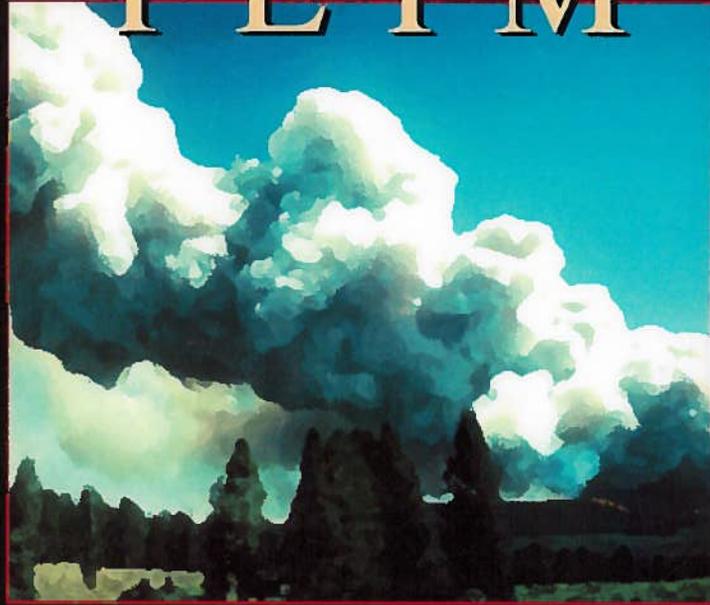


FIRE EFFECTS TRADEOFF MODEL

FETM



## FETM 4 User Manual

A Landscape-Scale Planning Model for  
Air Quality Specialists and Fire Managers



Prepared by Air Sciences, Inc.  
with assistance from TW Environmental, Inc.

March 2002

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# 1 Getting Started

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## 1.1 Introduction

The Fire Effects Tradeoff Model Version 4 (FETM 4) is a landscape-scale, strategic planning model designed to simulate the long-term tradeoffs between wildland fire and various fuel treatment alternatives over large areas of the landscape encompassing diverse environmental conditions, natural fire regimes, and land management policies.

FETM 4 has nationwide application, and can be used by any federal, state, or private organization. The model is aimed at land management planners, fire planners, air quality specialists, and other resource specialists who seek a model capable of assessing the long-term consequences of land management practices, and which can provide the information needed to:

- ❑ Support budgeting and planning decisions
- ❑ Identify the economic and environmental tradeoffs between fuel treatment alternatives and wildland fire
- ❑ Assess the long-range impacts to ecosystems
- ❑ Assist fuel specialists in identifying specific vegetation types to target for fuel reduction

A diversity of outputs are available from FETM 4, including annual fuel treatment acres (planned and accomplished), annual wildland fire acres burned by fire intensity level, annual vegetation composition, annual pollutant emissions, and annual costs and benefits of wildland fire versus various fuel treatment alternatives.

At its core, FETM 4 is a vegetation dynamics model that simulates changes in vegetation composition over time in response to various human-caused and natural disturbances. A wide variety of disturbances may be accounted for in the model, including timber harvesting and other forms of fuel removal (e.g., firewood collection), mechanical fuel treatments, prescribed fire, wildland fire, windthrow, insects, disease, and, in the absence of disturbance, natural succession. A key feature of FETM 4 that distinguishes it from other vegetation dynamics models is its link between vegetation composition (fuel loading) and wildland fire behavior and effects. For example, an increase in the proportion of highly flammable vegetation classes in an area will produce a concomitant increase in the number of wildland fire acres burned annually. Over time, this increased number of wildland fire acres burned (a form of natural fuel treatment) can, in combination with other management actions, reduce the proportion of highly flammable vegetation classes across the landscape and lead to a reduction in the number of wildland fire acres burned annually.

The amount of wildland fire and other fuel treatments required to “tip the scales” in favor of lower average flammability (and lower numbers of wildland fire acres burned annually) depends on the magnitude of the fuel treatments (outflow) as it relates to the rate of recruitment into the more flammable vegetation classes (inflow) resulting from a combination of natural disturbances

(e.g., insects, disease, windthrow), management activities (e.g., timber harvesting), and natural succession.

FETM 4 is non-spatial, meaning that while it can predict the overall outcome of a treatment (for example, prescribed fire) within a specific Analysis Area, it cannot predict where specific impacts may occur. For example, within a particular stand type (immature mixed conifer, for example), FETM 4 can predict the number of acres of the stand that will be affected by wildland fire, but cannot predict where within the stand those effects will occur or if they will be contiguous or dispersed.

Because it is a dynamic model, FETM 4 can predict changes in landscape composition over time. The resultant changes can then be used by the model to predict air quality emissions during a planned or unplanned fire event, costs associated with controlled or uncontrolled burns, and treated acres.

FETM 4 is also a stochastic model because it includes one or more random variables. Currently the random variables include annual wildland fire numbers by fire weather class and wildland fire size for the fires that fall outside the range of recent historical data for the Analysis Area.

## 1.2 System Specifications

	<b>Minimum</b>	<b>Recommended</b>
Processor Speed	266 MHz	400+
Available Disk Space	200 MB	400 MB
Random Access Memory	64 MB	128 MB+
Screen Resolution	Running FETM 4 at less than 1024 by 768 pixels may result in the right-hand side of the screen being cut off in the display.	1024 by 768 pixels
Color Resolution		True Color (32-bit)
CD-ROM Drive	Required	Required
CD-Read/Write Drive		Recommended for storing Analysis Area-specific database files

FETM 4 must be run at a screen resolution of 1024 by 768 pixels or greater for you to see all of the screens. To set your screen resolution, click on your Windows “Start” button, and then select “Settings,” and then “Control Panel.” At the Control Panel, double click on the “Display” icon. Select the “Settings” tab. In the lower left corner of the dialog box is a slide control labeled “Screen Area.” Slide the control toward “More” until the reading under the slide control reads “1024 by 768 pixels” or greater, then mouse click on “OK.” The computer will automatically reset your screen resolution. You can also reset your color resolution in this same area by selecting the appropriate color resolution from the pull-down menu.

## 1.3 Installation

To install FETM 4 on your computer:

- ❑ Insert the FETM 4 CD-ROM in your CD drive.
- ❑ The Setup routine has an auto-start feature that automatically begins the setup process.
- ❑ If the program doesn’t auto-start:
  - From the Windows START menu, select “Run.”
  - At the “Run” dialog box, select “Browse.” Select your CD drive, then select the FETM subdirectory.
  - Once you are in the FETM subdirectory, click twice on the “Setup” icon.

The Setup program will automatically guide you through the remainder of the process. The following “shortcut” icon will automatically be installed on your computer desktop.



FETM 4 requires that you have a version of the Personal Computer Historical Analysis (PCHA) available on your computer system. If you do not currently use PCHA, you can obtain a copy online at:

<http://www.fs.fed.us/land/fire/pcha.htm>

Instructions for installing that program are included online.

## 1.4 On Your Mark...Navigating Inside FETM 4

Before you begin to use FETM 4, there are a few things to know about the program and how it works.

### Index Tree Diagram

The opening screen of FETM 4, shown below, features an Index Tree on the left and a graphic display on the right. The Index Tree will run in the background at all times while you are using FETM 4. You can access it at any time by simply minimizing the active window. The Index Tree serves a directory to the program—you can click on any of the colored boxes, called branch nodes, to bring up sections of the program. You should generally start at the top of the list and progress to the bottom, expanding the branch nodes as needed to access additional forms.

Some branch nodes are marked with small boxes to the left that contain either a + or a – sign. A plus sign indicates that the branch node is contracted—specifically, that there are more menu items beneath the node. A minus sign indicates that the branch node is expanded and all choices are currently shown.



## Process Diagram

A process diagram is also available from the help menu on the opening screen. The process diagram is shown in rough order of execution and should help you decide which areas of the model need your input. To access the process diagram, select “Help” from the pull-down menu on the opening screen, and then select “Process Diagram.” A printout of the Process Diagram is included at the end of this section.

## On-Line Help System

Online help is also available from the pull-down menu. Simply select “Help,” then “Contents” and select the appropriate topic. Online help is not available for the HAIA portion of the program.

## **Read-Only Boxes**

Several screens, particularly pop-up boxes, have an “Open as read-only” box at the bottom of the screen. This option is frequently non-functional—the box is standard in the browser box utility that FETM 4 uses. Please ignore it.

## **Changing Column Widths in Spreadsheet Forms**

Several forms may appear onscreen with overlapping columns. To change the column widths, simply hold the cursor on the vertical line separating the column headings until a double vertical line appears ( || ). Holding down the left mouse key, move the double vertical line to the left or right to change the column width. You can save the column widths on these screens by selecting the gray “Save column widths” button at the bottom of the screen.

## **Entering Data on Forms**

FETM 4 uses input from external files as well as user input. In addition, some forms require user input to compute information that will appear on other forms. Boxes that are not shaded allow user input or can be edited. Boxes that are shaded are shown for your information, but cannot be edited.

You must exit one program area before you can access another area of the program. You can do this by clicking on the “X” in the upper right-hand corner of the window. Some windows also have a “Close” button located at the bottom of the screen that you can select to close the window. Or you can simply click on any other Index Tree item without closing the current window first; the current form will be automatically closed before the new form opens.

## **Tool Tips**

Tool tips are pop-up text boxes that explain the contents of the cell you point to with your mouse. They are only available on the command button of selected forms. Tool tips are also available on the “Run Status” form to indicate the screening criteria that were used to determine completeness. This will be explained in further detail in the “Run Status” section of this manual.

## **1.5 Get Set...Some Important Information on the Modeling Process**

Before you begin using FETM 4, here are some important facts to know about the modeling process and how it should be conducted.

### **Forming an FETM 4 Application Team**

Because of its breadth and high degree of complexity, FETM 4 is a model that is best used in a team setting. FETM 4 will require input and expert knowledge from several natural resource disciplines, including, but not limited to, fire planners, fire ecologists, air quality specialists, fuel specialists, and vegetation management specialists. At least one member of the team should be a person who is highly computer literate, and whose skill and experience are in the discipline

area for which the modeling analysis is being conducted. For example, if FETM 4 is being used to analyze the long-term effects of alternative management policies as part of a forest plan update, then the team should include a forest-planning specialist. Or, in another example, if FETM 4 is being used to evaluate the tradeoffs between wildland fire and prescribed fire smoke emissions, then the team should include a regional or zone air quality specialist. The team leader's responsibility is to coordinate the group of specialists. No single person is likely to have the range of skills necessary to run the model by themselves. In our experience, the average FETM 4 team consists of five professionals. Appendix A is a description of FETM 4 team roles.

## **Overview of the Modeling Process**

The FETM 4 model that accompanies this manual has been programmed with a demonstration (Demo) scenario to help you understand how the program works. The Demo scenario includes 98 fuel characteristic classes, and is based on a forest mixture of 2/3 chaparral and one to two timber forest types. The Demo scenario is based on data from the Angeles National Forest in southern California. It has been modified for instructional purposes, and should not be taken as an accurate reflection of that analysis area. Your results will be different.

The FETM 4 modeling process is a series of five steps, described below.

### *Selecting an Analysis Area*

FETM 4 has been designed to analyze impacts within a particular geographic area called an Analysis Area. An Analysis Area may be a single administrative unit (AU) (for example, a National Forest, BLM District, or National Wildlife Refuge), or any combination of administrative units (for example, two or more National Forests or BLM Districts), or portions of administrative units, provided those different units form a single, contiguous area. The modeling objectives usually dictate the appropriate geographic scale.

### *Stratifying the Analysis Area by FCCs*

Once the Analysis Area has been identified, it may be stratified into a series of user-designated vegetation and fuel-loading classes called Fuel Characteristic Classes (FCCs). Each FCC is a unique description of the total fuel bed, which begins at mineral soil and ends at the top of the tallest shrubs or trees occupying each site. In FETM 4, FCCs are described in terms of qualitative, quantitative, and stand characteristics, which are summarized below.

The four qualitative attributes are:

- Predominant vegetation
- Age class
- Loading class
- Activity class

FCCs can be described quantitatively in terms of a host of physical parameters that relate to fuel loading of dead-and-down woody fuels, including:

- Size class
- Duff loading
- Fuel bed depth
- Fuel moisture content

Lastly, FCC descriptions include stand characteristics such as:

- Height to the base of the live crown
- Foliage and 1-hour fuel loading
- Stand density
- Average stand diameter
- Total stand height

Because of their differing characteristics, each FCC has potentially different fire behavior (e.g., fire spread rate), disturbance effects, fuel consumption, and emissions.

The process of stratifying the area into FCCs is one of the more challenging aspects of FETM 4, mainly because how best to characterize the Analysis Area is entirely at the user's discretion. There is no limit on the number of FCCs that may be defined: the user may define just a few, or several hundred. The greater the number of FCCs selected, the greater the resolution in defining successional and disturbance pathways, the greater the accuracy of the simulation process. However, the decision to employ many FCCs comes at a considerable price in terms of the difficulty of obtaining the required inputs and the time it takes to enter the data and to run the model. Experience has shown that most Analysis Areas of up to 1,000,000 acres in size can be adequately described with fewer than 200 FCCs.

### *Defining Disturbance Types and Effects*

Once the Analysis Area has been stratified into FCCs, the types and effects of disturbances may be characterized. The effects of various management-related and natural disturbances on vegetation composition and fuel loading are simulated in FETM 4 using a system of schedules and effects matrices. The schedules define the magnitude of the disturbance (i.e., the number of acres that are affected annually), and the effects matrices define the direction of change following the disturbance. In the case of wildland fire disturbances, FETM 4 predicts the magnitude of the disturbance.

Form-based schedules are used to assign the magnitude of disturbance from selected management activities, such as timber harvesting, mechanical fuel treatments, and prescribed fire. Schedules are also used to define the magnitude of disturbance from some natural causes such as insects, disease, and windthrow. Each FCC must be scheduled separately. If no acres are entered in the schedule for an FCC, it means that no disturbance is expected for that FCC. The effects matrices are populated with fractional numbers that determine the number of acres transferred from the parent FCC to one or more sibling FCCs following disturbance. FETM 4

contains one matrix for each disturbance type except fire, which uses three separate disturbance matrices (one for each of three fire intensity classes: low, moderate, high). Each column in the matrix represents a different parent FCC; each row represents a different sibling FCC.

In FETM 4, the effects of a disturbance are always manifested as a transfer in the number of acres from one FCC to one or more FCCs following the disturbance. For example, the effect of a moderate-intensity wildland fire in an overstocked, immature Ponderosa Pine FCC might be to transfer 50 percent of the parent FCC acres to bare ground, and 30 percent to an immature Ponderosa Pine FCC with a lower stand density and lower total surface fuel loading. In this example, 20 percent would remain in the parent FCC; that is, 20 percent of the area is assumed to be unaffected by a moderate-intensity wildland fire.

### *Defining the Relationship between the Fire Spread Rate and Expected Wildland Fire Size*

Wildland fire is treated as a random (stochastic) event for which size varies according to the fire weather conditions and the vegetation composition within the Analysis Area. The largest fires are expected to occur under high or extreme fire weather conditions, when the fire rate of spread is the greatest. Smaller fires are expected under low or moderate fire weather conditions, when the expected spread rates are lower.

The accuracy of the fire size simulation in FETM 4 depends on a reasonable characterization of the relationship between the expected fire size and the fire rate of spread in each of four fuel categories: timber litter, slash, grass, and brush. To build these relationships, an experienced fire planner or fire behavior analyst is needed to evaluate the fire rates of spread required to achieve a set of fixed—or breakpoint—fire sizes: 0.25 acre, 10 acres, 100 acres, 300 acres, and 1,000 acres. A fire behavior analyst is also needed to survey the recent historical record and to extract representative wind-driven “escaped” wildland fires (that is, wildland fires that escaped initial attack), and whose size and active spread time is known.

A separate but related task in FETM 4 is to characterize each of the four National Fire Danger Rating System (NFDRS) fire weather classes in terms of ranges of computed spread components. The median spread component for each fire weather class is used to determine the expected fire size in that fire weather class, and indirectly to determine the average weather conditions within each fire weather class.

### *Defining Scenarios and Running the Model*

Prior to running the model, the user must define a *scenario*. A scenario (also called a *run scenario*) is a set of assumptions used to define a modeling analysis within the Analysis Area. A scenario is defined by the following inputs and assumptions (partial list): a set of FCCs with initial acreage estimates for each, a set of schedules and disturbance types, effects matrices, and other factors such as pollutant species to model, number of years in the simulation, and the number of simulation iterations over which to average simulation outputs.

FETM 4 may be run with a single iteration, or averaged over multiple iterations of the model. A single iteration provides the user with a view of the episodic pattern of wildland fire. Because of the stochastic nature of FETM 4, the outcome of individual simulations can vary widely; therefore, averaging multiple runs of FETM 4 is recommended to provide an adequate sampling of the consequences of wildland fire in combination with various fuel treatments designed to achieve certain resource objectives or to mitigate the hazard of wildland fire.

Prior to initiating a run, the program will automatically display a "Run Status" form. This form contains a listing of the various required inputs, and the current status of the inputs is listed as either "Complete," "Questionable," or "Incomplete." The model will not run if any "Incomplete" messages are found.

Running the program may take from 5 minutes to 30 minutes depending on the complexity of run scenario and the speed of the machine that FETM 4 is running on. A model run consisting of 200 FCCs, 7 levels of prescribed fire treatment, and 2 pollutants over 100 years of simulation takes about 5 minutes on a Pentium III/300 Megahertz coprocessor with 128 Megabytes RAM.

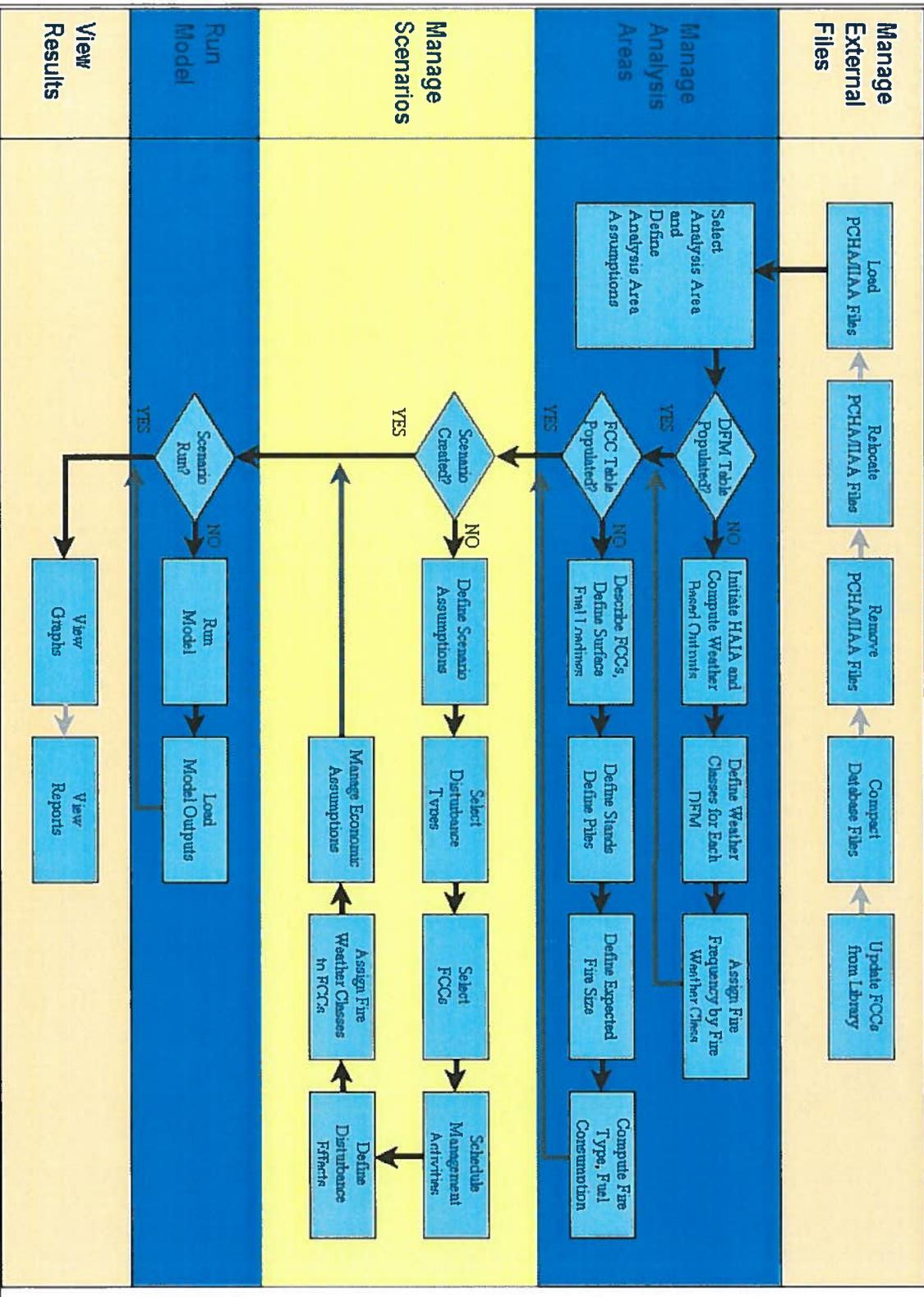
After the run is complete, the user must load the outputs into the model database to view the graphs. This is discussed further in Section 5, Run Model. This process normally takes less than 5 minutes per scenario. A detailed discussion of FETM 4 ASCII Output Files is located in Appendix B.

## **1.6 Go!**

The remainder of this manual is ordered to follow the process diagram.

# Process Diagram for Fire Effects Tradeoff Model Version 4.2

*Click on Annotated to View Help*





## 2 Managing External Files

---

FETM 4 uses basic information on the administrative units that make up the Analysis Area, which it obtains from Microsoft Access database files produced by both the Personal Computer Historical Analysis (PCHA) and the Interagency Initial Attack Assessment (IIAA) models. PCHA is a PC program developed to complete the historical fire and weather analyses required for the National Fire Management Analysis System (NFMAS). PCHA is designed to help analyze historical wildland fire occurrence for wildland fire planning. IIAA is used to develop budget requests as part of the NFMAS process.

In this section you will select and manage those files that will be used to support the modeling analyses that you perform in the “Manage Analysis Areas” section of the program. You will need to obtain these files from the fire management or fire planning specialist responsible for those administrative units that you intend to use in defining your Analysis Area.

### 2.1 Load PCHA/IIAA Files

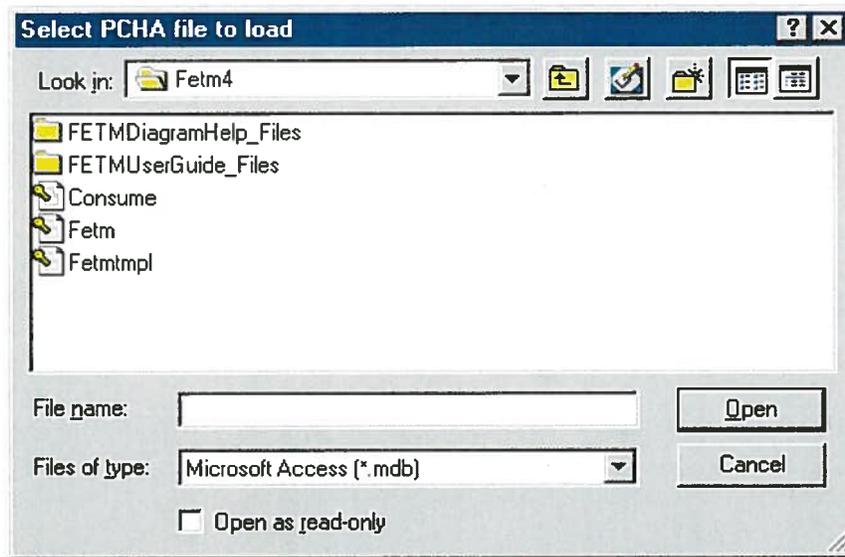
In this program area users load NFMAS descriptive information from their administrative unit-specific PCHA and IIAA database files. You must load a PCHA file before FETM 4 can be run. PCHA files can be obtained from the fire planning specialist responsible for those administrative units that you intend to include in your Analysis Area. In addition, FETM 4 requires that you have a version of PCHA available on your system. This can be obtained online at:

<http://www.fs.fed.us/land/fire/pcha.htm>

Installation instructions and a user guide are also available online.

Prior to this step, you must obtain the appropriate PCHA and IIAA database files for each administrative unit found within the desired Analysis Area, and place the database files in a folder on your computer’s hard drive. These files may be obtained from the unit’s fire planning staff. Once obtained, the files may be stored anywhere on the hard drive that makes sense to the user and can be navigated to easily; the storage folder need not be placed in the same area as the FETM 4 program files.

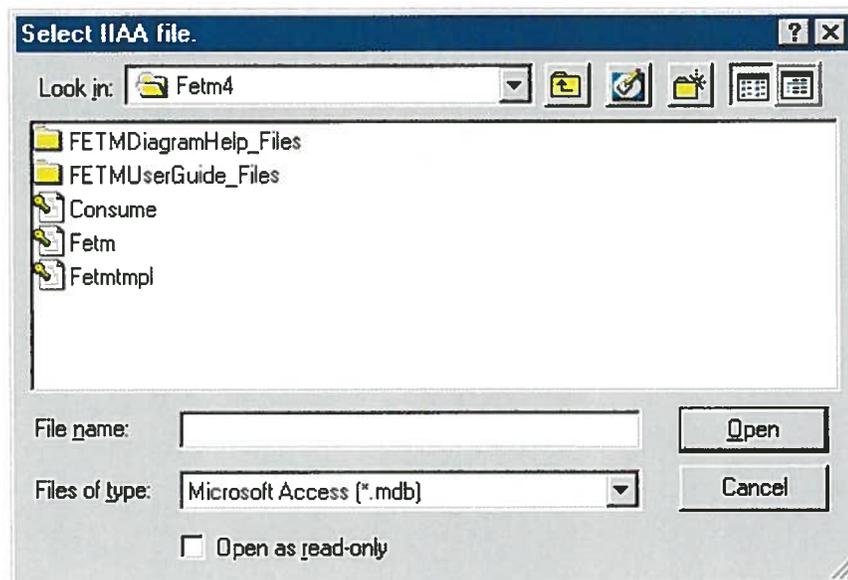
To load (or more correctly, to *link to*) the PCHA and IIAA files, click on the colored box next to “Load PCHA/IIAA Files” on the Index Tree. The following pop-up window will appear onscreen:



Navigate to the directory containing the desired PCHA file. Next, highlight the PCHA file you want to load, then click on the “Open” command button. You may also double-click on the target file name. Disregard the “Open as read-only” option, which is not functional but comes standard in the browser box utility that FETM 4 uses.

Once the PCHA file has loaded, the window to the right will appear. Again, navigate within the window to the target IIAA file, highlight it, then click on the “Open” button. You may also double-click on the target file name.

FETM 4 does not acknowledge that the file has loaded, so this screen will remain open until you close it. You can close this box by clicking on the “X” in the upper right-hand corner.



## 2.2 Relocate PCHA/IIAA Files

This program area allows you to relocate PCHA and IIAA files that have been previously loaded. You may direct an Analysis Area to use a different PCHA or IIAA file, or to use the same files that have been relocated to a different directory. You may wish to do this to keep the reference files together in a file folder with the Analysis Area files that you will create.

To relocate files, click once on the box to the left of “Relocate PCHA/IIAA Files” on the Index Tree. The following form will appear onscreen:

Available PCHA and IIAA Files									
	Unit	Name	Agency	Region	State	Year From	Year To	PCHA File	IIAA File
▶	01	Angeles National	F	05	CA	1974	1983	C:\FETM4\adata\Demo\p	C:\FETM4\adata\Demo

Browse for PCHA File New Location    Browse for IIAA File New Location   

Note: To change the column widths, simply hold the cursor on the vertical line separating the column headings until a double vertical line appears (||). Holding down the left mouse key, move the double vertical line to the left or right to change the column width. To enable the word-wrap feature (essential for viewing the entire contents of the cell), hold the cursor on the *horizontal* line between the rows on the left-hand side until a double horizontal line appears. Then, holding down the left mouse key, move the double horizontal line up or down to change the row height and to initiate the word-wrap feature.

Shaded cells (gray or yellow) cannot be edited, although white cells can be. In this form, only the PCHA and IIAA file locations can be changed. You can either change them by clicking twice in the PCHA or IIAA File fields and typing the new location directly into the field, or by clicking on the “Browse” buttons at the bottom of the page. These will allow you to navigate through your pull-down menus to select a new location for the PCHA or IIAA files. Once you have selected a new location, click on “Open.” Although no confirmation will appear onscreen, your files will be saved in the new location.

The following information from the PCHA file appears in this window. It can only be edited by clicking on “Manage Analysis Areas” and “Define Analysis Area” on the Index Tree.

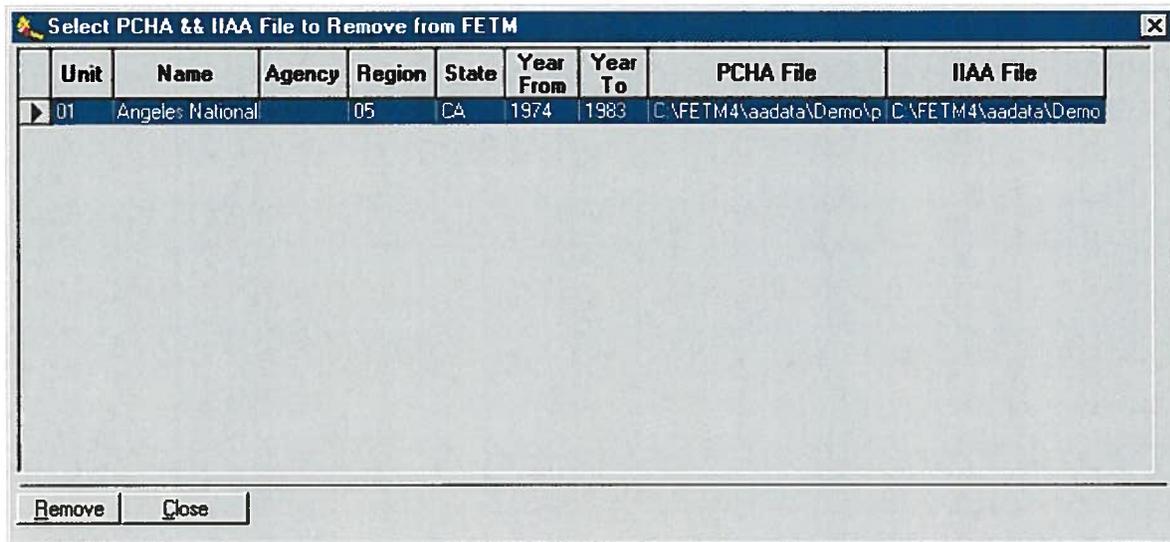
- Administrative unit number
- Name of administrative unit
- Agency name
- Region
- State in which administrative unit is located
- Starting year of NFMAS analysis
- Ending year of NFMAS analysis

You can click on the “Close” button at any time to close this window.

### 2.3 Remove PCHA/IIAA Files

This program area allows you to delete library information on an existing PCHA or IIAA file. This may be necessary to clean up the files associated with a deleted Analysis Area, or to delete any “old” PCHA or IIAA files that have been replaced by different or updated files. It is primarily a housekeeping function.

To remove a set of PCHA and IIAA files, click once on the colored box to the left of “Remove PCHA/IIAA Files.” The following screen will appear:



To delete the FETM 4 link to the file, highlight the target row by clicking on the gray box to the left of the “Unit” field. An arrow will appear in the field. Then click on the “Remove” command button on the lower left side of the form.

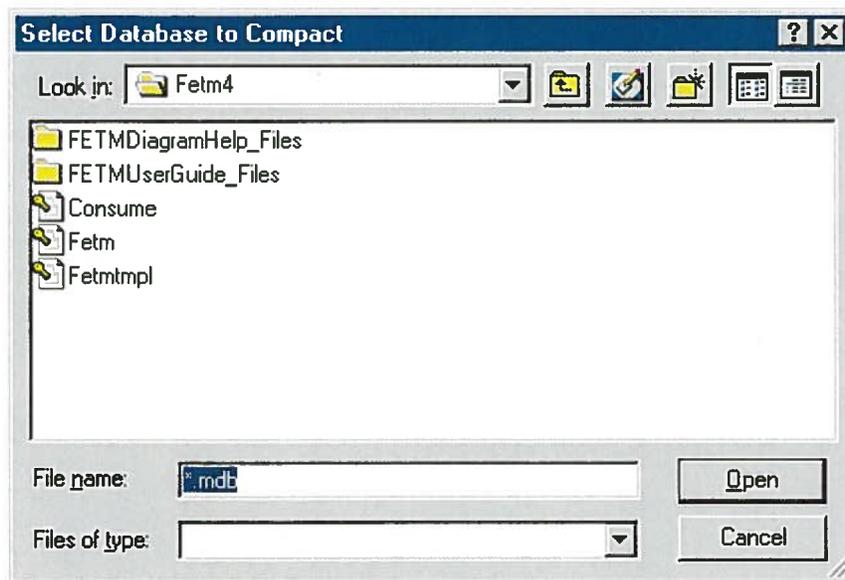
This action will not delete the PCHA or IIAA files themselves. It will only remove the library information stored in the fetm\_dat.mdb (Microsoft Access database file) that is used by FETM 4.

To adjust the column widths, hold the cursor on the vertical line separating the column headings until a double vertical line (||) appears. Holding down the left mouse key, move the double vertical line to the left or right to change the column width.

## 2.4 Compact Databases

The Analysis Area database file can grow large enough to impair the performance of FETM, and may even cause FETM to crash. You should compact the Analysis Area databases files frequently to prevent these problems.

To compact a file, click on the colored box or line shown to the left of “Compact Databases” on the Index Tree. A dialog box will appear that says, “This operation will take several minutes to complete. Do you want to continue?” If not, select the “no” button. To compact files, select the “yes” button. This will reveal the following window:

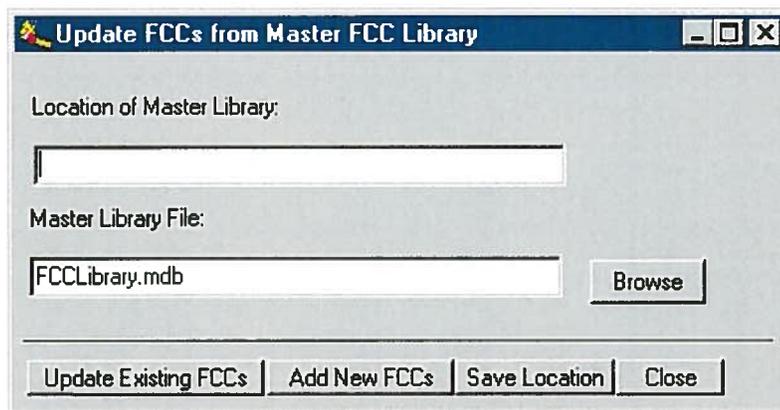


Now navigate to the file you wish to compact, highlight it, then click on the “Open” button in the lower right-hand corner. Double clicking on the target file name will also initiate the compaction routine. When it is completed, a dialog box with the words “Database compact complete” will appear onscreen. Click “OK” to close the dialog box.

## 2.5 Update FCCs from Library

FETM 4 reads data on the default fuel characteristic classes (FCC) from a separate FCC library file (FCCLibrary.mdb) stored in the FETM program directory. A total of 206 FCCs are considered to be “system FCCs.” Additional FCCs can be added in the “Define FCCs” segment of this manual (see page 59). A description of what constitutes an FCC is included in the Glossary.

To modify the FCC library or to update the FCC data for the current Analysis Areas, click on the colored box to the left of the words “Update FCCs from Library” on the Index Tree. The following window will appear:



To update the FCCs in a current (and open) Analysis Area from the FCC library, click on the “Update Existing FCCs” button on the bottom of the screen. When the update is complete, a message box with the words “FCCs Updated” will be displayed. Only the active Analysis Area will be updated. To activate an Analysis Area, see “Select Analysis Area” (see page 22).

New FCCs may be created inside an Analysis Area and the FCC library file can be updated by clicking on the “Add New FCCs” button at the bottom of the screen.

If the user moves the original setup location of the FCC library file, relocate the file by browsing to the new location using the “Browse” button on the right side of the screen. Once you have done this, you need to click on the “Save Location” button at the bottom of the screen to relocate the files.

The “Update FCCs from Master FCC Library” window may be closed at any time by clicking on the “Close” button or the “X” in the upper right corner.



## 3 Managing Analysis Areas

---

This section of the program allows you to add, copy, delete, or select areas for analysis. The Analysis Area forms the basis of the FETM modeling and reports. Each Analysis Area is unique as defined by you, the user. An Analysis Area can encompass one or several administrative units, or can be made up of parts of one or several administrative units. "Manage Analysis Areas" is the main program area of FETM 4. Here Analysis Areas are created and modified, scenarios within an Analysis Area are created and modified, and scenarios are run and outputs generated.

To access the options within the "Manage Analysis Areas" section of the program, click on the + sign to the left of "Manage Analysis Areas" on the Index Tree. The Index Tree will then expand to show you additional selections, which are discussed in the following sections.

### 3.1 New Analysis Area

This section of the program allows you to create new Analysis Areas, including name, description, a unique file code, and an associated eco-region. It also allows you to identify those specific administrative units that should be included in the modeling analysis.

