USDA United States Department of Agriculture

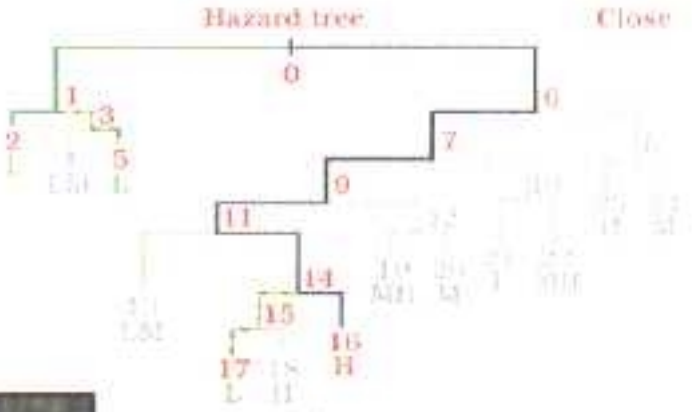
Forest Service

Pacific Northwest Research Station

General Technical Report PNW-GTR-401 August 1997

SBexpert Users Guide (Version 2.0): A Knowledge-Based Decision-Support System for Spruce Beetle Management

Keith M. Reynolds and Edward H. Holsten



To order software, contact Edward H. Holsten, Forest Service Alaska Region, Forest Health Management at 3301 C Street, Suite 524, Anchorage, AK 99508.

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Abstract

Reynolds, Keith M.; Holsten, Edward H. 1997. SBexpert users guide (version 2.0): a knowledge-based decision-support system for spruce beetle management. Gen. Tech. Rep. PNW-GTR-401. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 62 p.

SBexpert version 2.0 is a knowledge-based decision-support system for spruce beetle *(Dendroctonus rufipennis* (Kby.)) management developed for use in Microsoft (MS) Windows with the KnowledgePro Windows development language. Version 2.0 is a significant enhancement of version 1.0. The SBexpert users guide provides detailed instructions on the use of all SBexpert features. The SBexpert application now consists of four separate programs: **SBexpert** (formerly, the Analysis topic in version 1.0), **SBtext, SBlit,** and **SBhelp. SBexpert** 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 application of the full system. **SBtext** and **SBlit** provide complementary decision support. **SBtext** provides background information on the biology, ecology, and management of spruce beetles. **SBlit** provides database utilities for retrieving literature citations. 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 MS Windows system-ievei help, window-specific help, a text editor that facilitates preparing standard reports from **SBtext.** and automatic report generation in **SBexpert.**

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

Authors

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Contents

Introduction

SBexpert version 2.0 is a knowledge-based decision-support system for management of spruce beetle (*Dendroctonus rufipennis* (Kby.)), developed cooperatively by the Pacific Northwest Research Station and Forest Health Management, Alaska Region of the USDA Forest Service. Version 2.0 was developed for Lutz *(Picea xlutzii),* white *(Picea glauca* (Moench) Voss), and Sitka spruce *(Picea sitchensis* (Bong.) Carr.) in 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™ (MS Windows) application written in the KnowledgePro® Windows development language.[1] The SBexpert application includes four programs: **SBexpert, SBtext, SBlit,** and **SBhelp** (throughout the user guide, SBexpert program names as well as topics (subprograms) within programs are identified in **Arial bold).** The sets of programs constitute the SBexpert application. When we refer to the application as a whole, we use "SBexpert."

- **SBhelp** is the SBexpert help system.
- **SBexpert** is an advisory system for spruce beetle management that provides recommendations for reducing spruce beetle hazard and risk to spruce stands. **SBexpert** is the main analytical component of the system. The section, "The **SBexpert** Program," consists of two main subsections that describe the **Hazard** and **Risk** topics.
- **SBtext** and **SBlit** provide complementary decision support for **SBexpert. SBtext** provides background information on the biology, ecology, and management of spruce beetles. **SBlit** provides database utilities for retrieving **SBlit** citations. A separate utility program, **SBlitnew** (not distributed with the system), is used by the authors to update the **SBlit** database.

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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 MS Windows system-level help, topic-specific help, and window-specific help.
4. A text editor that facilitates preparing standard reports from **SBtext**.
5. Automatic report generation in **SBexpert.**

New Features in Version 2.0

- The original SBexpert application has been broken into four separate programs and compiled in C++. It now runs much faster as a result.
- The hazard and risk analyses now cover Sitka spruce in addition to Lutz and white spruce.
- The help system has been completely overhauled to look and feel like standard Windows help systems.
- All text-based resources are now stored in archives, which makes the information more secure and speeds retrieval.
- The installation process has been automated and greatly simplified.
- Choice of text editor is now configurable (MS Windows **Write** is the default).
- Figures from **SB text** can be copied to the **Text Editor** if the editor supports graphic display.

SBexpert Basics

If you are already familiar with MS 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 MS 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 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, position the mouse pointer on the object, and click on the object. The term "select" in all instructions in this guide always means "select the object with a single click."
- Double click: Position the mouse pointer on the choice and double click. This method is frequently used in standard Windows applications to select a choice from a ***list box.*** In SBexpert, however, almost all ***list box*** items are now selected with a single click. In the few exceptional cases, we provide a note prompting you to use a double click.
- 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.

Keyboard Control

Control of SBexpert is easiest with a mouse, which 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-pressing 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. Often, more than one alternative keyboard procedure is possible 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 on the screen in green 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 (generally, this is handled by **SBhelp). In SB text,** for example, ***hypertext*** is used to provide definitions of terms, expanded explanations of concepts, **SBlit** references, and graphic figures illustrating a particular topic. ***Hypertext*** appears throughout the SBexpert windows. 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

MS Windows must already be installed on your system before SBexpert is installed, because the install program is an MS Windows application. If MS Windows is not already installed, you MUST install it before proceeding further with these instructions.

The installation program creates two subdirectories in addition to the \SBEXP2 directory. The \SBEXP2 directory contains the executable code for SBexpert and associated text files. The \SBEXP2\STANDS directories contain high-resolution bitmap images used in the hazard analysis component of SBexpert. The \SBEXP2\EDITOR directory is empty when SBexpert is first set up. Reports generated by the application are automatically written to this directory by default.

The standard version of SBexpert comes on 5 1.44-MB floppy disks. This version includes a limited set of stand images for illustrating stand hazard. Optionally, a complete set of stand images can be downloaded from the World Wide Web homepage of the Protection of Forest Health and Productivity Research, Development and Application (RD&A) Program (USDA Forest Service, Pacific Northwest Research Station). The universal resource locator (URL) to get to the homepage is "http://www.fsl.orst.edu/home/usfs/fhealth/fhealth.htm" .

Installation

Installation of SBexpert version 2.0 is now mostly automatic. You MUST install from MS Windows, by using the File Run command. In Program Manager:

1. Select File on the menu bar.
2. Select Run from the File menu.
3. On the command line, enter A:!NSTALL
4. Select the ***OK button.***

CAUTION: If you are upgrading to version 2.0 from version 1.0, be sure to read the later section, **"Upgrading From SBexpert Version 1.0."**

By default, the source for installation is drive A:. If you are installing from drive B:, type "B:INSTALL B:" at step 3 (Be sure to type the second B: in the command).

The default drive and directory for installation is C:\SBEXP2. The install program displays this information in an edit line. Edit this line to specify either a different drive or directory. From this point, installation is almost totally automatic. Just follow directions on the screen. After the install program finishes creating directories and copying files, it continues with the necessary MS Windows setup.

Setup Procedures for Microsoft Windows

Microsoft Windows setup of SBexpert version 2.0 is now automatic. The install program automatically:

1. Creates an SBexpert group in Windows Program Manager.
2. Adds program item icons to the group window.
3. Assigns icons to program items.
4. Creates a custom SBEXP2.INI file that the SBexpert system uses to locate system directories and files.

When step 4 is completed, the install program informs you that installation is complete and gives you the opportunity to view the README file.

Upgrading From SBexpert Version 1.0

If you have SBexpert version 1.0 and are upgrading to version 2.0, three options are possible:

1. Install version 2.0 into a different directory. The default directory for version 2.0 is "\SBEXP2," so the install program will not automatically overwrite an earlier version. Although this is a simple alternative, it will use a great deal of hard disk space.
2. Delete version 1.0 from your system completely and perform the full version 2.0 installation. This is safe and uses minimum disk space, but it takes extra time.
3. Perform a partial install of version 2.0. Disks 3 to 5 of the installation set for version 2.0 contain the identical set of stand image files contained in the \SBEXP2\STANDS subdirectory.

Upgrade option 2—CAUTION: If you delete version 1.0, be sure that you copy any report files out of the \SBEXP2\EDITOR subdirectory before deleting the subdirectory.

Upgrade option 3—Option 3 for upgrading is the most efficient, and fairly easy to do. We strongly recommend, however, that you not install version 2.0 over an existing earlier version. Overwriting a previous version may be all right, but we have not tested such a scenario. Moreover, there are many new files in version 2.0, and many old files in version 1.0 are no longer used.

To use this option:

1. Delete all files in the SBexpert version 1.0 directory.
2. Also delete the \SBEXP2\TEXTF!GS subdirectory and all its contents (they are no longer needed).

Do steps 1 and 2 before beginning the version 2.0 installation. When the install process starts, the installation program will detect the preexisting version 1.0 directories, and automatically bypass copying the stand images contained on disks 3 to 5.

NOTE: The install program can detect the previous version only if you install to the same directory name, if you installed version 1.0 to a directory other than \SBEXPERT, specify the same name when installing version 2.0

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 the 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). The SBexpert application was installed in its own group window labeled "SBexpert 2.0."

To start SBexpert from the Program Manager:

1. If the SBexpert 2.0 group window is not already open, double click on the SBexpert 2.0 ***program group icon*** to open the group window (Key: **Ctrl+F6,** Enter) (fig. 2).
2. Double click on one of ***program item icons*** to start **SBexpert, SBtext,** or **SBlit** (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 programs 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 figure 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.***

By default, the SBexpert application is installed in a directory named \SBEXP2 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 desired EXE file 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).

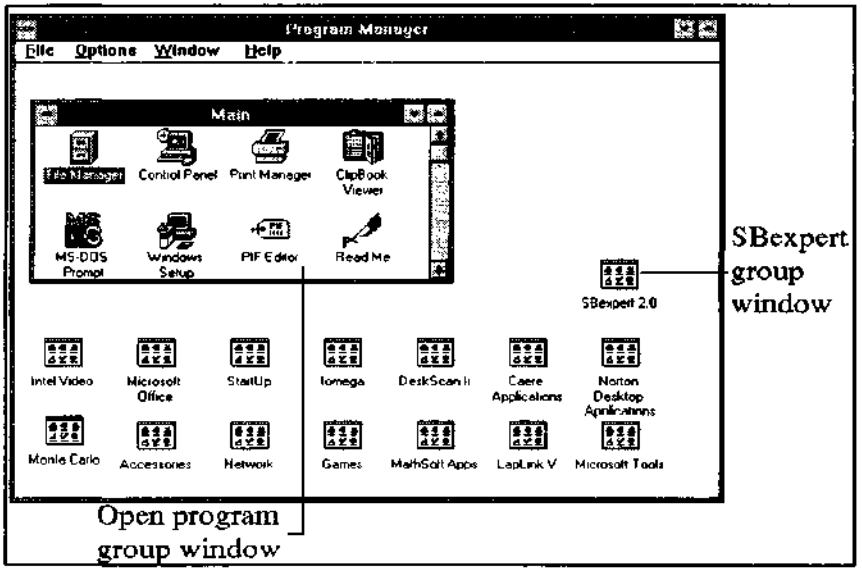

Figure 1—Microsoft Windows Program Manager with SBexpert ***program group window*** closed.

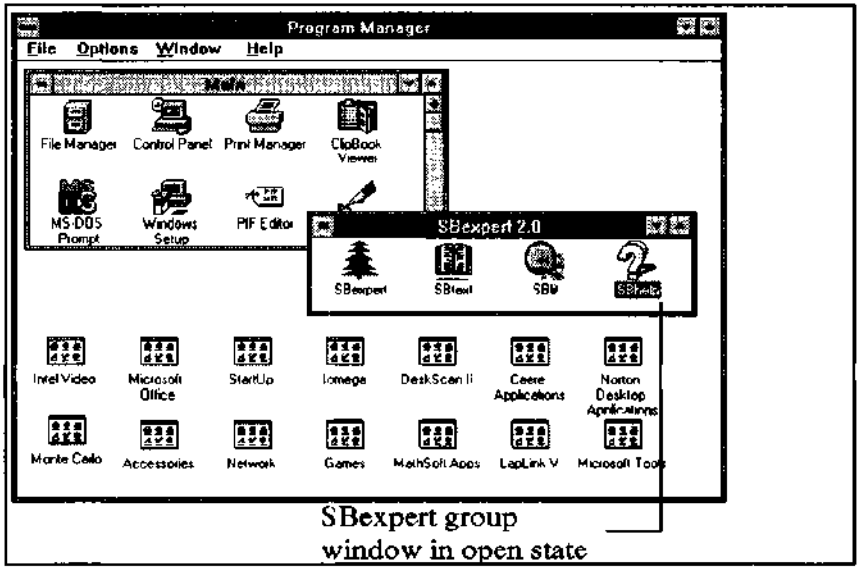

Figure 2—The ***program group window*** for SBexpert in an open state.

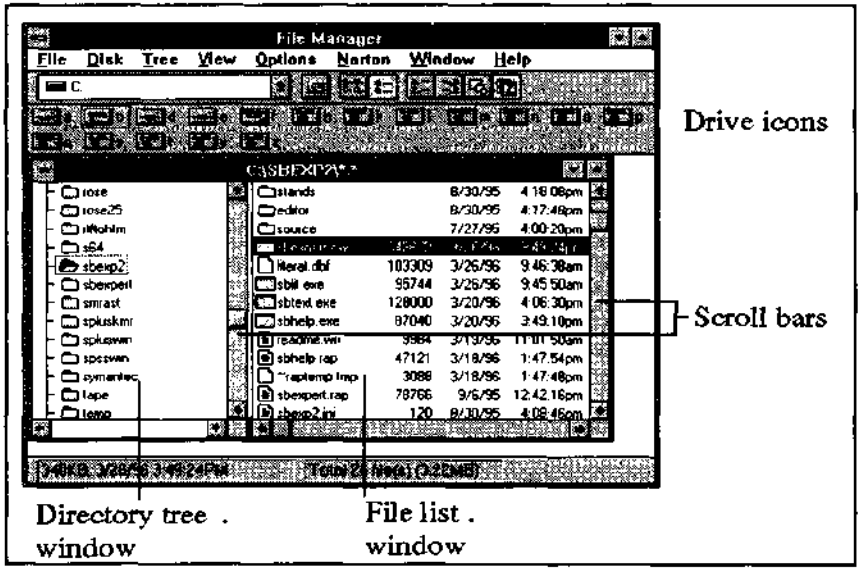

Figure 3—Using Microsoft Windows File Manager to start SBexpert.

5. Double click on the SBEXPERT.EXE, SBTEXT.EXE, or SBLIT.EXE in the directory file listing to start **SBexpert, SBtext,** or **SBlit,** respectively (Key: **arrow,** Enter).

