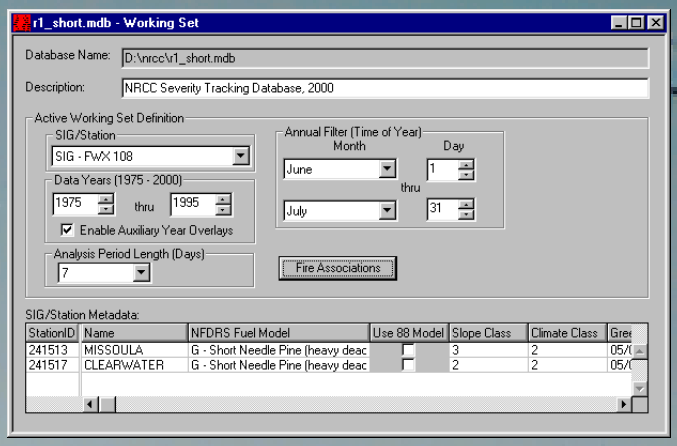
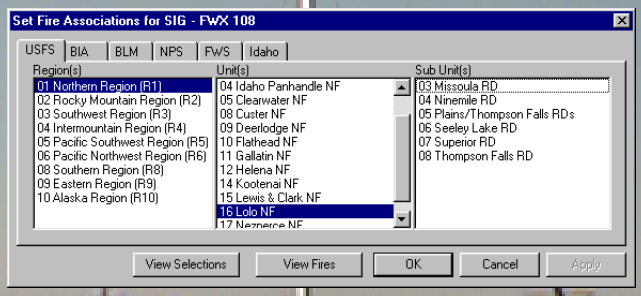
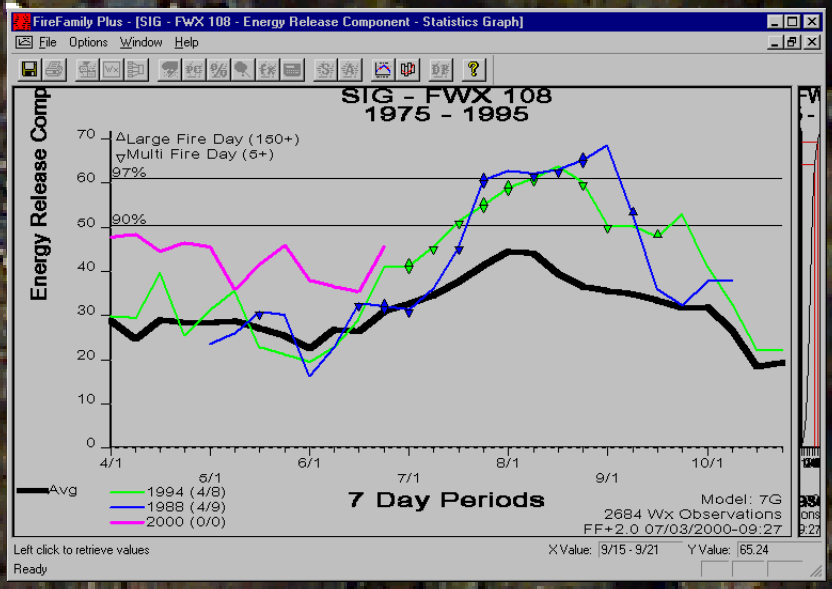
Fire Family Plus User's Guide

version 3.0







United States Department of Agriculture

Forest Service

Rocky Mountain Research Station
Fire Sciences Lab
Systems for Environmental Management

January, 2002

Preface

Welcome to the FireFamily Plus User's Guide. This guide explains how to use the FireFamily Plus software application to perform fire danger analysis.