To create a new Analysis Area, click on the colored box to the left of "New Analysis Area" on the Index Tree. You must then fill in the white (user-edited) boxes in the window shown below.

These user-required entries include:

- Name**            Enter any string of characters to describe the new Analysis Area.
- File Code**        Enter a one to four character code to uniquely identify the new Analysis Area (e.g., BW01, 123, yz).
- Eco-Region**      Select an eco-region code by clicking on the pull-down box on the upper right of the screen. If you are unsure about the appropriate Eco-Region, mouse click on the “View Eco-Region Map” button located at the bottom of the screen to see a map of the eco-regions. You cannot copy numbers from the Eco-Region map, so you will need to make a note of the appropriate eco-region number to include in the program.
- Description**      Enter a description of the Analysis Area (optional).
- n**
- Option**            Select the suppression organization option identifier (“Option”) by highlighting the appropriate code on the pull-down menu.

The remainder of the information on the screen is updated from the external PCHA/IIAA files using the selection buttons at the bottom of the screen, which are described below.

**Previous AU/**  
**Next AU**

These buttons allow you to move among the administrative units selected for a particular Analysis Area. You may only display details associated with one administrative unit at a time on this form. Clicking on this command button will allow you to view the details associated with the next administrative unit included within the Analysis Area. On each administrative unit screen you can adjust the suppression organization option identifier (“Option”) by selecting the appropriate code on the pull-down menu. The associated name will show in the “Option” box.

**New AU**

You can add a new administrative unit to the Analysis Area by selecting it from the external files; however, you must fill in the Analysis Area name, file code, and eco-region code before adding an administrative unit or you will get a “type mismatch” error message. To add administrative units to the Analysis Area, click on the “New AU” button at the bottom of the screen. The following screen will appear:

Unit	Name	Agency	Region	State	From	To	PCHA File	IIAA File
▶ 01	Angeles	F	05	CA	1974	1983	C:\FETM4\aadata\Demo\pchaia	C:\FETM4\aadata\Demo\pchaiaa\iaa99

Click on the gray square next to the unit number of the administrative unit you wish to include. A black arrow will appear. To select another administrative unit, simply repeat this process and double click on a different administrative unit number. You may continue to add administrative units to the Analysis Area using this approach. When you are finished, exit this screen by selecting the “Close” button.

**Delete AU**

You can remove an administrative unit by selecting this button. The administrative unit on the screen at the time is the administrative unit that will be deleted. Use the “Previous AU” and “Next AU” buttons to scroll through the administrative units until you find the one you wish to delete. Then click the “Delete AU” button. A dialog box will appear that says, “Are you sure you want to delete administrative unit # from the Analysis Area?” Click the “Yes” button to delete. Click “No” to return to the previous screen.

The following information will appear onscreen from the PCHA/IIAA files once you have selected the administrative units to be included. These fields cannot be edited on this screen.

- Administrative unit number
- Administrative unit name
- Administrative unit agency
- Administrative unit region
- Analysis Area acres
- Administrative unit state
- Start year for PCHA
- End year for PCHA
- PCHA file name and path associated with this administrative unit number (see “Managing External Files/Load PCHA/IIAA Files,” page 11)
- IIAA file name and path associated with this administrative unit number
- List of Fire Management Zone (FMZ) numbers and descriptions

Once you have selected all of the administrative units you want to associate with this Analysis Area, you will need to fill in the following areas. The FMZ information should be available from your organization’s fire planning staff. It is used by FETM 4 to compute the breakpoint average rates of spread under “Define Expected Fire Size” on the Index Tree (see page 83 for further discussion).

- |                                 |   |
|---------------------------------|---|
| <b>Total FMZ Acres</b>          | Enter the sum of all FMZ acres within the administrative unit(s).   |
| <b>AA FMZ Acres</b>             | Enter the acres found within the Analysis Area and the FMZ. The number of acres within the Analysis Area and FMZ may be less than the total FMZ Acres if the Analysis Area is smaller than the administrative unit. This uses the rate of spread from the IIAA program to determine area weighting.                         |
| <b>AA FMZ Fires</b>             | Enter the number of fires per year found within the Analysis Area and the FMZ. The number of fires within the Analysis Area and FMZ may be less than the total FMZ fires if the Analysis Area is smaller than the administrative unit. This uses the rate of spread from the IIAA program to determine frequency weighting. |
| <b>Update FCCs from Library</b> | Selecting this button performs the same function as described in “Manage External Files/Update FCCs from Library.” It is provided here for convenience.   |

## 3.2 Copy Analysis Area

This program area allows you to copy all the data from one Analysis Area to another. This allows you to make relatively simple changes to an Analysis Area without requiring you to re-enter all of the data.

To copy an Analysis Area, simply click on the colored box or text line to the left of “Copy Analysis Area” on the Index Tree. The following screen will appear:

**Copy Analysis Area**

**Analysis Area to Copy**

**Name:**

**Description:**  
44 fires in AA based on area-weight of Angeles total of 71 fires/year  
Added 8 additional fires based on conversation with Marc Witala, who found 52 fires/year within AA

**New Analysis Area**

**Name:**

**File Code:**   
(Max 4 Chars.)

**Description:**

### Analysis Area to Copy

**Name** Under “Analysis Area to Copy” you may select the name of the Analysis Area you wish to copy by clicking on the pull-down arrow, then highlighting the appropriate Analysis Area.

## New Analysis Area

- Name** Further down the screen, in the “New Analysis Area,” enter the name of the new Analysis Area you wish to create from the copied material.
- File Code** Enter a one- to four-character code for the new Analysis Area (letters or numbers)
- Description** Enter additional descriptive information about the new Analysis Area in this field (optional).
- Copy** When you have completed the form and are ready to copy the Analysis Area, click the “Copy” button. The “Copy” button is disabled until the form has been filled out.
- Close** The “Close” button may be clicked at any time to exit this form, or you can click on the “X” in the upper right corner.

### 3.3 Delete Analysis Area

This program area allows you to remove Analysis Areas that are no longer in use. However, it is important to remember that deleting an Analysis Area is PERMANENT. There is no possibility of recovering data once the Analysis Area has been deleted. Proceed with caution!

To delete an Analysis Area, click on the colored box to the left of “Delete Analysis Area” on the Index Tree. This will reveal a list of all Analysis Areas currently in the system. To delete an Analysis Area, simply click on the gray box to the left of the Analysis Area that you wish to delete, and then click the “Delete” button on the lower left-hand side of the form. If you decide to rethink your decision to delete an Analysis Area, simply click on the “Cancel” button to return to the Index Tree.

### 3.4 Select an Analysis Area

It is within specific Analysis Areas that the most important work of FETM is done. This is the area where the model analyzes the tradeoffs between wildland fire and fuel treatment alternatives, analyzes the economic costs and benefits of alternative treatment programs, and forecasts the impacts of future wildland fires on the ecosystem within a defined Analysis Area.

Previously created Analysis Areas may be opened (activated) by clicking on the folder icon or text line to the left of “Select Analysis Area” on the Index Tree. To show the list of available Analysis Areas, click on the + sign immediately to the left of “Select Analysis Area.” This will

change the + sign to a – sign and expand the Index Tree to show all available Analysis Areas. Click the – sign to reverse the process.

The Analysis Area used in the last FETM 4 session will be automatically opened. To select another Analysis Area, simply click on the desired folder icon. A dialog box that reads “Analysis Area has been successfully opened” will be shown on the screen once the Analysis Area has been opened. Click “OK” to continue.

Because this section of the program is the most complex, the following sections of the manual have been broken out with dividers to aid the user in finding specific information.



### **3.5 Define Analysis Areas**

Once an Analysis Area has been opened, the first item on the Index Tree on the left-hand side is “Define Analysis Area.” This program area lets you review (and modify if necessary) the Analysis Area assumptions specified when the Analysis Area was created. The field definitions are the same as those described in “Managing Analysis Areas/New Analysis Area” (see page 17). Any changes made to these fields are automatically saved in FETM 4.

If the list does not appear on the Index Tree under the Analysis Area, click on the + sign immediately to the left of the folder name.



### 3.6 Manage Derivative Fuel Models (DFM)

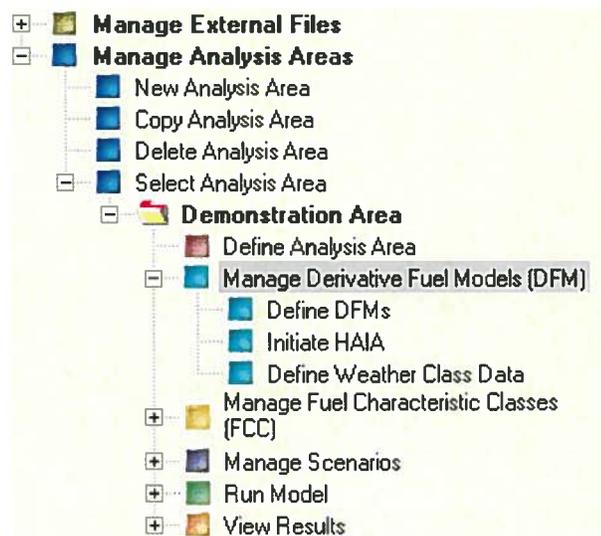
This program area computes the basic fire behavior parameters (e.g., rate of spread) used elsewhere in the FETM program. In this area, you may view the Derivative Fuel Model (DFM) characteristics, compute weather-based outputs and breakpoint rates using the Historical Analysis-Initial Attack (HAIA) model, define the spread component breakpoints between each of four fire weather classes, and specify the mean fire frequency in each of the fire weather classes. Much of the information in this section of the program is derived from other program areas (such as “Initiate HAIA”) and does not require direct user input in this section.

Derivative Fuel Models (DFMs) are fuel models that are used in predicting fire behavior (e.g., rate of spread) in FETM 4. A total of 284 DFMs currently exist in FETM 4. These 284 DFMs have been derived from the 20 parent NFDRS fuel models. Each DFM is identified by a unique three-character code. The first letter in the code is the parent NFDRS fuel model (A through L, N through U). The second character is the loading classification. Loading options include L (low loading; loading is 30% lower than parent NFDRS fuel model); M (moderate loading; same loading as parent NFDRS fuel model); and H (high loading; loading is 30% higher than parent NFDRS fuel model). The last character is an arbitrary number that represents a unique combination of wind reduction factor (0.2, 0.3, 0.4, 0.5) and shading condition (shaded, unshaded).

#### Define DFMs

Click on “Define DFMs” on the Index Tree to open the DFM data table. The DFM data table contains all the information that characterizes the DFMs for the selected Analysis Area. It comprises both raw entered data and values computed using algorithms embedded in FETM 4.

Click on the “Define Derivative Fuel Models (DFM)” node to expand the Index Tree, as shown to the right:



Click on the “Define DFMs” node to display the following spreadsheet on the right-hand side of the window:

Derivative Fuel Model Data Table															
View															
FUEL MODEL CHARACTERIZATION - SURFACE FUEL LOADING (TONS/ACRE)															
Derivative Fuel Model	Parent Fuel Model Name	Loading Class	Shaded / Unshaded	Wind Reduction Factor	0-3" D&D Wood Loading	Total D&D Wood Loading	Fuel Bed Depth (feet)	Total Live + D&D Wood Loading	Total Live Loading	Live-Woody Loading	Live-Herb Loading	1-Hr Fuel Loading	10-Hr Fuel Loading	100-Hr Fuel Loading	1000-Hr Fuel Loading
A	Western annual grasses	Medium	Unshaded	0.36	0.20	0.20	0.80	0.50	0.30	0.00	0.30	0.20	0.00	0.00	0.00
AH1	Western annual grasses	High	Shaded	0.20	0.27	0.27	1.07	0.67	0.40	0.00	0.40	0.27	0.00	0.00	0.00
AH2	Western annual grasses	High	Unshaded	0.50	0.27	0.27	1.07	0.67	0.40	0.00	0.40	0.27	0.00	0.00	0.00
AL1	Western annual grasses	Low	Shaded	0.20	0.13	0.13	0.53	0.33	0.20	0.00	0.20	0.13	0.00	0.00	0.00
AL2	Western annual grasses	Low	Unshaded	0.50	0.13	0.13	0.53	0.33	0.20	0.00	0.20	0.13	0.00	0.00	0.00
AM1	Western annual grasses	Medium	Shaded	0.20	0.20	0.20	0.80	0.50	0.30	0.00	0.30	0.20	0.00	0.00	0.00
AM2	Western annual grasses	Medium	Unshaded	0.50	0.20	0.20	0.80	0.50	0.30	0.00	0.30	0.20	0.00	0.00	0.00
B	California mixed chaparral	Medium	Unshaded	0.55	8.00	8.00	4.50	19.50	11.50	11.50	0.00	3.50	4.00	0.50	0.00
BH1	California mixed chaparral	High	Unshaded	0.30	10.67	10.67	6.00	25.97	15.30	15.30	0.00	4.70	5.30	0.67	0.00
BH2	California mixed chaparral	High	Unshaded	0.50	10.67	10.67	6.00	25.97	15.30	15.30	0.00	4.70	5.30	0.67	0.00
BL1	California mixed chaparral	Low	Unshaded	0.30	5.37	5.37	3.02	13.08	7.71	7.71	0.00	2.35	2.68	0.34	0.00
BL2	California mixed chaparral	Low	Unshaded	0.50	5.37	5.37	3.02	13.08	7.71	7.71	0.00	2.35	2.68	0.34	0.00
BM1	California mixed chaparral	Medium	Unshaded	0.30	8.00	8.00	4.50	19.50	11.50	11.50	0.00	3.50	4.00	0.50	0.00
BM2	California mixed chaparral	Medium	Unshaded	0.50	8.00	8.00	4.50	19.50	11.50	11.50	0.00	3.50	4.00	0.50	0.00
C	Pine grass savanna	Medium	Unshaded	0.25	1.40	1.40	0.75	2.70	1.30	0.50	0.80	0.40	1.00	0.00	0.00
CH1	Pine grass savanna	High	Shaded	0.20	1.86	1.86	1.00	3.60	1.74	0.67	1.07	0.53	1.33	0.00	0.00
CH2	Pine grass savanna	High	Unshaded	0.40	1.86	1.86	1.00	3.60	1.74	0.67	1.07	0.53	1.33	0.00	0.00
CL1	Pine grass savanna	Low	Shaded	0.20	0.94	0.94	0.50	1.80	0.86	0.33	0.53	0.27	0.67	0.00	0.00
CL2	Pine grass savanna	Low	Unshaded	0.40	0.94	0.94	0.50	1.80	0.86	0.33	0.53	0.27	0.67	0.00	0.00
CM1	Pine grass savanna	Medium	Shaded	0.20	1.40	1.40	0.75	2.70	1.30	0.50	0.80	0.40	1.00	0.00	0.00
CM2	Pine grass savanna	Medium	Unshaded	0.40	1.40	1.40	0.75	2.70	1.30	0.50	0.80	0.40	1.00	0.00	0.00
D	Southern rough	Medium	Shaded	0.12	3.00	3.00	2.00	6.75	3.75	3.00	0.75	2.00	1.00	0.00	0.00
DH1	Southern rough	High	Shaded	0.20	3.90	3.90	2.60	8.78	4.88	3.90	0.98	2.60	1.30	0.00	0.00
DH2	Southern rough	High	Unshaded	0.40	3.90	3.90	2.60	8.78	4.88	3.90	0.98	2.60	1.30	0.00	0.00
DL1	Southern rough	Low	Shaded	0.20	2.04	2.04	1.40	4.55	2.51	2.01	0.50	1.34	0.70	0.00	0.00
DL2	Southern rough	Low	Unshaded	0.40	2.04	2.04	1.40	4.55	2.51	2.01	0.50	1.34	0.70	0.00	0.00
DM1	Southern rough	Medium	Shaded	0.20	3.00	3.00	2.00	6.75	3.75	3.00	0.75	2.00	1.00	0.00	0.00
DM2	Southern rough	Medium	Unshaded	0.40	3.00	3.00	2.00	6.75	3.75	3.00	0.75	2.00	1.00	0.00	0.00
E	Hardwood (winter)	Medium	Unshaded	0.25	2.25	2.25	0.40	3.25	1.00	0.50	0.50	1.50	0.50	0.25	0.00
EH1	Hardwood (winter)	High	Shaded	0.20	3.01	3.01	0.53	4.35	1.34	0.67	0.67	2.00	0.67	0.34	0.00
EH2	Hardwood (winter)	High	Unshaded	0.30	3.01	3.01	0.53	4.35	1.34	0.67	0.67	2.00	0.67	0.34	0.00
EL1	Hardwood (winter)	Low	Shaded	0.20	1.51	1.51	0.27	2.19	0.68	0.34	0.34	1.01	0.33	0.17	0.00
EL2	Hardwood (winter)	Low	Unshaded	0.30	1.51	1.51	0.27	2.19	0.68	0.34	0.34	1.01	0.33	0.17	0.00

The tabs listed across the top of the Derivative Fuel Model Data Table are explained in greater detail below. The current (active) tab will have a matchstick icon on it, and will be located in the first row, on the left-hand side. Use the horizontal and vertical scroll bars to view the entire sheet.

**Blank fields** within these spreadsheets indicate either that the DFMs have not been processed through HAlA (see “Initiate HAlA”), or that the fire weather classes have not been defined (see “Define Weather Class”).

<b>Fuel Model Characterization</b>	Click this tab to reveal a list of fuel models and their characteristics (non-editable; data imported from "haia2000.new" file), including: <ul style="list-style-type: none"> <li><input type="checkbox"/> Derivative Fuel Model Code</li> <li><input type="checkbox"/> Parent Fuel Model Name</li> <li><input type="checkbox"/> Loading Class</li> <li><input type="checkbox"/> Shading</li> <li><input type="checkbox"/> Wind Reduction Factor</li> <li><input type="checkbox"/> Wood, Fuel, and Herb Loading Characteristics</li> </ul>
<b>Danger Rating-Spread Component (SC)</b>	Click this tab to reveal the HAIA-computed spread component values by fire weather class (Low, Moderate, High, Extreme). These values cannot be edited.
<b>Danger Rating-Energy Release Component (ERC)</b>	Click this tab to reveal the HAIA-computed energy release component values by fire weather class (Low, Moderate, High, Extreme). These values cannot be edited.
<b>Danger Rating-Burning Index (BI)</b>	Click this tab to reveal the HAIA-computed burning index values by fire weather class (Low, Moderate, High, Extreme). These values cannot be edited.
<b>Danger Rating-Ignition Component (IC)</b>	Click this tab to reveal the HAIA-computed ignition component values by fire weather class (Low, Moderate, High, Extreme). These values cannot be edited.
<b>Surface Fuel Moisture</b>	Click this tab to reveal the fuel moisture content of 10-hour and 1,000-hour time-lag fuels by fire weather class (Low, Moderate, High, Extreme).
<b>Fire Behavior-Rate of Spread (ROS)</b>	Click this tab to reveal the rate of spread of fires by fire weather class (Low, Moderate, High, Extreme).
<b>Fire Behavior-Fireline Intensity</b>	Click this tab to reveal the fireline intensity values by fire weather class (Low, Moderate, High, Extreme).

To change and save the column widths, hold the cursor on the vertical line separating the column headings until a double vertical line ( || ) appears. Holding down the left mouse key, move the double vertical line to the left or right to expand or contract the column width. When the desired width is attained, click on the "Save Column Widths" button to save the current setting.

To close this form at any time, click on the "Close" button or the "X" in the top right-hand corner.

## Initiate HAIA

FETM 4 uses a custom adaptation of the PCHA (PCHA99) and IIAA (IIAA99) models, called the Historical Analysis-Initial Attack (HAIA) model. The purpose of the HAIA program is to gather and pre-process weather and fire occurrence data from the NFMAS IIAA and PCHA .mdb files. The pre-processed weather data are NFDRS indices to facilitate the generation of percentile weather within FETM. The pre-processed fire occurrence data are the breakpoint rates-of-spread by NFDRS derivative fuel model for the fire size class breaks 0.25 acres, 10 acres, 100 acres, 300 acres, and 1,000 acres. These breakpoint rates-of-spread values are used in FETM 4 to aid in the construction of rate-of-spread versus final fire size curves for final fire sizes less than 1,000 acres.

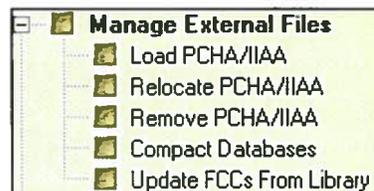
User manuals for both the PCHA and IIAA programs are available from the USFS Fire Applications Support website at:

*[www.fs.fed.us/fire/planning/nist](http://www.fs.fed.us/fire/planning/nist)*

Click on “Distribution” at the bottom of the web page, then select “User Guide” and you will find user guides for IIAA and PCHA that you can download.

### *Locating NFMAS PCHA and IIAA Files*

See “Load PCHA/IIAA Files” on page 11 for a description of how to load (locate) and relocate PCHA and IIAA files. Before PCHA and IIAA files can be assigned to an Analysis Area, they must first be made available to FETM 4 through “Load PCHA/HAIA Files” Index Tree.

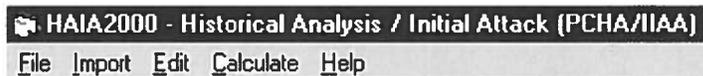


### *Identifying NFMAS PCHA and IIAA Files for an Analysis Area*

When defining an analysis area, you will need to specify which administrative units and PCHA and IIAA files will be used for the Analysis Area. This is done under “Define Analysis Area” on the Index Tree (see page 24). You must also select a fire program option from IIAA for HAIA to use to calculate the breakpoint rates-of-spread values.

## *Using the HAIA Program within FETM 4*

To execute HAIA, click “Initiate HAIA” on the Index Tree. The program will transfer to HAIA and a blank, gray-colored screen will appear. This is similar to the screen that appears after initiating PCHA99. The program is menu-driven, so you must select from the menu to continue. The steps required to execute HAIA must be done in a particular order, which corresponds to following the pull-down menus shown below from left to right and completing the tasks shown on each pull-down menu from top to bottom. Each of these menus is discussed in more detail in the following sections.



An outline of the tasks you must complete to execute HAIA follows:

### Import weather data from PCHA:

- Import weather stations
  - Import weather stations
  - Prioritize duplicate observations
  - Years to import
  - Import weather observations
- Assign prioritization for multiple weather stations in Analysis Area
- Assign years to import for each weather station
- Import weather and fuel moisture data
- Import fire dates from PCHA

### Edit values:

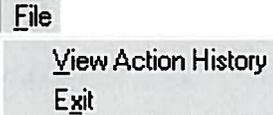
- Fire season start and stop dates
- Calibrated fireline production rates
- Fuel model fireline production rates
- Fuel model-specific site parameters
- Select fuel models to run
- Assign percentage of each representative location (RL) that lies within the Analysis Area

### Assign Net Value Change (NVC):

- Assign stumpage values by timber species
- Assign timber table parameters for mature timber
- Assign timber table parameters for immature timber
- Assign NVC for forage species
- Assign NVC for other non-timber, non-forage paramount values
- Calculate weather-based outputs
- Calculate breakpoint rates of spread
- Exit HAIA and return to FETM 4

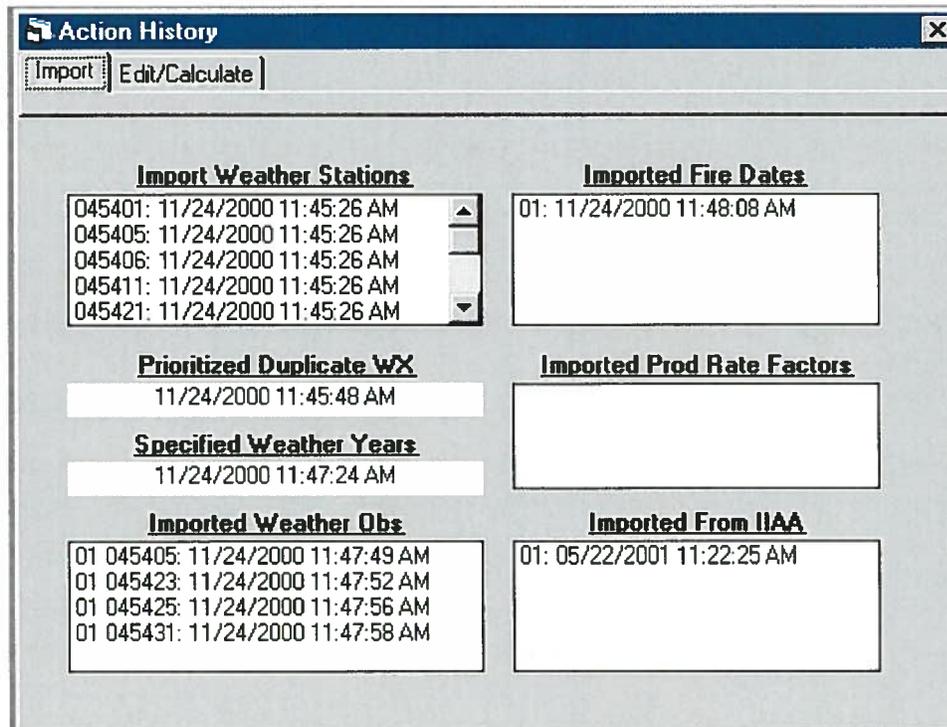
## File

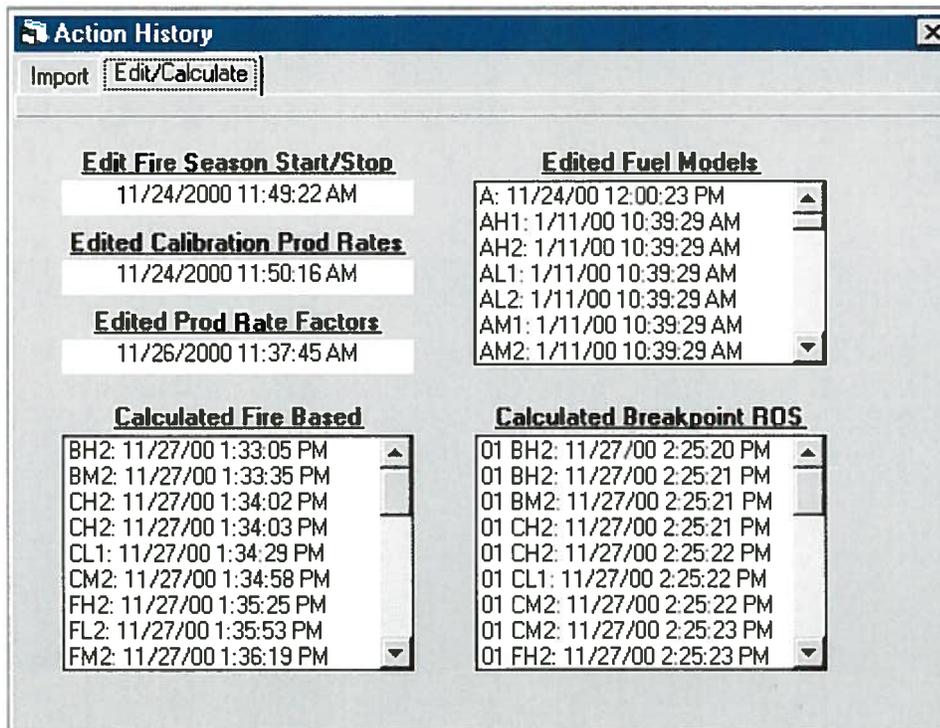
The File menu, shown at right, allows you to view a table that shows when the functions performed within HAIA have occurred. This menu is also used to exit from the HAIA program and return to FETM 4.



## View Action History

When you select "View Action History" on the "File" menu, a table with two tabs — "Import" and "Edit/Calculate" — will appear, as shown in the following two screens. The date and time that a function was last performed is shown. This allows the user to check if all necessary functions have been performed as well as when they were performed. Because this menu is primarily informational, it does not require you to follow the strict order of the other menus.



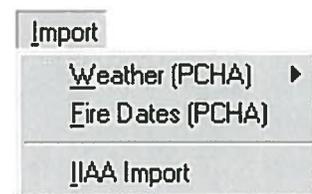


**Exit**

Click on “Exit” on the “File” menu to return to FETM 4. The following dialog box will appear onscreen, “Do you want to recalculate Fire Behavior values? The process may take a while.” If new calculation functions (Weather-Based Outputs or Breakpoint Rates-of-Spread) have been performed, select “Yes.”

**Import**

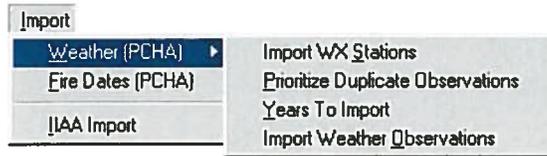
The following information is imported into HAIA using this menu: weather observations, fire occurrence dates, information on fire production resources at the fire program option used in the analysis, fire suppression costs, and economic fire effects information. Each of these is discussed in more detail below.



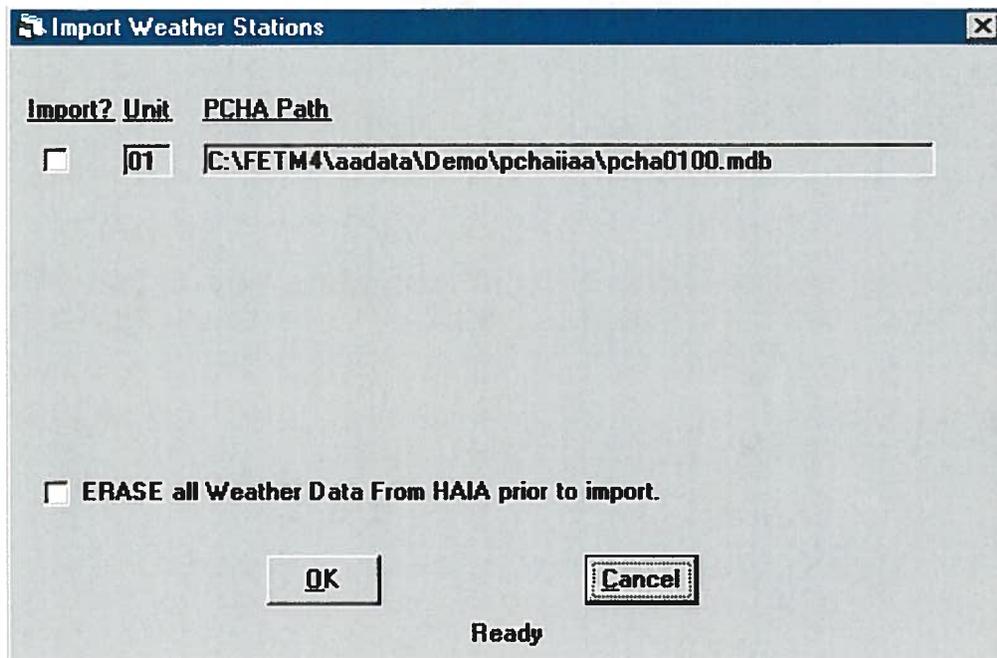
**Weather (PCHA)**

Weather observations need to be imported to HAIA from PCHA. Before the actual import can occur, you will need to define which weather stations to import data from, prioritize weather observations from stations that are found in more than one administrative unit PCHA file, specify the years of data to import, and select those specific weather observations to import. The “Weather (PCHA)”

menu is shown below, as well as an explanation of each menu item.



**Import Wx Stations** From the main HAIA screen, select “Import,” “Weather (PCHA),” and then “Import Wx Stations.” The screen shown below or a similar screen will appear. If more than one administrative unit is included in an Analysis Area, data may be extracted from each administrative unit’s PCHA file. In that case, multiple paths will be shown. Click on the box to the left of each file from which the import of weather stations is desired. Then click on the “OK” button. To return to the previous screen without selecting a path, click on “Cancel” or the “X” in the upper right corner.



**Prioritize Duplicate Observations** From the main HAIA screen, select “Import,” “Weather (PCHA),” and then “Prioritize Duplicate Observations.” Each weather station that has been imported to HAIA is listed in rows, with each administrative unit in the Analysis Area shown in columns (see following screen). If the same weather record is found in more than one administrative unit's PCHA database, you will need to prioritize them. A higher number indicates a higher priority. If more than one administrative unit is specified in the Analysis Area, then a separate column for each administrative unit will appear in the form. The weather station priorities need to be assigned across all of the administrative units. There is no identification of which weather stations are associated with each administrative unit; therefore, the user should assume that all weather stations are found in all administrative units unless they have independent information about the location of the stations.

If all stations in all of the administrative units have equal priority, than the same number (it doesn't matter what the number is in this case) should be entered in the space next to each six-digit weather station number.

**Prioritize Weather Import Duplicates**

If the same weather record is found in more than one Administrative Unit's PCHA database, which has priority? Please enter a higher number to indicate a higher priority. (Leaving blank means do NOT import.)

Station	01
▶ 045401	5
045405	2
045406	5
045411	5
045421	5
045423	3
045425	4
045426	5
045430	5
045431	1
045435	5
045436	5

OK Cancel

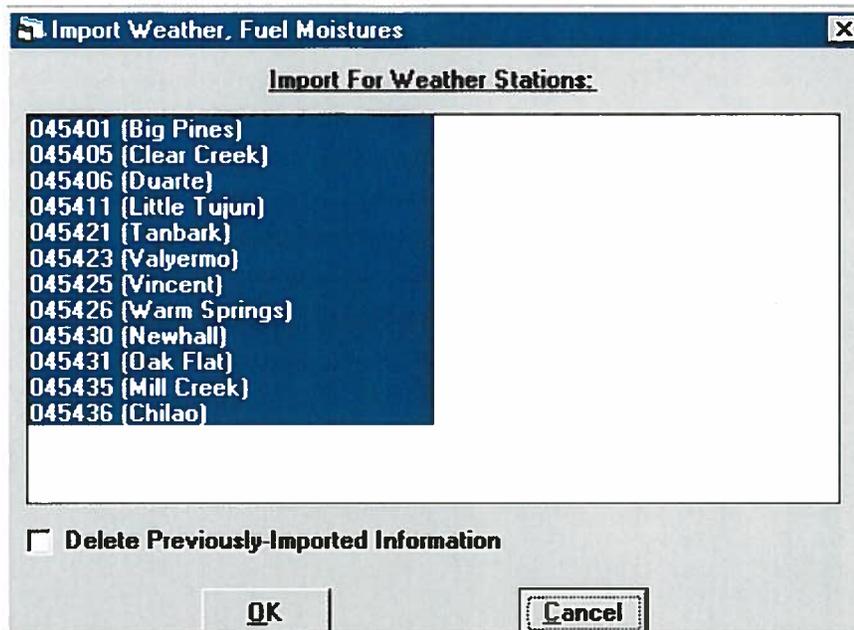
**Years to Import** From the main HAIA screen, select “Import,” “Weather (PCHA),” and then “Years to Import.” The screen shown below will appear. Click in the appropriate cells for the weather stations and years you want to import. An “X” will appear in the selected boxes. You can select all years for all stations by clicking on the “Fill All” button. You can also clear the screen of all checked cells by clicking on the “Erase All” button. Once you have selected the years to be included, click on “OK” or click “Cancel” or “X” to return to the previous screen.

**Weather Years** [X]

Consider Years FROM:  THROUGH:

Station	1979	1980	1981	1982	1983	1984	1985
▶ 045401							
045405	X	X	X	X	X	X	X
045406							
045411							
045421							
045423	X	X	X	X	X	X	X
045425	X	X	X	X	X	X	X
045426							
045430							
045431	X	X	X	X	X	X	X
045435							
045436							

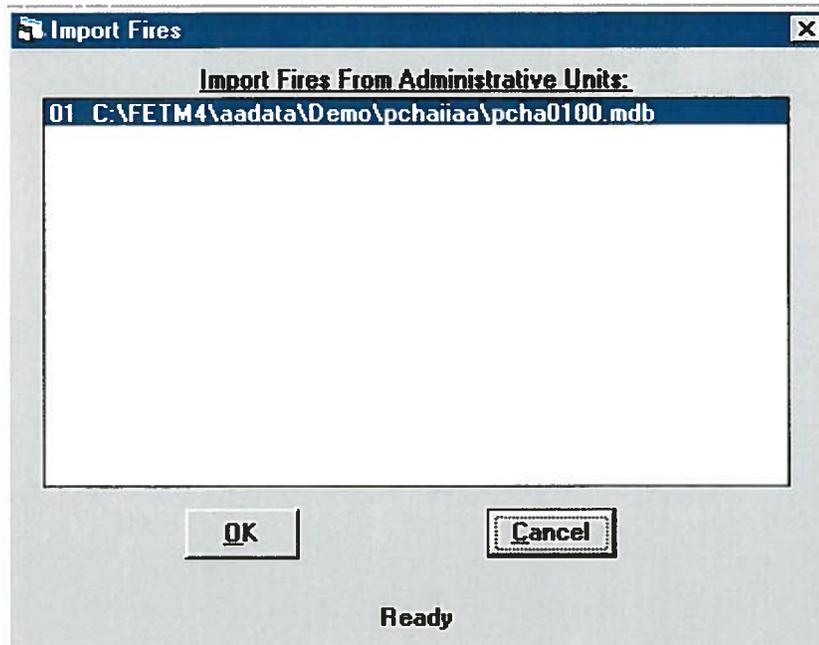
**Import Weather Observations** From the main HAIA screen, select “Import,” “Weather (PCHA),” and then “Import Weather Observations.” The screen shown below will appear. Click on each weather station you want to import. Weather stations selected for import will be highlighted in blue. Click on the “OK” button to start the import function or click “Cancel” to return to the previous screen.