Standard Elements of SBexpert Windows

Screen objects that appear in the main window of all three programs are the ***title bar, minimize button, menu bar,*** and the ***control menu*** (fig. **4).** The ***title bar*** displays the name of the program. To temporarily exit one of the programs without terminating it, select the ***minimize button*** to reduce the program 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," below.

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).

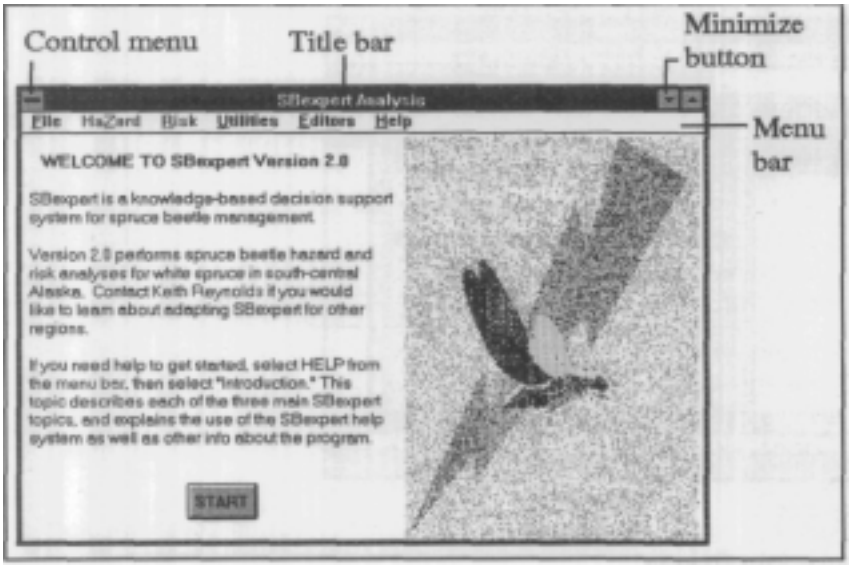

Figure 4—Main window of the **SBexpert** (analysis) program.

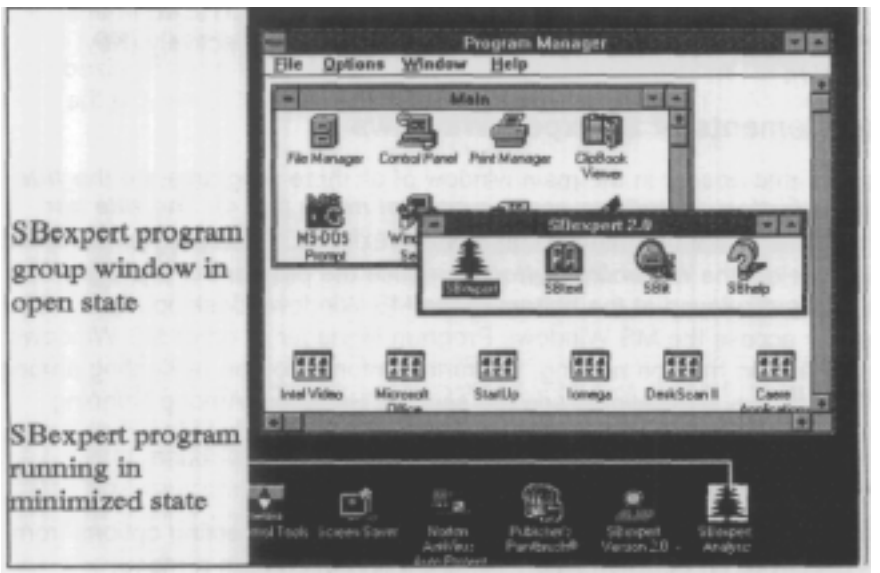

Figure 5—Example of a minimized program icon.

To close a menu without selecting an option:

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

The Control Menu

To open the ***control menu*** of a main SBexpert 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 program ***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, Qlose* and *Switch to* (figs. 6 and 7). The *Qlose, Move,* and *Maximize* options are always selectable, whether an SBexpert program is currently displayed in normal view (fig. 4) or minimized view (fig. 5). When the ***control menu*** is open:

- Select *Restore* (Key: R) to return an SBexpert program window to full size (fig. 4) after it has been minimized (fig. 5). *Restore* is available only when an SBexpert program has been minimized (that is, reduced to a ***program item icon),*** in which case the program ***icon*** is displayed near the bottom of the MS Windows desktop (fig. 7). To use *Restore,* first select the program ***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 the program window without displaying the ***control menu*** (Key: **ALT+Tab).**
- Select *Move* (Key: M) to relocate an SBexpert program 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 an SBexpert program window on the screen.
- Select *Size* (Key: S) to resize an SBexpert program window. After selecting *Size,* the cursor changes to a four-headed arrow. Use the arrow keys to resize the window, and press the Enter key when done. Window size is more conveniently adjusted with a mouse. To resize with a mouse, move the cursor over the edge of the window frame. The cursor changes to a double-headed arrow. Click and drag the window frame to resize.

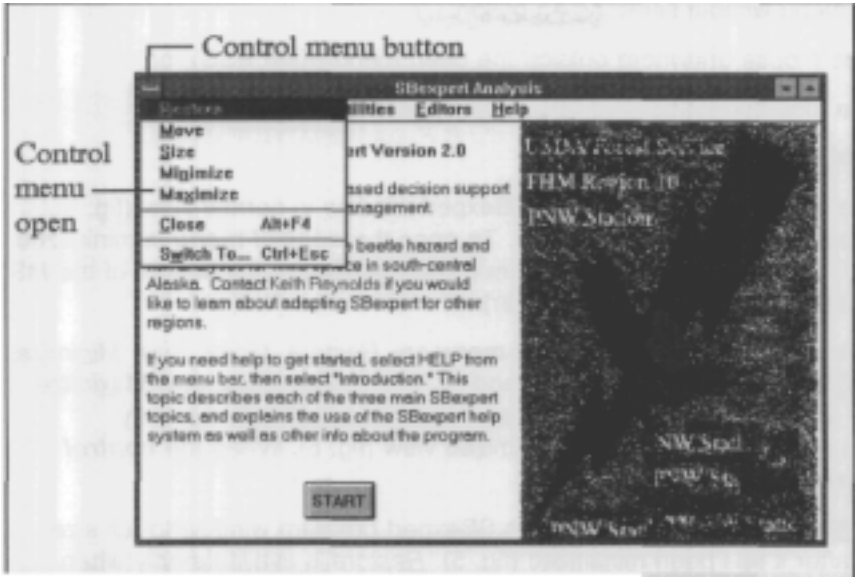

Figure 6—**SBexpert *control menu.***

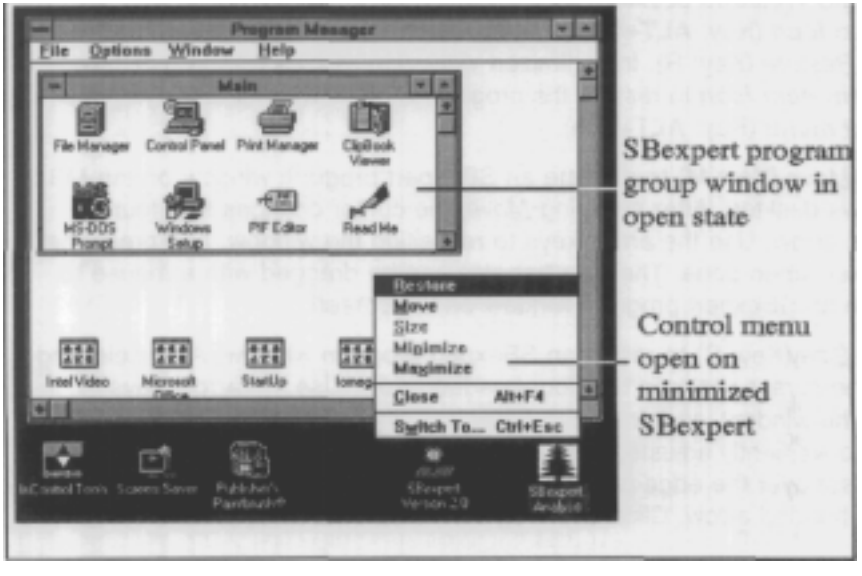

Figure 7—Opening the ***control menu*** on a minimized program icon.

- Select *Minimize* (Key: N) to reduce an SBexpert program to a ***program item icon*** displayed at the bottom of the MS Windows desktop (fig. 5). *Minimize* is available only when a 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*** with a mouse and is the only keyboard method for minimizing an application.
- Select *Maximize* (Key: X) to expand an SBexpert program to fill the entire desktop. *Maximize* is not available when a main SBexpert window is already maximized. Selecting *Maximize* from the ***control menu*** is equivalent to selecting the ***maximize button*** with a mouse and is the only keyboard method for minimizing an application.
- Select *Qlose* (Key: C) to terminate the program. In normal view, double click on the ***control menu*** to close the program without opening the ***control menu.***

Getting Help in SBexpert

In addition to this guide, an extensive on-line help system is available in SBexpert. The help system has been extensively revised in SBexpert version 2.0, and now has the look and feel of a standard MS Windows help system. Each of the three SBexpert programs **(SBexpert, SBtext,** and **SBlit)** have a Help menu (fig. 8). The list of ***menu items*** is identical on all three menus.

The Help Menu

- The ***Help Menu*** contains the following ***menu items.***
- *Contents* displays the main table of contents for the help system.
- *Introduction* provides complete step-by-step instructions on use of **SBexpert, SBtext,** and **SBlit.**
- *Definitions* explains the meaning of key terms as they are used in the SBexpert system.
- *How to* explains some standard MS Windows procedures for working with screen objects.
- *Using SBexpert Help* explains use of the help system.

Using the Help Window

SBhelp is a separate SBexpert program that is started when a ***menu item*** is selected from the ***Help menu*** **in SBexpert, SBtext,** or **SBlit.** The initial contents of the help window are determined by the ***menu item*** that was selected from the

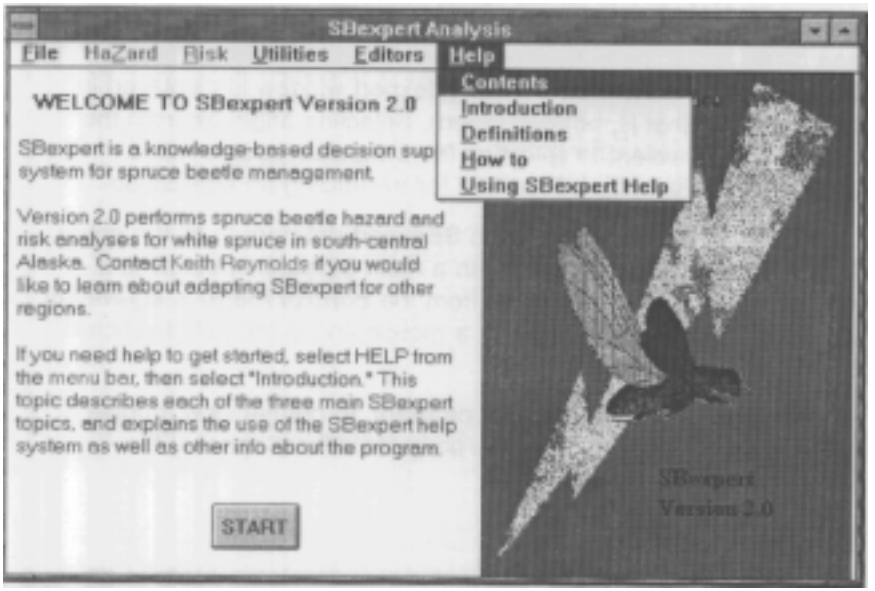

Figure 8--The ***help menu is*** **common to all SBexpert programs.**

Help menu (see the previous section). Ail text displayed in green within the application is ***hypertext,*** which leads to either a deeper level of explanation of a topic or a related topic Simply select the hypertext (Key: **Tab,** Enter) to view it.

The Help Window aiso contains a ***button bar*** with ***buttons*** for various help functions (fig. 9), Select one of the following ***buttons:***

- ***Contents*** (Key: F1) displays the main table of contents for the help system.
- ***Search*** (Key: F2) displays a iist of all help topics. Select an item from the list, then select the ***Go to button*** to display the selected topic, or select the ***Cancel button*** to quit the search window (Key: type the name of the topic, **Tab** to ***buttons.*** Enter).
- ***Back*** (Key: F3) goes back one topic in the chain of topics that have been followed.
- ***Print*** (Key: F4) prints the contents of the current help display.
- ***Help*** (Key: F5) displays the *Using SBexpert Help* topic.
- ***Exit*** (Key: F6) exits the help system.

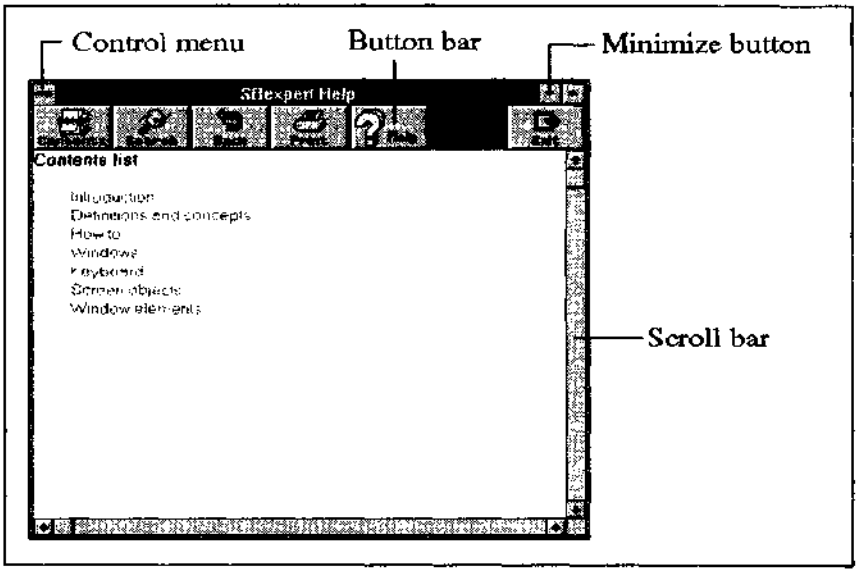

Figure 9—The SBexpert **Help** program with ***button bar.***

Other Sources for 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), activates the help system, which displays additional information related to the ***hypertext*** topic.

The SBtext Program

The **SBtext** program is a hypermedia 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 illustrations 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.

