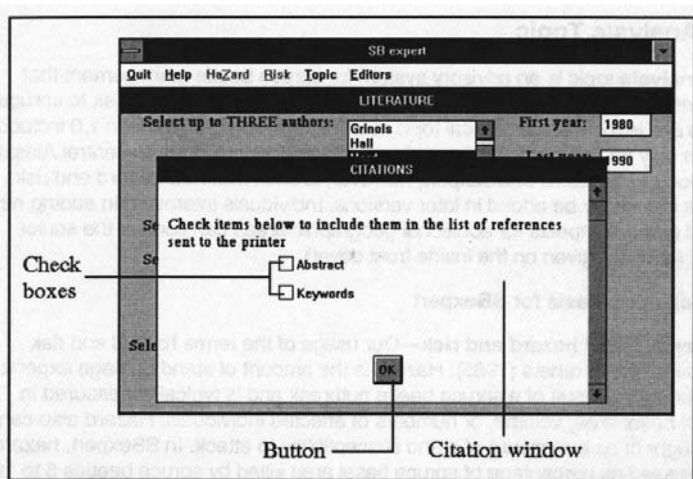


Figure 23—Selecting options for displaying citations after a literature retrieval.

If **Analysis** has not already been opened in the current SBexpert session, the Report option on the Editors menu will appear dim, thereby indicating that **Report Editor** is not available. Assuming, however, that **Analysis** had been opened previously in the current session, **Report Editor** will open after the *Report* option is selected. Similarly, if **Text Editor** has been opened already in the current SBexpert session, its editor window also will open immediately. If **Text Editor** has not been opened previously in the current SBexpert session, the *Text* option still will be available, but instead of **Text Editor** opening immediately, a **dialog window** is displayed that requests a file name for the edit file. For instructions on responding to the file name **dialog window** see the section "The Sbexpert Editors—Opening the SBexpert Editors for the First Time."

To copy the contents of the MS Windows CLIPBOARD into either SBexpert editor (fig. 19):

1. Position the cursor with the editing keys (appendix C) or by clicking the mouse so that the cursor is positioned in the editor window where the text is to be inserted.
2. Select the *Edit menu* from the **menu bar** of the editor (Key: ALT+E).
3. Select the Paste option from the Edit **menu** (Key: P).

The Analysis Topic

The **Analysis** topic is an advisory system for spruce beetle management that provides recommendations for reducing spruce beetle hazard and risk to spruce stands and is the main analytical topic in SBexpert. SBexpert version 1.0 includes models only for spruce beetle hazard and risk appropriate to south-central Alaska. The modular structure of SBexpert, however, is such that new hazard and risk models can easily be added in later versions. Individuals interested in adding new hazard and risk models for additional geographic areas can contact the senior author (address given on the inside front cover).

The Scientific Basis for SBexpert

The concepts of hazard and risk—Our usage of the terms hazard and risk follows Paine and others (1985). Hazard is the amount of stand damage expected to occur as the result of a spruce beetle outbreak and is typically measured in units of basal area, volume, or numbers of affected individuals. Hazard also can be thought of as a measure of stand susceptibility to attack. In SBexpert, hazard is expressed as percentage of spruce basal area killed by spruce beetles 5 to 10 years after the start of an outbreak in a stand and is predicted in terms of various site and stand factors (Reynolds and Holsten 1994a). Because stand conditions that affect hazard change relatively slowly, hazard predictions are useful for developing strategic plans for forestwide treatment schedules.

Risk is a measure of the likelihood, or probability, that an outbreak will occur and usually is expressed as a proportion (for example, a risk value of 1.0 indicates a certain event). Although hazard and risk measure very different aspects of a spruce beetle outbreak, the two measures are also closely related to each other in our conceptual model. In particular, risk is predicted in terms of hazard as well as the size of the available spruce beetle population. Spruce beetle populations, in turn, are affected by availability of breeding materials and weather conditions (Reynolds and Holsten 1994b), both of which may change markedly from year to year. Because the size of a spruce beetle population, and therefore also the associated risk, may change rapidly over a few years, reliable predictions of spruce beetle risk can be made for only 2 to 3 years. Therefore, risk predictions are most useful for short-term tactical planning at the early stages of an outbreak.

The hazard model—Stand hazard is classified with a classification model (dark and Pregibon 1991) developed for the Kenai Peninsula, Alaska (Reynolds and Holsten 1994a). Hazard, expressed as percentage of basal area loss due to spruce beetle-caused mortality at 5 to 10 years after start of an outbreak, is predicted from stand inventory data and physiographic site data. The final decision-tree structure (fig. 24, table 2) distinguishes seven possible hazard outcomes based on total stand basal area, percentage of total basal area composed of

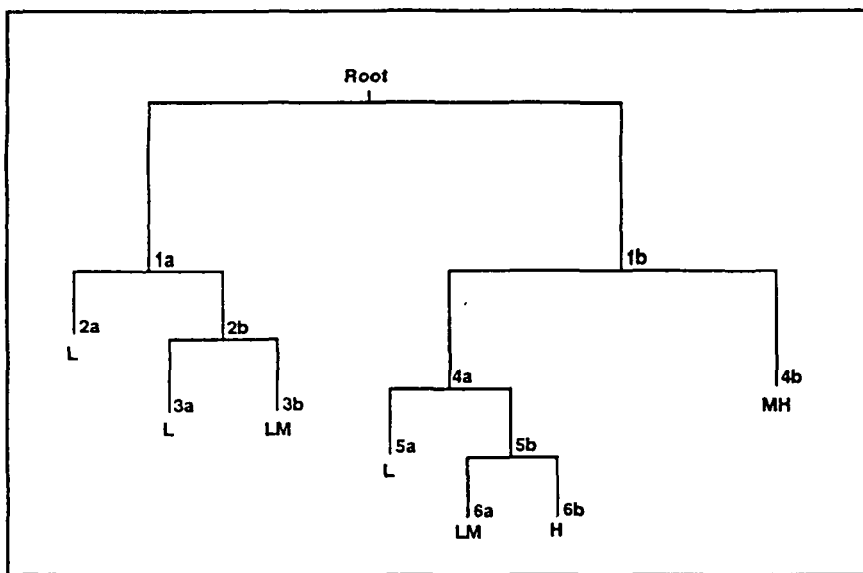


Figure 24—Classification tree for predicted spruce beetle hazard classes. Nodes are labeled 1a, 1 b, etc., and correspond to nodes listed in table 2. Each terminal node is labeled with its predicted hazard class (L=low, LM=low-medium, MH=medium-high, and H=high).

spruce, percentage of spruce basal area composed of trees with diameter >25 centimeters, stand elevation, and stand aspect. Three paths in the decision tree lead to low-hazard outcomes (spruce basal area loss <10 percent); one path leads to a high-hazard outcome (spruce basal area loss >40 percent). No paths through the decision tree lead to a medium-hazard outcome (spruce basal area loss >10 percent, but <40 percent), but three less precise outcomes of low-medium and medium-high hazard were considered useful and have been retained in the final model for south-central Alaska (fig. 24).

Results of model verification were considered very acceptable; in the worst case, predictions of high hazard were correct for 73 percent of the observations. Model validation results also were considered acceptable considering the small number of observations available for this phase of analysis. For a complete description of hazard model development for south-central Alaska, see Reynolds and Holsten (1993a).

Hazard classes reported by SBexpert are low (0-10 percent), low-medium (<40 percent), medium-high (>10 percent), and high (>40 percent). Inventory data required for hazard classification are total stand basal area ($\text{m}^2 \cdot \text{ha}^{-1}$), percentage of stand basal area in spruce, and percentage of spruce basal area in trees with a 25-centimeter diameter at breast height. Site data required are elevation (meters), and slope aspect (degrees).

Table 2—Decision tree for predicted spruce beetle hazard classes

Node ²	Decision criterion ³	N ⁴	Nominal hazard class ⁵	Class frequencies ¹		
				L	M	H
1a	BA ₃ < 67.5	33		61	30	9
2a	BA, ^ 45.0	11	L	91	9	0
2b	BA, > 45.0	22		45	41	14
3a	Elev\$ 210	9	L	78	22	0
3b	Elev > 210	13	LM	23	54	23
1b	BA, > 67.5	67		21	33	46
4a	BA, ^ 36.3	34		35	18	47
5a	BA, < 73.0	13	L	61	8	31
5b	BA, > 73.0	21		19	24	57
6a	East < -0.49	6	LM	33	50	17
6b	East > -0.49	15	H	13	13	73
4b	BA, > 36.3	33	MH	6	48	45

¹ Percentage of observations classified into a node whose true hazard class was low, medium, or high (L, M, or H, respectively).

² Node labels correspond to those in figure 2.

³ BA₂, BA_y, and BA₃ are total stand basal area, spruce basal area, and basal area of spruce with diameter S25 centimeters at breast height, respectively. Elev = elevation (meters), and East = cosine of slope aspect (radians).

⁴ Number of observations classified into a node.

⁵ Nominal hazard class is the hazard outcome assigned to a node by the classification algorithm, based on the true hazard class with the highest frequency at the node.

The risk model—Nine potential risk factors (table 3) were evaluated by spruce beetle experts from Western North America. Risk factors were organized into a hierarchical model of spruce beetle risk (fig. 25) and the relative importance of factors for determining risk was analyzed with the analytic hierarchy process that derives subjective estimates of factor priorities through a process of pair-wise comparisons (Saaty 1980).

Risk factors considered in the analysis were stand hazard, size and trend of spruce beetle population in neighboring stands, daily ambient air temperature maxima in the past June, total rainfall in the past summer, and availability of four types of breeding material (table 3). The beetle population trend factor ultimately was dropped from the analysis. Stand hazard and wind-thrown trees were identified as the two most important factors determining risk of a spruce beetle outbreak

Table 3—Definitions of spruce beetle risk components

Component in hierarchy ¹	Factor number ²	Definition of component
Hazard (1)	1	Expected spruce beetle damage to a stand 5-10 years after start of an outbreak.
Expected population (1):		Size of spruce beetle population in the next 2 years in stands within 0.5 kilometer of the target stand border.
Current population (2)	2	Spruce beetle-caused mortality in the previous year (stems per hectare) in stands within a 0.5-kilometer radius of the subject stand.
Population trend (2)	3	Relative change in tree mortality in stands within a 0.5-kilometer radius of the subject stand between 5 years ago and 1 year ago.
Weather (2):		Weather conditions local to the subject stand and stands within 0.5 kilometer of the subject stand
Temperature (3)	4	Cumulative degree-days in the past June.
Rainfall (3)	5	Total precipitation for June, July, and August in the past year.
Breeding material (2)		Breeding materials in either the subject stand or stands within 0.5 km of the subject stand that were available for spruce beetle brood production in past 2 years
Windthrow (3)	6	Maximum density of windthrown trees (stems per hectare).
Right-of-way (3)	7	Maximum density of trees felled for right-of-way clearing (stems per hectare).
Fire (3)	8	Area damaged by fire (hectare).
Logging (3)	9	Area that was logged (hectare).