### **Import Fire Dates (PCHA)**

From the main HAIA screen, select “Import,” and then “Fire Dates (PCHA).” The screen shown below will appear. To import fire dates from the listed files, select “OK.” To return to the previous screen without importing the fire dates, select “Cancel” or “X.”

HAIA will import the following information from PCHA: administrative unit identifier, the Fire Management Zone (FMZ) and the discovery date for all fires since 1970 for which data are available. HAIA uses these fire dates to determine days when fires happened historically. This information is used to support calculation of fire frequency by percentile fire weather class (low, moderate, high, and extreme).



## IIAA Import

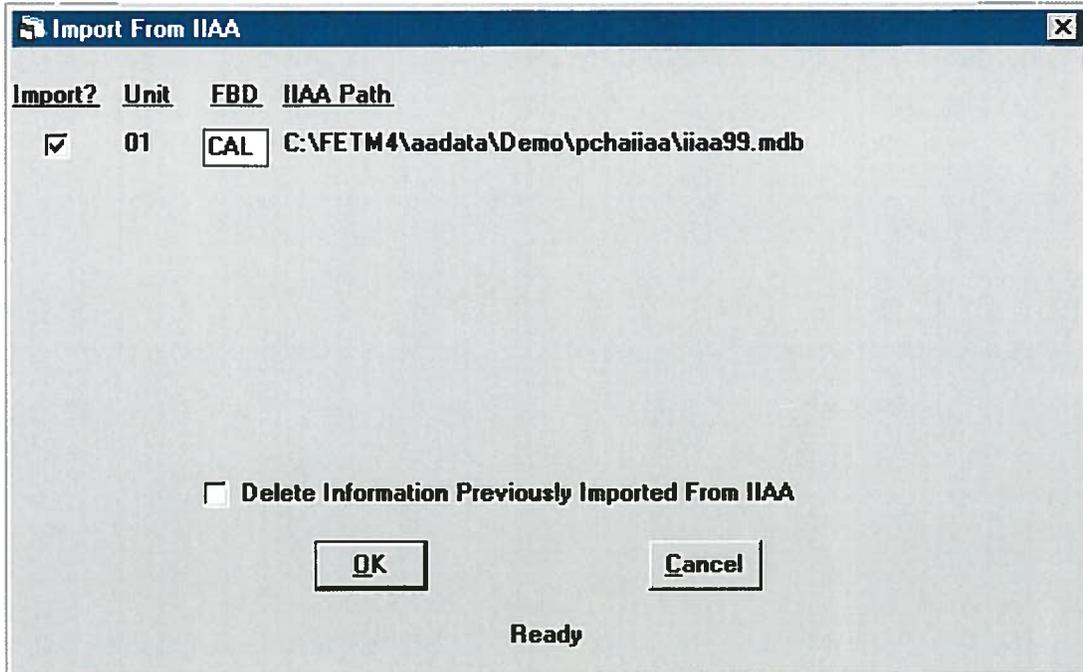
Select “IIAA Import” from the “Import” menu. The screen shown below will appear. Select the appropriate boxes for the IIAA files you wish to import in the “Import?” column, then type the three letter code for the FBD file that you want to use. The following information will be imported from each Administrative unit’s IIAA .mdb file.

- Average Acre Costs
- Acres Burned by Rep Loc by Fire Intensity Level (FIL) for the Defined Fire Program Option
- Information on Production Resources Available in the Defined Fire Program Option
- Net Value Change Data
- Percent of Fire Frequency by FIL for each FMZ
- Percent of Fire Frequency by Rep Loc for each FMZ
- Unit Mission Costs

Some of this information is used to provide cost and economic effects information for FETM 4, as well as to develop breakpoint rate-of-spread values to support construction of the rate-of-spread versus final-fire-size values.

It is possible to import data for one FBD (“CAL” in this case) and then for another FBD later. Both will be retained in the database unless you check the box that says, “Delete information previously imported from IIAA.” Checking this box will clear the previous

FBD-related information before importing the next set of data.



The image shows a dialog box titled "Import From IAA" with a close button (X) in the top right corner. The dialog contains a table with the following columns: "Import?", "Unit", "FBD", and "IAA Path". There is one row of data: a checked checkbox, "01", "CAL", and "C:\FETM4\aadata\Demo\pchaiiaa\iaa99.mdb". Below the table is a checkbox labeled "Delete Information Previously Imported From IAA" which is unchecked. At the bottom are "OK" and "Cancel" buttons, and the word "Ready" is centered below them.

<u>Import?</u>	<u>Unit</u>	<u>FBD</u>	<u>IAA Path</u>
<input checked="" type="checkbox"/>	01	CAL	C:\FETM4\aadata\Demo\pchaiiaa\iaa99.mdb

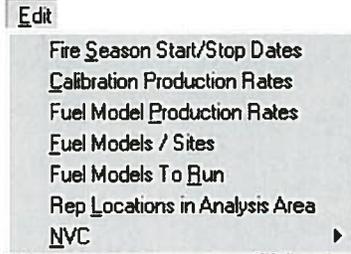
Delete Information Previously Imported From IAA

OK Cancel

Ready

## Edit

The values shown on the menu to the right need to be defined, verified, or edited to facilitate outputs from HAIA. Specific directions for each menu area are given in the following sections.



### Fire Season Start/Stop Dates

Percentile weather is calculated using weather and fire occurrence data for a defined fire season. To allow this, the start and stop dates for the fire season must be designated, as well as those years to be included in the analysis. To define the fire season, from the main HAIA screen select “Edit” and then “Fire Season Start/Stop Dates.” The screen shown below will appear. Enter the appropriate information, then click on “OK.” You can also click on “Cancel” or “X” to return to the previous screen.

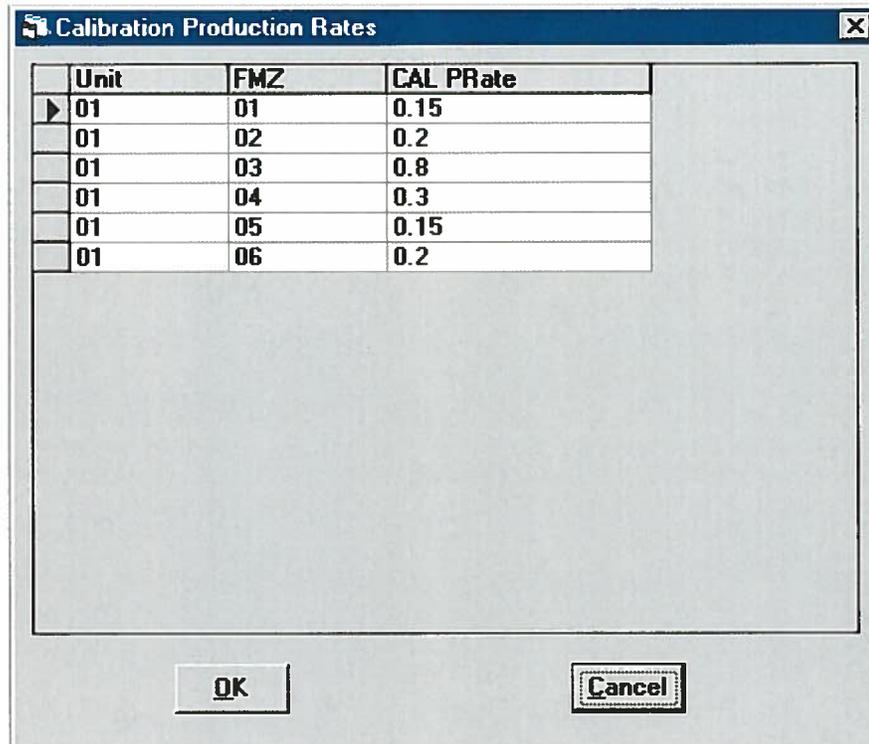
### Calibration Production Rates

Within IIAA, the fireline production rates used at calibration are contained in the Master Resource Table (MRT), which can be viewed in the “Database Browser” discussed later in this section. On the MRT, Default Production Rates menu in IIAA, the fireline production rate for a one-person handline crew is shown on the first row. Examples of the IIAA menu and screen follow:



LineID	A	B	C	D	E	G	H
1	0.9	0.25	0.8	0.1	1.2	0.5	
2H	3	3	3				

In HAIA, a default set of fireline production rates for a one-person handline crew will need to be input by FMZ. To do this, from the main HAIA screen select "Edit" then "Calibration Production Rates." The screen shown below will appear. Enter the one-person handline crew production rate in the third column, "CAL PRate." This should be the same rate that was used in the IIAA program during calibration. Once you have finished entering the production rates, select "OK." To return to the previous screen, select "Cancel" or "X."



### Fuel Model Production Rates

The fireline production rates used in the IIAA have been modified for use in HAIA by the factor shown below.

$$\text{Fireline production rate used for a resource in HAIA} = \text{Fireline production rate for a resource in HAIA} * \frac{\text{1-person hand-line crew fuel model production rate}}{\text{1-person hand-line crew calibration production rate}}$$

You can either enter a one-person hand-line crew production rate for each derivative fuel model or use the default production rates that are provided. These values are entered by NFDRS slope class. Fireline production capability varies by derivative fuel model and by slope class

slope class.

To perform this function, from the main HAIA screen select “Edit” and then “Fuel Model Production Rates.” The screen shown below will appear. Click on the black arrow to the right of the “Admin. Unit” cell, then select an administrative unit from the pull-down list. The default production rates will appear in the cells. To accept the default rates, click on the “Use Defaults” button on the bottom right of the screen. The defaults will be accepted. Click on “OK” to return to the previous screen. To change the default rates, click in the appropriate cells and replace the default rates with the production rates that you wish to use. Then click “OK.” The changed production rates will be saved and you will be returned to the previous screen. To return to the previous screen without changing the production rates, click on the “X” in the upper right corner.

**Fuel Model Production Rates** [X]

Admin Unit:  (Changing automatically SAVES)

	Fuel Mdl	0-25%	25-40%	41-55%	56-75%	76+ %
▶	A					
	AH1					
	AH2					
	AL1					
	AL2					
	AM1					
	AM2					
	B					
	BH1					
	BH2					
	BL1					
	BL2					
	BM1					
	BM2					
	C					
	CH1					
	CH2					
	CL1					
	CL2					
	CM1					
	CM2					

OK Use Defaults

**Fuel Models/Sites**

HAIA will use the fuel model and site parameters defined here to calculate fire behavior. HAIA contains the 20 NFDRS fuel models plus 264 derivative NFDRS fuel models. These fuel models should not be changed. Additional derivative NFDRS fuel models can be defined in HAIA. Custom fuel models should be developed by staff with advanced training in this subject because unrealistic NFDRS indices can result in fuel models with an unrealistic set of input parameter values.

**Fuel Model Parameters**

To run fuel model and site parameters, from the main HAIA screen select “Edit” then “Fuel Models/Sites.” The screen shown below will appear. Please note that it has two tabs. The first, Fuel Model

Parameters, is explained here. The second, Site Parameters, will be explained below.

The following information is available on the “Fuel Model Parameters” tab:

**ID**—The fuel model ID code—a combination of up to three letters and numbers.

**Name**—The name of the fuel model.

**SA Vol**—The surface area-to-volume ratio for each of the fuels listed below measured in square feet to cubed feet ( $\text{ft}^2/\text{ft}^3$ ).

- 1-hour fuel loading (1-hr)
- 10-hour fuel loading (10-hr)
- 100-hour fuel loading (100-hr)
- Live woody fuel loading
- Live herbaceous fuel loading (herb)

Surface area-to-volume ratios can range from 109 to 4,000  $\text{ft}^2/\text{ft}^3$ . Definitions of each of the individual fuels are found in the Glossary.

**Loads**—The fuel loading (up to 30.49 tons per acre) for each fuel type.

**Depth**—The average depth of the surface fuel (0.05 to 6.00 feet). Fuel bed depth is sometimes called fuel bed bulk depth. It should not be confused with the average high particle depth, which is an output of the planar intercept dead down woody fuel sampling process.

**Heat Content**—The dead and live fuel heat content in British thermal units (Btu) per pound of fuel (Btu/lb). This is the amount of heat energy contained in a unit of fuels, ranging from 6,000 to 12,000 Btu/lb. The most commonly used heat content is 8,000 Btu/lb.

**Herbs**—This indicates whether the live herbaceous fuel loading (herb) category to the left is annual or perennial.

**Shaded**—The NFDRS calculations assume that fuels are unshaded from the sun because the weather observations used in the NFDRS calculations are taken in the open. This box is checked if the fuel model is for shaded conditions (greater than 50 percent shading from the sun by vegetation).

**Extinction Moisture**—The dead fuel moisture of extinction (from 5 to 100 percent). This is the maximum moisture content of the dead fuels at a predictable steady state rate of fire spread, if attainable. If the dead fuel moisture is greater than this value, a predictable steady state rate of fire spread cannot be predicted even though the fire may continue to smolder and spread.

**SC Max**—The Spread Component Maximum (SCM), which can range from 1 to 301. This is the highest expected rate of spread from the fuel model. It is used to help calculate the NFDRS Ignition Component index.

**NFDRS Fuel Model**—The derivative NFDRS fuel model(s) that you wish to run. There are 284 different fuel models to choose from in

**Copy Site Characteristics to ALL Fuel Models** If you want the site parameters to be applied to all of the defined NFDRS and derivative fuel models, click on the “Copy Site Characteristics to ALL Fuel Models” button at the bottom of the “Site Parameters” tab. A dialog box that says, “OK to copy site characteristics to ALL fuel models?” will appear. If you wish to continue, select “Yes.” If you wish to return to the “Site Parameters” tab, select “No.”

**Fuel Models to Run** This menu item allows you to select those fuel models for which fire behavior will be calculated by HAIA. It is critical that fire behavior be calculated for all NFDRS and derivative NFDRS fuel models that are assigned to any FCC that is to be used in an Analysis Area.

From the main HAIA screen select “Edit” then “Fuel Models to Run.” The screen shown below will appear. Click on the ID codes for those fuel models you wish to run. Selected fuel models are highlighted in blue.

You can select all of the listed fuel models by clicking on the “Select All” button on the bottom right. You can remove the highlighting from all of the ID codes by clicking on “Clear All” at the bottom left of the screen. Once you have highlighted the fuel models that you want to include, you can return to the previous screen by clicking on the “X” in the upper right corner of the screen.

Select Fuel Models To Run										
A	E	GM2	IH4	IY5	JH5	JZ6	KL6	LM2	QM2	UL1
AH1	EH1	GM3	IH5	IY6	JH6	JZ7	KL7	N	R	UL2
AH2	EH2	GM4	IH6	IY7	JH7	JZ8	KL8	NH1	RH1	UM1
AL1	EL1	GM5	IH7	IY8	JH8	JZ9	KL9	NH2	RH2	UM2
AL2	EL2	GM6	IH8	IY9	JH9	K	KM1	NL1	RL1	
AM1	EM1	H	IH9	IZ1	JL1	KA1	KM2	NL2	RL2	
AM2	EM2	HH1	IL1	IZ2	JL2	KA2	KM3	NM1	RM1	
B	F	HH2	IL2	IZ3	JL3	KA3	KM4	NM2	RM2	
BH1	FH1	HH3	IL3	IZ4	JL4	KA4	KM5	O	S	
BH2	FH2	HL1	IL4	IZ5	JL5	KA5	KM6	OH1	SH1	
BL1	FL1	HL2	IL5	IZ6	JL6	KA6	KM7	OH2	SH2	
BL2	FL2	HL3	IL6	IZ7	JL7	KA7	KM8	OL1	SL1	
BM1	FM1	HM1	IL7	IZ8	JL8	KA8	KM9	OL2	SL2	
BM2	FM2	HM2	IL8	IZ9	JL9	KA9	KZ1	OM1	SM1	
C	G	HM3	IL9	J	JM1	KH1	KZ2	OM2	SM2	
CH1	GH1	I	IM1	JA1	JM2	KH2	KZ3	P	T	
CH2	GH2	IA1	IM2	JA2	JM3	KH3	KZ4	PH1	TH1	
CL1	GH3	IA2	IM3	JA3	JM4	KH4	KZ5	PH2	TH2	
CL2	GH4	IA3	IM4	JA4	JM5	KH5	KZ6	PL1	TH3	
CM1	GH5	IA4	IM5	JA5	JM6	KH6	KZ7	PL2	TL1	
CM2	GH6	IA5	IM6	JA6	JM7	KH7	KZ8	PM1	TL2	
D	GL1	IA6	IM7	JA7	JM8	KH8	KZ9	PM2	TL3	
DH1	GL2	IA7	IM8	JA8	JM9	KH9	L	Q	TM1	
DH2	GL3	IA8	IM9	JA9	JZ1	KL1	LH1	QH1	TM2	
DL1	GL4	IA9	IY1	JH1	JZ2	KL2	LH2	QH2	TM3	
DL2	GL5	IH1	IY2	JH2	JZ3	KL3	LL1	QL1	U	
DM1	GL6	IH2	IY3	JH3	JZ4	KL4	LL2	QL2	UH1	
DM2	GM1	IH3	IY4	JH4	JZ5	KL5	LM1	QM1	UH2	

Clear All      Select All

**Representative Locations in Analysis Area**

This information is used by HAIA in the calculation of the fire suppression and net value change values that will be used in the Analysis Area. You will need to use GIS or other means to obtain the acreage information from which the percentages can be determined.

To enter the percentage of each representative location found in the Analysis Area select "Edit" then "Rep Locations in Analysis Area." For each administrative unit, enter the percentage of each representative location found in the Analysis Area. Then go on to the next step described below.

	AdminUnit	FMZ	RL	% of RL in AA
	01	01	1	100
	01	01	2	100
	01	01	3	100
	01	02	1	100
	01	02	2	100
	01	02	3	100
	01	02	4	100
	01	03	1	100
	01	03	2	100
	01	03	3	100
	01	03	4	100
	01	04	1	100
	01	05	1	100
	01	06	1	100

**Net Value Change (NVC)**

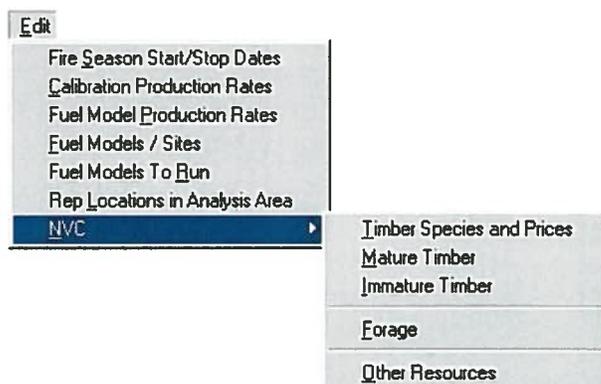
If you want FETM 4 to project timber Net Value Change values for selected FCCs, you will need to develop an NVC table for those FCCs. You are encouraged to consult the National Fire Management Analysis System (NFMAS) IIAA User’s Guide for specific definitions and information regarding how NVC values are developed. The user’s guide is available from the U.S. Forest Service Fire Applications Support website at:

*[www.fs.fed.us/fire/planning/nist](http://www.fs.fed.us/fire/planning/nist)*

Click on “Distribution” at the bottom of the web page, then select “User Guide” and you will find user guides for IIAA and PCHA that you can download.

This User’s Guide assumes that you have a working knowledge of the NFMAS analysis processes. All of the processes used in IIAA to develop NVC tables are repeated in HAIA to allow you to generate NVC values if they have not been developed in the IIAA .mdb. The Import, Import IIAA menu item, described earlier in this section, populates the HAIA .mdb with all of the NVC table information from the IIAA .mdb for each administrative unit.

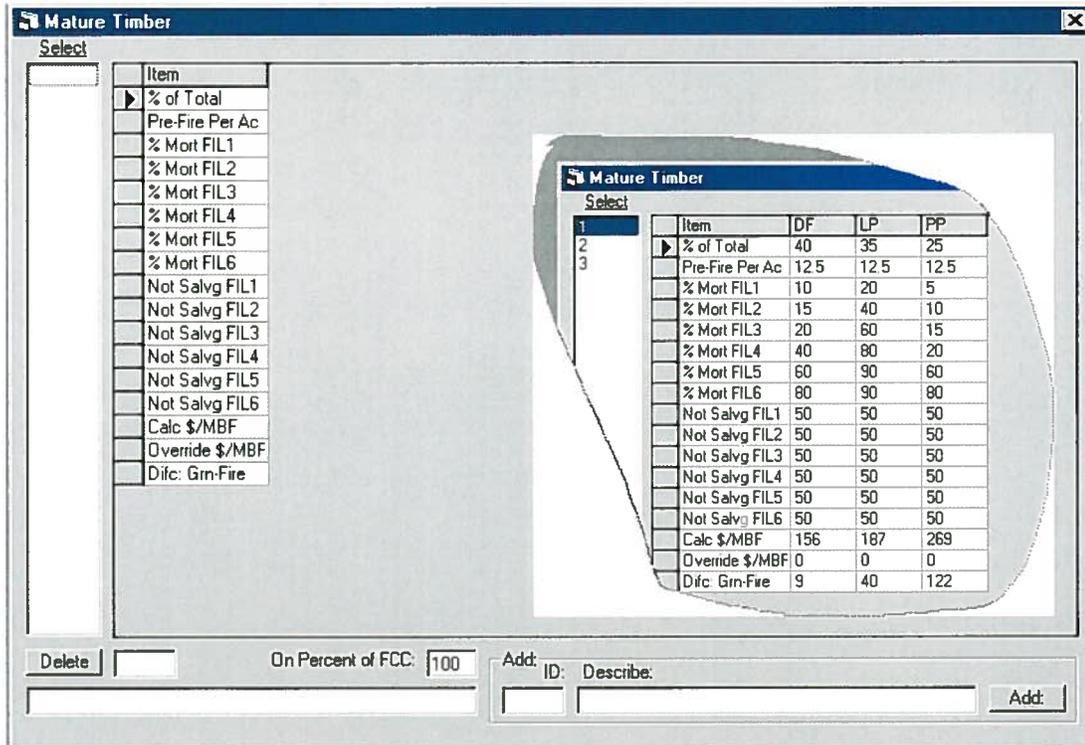
To generate an NVC table, from the main HAIA screen select "Edit" then "NVC." The submenu shown to the right will appear. The items included in the submenu are described in greater detail below.



**Timber Species and Prices** Timber stumpage values have been imported from the IIAA. An example is shown below. If there is no commercial timber in the Analysis Area, nothing will be listed on the table.

Timber Species/Stumpage Price							
Describe 3 Years Used: 1 - 3							
Species	Yr-1 \$/MBF	Yr-1 Vol	Yr-2 \$/MBF	Yr-2 Vol	Yr-3 \$/MBF	Yr-3 Vol	Average
DF	156	2600	156	1500	156	2200	156
LP	187	2800	187	700	187	4500	187
PP	269	500	269	900	269	300	269
*							

**Mature Timber** The mature timber table values have been imported from the IIAA. An example is shown below. You can select the entries for each mature timber table defined. Again, if there is no commercial timber in the Analysis Area, as shown in the sample screen, nothing will be listed on the table. The inset screen is an example of an Analysis Area with commercial timber information



***Immature  
Timber***

The immature timber table values have been imported from IIAA. An example is shown below. You can select the entries for each immature timber table defined for the species/size class definition to review or enter the percent affected by FIL. In the bottom left corner, you can also specify the percent of the FCC that is in each of the Poles and Seedling/Saplings groups.

Immature Timber						
Entry	DF (Poles)	DF (Sd/Sap)	LP (Poles)	LP (Sd/Sap)	PP (Poles)	PP (Sd/Sap)
% of Stand	40	40	30	30	30	30
ARPI	0.025	0.025	0.025	0.025	0.025	0.025
Calc \$/MBF	156	156	187	187	269	269
Override \$/MBF	0	0	0	0	0	0
Age	40	20	40	20	40	20
Thin-1 Vol	0	1	0	1	0	1
Thin-2 Vol	3	0	3	0	3	0
Thin-3 Vol	0	0	0	0	0	0
Final Vol	7	7	7	7	4	4
Thin-1 Years	60	30	80	20	60	30
Thin-2 Years	0	0	0	0	0	0
Thin-3 Years	0	0	0	0	0	0
Final Years	0	0	0	0	0	0

Select

1
2

% Affected For:

DF (Poles)
DF (Sd/Sap)
LP (Poles)
LP (Sd/Sap)
PP (Poles)
PP (Sd/Sap)

Percent Affected By FIL

% Affected	FIL-1	FIL-2	FIL-3	FIL-4	FIL-5	FIL-6
> 75%	20	40	60	80	100	100
25-75	20	40	40	20	0	0
< 25%	60	20	0	0	0	0

Delete ID:

Add Describe:

Poles On What Percent of FCC:

Seeds/Saps On What Percent of FCC:

**Forage** The forage values and expected changes by FIL have been imported from IIAA. An example is shown below.

Forage NVC											
Forage ID	Describe	% FCC	\$/AUM	Prefire	Period	PostFIL1	PostFIL2	PostFIL3	PostFIL4	PostFIL5	PostFIL6
01	FMZs 1 and 2	1	8	6	42	42	42	33.6	29.4	25.2	25.2
02	FMZ 3	0	0	0	0	0	0	0	0	0	0
03	FMZ 4	0	0	0	0	0	0	0	0	0	0

**Other Resources** HAIA allows you to consider the values of additional, or “other,” resources in your calculations. These include water, fish, wildlife, and recreation. These values are imported into tab 4, shown in the screen below, from IIAA for varying fire intensity levels. Tabs 1 through 3 allow you to define these NVC values if they were not developed in the IIAA .mdb. The user is encouraged to consult the NFMAS IIAA Users’ Guide for specific definitions and information on how these NVC values are developed.

To define other resources, from the main HAIA screen select “NVC,” then “Other Resources.” To use the information imported from IIAA and presented on tab 4, select the “Imported Values

Shown on Tab 4” radio button at the bottom right of the screen. To define other resources manually, select the “Values on Tab 3 from Manual Entries on Tabs 1 & 2” radio button at the bottom left of the screen, then enter the information indicated on tabs 1 and 2.

To return to the previous screen, click on the “X” in the upper right corner.

NVC Table
X

3: Final NVC Values Calculated From Manual Entry				4: Final NVC Values Imported From IIAA		
1: Acres and Pre-Fire Initial Values				2: Post-Fire Effects Values		
Resource	AA %	Units	Pre-Fire	Period	Value Per Unit	
Water Use	100	AcFt	0	7	0	
WaterStorage	100	AcFt	0	1	0	
Fish Warm/Cold Wtr	100	RVD	0	7	0	
Fish Anad Sprt	100	RVD	0	7	0	
Fish Commercial	100	M lb	0	7	0	
Wildlife Big Game	100	RVD	0	7	0	
Wildlife Other	100	RVD	0	7	0	
Rec Disp/Dev	100	RVD	0	7	0	
Rec Wilderness	100	RVD	0	7	0	

NVC Table to Utilize:

Values on Tab 3 From Manual Entries on Tabs 1&2
 Imported Values Shown On Tab 4

### Calculate

Two major processes are calculated within HAIA—weather-based outputs and breakpoint rates of spread.

Calculate

Weather-Based Outputs

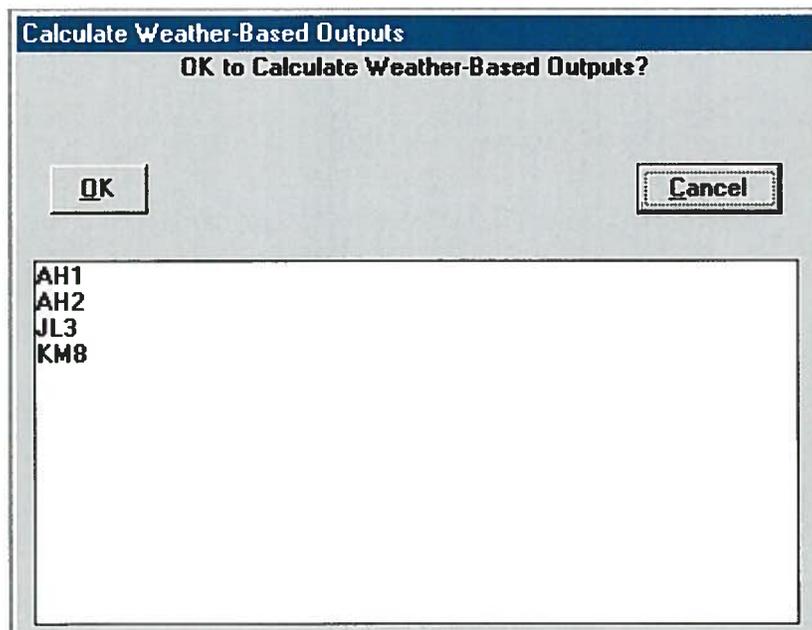
Breakpoint Rates-of-Spread

Under “Weather-Based Outputs,” FETM 4.2 calculates the NFDRS indices Spread Component, Energy Release Component, Burning Index, and Ignition Component. The values are generated to aid in the determination of percentile weather by NFDRS fuel model and each derivative NFDRS fuel model.

The breakpoint rates-of-spread by NFDRS derivative fuel model are for the fire size class breaks of 0.25 acres, 10 acres, 100 acres, 300 acres and 1,000 acres. These breakpoint rate-of-spread values are used in FETM to aid in the construction of rate-of-spread versus final fire size curves for final fire sizes of less than 1,000 acres.

## **Weather-Based Outputs**

To calculate the weather-based outputs, from the main HAIA menu select “Calculate” then “Weather-Based Outputs.” A list of the fuel models will appear, as shown below. To calculate the outputs, click on “OK.” Once the outputs have been calculated, a dialog box with the following message will appear, “NFDRS Calculations have been completed. The resulting values will be save in the Interval Wx table in the .mdb and can be viewed using the “Database Browser,” which is found under the “Help” menu item. To return to the previous screen, press “OK.” The key to the NFDRS Index in the Interval Wx table is 1=Spread Component, 2=Burning Index, 3=Energy Release Component, and 4=Ignition Component. To return to the previous screen without calculating the outputs, select “Cancel.”



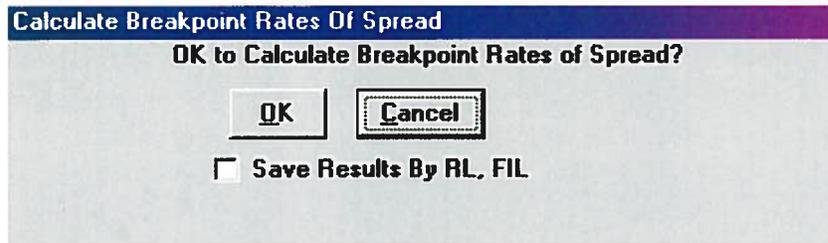
## **Breakpoint Rates-of-Spread**

To calculate the breakpoint rates of spread (BROS), from the main HAIA menu select “Calculate” then “Breakpoint Rates of Spread.” Check the box at the bottom of the screen if you want to save the results by representative location (RL) or fire intensity level (FIL), then click on “OK.” It may take quite a while for your computer to process these calculations. The BROS screen is shown below.

The breakpoint rates of spread are saved in the BROS table in the .mdb and can be viewed using the “Database Browser,” which is included on the “Help” menu and discussed in greater detail below.

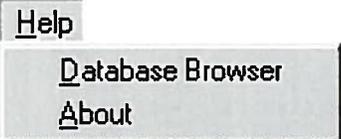
To return to the previous screen without calculating these rates, click

on “Cancel.”



## Help

The Help menu has two menu items, as shown to the right. The “Database Browser” allows you to view any table in the HAIA database (.mdb). The “About” menu item shows a screen with information about the version of HAIA that you are running.



## Database Browser

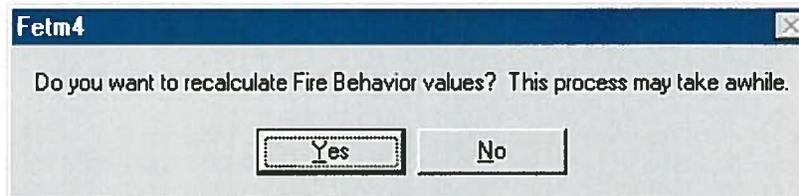
The database browser allows you to view any of the NVC tables included in HAIA. To access it, from the main HAIA screen, select “Help,” then “Database Browser.” The screen shown below will appear. Click the name of the table you wish to see in the list on the left side of the screen. The information and column headings included will vary according to the table selected.

You can return to the previous screen by clicking on the “X” in the upper right corner of the screen.



## *Recalculate Fire Behavior Values*

Once the weather-based outputs and breakpoint rates of spread have been calculated in HAIA, the values are immediately populated in the DFM table (see “Define DFMs”). To recalculate the maximum fire rate of spread (used in the calculation to determine fire size and type), the user is prompted with the following message upon returning to FETM 4 from HAIA:

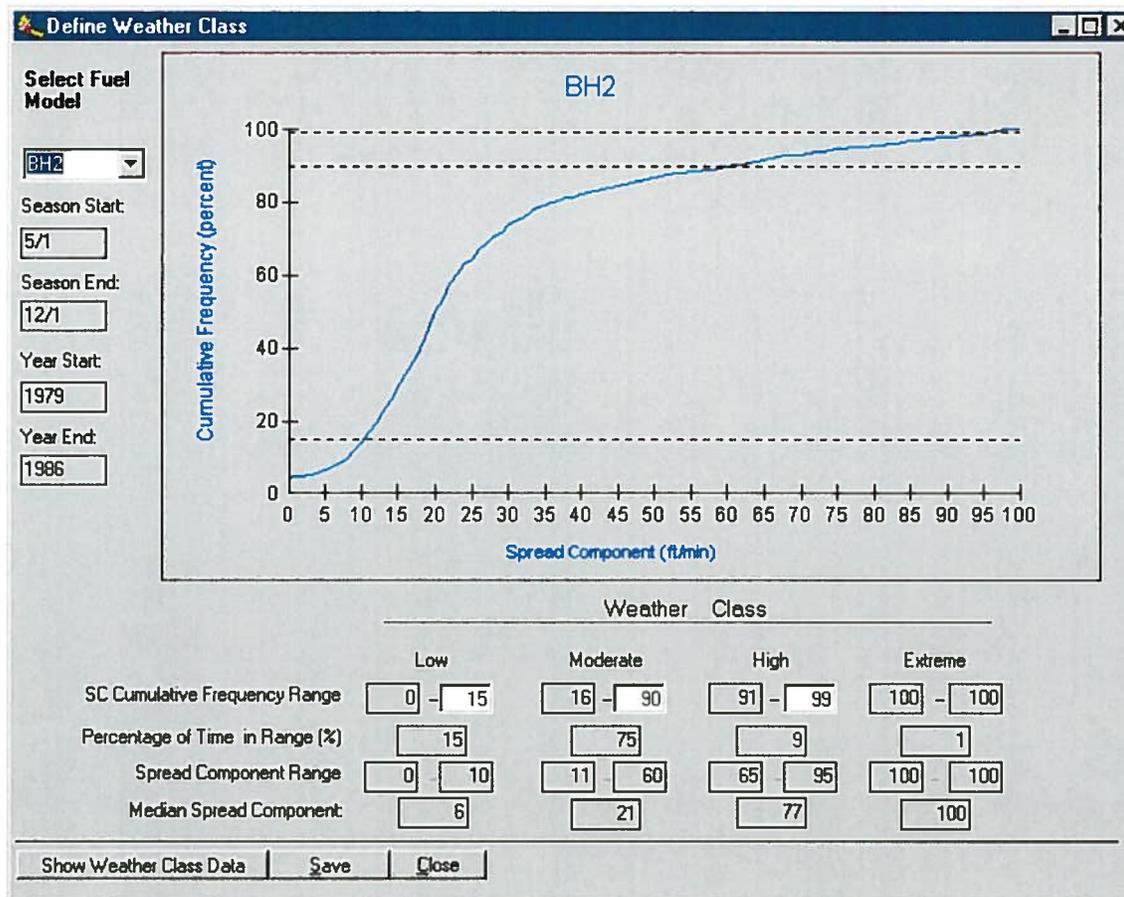


Clicking “Yes” will cause the fire behavior values to be recomputed, and the new values will be stored in the DFM data table. Clicking “No” means that the new fire behavior values will not be recomputed or stored in the DFM data table. In that case, the previous values will be retained in the DFM data table.

## **Define Weather Class Data**

The purpose of this program area is to establish the Spread Component ranges that will be used to characterize the four fire weather classes—low, moderate, high, and extreme—in FETM 4.

Click on the “Define Weather Class” node on the Index Tree to reveal the following cumulative frequency diagram for the specific derivative fuel model. The diagram shows the cumulative frequency of time (y axis) for different spread component values (x axis).



You must input the following information on this screen:

**Select Fuel Model**

Select the appropriate fuel model from the drop-down list. To determine the characteristics of a particular fuel model, go to the “Define DFMs” section of the program (see specific instructions on page 25)

**Spread Component Cumulative Frequency Range**

This range is used to characterize each weather class. Enter the upper end of each range; the lower end of each range will be automatically adjusted. You may review or edit the weather classes by clicking on the “Show Weather Class Data” button on the bottom left of the screen. More detailed instructions for editing the weather classes are shown below.

The following information will be entered from the PCHA file previously selected and cannot be edited here. For more information on selecting PCHA files, please refer to the “Manage External Files” section of this manual.