SBtext can be used in combination with an external **Text Editor** such as MS Windows **Write,** for example, to compose introduction and discussion sections for basic reports. **SBtext** also can be used in combination with SBexpert's internal **Report Editor** to add supplementary information on the biology, ecology, and

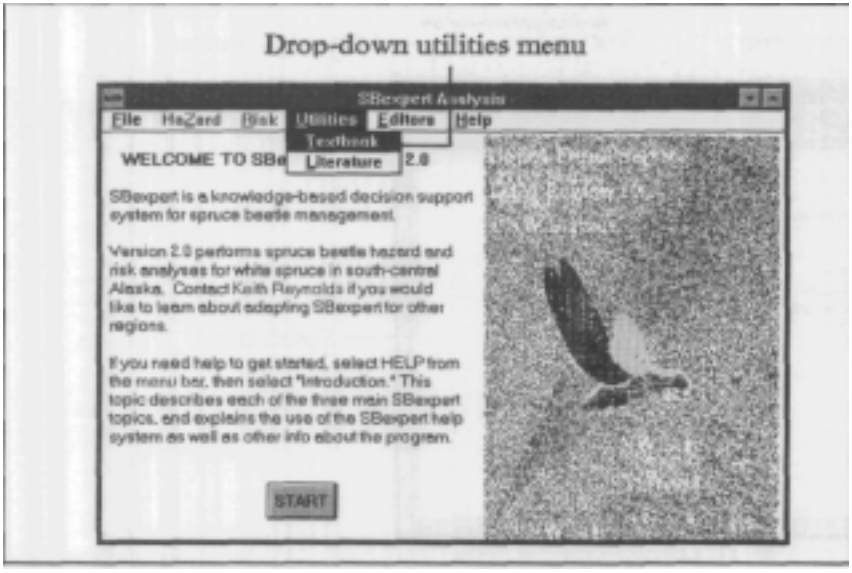

Figure 10—The ***Utilities menu*** on the **SBexpert *menu bar***.

management of spruce beetles to the report that is automatically created by **SBexpert.** Copying text from **SB text** to either editor is a simple process because all text displayed in a chapter-section window can be copied to a temporary MS Windows file, called the clipboard, when a chapter section is displayed in **SB text.**

Opening SB text

In SBexpert version 2.0, **SBtext** (formerly, the Textbook topic in version 1.0) is a stand-alone program. It can be started either from the Windows Program Manager by double clicking on its ***program item icon*** in the SBexpert group window (fig. 2) or by selecting *Textbook* from the ***Utilities menu*** of **SBexpert** (fig. 10, Key: ALT+U, T).

The SBtext Button Bar

The SBtext window has a button bar that implements several functions (fig. **11):**

- ***Contents*** (Key: F1) displays the list of chapters in **SBtext** as ***hypertext.***
- ***Search*** (Key: F2) displays a list of all **SBtext** topics.
- *Back* (Key: F3) goes back one topic in the chain of topics that have been followed.

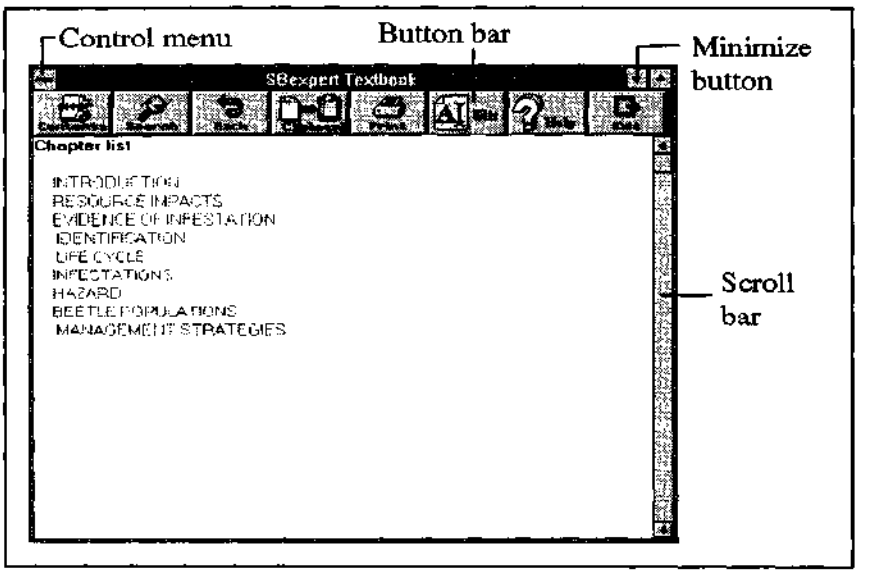

Figure 11—Main window of the **SBtext** program with ***button bar.***

- ***Clipboard*** (Key: F4) copies the contents of the **SBtext** window to the MS Windows clipboard.
- ***Print*** (Key: F5) prints the contents of the current help display.
- ***Edit*** (Key: F6) opens an external text editor.
- ***Help*** (Key: F7) displays the Using SBexpert Help topic.
- ***Exit*** (Key: F8) exits **SBtext.**

Each function is described in greater detail in subsequent sections.

Navigating in SBtext

The **SBtext** window initially displays a list of chapters as ***hypertext.*** This is the main contents for **SBtext.** As elsewhere in SBexpert 2.0, ***hypertext*** items are always highlighted in green text in the application. Select a chapter to view a list of the sections covered by the chapter (Key: **Tab,** Enter). From the list of chapter sections, select a section to view.

SBtext maintains a history of the topics that have been visited in the current session.

- To backtrack to a previous topic, select the ***Back button*** from the ***button bar*** (Key: F3).
- To return to the **SB text** table of contents, select the ***Contents button*** from the ***button bar*** *(Key:* F1).
- To randomly access ***hypertext*** topics, select the ***Search button*** (Key: F2). Select an item from the list, then select the ***Go to button*** to go to the selected topic, or select the ***Cancel button*** to quit the search window (Key: type the name of the topic, Tab to ***buttons,*** Enter).

Copying Text and Graphics From SB text to an SBexpert Editor

Two editors are available in the SBexpert application. The **Report Editor** is an integral part of the **SBexpert** program and is used by **SBexpert** to automatically output results of analyses. While an analysis is in progress, the **Report Editor** can be opened to add supplementary information. The **Text Editor** is an external application that SBexpert has been configured to use. By default, when SBexpert was installed, the **Text Editor** was set to MS Windows **Write.** See the later section, 'The SBexpert Editors," for additional information on use of the editors and changing the default **Text Editor.**

To copy the contents of a chapter section in **SB text** to either editor:

1. Display the desired chapter section in **SBtext.**
2. Select the ***Clipboard button*** from the **SBtext** ***button bar*** (fig. 11) to copy the text to the MS Windows clipboard (Key: F4).
3. Select the ***Edit button*** from the **SBtext** ***button bat*** (fig. 11) to open the **Text Editor** (Key: F6), or open the **Report Editor** in **SBexpert** by selecting *Report* from the ***Editors menu*** (fig. 12, Key: ALT+E, **R).**
4. 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.
5. Select *Paste* from the editor's ***Edit menu*** (fig. 13).

When **SBexpert** is first started, the *Report* ***menu item*** on the ***Editors menu*** is disabled (appears dim). The **Report Editor** cannot be opened until the ***Start button*** on the introductory window has been selected and a name has been assigned to the report for the current SBexpert session.

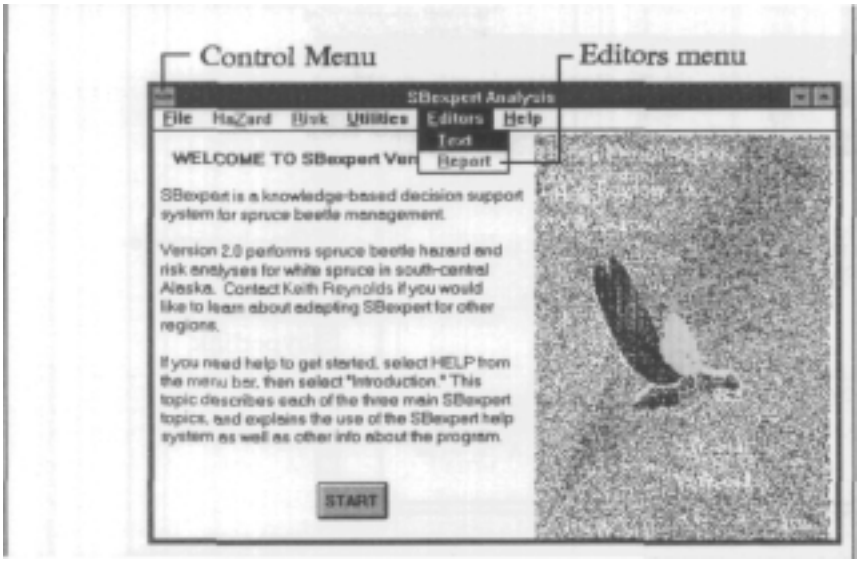

Figure 12—The ***Editors menu*** **on** the **SBexpert** ***menu bar.***

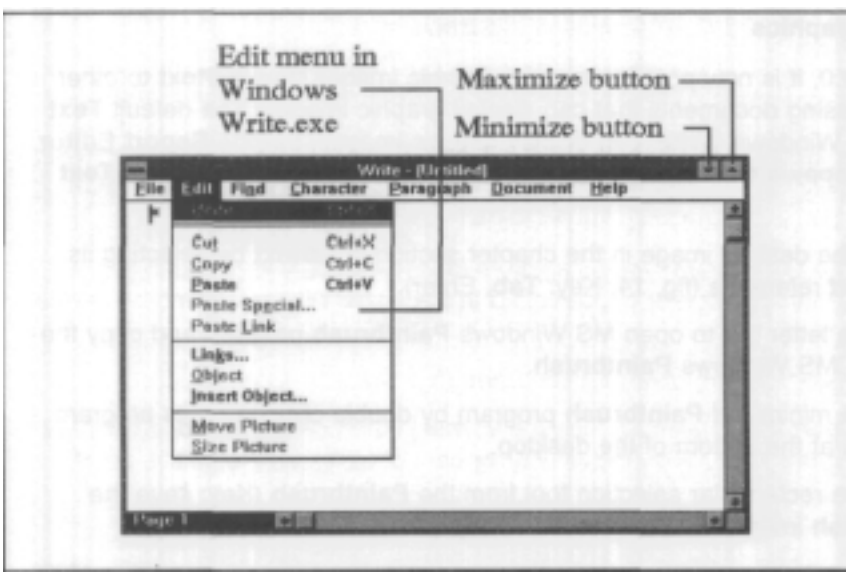

Figure 13—Opening the ***Edit menu*** in an SBexpert editor.

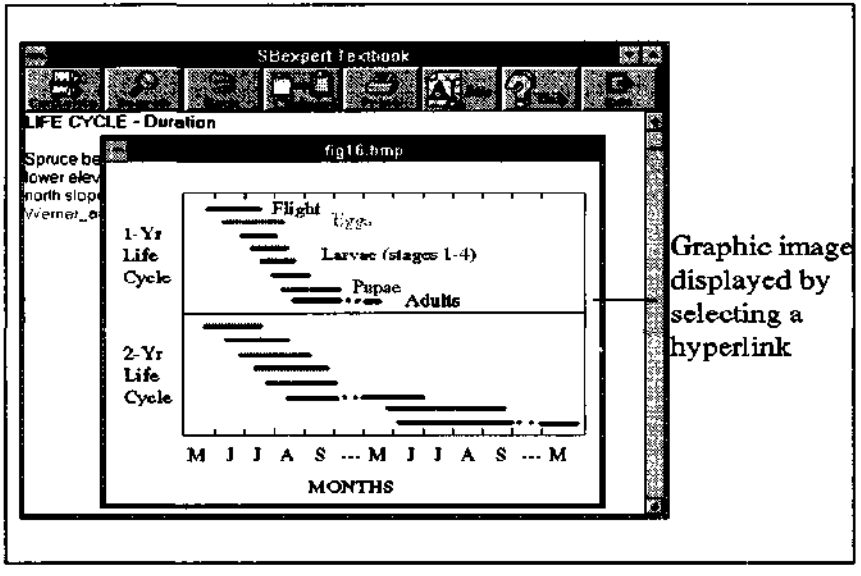

Figure 14—View of a chapter section in SB text with a hyperlink to a graphic image displayed.

Copying Graphics

In version 2.0, it is now possible to copy graphic images from **SBtext** to other word processing documents that can display graphic images. The default **Text Editor,** MS Windows **Write,** can display graphic images, but the **Report Editor** cannot. To copy a bitmap image from a chapter section in **SBtext** to the **Text Editor,**

1. Display the desired image in the chapter section in **SBtext** by selecting its ***hypertext*** reference (fig. 14, Key: **Tab,** Enter).
2. Press the letter "C" to open MS Windows **Paintbrush** program and copy the image to MS Windows **Paintbrush.**
3. Open the minimized **Paintbrush** program by double clicking on its program item icon at the bottom of the desktop.
4. Select the rectangular selection tool from the **Paintbrush** (Key: save the **Paintbrush** image to a file with ALT+F.S).
5. Drag the selection tool to select either the entire image or some portion of it (no keyboard equivalent).
6. Select *Qopy* from the **Paintbrush *Edit menu*** (do not use for keyboard).

7. Select the ***Edit button*** from the **SB text *button bar*** (fig. 11) to open the **Text Editor** (Key: F6).

8. 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.

9. Select *Easte* from the editor's ***Edit menu*** (fig. 13, Key: select *Insert Object* from the MS **Write *Edit menu*** (ALT+E, N), then choose **Paintbrush** picture from the list of choices).

The SBlit Program

Literature searching is performed by the **SBlit** program. The present database of spruce beetle literature contains over 450 references and is current through 1995. Up to three authors and keywords as well as 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.**

Opening SBlit

In SBexpert version 2.0, **SBlit** (formerly, the Literature topic in version 1.0) is a stand-alone program. It can be started either from the MS Windows Program Manager by double clicking on its ***program item icon*** in the SBexpert group window (fig. 2) or by selecting *Literature* from the ***Utilities menu*** of **SBexpert** (fig. **10,** Key: **ALT+U, L).**

Choosing Criteria to Define a Search

The first **SBlit** window displays ***list boxes*** for selecting authors and keywords and ***edit lines*** for entering the first and last years of a search (fig. 15). The combination of choices or entries made in these four fields specify the criteria for an SBlit search. Any field can be left blank, in which case the blank field is treated as a wildcard (that is, all SBlit records in the database match a blank field). In searching the database, a record is retrieved only 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. 15):

1. Select the author ***list box*** to make it the active screen object (Key: **Tab).**

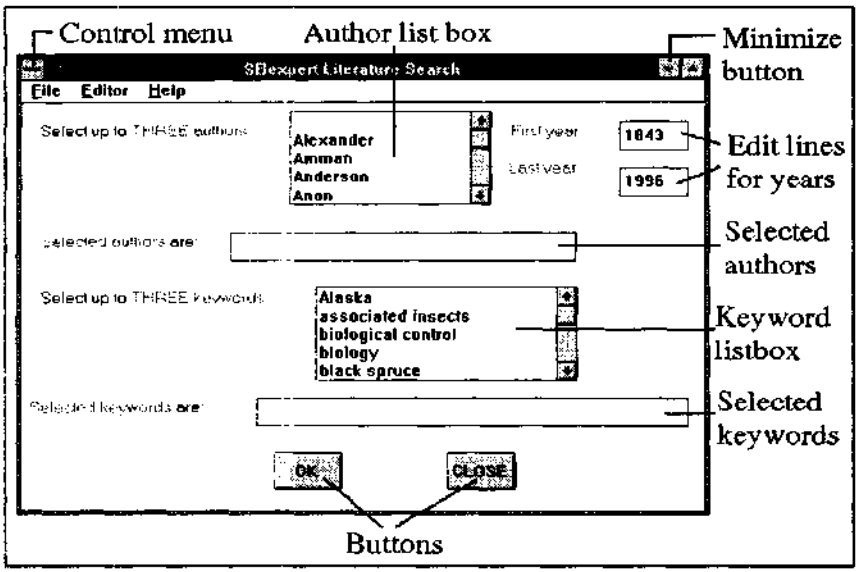

Figure 15—The main window of the SBlit program.