¹ Numbers in parentheses indicate the level of a component in the hierarchical structure of risk model components (fig. 23).

² Factors are model components that occupy terminal nodes in the model structure (fig. 23).

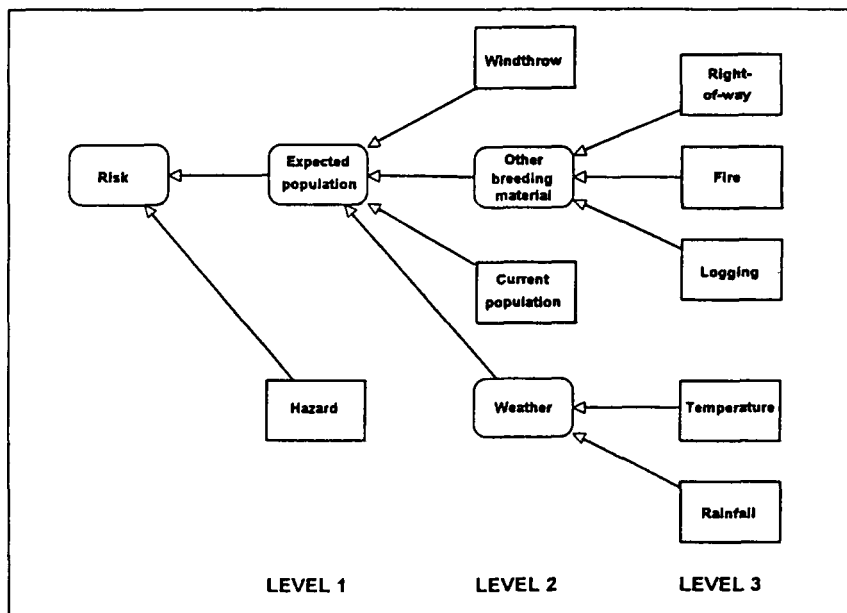


Figure 25—Structure of the spruce beetle risk model. Square boxes indicate factors that occupy terminal nodes in the model structure (table 2). Rounded boxes indicate intermediate factors that were included to create a hierarchical structure.

(table 4), Hazard and windthrow were considered about equally important and together accounted for almost two-thirds of the total allocation of priority among risk factors.

In SBexpert, a raw risk score, r , is initially computed as,

$$r = \sum_{i=1}^n f_i s_i ,$$

where

f_i = priority of the i^{th} risk factor
and s_i = score for intensity of the i^{th} factor.

Each risk factor is scored for intensity on a standard scale of 0 to 9, with $s_i = 0$ indicating absence of the i^{th} factor and $s_i = 9$ indicating that the risk factor is present and conditions associated with the factor are maximally conducive to outbreak. Because the f_i sum to 1.0, and all s_i are scaled on the interval [0, 9], r also takes on values on the interval [0, 9].

Table 4—Priorities of factors contributing to risk of a spruce beetle outbreak*

Risk factor ²	Priority ³
Hazard	0.32
Beetle population	.18
Temperature	.09
Rainfall	.02
Breeding materials ⁴ :	
Windthrow	.33
Right-of-way	.03
Fire	.03
Logging	.01
Consistency ratio ⁵	.01

* Priorities obtained as eigenvector solutions from analytic hierarchy analysis

² Arrangement of risk factors in analytic hierarchy model is illustrated in figure 23 in which risk factors are shown as rectangles.

³ Proportional contribution that a risk factor makes to the overall raw risk score.

⁴ See table 3 for definitions of materials.

⁵ A consistency ratio SO. 10 is considered acceptable. The value of 0.01 indicates a high level of internal consistency in judgments used to develop risk factor priorities.

The raw risk score is thus a simple linear function of risk factor intensities weighted by their respective priorities. To approximately reproduce some of the asymptotic behavior of risk functions commonly observed in nature, a final risk score, r' , is obtained as a Weibull transformation of r :

$$r' = 1 - e^{-(r/5)^8} .$$

For a more complete discussion on development of the spruce beetle risk model, see Reynolds and Holsten (1993b).

Drop-down Topic menu

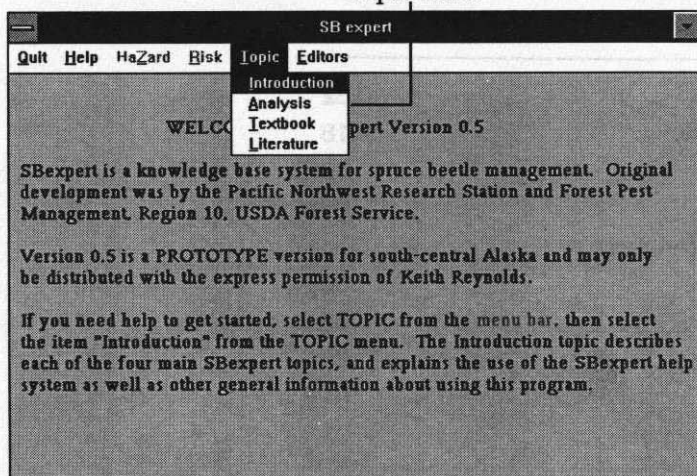


Figure 26—Opening the Topic *menu* on the main SBexpert *menu bar*.

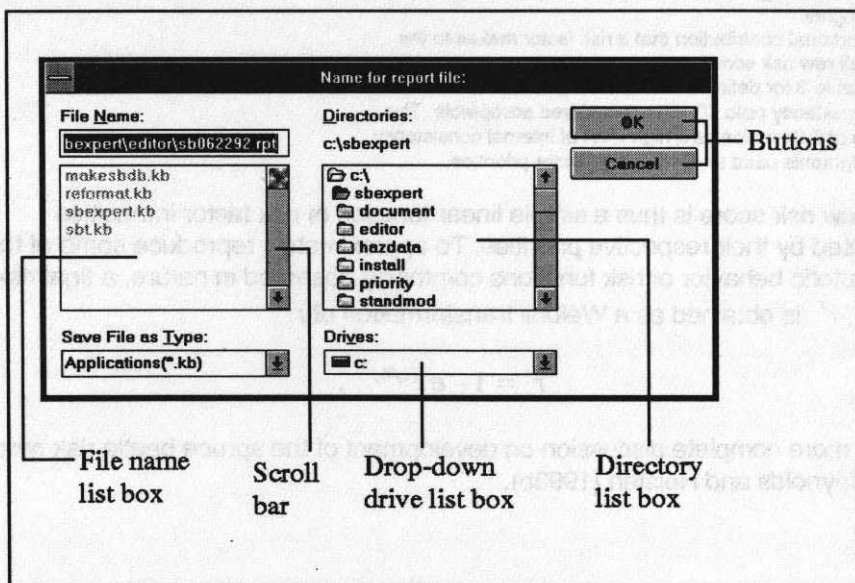


Figure 27—Specifying a file name for the SBexpert report.

Opening and Closing Analysis

To open **Analysis** (fig. 26):

1. Select the Topic **menu** from the SBexpert **menu bar** (Key: ALT+T).
2. Select *Analysis* from the list of choices (Key: ALT+A).

SBexpert automatically generates a report whenever the hazard analysis is initiated. When the hazard analysis starts, SBexpert displays a window asking for the name to be assigned to the hazard and risk report file (fig. 27). By default, the report is written to the \EDITOR subdirectory of the main \SBEXPERT programs directory. The default file name is sbmmdyy.rpt, in which mm, dd, and yy specify the month, day, and year, respectively. To accept the default directory and file name, select the OK **button** (Key: **Tab**, Enter) (fig. 27). In addition, the drive, directory, and file name can all be changed.

- To change the drive for the report file, select the down arrow on the *drop-down list* box labeled Drives to open the *list box* (Key: V), and double click to select one of the available drives (Key: arrow, spacebar, Enter).
- To change the directory, double click on the appropriate directory in the Directories **list box** (Key: D, **arrow**, spacebar, Enter). If the directory contains subdirectories, the contents of the **list** box will change to display them. Continue selecting subdirectories until arriving at the one you wish to use.
- To change the file name, select the File Name **edit line** (Key: N), and use the arrow, Del, and BkSp keys to edit the name. Drive and directory changes also can be typed directly in the File Name **edit line**.

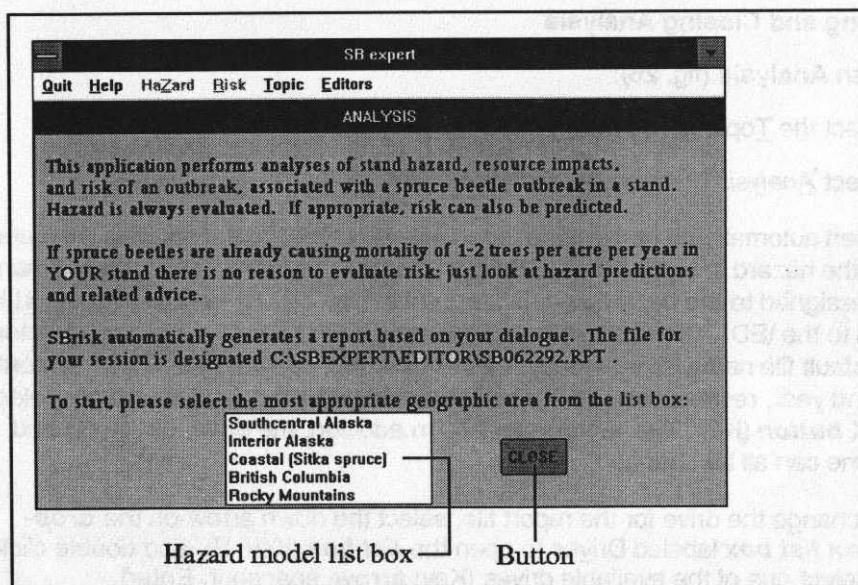


Figure 28—The main window of the Analysis topic.

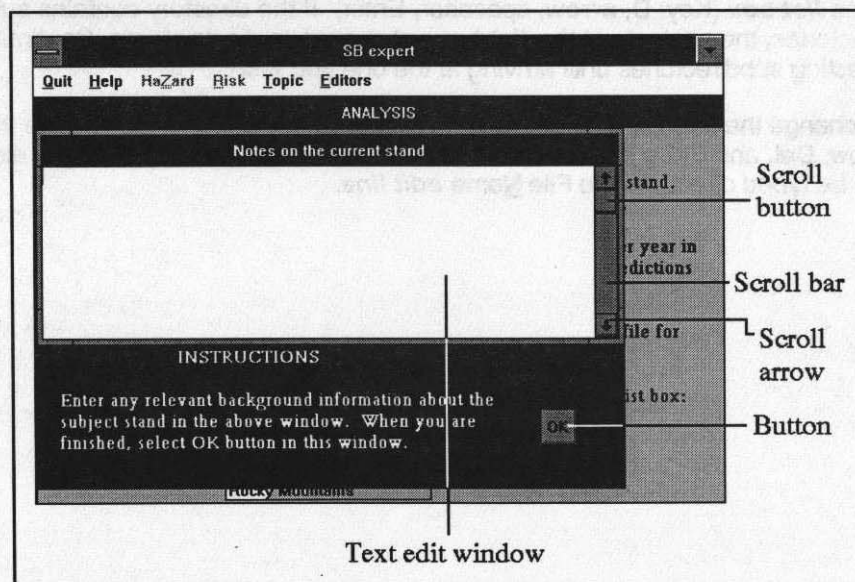


Figure 29—Edit window for annotating an SBexpert report.