We hope you find this guide friendly and easy-to-use. If you have any questions, comments, or concerns about this guide, please contact:

USDA Forest Service
National Fire and Aviation Management Information Systems Team
3833 S. Development Avenue
Boise, ID 83705

(800) 253-5559

You can email us at:

fire_help@dms.nwcg.gov

To obtain a copy of the FireFamily Plus User's Guide

1. Start your Internet browser.
2. In the address box, type **http://www.fs.fed.us/fire/planning/nist**, and then press ENTER.
3. Click **Distribution**, and then click **FireFamily Plus User's Guide**.

What's new

Version 3.0 is the upgrade to version 2.0 that was released in July 2000. We've incorporated many of the suggestions from the user community and continue modifications that allow the program flow better. All reported bugs from version 2.0 have been corrected.

The following specific corrections have been made:

- All text reports now print as expected.
- All graphs now print with the same line styles as displayed on your screen.
- All Graph Options are now correctly saved as default values when you declared them as such.
- The Pocketcard correctly displays 2000 fire dates.
- Fire-Day Probability Analysis Logistic Regression is no longer blocked by real-time file protection anti-virus software.
- Up to three additional variables may be merged onto the base Climatology-Statistics Graph. You can select individual years, all years, and period averages.
- Denote number of fires and large-fires on the Season-Daily List report, along with the date and index fields.

- PNG support for graphs has been added. Proprietary GIF support has been removed.
- Fire-Day probability analysis now allows you to perform conditional probability analysis for large and multiple fire-days.
- View rejected fires from a Fire-Day probability analysis in a separate window.
- Import multiple files, including station catalogs, fire weather, and "agency standard" fire occurrence files.
- NFDRS indexes are computed based on an "active-x" control, instead of hard wired code, which allows for easier distribution and update of the NFDRS calculation kernel.
- The FireFamily Plus Database is now Access 2000 level compatible.
- When copying FireFamily Plus databases onto a compact disc, you no longer must change the file properties from read-only prior to use.
- The most current Department of Interior Agency Organization Structures have been loaded into the template database, fireplus.ffp. This addresses the rename of the NPS Regional Offices to Field Offices.

Windows 95, Windows 98, Windows 2000, and Windows NT are registered trademarks of Microsoft Corporation. This guide employs many styles, conventions, and guidelines established in "The Microsoft Manual of Style for Technical Publications."

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Chapter 1. About this guide

This guide explains how to use FireFamily Plus version 3.0. It contains information about how to create a new database by importing station catalog and weather and fire data, how to define an active working set, how to generate reports and pocket cards, and how to perform fire analysis and forecasting functions.

Before you begin

Before using FireFamily Plus software, you must feel confident that:

- You are familiar with your personal computer and function keys and understand personal computer concepts.
- You are familiar with Windows 95, Windows 97, or Windows NT and can log on and log off.
- You have a basic understanding of fire weather observations, fire danger concepts, and terminology.

How to use this guide

You do not need to read this entire FireFamily Plus User's Guide to complete a specific task. Once you understand how to start FireFamily Plus, you can quickly locate commonly used tasks by reviewing the “Contents” in the front of this guide.

This guide is divided into chapters. The chapter title appears at the top of each page. At the beginning of each chapter you will find an overview of the topics explained. Where appropriate, diagrams are shown immediately following each task.

Chapter 1, “About this guide,” introduces the *FireFamily Plus User’s Guide* and explains how to use the guide.

Chapter 2, “Introducing FireFamily Plus,” explains Windows-based terms and concepts and how to install FireFamily Plus.

Chapter 3, “Working with FireFamily Plus,” explains how to create a database and define a working set, review weather data and generate reports, work with Season reports, and use the Event Locator and the NFDRS Calculator.

Chapter 4, “Working with fire analysis tools,” explains how to use the fire analysis and decision point tools in FireFamily Plus to view and interpret combined weather and fire occurrence data.

Chapter 5, “Generating a pocket card,” explains how to generate a pocket card that identifies two years of interest for comparison. It also includes instructions on changing the background pattern for your pocket card graphs.

Chapter 6, "Working with fire danger projections," explains how to generate medium range fire danger projections based on current year-to-date weather. It also outlines several techniques for developing fire weather scenarios.