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).**

3. Select 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. 15). 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. 15):

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.

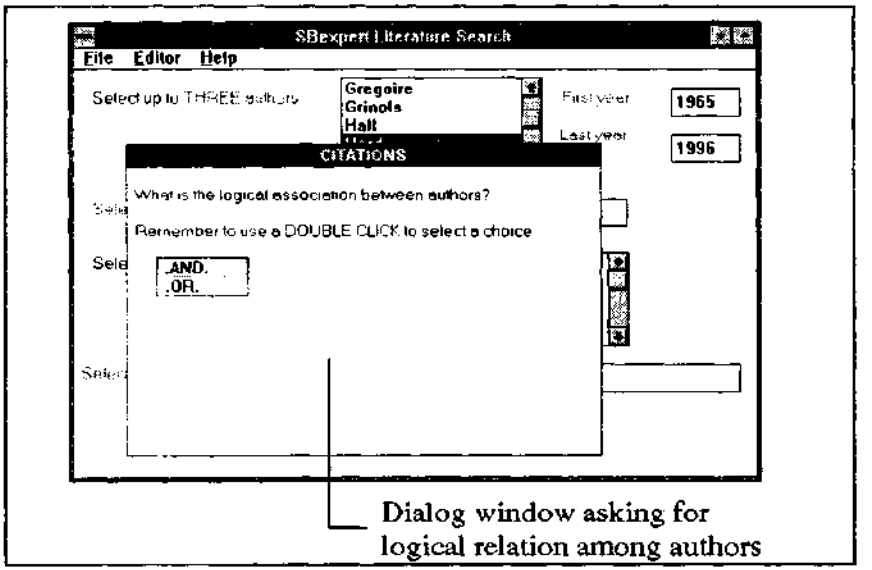

Figure 16—Selecting the logical relation between authors in a literature search.

- Use the Delete (Del) and Backspace (BkSp) keys for deleting text.
- 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. 15) (Key: **Tab,** Enter). If multiple authors or keywords were selected, a window opens, asking for the logical relation between the selections (fig. 16) (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. 17). 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 (Key: F1).
- Move to the previous citation (Key: F2).
- Delete (drop) the current citation (from the retrieved list but not from the permanent database) (Key: F3).
- Close the citation window (Key: F4).

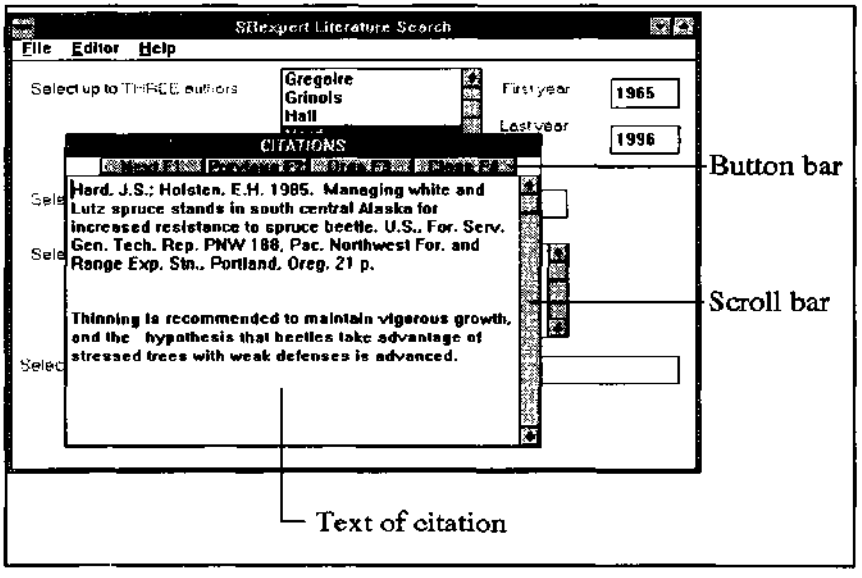

Figure 17—View citations obtained from an **SBlit** literature search.

When the Close ***button*** is selected (fig. 17), 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. 18). 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 **Text Editor** or **Report Editor.**

To terminate **SBlit,** select the CLOSE ***button*** located near the bottom of the main **SBlit** window (fig. 15).

Copying SBlit Citations to an SBexpert Editor

SBlit citations can be copied to either SBexpert editor any time after the citations window has been closed. It is not necessary to close **SBlit.** Because the list of citations is stored in the MS Windows CLIPBOARD, the list should be copied into the appropriate editor before further cutting or copying is performed and before a new chapter section in **SBtext** is displayed. Cut and copy procedures as well as the display procedure in **SBtext** 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. 12):

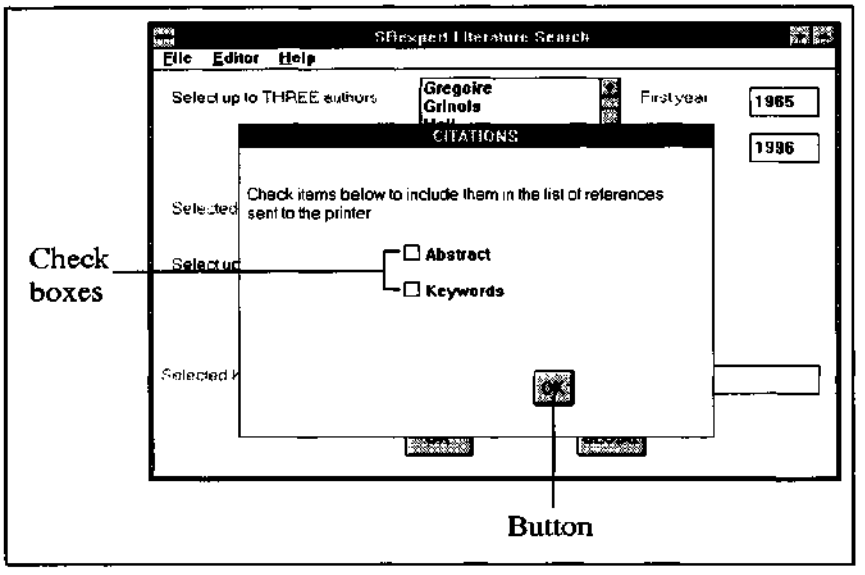

Figure 18—Selecting options for displaying citations after literature retrieval.

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 SBexpert 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 **SBexpert** had been opened previously in the current session, **Report Editor** will open after the *Report* option is selected.

To copy the contents of the MS Windows CLIPBOARD into either SBexpert editor (fig. 13):

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 SBexpert Program

The **SBexpert** program 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 included models only for spruce beetle hazard and risk appropriate to Lutz and white spruce in south-central Alaska (Reynolds and Holsten 1994a). Hazard and risk analyses in SBexpert 2.0 have been extended to also include Sitka spruce in south-central Alaska (Reynolds and Holsten 1996). The modular structure of SBexpert is such that new hazard and risk models can easily be added in later versions to extend the geographic scope of the system. Individuals interested in adding new hazard and risk models for new geographic areas or new spruce species 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 typically is 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 a 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 also are 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 differ markedly from year to year. Because the size of a spruce beetle population, and therefore 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. Risk predictions, therefore, are most useful for short-term tactical planning at the early stages of an outbreak.

The hazard model—Stand hazard is classified with a new classification model (Clark and Pregibon 1991) developed for Lutz, white, and Sitka spruce on the Kenai Peninsula, Alaska (Reynolds and Holsten 1996). Hazard, expressed as a

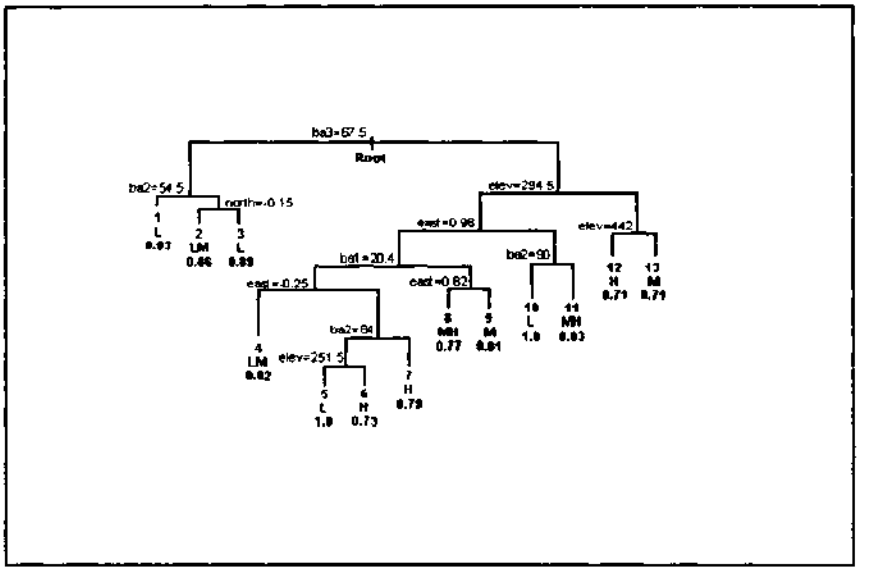

Figure 19—Classification tree for predicted spruce beetle hazard classes. Nodes labeled 1, 2, etc., correspond to nodes listed in table 1. Each terminal node is labeled with its predicted hazard class (L=low, LM=low-medium, M=medium, MH=medium-high, and H=high).

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. 19, table 1) distinguishes 13 possible hazard outcomes based on total stand basal area, percentage of total basal area composed of spruce, percentage of spruce basal area composed of trees with diameters >25 centimeters, stand elevation, and stand aspect. Four paths in the decision tree lead to low-hazard outcomes (spruce basal area loss ≤10 percent); two paths through the decision tree lead to a medium-hazard outcome (spruce basal area loss >10 percent, but ≤40 percent); and three paths lead to a high-hazard outcome (spruce basal area loss >40 percent). Four 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. 19).

Results of model verification were considered very acceptable; in the worst case, predictions of high hazard were correct for 73.7 percent of the observations. Model validation results also were considered acceptable given the small number of observations available for this phase of SBexpert. For a complete description of hazard model development for south-central Alaska, see Reynolds and Holsten (1996).

Table 1—Decision tree for predicted spruce beetle hazard classes

Node	Description[a]	N	Class[b]	Probability P(L)[c]	p(M)	P(H)	Leaf[d]	Hazard[e]
1	Root	286						
2	BA3 < 67.5	30	L	0.77	0.17	0.06		
4	BA2 < 54.5	14	L	.93	.00	.07	1	L
5	BA2 54.5	16	L	.63	.31	.06		
10	North < -0.15	7	M	.29	.57	.14	2	LM
11	North -0.15	9	L	.89	.11	.00	3	L
3	BA3 67.5	256	H	.30	.31	.39		
6	Elev < 294.5	204	L	.35	.31	.34		
12	East < 0.96	183	H	.30	.34	.36		
24	BA1 < 20.4	90	H	.38	.22	.40		
48	East < -0.25	49	L	.47	.35	.18	4	LM
49	East -0.25	41	H	.27	.07	.66		
98	BA2 < 64	17	L	.53	.00	.47		
196	Elev < 251.5	6	L	1.00	.00	.00	5	L
197	Elev 251.5	11	H	.27	.00	.72	6	H
99	BA2 64	24	H	.08	.12	.79	7	H
25	BA1 20.4	93	M	.22	.46	.32		
50	East < 0.82	82	M	.23	.40	.37	8	MH
51	East 0.82	1	M	.18	.82	.00	9	M
13	East 0.96	21	L	.76	.10	.14		
26	BA2 < 90	15	L	1.00	.00	.00	10	L
27	BA2 90	6	H	.17	.33	.50	11	MH
7	Elev 294.5	52	H	.11	.27	.62		
14	Elev < 442	45	H	.09	.20	.71	12	H
15	Elev 442	7	M	.29	.71	.00	13	M

[a] Variable abbreviations are as follows: BA1, BA2, and BA3 are total stand basal area, spruce basal area as a percentage of total, and basal area of large-diameter spruce as a percentage of spruce basal area, respectively; east and north are indicator variables for angular departure (radians) of slope aspect from east and north directions, respectively; and elev is stand elevation in meters.

[b] L, M, and H indicate nominal hazard classes of low, medium, and high, respectively, which correspond to spruce mortality of 10 percent 10-40 percent, and >40 percent resprectively.

[c] p(L), p(M), and p(H) are probabilities that the corresponding node in the classification tree represents low, medium, and high hazard, respectively.

[d] In fig. 19, the node designation appears in the first line of annotation immediately below each leaf.

[6] Predicted hazard class assigned to the leaf. L, LM, M, MH, and H indicate low, low-medium, medium, medium-high, and high hazard, respectively. Classes L, M, and H indicate predicted spruce mortality of 10 percent 10-40 percent, and >40 percent, respectively. LM and MS indicate predicted spruce mortality of 40 percent, and >10 percent, respectively.

Hazard classes reported by SBexpert are low (0-10 percent), low-medium (40 percent), medium (11-40 percent), medium-high (>10 percent), and high (>40 percent). Inventory data required for hazard classification are total stand basal area ($m^2 \cdot ha^{-1}$), 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).

The risk model—Nine potential risk factors (table 2) were evaluated by spruce beetle experts from western North America. Risk factors were organized into a hierarchical model of spruce beetle risk (fig. 20) 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 development of SBexpert were stand hazard, size and trend of spruce beetle population in neighboring stands, daily ambient air temperature maxima in the previous June, total rainfall in the past summer, and availability of four types of breeding material (table 2). The beetle population trend factor ultimately was dropped from SBexpert. Stand hazard and wind-thrown trees were identified as the two most important factors determining risk of a spruce beetle outbreak (table 3). 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

fi = priority of the *i*th risk factor, and

si = 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 *si* = 9 indicating that the risk factor is present and conditions associated with the factor are maximally conducive to outbreak. Because the *fi* sum to 1.0, and all *si* are scaled on the interval [0, 9], *r* also takes on values on the interval [0, 9].

Table 2—Definitions of spruce beetle risk components

Component in hierarchy[a]	Factor number[b]	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 previous June
Rainfall (3)	5	Total precipitation for June, July, and August in the previous 12 months
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 (in hectares)
Logging (3)	9	Area that was logged (in hectares)

[a] Numbers in parentheses indicate the level of a component in the hierarchical structure of risk model components (fig. 20).
[b] Factors are model components that occupy terminal nodes in the model structure (fig. 20).