After all changes have been made, select the OK **button** (Key: **Tab**, Enter) to complete the file name selection. The main window of **Analysis** opens as soon as the file name **dialog window** has closed (fig. 28). The window displays a **list box** of geographic areas for which analyses can be performed (as of version 1.0, however, only the south-central Alaska models are available) as well as a CLOSE **button**.

- Double click to make a selection in the **list box** (Key: **Tab** until highlight moves to the **list box**, then **arrow**, spacebar, Enter).
- Select the CLOSE **button** to exit from **Analysis**.

As soon as a geographic area has been selected, an **edit window** for recording notes on the current stand overlays the **Analysis** window (fig. 29). Use the **edit window** to make any annotations that may be relevant to the hazard and risk report. For example, at a minimum, the location of the forest stand should be noted so that the location is mentioned at the head of the report. Add as much commentary as you wish; however, any documentation of personal observations may assist you or others in interpreting the analysis output. All basic editing functions are available in the **edit window** (appendix C). A **scroll** bar also is located on the right side of the **edit window** in case you get carried away! After entering the stand information, select the OK **button** to close the edit window (Key: press Ctrl+F6 **three times**, then Tab, Enter) and proceed to the hazard analysis.

Recovering from Mistakes

The **Analysis** topic is composed of two main subtopics, **Hazard** and **Risk**, each of which, in turn, is composed of a lower level of subtopics that correspond to options on the *Hazard* and *Risk* **menus**. Each subtopic of **Hazard** and **Risk** has its own window that generally produces a series of displays in which responses of various sorts need to be entered. The current version of SBexpert does not provide the ability to backtrack through a sequence of displays produced within a single window. Consequently, if a mistake is made while entering hazard data, for example, and the error is not caught until after an OK **button** has been selected to proceed to the next display in the sequence, then the only option is to finish progressing through the sequence until a CLOSE **button** is displayed within the window or the window closes automatically after selecting the last OK **button**. However, each display in all display sequences includes an OK **button** to minimize the chances of making an unintentional selection: no selections made in a display take effect until the OK **button** in the display has been selected.

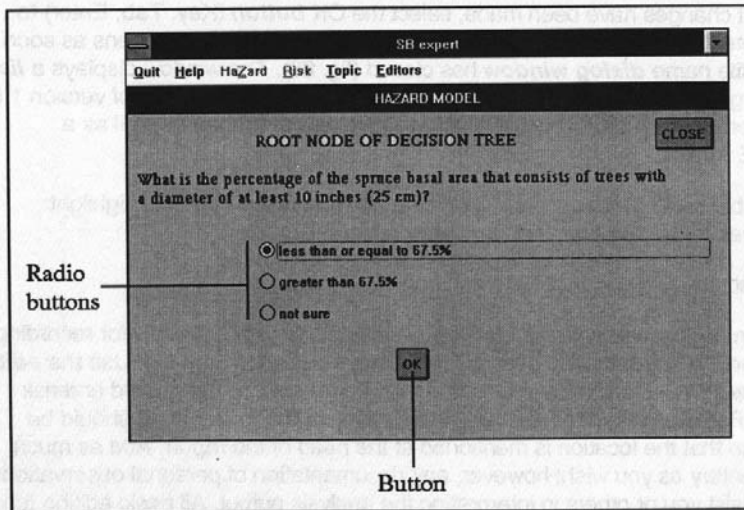


Figure 30—A decision node in the classification model for hazard.

The Hazard Topic

The decision tree—The initial phase of a hazard analysis begins by navigating through a decision tree (fig. 24). At each node are two mutually exclusive choices and a third "not sure" alternative (fig. 30).

1. Select one of the three **radio buttons** (Key: **arrow**, Enter).
2. Select the OK **button** (Key: Tab, Enter).

The number of nodes that the decision path traverses through the decision tree differs, depending on the particular path traversed and how often the "not sure" alternative is selected. When the final node has been processed, the display changes to a message with an OK **button** (fig. 31). Select the OK **button** to proceed to the display of hazard outcomes.

Hazard outcomes—After the OK **button** is selected, the window is cleared, and the results of the hazard analysis are displayed in abbreviated form in a list of **radio buttons** (fig. 32). Each **radio button** lists a hazard outcome labeled "leafXX", followed by the hazard rating for that leaf. Each leafXX defines a unique outcome (position) on the decision tree (see the section, "Logic diagram," below).

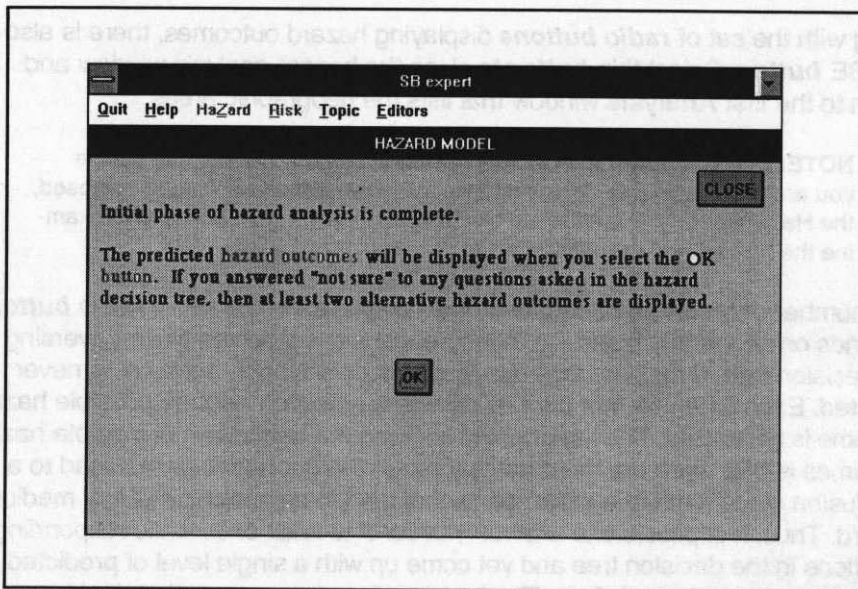


Figure 31—Message about predicted hazard outcomes.

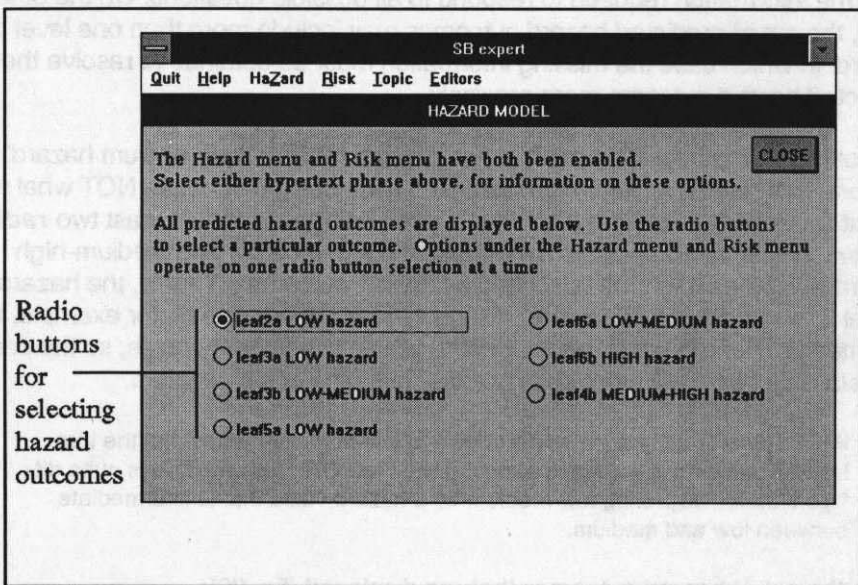


Figure 32—Display of hazard outcomes.

Along with the set of *radio buttons* displaying hazard outcomes, there is also a *CLOSE button*. Select this button to close the hazard analysis window and return to the first Analysis window that lists the geographic areas.

NOTE: DO NOT select the *CLOSE button* in this window (fig. 32) unless you are COMPLETELY finished. Once the hazard analysis window is closed, the HaZard and Risk menus are disabled and it will not be possible to examine the hazard and risk advice.

The number of predicted hazard outcomes displayed in the set of *radio buttons* depends on how many times the "not sure" choice is selected while traversing the decision tree. Only one hazard outcome is displayed if "not sure" is never selected. Each time that "not sure" is selected, however, another possible hazard outcome is generated. The logic behind allowing the generation of multiple-hazard outcomes is that there are three paths through the decision tree that lead to a conclusion of low hazard and two paths that lead to a conclusion of low-medium hazard. Thus, it is possible to answer "not sure" at least once while responding to questions in the decision tree and yet come up with a single level of predicted hazard in the set of predictions. The "not sure" choice assures that the hazard analysis can always run to completion: you are not necessarily stuck if you do not have the information required to respond to all possible questions. On the other hand, the set of predicted hazard outcomes may include more than one level of hazard, in which case the missing information must be obtained to resolve the predicted hazard outcome more precisely.

Two of the seven possible hazard outcomes are labeled "low-medium hazard" and one is labeled "medium-high hazard." These designations are NOT what is meant by multiple outcomes. "Multiple outcomes" means that at least two *radio button* choices are displayed. In contrast, the low-medium and medium-high hazard outcomes might be described as "fuzzy" outcomes. That is, the hazard model was not able to adequately distinguish between cases of, for example, low and medium hazard based on the best available predictor variables, so the case was classified as the fuzzier (less precise) outcome of low-medium.

IMPORTANT: a fuzzy hazard outcome of low-medium means that the true hazard outcome is expected to be EITHER low OR medium. This is quite different than interpreting low-medium as a hazard value that is intermediate between low and medium.

From the set of hazard outcomes that are displayed (fig. 32):

1. Select a leaf, representing a specific hazard outcome, from the *radio buttons* (Key: arrow, Enter).
2. Select either Hazard Advice or View from the HaZard *menu* (fig. 33).