- Fire season starting month and day
- Fire season ending month and day
- Starting year of weather record
- Ending year of weather record

The following information that appears on this screen is calculated by FETM 4 and cannot be edited here. It is based on the user-selected Weather Classes and Spread Component Cumulative Frequency Range.

**Percentage of Time in Range**

The percentage of time in range occupied by each weather class is calculated by subtracting the lower frequency value from the upper frequency value. For example, 90%-16%=75% would be characterized as moderate fire weather.

**Spread Component Range**

This line presents the spread component values found in each cumulative frequency range.

**Median Spread Component**

This value represents the median (50th percentile) spread component found in each cumulative frequency range.

Click on the “Save” button to save any changes you have made to the spread component ranges.

Click on the “Close” button or “X” at any time to close the form.

*Show Weather Class Data*

To review or edit the weather classes used in this form, click on the “Show Weather Class Data” button, shown at the lower left of the previous screen. The following screen will appear:

	Weather Class			
	Low	Moderate	High	Extreme
SC Subset (Range)	5 - 6	21 - 21	77 - 77	100 - 100
Number of Observations	12	42	4	1
1-hr Fuel Moisture (%)	6.27	5.66	4.46	3.42
10-hr Fuel Moisture (%)	10.50	9.19	6.75	6.00
100-hr Fuel Moisture (%)	11.64	10.75	6.45	6.62
1000-hr Fuel Moisture (%)	15.25	12.66	9.17	9.10
Herb Fuel Moisture (%)	71.16	29.68	4.46	3.42
Woody Fuel Moisture (%)	119.76	94.69	63.01	69.59
20 ft Wind Speed (mph)	4.00	13.00	12.00	15.00
Fuel Temperature (°F)	91.00	98.00	104.00	117.00
Calculated SC:	7	20	84	100
Calculated ERC:	28	34	71	80
Calculated BI:	34	61	164	189
Calculated IC:	18	35	73	89

SC Subset from...  
 Previously Saved Data  
 Current Data

Retrieve Fuel Data | Recalculate Indices | Save | Back

The default data in this table are based on the HAIA data calculated previously in this program. These are the averages of the weather records for all of the fires included under “Number of Observations” on the previous screen, and are based on the average spread component range for each class defined. For more information on HAIA, refer to the “Initiate HAIA” section of this manual (see page 28).

The fields on this form are explained in greater detail below.

<b>SC Subset (Range)</b>	The SC (Spread Component) Subset is used to characterize all of the other fields on this form. By default, the “range” is simply the median spread component from the previous form. However, you may edit this range to any starting and ending values as long as they lie within the ranges specified in the “Spread Component Range” field found near the bottom of the previous form. If the range is modified, you must retrieve additional fuel data and recalculate the fire danger rating parameters by clicking on the “Retrieve Fuel Data” and then the “Recalculate Indices” button at the bottom of this screen.
<b>Number of Observations</b>	This is the number of daily weather records that lie within the specified SC range. This number is taken from the weather records imported from the administrative unit-specific PCHA database files using HAIA.
<b>Fuel Moisture Percentages</b>	This is the arithmetic average of fuel moisture values for days falling within the SC range of values for each fire weather class. Note that the user can edit these values. However, if you change these values, you must recalculate the fire danger rating parameters by clicking on the “Recalculate Indices” button.
<b>Wind Speed</b>	This is the arithmetic average of wind speed for days falling within the SC range of values for each fire weather class. Note that the user can edit these values. However, if you change these values, you must recalculate the fire danger rating parameters by clicking on the “Recalculate Indices” button.
<b>Fuel Temperature</b>	This is the arithmetic average of fuel moisture values for days falling within the SC range of values for each fire weather class. Note that the user can edit these values. However, if you change these values, you must recalculate the fire danger rating parameters by clicking on the “Recalculate Indices” button.

The following information that appears on this form is calculated from the SC Subset and Fuel Moisture, Wind Speed, and Fuel Temperature entered above. It cannot be edited.

- Calculated Spread Component (SC)
- Energy Release Component (ERC)
- Calculated Burning Index (BI)
- Calculated Ignition Component (IC)

**SC Subset From**      The program defaults to the “Current Data” button on the right side of the screen while you are editing the form. However, there may be times when you have made changes to the Weather Class Data form and then decide to revert to the previous information. As long as you have not saved the changes using the “Save” button at the bottom of the screen, you may revert to the previous data by clicking on the “Previously Saved Data” button. This will reset the data to whatever was there when you opened the form.

**Retrieve Fuel Data**      Click on this button to retrieve the Analysis Area weather data using the SC Subset values shown above.

**Recalculate Indices**      Click on this button to recompute the danger rating parameters (SC, ERC, BI, IC) using the user-input values displayed above.

**Save**      Click on this button to save the user-specified and calculated values displayed on this form.

**Back**      Click on this button to return to the previous (Define Weather Class) form.



### 3.7 Manage Fuel Characteristic Classes

This program area allows you to create and modify fuel characteristic classes (FCCs) for use in FETM. An FCC is a unique, qualitative, and quantitative description of the fuel profile from the mineral-soil interface to the top of the canopy. Where derivative fuel models are used to characterize fire behavior, FCCs are used to characterize the landscape composition and fire effects. Multiple FCCs may be assigned within an Analysis Area.

Scientists from the Pacific Northwest Forestry Laboratory in Seattle, Washington are in the process of developing a comprehensive system of fuel characteristic classifications. The FCC library for FETM will eventually incorporate those classifications. In the meantime, FETM comes with a default set of FCCs. In this section, users can accept the default settings regarding these classifications, or can create FCC definitions with more detailed information regarding vegetation structure and fuel biomass.

#### Define FCCs

To define FCCs, click on the “Define FCCs” node on the Index Tree. The following screen, the Fuel Condition Class Data table, with a pull-down “Edit” menu in the top left corner and 18 tabs across the top will appear:

The screenshot shows a software window titled "Fuel Condition Class Data" with an "Edit" menu. Below the menu are 18 tabs: Fire Behavior - Fine Intensity, Fire Behavior - Crown ROS, Fire Behavior - Fire Type, Fire Behavior - Potential Fire Size, Fuel Moisture, Prescribed Fire Consumption, Wildland Fire Surface Consumption, Wildland Fire Crown Consumption, Prescribed Fire Emissions, Wildland Fire Surface Emissions, Wildland Fire Crown Emissions, FCC Definition (selected), FCC Surface Fuel Loading, Crown Fuel Loading, Surface Fuel Adjustments, Stand Characteristics, Fuel Model Assignment, and Fire Behavior - Surface ROS.

FCC	Vegetation Type	Age Class	Loading Class	Activity Class	Other Class	Fuel Category	User Group
AF01-0001	Jeffrey pine	Bare	Low	Natural	Open	Timber Litter	
AF01-0002	Jeffrey pine	S&S&Poles	Medium	Natural	L	Grass	
AF01-0003	Jeffrey pine	S&S&Poles	Medium	Natural	M	Grass	
AF01-0004	Jeffrey pine	S&S&Poles	Medium	Natural	H	Grass	
AF01-0005	Jeffrey pine	Small	Medium	Natural	L	Timber Litter	
AF01-0006	Jeffrey pine	Small	Medium	Natural	M	Timber Litter	
AF01-0007	Jeffrey pine	Small	Medium	Natural	H	Timber Litter	
AF01-0008	Jeffrey pine	Medium	High	Natural	L	Timber Litter	
AF01-0009	Jeffrey pine	Medium	High	Natural	M	Timber Litter	
AF01-0010	Jeffrey pine	Medium	High	Natural	H	Timber Litter	
AF01-0011	Jeffrey pine	Large	Medium	Natural	L	Grass	
AF01-0012	Jeffrey pine	Large	Medium	Natural	M	Grass	
AF01-0013	Jeffrey pine	Large	Medium	Natural	H	Grass	
AF01-0014	MC Ponderosa pine	Bare	Low	Natural	Open	Timber Litter	
AF01-0015	MC Ponderosa pine	S&S&Poles	Medium	Natural	L	Grass	
AF01-0016	MC Ponderosa pine	S&S&Poles	Medium	Natural	M	Grass	
AF01-0017	MC Ponderosa pine	S&S&Poles	Medium	Natural	H	Grass	
AF01-0018	MC Ponderosa pine	Small	Medium	Natural	L	Timber Litter	
AF01-0019	MC Ponderosa pine	Small	Medium	Natural	M	Timber Litter	
AF01-0020	MC Ponderosa pine	Small	Medium	Natural	H	Timber Litter	
AF01-0021	MC Ponderosa pine	Medium	High	Natural	L	Timber Litter	
AF01-0022	MC Ponderosa pine	Medium	High	Natural	M	Timber Litter	
AF01-0023	MC Ponderosa pine	Medium	High	Natural	H	Timber Litter	
AF01-0024	MC Ponderosa pine	Large	Medium	Natural	L	Grass	
AF01-0025	MC Ponderosa pine	Large	Medium	Natural	M	Grass	
AF01-0026	MC Ponderosa pine	Large	Medium	Natural	H	Grass	
AF01-0027	MC White fir	Bare	Low	Natural	Open	Timber Litter	
AF01-0028	MC White fir	S&S&Poles	High	Natural	L	Timber Litter	
AF01-0029	MC White fir	S&S&Poles	High	Natural	M	Timber Litter	
AF01-0030	MC White fir	S&S&Poles	High	Natural	H	Timber Litter	

At the bottom of the window are buttons for "Copy Fuel Profile", "Close", and "Save Column Widths".

The functions listed on the Edit menu are described in detail below under “FCC Edit Menu.” Each of the 18 tabs is described in detail in the “FCC Tabs” section, which begins on page 66.

### *FCC Edit Menu*

You can access the FCC edit menu by clicking on “Edit” at the top left of the “Define FCCs” screen. The following pull-down menu will appear:

<u>C</u> ut	Ctrl + X
<u>C</u> opy	Ctrl + C
<u>P</u> aste	Ctrl + V
<u>A</u> dd new FCC to user portion of database	
Copy FCC records to user portion of database	
<u>D</u> elete FCC Records	
Re <u>N</u> umber user portion of database	
Filter FCC records	
Undo all filters	
Restore FCC records to system portion of database	
Age class list	
Fuel category list	
Loading class list	
Other class list	
User group	
Vegetation type list	

The last six items on the menu can also be accessed by right clicking on any cell within the FCC tabs. This is discussed in further detail under FCC Tabs (see page 67). Each of these Edit menu selections is described in greater detail below.

#### **Cut**

This selection is a reminder of the control command that can be used to cut information from the FCC data table. You cannot actually use it to cut information from the table.

You can use this command on a cell-by-cell or a line-by-line basis. To cut information from a cell, highlight the cell, then hold down the Ctrl key and press “X.” To cut an entire line, select the gray box to the left of the line or lines you want to cut, then hold down the Ctrl key and press “X.” FETM 4 is unlike other Windows programs you may be used to. Once you cut information, you cannot retrieve it.

**Copy/Paste**

These selections are a reminder of the control commands that can be used to copy and paste information within the FCC data table. You cannot actually use them to copy or paste information within the table.

You can use these commands on a cell-by-cell or a line-by-line basis. To copy information from a cell, highlight the cell, then hold down the Ctrl key and press "C." Next, drag your cursor to the cell where you would like to insert the information, then hold down the Ctrl key and press "V." To copy an entire line, select the gray box to the left of the line or lines you want to copy, then hold down the Ctrl key and press "C." You can only copy one line at a time.

**Add new FCC to user portion of database**

Clicking on this menu item will add a new FCC number and row at the bottom of the FCC data table. You can then use the pull-down menus under each column to fill in the row.

**Copy FCC records to user portion of database**

To copy an existing FCC record, click in the gray box to the left of the FCC you want to copy, then click on this item on the "Edit" menu. The FCC information will be copied to the bottom row of the FCC table.

**Delete FCC Records**

To delete FCC records from the FCC data table, click in the gray box to the left of the FCC you want to delete. If you want to delete more than one FCC, you can hold down the Ctrl key while you are selecting. Next, select "Delete FCC Records" from the "Edit" menu. A dialog box will appear that says, "Deleting these user-defined FCCs will also delete them from any scenarios where they are included. Do you want to continue?" If yes, click on the "Yes" button. If you want to go back and think about it again, click on the "No" button. There are 206 FCCs records that are system FCCs, meaning that they are associated with specific eco-regions. These FCCs cannot be deleted. However, selecting them under this command will cause them to be "hidden." For instructions on how to retrieve these system FCCs, see "Restore FCC Records to System Portion of Database" on the following page (page 62).

**ReNumber user portion of database**

Once you have added, deleted, and copied FCCs, you will have gaps in your numbering system. This menu item lets you go back and renumber the FCCs in consecutive order. It will also replace the first four characters of any FCCs you have copied with the four-character identifier for this scenario. To renumber the FCCs, simply click on this option on the "Edit" menu.

**Filter FCC Records**

This menu item allows you to create an FCC data table using specific characteristics. To use the filter feature, select “Filter FCC records” from the “Edit” menu. The screen shown below will appear.

The screenshot shows a dialog box titled "Filter Selection". It contains the following elements:

- A "Filter on" label above a dropdown menu.
- A "Type of Filter" label above a dropdown menu.
- A "Match Request" label above a text input field.
- Two checkboxes: "Add to existing filter" and "Undo Filters".
- Two buttons at the bottom: "Filter" and "Close".

You may sort by any of the column headings on the FCC data table. Click on the black arrow to the right of the “Filter On” field to see a list of filters available. You can also select the type of filter you wish to use. Filter types are specific to the filter you selected in the previous field. Click on the black arrow to the left of the “Type of Filter” field to see the selections available. Lastly, you can filter using the “Match Request” field. This field allows you to filter by word, letter, or number. Just type whatever you want to use into the field.

Once you have selected your filter parameters, you can apply them by selecting the “Filter” button at the bottom left of the screen. To return to the previous screen, select “Close” at any time.

**Undo All Filters**

To return to a complete list of FCCs on the FCC data table, select “Undo All Filters” from the “Edit” menu.

**Restore FCC Records to System Portion of Database**

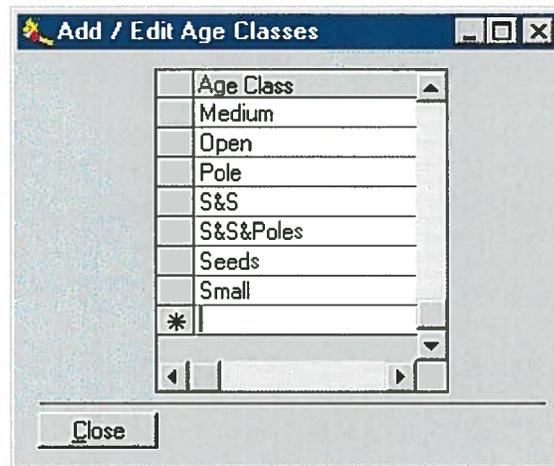
FETM 4 includes two types of FCC records—those that are user-defined and those that are preloaded into the system. If you have “hidden” system FCCs using the “Delete FCC Records” command, you can retrieve them here. Simply select “Restore FCC records to system portion of database” from the edit menu.

The final section of the menu allows you to edit existing or create user-defined characteristics for the FCCs. In addition to accessing these items on the "Edit" menu, you can also right-click on your mouse to see a list from anywhere within the tabbed screens. You can define characteristics in any of the following areas:

**Age Class List** To define an age class, select "Age Class List" from the "Edit" menu or by right-clicking your mouse in any cell within the FCC tabs and selecting it from the pull-down menu. The screen shown below will appear.

To redefine or replace an existing age class, simply highlight it by either clicking within the cell or by clicking on the gray square to the left of the row. Then type over the existing age class. All of the FCCs that had the previous characteristic will now list the new characteristic in the Age Class column.

To add a new age class to the pull-down menu, click in the cell next to the asterisk (\*). You may have to scroll down to see the bottom of the list. Type in the new age class you want to include, then select "Close." This age class will now be available on the pull-down menu.

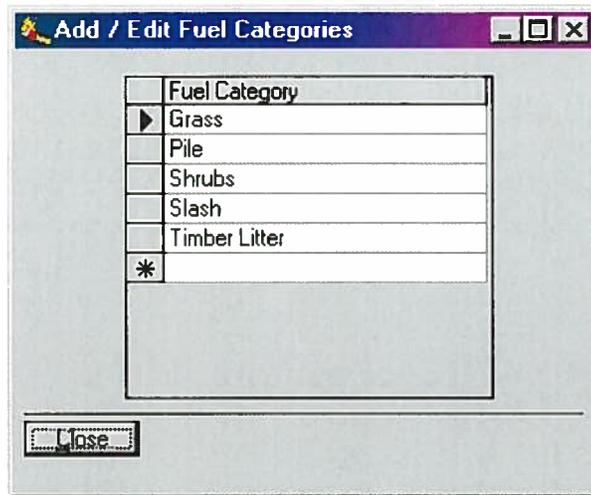


**Fuel Category List** To define a fuel category, select "Fuel Category List" from the "Edit" menu or by right-clicking your mouse in any cell within the FCC tabs and selecting it from the pull-down menu. The screen shown below will appear.

To redefine or replace an existing fuel category, simply highlight it by either clicking within the cell or by clicking on the gray square to the left of the row. Then type over the existing fuel category. All of the FCCs that had the previous fuel category will now list the new

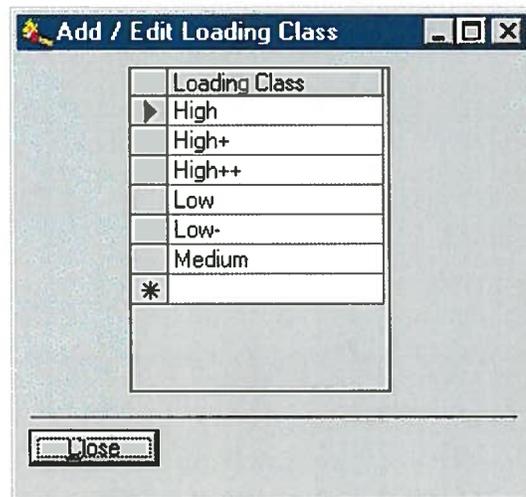
category in the Fuel Category column.

To add a new fuel category to the pull-down menu, click in the cell next to the asterisk (\*). You may have to scroll down to see the bottom of the list. Type in the new fuel category you want to include, then select “Close.” This fuel category will now be available on the pull-down menu.



### Loading Class List

To define a loading class, select “Loading Class List” from the “Edit” menu or by right-clicking your mouse in any cell within the FCC tabs and selecting it from the pull-down menu. The screen shown below will appear.



To redefine or replace an existing loading class, simply highlight it by either clicking within the cell or by clicking on the gray square to the left of the row. Then type over the existing loading class. All of the

FCCs that had the previous class will now list the new class in the Loading Class column.

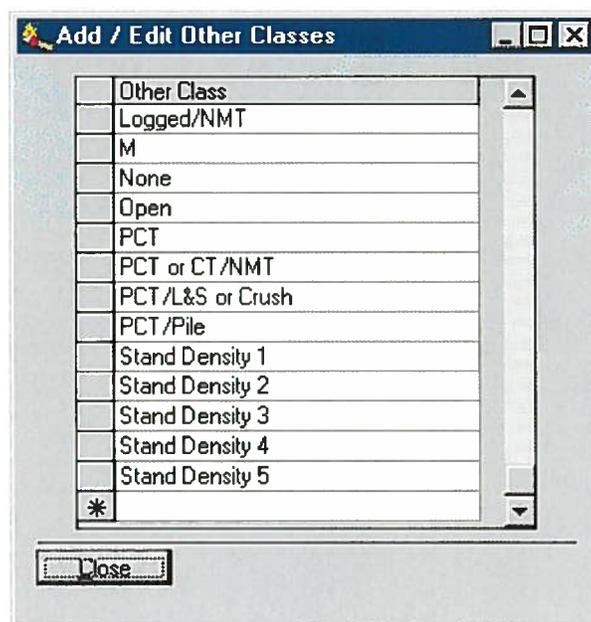
To add a new loading class to the pull-down menu, click in the cell next to the asterisk (\*). You may have to scroll down to see the bottom of the list. Type in the new loading class you want to include, then select "Close." This loading class will now be available on the pull-down menu.

## Other Class List

To define an "other" class, select "Other Class List" from the "Edit" menu or by right-clicking your mouse in any cell within the FCC tabs and selecting it from the pull-down menu. The screen shown below will appear.

"Other Class" is provided to let you tailor FETM 4 and the FCC definitions to your specific needs. For example, you may use the other class category to specify critical habitat, such as sage grouse or spotted owl. To redefine or replace a previously defined "Other" class, simply highlight it by either clicking within the cell or by clicking on the gray square to the left of the row. Then type over the existing other class. All of the FCCs that had the previous class will now list the new class in the Other Class column.

To add a new other class to the pull-down menu, click in the cell next to the asterisk (\*). You may have to scroll down to see the bottom of the list. Type in the new other class you want to include, then select "Close." This other class will now be available on the pull-down menu.

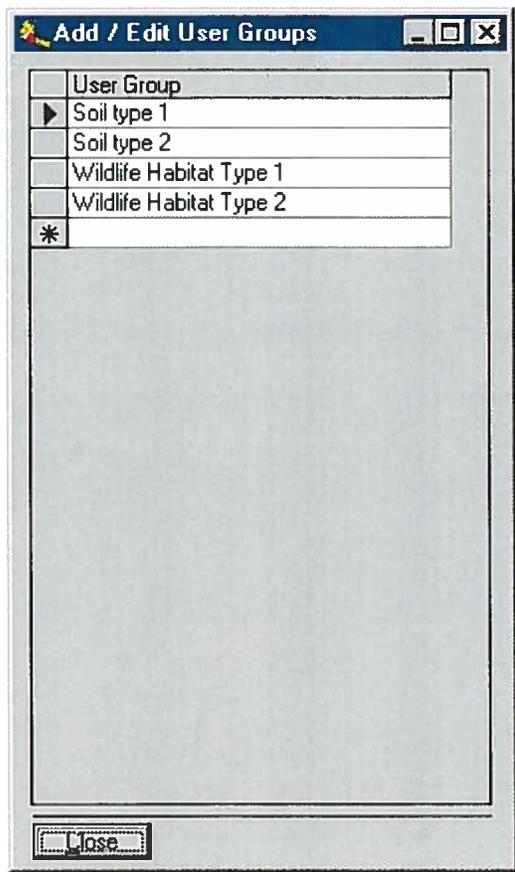


## User Group

To define a user group, select “User Group” from the “Edit” menu. The screen shown below will appear.

To redefine or replace an existing user group, simply highlight it by either clicking within the cell or by clicking on the gray square to the left of the row. Then type over the existing user group. All of the FCCs that had the previous group will now list the new group in the User Group column.

To add a new user group to the pull-down menu, click in the cell next to the asterisk (\*). You may have to scroll down to see the bottom of the list. Type in the new user group you want to include, then select “Close.” This user group will now be available on the pull-down menu.



## Vegetation Type List

To define a vegetation type, select “Vegetation Type List” from the “Edit” menu. The screen shown below will appear.

To redefine or replace a vegetation type, simply highlight it by either clicking within the cell or by clicking on the gray square to the left of the row. Then type over the existing vegetation type. All of the FCCs that had the previous type will now list the new vegetation type in the Vegetation Type column.

Vegetation Type	Description	Consume General Species
Basin Sagebrush	Basin Sagebrush	Shrub
Basin Sagebrush/Grass	Basin Sagebrush/Grass	Grass
BigCone DF-Coulter Pine	BigCone DF-Coulter Pine	Ponderosa
Canyon Live Oak	Canyon Live Oak	Shrub
Canyon Live Oak/Grass	Canyon Live Oak/Grass	Grass
Chamise Chaparral	Chamise Chaparral	Shrub
Chamise Chaparral-open	Chamise Chaparral-open	Shrub
Chamise Chaparral-open/Grass	Chamise Chaparral-open/Grass	Grass
Coast Live Oak-Walnut	Coast Live Oak-Walnut	Shrub
Coast Live Oak-Walnut/Grass	Coast Live Oak-Walnut/Grass	Grass
Coastal Sage-Shrub	Coastal Sage-Shrub	Shrub
Coastal Sage-Shrub/Grass	Coastal Sage-Shrub/Grass	Grass
Grass	Grass	Grass
G/LP		
G/PP		
Grass	Grass	Grass
Jeffrey pine	Jeffrey pine	Ponderosa
LLP		
LP		
MC		
MC Ponderosa pine	MC Ponderosa pine	Ponderosa

To add a new vegetation type to the pull-down menu, click in the cell next to the asterisk (\*). You may have to scroll down to see the bottom of the list. Type in the vegetation type you want to include, then select “Close.” This vegetation type will now be available on the pull-down menu.

## FCC Tabs

Each FCC appears on each of these tabs, and all of the information together makes up the definition of the FCC. Each FCC also has a unique code: for example, AF01-0001. The characters located to the left of the hyphen in the FCC name (here, AF01) represent the one- to

four-character code used to identify the Analysis Area (which was previously specified by the user under “Define Analysis Area”). The last four characters represent the FCC number within that Analysis Area. FETM 4 automatically assigns these numbers to FCCs as they are entered. You can choose to renumber these FCCs under the “Edit” menu on the “Define FCCs” screen (see page 61, ReNumber user portion of database, for additional explanation). The information displayed on each row of data across all of the tabs includes both quantitative and qualitative information that constitutes the full definition of the FCC for use in FETM 4.

The 18 tabs generally fall into four categories:

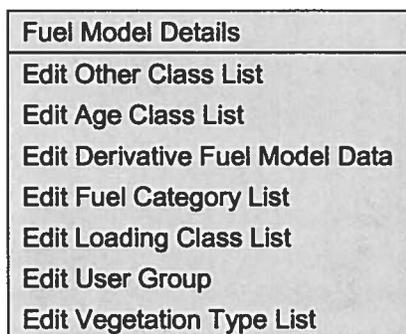
- FCC Characteristics
- Fire Behavior, Type, and Size Characteristics
- Wildland Fire Characteristics
- Prescribed Fire Characteristics

Each of these categories is described in greater detail below. In addition, all of the tabs have the following user buttons at the bottom of the screen:

- Copy Fuel Profile
- Save Column Widths
- Close

These user buttons are described in further detail following the discussions of each tab category (see page 72).

You may also review fuel model details and edit information in specific columns by right-clicking on any cell within the FCC tabs. The following pull-down menu will appear:



Screens for the **Other Class List**, **Age Class List**, **Fuel Category List**, **Loading Class List**, **User Group**, and **Vegetation Type** were shown previously under “FCC Edit Menu” (see pages 62-66). The “Fuel Model Details” screen and “Edit Derivative Fuel Model Data” screen are discussed below.

### **Fuel Model Details**

This list allow you to review the fuel models that are associated with the FCCs in the tabbed tables. To see this table, right-click in any cell with the FCC tabs. The Derivative Fuel Model Table shown on page

with the FCC tabs. The Derivative Fuel Model Table shown on page 30 will appear.

**Edit  
Derivative  
Fuel Model  
Data**

Right-click on this menu item for a short cut to the “Define DFMs” section of FETM 4. This section of the program is described in detail on page 25 of this manual.

*FCC Characteristics*

Tabs shown on this screen with pencil icons require user input. The currently active tab, whether it can be edited or not, is always displayed with a matchstick icon on it, and is always moved to the lowest tabbed row. Tabs without pencils show information that is calculated within FETM 4 or values that have been entered elsewhere in the program. Tabs that require user input are identified with a pencil icon and are discussed below.

**FCC (Fuel  
Characteristic  
Class)  
Definition**

Click on this tab to view or edit qualitative information used to identify FCCs. To edit the white cells within the table, click on the cell you wish to edit. A gray box with a black arrow in it will appear to the right side of the cell, as shown.

FCC DEFINITION		
	FCC	Vegetation Type
	AF01-0001	Jeffrey pine
	AF01-0002	Jeffrey pine
	AF01-0003	Jeffrey pine
	AF01-0004	Jeffrey pine

Click on the arrow to display the appropriate drop down list for the column, then select the information that you wish to insert by clicking on the highlighted text.

**FCC Surface  
Fuel Loading**

Click on this tab to characterize the surface fuel associated with a particular fuel characteristic class. You can enter the following information:

- Fuel Bed Depth
- Total Duff
- Duff Depth
- Live Wood
- Live Herb
- Dead & Down (DD) Wood for periods of 1 through 10,000+ hours

The program then automatically calculates Total DD Wood, Total Live Wood, and Total Live + DD Wood.

**Stand  
Characteristics**

Click on this tab to view summary information on the stands associated with each FCC, including density weighted diameter at breast height (inches), density weighted total stand height (feet), total stand density

**cs**

(trees/acre), calculated canopy base height (feet), the calculated maximum crown bulk density found in 1-foot vertical layers through the stand (pounds per cubic foot), and the foliar moisture content (percent).

The foliar moisture content values must be placed here in order for the correct fire type to be calculated. The other fields cannot be edited here. The information required for populating these fields is entered through the “Define Stands” node on the Index Tree (see page 73 for more information). If no stand is defined, the fields will be blank.

### **Fuel Model Assignment**

Click on this tab to view or edit the quantitative description of the fuel model assigned to each FCC. The fuel model assignment can be made either by selecting the desired model from the drop-down list in the column labeled “Derivative NFDRS Fuel Model” next to each FCC, or by using the “Define Derivative Fuel Model” node on the Index Tree (see page 25). You can also view the Derivative Fuel Model data for any FCC simply by double clicking on any data cell within the table. On this screen, the following fuel loading information can be edited:

#### ***Crown Fuel Loading***

Click on this tab to view information on the crown fuel loading by FCC for six fuel size classes: foliage, 1-hour wood time-lag fuels, total foliage + 1-hour wood time-lag fuels, 10-hour wood time-lag fuels, 100-hour wood time-lag fuels, and 1,000-hour wood time-lag fuels. All units are in tons per acre.

These fields cannot be edited here. The information required for populating these fields is entered through the “Define Stands” node on the Index Tree, which is discussed later in this user manual (see page 73). If no stand is defined, the fields will be left blank.

#### ***Surface Fuel Adjustments***

Click on this tab to view information on the mass of crown fuels that are deposited onto the surface in each of four fuel size classes: 1-hour, 10-hour, 100-hour, and 1,000-hour. Note that the deposited foliage mass is added to the 1-hour mass. All units are in tons per acre.

These fields cannot be edited here. The information required for populating these fields is entered under the “Define Stands” node on the Index Tree, which is discussed later in this user manual (see page 73). If no stand is defined, the fields will be left blank.

### ***Fire Behavior, Type, and Size Characteristics***

Several of the FCC tabs address fire behavior characteristics that are applicable to both prescribed and wildland fires. These tabs are described below.

<b>Fire Behavior-Surface ROS</b>	Click on this tab to view data on the calculated surface rate of spread (ROS) for each FCC by fire weather class. Information used to calculate these values was input in the “Define Weather Class” section of FETM 4 and mapped from derivative fuel models to FCCs on the “Fuel Model Assignment” tab of this table. All units are in chains per hour (1 chain = 66 feet).
<b>Fire Behavior-Fireline Intensity</b>	Click on this tab to view data on the calculated surface fireline intensities for each FCC by fire weather class. Information used to calculate these values was input in the “Define Weather Class” section of FETM 4. The information was subsequently mapped to the FCCs using the specified fuel model assignments shown on the “Fuel Model Assignment” tab of this table. This tab also displays the calculated critical fireline intensity required for crown fire initiation. All units are in British thermal units (Btus) per foot per second.
<b>Fire Behavior-Crown ROS</b>	Click on this tab for data on the calculated crown ROS for each FCC by fire weather class. Information used to calculate these values was input in the “Define Weather Class” section of FETM 4. The information was subsequently mapped to the FCCs using the specified fuel model assignments shown on the “Fuel Model Assignment” tab of this table. This tab also contains the calculated “Rate for Active Crowning” required for assessing crown fire propagation. All units are in chains per hour (1 chain = 66 feet).
<b>Fire Behavior-Fire Type</b>	This tab shows the computed fire type (surface, passive crown, active crown) for each fire weather class by FCC (see Glossary for a description of fire types).
<b>Fire Behavior-Potential Fire Size</b>	This tab includes the potential fire size for each FCC by fire weather class. All units are in acres per fire. The potential fire sizes for each FCC are calculated from the “Define Expected Fire Size” section of FETM 4 (see page 83).
<b>Fuel Moisture</b>	This tab contains 10-hour and 1,000-hour surface fuel moistures by fire weather class and by FCC. The units are all percent of oven-dry weight. These values are calculated in the “Define Weather Class” section of FETM 4.

### *Prescribed Fire Characteristics*

The following tabs provide information on prescribed fire characteristics associated with each FCC. The information on these tabs cannot be edited here. It is either input elsewhere in FETM 4, which will be discussed under the specific tab description, or is computed by FETM 4.

**Prescribed Fire Consumption** Click on this tab to view data on total prescribed-fire fuel consumption by fire weather class. All units are tons per acre. The values are computed using the CONSUME 2.1 dynamic link library, which is accessed via the “Compute Fuel Consumption” node on the Index Tree (see page 86).

**Prescribed Fire Emissions** Click on this tab to view information regarding the per-acre surface-fuel emissions from prescribed burning by pollutant, fire weather class (low, moderate, high, and extreme), and FCC. The per-acre emissions in tons per acre are given for the following pollutants:

- Particulate matter less than 2.5 microns in aerodynamic diameter (PM<sub>2.5</sub>)
- Particulate matter less than 10 microns in aerodynamic diameter (PM<sub>10</sub>)
- Carbon dioxide (CO<sub>2</sub>)
- Carbon monoxide (CO)
- Non-methane hydrocarbons (NMHC)
- Methane (CH<sub>4</sub>)

### *Wildland Fire Characteristics*

The following tabs provide information on wildland fire characteristics associated with each FCC. The information on these tabs cannot be edited here. It is either input elsewhere in FETM 4, which will be discussed under the specific tab description, or is computed by FETM 4.

**Wildland Fire Surface Consumption** Click on this tab to view information on total wildland fire surface fuel consumption by fire weather class. All units are in tons per acre. The values are computed using the CONSUME 2.1 dynamic link library, which is accessed via the “Compute Fuel Consumption” node on the Index Tree (see page 86).

**Wildland Fire Crown Consumption** Click on this tab to view information on the total consumption of crown fuels (all size classes combined) by weather class and by FCC. All units are in tons per acre. The values are computed using the CONSUME 2.1 dynamic link library, which is accessed via the “Compute Fuel Consumption” node on the Index Tree (see page 86).

**Wildland  
Fire  
Surface  
Emissions**

Click on this tab to view information regarding the per-acre surface-fuel emissions from wildland fire burning by pollutant, fire weather class (low, moderate, high, and extreme), and FCC. The per-acre emissions in tons per acre are given for the following pollutants:

- Particulate matter less than 2.5 microns in aerodynamic diameter (PM<sub>2.5</sub>)
- Particulate matter less than 10 microns in aerodynamic diameter (PM<sub>10</sub>)
- Carbon dioxide (CO<sub>2</sub>)
- Carbon monoxide (CO)
- Non-methane hydrocarbons (NMHC)
- Methane (CH<sub>4</sub>)

**Wildland  
Fire Crown  
Emissions**

Click on this tab to view information for each FCC regarding the per-acre emissions from wildland fire burning in crown fuels by pollutant and fire weather class (low, moderate, high, and extreme). The per-acre emissions in tons per acre are given for the following pollutants:

- Particulate matter less than 2.5 microns in aerodynamic diameter (PM<sub>2.5</sub>)
- Particulate matter less than 10 microns in aerodynamic diameter (PM<sub>10</sub>)
- Carbon dioxide (CO<sub>2</sub>)
- Carbon monoxide (CO)
- Non-methane hydrocarbons (NMHC)
- Methane (CH<sub>4</sub>)

*User Buttons on FCC Tabbed Screens*

The following buttons appear on all of the tabbed screens under “Define FCCs”:

**Save Column Widths**

You may not be able to see all of the columns onscreen. To change the column widths, simply hold the cursor on the vertical line separating the column headings until a double vertical line appears( || ). Holding down the left mouse key, move the double vertical line to the left or right to change the column width. You can save the column widths on these screens by selecting the gray “Save Column Widths” button at the bottom of the screen.

**Copy Fuel Profile**

To replace the fuel profile for the FCC with the corresponding fuel profile for its associated DFM, simply highlight the row (FCC) whose fuel profile you wish to replace by clicking in the gray box at the left side of the row. When the row is highlighted, click on the gray “Copy Fuel Profile” box at the bottom of the screen. This will replace the FCC fuel profile with the associated DFM fuel profile. The results will be displayed on the “FCC Surface Fuel Loading” tab.

**Close**

Click on this button or the “X” in the upper right corner at any time to close the FCC data table and return to the Index Tree.

**Define Stands**

In this section of FETM 4, you can include additional loading information that can be used to determine fire rates of spread and emissions. This program area also allows you to define stand characteristics that are common to more than one FCC, rather than having to define stand information for each individual FCC. Stands and their relationship to specific FCCs can be grouped using the following stand descriptors:

- Species
- Diameter at Breast Height
- Height
- Trees per Acre
- Crown Class
- Crown Ratio
- Proportion in Crown (Foliage, 1 Hour, 10 Hour, 100 Hour, 1000 Hour)
- Proportion Cut
- Proportion to Surface (Foliage, 1 Hour, 10 Hour, 100 Hour, 1000 Hour)
- Proportion Boles Left
- Proportion Rotten

In this section you will also calculate the crown fuel loading once you have defined the stands. FETM uses the information developed in this section as input to the FCC definitions discussed in the previous section (see page 69). You can also delete specific stand information or entire stands within this section of the program.