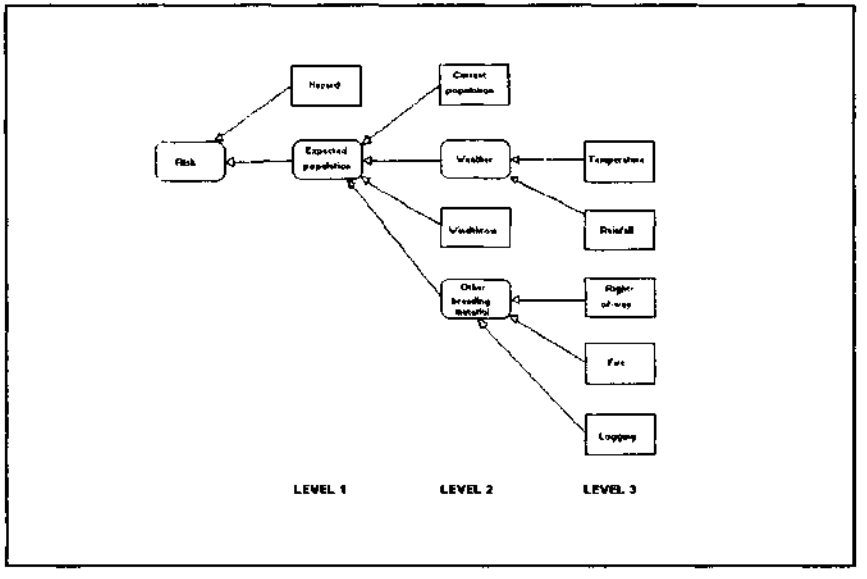

Figure 20—Structure of the spruce beetle risk model. Square boxes indicate factors that occupy terminal nodes in the model structure (table 2). Rounded boxes indicate intermediate factors included to create a hierarchical structure.

Table 3—Priorities of factors contributing to risk of a spruce beetle outbreak[a]

Risk factor[b]	Priority[c]
Hazard	0.32
Beetle population	.18
Temperature	.09
Rainfall	.02
Breeding materials[d]:	
Windthrow	.33
Right-of-way	.03
Fire	.03
Logging	.01
Consistency ratio[e]	.01

[a] Priorities obtained as eigenvector solutions from analytic hierarchy SBexpert.

[b] Arrangement of risk factors in analytic hierarchy model is illustrated in figure 20, in which risk factors are shown as rectangles.

[c] Proportional contribution that a risk factor makes to the overall raw risk score.

[d] See table 2 for definitions of materials.

[e] A consistency ratio 0.10 is considered acceptable. The value 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 lunctions commonly observed in nature, a final risk score, *r',* is obtained as a Weibull transformation of *r.*

$$r' = 1 - e^{(-r/5)3}$$

For a more complete discussion on development of the spruce beetle risk model, see Reynolds and Holsten (1994b).

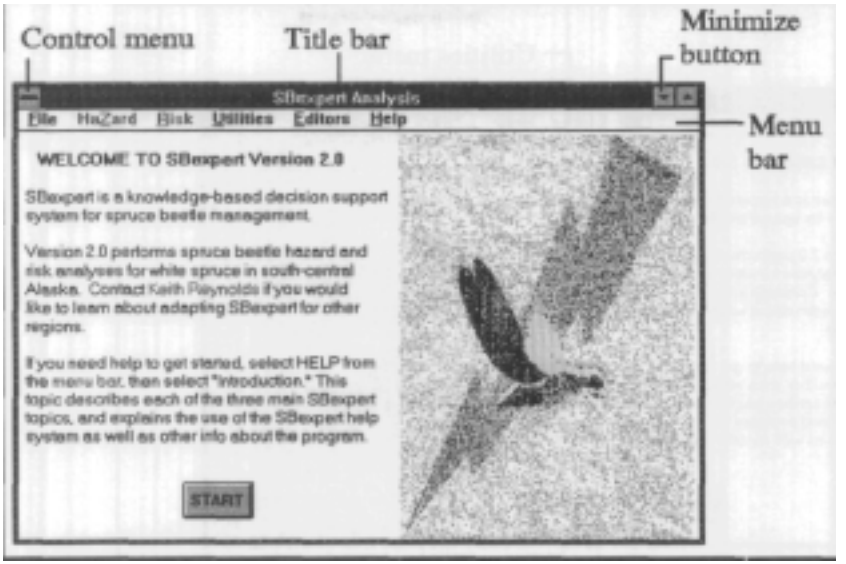

Figure 21—The main window of the **SBexpert** topic.

Opening and Closing SBexpert

In SBexpert version 2.0, the **SBexpert** program (formerly, the Analysis topic in version 1.0) is a stand-alone program that is started from MS Windows Program Manager by double clicking on its ***program item icon*** in the SBexpert group window (fig. 2). **SBexpert** initially displays a welcoming screen (fig. 21). Select the ***Start button*** to begin an analysis of spruce beetle hazard and risk (Key: **Tab,** Enter).

To exit **SBexpert,** select *Exit* from the ***File menu*** (Key: ALT+F, X), or double click on the program window's control menu (fig. 21).

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 after an initial hazard analysis has been completed in **SBexpert,** thereby indicating that these menus are now available.

SBexpert Utilities

SBtext and **SBlit** are utility programs that have been designed to provide complementary decision support for the **SBexpert** program. Detailed descriptions of the use of these utilities is presented in earlier chapters. Both **SBtext** and **SBlit** can

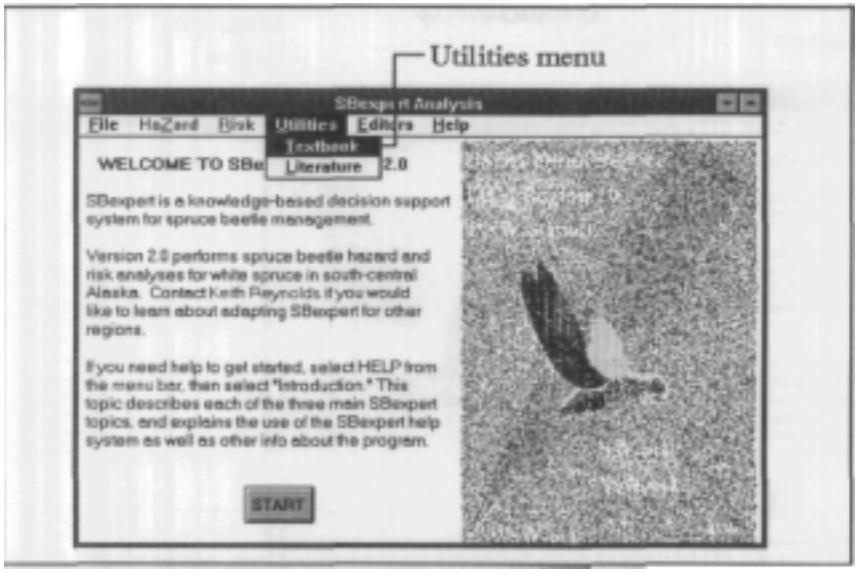

Figure 22—The ***Utilities menu*** **on the SBexpert** ***menu bar.***

be started either from the SBexpert group window by double clicking on the appropriate ***program item icon*** (fig. 2) or by selecting *Textbook* or *Literature,* respectively, from the ***Utilities menu*** on the SBexpert ***menu bar*** (fig. 22). See the later section, "Switching Among Running Applications," for suggestions on how to manage multiple programs on the MS Windows desktop.

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 **SBtext** and **SBlit** to assemble text on selected topics and literature references into documents. The **Report Editor** is specifically used to create and edit the report generated by an **SBexpert** analysis. Both editors can be selected from the ***Editors menu*** of the **SBexpert** ***menu bar*** (fig. 23, Key: ALT+E, then T or R).

Text Editor—Select *Iext* from the ***Editors menu*** to open a general **Text Editor** (fig. 23, Key: ALT+E, T). By default, the SBexpert application is configured at installation to use MS Windows **Write** as its general text editor. The SBEXP2.INI file in the Windows directory can be edited to replace **Write** with any other editor that may be preferred. The editor specified in the SBEXP2.INI file is used in both **SBexpert** and **SBtext.** The primary use of the general editor is for assembling

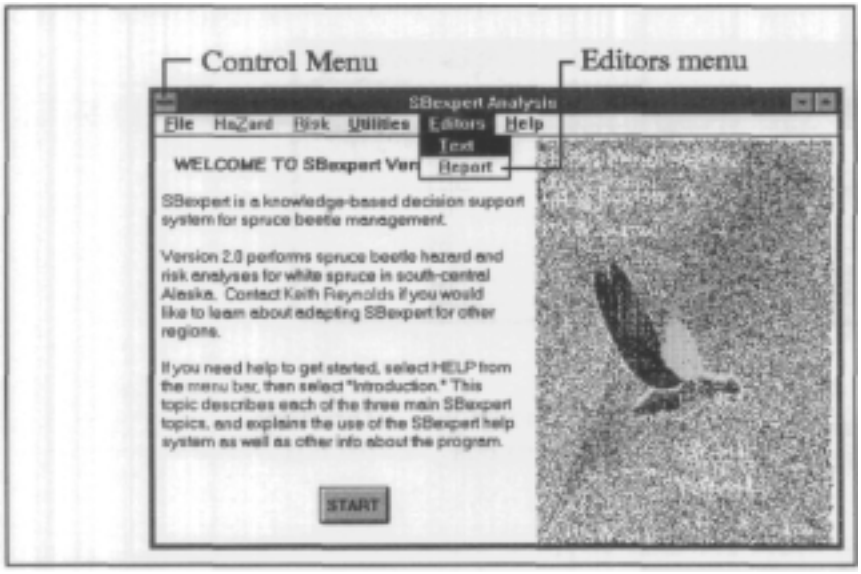

Figure 23—The ***Editors menu*** **on the SBexpert** ***menu bar.***

background information on spruce beetle biology, ecology, and management for reports. Graphic images from **SB text** also can be copied into **Write.** For general instructions on editing procedures with **Write,** see the program's ***help menu.***

SBexpert Reports—SBexpert automatically creates a report file for an analysis after selection of the ***Start button.*** Much of the information displayed in windows during the course of an analysis is also written to the report file to document the analysis for later reference.

After selecting the ***Start button,*** **SBexpert** displays a window asking for the name to be assigned to the hazard and risk report file (fig. 24). By default, the report is written to the \EDITOR subdirectory of the main \SBEXP2 programs directory. The default file name is sbmmddyy.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. 24). 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: ALT+V), and double click to select one of the available drives (Key: **arrow,** spacebar, Enter).

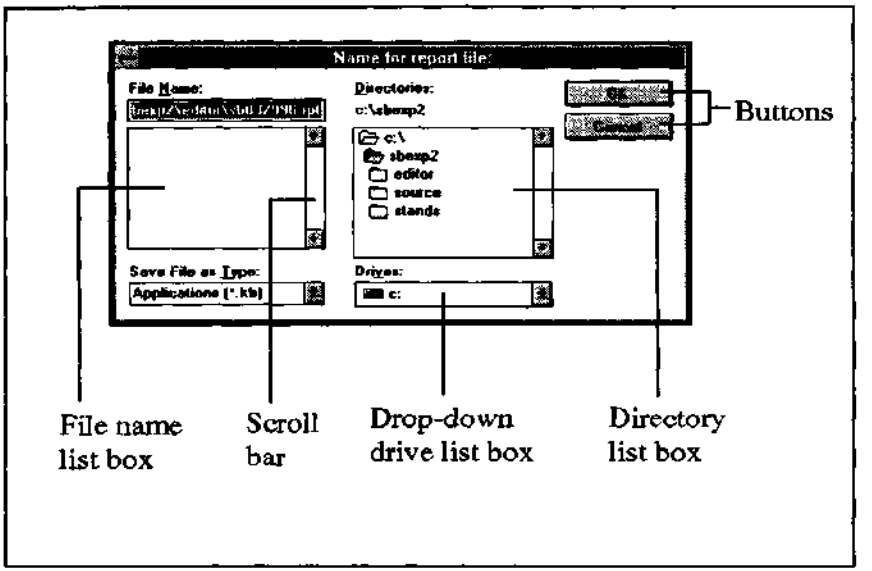

Figure 24—Specifying a file name for the SBexpert report.

- To change the directory, double click on the appropriate directory in the Directories ***list box*** **(Key: ALT+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: ALT+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.***

After all changes have been made, select the ***OK button*** (Key: **Tab,** Enter) to complete the file name selection. The main window of **SBexpert** changes to display introductory information about conduct of the present hazard analysis as soon as the file name ***dialog window*** has closed. Select the ***OK button*** at the bottom of the window to continue. Next, an ***edit window*** is displayed for recording notes on the current stand (fig. 25). Use the ***edit window*** 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 **SBexpert** output. All basic editing functions are available in the ***edit window***

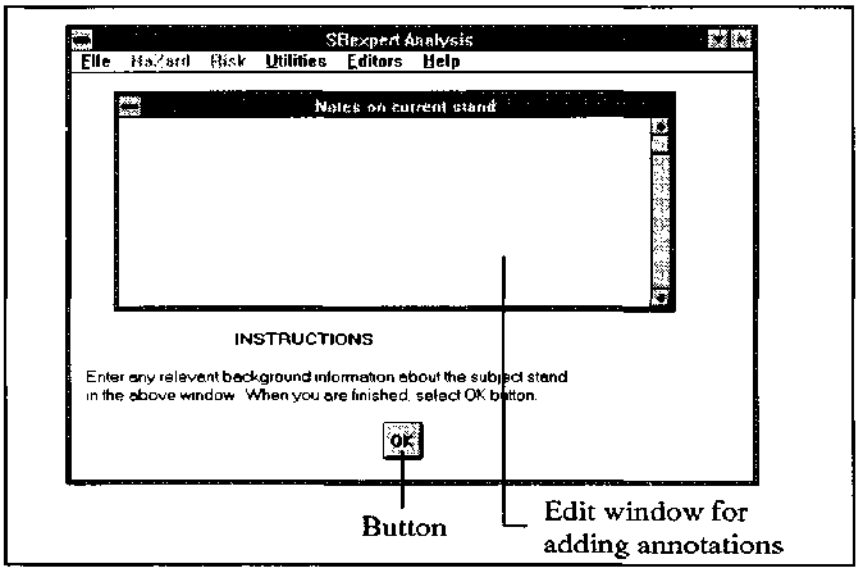

Figure 25—***Edit window*** for annotating an SBexpert report to provide notes on the current stand.

(appendix C). A ***scroll bar*** 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: ALT+spacebar, C) and proceed to the hazard analysis.

Opening the Report Editor—The **Report Editor** cannot be opened until the report file has been created as described in the previous section. If the ***Editors menu*** is selected before the report file is created (fig. 23), the *Report* ***menu item*** will appear dim, indicating that the **Report Editor** is not yet available.

Basic editing in the Report Editor—Basic cut-and-paste editing can be performed in the SBexpert **Report Editor.** 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 to 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 the text is to be inserted (Key: **arrows).**
2. Select *Easte* from the ***Edit menu*** (Key: Alt+E, P).

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

Saving and renaming the report file—During an **SBexpert** analysis, any time after a report file has been created, it can be saved under a new name by selecting *Save* /\s from the **Report Editor *File menu*** (Key: ALT+F, A) and entering a new name in the ***File Save*** *As* dialog window. Analysis output will now be written to the new file, and the next time that the **Report Editor** is opened from the ***Editors menu,*** the new report file will be opened.