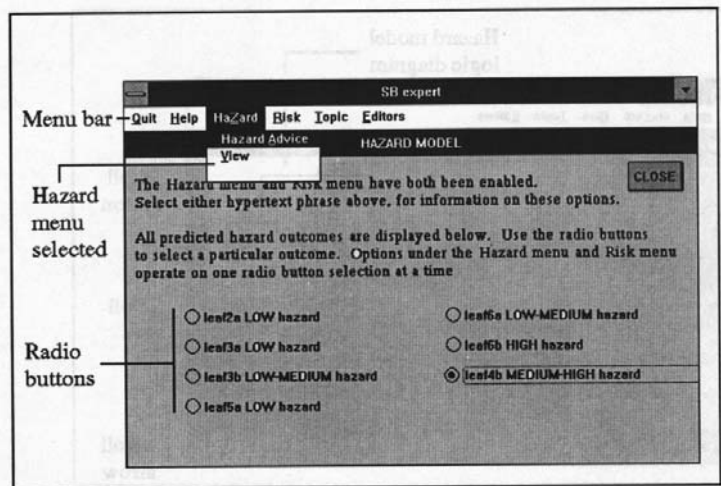


Figure 33—Opening the Hazard *menu* on the main SBexpert *menu bar*.

The Hazard Advice topic—Select the HaZard Advice option to get recommendations for stand management to reduce hazard of a spruce beetle outbreak for the specific hazard outcome selected from the *radio buttons*. The **Hazard Advice** window (fig. 34) presents details of the hazard analysis for a selected hazard outcome:

- It summarizes the stand attributes for the hazard outcome selected in fig. 33.
- Explains the rationale for the hazard outcome.
- Reports the approximate reliability of predictions.
- Suggests specific stand treatments to reduce hazard.

While viewing the hazard advice window:

- Use the scroll bar on the right side of the hazard advice window to scroll the full text.
- Select the logic diagram (Key: Tab) to view the logical path traversed in the analysis and that leads to the particular hazard outcome selected in fig. 33 (fig. 34).
- Select the **CLOSE button** (Key: Tab) near the top of the hazard advice window to return to the list of hazard outcomes in fig. 32.

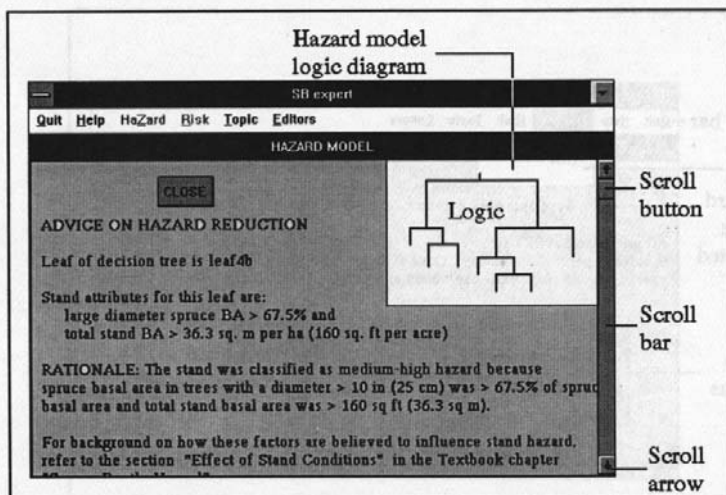


Figure 34—Viewing advice on reducing hazard.

The logic diagram (fig. 34) is a miniature of the decision tree for the hazard model. Selecting the logic diagram with keyboard procedures can be somewhat awkward:

1. Press the Tab key repeatedly until the last hypertext item in the hazard advice window is highlighted.
2. Press the PgUp key until the logic diagram comes back into view.
3. Press Tab once more to highlight the logic diagram, and press ENTER.

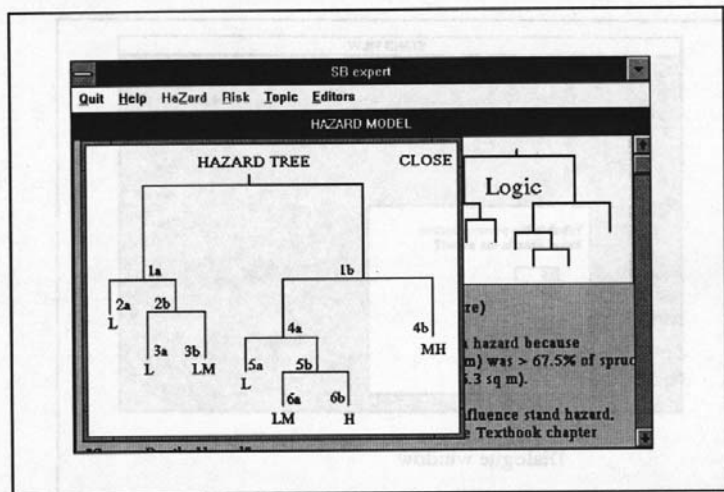


Figure 35—Logic diagram for structure of the hazard classification model.

Logic diagram—This window (fig. 35) illustrates the logical path used to arrive at a hazard outcome.

- Select the text labeled "HAZARD TREE" in the diagram for an explanation of how to use the diagram.
- Select the text labeled "CLOSE" in the diagram to close the logic window and return to the hazard advice window.
- Select any of the labeled decision nodes to get information about the node.

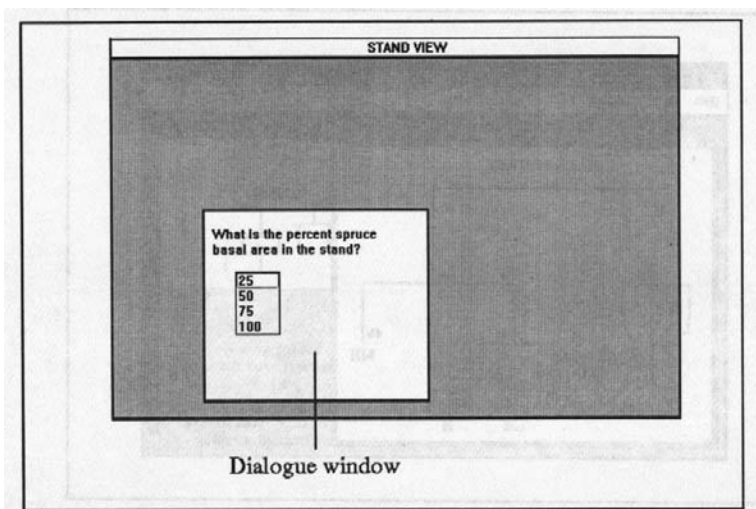


Figure 36—Providing additional stand information for the **View** topic.

Stand visualization in the View topic—SBexpert displays highly realistic, simulated images of forest stands damaged by spruce beetles. The stand images are provided to help users better understand what a particular level of mortality will look like. As with the hazard outcomes, to which the stand images correspond, depicted damage represents approximate mortality 5 to 10 years after the start of an outbreak. To initiate stand damage visualization:

1. Close the **Hazard Advice** window (fig. 34) if it is open, to redisplay the list of hazard outcomes.
2. Select the Hazard menu (fig. 33) (Key: ALT+Z).
3. Select the *View* option (Key: V).

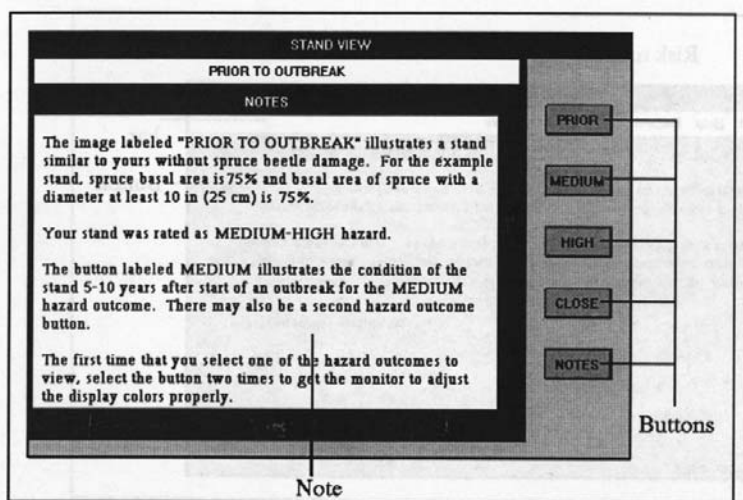


Figure 37—First window in **View**.

The **View** window completely covers the SBexpert application window, and a **dialog window** is displayed, requesting more specific information on the spruce composition of the stand, expressed as spruce basal area as a percentage of total stand basal area (fig. 36). Double click to select the appropriate spruce basal area percentage (Key: arrow, spacebar, Enter). Once a selection is made, the **dialog window** clears and displays a new question on the percentage of spruce basal area in trees with a diameter >10 inches (25.4 centimeters). After again selecting the appropriate answer, a new window, labeled "NOTES", displays information about how to use and interpret the stand images (fig. 37). In the view window:

- Select the **NOTES button** to return to the NOTES window.
- Select the **PRIOR button** to view a stand, structurally similar to the one you have described, before a spruce beetle outbreak.
- Select either the **LOW, MEDIUM, or HIGH button** (there will either be one or two of these displayed) to view the associated hazard condition.
- Select the **CLOSE button** to return to the list of predicted hazard outcomes (fig. 32).

If either a low-medium or medium-high hazard outcome was selected for viewing from the list of hazard outcomes, then there will be two hazard condition **buttons**. Otherwise, there will be only a single **button** for hazard condition.

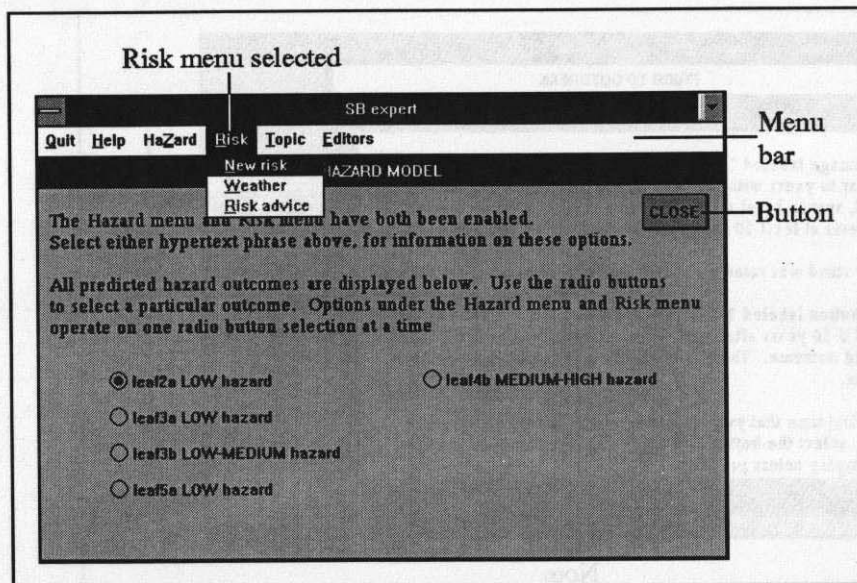


Figure 38—Opening the **Risk menu** on the main SBexpert **menu bar**.