Click on “Define Stands” on the Index Tree to reveal the following form:

Select FCCs

Select FCCs for Stand Summary Group

Include	FCC	Stand Group	Veg. Type	Age Class	Loading Class	Other Class
<input checked="" type="checkbox"/>	AF01-0001 <No Stand>		Jeffrey pine	Bare	Low	Open
<input type="checkbox"/>	AF01-0002 JP S&S&Pole-1		Jeffrey pine	S&S&Poles	Medium	L
<input type="checkbox"/>	AF01-0003 JP S&S&Pole-2		Jeffrey pine	S&S&Poles	Medium	M
<input checked="" type="checkbox"/>	AF01-0004 JP S&S&Pole-3		Jeffrey pine	S&S&Poles	Medium	H
<input type="checkbox"/>	AF01-0005 JP Small-1		Jeffrey pine	Small	Medium	L
<input type="checkbox"/>	AF01-0006 JP Small-2		Jeffrey pine	Small	Medium	M
<input checked="" type="checkbox"/>	AF01-0007 JP Small-3		Jeffrey pine	Small	Medium	H
<input type="checkbox"/>	AF01-0008 JP Med-1		Jeffrey pine	Medium	High	L
<input type="checkbox"/>	AF01-0009 JP Med-2		Jeffrey pine	Medium	High	M
<input type="checkbox"/>	AF01-0010 JP Med-3		Jeffrey pine	Medium	High	H
<input type="checkbox"/>	AF01-0011 JP Lrg-1		Jeffrey pine	Large	Medium	L
<input type="checkbox"/>	AF01-0012 JP Lrg-2		Jeffrey pine	Large	Medium	M
<input type="checkbox"/>	AF01-0013 JP Lrg-3		Jeffrey pine	Large	Medium	H
<input type="checkbox"/>	AF01-0014 <No Stand>		MC Ponderosa pine	Bare	Low	Open
<input type="checkbox"/>	AF01-0015 <No Stand>		MC Ponderosa pine	S&S&Poles	Medium	L
<input type="checkbox"/>	AF01-0016 <No Stand>		MC Ponderosa pine	S&S&Poles	Medium	M
<input type="checkbox"/>	AF01-0017 <No Stand>		MC Ponderosa pine	S&S&Poles	Medium	H
<input type="checkbox"/>	AF01-0018 MCpp Small-1		MC Ponderosa pine	Small	Medium	L
<input type="checkbox"/>	AF01-0019 MCpp Small-2		MC Ponderosa pine	Small	Medium	M
<input type="checkbox"/>	AF01-0020 MCpp Small-3		MC Ponderosa pine	Small	Medium	H
<input type="checkbox"/>	AF01-0021 MCpp Med-1		MC Ponderosa pine	Medium	High	L
<input type="checkbox"/>	AF01-0022 MCpp Med-2		MC Ponderosa pine	Medium	High	M
<input type="checkbox"/>	AF01-0023 MCpp Med-3		MC Ponderosa pine	Medium	High	H
<input type="checkbox"/>	AF01-0024 MCpp Lrg-1		MC Ponderosa pine	Large	Medium	L
<input type="checkbox"/>	AF01-0025 MCpp Lrg-2		MC Ponderosa pine	Large	Medium	M
<input type="checkbox"/>	AF01-0026 MCpp Lrg-3		MC Ponderosa pine	Large	Medium	H
<input type="checkbox"/>	AF01-0027 MCwf Bare-1		MC White fir	Bare	Low	Open
<input type="checkbox"/>	AF01-0028 MCwf S&S&Pole-1		MC White fir	S&S&Poles	High	L
<input type="checkbox"/>	AF01-0029 MCwf S&S&Pole-2		MC White fir	S&S&Poles	High	M
<input type="checkbox"/>	AF01-0030 MCwf S&S&Pole-3		MC White fir	S&S&Poles	High	H
<input type="checkbox"/>	AF01-0031 MCwf Small-1		MC White fir	Small	Medium	L
<input type="checkbox"/>	AF01-0032 MCwf Small-2		MC White fir	Small	Medium	M
<input type="checkbox"/>	AF01-0033 MCwf Small-3		MC White fir	Small	Medium	H
<input type="checkbox"/>	AF01-0034 MCwf Med-1		MC White fir	Medium	Medium	L
<input type="checkbox"/>	AF01-0035 MCwf Med-2		MC White fir	Medium	Medium	M
<input type="checkbox"/>	AF01-0036 MCwf Med-3		MC White fir	Medium	Medium	H

Any existing stand information defined for selected FCCs will be replaced.

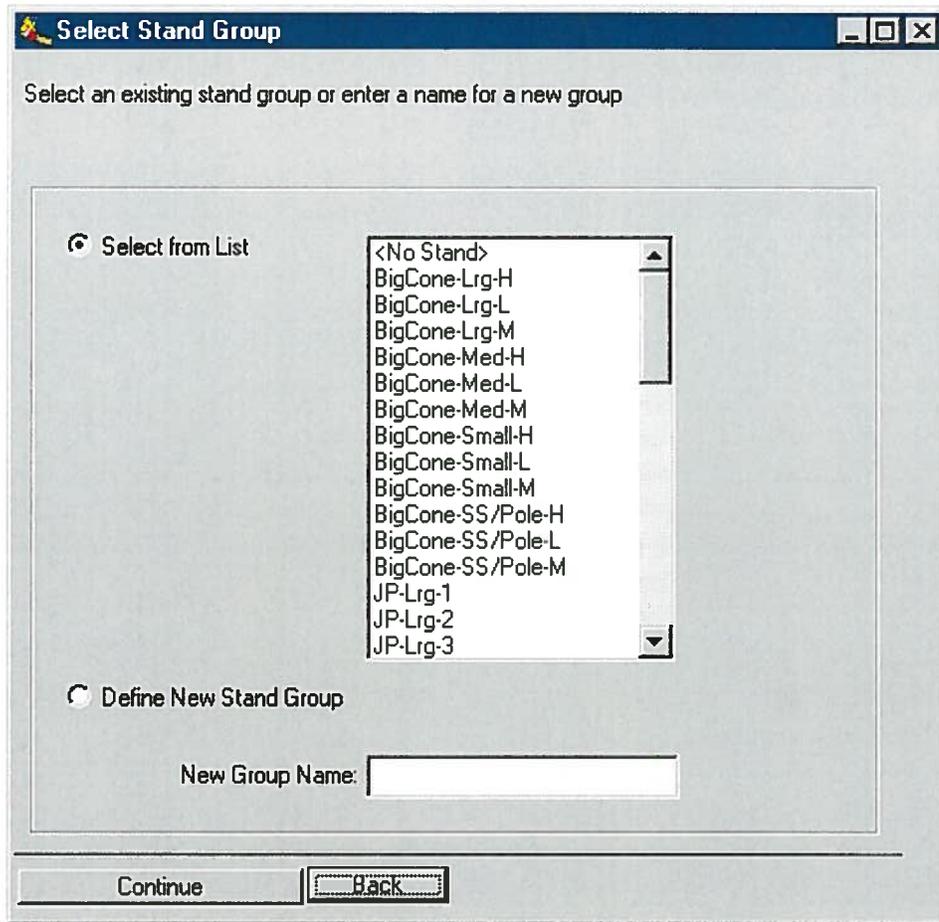
Define Stand Summary    Close

You may wish to adjust the column widths to see all of the information on this form. To do so, simply hold the cursor on the vertical line separating the column headings until a double vertical line appears (||). Holding down the left mouse key, move the double vertical line to the left or right to change the column width.

This form shows the list of previously defined FCCs and any existing stand groups associated with those FCCs. To define a new stand group or to edit an existing stand group, select those FCCs you wish to include by clicking on the gray boxes in the "Include" column to the left of the FCCs you wish to specify. A red check will appear in the boxes you have selected. If you select an FCC by accident or change your mind, simply click on the box again and the check will disappear.

Please note that all of the FCCs clicked at one time will be placed in the same stand group, so only click those that you wish to define together. If you choose FCCs that cross more than one existing stand group, you must choose one of the existing stand groups from a list (which will then be used to characterize all of the FCCs checked), or select a new stand group name with a new stand group definition to follow.

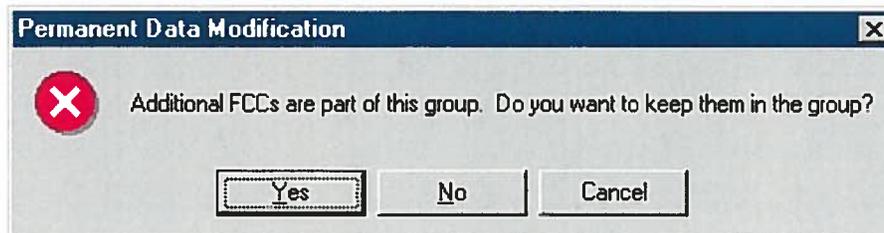
Once you have selected the FCCs that you wish to include, click on the “Define Stand Summary” at the bottom of the screen. The following screen will appear:



At this point, you may take one of two actions—“Select from List” or “Define New Stand Group”—that are discussed in greater detail below.

### *Select from List*

If you choose to select from the existing stand list, click on the radio button next to “Select from List,” highlight the existing stand definition that you wish to use, then click on the “Continue” button at the bottom of the screen. If you have not selected all of the FCCs that are currently included in the stand group, the following query will appear onscreen:



If you wish to list all of the FCCs that are currently included in this stand definition, select “Yes.” If you only want to keep those FCCs that you have specified on the “Include” form, select “No.” **If you are not sure, select “Cancel” and go back and check, because there is no going back once you have changed the stand definition!**

You can redefine the stand group associated with an FCC by highlighting any other stand group name in the list, and then clicking on “Continue.”

Once you have made this decision, the following screen will appear. You can use the gray scroll bar on the top left of the screen to see a list of all of the FCCs included in this stand definition. You can use the “Notes” box on the top right of the screen to enter any notes regarding the stand definition.

Stand Summary for FCCs:  
AF01-0008 JP-Med-1 Jeffrey pine Medium High L

Notes:

Definition Assumptions Crown Mass Profile

Stand Group Name: JP-Med-1

Species	DBH (in.)	Height (ft.)	Trees per Acre	Crown Class	Crown Ratio	Foliage	Proportion 1 Hr	in 10 Hr	Crown 100 Hr	Proportion 1000 Hr	Proportion Cut
PP - Ponderosa	5	30	571	I - Intermed	0.30	1.00	1.00	1.00	1.00	1.00	0.00
PP - Ponderosa	10	45	26	D - Dominant	0.42	1.00	1.00	1.00	1.00	1.00	0.00

Compute Crown Mass Copy Row(s) Delete Row(s) Delete Stand Definition Save Back

You will need to use the scroll bars to see all of the data in the tabbed tables. This screen includes two input tabs—Definition and Assumptions—and two output tabs—Crown Mass and Profile. Each of these tabs is explained in greater detail below.

**Definition**

Click on the “Definition” tab to define the stand species. Each table row contains data for a specific species included in the stand, as shown in the previous screen. You can change the species included in the stand by clicking on the black arrow to the right of the listed species and selecting a different species from the pull down menu. You can also add a species by clicking on the empty bottom row of the table and selecting a species from the pull-down menu. FETM 4 will automatically fill in the foliage information associated with the FCC, which you can then edit by clicking on the appropriate cell and typing over the existing information.

**Copy Row**

This button is only functional on the “Definition” tab. To copy a row within the “Definition” screen, click in the gray box to the left of the “Species” row, then click on the “Copy Row” button at the bottom of the screen. You can select more than one row to copy by holding down the “Ctrl” key while you click in the gray boxes. The row or rows will be copied to the bottom of the species list.

**Delete Row**

This button is only functional on the “Definition” tab. To delete a row within the “Definition” screen, click in the gray box to the left of the “Species” row, then click on the “Delete Row” button at the bottom of the screen. You can select more than one row by holding down the “Ctrl” key while you click in the gray boxes. A dialog box will appear with the message, “Are you sure you want to delete the selected rows?” Click on “Yes” to delete the highlighted rows. Click on “No” to return to the “Definition” screen.

**Assumptions**

Click on the “Assumptions” tab to identify the Crown Class Adjustments, Crown Fire Factors, and Equation Set used to define the current stand. The default values that are shown are those generally accepted by fuel and fire specialists. However, to change the default information, you can either click on the black arrows to show a drop-down box and select from the list provided, or you can highlight the information that you wish to change and type over it. Once you have input the changes, you can save your changes by selecting the “Save” button at the bottom of the screen. If you do not wish to save your changes, you may select the “Back” button, which will return you to the previous screen without saving your changes. The “Assumptions” screen is shown below.

**Define Stand Summary**

Stand Summary for FCCs:  
 AF01-0004 JP:S&S&Pole-3 Jeffrey pine S&S&Poles   
 Medium H   
 AF01-0007 JP-Small-3 Jeffrey pine Small Medium   
 H

Notes:

Definition | **Assumptions** | Crown Mass | Profile

**Crown Mass Factors**

**Crown Class Adjustments**

Dominant:   
 Co-Dominant:   
 Intermediate:   
 Suppressed:

**Crown Fire Factors**

Running Mean Window (ft):   
 1 Hour Contribution to Crown Fire:   
 Critical Canopy Bulk Density (#/ft<sup>3</sup>):

Equation Set:

Compute Crown Mass | Copy Row(s) | Delete Row(s) | Delete Stand Definition | Save | Back

### Crown Mass

To see the crown mass computation based on your input, select the “Crown Mass” tab. The screen shown below will appear. To update the calculated crown mass data, select the “Compute Crown Mass” button at the bottom of the screen. (You can actually do this from any point within this section of the program.)

**Define Stand Summary**

Stand Summary for FCCs:  
 AF01-0004 JP-S&S&Pole-3 Jeffrey pine S&S&Poles  
 Medium H  
 AF01-0007 JP-Small-3 Jeffrey pine Small Medium  
 H

Notes:

Definition | Assumptions | **Crown Mass** | Profile

Canopy Base Height (ft):

**Residual Crown Mass**

1 Hour (lbs/acre):

10 Hour (lbs/acre):

100 Hour (lbs/acre):

1000 Hour (lbs/acre):

Foliage (lbs/acre):

**Crown Mass Deposited to Surface**

1 Hour (lbs/acre):

10 Hour (lbs/acre):

100 Hour (lbs/acre):

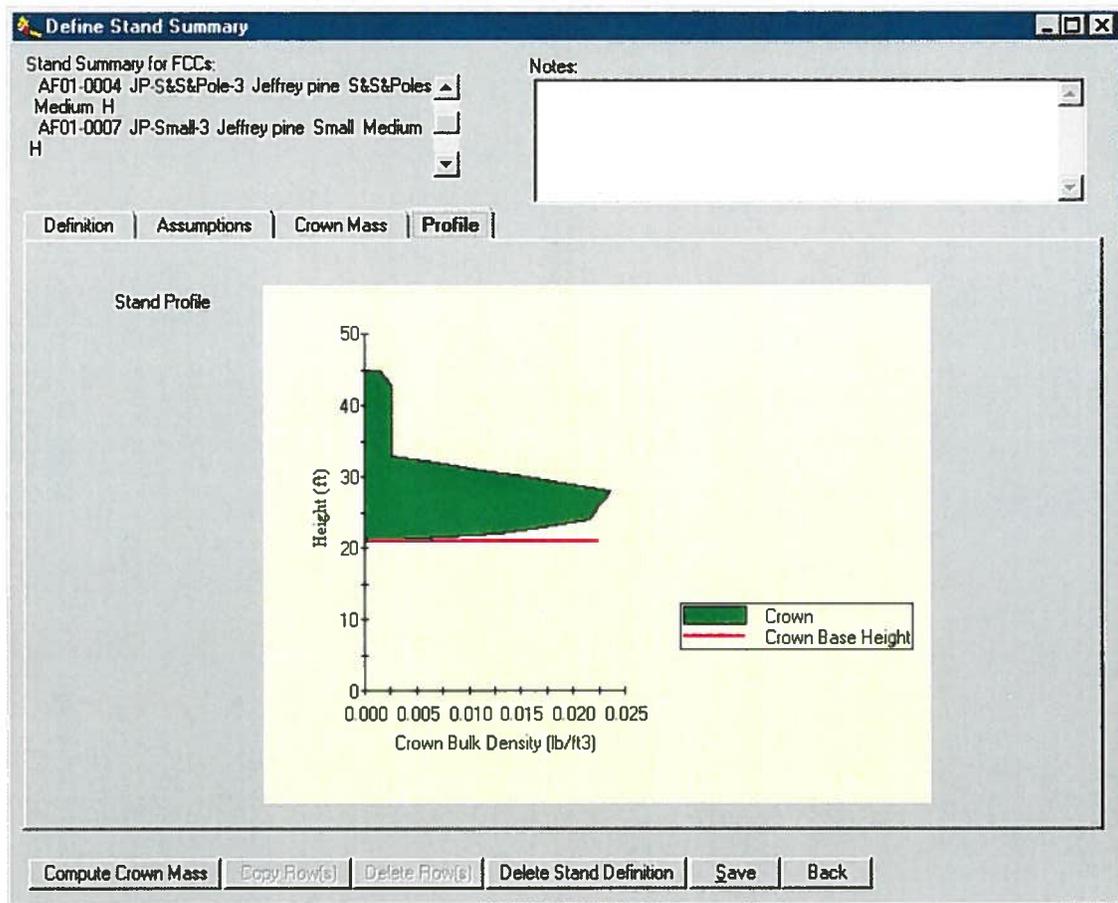
1000 Hour (lbs/acre):

Foliage (lbs/acre):

Segments	Number	Running-Mean Crown Bulk Density (lbs/ft <sup>3</sup> )	Max Crown Bulk Density	Critical Crown Bulk Density
	1	0.0000	<input type="checkbox"/>	<input type="checkbox"/>
	2	0.0000	<input type="checkbox"/>	<input type="checkbox"/>
	3	0.0000	<input type="checkbox"/>	<input type="checkbox"/>
	4	0.0000	<input type="checkbox"/>	<input type="checkbox"/>

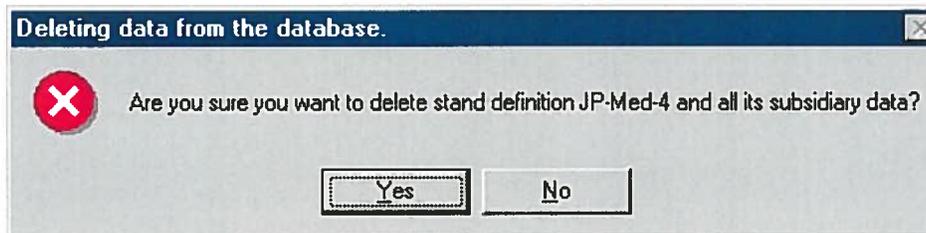
**Profile**

To see a graphic profile of the data you have input, select the "Profile" tab. A sample profile screen appears below. The profile may look similar or significantly different, depending on the information you have input.



**Delete  
Stand  
Definition**

To delete a stand that has been defined, click on the “Delete Stand Definition” button at the bottom of the screen. The following dialog box will appear, specific to the stand you have selected:



If you are sure you would like to delete the stand definition, select “Yes.” If there is any question in your mind, select “No” as there is no going back once you have deleted the definition.

## Define New Stand Group

If you choose to define a new stand group at the “Select Stand Group” screen (see page 75), click on the radio button next to “Define New Stand Group,” type in an abbreviation for the stand definition that you wish to create, then click on the “Continue” button at the bottom of the screen. The following screen will appear:

Species	DBH (in.)	Height (ft.)	Trees per Acre	Crown Class	Crown Ratio	Foliage	Proportion 1 Hr	in 10 Hr	Crown 100 Hr	Proportion 1000 Hr	Proportion Cut
---------	-----------	--------------	----------------	-------------	-------------	---------	-----------------	----------	--------------	--------------------	----------------

You can use the gray scroll bar on the top left of the screen to see a list of all of the FCCs that you included in this new stand definition. You can use the “Notes” box on the top right of the screen to enter any notes regarding the stand definition.

You will need to use the scroll bars to see all of the data in the tabbed tables. This screen includes two input tabs—Definition and Assumptions—and two output tabs—Crown Mass and Profile. These tabs are the same under “Define New Stand Group” as they are under the previous section, “Select from List.” Please return to that section (pages 75-81) for a detailed description of each of these tabs.

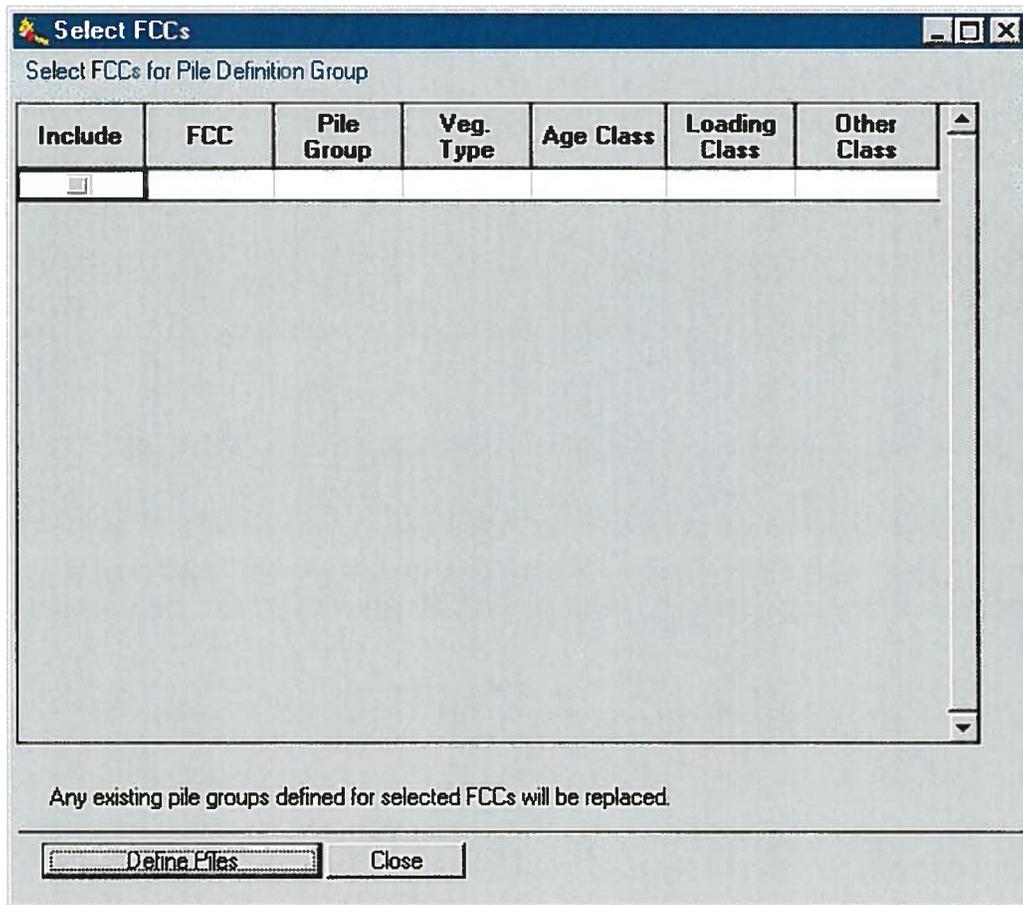
## Calculate Crown Fuel Loading

This Index Tree item is non-functional. It is there simply as a reminder that the crown fuel loading is computed under “Define Stands.”

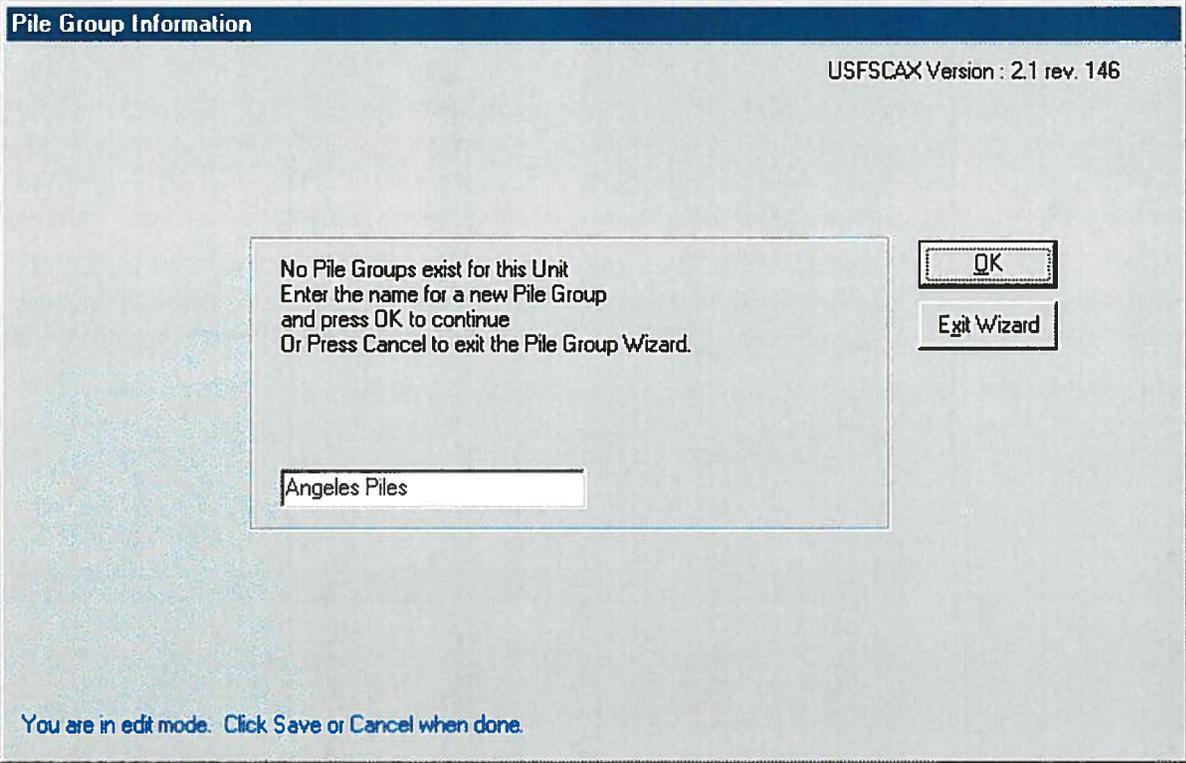
## Define Piles

This program area allows you to compute the fuel loading in piled slash by specifying the number of piles and the shape of the piles, among other characteristics. The pile wizard is the same as that used in the FASTRACS program. To use this program area, the "Pile" definition must be used for at least one FCC. This definition is applied in the "Fuel Category" column of the "FCC Definition" tab under "Define FCCs" screen (see page 59). If no piles are specified in that tab, you will get a "type mismatch" error when you try to use this section of the program.

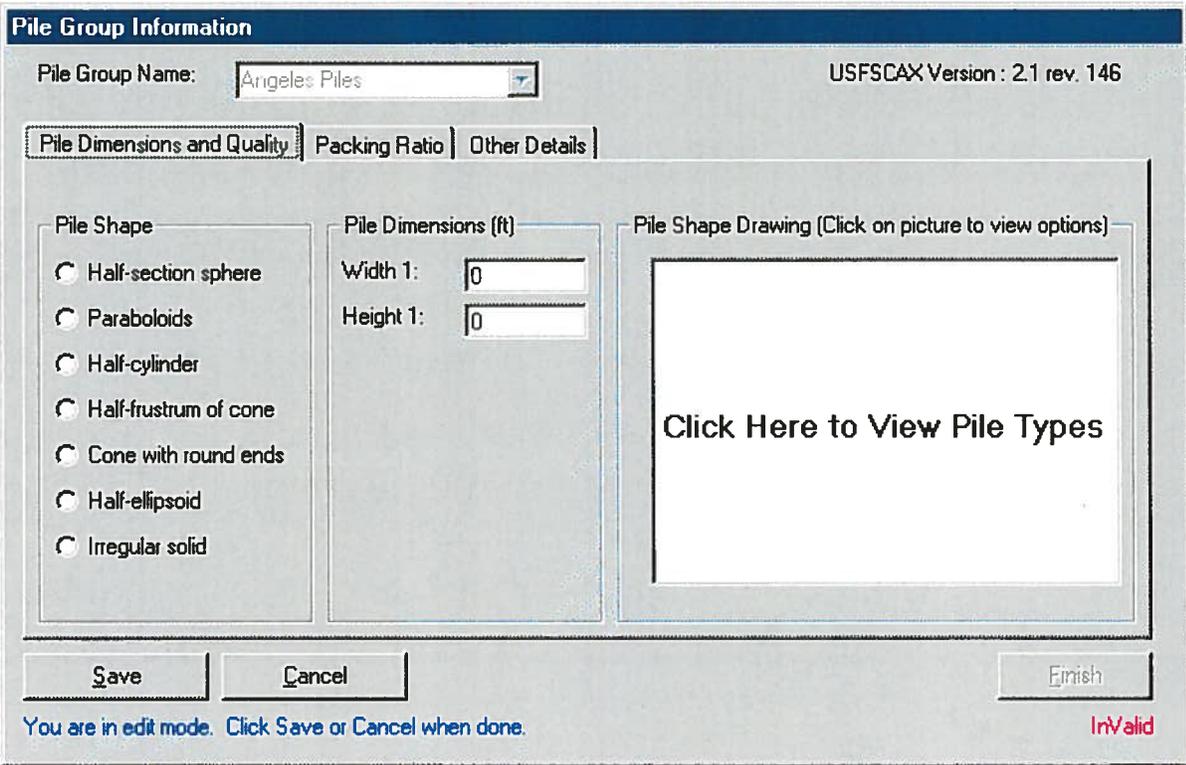
To define a pile associated with an FCC or group of FCCs, click on "Select Analysis Area," "Manage Fuel Characteristics Classes," then "Define Piles" on the Index Tree. The following screen will appear.



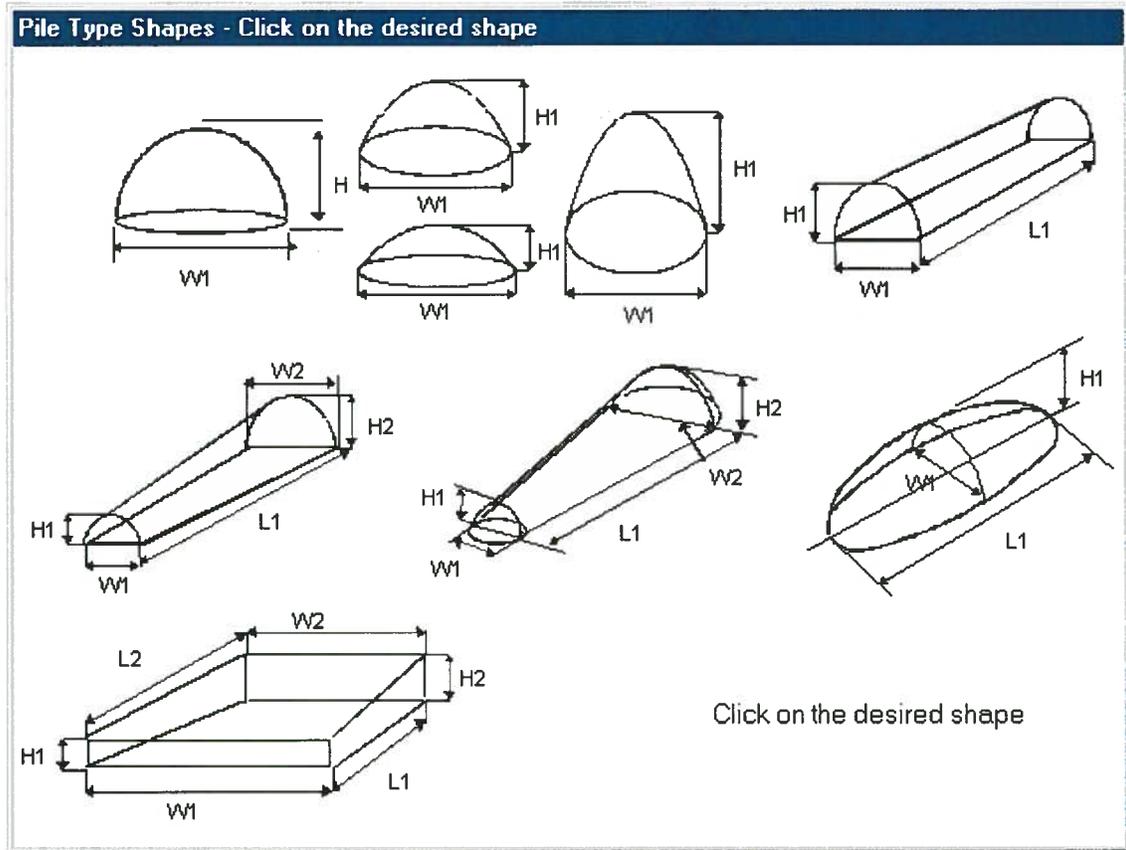
If FCCs associated with piles are listed, you can select them in the "Include" column. If not, you will need to define a new pile by selecting the "Define Piles" button at the bottom of the screen. Once you have done this, the screen shown below will appear. You may exit this function at any time by selecting "Close" or clicking on the "X" in the upper right corner.



First, type in a name for your pile definition. This can be anything (e.g., location, type of pile, associated FCC number). Then click on “OK.” The following screen will appear.



The three tabs across the top allow you to fully describe the piles. The first is “Pile Dimension and Quality.” On this tab you will select pile shape and dimensions. Click on the radio button next to the pile type you wish to use, or, to see examples of pile types, click in the white square on the left side of the screen. The following screen will appear.



Click on the appropriate pile type, then click on “OK.” You will be returned to the previous screen and the radio button next to the pile type will be selected.

Next, fill in the dimensions of the pile, then select another tab, either “Packing Ratio” or “Other Details.” If you try to save or cancel at this point, you will receive an error message because more information is required.

The “Packing Ratio” tab is shown below.

**Pile Group Information**

Pile Group Name:  USFSCAX Version : 2.1 rev. 146

Pile Dimensions and Quality **Packing Ratio** Other Details

(1) Piles with species content dominated by ponderosa pine, with mean diameters of the large woody fuel of less than 10 inches. Packing ratio = 10%.  
 (2) Piles dominated by short-needled conifers. Packing ratio = 20%.  
 (3) Highly compacted, clean piles with larger logs (diameters greater than 10 inches), especially those built with a crane or loader. Packing ratio = 25%.

The above categories provide packing ratios typical of these fuels. Select the packing ratio that best represents your fuels. Precise species are selected on the next page.

You are in edit mode. Click Save or Cancel when done. Invalid

Select the appropriate radio button, then move to the "Other Details" tab, which is shown below.

**Pile Group Information**

Pile Group Name:  USFSCAX Version : 2.1 rev. 146

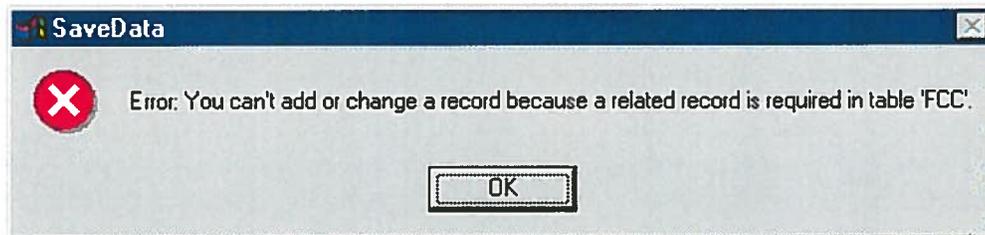
Pile Dimensions and Quality Packing Ratio **Other Details**

Percent of Pile that is Soil (Best Estimate)   
 Primary Species (>= 50%)  Wood Density  lb/ft<sup>3</sup>  
 Percent of Primary Species   
 Secondary Species (< 50%)  Wood Density  lb/ft<sup>3</sup>  
 Percent of Secondary Species   
 Number of piles of this type

Pile Quality  Clean  Dirty  Really Dirty

You are in edit mode. Click Save or Cancel when done. Invalid

Fill in the requested information, then select “Save.” If you have not chosen “Pile” previously under the “Define FCCs” section of the program, you will receive the following error message:



You will need to go back to that section of the program and include “pile” as a definition for at least one FCC under the “Fuel Category” column of the “FCC Definition” tab (see page 59 for additional information) before you can proceed with your pile definitions.

You may exit this function at any time by selecting “Cancel” or clicking on the “X” in the upper right corner of the screen.

## **Assign Derivative Fuel Model**

This program area contains a wizard that allows you to map the FCCs to a single derivative fuel model, either manually or automatically, using a set of weighting factors.