Copying text and graphics among SB text, SBlit and the editors—The earlier sections on **SBtext** and **SBlit** describe copying text, graphics, and literature citations to the **Text Editor.** The same procedures can be used to copy text and graphics from **SBtext** and literature citations from **SBlit** to the **Report Editor** instead or in addition. Consequently, it is possible to assemble reports that include:

1. Report information generated by an **SBexpert** analysis.
2. Supporting background information from a topic in **SBtext.**
3. Graphic images from **SBtext.**
4. Literature citations from **SBlit.**

Printed reports can include color illustrations, assuming that a color laser or ink-jet printer is available. Graphic images also generally will print well to any high-resolution printer that supports gray-scale printing (for example, a Hewlett-Packard Laserjet IV), but image rendition will be very poor on more basic black-and-white printers.

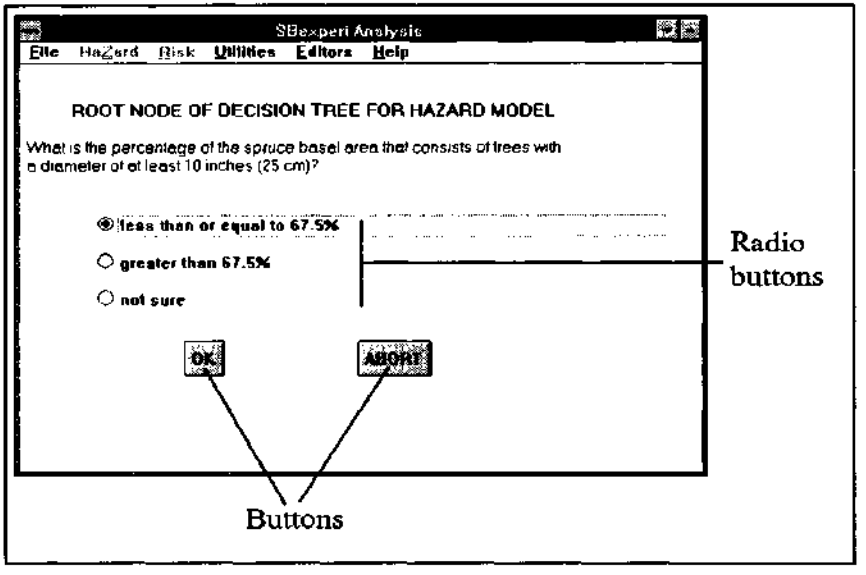

Figure 26—A decision node in the classification model for hazard.

Recovering From Mistakes

The **SBexpert** program is composed of two main subtopics, **Hazard** and **Risk,** each of which is composed of a lower level of subtopics that correspond to options on the ***Hazard*** and ***Risk menus,*** respectively. 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.*** 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.

The Hazard Topic

The decision tree—The initial phase of a hazard analysis in SBexpert begins by navigating through a decision tree (fig. 19). At each node, two mutually exclusive choices and a third "not sure" alternative are available (fig. 26).

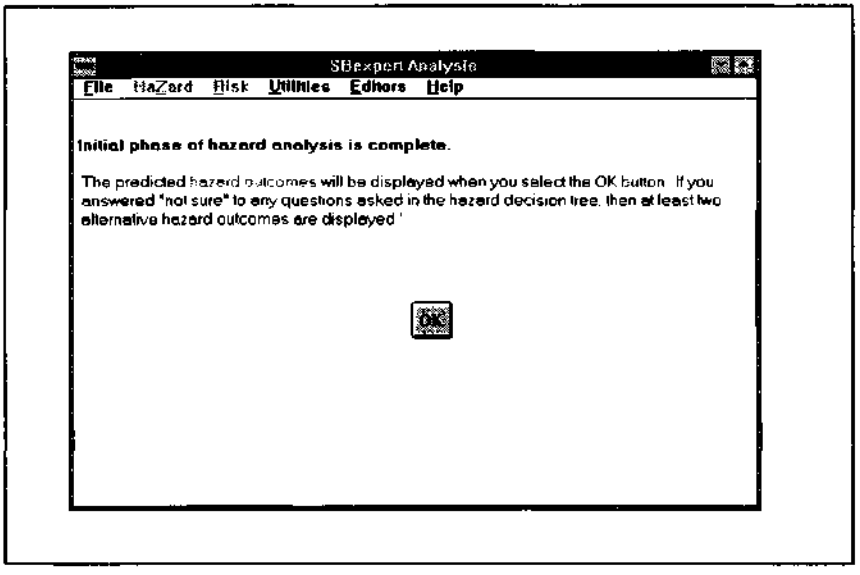

Figure 27—Message about predicted hazard outcomes.

1. Select one of the three ***radio buttons*** **(Key: arrow).**

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. 27). 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 SBexpert are displayed in abbreviated form in a ***list box*** (fig. 28). Each entry in the ***list box*** 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).

Along with the set of hazard outcomes displayed in the ***list box,*** there is also an ***EXIT button.*** Select this ***button*** to close the hazard SBexpert window and return to the introductory **SBexpert** window.

> NOTE: DO NOT select the ***EXIT button*** in this window (fig. 28) 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.

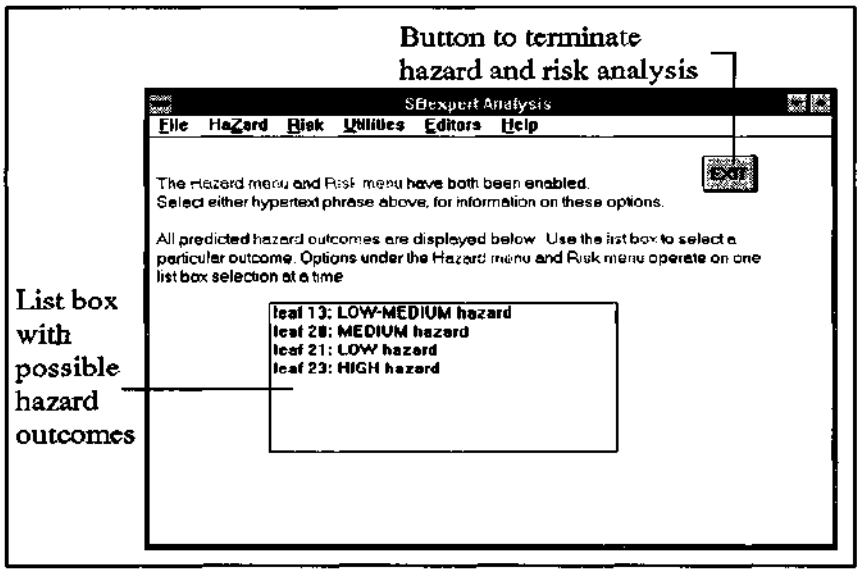

Figure 28—Display of hazard outcomes.

The number of predicted hazard outcomes displayed in the ***list box*** 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 multiple paths through the decision tree that lead to the same hazard rating. 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.

Some hazard outcomes are labeled "low-medium hazard" and some are labeled "medium-high hazard." These designations are NOT what is meant by multiple outcomes. "Multiple outcomes" means that at least two entries are listed in the ***list box.*** 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

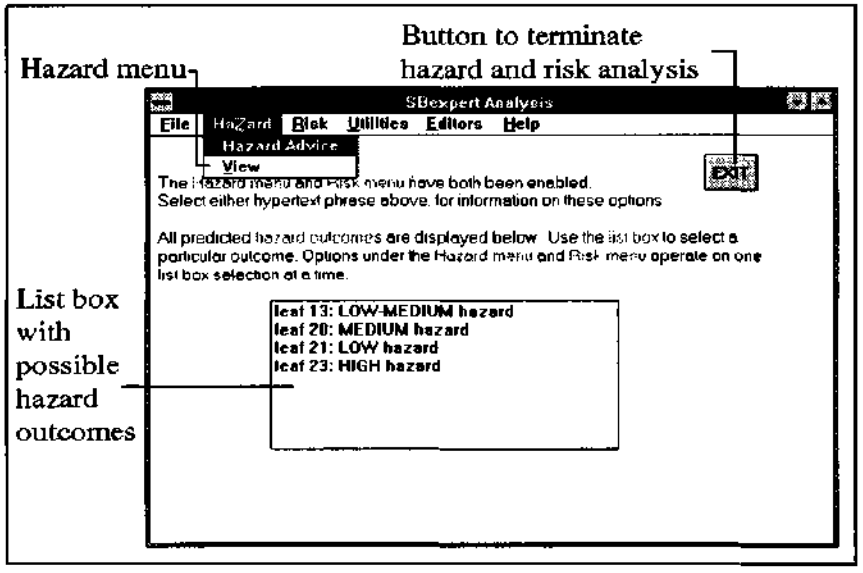

Figure 29—The ***Hazard menu*** **on the SBexpert** ***menu bar.***

adequately distinguish among 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 intermediate between low and medium.

From the set of hazard outcomes displayed (fig. 28):

1. Select a leaf, representing a specific hazard outcome, from the ***list box*** **(Key: arrow).**
2. Select either *Hazard Advice* or *View* from the ***HaZard menu*** (fig. **29).**

The Hazard Advice topic—Select *HaZard Advice* to get recommendations for stand management to reduce hazard of a spruce beetle outbreak for the specific hazard outcome selected from the ***list box.*** The **Hazard Advice** window (fig. 30) presents details of the SBexpert hazard analysis for a selected outcome:

- It summarizes the stand attributes for the hazard outcome selected in fig. 29.

- Explains the rationale for the hazard outcome.

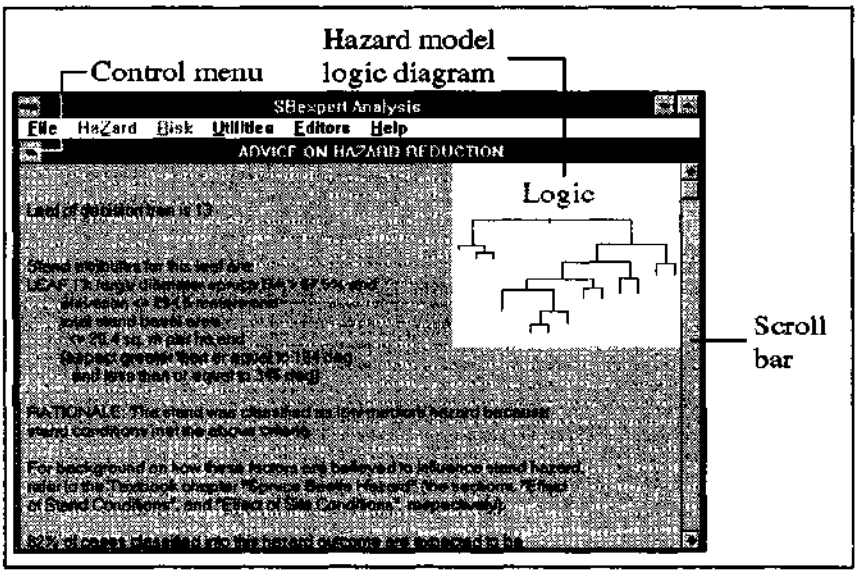

Figure 30—Viewing advice on reducing hazard.

- 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. 30).
- Select C*lose* from the ***control menu*** (Key: ALT+hyphen, C) in the upper left corner of the hazard advice window (fig. 30) to return to the list of hazard outcomes in fig. 28.

The small logic diagram in the upper right corner of the hazard advice window (fig. 30) is a miniature of the decision tree for the hazard model, and is a hyper-link to a larger graphic of the decision tree (fig. 31). Select the logic diagram in the hazard advice window to trace the logic of the decision process (Key: **Tab).**

Logic diagram—This window (fig. 31) illustrates the logical path used to arrive at a hazard outcome.

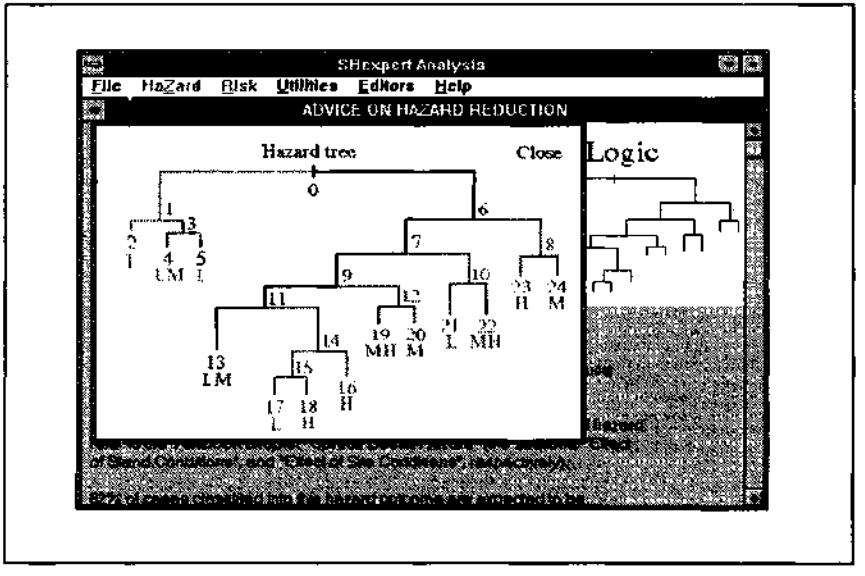

Figure 31— Logic diagram for structure of the hazard classification model.

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

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. 30) if it is open, to redisplay the list of hazard outcomes.

2. Select *View* from the ***HaZard menu*** (fig. 29)(Key: ALT+Z, V).

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. 32).

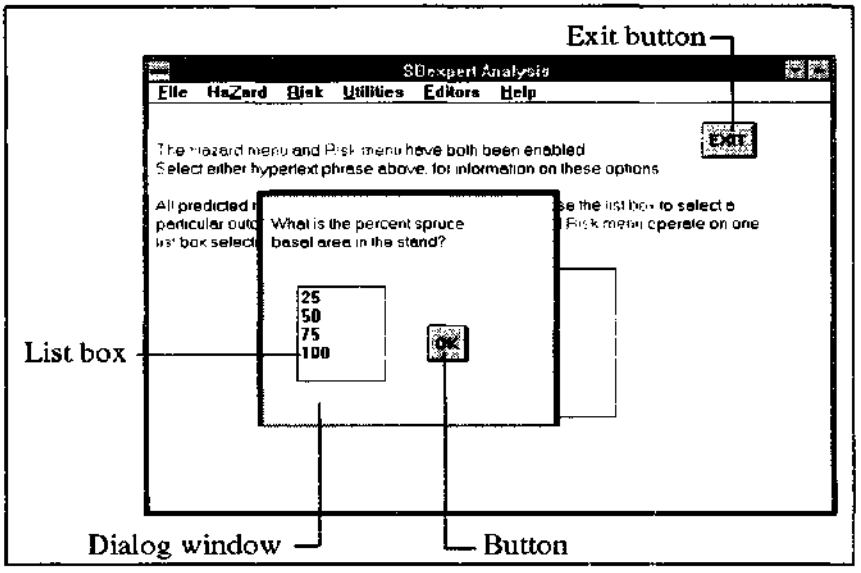

Figure 32—Providing additional stand information for the **View** topic.

1. Select the appropriate spruce basal area percentage from the ***list box*** **(Key: Tab, arrow).**
2. Select the ***OK button*** (Key: Tab, 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 >25.4 centimeters (10 inches). After again selecting the appropriate answer, a new window, labeled "NOTES", displays information about how to use and interpret the stand images (fig. 33). 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. 28).