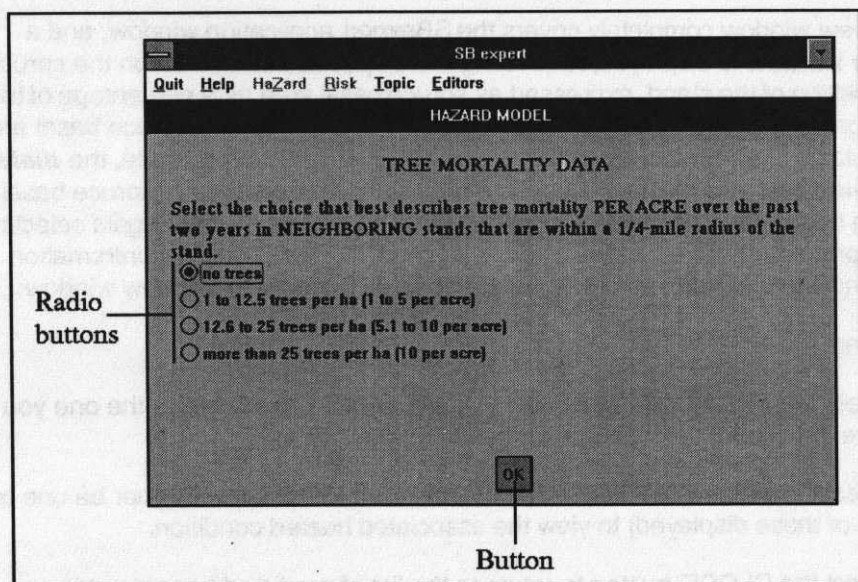


Figure 39—Entering data on tree mortality in the **New risk topic**.

The Risk Topic

The Risk **menu** remains dimmed, thereby indicating it is not selectable, until the hazard analysis has been completed. Once the hazard analysis has been completed, a risk analysis can be requested to estimate the likelihood of an outbreak for each hazard outcome. **Risk** has three subtopics:

- **New Risk:** An initial risk analysis, based on assumed weather conditions that occur commonly in the geographic region.
- **Weather:** An optional revised risk analysis, based on corrections to the default weather conditions that are supplied by the user.
- **Risk advice:** In which risk factors can be eliminated singly or in sets of two or more to evaluate their influence on risk.

The optional risk analysis for weather effects and the risk advice topics cannot be executed until the initial risk analysis has been completed.

The New Risk topic—To open the **New Risk** window and perform an initial risk analysis (fig. 38).

1. Select the Risk **menu** (Key: ALT+R).
2. Select the *New risk* option (Key: ALT+N).

Other options on the Risk **menu** are dimmed (not selectable) until the *New Risk* option has been selected and its associated topics completed.

Once *New risk* is selected, the window for the risk analysis topic opens and displays a set of **radio buttons** from which to select the range of spruce mortality observed in NEIGHBORING stands (fig. 39).

IMPORTANT: Risk was defined earlier as the probability of an outbreak occurring in the subject stand (as opposed to a neighboring stand). If there is already at least one spruce beetle-attacked tree per acre (2.5 trees per hectare) within the subject stand, no need exists to perform a risk analysis: you should consider that an outbreak has already started.

There is also an OK **button** located near the bottom of the window. To proceed (fig. 39);

1. Select the appropriate *radio button* (Key: arrow) for the amount of beetle-caused spruce mortality.
2. Select the OK **button** (Key: Tab, Enter).

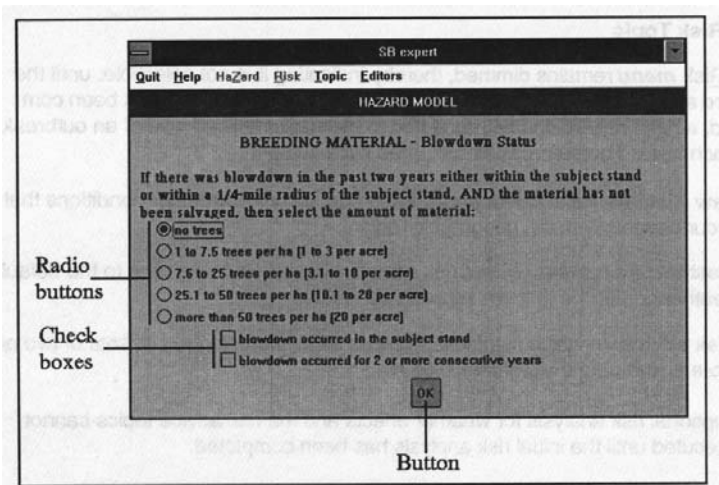


Figure 40—Example of entering data on breeding materials in **New risk**.

After the OK **button** is selected, the display changes to request additional information on the presence and amount of breeding materials such as recently blown-down or fire-damaged trees. The display format for blown-down material (fig. 40) is typical of all four displays on breeding material. In each display (fig. 40);

1. Select the appropriate **radio button** (Key: **arrow**).
2. Select any of the **check boxes** if they describe conditions in the subject, or neighboring, stands (Key: Tab, Enter).
3. Select the OK **button** (Key: Tab, Enter).

IMPORTANT: pay attention to the wording of text in the displays requesting input on breeding materials. As already noted, the risk model makes a distinction between conditions in subject and neighboring stands with respect to the presence of spruce beetle-caused tree mortality. Distinctions between effects in neighboring and subject stands occur throughout the four displays for breeding materials. For example, in the case of blown-down material (fig. 40), you are asked to indicate the amount of blow-down in **EITHER** the subject **OR** neighboring stands by selecting the appropriate **radio button**. There is also a **check box for** indicating that blow-down occurred in the subject stand. Blow-down also may have occurred in neighboring stands, but availability of more local blow-down is considered an overriding influence in the SBexpert risk model, so selecting the **check box** for occurrence of blow-down in the subject stand increases the factor score assigned to blown-down material.

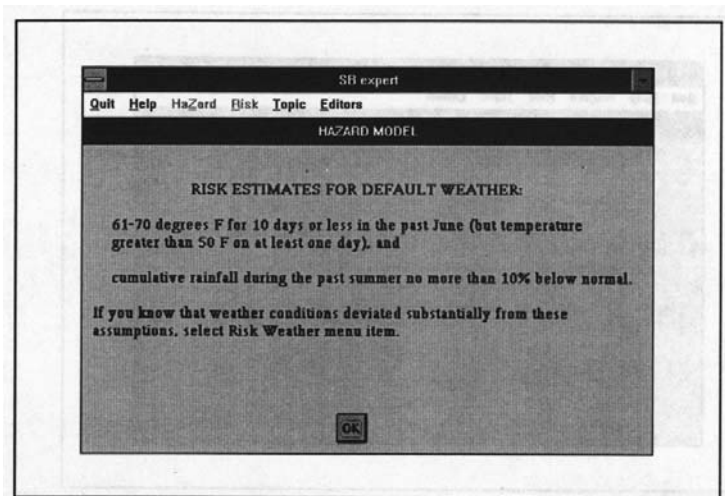


Figure 41—A message about risk predictions with default weather conditions

After selecting the OK **button** in the fourth display of breeding materials (logging material), the risk analysis topic displays a message about default weather conditions that are assumed for the initial phase of the risk analysis (fig. 41). Read the descriptions of temperature conditions for the past June and of cumulative rainfall for the past summer carefully. If temperature and rainfall are known to deviate substantially from those described (fig. 41), then the initial risk analysis should be followed by entering new weather data (see the section "The Weather topic" below). Select the OK **button**, (Key: Enter [the OK **button** is already selected, so Tab is not needed]) near the bottom of the display, to proceed to the last display in the initial risk analysis.

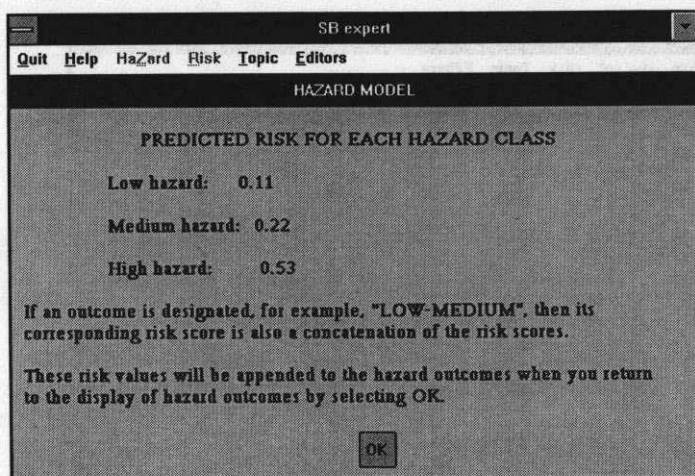
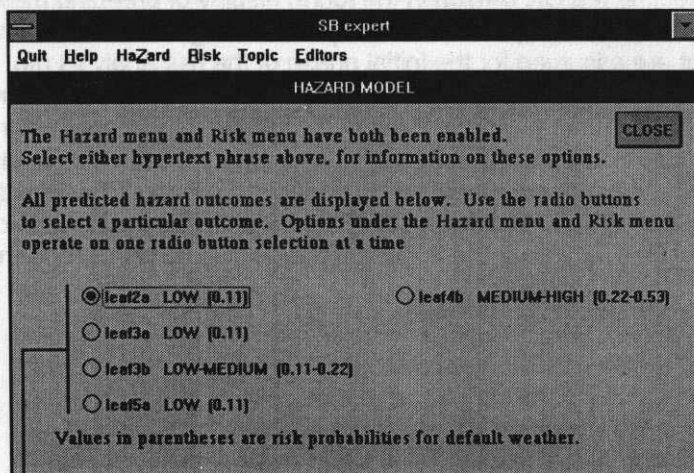


Figure 42—Risk predictions associated with each hazard class.



Risk scores appended to hazard outcomes

Figure 43—Modified list of hazard outcomes with risk estimates appended.

The final display in an initial risk analysis shows the predicted risk of a spruce beetle outbreak in the subject stand that is associated with each hazard class (fig. 42). Select the OK **button** (Key: Enter) to return to the display of hazard outcomes (fig. 43). The original display of hazard outcomes (fig. 32) is updated by appending the predicted risk values to the hazard outcomes listed in the set of **radio buttons**, (fig. 43) and a message is displayed at the bottom of the window, thereby indicating that risk predictions are currently based on default weather conditions.

IMPORTANT: fuzzy hazard predictions (for example, low-medium hazard) have correspondingly fuzzy risk predictions (for example, 0.11-0.22). Fuzzy risk predictions should be interpreted as EITHER 0.11 OR 0.22, for example, depending on whether the true hazard outcome will be low or medium hazard, respectively.