To assign a derivative fuel model to a specific FCC, select “Assign Derivative Fuel Model” from the Index Tree under “Manage Fuel Characteristic Classes.” The following screen will appear:

**Assign Derivative Fuel Model to FCCs**

**Weighting Factors**

Fuel Bed Depth:  Fine DD Loading (0-0.25"):  Small DD Loading (0"-3"):

**Fuel Category**

Timber Litter  Grass  All  
 Slash  Shrubs

FCC	Existing DFM Assignment	Include	DFM Recommendation	Relative Score	Accept
AF01-0001	HM2	<input type="checkbox"/>			<input type="checkbox"/>
AF01-0002	CL1	<input type="checkbox"/>			<input type="checkbox"/>
AF01-0003	CL1	<input type="checkbox"/>			<input type="checkbox"/>
AF01-0004	CL1	<input type="checkbox"/>			<input type="checkbox"/>
AF01-0005	UH1	<input type="checkbox"/>			<input type="checkbox"/>
AF01-0006	UH1	<input type="checkbox"/>			<input type="checkbox"/>
AF01-0007	UH1	<input type="checkbox"/>			<input type="checkbox"/>
AF01-0008	UM1	<input type="checkbox"/>			<input type="checkbox"/>
AF01-0009	UM1	<input type="checkbox"/>			<input type="checkbox"/>
AF01-0010	UM1	<input type="checkbox"/>			<input type="checkbox"/>
AF01-0011	CM2	<input type="checkbox"/>			<input type="checkbox"/>
AF01-0012	CM2	<input type="checkbox"/>			<input type="checkbox"/>
AF01-0013	CM2	<input type="checkbox"/>			<input type="checkbox"/>
AF01-0014	HM1	<input type="checkbox"/>			<input type="checkbox"/>
AF01-0015	CL1	<input type="checkbox"/>			<input type="checkbox"/>
AF01-0016	CL1	<input type="checkbox"/>			<input type="checkbox"/>
AF01-0017	CL1	<input type="checkbox"/>			<input type="checkbox"/>

Select All      Unselect All      Accept All      Reject All

Run      Save      Close

Default factors will appear under the “Weighting Factors” heading at the top left of the screen and the “Fuel Category” will default to “All.” To change the default weighting factors, simply highlight the default factor and type in a new one. The fuel bed depth (in feet) may be any number greater than zero. As indicated on the screen, the Fine Dead & Down (DD) Loading is the loading in fuel element sizes that range in diameter from 0 to 0.25 inch. The weighting factor for Small DD Loading (as indicated, fuel elements sizes that range in diameter from 0 to 3 inches) will be adjusted to balance the total of all three factors to 1.0. The default factors will not reset until you click on another area of the screen outside of the weighting factor box.

To change the Fuel Category, simply select the appropriate radio button.

The lower part of the screen contains a list of all FCCs currently defined in FETM 4 and the derivative fuel model currently assigned to them. Select those FCCs to which you wish to assign new Derivative Fuel Models by clicking on the appropriate gray box in the “Include” column. If you wish to see DFM recommendations or change DFM assignments for all of the FCCs, you can click on the “Select All” button at the bottom of the screen. You can also unselect all of the FCCs that you have highlighted and start over by selecting the “Unselect All” button at the bottom of the screen.

Once you have selected those FCCs that you wish to include, click on the “Run” button at the bottom left of the screen. The model will load the DFM recommendations and relative scores for those FCCs that you have included based on the weighting factors and fuel category that you have selected.

At this point, you can do one of three actions:

1. You can accept all of the recommendations by clicking the “Accept All” button at the bottom right of the screen.
2. You can reject all of the recommendations by clicking the “Reject All” button at the bottom right of the screen.
3. You can accept specific recommendations by highlighting the appropriate gray boxes in the “Accept” column on the right side of the screen, then selecting the “Run” button again.

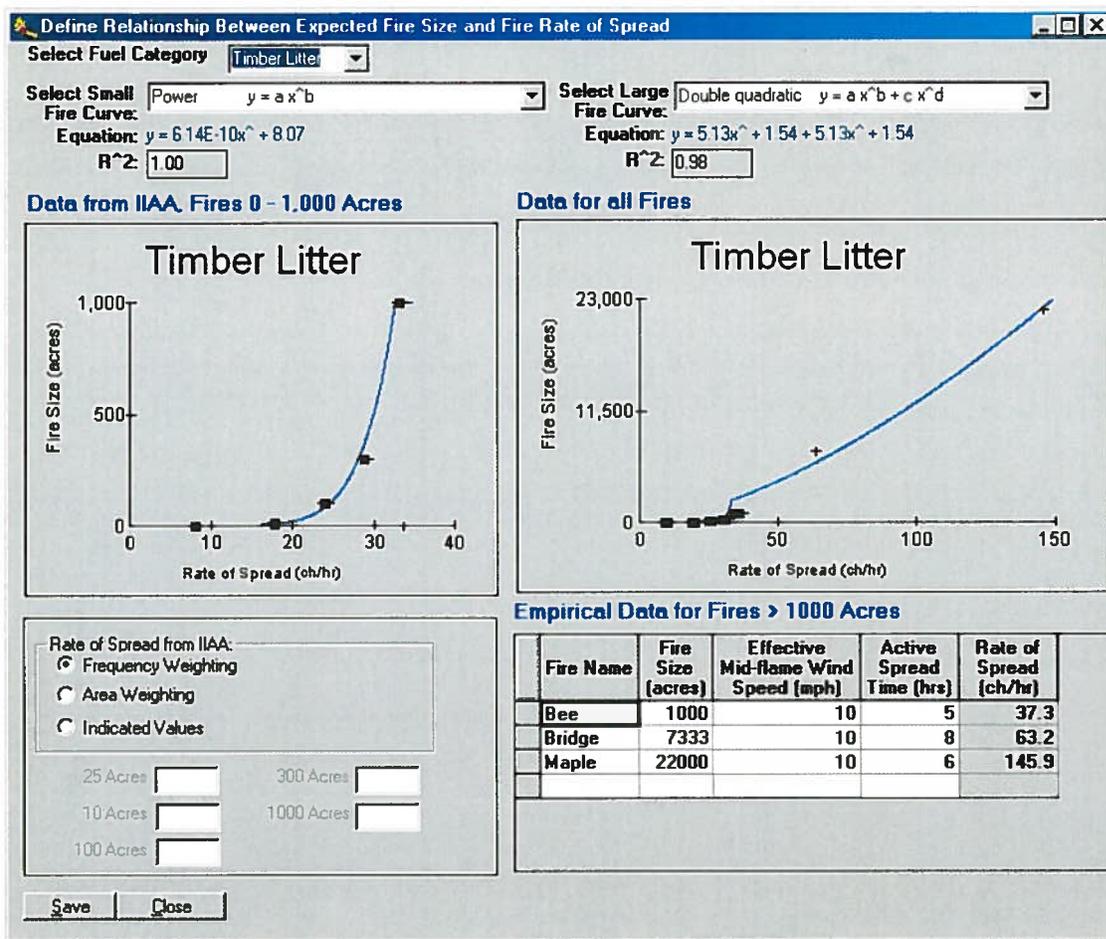
Once you have accepted and run the program, you can save your changes by clicking on the “Save” button on the lower left of the screen.

You can exit anytime without saving your changes by simply selecting the “Close” button at the bottom of the screen or the “X” at the upper right.

## **Define Expected Fire Size**

This program area allows you to define the relationship between the final fire size and the fire rate of spread for each of four fuel categories: timber litter, slash, grass, and brush.

To define this relationship, select “Define Expected Fire Size” from the Index Tree under “Manage Fuel Characteristic Classes.” The following screen will appear:



The graph on the left shows smaller fires up to 1,000 acres. The graph on the right shows all of the fires included.

Several fields on this screen require user input. Each is described below.

**Select Fuel Category**

To select a fuel category (timber litter, grass, shrubs), click on the black arrow to the right of the “Select Fuel Category” field at the top left of the screen. Then highlight and click on the fuel category you wish to use. Fire size relationships should be defined for each of the four fuel categories accessible from the drop-down list.

**Select Small Fire Curve Equation**

Select the Small Fire Curve Equation that you wish to use by clicking on the black arrow to the right of the “Select Small Fire Curve Equation” field at the top left of the screen. Then highlight and click on the equation you wish to use. You should select the curve equation that provides the best fit to the points shown in the graph on the left side of the screen. These equations are explained in greater detail in a separate volume, *Technical Documentation*.

<b>R<sup>2</sup> Field</b>	The equation and coefficient of determination (R <sup>2</sup> ) shown on the left side of the screen results from the curve equation selected for controlled fires of less than 1,000 acres. This is based on the relationship between the final fire size (acres) and the rate of spread (chains per hour) for controlled fires less than 1,000 acres in size. FETM 4 calculates this coefficient.
<b>Select Large Fire Curve Equation</b>	Select the Large Fire Curve Equation that you wish to use by clicking on the black arrow to the right of the “Select Large Fire Curve Equation” field at the top right of the screen. Then highlight and click on the equation you wish to use. These equations are explained in greater detail in a separate volume, <i>Technical Documentation</i> .
<b>R<sup>2</sup> Field</b>	The equation and coefficient of determination (R <sup>2</sup> ) shown on the right side of the screen result from the curve equation selected for escaped (i.e., right-hand side) fires only. FETM 4 calculates this coefficient. As stated on the screen, at least three fires must be associated with the curve for FETM 4 to make this calculation.
<b>Rate of Spread from IIAA</b>	You may select one of the following to define the Rate of Spread by clicking the appropriate radio button on the lower left of the screen:
<b>Frequency Weighting</b>	Breakpoint rates of spread from the IIAA model are weighted by the number of fires that occur in the various FMZs that make up the Analysis Area.
<b>Area Weighting</b>	Breakpoint rates of spread from the IIAA model are weighted by the area of the various FMZs that make up the Analysis Area.
<b>Indicated Values</b>	Breakpoint rates of spread are specified by the user. If you use the indicated values, the “Acres” cells will turn from gray to white and you must fill in the appropriate breakpoint rates of spread.
<b>Empirical Data from Fires</b>	This spreadsheet is for entering information on historical fires within the Analysis Area that have escaped initial attack (i.e., greater than 1,000 acres for IIAA users). You should enter the following information (in order from left to right): fire name, final fire size (acres; area within the controlled perimeter, including unburned acres), effective mid-flame wind speed (mph), active spread time of the fire (hours). Anderson’s fire size model is used to compute the effective rate of spread of the fire. Enter data from as many fires as exist (3 to 10 is ideal).
<b>Save</b>	Click here to save the data you have entered on this screen. If you do not wish to save the data, close without saving.

**Close**

Click here to return to the Index Tree.

## Compute Fire Type

This program area lets you compute the fire type for each FCC based on the fire weather data, fuel loading, and topography specified previously in various parts of the model. The fire type is computed to be one of the following: surface fire, passive crown fire, or active crown fire. The algorithms used to determine fire type are the same as those used in the FireFamily+ system of models, and are described in the *Technical Documentation* for FETM.

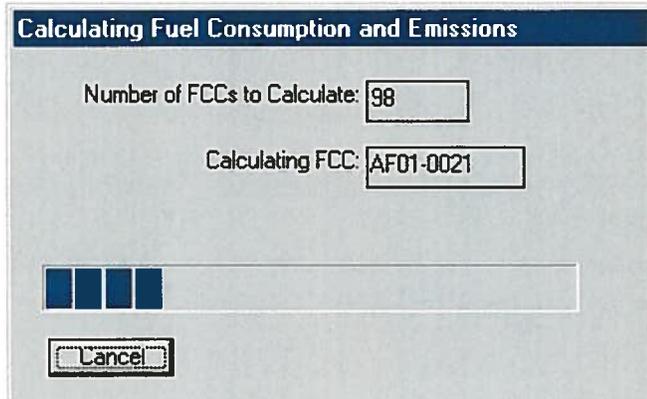
To compute the fire type and populate the FCC data table with the computed fire type, click once on the “Compute Fire Type” node on the Index Tree. FETM 4 will automatically compute the data and a “Calculation Complete” dialog box will appear onscreen. Simply click on “ok” to make the dialog box disappear.

## Compute Fuel Consumption

This program area allows you to compute fuel consumption and emissions for both surface and elevated fuels using the same algorithms as those used in the CONSUME 2.1 dynamic link library (version 2.01.0140).

To compute the fuel consumption and emissions, click once on the “Compute Fuel” node on the Index Tree. The box to the right will remain onscreen while FETM 4 automatically computes the data.

A “Calculation Complete” dialog box will appear onscreen when the calculation is finished. Simply click on “ok” to make the dialog box disappear.





# 4 Managing Scenarios

This program area allows you to set up scenarios using the data entered in the all of the previous Index Tree nodes. A scenario (also called a *run scenario*) is a set of assumptions used to define a modeling analysis within the Analysis Area. A scenario is defined by the following inputs and assumptions (partial list): FCCs to include, transition matrices that show effects of various fire and non-fire disturbances, schedule of management activities, pollutant type, years in simulation period, number of model iterations over which to average the results, and the levels of prescribed-fire treatment to include.

## 4.1 New Scenario

To create a new scenario, click on the “New Scenario” under “Manage Scenarios” on the Index Tree. The following screen will appear:

The screenshot shows a dialog box titled "Scenario Definition" with a close button (X) in the top right corner. The dialog is organized into several sections:

- Scenario Name:** A text input field.
- Scenario Description:** A large text area.
- Total Acres in Analysis Area:** A label with the value "565,096".
- Administrative Options:**
  - Prescribed Fire Treatment Scaling Factors:** A list of seven levels with checkboxes and input fields:
    - Level 1 (No Treatment):  [ ]
    - Level 2 (- 2 \* Increment):  [ ]
    - Level 3 (- Increment):  [ ]
    - Level 4 (Baseline Schedule):  [ 1 ] Increment: [ ]
    - Level 5 (+ Increment):  [ ]
    - Level 6 (+ 2 \* Increment):  [ ]
    - Level 7 (+ 3 \* Increment):  [ ]
  - Number of Years in Simulation (Default is 100):** [ ]
  - Number of Model Iterations Over Which Results Will Be Averaged (Default is 30):** [ ]
- Pollutant Species:** A list of pollutants with checkboxes:
  - PM 2.5, Particulate matter less than 2.5 micrometers
  - PM 10, Particulate matter less than 10 micrometers
  - NMHC, Non-methane hydrocarbons
  - CO2, Carbon dioxide
  - CO, Carbon monoxide
  - CH4, Methane
- Maximum Fire Size by Fuel Category (acres):** A table with columns for Timber Litter, Grass, Shrubs, and Slash.

	Timber Litter:	Grass:	Shrubs:	Slash:
Maximum Historical Fire:	[ 1,000 ]	[ 1,000 ]	[ 1,000 ]	[ ]
Maximum Fire Size:	[ ]	[ ]	[ ]	[ ]

- Buttons:** "Update FCC Data", "Save", and "Close".

You will need to fill in the following information:

- |   |  |
|---|--|
| <b>Scenario Name</b>  | Enter name.  |
| <b>Scenario Description</b>   | Enter scenario description (optional).   |
| <b>Prescribed Fire Treatment Scaling Factors</b>                      | If more than one level of prescribed fire treatment is to be run in the scenario, you will need to define the scaling factors. To define the scaling factors, first enter a percentage increment to the right of the field labeled "Increment," then click on the boxes to the left of the levels that you wish to include in the scenario. A check will appear in the boxes to the left of the selected levels. If you only wish to model the prescribed fire treatment schedule that will be input later in FETM 4, then put in a "0" increment and check only the box to the left of Level 4 (Baseline Schedule). |
| <b>Number of Years to Include in Simulation</b>                       | The range is 1 to 200 years, with a 100-year default.  |
| <b>Number of Model Iterations over which Results Will be Averaged</b> | You can enter any number of iterations. The default is 30.   |
| <b>Maximum Fire Size by Fuel Category</b>                             | Enter the maximum size of wildland fires that could occur within the Analysis Area by fuel category. The maximum size is always greater than or equal to the maximum controlled fire size of 1,000 acres.  |
| <b>Pollutant Species</b>  | Select one or more pollutant species to include in the scenario run by clicking in the box to the left of the pollutant species. A check will appear next to the selected species.   |
| <b>Update FCC Data</b>  | Click this button to update the scenario (hidden) using the data that are currently displayed on the FCC data table (under "Define FCCs" on the Index Tree).   |
| <b>Save</b>   | Click on the "Save" button to save the scenario you have created.  |

**Close**

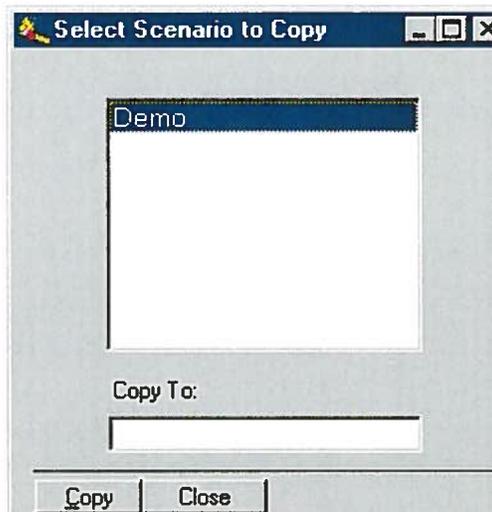
Click on the “Close” button on the “X” in the upper right to return to the Index Tree. If you close without saving, your scenario will not be saved. Fortunately, FETM 4 will ask you first if you want to save your changes. Select “yes” if you do and “no” if you don’t.

## 4.2 Copy Scenario

This section of the program allows you to copy existing scenarios, both those that have been run and those that have not. Copying a scenario is the only way to modify and run a scenario that has already been run. FETM will not allow you to modify a scenario that has been previously run.

To copy an existing scenario into a new scenario, click on the “Copy Scenario” node below “Manage Scenarios” on the Index Tree. The form to the right will appear onscreen:

Highlight the scenario you wish to copy, then enter the new scenario name in the “Copy To” field. Click on the “Copy” button at the lower left of the form. When the scenario has been copied, a “Scenario Copied” dialog box will appear. Click “OK” to make it disappear. You can continue to copy scenarios at this point or select “Close” or “X” to return to the Index Tree.

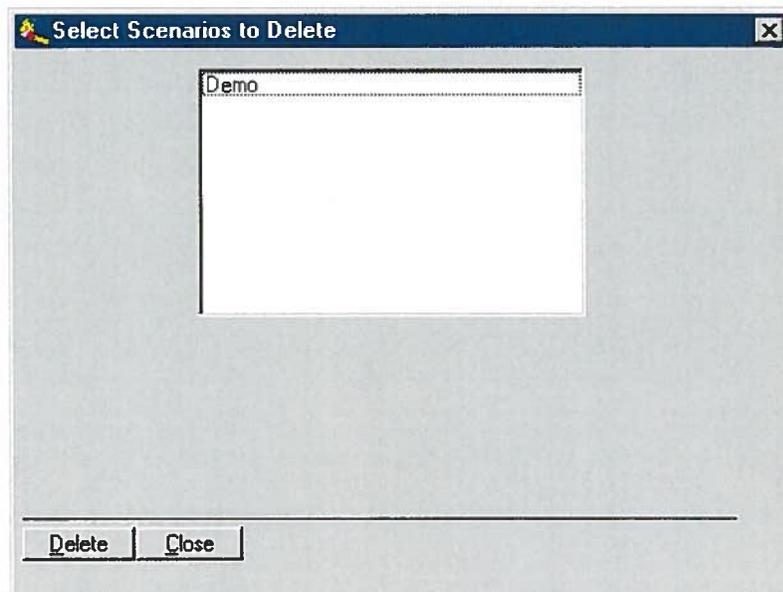


The screenshot shows a dialog box titled "Select Scenario to Copy". It features a list box containing the text "Demo". Below the list box is a text input field labeled "Copy To:". At the bottom of the dialog, there are two buttons: "Copy" and "Close".

## 4.3 Delete Scenario

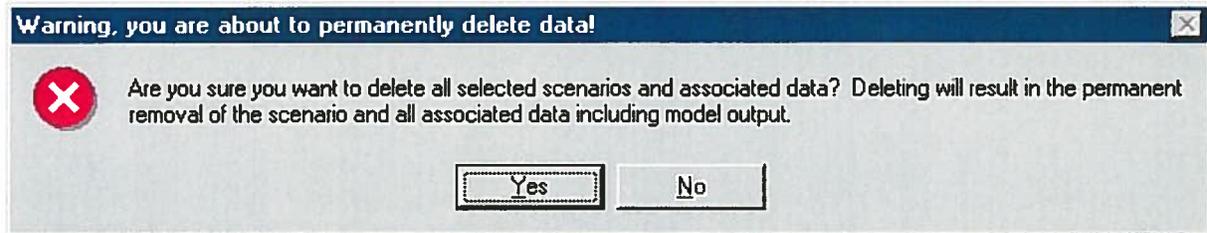
This section of the program allows you to delete existing scenarios, including those that have been run and those that have not. **Deleting a scenario will result in the permanent removal of the scenario and all associated data, including model output.**

To delete a scenario, click on the “Delete Scenario” node below “Manage Scenarios” on the Index Tree. The form to the right will appear onscreen:



The screenshot shows a dialog box titled "Select Scenarios to Delete". It features a list box containing the text "Demo". At the bottom of the dialog, there are two buttons: "Delete" and "Close".

Highlight the scenario you wish to delete and then click on the “Delete” button at the lower left of the form. The following warning box will appear:



If you wish to continue (that is, delete), select “Yes.” If you wish to rethink your decision (that is, not delete), select “No.”

You may select “Close” or “X” at any time to return to the Index Tree.

## 4.4 Select Scenario

This section of the program allows you to select from a list of existing scenarios, both those that have been run and those that have not. You may view the information for a scenario that has been run, but may not change it. A lock icon to the right of the listing identifies scenarios that have been run. You can modify the information discussed in the following subsections for scenarios that have not yet been run.

To select a specific scenario, double-click on the folder icon that appears to the left of the scenario that you wish to work with. Scenarios that have been previously run and are locked will appear in the list with a lock icon to the right of them.

Once you have selected a scenario, the Index Tree will expand to include the nodes discussed below.

### Define Scenario Assumptions

Clicking on the Define Scenario Assumptions node on the Index Tree will reveal the same form that appears when you create a New Scenario. See the “New Scenario” section (page 87) for a description of each field.

### Define Initial Fire Frequency

This program area allows you to specify the distribution of fires entered in the “Define Analysis Area” form by fire weather class.

Click on “Define Initial Fire Frequency” on the Index Tree to reveal the following form. (The total number of fires per year was entered previously in the “Define Analysis Area” form.)

**Define Initial Fire Frequency**

Select Fuel Model for Determining Fire Frequency:

Season Start:  Season End:

Select Number of Fires Based on:

Percentage of Time in Range     HAIA Distribution of Fires     User Supplied Values

	Low	Moderate	High	Extreme	Total
SC Cumulative Frequency Range	<input type="text" value="0"/> - <input type="text" value="15"/>	<input type="text" value="16"/> - <input type="text" value="90"/>	<input type="text" value="91"/> - <input type="text" value="99"/>	<input type="text" value="100"/> - <input type="text" value="100"/>	
Percentage of Time in Range (%)	<input type="text" value="15"/>	<input type="text" value="75"/>	<input type="text" value="9"/>	<input type="text" value="1"/>	<input type="text" value="100"/>
HAIA Distribution of Fires (%)	<input type="text" value="15.8"/>	<input type="text" value="76.7"/>	<input type="text" value="4.2"/>	<input type="text" value="3.3"/>	<input type="text" value="100"/>
Number of Fires in Administrative Units	<input type="text" value="19"/>	<input type="text" value="92"/>	<input type="text" value="5"/>	<input type="text" value="4"/>	<input type="text" value="120"/>
Fire Frequency in Analysis Area	<input type="text" value="28.8"/>	<input type="text" value="14.3"/>	<input type="text" value="6.1"/>	<input type="text" value="2.8"/>	<input type="text" value="52"/>

Comments:

The user can edit the following areas on this form:

**Select Fuel Model for Determining Fire Frequency**

To select a fuel model to characterize fire frequency by fire weather class within the Analysis Area, choose the fuel model that dominates fire behavior in the Analysis Area from the drop-down list. Information regarding the fuel model characteristics is found in the “Define DFMs” section of this program.

**Select Number of Fires Based on**

Click on one of the following buttons to select the method by which the number of fires within the Analysis Area will be determined:

**Percentage of Time in Range**

Click on this button to characterize the fire frequency distribution as a percentage of time in each spread component range. The fire frequency distribution is based on all weather conditions within the user-defined fire season. For example, if 15 percent of the fire season is characterized by low fire weather conditions, then 15 percent of the fires are assumed to occur in the low fire weather class. The formula for each weather class is as follows:

$$\text{Fire Frequency in Weather Class} = \left( \frac{\% \text{ of Time in Range}}{100} \right) \text{Total Fire Frequency}$$

**HAIA Distribution of Fires**

Click on this button to characterize the fire frequency distribution according to the HAIA distribution of fires. This fire frequency distribution is based on the weather specifically for those days on which fires occurred. This information is taken from the PCHA weather files. HAIA tracks the spread components for days on which fires occur during the specified fire season. These fires are then accumulated in the spread component “bins” for each fire weather class. For example, if 11.7 percent of the fires occur on days when the spread component ranges from 0 to 15, then 11.7 percent of the fires are assumed to occur in the low fire weather class. The formula is as follows:

$$\text{Fire Frequency in Weather Class} = \left( \frac{\text{HAIA Distribution of Fires (\%)}}{100} \right) \text{Total Fire Frequency}$$

**User-Supplied Values**

Select this option if you want to input specific fire frequency information for this Analysis Area. Once you have selected this option, the “Fire Frequency in Analysis Area” cells on the form will turn from gray to white and you can input fire frequencies for the following fire weather classes: low, moderate, high, and extreme. Note that the total of the four fire weather classes must sum exactly to the total value shown, which cannot be edited here. To change this number, you will need to return to the “Define Analysis Area” screen in FETM 4.

**Fire Frequency in Analysis Area**

As discussed above, these cells only require input if you select “User-Supplied Values” in the previous area. Otherwise, they are calculated by the formulas shown above. If you choose to enter your own values, you will enter the fire frequency for each fire weather class in these cells. The total fire frequency must equal the number shown under “Total Fire Frequency” on the previously shown screen.

**Comments**

You may input any information within this cell. If you used “User-Supplied Values” above, you may want to include specific

information about how those values were derived.

The following information that is included on this form is derived from other forms within the FETM 4 program and cannot be edited here.

<b>Season Start and End Dates</b>	These are used to characterize the fire weather classes.
<b>SC Cumulative Frequency Range</b>	Spread component frequency range for the derivative fuel model selected. This range was specified previously on the “Define Weather Class” form.
<b>Percentage of Time Occupied by Each Fire Weather Class</b>	This range was specified previously on the “Define Weather Class” form.
<b>HAIA Distribution of Fires</b>	Information by fire weather class for derivative fuel model selected. This is a calculated value from the HAIA program that includes all of the fires in each selected administrative unit.
<b>Number of Fires in Administrative units</b>	This is the same as the HAIA Distribution of Fires, except that the distribution of fires is based on the total number of fires within all of the administrative units included in the Analysis Area, not just those fires within the actual Analysis Area. Consequently, these two numbers may differ if only parts of an administrative unit are included within the Analysis Area.
<b>Fire Frequency in Analysis Area</b>	As discussed previously, you cannot edit these cells if you choose to select the number of fires based on either the Percentage of Time in Range or the HAIA Distribution of Fires.

Click on “Save” to save the values as currently displayed on this form. If you do not wish to save the changes you have made, simply close the form without saving.

Click on “Close” or “X” at any time to return to the Index Tree.

## **Select Disturbance Types**

The user must select from a list of 10 available disturbance types. You will define the effects of the disturbances you identify later under “Define Disturbance Effects” (see page 95).

Click on the “Select Disturbance Types” node on the Index Tree to reveal the following form:

**Disturbance Types for Scenario**

Select and name the disturbance types to be applied for the scenario

Order of Application	Include	Name
1.	<input type="checkbox"/>	Management Activity 1
2.	<input type="checkbox"/>	Management Activity 2
3.	<input type="checkbox"/>	Management Activity 3
4.	<input type="checkbox"/>	Management Activity 4
5.	<input checked="" type="checkbox"/>	Prescribed Fire
6.	<input type="checkbox"/>	Disease/Insect 1
7.	<input type="checkbox"/>	Disease/Insect 2
8.	<input type="checkbox"/>	Disease/Insect 3
9.	<input checked="" type="checkbox"/>	Wildland Fire
10.	<input checked="" type="checkbox"/>	Natural Succession

Save Close

The model will account for the disturbance types in the order they are listed. Management activities are always accounted for before prescribed fire, insect/disease, wildland fire, or natural selection.

The form will default to “Management Activity” and “Disease/Insect,” as shown in the previous screen. To edit the fields, highlight the default text and type in the name of the disturbance type that you wish to include. Some examples are thinning, final harvesting, or firewood collection.

Once you have named the disturbances and listed them in the order you wish them to be considered, click in the appropriate boxes in the “Include” column to include the disturbance type in the analysis. One or any combination of the disturbances may be checked.

To save the list of disturbance types to be included, click on the “Save” button at the bottom of the screen. To close the form and return to the Index Tree, click on the “Close” button or the “X” in the upper right.

## Select FCCs

In this program section, the user selects the FCCs that are to be included in a run scenario.

To select the FCCs, click on the “Select FCCs” node on the Index Tree. The following form will appear onscreen:

FCC	Include	Vegetation	Loading Class	Age Class	Other Class	Managed Initial Acres	Natural Initial Acres
AF01-0	<input checked="" type="checkbox"/>	Jeffrey pine	Bare	Low	Open	0	1
AF01-0	<input checked="" type="checkbox"/>	Jeffrey pine	S&S&Poles	Medium	L	75	0
AF01-0	<input checked="" type="checkbox"/>	Jeffrey pine	S&S&Poles	Medium	M	152	13
AF01-0	<input checked="" type="checkbox"/>	Jeffrey pine	S&S&Poles	Medium	H	0	1
AF01-0	<input checked="" type="checkbox"/>	Jeffrey pine	Small	Medium	L	509	0
AF01-0	<input checked="" type="checkbox"/>	Jeffrey pine	Small	Medium	M	637	29
AF01-0	<input checked="" type="checkbox"/>	Jeffrey pine	Small	Medium	H	13	5
AF01-0	<input checked="" type="checkbox"/>	Jeffrey pine	Medium	High	L	898	0
AF01-0	<input checked="" type="checkbox"/>	Jeffrey pine	Medium	High	M	2,732	108
AF01-0	<input checked="" type="checkbox"/>	Jeffrey pine	Medium	High	H	257	58
AF01-0	<input checked="" type="checkbox"/>	Jeffrey pine	Large	Medium	L	0	1
AF01-0	<input checked="" type="checkbox"/>	Jeffrey pine	Large	Medium	M	34	0
AF01-0	<input checked="" type="checkbox"/>	Jeffrey pine	Large	Medium	H	4	0
AF01-0	<input checked="" type="checkbox"/>	MC Ponderc	Bare	Low	Open	0	1
AF01-0	<input checked="" type="checkbox"/>	MC Ponderc	S&S&Poles	Medium	L	141	114

View FCC Definition    Total Acres in Analysis Area: 565,096    Assigned Acres: 543,807    Unassigned Acres: 21,289

Save    Close

To include a FCC in the scenario run, simply enter the number of acres in the FCC in one or both of the two right-most columns on the form. Acres can be entered in one or both of the columns labeled “Managed Initial Acres” (i.e., area on which mechanized equipment is permitted—essentially commercial forest or rangeland) or “Natural Initial Acres” (i.e., area on which mechanized equipment is not allowed—essentially non-commercial forest or rangeland). Once you have entered acreage in either of these columns, a red check mark will appear in the “Include” column next to each FCC for which acreage has been entered. You cannot check the “Include” box itself; the check mark appears only after acres have been entered for the FCC. If you do not wish to include an FCC, simply set both acreage figures to zero.

When you are satisfied, click on the “Save” button in the lower left corner and then on the “Close” button to close the form.

## Schedule Management Activities

In this portion of the program, you may specify the number of acres treated by FCC and by year for each of the four available management activities, for prescribed fire (baseline level only), and for each of the three insect and disease disturbance types.

Click on “Schedule Management Activities” under the “Manage Scenarios” section of the Index Tree to reveal the following form:

Schedule Definition
⌵ ⌵ ⌵

### Scheduling for Scenario demo2

Schedule Incomplete

Disturbance Type:

FCC:  Simulation Years: 100  
 Veg.  Age:  Initial Total Acres: 1

	Year Start	Year End	Acres Treated	Treatment Cost (\$/acre)
	1			

When scheduling by vegetation and age classes, pre-existing schedules will not be displayed. They will be replaced when the new data is saved.

Copy Schedule
Clear Schedule
Save
Close

Select the disturbance type that you wish to schedule for from the drop down list at the top of the screen. You must then decide to schedule either by FCC or by vegetation type and age.

If you select FCC, click on the radio button to the left of “FCC,” then select the first FCC that you wish to schedule. You must then enter the start year (FETM 4 will default to “1”), the end year, and the number of acres to be treated. You may choose to enter the treatment cost per acre; it is optional. Another line will appear on the list once you have entered the required information. You may continue to add as many FCCs as you would like to schedule. Any FCCs that are unscheduled are assumed to be undisturbed by the activity. Be sure to schedule the entire period from year 1 through the final year in the simulation.

### *View Scheduling Progress*

Click on the “View Scheduling Progress” node below the “Schedule Management Activities” node on the Index Tree to reveal the following form:

The screenshot shows a window titled "Scheduling Progress" with a subtitle "Schedule Completeness for Scenario Demo 2". The window contains a table with the following columns: FCC, Management Activity 1, Harvesting, Prescribed Fire, Thinning, and Vermicillium. The table lists 24 FCCs (Demo-0001 to Demo-0024), all of which have "None" in every column, indicating they are not scheduled for any of the listed disturbance types. A "Close" button is visible at the bottom left of the window.

FCC	Management Activity 1	Harvesting	Prescribed Fire	Thinning	Vermicillium
Demo-0001	None	None	None	None	None
Demo-0002	None	None	None	None	None
Demo-0003	None	None	None	None	None
Demo-0004	None	None	None	None	None
Demo-0005	None	None	None	None	None
Demo-0006	None	None	None	None	None
Demo-0007	None	None	None	None	None
Demo-0008	None	None	None	None	None
Demo-0009	None	None	None	None	None
Demo-0010	None	None	None	None	None
Demo-0011	None	None	None	None	None
Demo-0012	None	None	None	None	None
Demo-0013	None	None	None	None	None
Demo-0014	None	None	None	None	None
Demo-0015	None	None	None	None	None
Demo-0016	None	None	None	None	None
Demo-0017	None	None	None	None	None
Demo-0018	None	None	None	None	None
Demo-0019	None	None	None	None	None
Demo-0020	None	None	None	None	None
Demo-0021	None	None	None	None	None
Demo-0022	None	None	None	None	None
Demo-0023	None	None	None	None	None
Demo-0024	None	None	None	None	None

This form is a list of those FCCs that have and have not been scheduled for each disturbance type.

## Define Disturbance Effects

This program area requires the user to specify the effects of the disturbances that were selected under “Select Disturbance Types.” The effects are specified as a fraction of the target FCC, which is allocated to one or more FCCs as a result of the disturbance. Disturbances are either those specified previously under “Select Disturbance Types” (see page 90) or disturbance effects from fire.

Disturbance effects from fire are specified by fire intensity level. The user is required to specify the effects for FIL 1 and 2 fires, for FIL 3 and 4 fires, and for FIL 5 and 6 fires. To define the disturbance effects for FIL 1 and 2 fires, click on the down arrow on the right-hand side of the “Disturbance Effects Matrix” field and select “Fire (FIL 1 & 2)” from the drop-down list. Then select the FCC to be disturbed from the field labeled “Transition From FCC.” The selected FCC will be displayed in the first column on the left in the work sheet.

Next, select the FCC that the selected FCC (AF01-0001, in this case) will move to as a result of disturbance from FIL 1 & 2 fires. The fraction of “From FCC” area that moves to the “To FCC” area each year as a result of disturbance is shown in the column labeled “Transition Factor.”

Click on “Define Disturbance Effects” under “Select Scenario” and the scenario name on the Index Tree to reveal the form to the right:

From FCC	To FCC	Transition Fraction	Transition Total
demo-0001, Jeffrey pine, B	demo-0001, Jeffrey pine, Ba	0.800000	1.000000
demo-0001, Jeffrey pine, B	demo-0003, Jeffrey pine, St	0.200000	

To view the data at any time in matrix format (“FCC” rows by “FCC” columns), click on the “View Matrix” button on the lower left-hand side of the screen.

### Assign Fire Weather Class for Prescribed Fire

Click on “Assign Fire Weather Class” under “Select Scenario” and the scenario name on the Index Tree to reveal the following form:

FCC	Low	Moderate	High	Extreme
AF01-0001	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF01-0002	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF01-0003	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF01-0004	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF01-0005	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF01-0006	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF01-0007	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF01-0008	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF01-0009	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF01-0010	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF01-0011	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF01-0012	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF01-0013	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF01-0014	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF01-0015	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF01-0016	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF01-0017	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF01-0018	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF01-0019	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF01-0020	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF01-0021	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF01-0022	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF01-0023	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF01-0024	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AF01-0025	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

The user must select the fire weather class that each FCC will be burned under by prescribed fire. To select the fire weather class for each FCC, simply click on the appropriate weather class box next to each FCC number. Clicking on “Select All” will allow you to specify that every FCC will be burned under the same fire weather class (low, moderate, high, or extreme).