Chapter 7, "Performing hourly data analysis," explains how to work with hourly weather data.

The Glossary lists terms and definitions used in this guide.

References are arranged alphabetically and contain sources of information used to complete this guide.

Conventions

The following conventions are used within this guide:

- Option button labels and hard label keys appear in bold, in the same case as on your keyboard or screen. For example, the second step in a procedure might instruct you to

  2 On the **Set Fire Associations** dialog box, click the **USFS** tab.

- Topics of special interest or hints that will help you perform a specific task show a line before and after the text. The text appears in italic type. For example

  Although you can delete and then recreate a SIG, you cannot change its name once you save it.

Chapter 2. Introducing FireFamily Plus

This chapter explains the information you need to log on and use FireFamily Plus. Topics include:

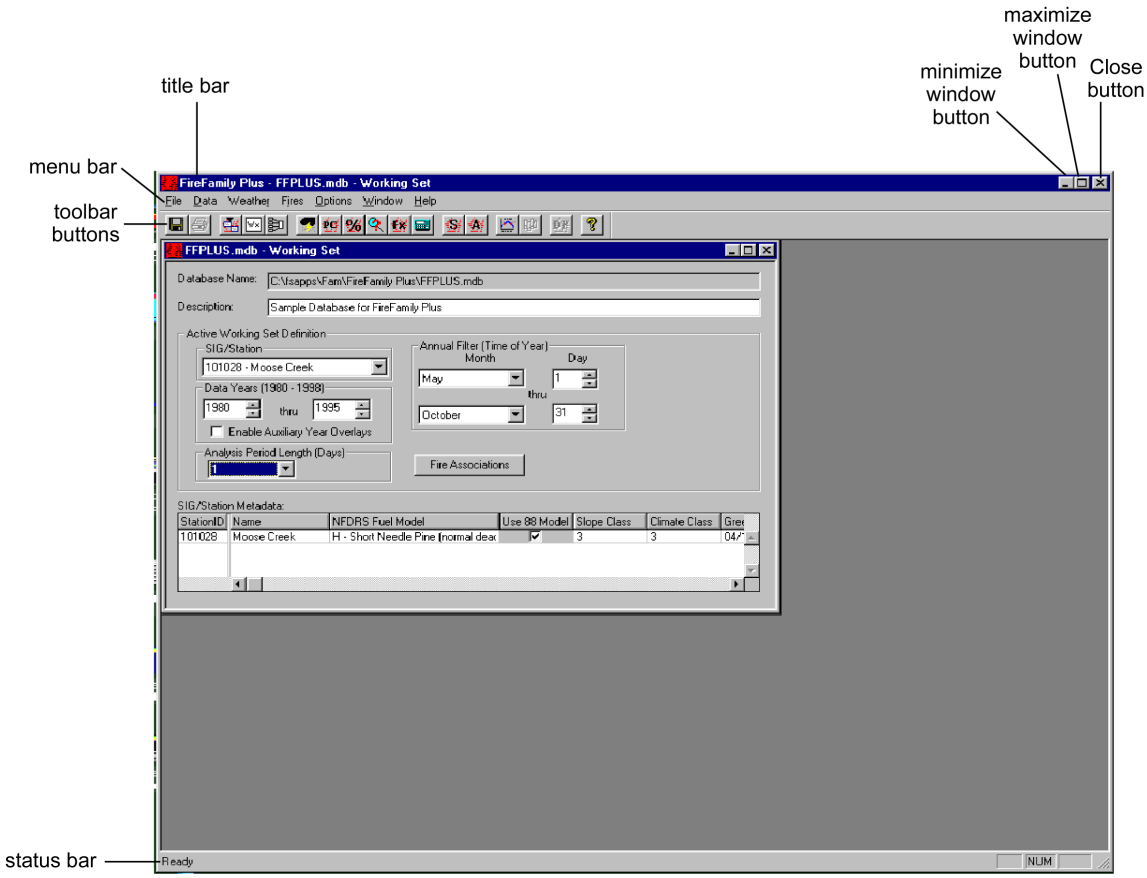
- Terms and concepts
- Installing FireFamily Plus.