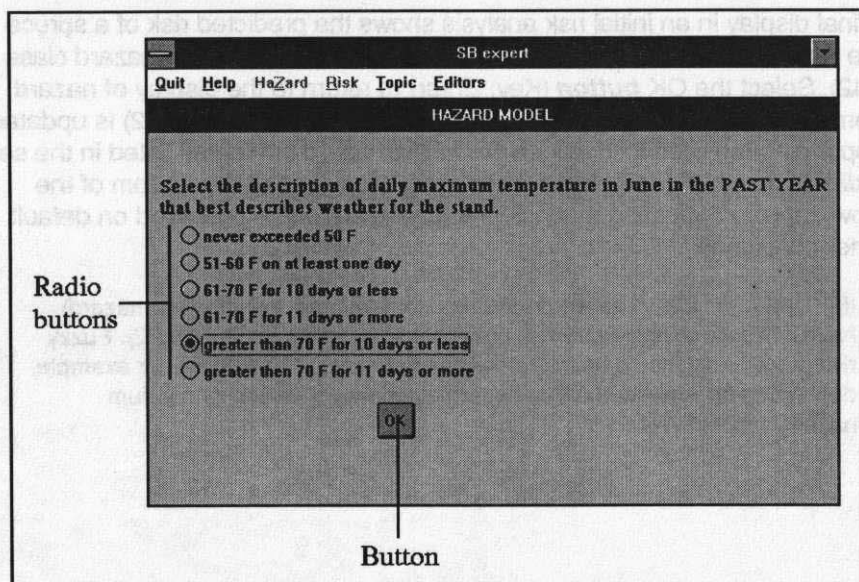


Figure 44—Overriding default air temperature assumptions in the risk model.

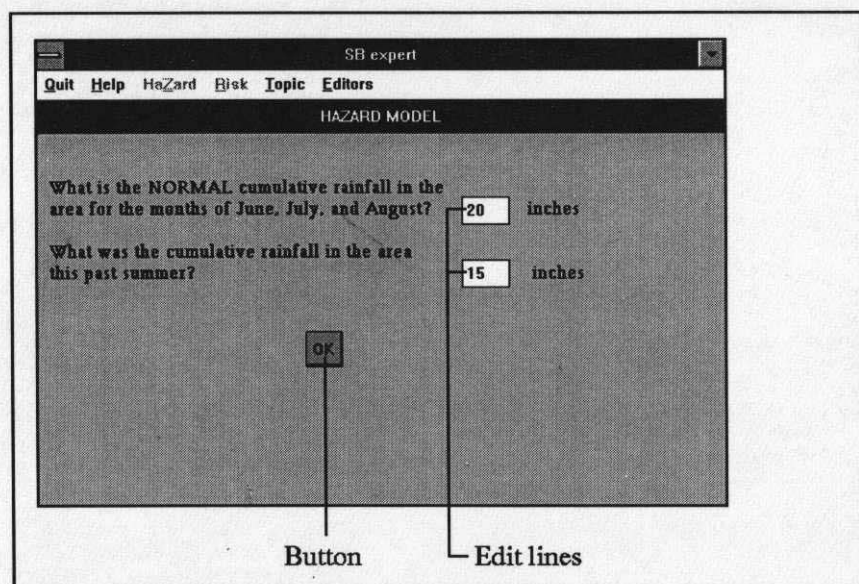


Figure 45—Overriding default rainfall assumptions in the risk model.

The Weather topic—The initial risk analysis is based on default weather conditions that are considered to commonly occur in the geographic region. If weather conditions are known to have deviated substantially from the default conditions, then new weather data should be entered. To modify the default weather conditions (fig. 38);

1. Select the Risk **menu** (Key: ALT+R).
2. Select the *Weather* option (Key: W).

The window for the **Weather** topic opens to display choices for daily maximum air temperature conditions in the past June in a set of **radio buttons** (fig. 44).

1. Select the appropriate **radio button** for June temperature conditions (Key: **arrow**).
2. Select the OK **button** to proceed (Key: Tab, Enter).

After selecting the OK **button**, the Weather window changes to a display requesting input of total cumulative rainfall in a normal (average) year and in the past summer (fig. 45). Enter the rainfall data in the two *edit lines* provided. An edit cursor is already positioned in the first *edit* line for normal rainfall amount.

1. Type an answer to complete the first field.
2. Select the second field (Key: Tab).
3. Complete the second field.
4. Select the OK **button** (Key: Tab, Enter) to proceed.

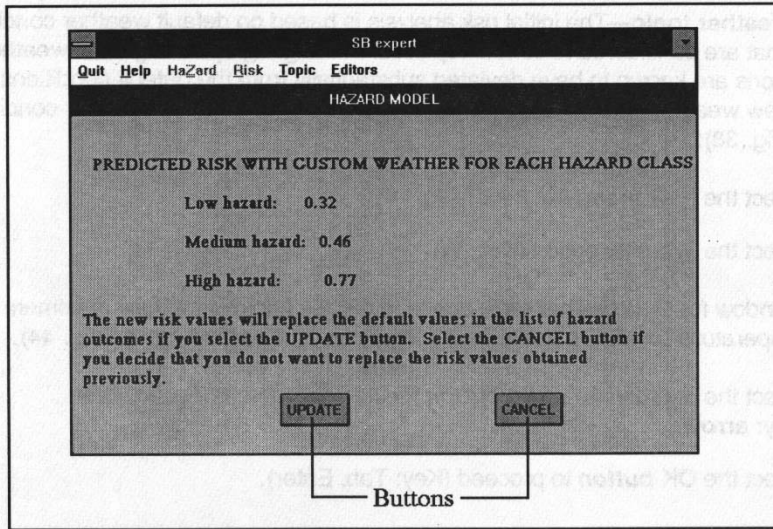


Figure 46—Modified risk predictions associated with each hazard class after overriding default weather conditions.

While the edit cursor is positioned in either **edit line**, use the Del, BkSp, and arrow keys to edit the value entered if you make a mistake. After selecting the OK **button**, the **Weather** window displays a new set of risk predictions for each hazard class (fig. 46).

- Select the UPDATE **button** (Key: Enter) to modify the previous set of risk predictions, or
- Select the CANCEL **button** (Key: Tab, Enter) if you do not wish to replace the previous risk predictions.

After selecting either the UPDATE or CANCEL button, the window of hazard outcomes is redisplayed (fig. 43). If risk predictions were updated, the message displayed at the bottom of the window changes to indicate that default weather conditions are no longer in effect.

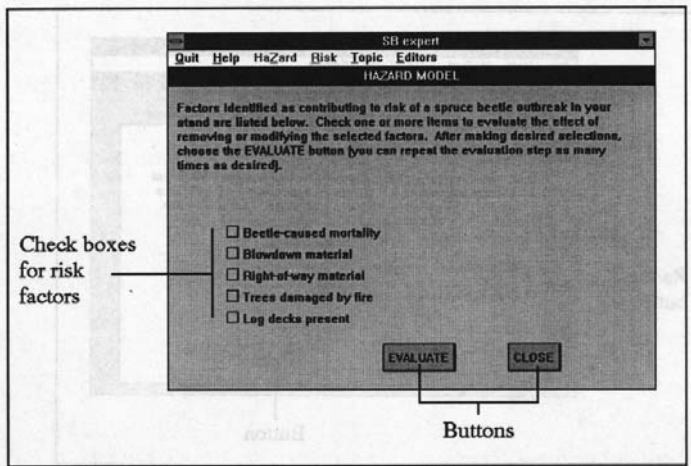


Figure 47—Evaluating the influence of altering risk factors.

The Risk Advice topic—To open Risk Advice (fig. 38):

1. Select the Risk **menu** (Key: ALT+R).
2. Select the *Risk Advice* option (Key: R).

The **Risk Advice** window displays a set of **check boxes**, each labeled with one of the risk factors that have contributed to the current estimate of risk as determined previously in the **New Risk** topic (fig. 47).

1. Select the **check box** (Key: Tab, Enter) corresponding to each risk factor to be modified.
2. A new window opens. If the risk factor was not designated as local to the subject stand, a brief message is displayed, thereby indicating that the effect of the factor will be removed. If the factor DID occur in the subject stand, treatment options are displayed in a set of **radio buttons** (fig. 48). Select the appropriate **radio button** (Key: arrow, Enter).
3. Select the OK **button** (Key: Tab, Enter).

Repeat steps 1-3 for all risk factors that you wish to modify. After all desired changes have been made,

4. Select the EVALUATE **button** (fig. 47).

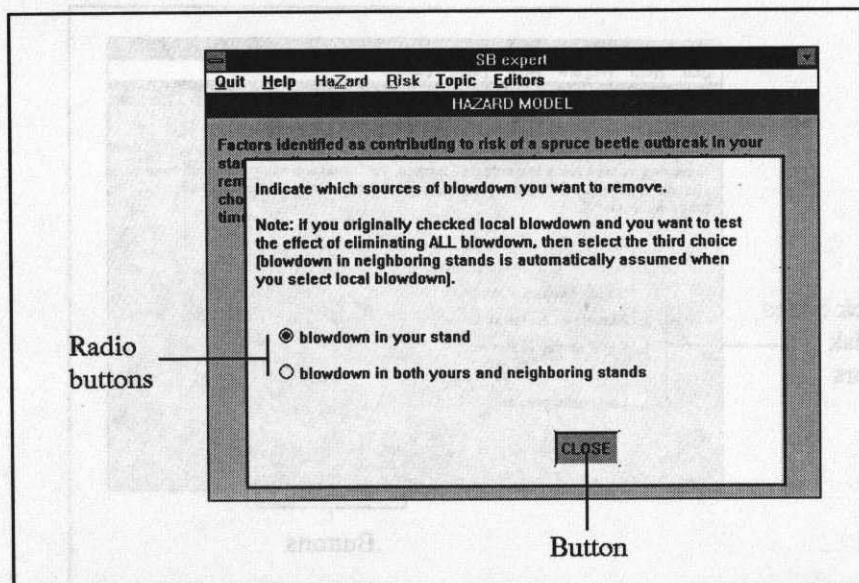


Figure 48—Example of modifying a risk factor.