## Update FCCs

Click on “Update FCCs” under “Select Scenario” and the scenario name on the Index Tree to update the current scenario data table using data from the FCC data table (see “Define FCCs,” page 59). A dialog box with “Are you sure you want to update the scenario FCCs using the information displayed in the FCC Data Table?” will appear on screen. If you want to update the FCCs, click on “Yes,” if not, click on “No.” The FCC data table cannot be viewed here. See “Update FCCs” or “View Graphs and Reports” for more information on viewing the FCC data table.

## Manage Scenario Economics

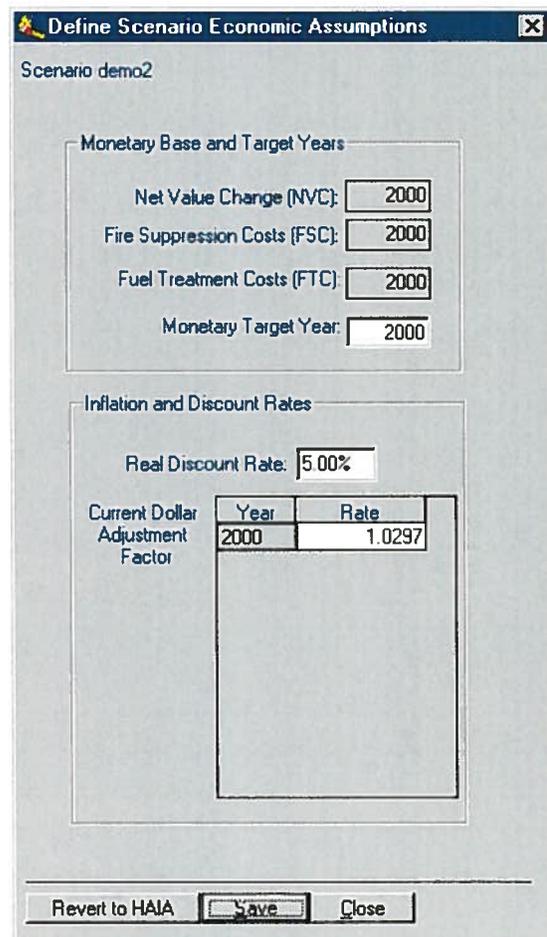
In this section of the program, you can define economic assumptions, net value change, fire suppression costs, and fuel treatment costs. To access these areas, click on “Manage Scenario Economics” under “Select Scenario” and the scenario name on the Index Tree. The Index Tree will expand as shown. Each of these areas is discussed in greater detail below.



### Define Economic Assumptions

Click on “Define Economic Assumptions” on the Index Tree to reveal the form to the right. The Net Value Change (NVC), Fire Suppression Costs (FSC), and Fuel Treatment Costs (FTC) fields are imported from IIAA (via HAIA) and cannot be edited. You can, however, edit the Monetary Target Year. If the Monetary Target Year is greater than the NVC, FSC, and FTC base years, then the Current Dollar Adjustment Factor is used to escalate costs from the base year to the target year. Costs and revenues occurring in any future year (that is, any year greater than the target year) will be discounted to the target year using the real discount rate that you enter in the middle of the form.

If you make changes to the form and wish to revert to the HAIA numbers, simply click on the “Revert to HAIA” button on the lower left side of the screen. To save any changes you have entered, select the “Save” button before you close the screen. Click on “Close” to return to the Index Tree.



Scenario demo2

Monetary Base and Target Years

Net Value Change (NVC): 2000

Fire Suppression Costs (FSC): 2000

Fuel Treatment Costs (FTC): 2000

Monetary Target Year: 2000

Inflation and Discount Rates

Real Discount Rate: 5.00%

Current Dollar Adjustment Factor

Year	Rate
2000	1.0297

Revert to HAIA Save Close

## Define Net Value Change (NVC)

Click on “Define Net Value Change (NVC)” on the Index Tree to reveal the following form:

Scenario demo2

Timber & Range Resources | Other Resources

**Define Net Value Change (NVC) for Timber & Range Resources  
(2000 Dollars/Acre)**

FCC: AF01-0001, Jeffrey pine, Bare, Low, Open

HAIA Timber & Range Tables Selected  
Immature Timber:  
Mature Timber:  
Range:

Map FCC to Timber & Range Tables

Resource	← 1	2	Fireline 3	Intensity 4	Level 5	→ 6	HAIA Values	User-Defined Values
Immature Timber	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Mature Timber	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Range	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<b>Total Monetary NVC</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>	<b>\$0.00</b>		

Save Close

There are two tabs on the form: Timber & Range Resources and Other Resources. You may either enter user-specified NVC values by fire intensity level for each resource (click on the boxes in the column labeled User-Defined Value, then enter the NVC values in the white fields), or use the HAIA-specific values for the Analysis Area (click on the boxes in the column labeled HAIA Values).

In this example, there are no FCCs mapped to Timber & Range Tables. To map an FCC to a specific timber or range table, click on the Map FCC to Timber & Range Tables button in the right center of the screen, then select the appropriate timber and range table from the list displayed. Continue for each FCC in the drop-down list shown above.

## Define Fire Suppression Costs

Click on this Index Tree node to enter the fire suppression costs by wildland fire size ranges in each of six size ranges.

You can either (1) specify your own values by clicking on the User-Defined Values, or (2) use the values from HAIA by clicking on the HAIA Values button.

*Define Fuel Treatment Costs*

This is a placeholder node on the Index Tree. It is here to remind you to enter the fuel treatment costs by FCC on the Schedule Management Activities form (see Schedule Management Activities node on Index Tree).



# 5 Run Model

Scenarios may be run once they have been defined. The Run Model node on the Index Tree is divided into two parts: scenarios that have not yet been run (Not Yet Run), and scenarios that have already been run (Previously Run). Both of these functions are explained below.

## 5.1 Not Yet Run

Clicking on “Not Yet Run” on the Index Tree will reveal the following form:

**Run Model for Scenario** [min] [max] [close]

**Review Scenario Completeness** Demo 2

Scenario	FCCs	Schedules
<b>Status</b>		
Admin Option Selected:	Complete	
Years in Simulation > 0:	Complete	
Iterations in Simulation > 0:	Complete	
Maximum Fire Size > Maximum Historical Fire:	Complete	
Pollutants Selected:	Complete	
Disturbance Types Selected:	Complete	
FCCs Selected:	Complete	
Monetary Target Year Set:	Complete	
Treatment Increment Set:	Complete	
Included Treatment Levels Set:	Complete	
Prescribed Fire Emissions:	Complete	
Wildfire Surface Emissions:	Complete	
Wildfire Crown Emissions:	Complete	
Initial Fire Frequency:	Complete	

**Running Scenario**

Click again on the name of the scenario to reveal a run status form, with tabs for different groups of data. The fields in the run status form will contain one of three messages: complete (gray background), questionable (yellow background), or incomplete (red background). The Run button on the form will be disabled if there are any “incomplete” messages on any of the tabs in the form. The Run button will be enabled if all of the status messages are either “complete” or “questionable.”

For a description of the screening criteria used to determine the run status, click on the column heading in the form and then hold the cursor still until the tool tip appears.

Note that the “Load Model Outputs” button at the bottom of the form is disabled for all scenarios that have not yet been run. For scenarios that have been copied from previously run scenarios, data are available for loading and the button is enabled.

## **5.2 Previously Run**

The “Previously Run” node on the Index Tree operates in the same way as the “Not Yet Run” node described above. The only difference is that output data may be loaded for previously run scenarios. To load output data from FETM 4 for graphing and reporting purposes, simply click on the “Load Model Outputs” button at the bottom of the form.



# 6 View Results

---

In this section of the program, the user can develop and print a variety of graphs and reports showing the economic and environmental tradeoffs resulting from the variables input throughout the FETM modeling process. Available graphs include:

- Time-Series Plot of Landscape Composition \*\*
- Landscape Composition in Selected Year \*\*
- Time-Series Plot of Fire Emissions
- Fire Emissions by Prescribed Fire Treatment Level in Selected Years
- Surface Plot of Fire Emissions by Year and Treatment Level
- Time-Series Plot of Wildland Fire Acres
- Time-Series Plot of Fuel Treatment Acres
- Time-Series Plot of Area-Average Fuel Loading
- Cost-Benefit Analysis of Fuel Treatment

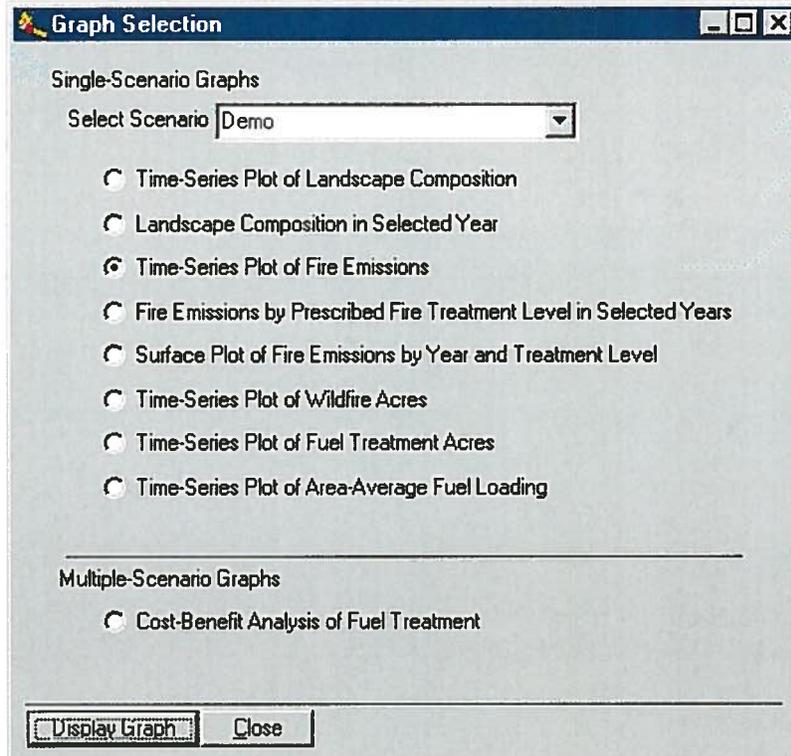
\*\*FCC specific graphs that permit outputs that are grouped according to user-defined categories (e.g., wildlife habitat types)

Reports can be developed based on scenario or cost-benefit analyses or specific analysis area characteristics.

Annotated sample graphs and reports are found in Appendix B of this manual.

## 6.1 Graphs

Graphical output from all previously run scenarios may be viewed or printed by clicking on “View Graphs” on the Index Tree. To view or print a graph, select the appropriate scenario from the drop-down list at the top of the form that appears (see example at right), then click on the box next to the type of graph that you wish to produce. Additional graphing instructions (selections) will then appear. The subsequent steps needed to produce a graph should be clear from the selections on each graphing form.



Note that on any of the graphs, a table with the graphed values can be displayed by clicking on the “Generate Table” button at the lower left of the graph form. This button is enabled only after the graph has been generated. Click on the “Generate Graph” button, wait until the graph appears, then click on the “Generate Table” button. You can highlight the values in the table, copy the values to the clipboard by pressing “Ctrl” and “C” at the same time, and then paste the values into another document by pressing “Ctrl” and “V” at the same time (or by using the “Paste” function available in the application being used).

## 6.2 Reports

Reports containing the scenario-specific data may be viewed and printed by clicking on “Reports” on the Index Tree under “View Results.” To view or print a report, select the scenario from the drop-down list at the top of the form that appears (see below for example), then click on the box next to the type of report that you wish to review.

**Report Selection** [minimize] [maximize] [close]

Scenario Related Reports

Select Scenario

Scenario Description

Sections to Include

- Assumptions
- FCC Data
- Economic Data

Cost Benefit Analysis

---

Analysis Area Related Reports

- FCC Description
- Derivative Fuel Model Description
- Analysis Area Report



# Index

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# A

## Appendix A: FETM 4 Modeling Team Roles

**Appendix A**  
**FETM 4 TEAM ROLES MODELING**

---

## **FETM 4 Team Composition and Responsibilities**

<b>Team Coordination</b>	One person should be selected for this role on the basis of their understanding of the FETM 4 modeling objectives (for example, to evaluate alternative fuel treatments in EIS), their overall understanding of the FETM 4 model, and their ability to direct a diverse team of resource specialists. Primary responsibility for selecting FETM 4 team members and coordinating team activities. Responsible for coordinating team meetings, including one or more workshops to define FCCs and to populate effects matrices. Primary responsibility for assembling and documenting inputs, assumptions, and modeling results in final technical report.
<b>Fire Planning</b>	Primary responsibility for obtaining PCHA and IIAA database files for the analysis area of interest. Primary responsibility for running HAIA and determining breakpoint spread components used to characterize the fire weather classes in FETM 4. Primary responsibility for obtaining information on large, wind-driven fires within and surrounding the analysis area. This information will be used to develop the potential fire size versus rate of spread curves (by fuel category) in FETM 4. Primary responsibility for reviewing economic inputs and outputs in FETM 4.
<b>Vegetation Composition and Disturbance Effects<sup>1</sup></b>	A small team of vegetation specialists should be selected on the basis of their knowledge of the qualitative and quantitative structure of vegetation communities that occupy the analysis area of interest, the disturbances (both natural and managed) that affect those communities, and the known or probable effects of those disturbances. Primary responsibility for developing FCCs and characterizing impacts of management policies (that is, developing treatment schedules and management practice effects matrices) and natural succession matrix.
<b>Fire Ecology</b>	Primary responsibility for populating three fire effects matrices (FIL 1&2, FIL 3&4, and FIL 5&6) and providing feedback to the vegetation specialists on the suitability of the FCCs for characterizing fire effects.

<sup>1</sup> May be provided by one or more of the following disciplines: forester, fuel specialist, ecologist, botanist, silviculturist, range conservationist, wildlife habitat specialist

**Air Quality**

Primary responsibility for reviewing the emissions estimates for wildland fire by fire weather class.

**Data Entry**

Primary responsibility for entering data into FETM 4. This is a fairly tedious task, requiring 3 to 5 days for a typical analysis area.

**Programming  
and Data  
Analysis**

Primary responsibility for assembling output data in format that facilitates the analysis. FETM 4 provides numerous output tables and reports, but often customer-defined tables are needed. Use of Excel or Quattro-Pro macro script language (VBA) is highly recommended.

# B

## Appendix B: FETM 4 ASCII Output Files

**Appendix B**  
**FETM 4 ASCII Output Files**

---

## Directory Structure

The output files from FETM 4 are always stored in a directory with the same name as the scenario name, which is located in “aadata” (analysis area data) directory under the directory holding the FETM 4 program files. Generically, these output files are found in:

[FETM 4 program file directory]\aadata\[scenario name]

For example, if the FETM 4 model is installed in c:\models\fetm4, and the scenario is called “testrun,” then the ASCII output files would be found in:

C:\models\fetm4\aadata\testrun\

If the FETM 4 model is installed in c:\program files\fetm4, and the scenario is called “basecase,” then the ASCII output files would be found in:

C:\program files\fetm4\aadata\basecase\

## File Names and Descriptions

The names and descriptions of the text output files are described below. All files are space-delimited. They are most easily viewed and used by opening in Microsoft Excel.

Output File Name	Description of Contents
[filename].inp	Input file containing information needed in dynamic calculations (e.g., wildland fire acres and emissions). Maximum of 8 characters in filename.
acres.csv	File containing FCC acres in each year of simulation. Fields are: <ul style="list-style-type: none"><li>□ Prescribed fire treatment level: Column 1</li><li>□ Prescribed fire scaling factor: Column 2</li><li>□ FCC number: Column 3</li><li>□ FCC Acres by year: Columns 4 through (4 + Maximum Years in Simulation)</li></ul>
acerr.csv	File containing standard deviation of FCC acres in each year of simulation (sample population composed of number of iterations assigned by user within the run scenario). Fields are: <ul style="list-style-type: none"><li>□ Prescribed fire treatment level: Column 1</li><li>□ Prescribed fire scaling factor: Column 2</li><li>□ FCC number: Column 3</li><li>□ FCC Acres by year: Columns 4 through (4 + Maximum Years in Simulation)</li></ul>

Output File Name (cont.)	Description of Contents (Cont.)
fta.csv	<p>File containing fuel treatment acres (actual, not scheduled) by FCC in each year in the simulation. Fields include:</p> <ul style="list-style-type: none"> <li>□ Prescribed fire treatment level: Column 1</li> <li>□ Prescribed fire scaling factor: Column 2</li> <li>□ Fuel treatment type: Column 3 (“m1” through “m4” are management activities 1-4 and “p” is prescribed fire)</li> <li>□ FCC number: Column 4</li> <li>□ Fuel treatment acres by year: Columns 5 through (5 + Maximum Years in Simulation)</li> </ul>
numfire.csv	<p>File containing numbers of wildland fires by fire size class in each year of the simulation. Fields include:</p> <ul style="list-style-type: none"> <li>□ Prescribed fire treatment level: Column 1</li> <li>□ Prescribed fire scaling factor: Column 2</li> <li>□ Fire size class: Column 3 (A, B, C, D, E, and F fires are: 0-¼ acres, &gt; ¼ to 10 acres, &gt; 10 to 100 acres, &gt;100 to 300 acres, &gt; 300 to 1,000 acres, and &gt; 1,000 acres in size, respectively)</li> <li>□ Numbers of wildland fires by year: Columns 4 through (4 + Maximum Years in Simulation)</li> </ul>
pfa.csv	<p>File containing number of prescribed fire acres (actual, not scheduled) by fire intensity level and FCC in each year in the simulation. Fields include:</p> <ul style="list-style-type: none"> <li>□ Prescribed fire treatment level: Column 1</li> <li>□ Prescribed fire scaling factor: Column 2</li> <li>□ Fire intensity level (FIL): Column 3 (FIL 1: 0- to 2-foot flame lengths, FIL 2: 2-4 foot flame lengths, FIL 3: 4 -to 6-foot flame lengths, FIL 4: 6- to 8-foot flame lengths, FIL 5: 8- to 12-foot flame lengths, and FIL 6: greater than 12-foot flame lengths)</li> <li>□ FCC number: Column 4</li> <li>□ Number of prescribed fire acres by year: Columns 5 through (5 + Maximum Years in Simulation)</li> </ul>

Output File Name (cont.)	Description of Contents (Cont.)
rx.e.csv	<p>File containing prescribed fire emissions by pollutant (tons per year) in each year of the simulation. Fields include:</p> <ul style="list-style-type: none"> <li>□ Prescribed fire treatment level: Column 1</li> <li>□ Prescribed fire scaling factor: Column 2</li> <li>□ Pollutant: Column 3 (named)</li> <li>□ Prescribed fire emissions (tons) by year: Columns 4 through (4 + Maximum Years in Simulation)</li> </ul>
size.a.csv	<p>File containing number of wildland fire acres by fire size class in each year of the simulation. Fields include:</p> <ul style="list-style-type: none"> <li>□ Prescribed fire treatment level: Column 1</li> <li>□ Prescribed fire scaling factor: Column 2</li> <li>□ Fire size class: Column 3 (A, B, C, D, E, and F fires are: 0-¼ acres, &gt; ¼ to 10 acres, &gt; 10 to 100 acres, &gt;100 to 300 acres, &gt; 300 to 1,000 acres, and &gt; 1,000 acres in size, respectively)</li> <li>□ Numbers of wildland fire acres by year: Columns 4 through (4 + Maximum Years in Simulation)</li> </ul>
wfa.csv	<p>File containing number of wildland fire acres by fire intensity level and FCC in each year in the simulation. Fields include:</p> <ul style="list-style-type: none"> <li>□ Prescribed fire treatment level: Column 1</li> <li>□ Prescribed fire scaling factor: Column 2</li> <li>□ Fire intensity level (FIL): Column 3 (FIL 1: 0- to 2-foot flame lengths, FIL 2: 2-4 foot flame lengths, FIL 3: 4 -to 6-foot flame lengths, FIL 4: 6- to 8-foot flame lengths, FIL 5: 8- to 12-foot flame lengths, and FIL 6: greater than 12-foot flame lengths)</li> <li>□ FCC number: Column 4</li> <li>□ Number of wildland fire acres by year: Columns 5 through (5 + Maximum Years in Simulation)</li> </ul>
wfafcc_rx1.csv	<p>File containing wildland fire acres by FCC and year in the simulation for <u>prescribed fire treatment level 1</u>. Fields include (separated vertically in blocks for extreme, high, moderate, and low fire weather):</p> <ul style="list-style-type: none"> <li>□ FCC number: Column 1</li> <li>□ Number of wildland fire acres by year: Columns 2 through (2 + Maximum Years in Simulation)</li> </ul>

Output File Name (cont.)	Description of Contents (Cont.)
wfafcc_rx2.csv	File containing wildland fire acres by FCC and year in the simulation for <u>prescribed fire treatment level 2</u> . Fields are the same as those described for wfafcc_rx1.csv.
wfafcc_rx3.csv	File containing wildland fire acres by FCC and year in the simulation for <u>prescribed fire treatment level 3</u> . Fields are the same as those described for wfafcc_rx1.csv.
wfafcc_rx4.csv	File containing wildland fire acres by FCC and year in the simulation for <u>prescribed fire treatment level 4</u> . Fields are the same as those described for wfafcc_rx1.csv.
wfafcc_rx5.csv	File containing wildland fire acres by FCC and year in the simulation for <u>prescribed fire treatment level 5</u> . Fields are the same as those described for wfafcc_rx1.csv.
wfafcc_rx6.csv	File containing wildland fire acres by FCC and year in the simulation for <u>prescribed fire treatment level 6</u> . Fields are the same as those described for wfafcc_rx1.csv.
wfafcc_rx7.csv	File containing wildland fire acres by FCC and year in the simulation for <u>prescribed fire treatment level 7</u> . Fields are the same as those described for wfafcc_rx1.csv.
wfafwx.csv	<p>File containing wildland fire acres by fire weather class and year in the simulation. Fields include:</p> <ul style="list-style-type: none"> <li>□ Prescribed fire treatment level: Column 1</li> <li>□ Prescribed fire scaling factor: Column 2</li> <li>□ Fire weather class: Column 3 (Ex: Extreme, Hi: High, Md: Moderate, Lo: Low)</li> <li>□ Numbers of wildland fire acres by year: Columns 4 through (4 + Maximum Years in Simulation)</li> </ul>

Output File Name (cont.)	Description of Contents (Cont.)
wfastat.csv	<p>File containing wildland fire statistics <u>by decade</u> for the period of simulation. Fields include:</p> <ul style="list-style-type: none"> <li>❑ Prescribed fire treatment level: Column 1</li> <li>❑ Prescribed fire scaling factor: Column 2</li> <li>❑ Statistical parameter: Column 3 (“Mean WF Acres”: Mean decade-total wildland fire acres, “Std Dev WF Acres”: Standard deviation of decade-total wildland fire acres, “95% CI WF Acres”: 95% confidence interval for decade-total wildland fire acres; two-tailed distribution)</li> <li>❑ Value of statistical parameters by decade: Columns 4 through (4 + Number of Full Decades in the Simulation)</li> </ul>
wfe.csv	<p>File containing prescribed fire emissions by pollutant (tons per year) in each year of the simulation. Fields include:</p> <ul style="list-style-type: none"> <li>❑ Prescribed fire treatment level: Column 1</li> <li>❑ Prescribed fire scaling factor: Column 2</li> <li>❑ Pollutant: Column 3 (named)</li> <li>❑ Wildland fire emissions (tons) by year: Columns 4 through (4 + Maximum Years in Simulation)</li> </ul>
wferr.csv	<p>File containing standard deviation of wildland fire acres in each year of simulation (sample population composed of number of iterations assigned by user within the run scenario). Fields are:</p> <ul style="list-style-type: none"> <li>❑ Prescribed fire treatment level: Column 1</li> <li>❑ Prescribed fire scaling factor: Column 2</li> <li>❑ FCC number: Column 3</li> <li>❑ Wildland fire acres by year: Columns 4 through (4 + Maximum Years in Simulation)</li> </ul>

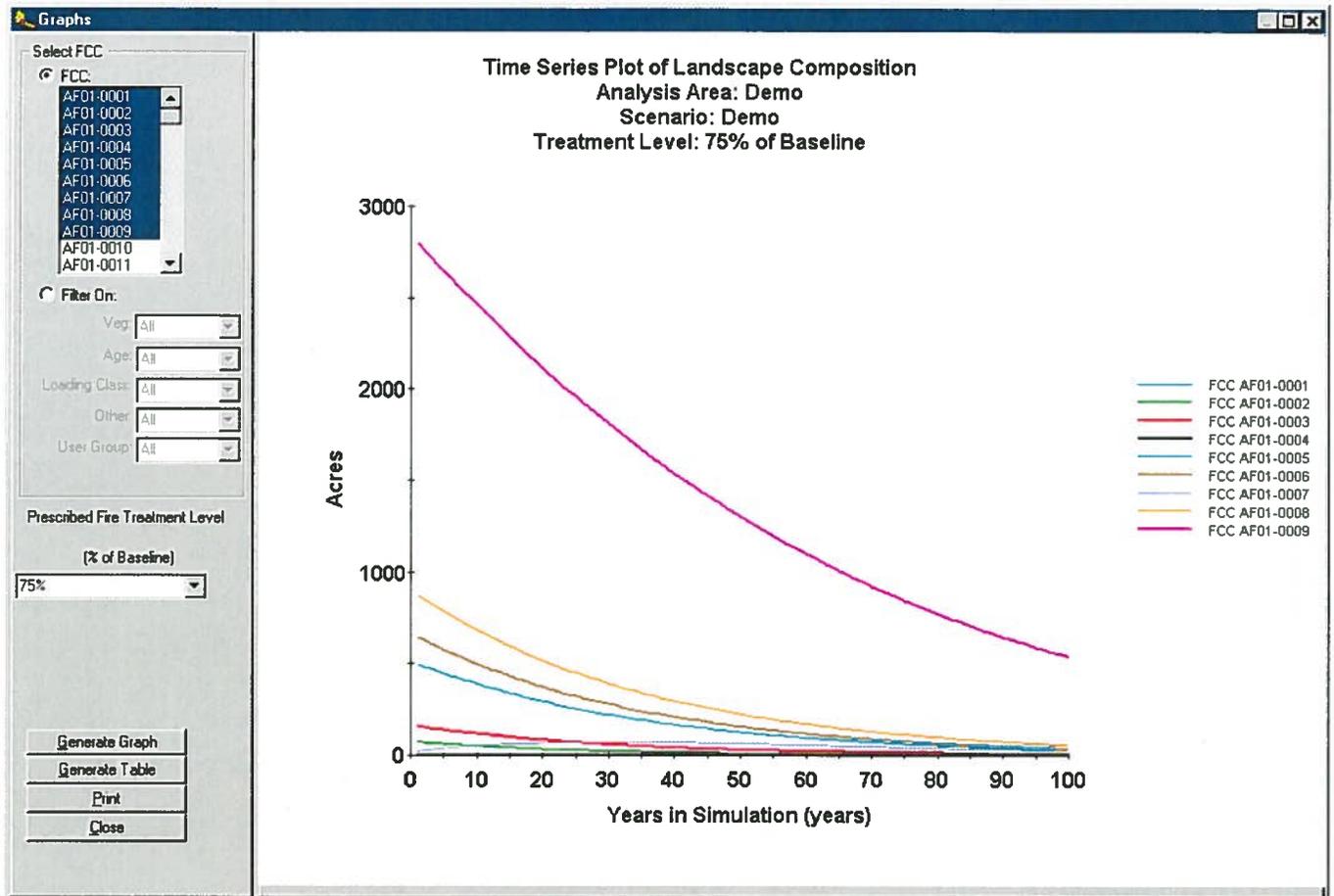


**Appendix C**  
**SAMPLE GRAPHS AND REPORTS**

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# Sample Graphs

## Time-Series Plot of Landscape Composition



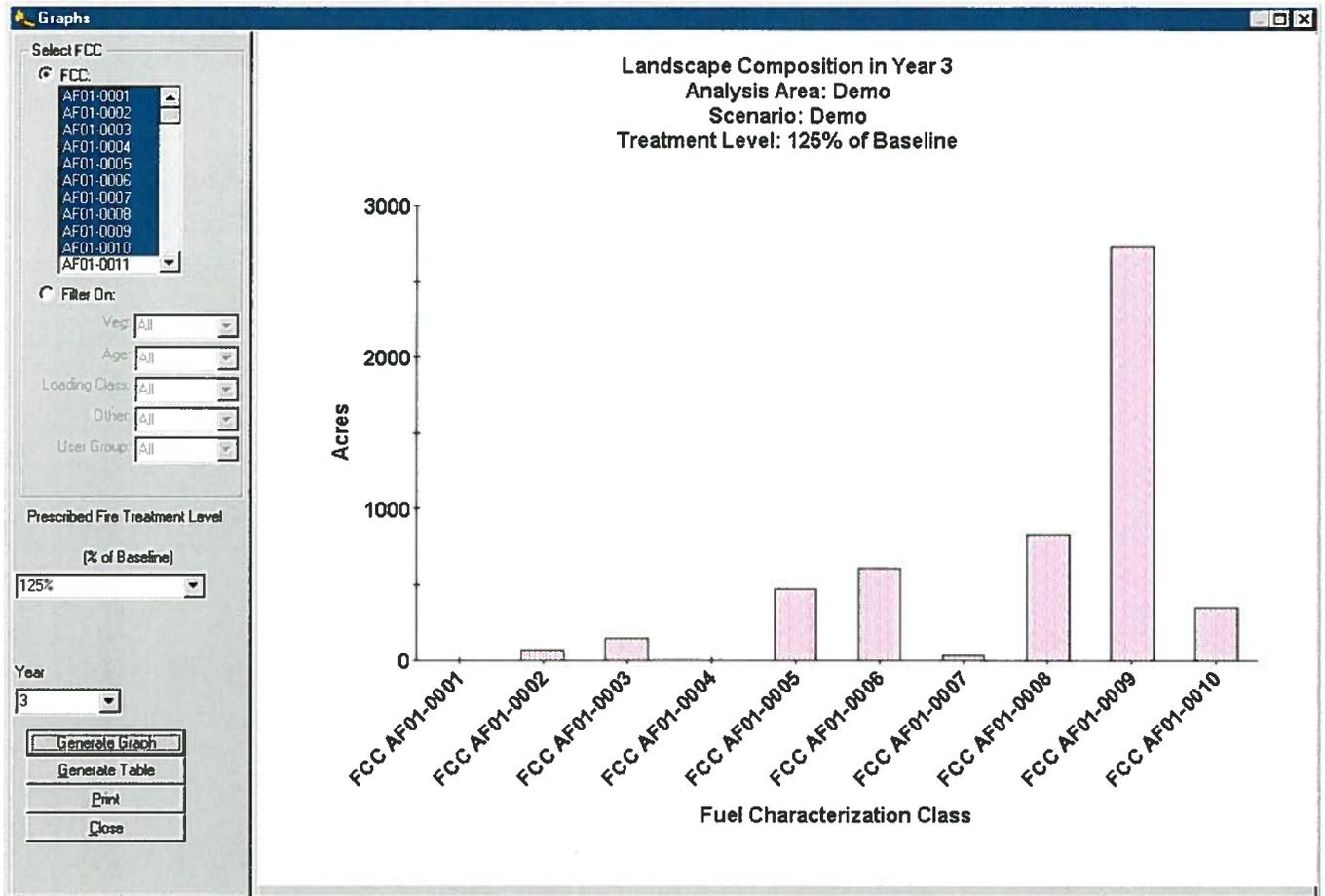
This is a graph showing the total area in user-selected FCCs (in acres; vertical axis) versus simulation time (in years; horizontal axis). The user may select up to 10 different FCCs for display (click on “FCC” radio button), or may display the combined acreage in a user-selected group defined by selecting: a vegetation type, an age class, a loading class, an “activity” class, and/or a “user group” name from the drop-down lists (click on “Filter On” radio button). The effects of various levels of prescribed fire treatment may also be viewed by selecting one level from the drop-down list below the words “Prescribed Fire Treatment Level (% of Baseline).”

To display the graph, press the gray “Generate Graph” button. To view the data points used in the current graph, press the gray “Generate Table” button. To print the graph screen on the user’s default printer (there are no print setup options available), press the gray “Print” button. To close the form at any time, press the gray “Close” button.

To widen the left-hand-side menu bar (sometimes necessary to view the full names in the drop-down lists), click once on the graph and move the cursor slowly over the vertical line

separating the menu from the graph until a single vertical cursor line appears. Then hold down the left mouse key and drag the menu bar to the right or left to widen or shrink the menu bar. The widths are not saved, so this procedure will have to be repeated each time you enter a particular graph.

## Landscape Composition in Selected Year

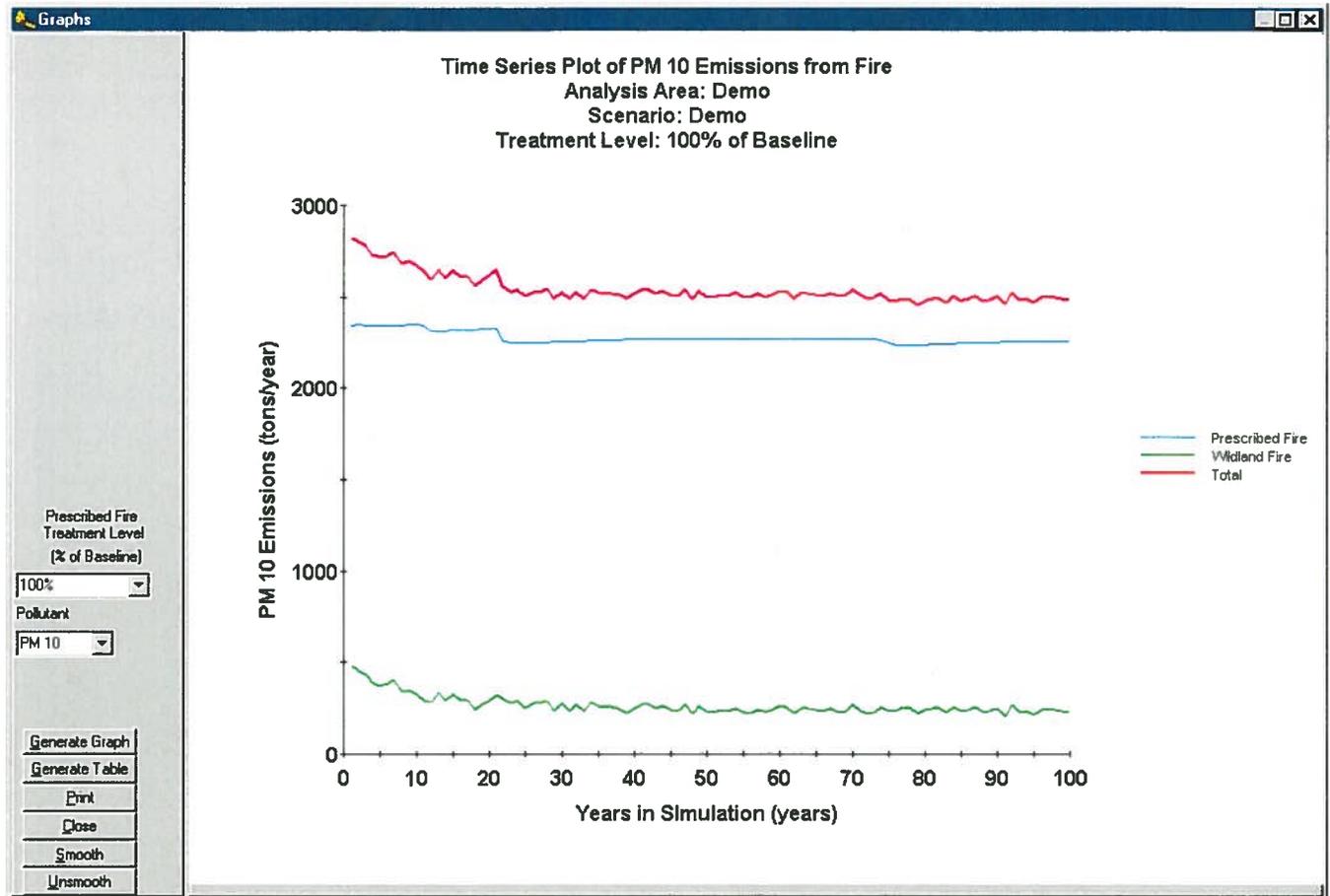


This bar chart is similar to the previous graph, but displays the results in a single year instead of a progression over all years in the simulation. The number of acres for user-selected FCCs is displayed on the vertical axis; the FCCs are displayed as bars along the horizontal axis. The user may select up to 10 different FCCs for display (click on “FCC” radio button), or may display the combined acreage in a user-selected group defined by selecting: a vegetation type, an age class, a loading class, an “activity” class, a “user group” name from the drop-down lists (click on “Filter On” radio button). The effects of various levels of prescribed fire treatment may also be viewed by selecting one level from the drop-down list below the words “Prescribed Fire Treatment Level (% of Baseline).”

To display the graph, press the gray “Generate Graph” button. To view the data points used in the current graph, press the gray “Generate Table” button. To print the graph screen on the user’s default printer (there are no print setup options available), press the gray “Print” button. To close the form at any time, press the gray “Close” button.

To widen the left-hand-side menu bar (sometimes needed to view the full names in the drop-down lists), click once on the graph and move the cursor slowly over the vertical line separating the menu from the graph until a single vertical cursor line appears. Then hold down the left mouse key and drag the menu bar to the right or left to widen or shrink the menu bar. The widths are not saved, so this procedure will have to be repeated each time you enter a particular graph.