Terms and concepts

This section identifies some of the screens, toolbars, and menus that you will be using in FireFamily Plus. If you are not already familiar with Windows-based programs, become familiar with these terms and concepts before proceeding with the remaining chapters in this guide.

Screen terminology

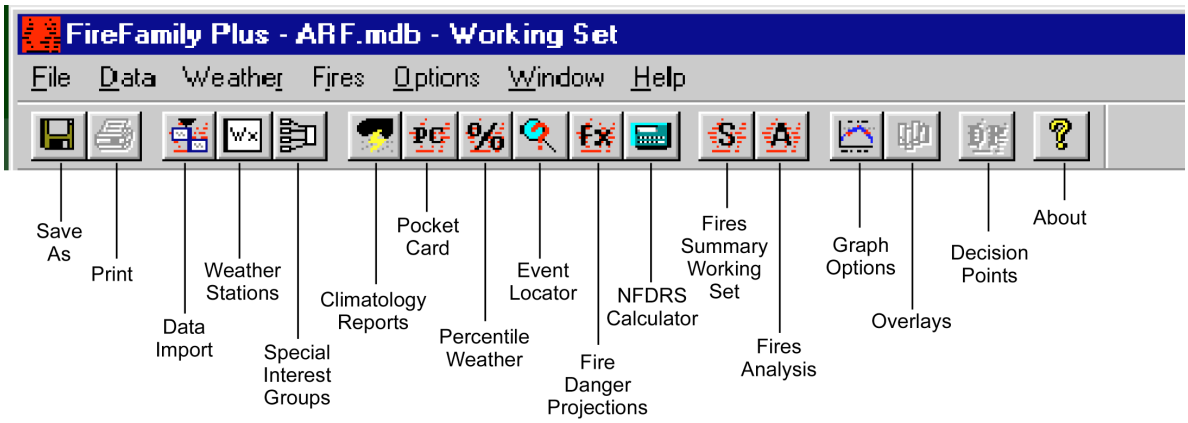
The following diagram outlines many of the elements available on the Windows-based FireFamily Plus screen.



Screen elements and toolbars unique to a specific module are introduced within the corresponding chapter.