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.

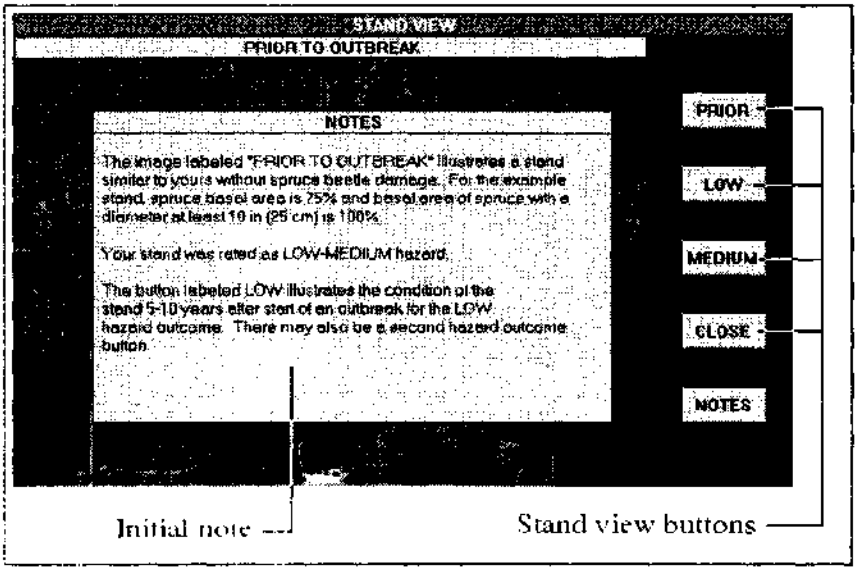

Figure 33—First window in **View.**

The Risk Topic

The ***Bisk 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. The **Risk** topic 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, select *New risk* from the ***Bisk menu*** (fig. 34, Key: ALT+R, N). Other options on the ***Risk menu*** are dimmed (not selectable) until *New Risk* has been selected and its associated topics completed.

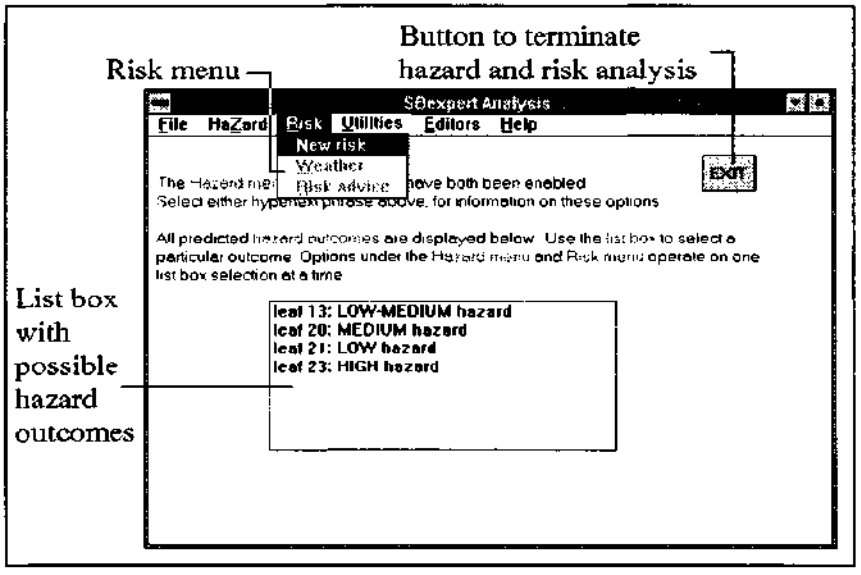

Figure 34—The ***Risk menu*** **on the SBexpert** ***menu bar.***

Once *New risk* is selected, the window for the **New 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. 35).

> 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 may have already started.

There is also an ***OK button*** located near the bottom of the window (fig. 35). To proceed:

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

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. 36) is typical of all four displays on breeding material. In each display:

1. Select the appropriate ***radio button*** **(Key: arrow).**

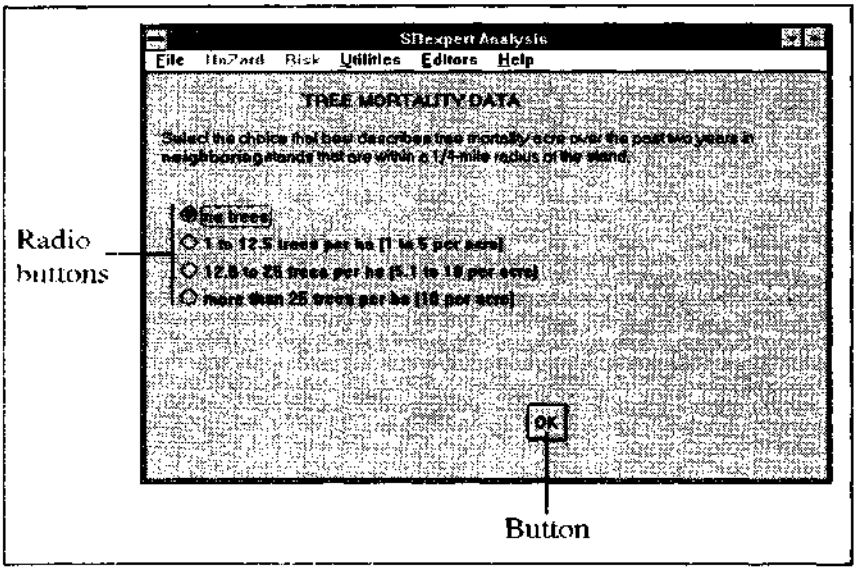

Figure 35—bntering data on tree mortality in the **New risk** topic.

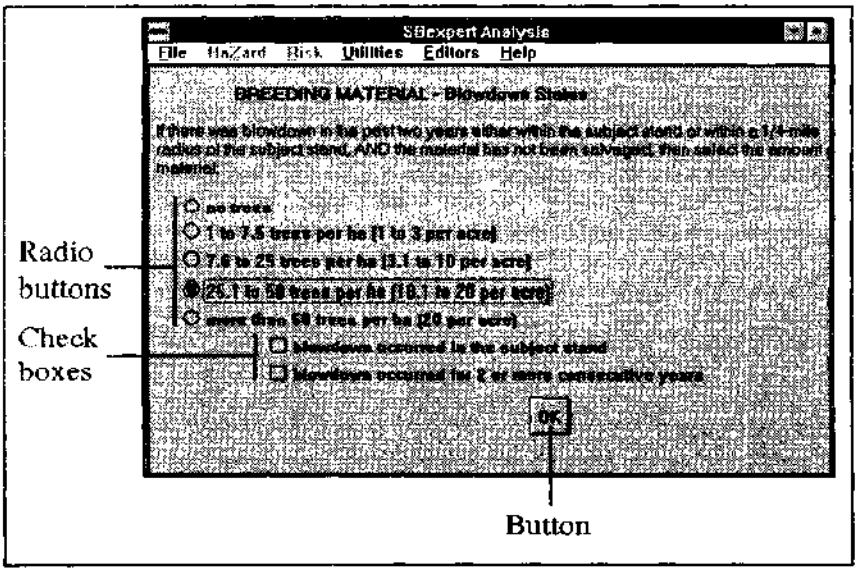

Figure 36—Example of entering data on breeding materials in **New risk.**

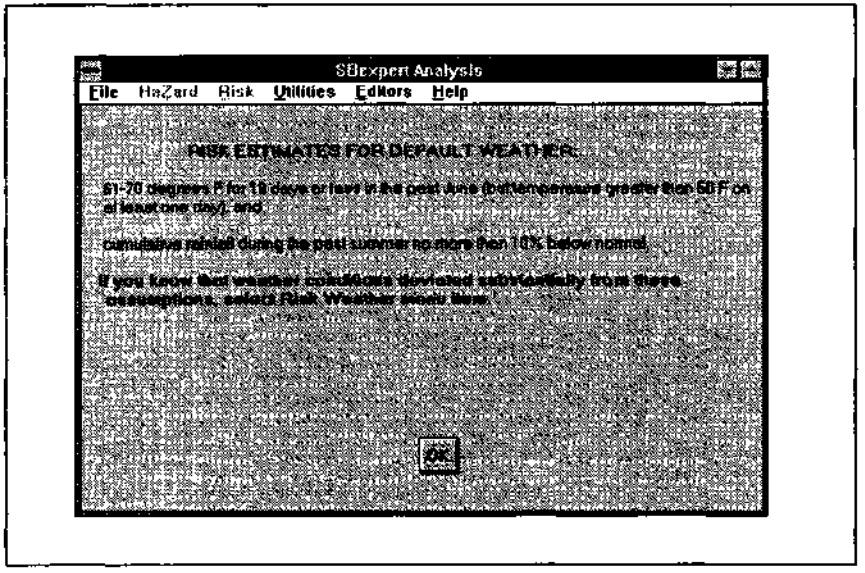

Figure 37—A message about risk predictions with default weather conditions.

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. 36), you are asked to indicate the amount of blowdown in either the subject or neighboring stands by selecting the appropriate ***radio button.*** There is also a ***check box*** for indicating that blowdown occurred in the subject stand. Blowdown also may have occurred in neighboring stands, but availability of more local blowdown is considered an overriding influence in the **SBexpert** risk model, so selecting the ***check box*** *tor* occurrence of blowdown in the subject stand increases the factor score assigned to blown-down material.

After selecting the ***OK button*** in the fourth display of breeding materials (logging material), the **New Risk** topic displays a message about default weather conditions that are assumed for the initial phase of the SBexpert risk analysis (fig. 37).

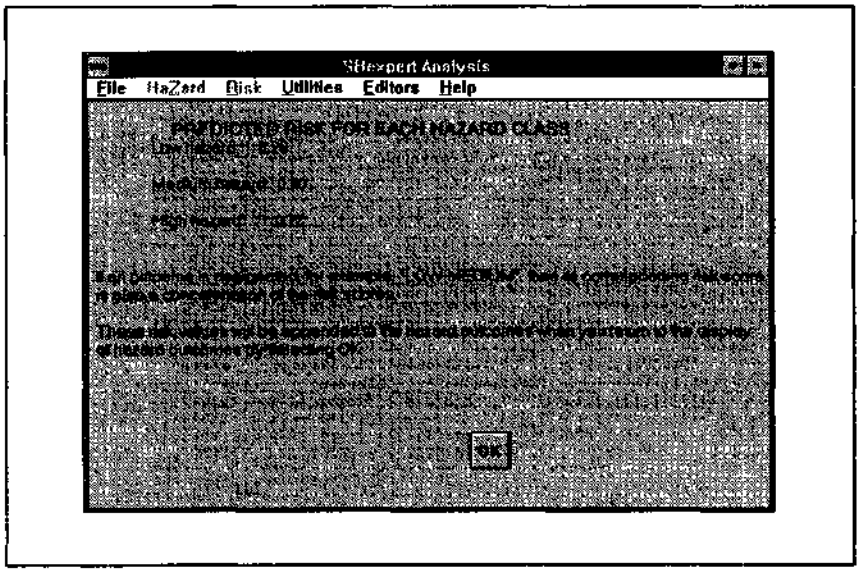

Figure 38—Risk predictions associated with each hazard class.

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, 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 **New Risk** topic.

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. 38). Select the ***OK button*** (Key: Enter) to return to the display of hazard outcomes (fig. 39). The original display of hazard outcomes (fig. 28) is updated by appending the predicted risk values to the hazard outcomes displayed in the list box (fig. 39) and a message is displayed at the bottom of the window, 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.

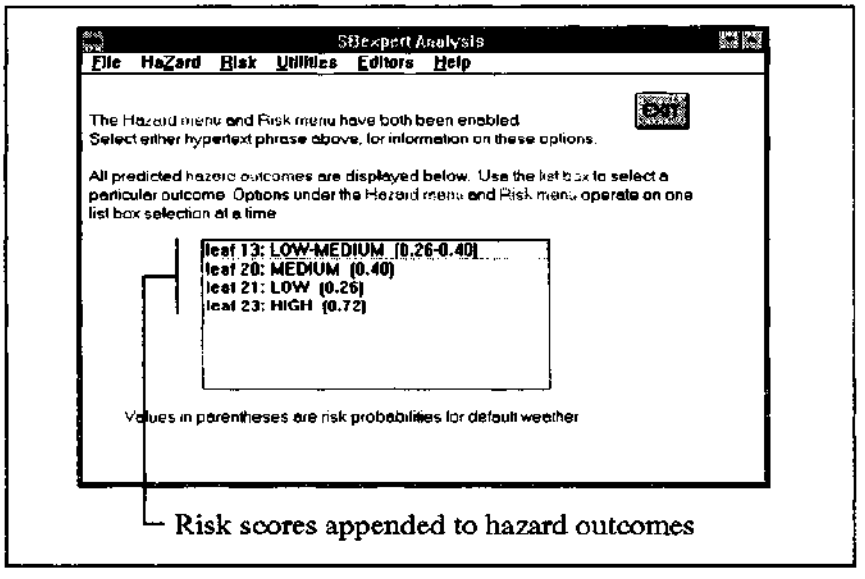

Figure 39—Modified list of hazard outcomes with risk estimates appended.

The Weather topic—The initial risk analysis performed in **New Risk** is based on default weather conditions 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. 37), select *Weather* from the ***Risk menu*** (Key: ALT+R, W). The window for the **Weather** topic opens to display choices for daily maximum air temperature conditions in the previous June in a set of ***radio buttons*** (fig. 40).

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

After the **OK *button*** is selected, the **Weather** window changes to a display requesting input of total cumulative rainfall in a normal (average) year and in the past summer (fig. 41). 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.

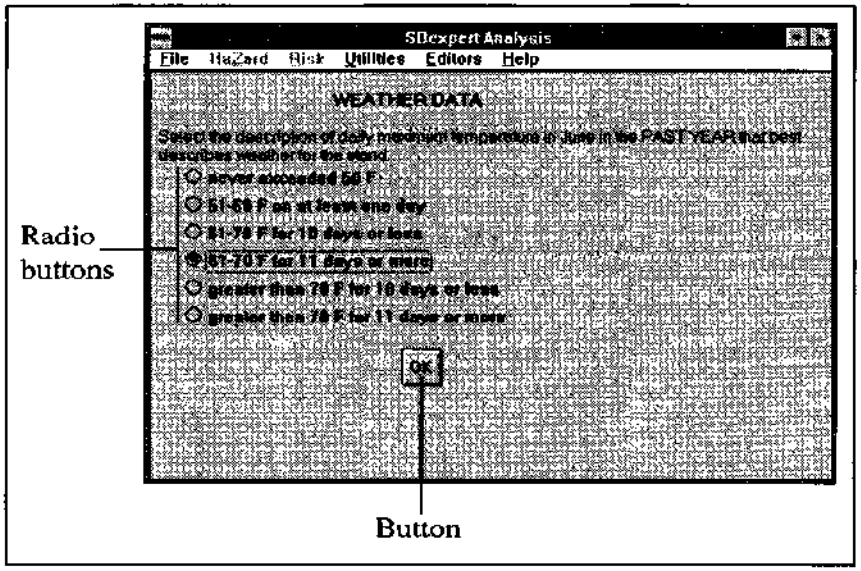

Figure 40—Overriding default air temperature assumptions in the risk model.