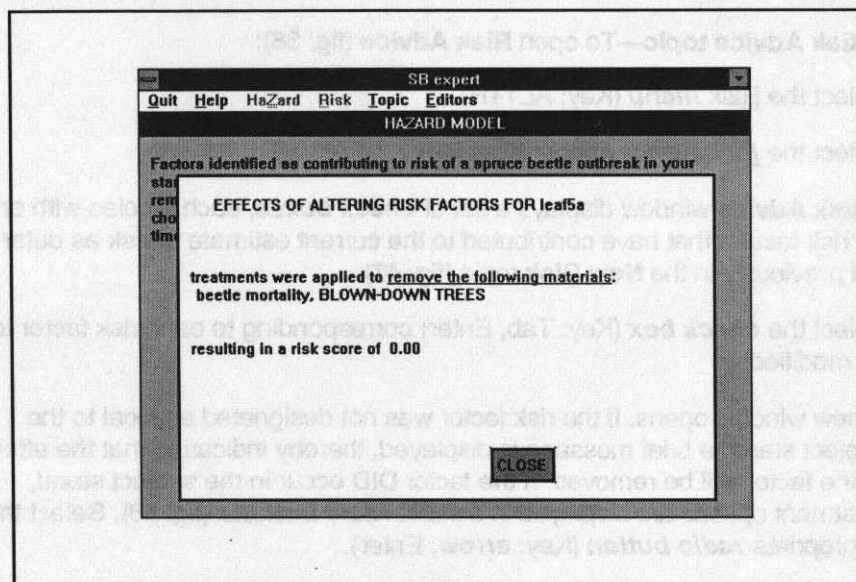


Figure 49—Example of a risk evaluation with modified risk factors.

A brief report of effects of the proposed changes in risk factors is then displayed (fig. 49). Risk factors displayed in lower-case letters were eliminated only from the subject stand. Risk factors displayed in upper-case letters were eliminated from both the subject and neighboring stands. The effect on the risk outcome of modifying a risk factor depends on whether the factor was specified as local to the subject stand or occurred only in neighboring stands. In general, a risk factor present in the subject stand has a greater effect on increasing risk than a factor that occurs only in neighboring stands. Most importantly, the model assumes that if a risk factor occurs in the subject stand, it **ALSO** occurs in neighboring stands. There is no option to reduce a risk factor in neighboring stands when a local effect is present, because (in the risk model) a local effect takes precedence. That is, eliminating a risk factor from neighboring stands would have no influence on reducing risk if the factor also is present within the subject stand.

Select the **CLOSE button** (fig. 49) to return to the list of risk factors. You can select different combinations of risk factors to alter by repeating steps 1-4, above, as many times as desired. In the window displaying the list of risk factors (fig. 47), select the **CLOSE button** to close the **Risk Advice** window and return to the listing of the hazard outcomes.

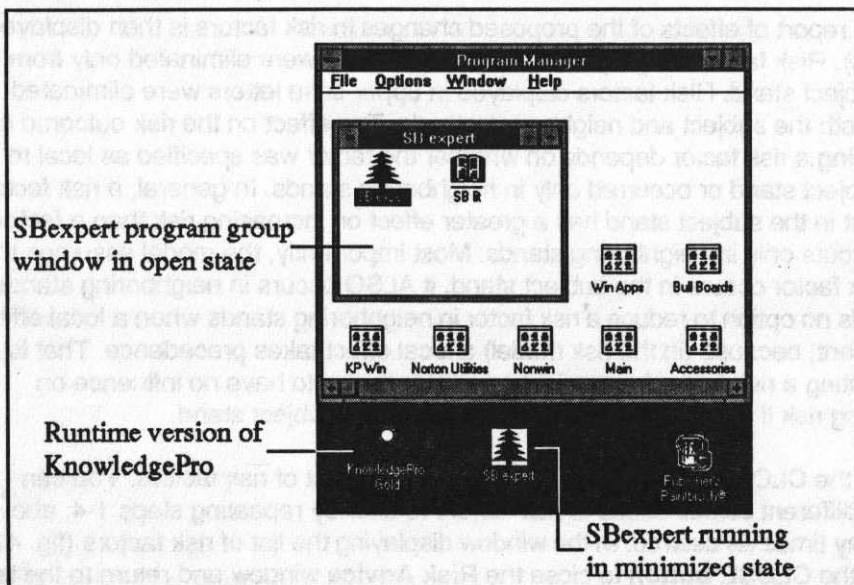


Figure 50—Example of a minimized program icon.

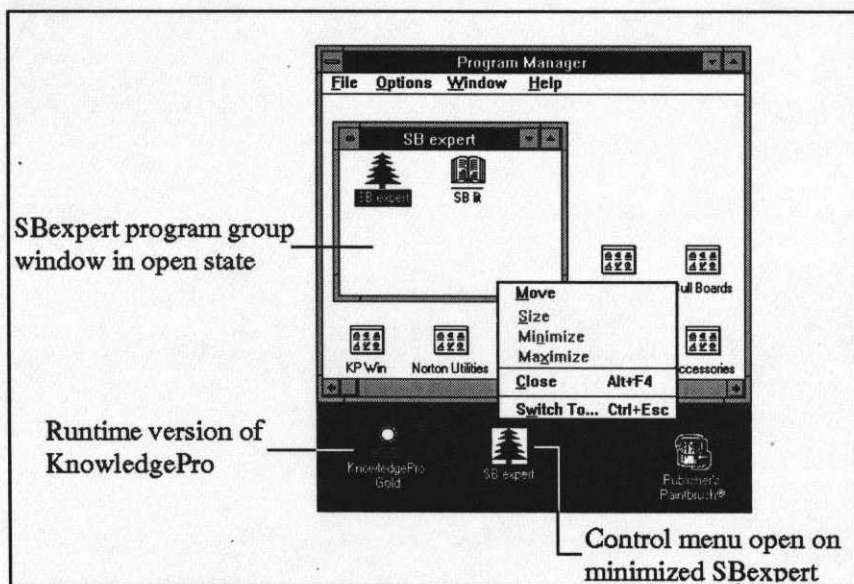


Figure 51—Opening the *control menu* on a minimized program icon.

Switching Among Running Applications

When two or more MS Windows applications are running concurrently, it is possible to switch between them fairly easily. The easiest way to switch from one application to another depends on whether the application to which you want to switch has been minimized. If a running application has been minimized, its **program icon** is displayed near the bottom of the MS Windows desktop (fig. 50).

To switch to another MS Windows application that is already running and that has not been minimized:

1. Open the SBexpert **control menu** (ALT+SPACEBAR).
2. Select the option labeled *Switch to* (Key: W).
3. Select the application you want from the list that appears in the Task List **dialog window** {Key: **arrows**}.
4. Select the **button** labeled "Switch To" (Key: **Tab**, Enter).

There are two shortcut methods that are also the best methods for keyboard users:

- Press Ctrl+ESC to open the Task List **dialog window**, then proceed with steps 3 and 4, above.
- Or press ALT+Tab repeatedly to cycle among running applications.

To switch to another MS Windows application that is already running, but that is displayed in a minimized state (fig. 51):

1. Select the **program icon** of the application to open its **control menu**.
2. Select the *Restore* option.

As a shortcut to the latter two-step method, double click on the **program icon** of the application (Key: **Alt+Tab**).

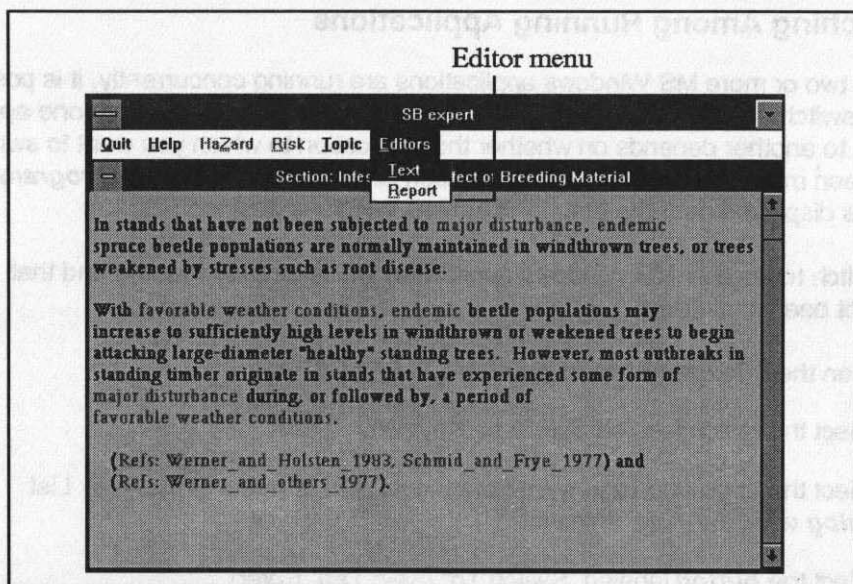


Figure 52—Opening the Editors menu on the main SBexpert menu bar.

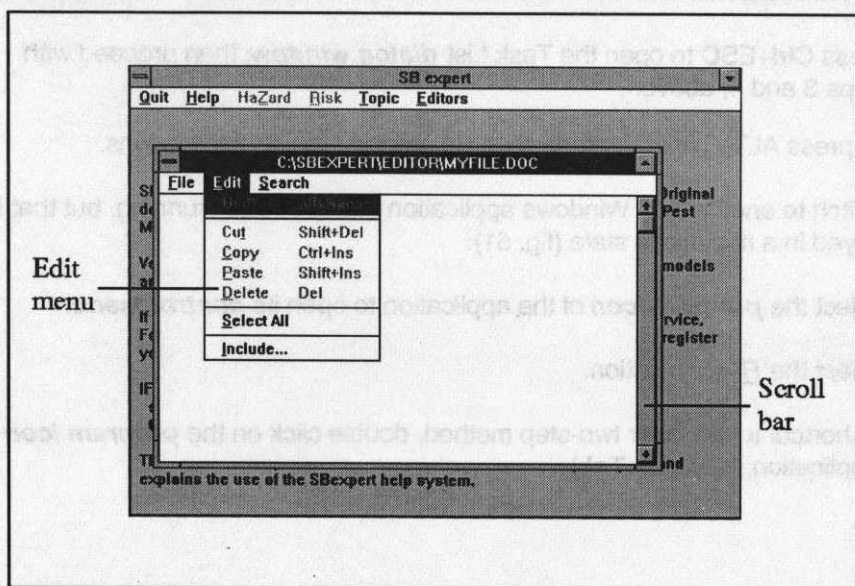


Figure 53—Opening the Edit menu in one of the SBexpert editors.

The SBexpert Editors

SBexpert has two text editors referred to as the **Text Editor** and the **Report Editor**. The **Text Editor** is intended for use with **Textbook** and **Literature** to assemble text on selected topics and literature references into documents. The Report Editor is specifically used to edit the report generated by **Analysis**.

All text displayed in chapter section windows is automatically copied to a temporary MS Windows file called the CLIPBOARD when the chapter section is displayed in **Textbook**. To copy the contents of a **Textbook** chapter section into the Text Editor, first display the desired chapter section in **Textbook**. Next, open the **Text Editor** (fig. 52);

1. Select the Editors **menu** (Key: ALT+E) from the SBexpert **menu bar**.
2. Select the *Text* option (Key: T) from the **menu**.

The **Text Editor** window opens immediately after the *Text* option is selected, if the editor has already been opened at least once in the current SBexpert session (if the editor has not been opened previously, see the section, "Opening SBexpert Editors for the First Time"). To copy the contents of the CLIPBOARD into **Text Editor** (fig. 53):

1. Position the cursor in the editor window with the editing keys or mouse (appendix C).
2. Select the Edit **menu** (Key: ALT+E) from the **menu bar of Text Editor**.
3. Select the Paste option (Key: P) from the Edit **menu**.