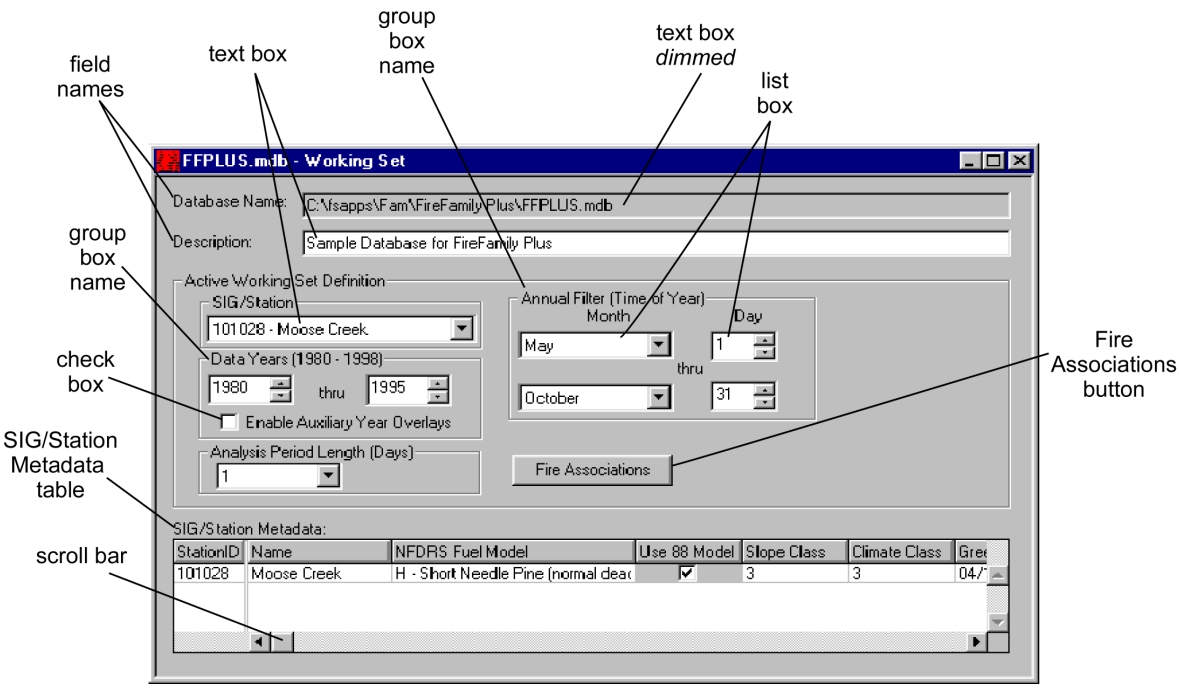
FireFamily Plus toolbar

The following diagram shows the expanded FireFamily Plus toolbar. This toolbar allows you to quickly access many FireFamily Plus functions by simply clicking a button.



Working set screen elements

The following diagram shows the new FireFamily Plus Working Set screen.



The "Observation Type" group box, which allowed you to select either "Daily" or "Hourly" observation data, has been removed from this screen.

Installing FireFamily Plus

This section outlines the basic instructions to install the FireFamily Plus program for Windows 95, Windows 98, and Windows NT operating environments. The "FireFamily Plus Version 2.0 Release Notice" contains the information and instructions you need to choose the correct self-extracting install and/or upgrade setup program.

You can display the FireFamily Plus Version 2.0 Release Notice from the Internet by entering the following address:

http://www.fs.fed.us/fire/planning/nist/distribu.htm

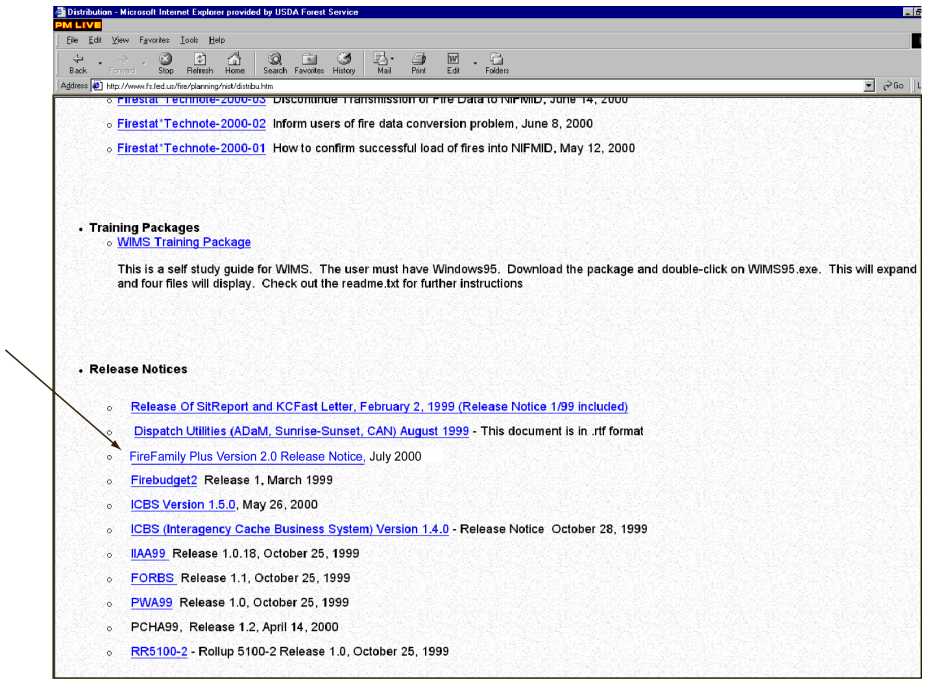
This release notice also identifies the system and data requirements, sample database, and uninstall instructions. Review the entire notice carefully for complete instructions.