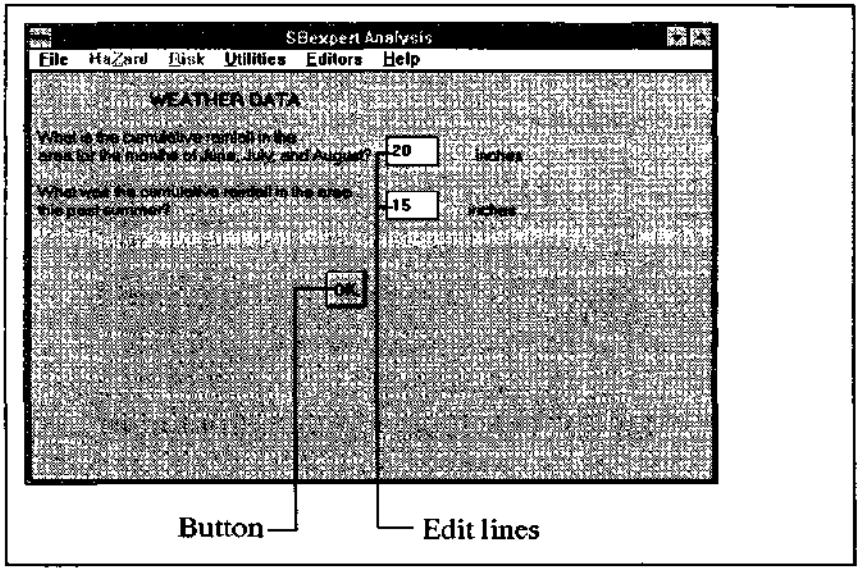

Figure 41—Overriding default rainfall assumptions in the risk model.

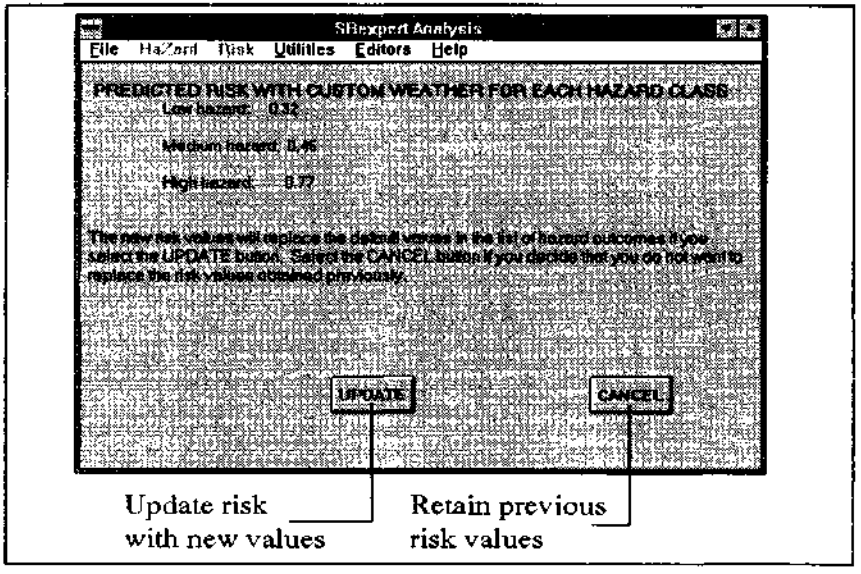

Figure 42—Modified risk predictions associated with each hazard class after overriding default weather conditions.

4. Select the ***OK button*** (Key: Tab, Enter) to proceed.

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 the ***OK button*** is selected, the **Weather** topic window displays a new set of risk predictions for each hazard class (fig. 42).

- 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. 39). 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.

The Risk Advice topic—To open **Risk Advice,** select *Risk Advice* from the ***Risk menu*** (fig. 34, Key: ALT+R, R).

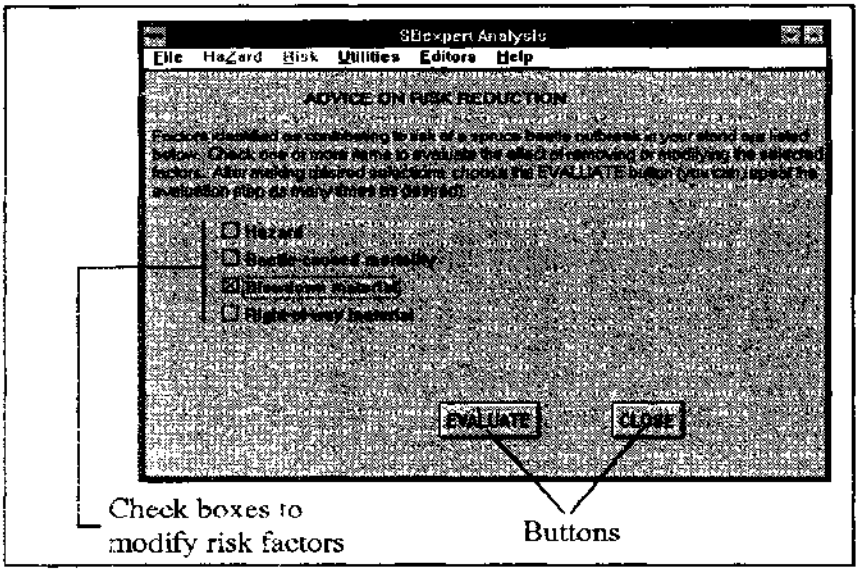

Figure 43—Evaluating the influence of altering risk factors.

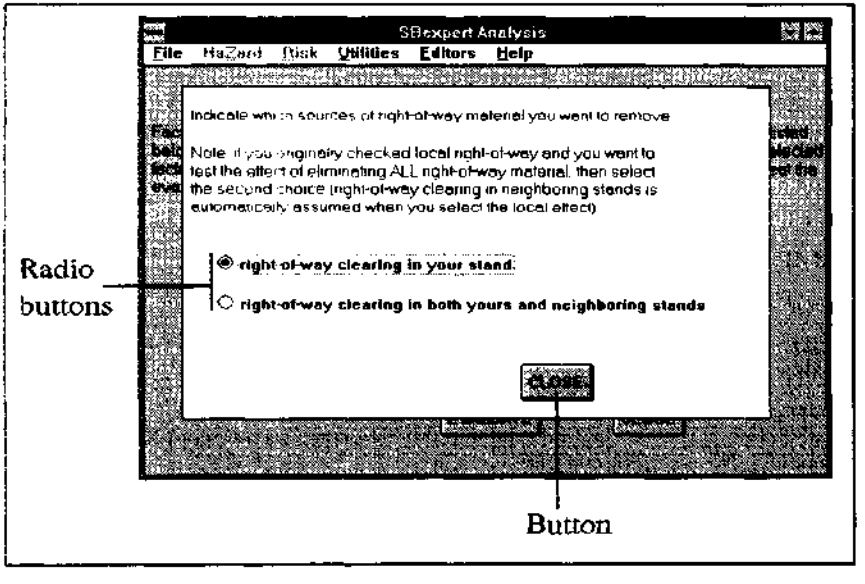

Figure 44—Example of modifying a risk factor.

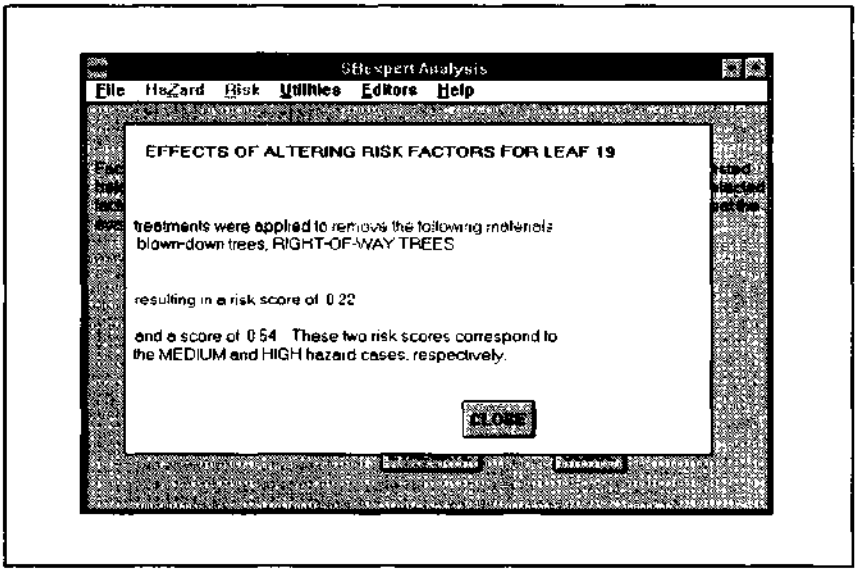

Figure 45—Example of a risk evaluation with modified risk factors.

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. 43).

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. 44). Select the appropriate ***radio button*** (Key: **arrow,** Enter).
3. Select the ***OK button*** (Key: Tab, Enter).

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

4. Select the ***EVALUATE button*** (fig. 43).

A brief report of effects of the proposed changes in risk factors is then displayed (fig. 45). 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

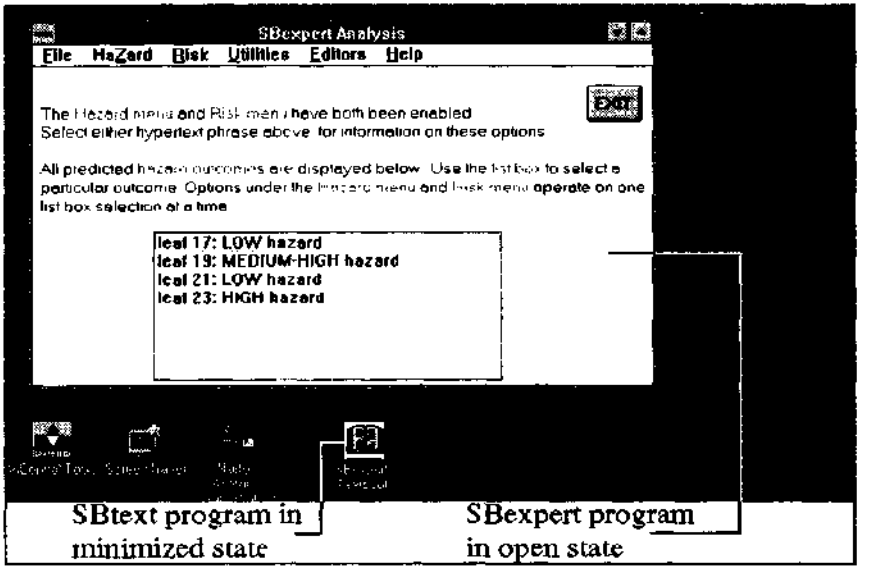

Figure 46—Example of a minimized program icon.

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. 45) 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. 43), select the ***CLOSE button*** to close the **Risk Advice** window and return to the listing of the hazard outcomes.

Switching Among Running Applications

SBexpert, SBtext, and **SBlit** as well as **SBhelp** are now independent programs. Any or all SBexpert programs can be running at the same time, but only one can be active at any given instant.

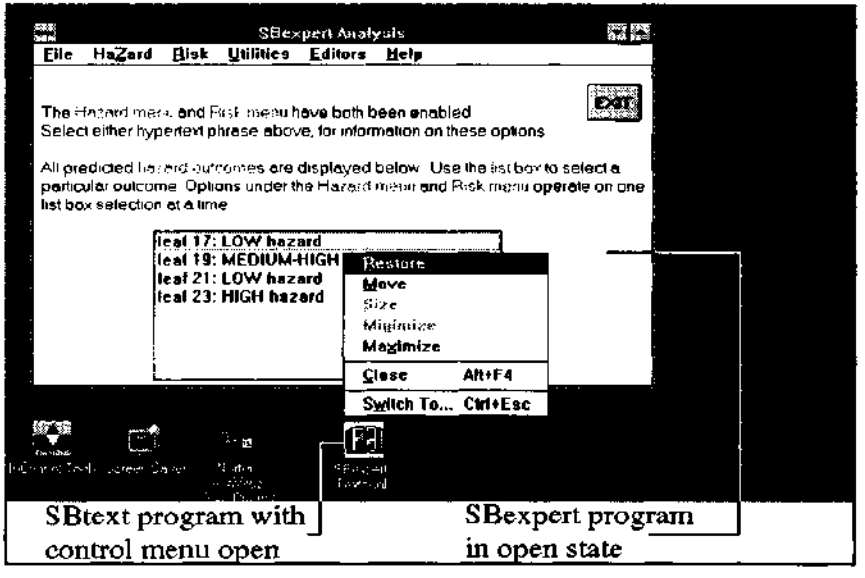

Figure 47—Opening the ***control menu*** on a minimized program icon.

When two or more MS Windows applications are running concurrently, it is possible to switch among 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 screen (fig. 46).

To switch from any of the SBexpert programs, for example, to any other MS Windows application (including another SBexpert program) that is already running and that has not been minimized, simply select the program window of the desired application to make the program window active. There are three keyboard methods that also can be used. The basic method is as follows:

1. Open the ***control menu*** (ALT+SPACEBAR) of the currently active program window.
2. Select *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 ***Switch To button*** (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. 47):

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).**

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 Research Station, Logan, Utah; and Borys Tkacz, USDA Forest Service, Forest Pest Management Southwestern Region, 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

Microprocessor: An 80386 microprocessor is required for SBexpert version 2.0.

Operating system: SBexpert runs on IBM® personal computers and compatibles with either PC-DOS or MS-DOS operating systems, running Microsoft Windows 3.1 or Windows 95.

RAM: 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.

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

Disk space: SBexpert requires 7.1 MB of memory, 3.7 MB of which is needed for storage of graphic images of stands. A larger, more complete set of stand images that requires 14.4 MB of disk space also is available from the senior author.

Mouse: A mouse pointer device is not required to use SBexpert, 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
Scroll in text window	arrows, PgUp, PgDn
Move to object (a set of radio buttons is a single object):	
move forward	Tab
move backward	SHFT+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. 1997. SBexpert users guide (version 2.0): a knowledge-based decision-support system for spruce beetle management. Gen. Tech. Rep. PNW-GTR-401. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 62 p.

SBexpert version 2.0 is a knowledge-based decision-support system for spruce beetle *(Dendroctonus rufipennis* (Kby.)) management developed for use in Microsoft (MS) Windows with the KnowledgePro Windows development language. Version 2.0 is a significant enhancement of version 1.0. The SBexpert users guide provides detailed instructions on the use of all SBexpert features. The SBexpert application now consists of four separate programs: **SBexpert** (formerly, the Analysis topic in version 1.0), **SBtext, SBlit,** and **SBhelp. SBexpert** 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 application of the full system. **SBtext** and **SBlit** provide complementary decision support. **SBtext** provides background information on the biology, ecology, and management of spruce beetles. **SBlit** provides database utilities for retrieving literature citations. 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 MS Windows system-level help, window-specific help, a text editor that facilitates preparing standard reports from **SBtext,** and automatic report generation in **SBexpert.**

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

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