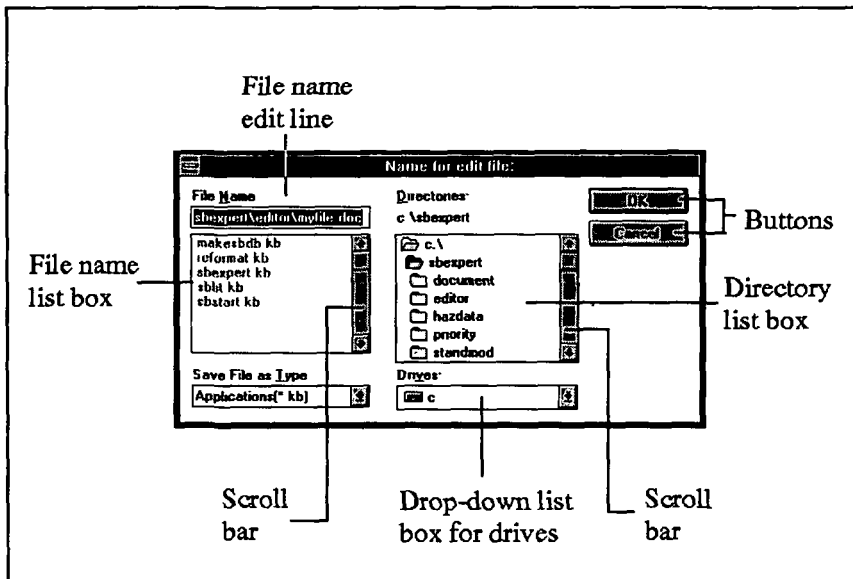


Figure 54—Specifying a file name for the SBexpert edit file.

Opening SBExpert Editors for the First Time

If **Text Editor** has not been opened previously in the current SBExpert session, a **dialog window** opens (fig. 54) and displays the default directory and file name, \sbexpert\editor\myfile.doc, in an **edit line**. Supply a different file name for the edit file to avoid overwriting a preexisting file and to avoid someone later overwriting the new file. When the file name **dialog window** first opens, the full directory path and file name are already highlighted in the File Name **edit line**. To change the file name:

1. Deselect the highlighted text on the **edit line** by clicking the mouse anywhere within the edit line (Key: arrow).
2. Drag the mouse over the name, myfile.doc, to select just this portion of the file specification (Key: arrow, Shift+arrow).
3. Type a new file name.

As soon as you start to type a new file name, the selected text is deleted. After step 1, above, instead of dragging the mouse over the file name and typing a new name, the Home, End, Del, BkSp, and left and right arrow keys can be used to edit the file name in the **edit line** (appendix C).

The edit file **MUST BE** located on the same disk drive as the \sbexpert programs directory, but it does not have to be located in the default directory, \sbexpen\editor. To change both the file name and directory:

1. Press the Del key as soon as the *dialog window* opens (the directory and file name are already highlighted in the file name *edit line*).
2. Type a new file name.
3. Choose a new directory from the Directories **list box** by double clicking on one of the directory items (Key: **Tab**, **arrow**, spacebar, Enter).

After the file name, and optionally the directory name, has been edited, select the OK **button** (Key: Tab, Enter) to close the *dialog window*. The Text Editor window opens as soon as the *dialog window* closes.

Basic Editing in the SBexpert Editors

Basic cut-and-paste editing can be performed in the SBexpert **Text** Editor. For greater editing capabilities, load the edit file created in SBexpert into a commercial word processing application.

To delete, copy, or move text in the editor with either a mouse or keyboard commands, the text first must be selected. To select a block of text:

1. Scroll the start of the text block into view, if necessary, with the scroll bar (Key: arrows, PgUp, PgDn keys).
2. Click the mouse to move the edit cursor to the start of the text block (Key: **arrows**).
3. Drag the mouse over the text block to select it (Key: Shift+arrow).

Once the text block has been selected:

- Press the Del key to delete the text.
- Select *Copy* from the Edit **menu** on the **menu bar** to copy the text.
- Select *Cut* from the Edit **menu** to move the text.

To complete a copy or move operation:

1. Position the edit cursor at the location where text is to be inserted (Key: **arrows**).
2. Select Paste from the Edit **menu** (Key: Alt+E, P).

Use the **control menu** of the **Text Editor** window to close **Text Editor** (Key: Alt+hyphen, C).

Moving Text From Textbook to Analysis

It is not necessary to close **Textbook** to move to other topics (see the section, "Opening and Moving Among SBexpert Topics"). When **Textbook** is left open, text from **Textbook** can be copied to the report generated by **Analysis** to add background information on the biology, ecology, and management of spruce beetles to the report. All text displayed in chapter section windows is also automatically copied to the CLIPBOARD, which is a temporary file maintained by MS Windows. To copy a chapter section from **Textbook** to the **Report Editor**:

1. Display the appropriate chapter section (see the section "The Textbook Topic—Selecting a Chapter Section to View" earlier),
2. Select Report from the Editors **menu** (Key: Alt+E, R) on the SBexpert **menu bar** to open the **Report Editor** (fig. 52).
3. Position the edit cursor in the **Report** Editor at the location where the text is to be inserted (see the section, "The SBexpert Text Editors-Basic Editing").
4. Select Paste from the Edit **menu** (Key: Alt+E, P) on the **Report Editor menu bar** (fig. 53).

Acknowledgments

We thank Terry Shore, Natural Resources Canada, Pacific Forest Research Centre, Victoria, British Columbia; Darrell Ross, Department of Forest Science, Oregon State University, Corvallis, Oregon; Dale Bartos, USDA Forest Service, Intermountain Forest and Range Experiment Station, Logan, Utah; and Borys Tkacz, USDA Forest Service, Forest Pest Management Region 3, Flagstaff, Arizona for their careful review of the manuscript and thorough testing of the SBexpert software.

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Appendix A: Hardware and Software Requirements

SBexpert applications run on IBM® personal computers and compatibles with either PC-DOS or MS-DOS operating systems. Microsoft Windows and an 80286 microprocessor are required, but an 80386 microprocessor operating at 25 MHz is preferred. A minimum of 2 MB of RAM is needed due to the overhead requirements of Microsoft Windows, but 4 MB of RAM is preferable to avoid heavy Windows system use of swap files which can significantly impair system performance.

A super-VGA monitor also is required for correct display of graphic images. Although it is possible to run all SBexpert applications in standard VGA mode, graphic images displayed by the applications will be seriously degraded.

The full version of SBexpert requires about 25 MB of memory, 23 MB of which is needed for storage of graphic images (the smaller version distributed on floppy disks only requires about 5 MB). If an external hard disk or other mass storage device with an addressable drive designation is available, most of the graphic images can be located off the primary hard drive of the system (see "Installation and Setup" for details).

A mouse pointer device is not required to use the SBexpert applications, but application control is greatly facilitated by use of a mouse.

Appendix B: Keyboard Commands

Inside SBexpert:

Open control menu:

child windows

ALT+hyphen

other windows

ALT+spacebar

Cancel control menu

ALT

Close window:

child windows

Ctrl+F4

other windows

ALT+F4

Move among topic windows

F6

Move within help windows:

to text display area

Ctrl+F6 (twice)

to button bar

Ctrl+F6

Scroll in text window

arrows, PgUp, PgDn

Move to object (a set of radio buttons is a single object):

move forward

Tab

move backward

SHIFT+Tab

Activate a selected button

Enter

Move within object

arrows

Check box choices:

select item

spacebar

deselect item

spacebar

List box choices:

select item

spacebar

deselect item

spacebar

accept selection(s)

Enter

Menu bar:

move to menu bar

ALT

move across menu bar

arrows

leave menu bar

ESC

Menus:

direct access

ALT+ underlined letter in menu name

select menu item

underlined letter in menu item name

Move Between Windows Applications:

Cycle among open programs

ALT+Tab

Open Task List

Ctrl+ESC

Control Inside Program Manager:

Cycle between groups

Ctrl+F6

Open group control menu

ALT+hyphen (-)

Move among icons in group

arrows

Run application

ENTER

Appendix C: Basic Editing

Cursor Movement:

Home	move to first character in a line
Ctrl+Home	move to start of text
End	move to last character in a line
Ctrl+End	move to end of text
PgUp	move up one window
PgDn	move down one window
up arrow	move up one line
down arrow	move down one line
left arrow	move one character left
Ctrl+left	move one word left
right arrow	move one character right
Ctrl+right	move one word right
Del	delete character to right
Ctrl+Del	delete to end of line
BkSp	delete character to left

Selecting Text:

Shift+Home	select to first character in line
Shift+Ctrl+Home	select to start of text
Shift+End	select to last character in line
Shift+Ctrl+End	select to end of text
Shift+PgUp	select up one window
Shift+PgDn	select down one window
Shift+up arrow	select up one line
Shift+down arrow	select down one line
Shift+left arrow	select one character left
Shift+Ctrl+left	select one word left
Shift+right arrow	select one character right
Shift+Ctrl+right	select one word right

Reynolds, Keith M.; Holsten, Edward H.; Werner, Richard A. 1994. SBexpert users guide (version 1.0)- a knowledge-based decision-support system for spruce beetle management. Gen. Tech. Rep. PNW-GTR-345 Portland, OR' U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 72 p.

SBexpert version 1.0 is a knowledge-based decision-support system for spruce beetle (*Oendroctonus nriipennis* (Kby.)) management developed for use in Microsoft Windows with the KnowledgePro Windows development language. The SBexpert users guide provides detailed instructions on the use of all SBexpert features. SBexpert has four main topics (subprograms): **Introduction, Analysis, Textbook, and Literature.** **Introduction** is the first of five subtopics in the SBexpert help system. **Analysis** is an advisory system for spruce beetle management that provides recommendations for reducing spruce beetle hazard and risk to spruce stands and is the main analytical topic in SBexpert. **Textbook** and **Literature** provide complementary decision support for Analysis. **Textbook** provides background information on the biology, ecology, and management of spruce beetles. **Literature** provides database utilities for retrieving literature citations. A separate utility program, SBit.CKB, allows users to update the literature database. Basic features of the SBexpert system include an intuitive graphical user interface, efficient presentation and retrieval of information through hypertext and hypergraphics, easy access to an extensive help system for Microsoft Windows system-level help, topic- and window-specific help, a text editor that facilitates preparing standard reports from **Textbook**, and automatic report generation in **Analysis**.

Keywords: Spruce beetle, risk, hazard, decision support, knowledge base, expert system, management.

The **Forest Service** of the U.S. Department of Agriculture is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives—as directed by Congress—to provide increasingly greater service to a growing Nation.

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