To download the FireFamily Plus installation file from the Internet

1. Start your Internet browser.
2. In the address box, type **http://www.fs.fed.us/fire/planning/nist/distribu.htm**, and then press ENTER.
3. Scroll down to **Release Notices**, and then double-click **FireFamily Plus Version 2.0 Release Notice**.
4. Review the release notice to determine the appropriate installation file you need to upgrade to FireFamily Plus version 2.0.
5. Double-click the appropriate installation file, and then save it in the folder of your choice.

   *For a new installation, double-click **ffp_20_setup.exe**. To upgrade from an older version of FireFamily Plus, double-click **ffp_20_upgrade.exe**.*

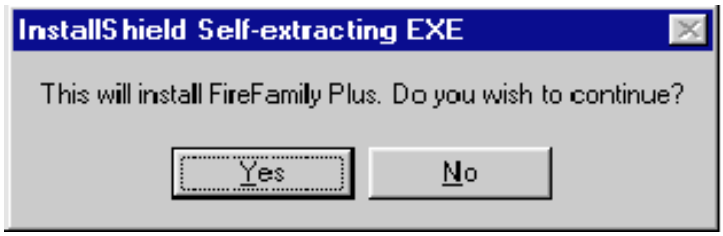
The following diagram shows the Fire Applications Support Distribution page. The arrow points to the FireFamily Plus release notice.



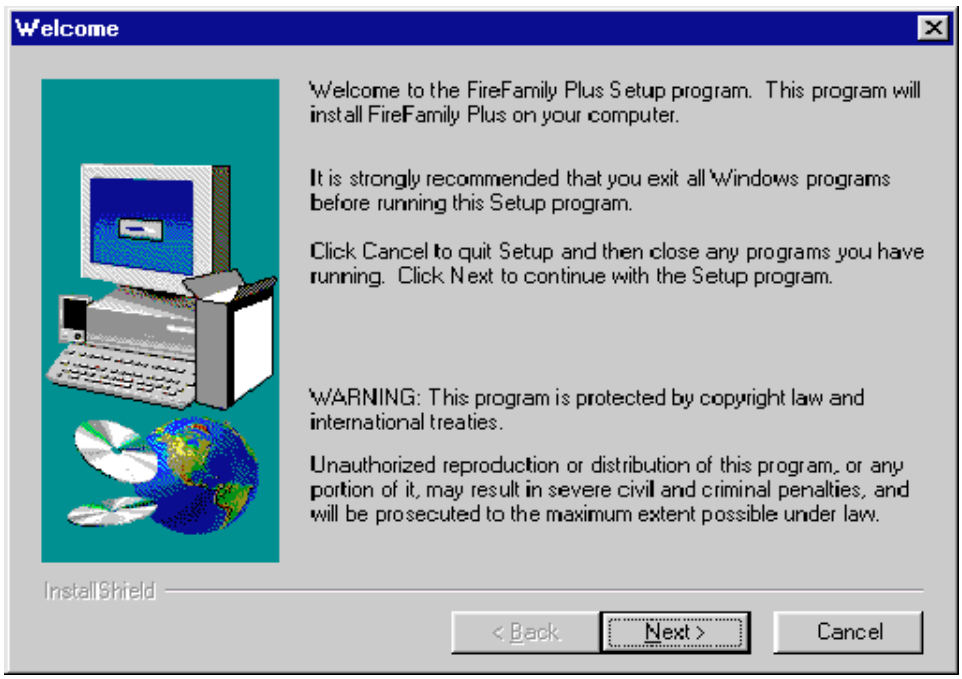
To install FireFamily Plus

1. From your personal computer, double-click the self-extracting FireFamily Plus installation file.
2. Complete the installation process as instructed on your screen.