## Time-Series Plot of Fire Emissions

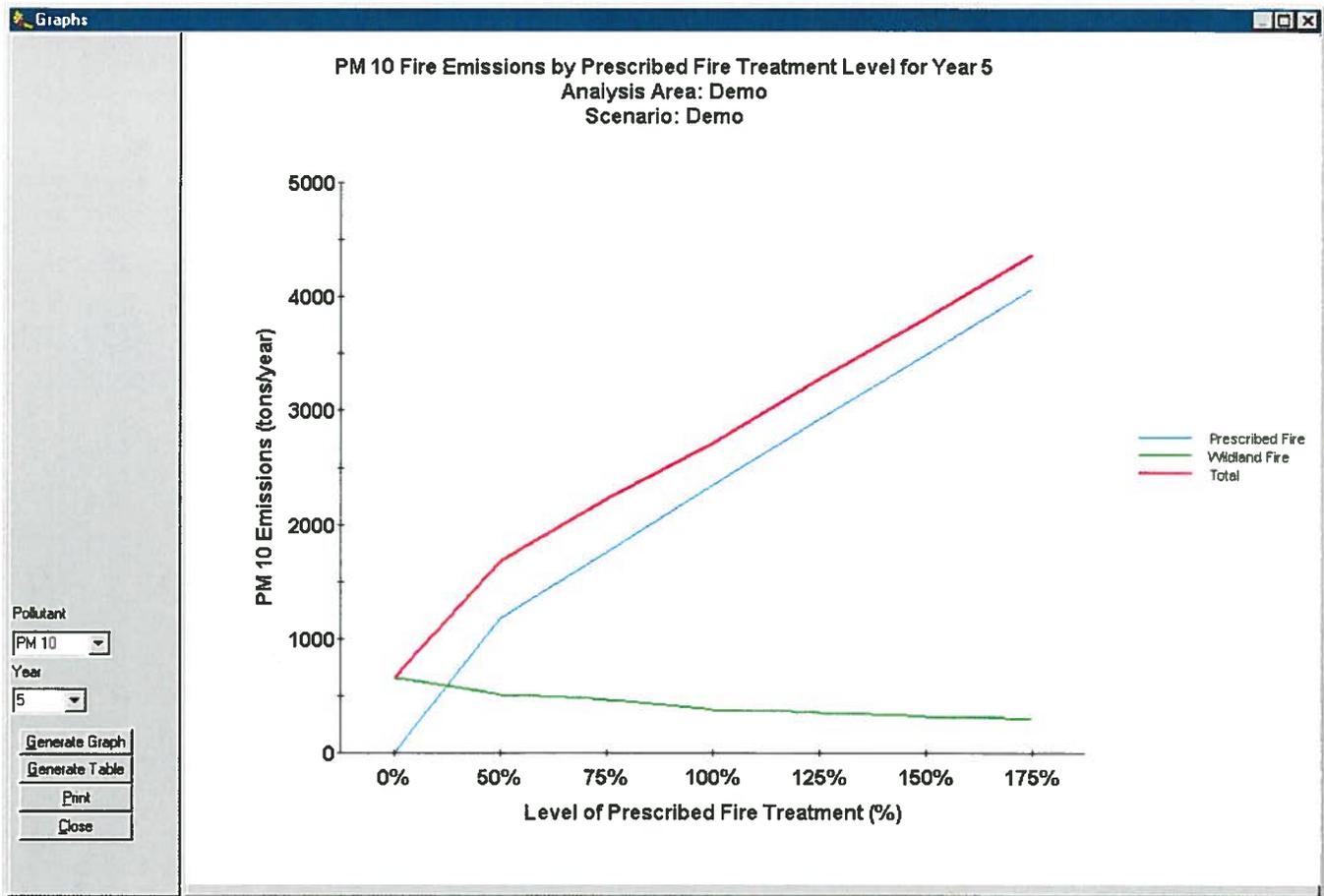


This graph shows the total emissions for specific pollutants (in tons per year; vertical axis) versus simulation year (in years). The user must select one level of prescribed fire treatment and one pollutant from the drop-down lists.

To display the graph, press the gray “Generate Graph” button. To view the data points used in the current graph, press the gray “Generate Table” button. To print the graph screen on the user’s default printer (there are no print setup options available), press the gray “Print” button. To close the form at any time, press the gray “Close” button.

The gray button marked “Smooth” is designed to smooth the results over successively longer periods of time (e.g., in 5-year increments starting with 5 years). Press “Unsmooth” to display the original results.

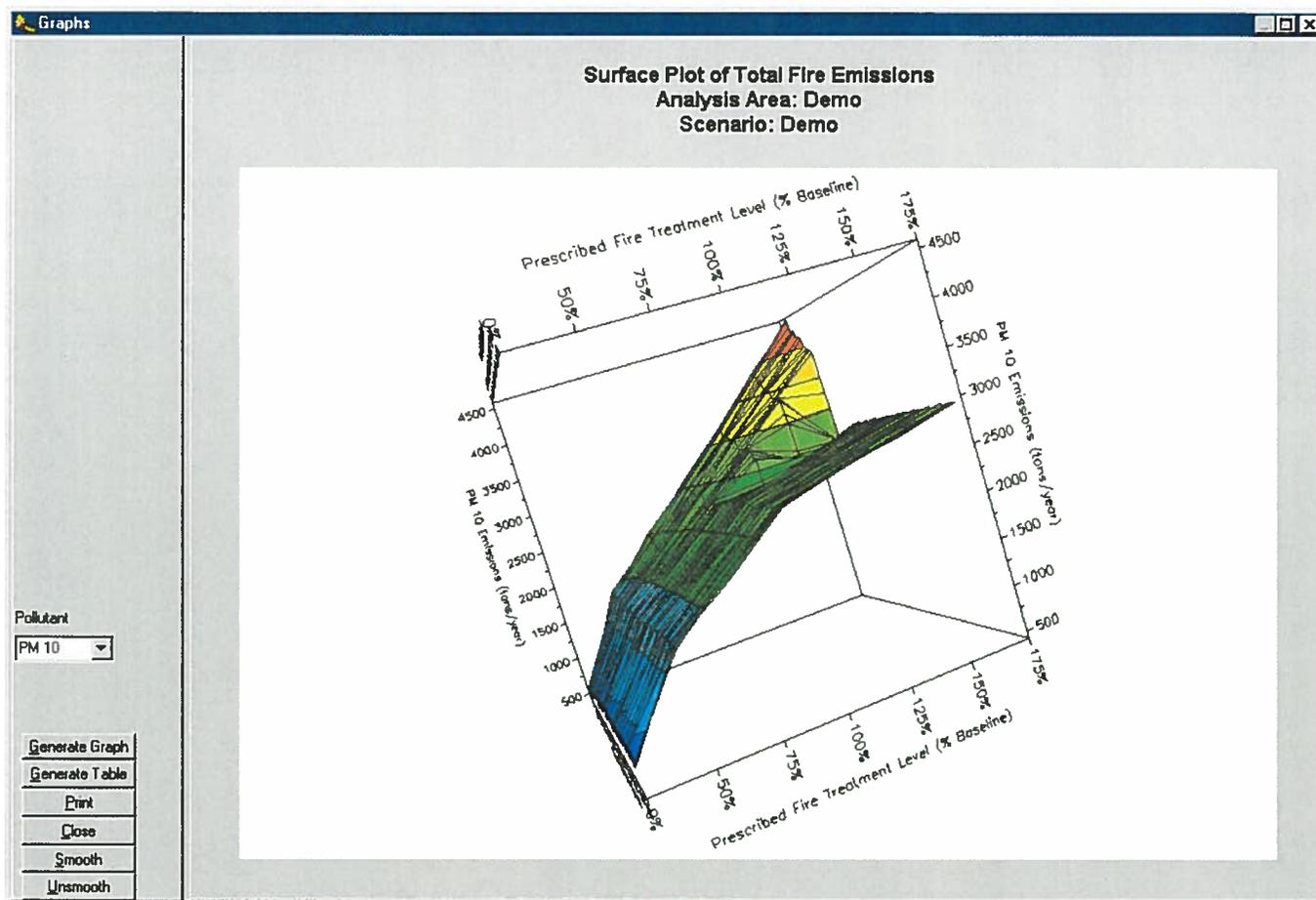
## Fire Emissions by Prescribed Fire Treatment Level in Selected Years



This graph displays the emissions for prescribed fire, wildland fire, and the sum of wildland fire and prescribed fire (in tons; vertical axis) versus the level of prescribed fire treatment (in percent of baseline; horizontal axis) for a user-selected year. The user must select the level of prescribed fire treatment and the simulation year from the drop-down lists.

To display the graph, press the gray “Generate Graph” button. To view the data points used in the current graph, press the gray “Generate Table” button. To print the graph screen on the user’s default printer (there are no print setup options available), press the gray “Print” button. To close the form at any time, press the gray “Close” button.

## Surface Plot of Fire Emissions by Year and Treatment Level



This graph shows a surface plot of total emissions (prescribed fire plus wildland fire emissions; vertical axis) versus simulation year (horizontal axis) and level of prescribed fire treatment (horizontal axis) for a user-selected pollutant. The user must select the pollutant species from the drop-down list.

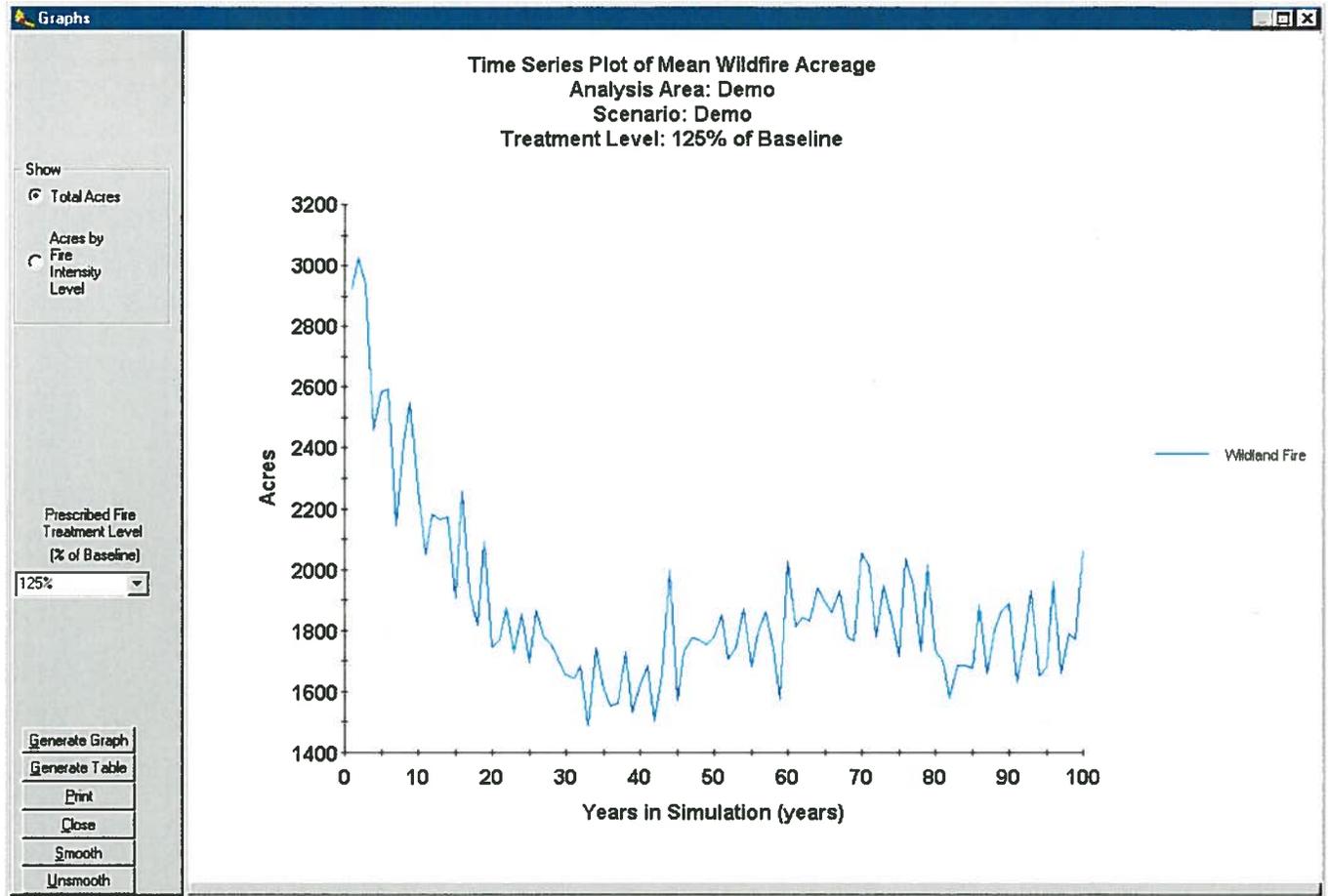
To display the graph, press the gray “Generate Graph” button. To view the data points used in the current graph, press the gray “Generate Table” button. To print the graph screen on the user’s default printer (there are no print setup options available), press the gray “Print” button. To close the form at any time, press the gray “Close” button.

The gray button marked “Smooth” is designed to smooth the results over successively longer periods of time (e.g., in 5-year increments starting with 5 years). Press “Unsmooth” to display the original results.

The surface plot may be rotated by holding down the left mouse key and dragging the image in any direction on the screen. Making small, clockwise circles with the cursor in one place

will rotate the image counterclockwise. The larger the circle used, the faster the image will rotate.

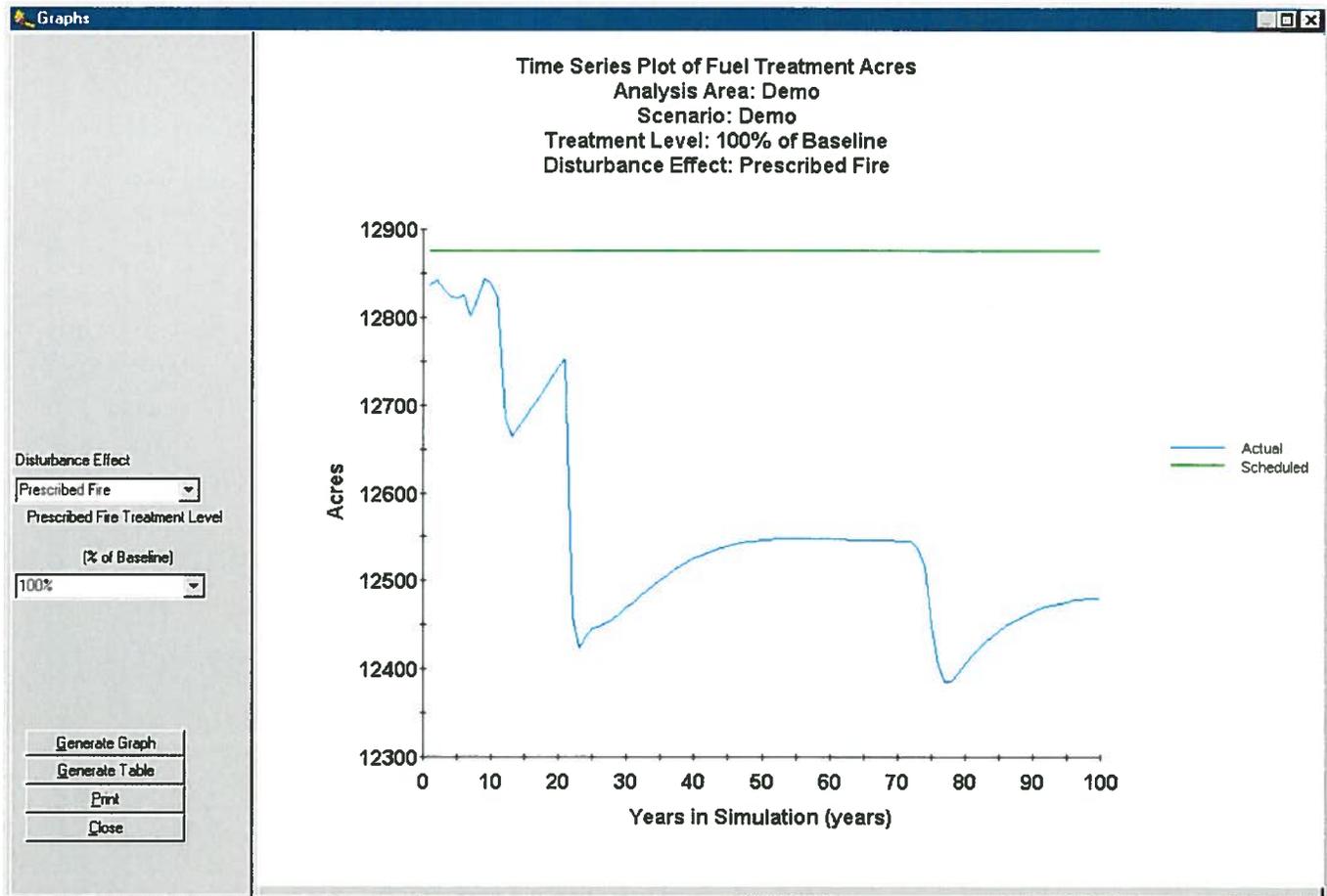
## Time Series Plot of Wildland Fire Acres



This graph shows the number of wildland fire acres (total or by fire intensity level; vertical axis) versus simulation year (horizontal axis). The user must select one of the following two radio buttons: “Total Acres,” or “Acres by Fire Intensity Level.” The user must also select the prescribed fire treatment level to graph by selecting from the drop-down list.

To display the graph, press the gray “Generate Graph” button. To view the data points used in the current graph, press the gray “Generate Table” button. To print the graph screen on the user’s default printer (there are no print setup options available), press the gray “Print” button. To close the form at any time, press the gray “Close” button.

## Time Series Plot of Fuel Treatment Acres

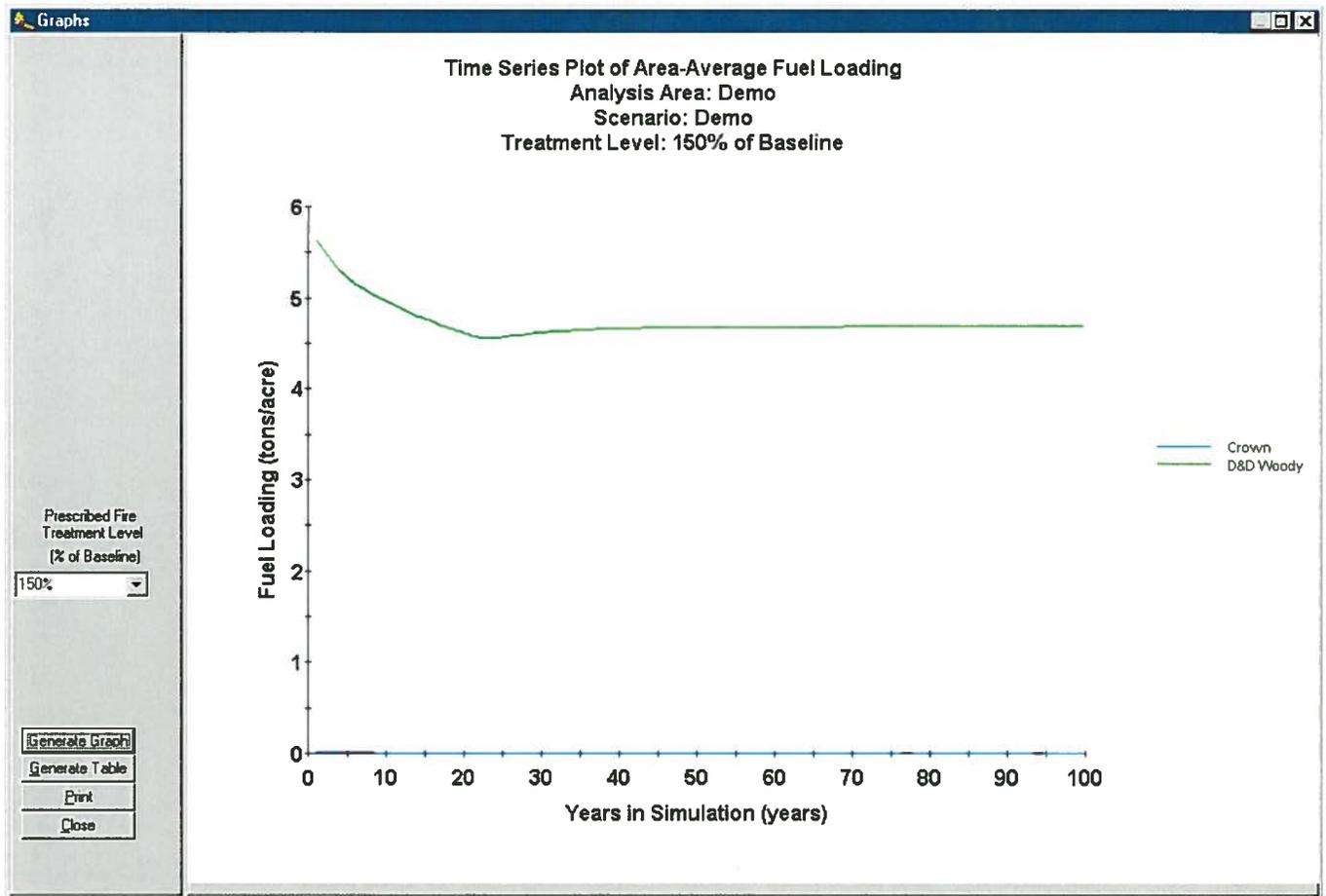


This graph shows the targeted and actual fuel treatment acres (vertical axis) versus simulation year (horizontal axis) for user-selected disturbance types. The user must select the disturbance type (i.e., fuel treatment) and the prescribed fire treatment level from the drop-down lists.

To display the graph, press the gray “Generate Graph” button. To view the data points used in the current graph, press the gray “Generate Table” button. To print the graph screen on the user’s default printer (there are no print setup options available), press the gray “Print” button. To close the form at any time, press the gray “Close” button.

The graph shows the targeted number of treatment acres (entered by the user in the treatment schedule), and the actual number of acres treated. The actual area will be less than the targeted area if the pool of available acres has been exhausted by this or other disturbances, or by outgrowth due to natural succession.

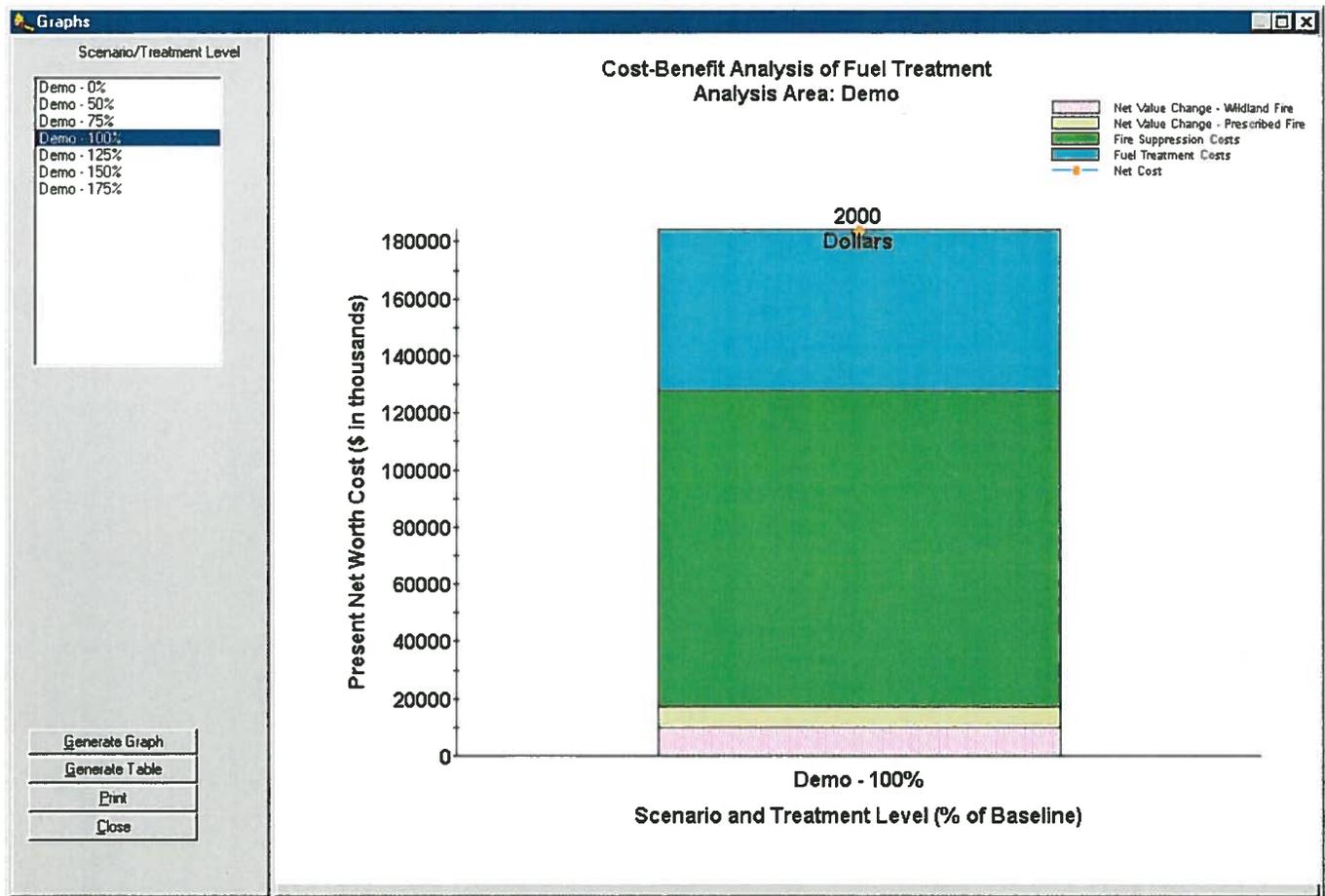
## Time Series Plot of Area-Average Fuel Loading



This graph shows the analysis-area average fuel loading (vertical axis) versus simulation year (horizontal axis) for a user-selected level of prescribed fire treatment. The area-average fuel loading is shown for two categories of fuel: crown fuels (“Crown”), and surface fuels (“D&D Woody”). The user must select the level of prescribed fire treatment from the drop-down list.

To display the graph, press the gray “Generate Graph” button. To view the data points used in the current graph, press the gray “Generate Table” button. To print the graph screen on the user’s default printer (there are no print setup options available), press the gray “Print” button. To close the form at any time, press the gray “Close” button.

# Cost-Benefit Analysis of Fuel Treatment



This graph shows a bar chart of the present net value (PNV) of costs and benefits (in base year dollars; vertical axis) associated with specific FETM 4 run scenarios (horizontal axis). The user must select the run scenarios to graph from the drop-down list. One or all of the available scenarios may be graphed at one time.

To display the graph, press the gray “Generate Graph” button. To view the data points used in the current graph, press the gray “Generate Table” button. To print the graph screen on the user’s default printer (there are no print setup options available), press the gray “Print” button. To close the form at any time, press the gray “Close” button.

The vertical bars are divided into shaded regions for each of the components costs and benefits: fire suppression costs, fuel treatment costs, net value change-wildland fire, and net value change-prescribed fire. The net cost is displayed with an “x” and a line. The net cost line will always be at the top of the bars unless one or both net value changes are less than zero (indicating a net benefit due to fire). The baseline year used in each scenario is displayed at the top of each bar.

## Sample Reports



**Appendix D**  
**ACRONYMS AND GLOSSARY**

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## Acronyms

AA	Analysis Area
AU	Administrative Unit
BI	Burning Index
BLM	Bureau of Land Management
BROS	Breakpoint Rate of Spread
Btu	British thermal unit
CH <sub>4</sub>	Methane
CO	Carbon monoxide
CO <sub>2</sub>	Carbon dioxide
DD	Dead and Down (that is, dead surface material)
DFM	Derivative Fuel Model
ERC	Energy Release Component
FCC	Fuel Characteristic Class
FETM	Fire Effects Tradeoff Model
FIL	Fire Intensity Level
FMZ	Fire Management Assessment Zone
FMZ	Fire Management Zone
FSC	Fire Suppression Costs
FTC	Fuel Treatment Costs
GIS	Geographic Information System
HAIA	Historical Analysis-Initial Attack (HAIA) model; a component (dynamic link library) in FETM 4
IC	Ignition Component
IIAA	Interagency Initial Attack Assessment (IIAA) model.
.mdb	Microsoft database file
mph	miles per hour
MRT	Master Resource Table
NFDRS	National Fire Danger Rating System
NFMAP	National Fire Management Assessment Program
NFMAS	National Fire Management Analysis System
NMHC	Nonmethane hydrocarbons
NVC	Net Value Change
PCHA	Personal Computer Historical Analysis model
PM <sub>10</sub>	Particulate matter less than 10 microns in aerodynamic diameter
PM <sub>2.5</sub>	Particulate matter less than 2.5 microns in aerodynamic diameter
PNV	Present net Value
RL (or RepLoc)	Representative Location
ROS	Rate of Spread
SAVol or SA/V	Surface-to-Area Volume
SC	Spread Component
SCM	Spread Component Maximum
USFS	United States Forestry Service

# Glossary

Term	Description
Active Crown Fire	Crown fire whose rate of spread is linked to the presence of an intense surface fire. Associated with “pulsing” spread, where a crown fire initially spreads ahead of the surface fire front but then weakens due to a lack of reinforcing surface fire heat. After the surface fire catches up to the now-weakened crown fire front, a new “pulsing” crown fire spread is initiated.
Analysis Area	The geographic area of interest within FETM 4, comprising all or part of one or more administrative units of any combination of federal, state, and private ownership.
Bailey’s Eco-regions	A mapping based on distinctive climates (following Köppen, 1931), potential natural vegetation (after Kuchler, 1964), and soils (according to the classification of Crowley, 1967). Bailey uses a hierarchical classification: Domains describe sub-continental areas of broad climatic similarity; Divisions describe subdivisions of the domain that are determined by isolating areas of differing vegetation and regional climates; and Provinces are broad vegetation regions that have uniform regional climate and the same type or types of zonal soils. The eco-region maps in FETM 4 are at the Division level. For more information, visit the following web site:  <a href="http://www.stockton.edu/~cromartw/ecoprinciples/03hab.htm">http://www.stockton.edu/~cromartw/ecoprinciples/03hab.htm</a>
Breakpoint Rates of Spread (BROS)	Rate of spread of fires (measured in chains per hours) at the “breakpoints” that divide the fire size classes (that is, the rate of spread that occurs at fire sizes of ¼, 10, 100, 300, and 1,000 acres)
Chain	A chain is a measurement equal to 66 feet.
CONSUME	CONSUME is a user-friendly computer program designed for resource managers with some working knowledge of Microsoft applications. The software predicts the amount of fuel consumption and emissions from the burning of logged units, piled debris, and natural fuels based on weather data, the amount and fuel moisture of fuels, and a number of other factors. Using these predictions, the resource manager can accurately determine when and where to conduct a prescribed burn to achieve desired objectives while reducing impacts on other resources. CONSUME can be used for most forest, shrub, and grasslands in North America
Dependent Crown Fire	Synonymous with “Passive Crown Fire.”
Dynamic	A modeling term meaning “includes time as a dimension.” That is, model results are generated over time.
Eco-regions	See “Bailey’s Eco-regions.”

Fire Intensity Level (FIL)	An expression of fireline intensity, based on the typical flame length of a fire and used to reflect differences in difficulty of suppression. FILs are classified as follow: FIL 1=0- to 2-foot flame lengths; FIL 2=2- to 4-foot flame lengths; FIL 3=4- to 6-foot flame lengths; FIL 4=6- to 8-foot flame lengths; 5=8- to 12-foot flame lengths; and 6=>12-foot flame lengths.
Fire Management Zone (FMZ)	The basic geographic area for the analysis within the planning unit represented by a single set of fire behavior characteristics that are based on fuels, topography, and local weather.
Fuel Characteristic Class (FCC)	A unique, qualitative and quantitative description of the fuel profile from the mineral-soil interface to the top of the canopy. Where derivative fuel models are used to characterize fire behavior, FCCs are used to characterize the landscape composition and fire effects.
Fuel loading	Time lag dead fuel categories, generally given in hours, as follows: <ul style="list-style-type: none"> <li>• 1-hour—includes fuels from 0 to 0.24 inches in diameter. (This includes needles, leaves, cured herbaceous plants and fine dead stems of plants.)</li> <li>• 10-hour—includes fuels from 0.25 to 0.99 inch in diameter.</li> <li>• 100-hour—includes fuels from 1 to 2.99 inches in diameter.</li> </ul>
Interagency Initial Attack Assessment (IIAA)	A PC-based model designed to perform initial attack simulation to support the analysis of the effects of candidate fire programs. A companion to the PC Historical Analysis (PCHA) model—together they make up the National Fire Management Analysis System (NFMAS).
Independent Crown Fire	Crown fire that propagates through the tree crowns without support from an intense surface fire. Van Wagner (1993) suggests that independent crown fires are very uncommon and short lived.
Live herbaceous fuel loading	Living grasses and forms
Live herbaceous surface area-to-volume ratio	Total surface area of a herbaceous plant leaf divided by the volume occupied by the plant leaf. Live herbaceous fuels frequently have surface area-to-volume ratios from 1,500 to 3,500 (ft <sup>2</sup> /ft <sup>3</sup> ). Some course grass and some conifer needles have a 1-hour SA/V of 500 to 1,500 ft <sup>2</sup> /ft <sup>3</sup> . Average grasses, broadleaf tree leaves and most conifer needles have a 1-hour SA/V of 1,500 to 2,500 ft <sup>2</sup> /ft <sup>3</sup> . Fine grasses, most broadleaf tree leaves and some conifer needles have 1-hour SA/V of 2,500+ ft <sup>2</sup> /ft <sup>3</sup> .
Live herbaceous vegetation type	Herbaceous vegetation that can be herbaceous or annual.
Live woody fuel loading	Living shrubs.

Live woody surface area-to-volume ratio	Total surface area of a woody plant leaf divided by the volume occupied by the plant leaf. Woody fuels frequently have surface-area-to-volume ratios from 1,000 to 2,000 ft <sup>2</sup> /ft <sup>3</sup> .
Mechanical Fuel Treatment	Fuel treatment accomplished through mechanical or chemical means to reduce fire hazard of wildland fire.
Net Value Change (NVC)	The measure of the net change in the positive and negative economic impacts of a fire on planned resource outputs.
1-hour surface area-to-volume ratio	The 1-hour surface area-to-volume ratio (1-h SA/V) is the amount of area on the outside of the fuel (surface area) divided by the volume of the fuel. A way to visualize the surface area-to-volume ratio is the square feet of wrapping paper needed to wrap a box divided by the volume of the box in cubic feet. The 10-hour and 100-hour SA/V are set at 109 ft <sup>2</sup> /ft <sup>3</sup> and 30 ft <sup>2</sup> /ft <sup>3</sup> for all fire behavior fuel models.
Passive Crown Fire	Crown fire whose rate of spread depends on the surface rate of spread. Small-scale, usually consuming single trees or small groups of trees and brush. Synonymous with “dependent crown fire.” Also referred to as “torching.”
PC Historical Analysis (PCHA)	A companion model to the Interagency Initial Attack Assessment (IIAA) model. Together they make up the National Fire Management Analysis System (NFMAS).
Potential Fire Sizes	Hypothetical size that a wildland fire would attain if allowed to burn uniformly and continuously within a single fuel model.
Prescribed Fire	Any fire ignited by management actions to meet specific objectives.
Primary Input	Value input (or flag set) by the user. Contrasted with Secondary Input.
Proportion Boles Left	The proportion of harvested boles that remain on site.
Proportion Cut	The proportion of the stand that is harvested and lying on the ground.
Proportion in Crown	The proportion of the total potential mass that is actually in the crown. For example, if insects consumed 50% of the potentially available foliage, then the foliage percent would be listed at 0.50.
Proportion Rotten (Boles)	The proportion of harvested boles that remain on site and that are rotten.
Proportion to Surface	The proportion of the calculated crown mass that is deposited onto the surface through some means.
Real Discount Rate	The interest rate, over and above the rate of inflation, at which future values are discounted to present values.

Representative Location (RL or Rep Loc)	A term used to designate a portion of an FMZ represented by a unique set of data relating to the planned typical dispatch of preparedness forces (kind, amount, attack time), potential NVC, and escaped fire potential. An RL is the basic analysis area and represents a defined fire occurrence rate. One RL may represent an entire FMZ if conditions are reasonably uniform. An RL and its descriptors reflect average conditions over the area as a whole.
Run Scenario	See "Scenario."
Scenario	A scenario (also called a <i>run scenario</i> ) is a set of assumptions used to define a modeling analysis within the Analysis Area. A scenario is defined by the following inputs and assumptions (partial list): a set of FCCs with initial acreage estimates for each, a set of schedules and disturbance types, effects matrices, and other decisions such as pollutant species to model, number of year in the simulation, and the number of iterations over which the expected outcome is to be assessed.
Secondary Input	Value calculated by FETM 4 user interface algorithm(s) prior to use in dynamic algorithms.
Stochastic	A statistical term meaning "involving or containing one or more random variables."
Surface Fire	Fire that burns only in the surface fuel bed.
Torching	Synonymous with "Passive Crown Fire."
Wildland Fire	Any non-structural fire, other than prescribed fire, that occurs in the wildland. Prescribed fire is not considered wildland fire.