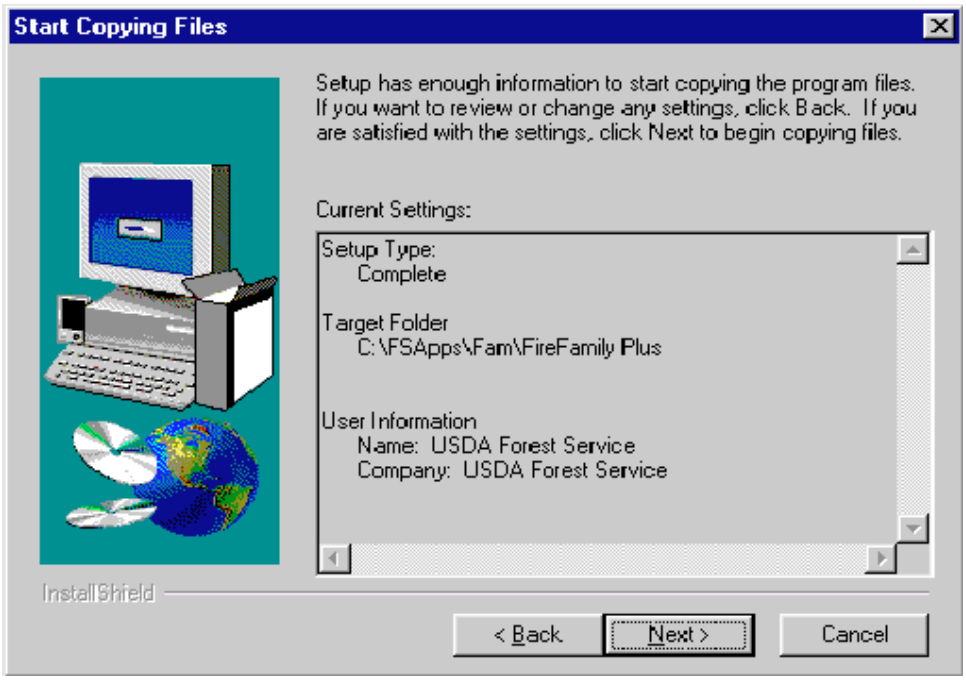
The following diagram shows the InstallShield dialog box.



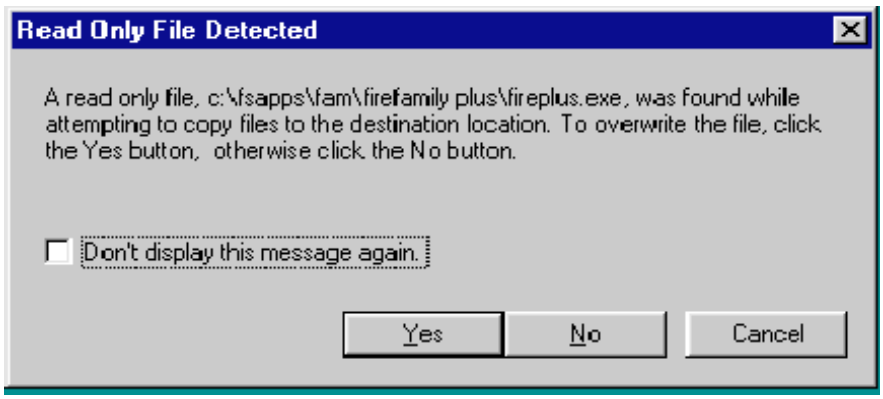
The following diagram shows the Welcome dialog box. Click **Next** to continue the installation process.



The following diagram shows the Start Copying Files dialog box. Review the Target Folder for the FireFamily Plus software, and then click **Next** to continue the installation process.



The following diagram shows the Read Only File Detected dialog box. This displays when you already have FireFamily Plus installed on your personal computer. To proceed, click **Yes**.



To start FireFamily Plus

- On the **Start** menu, point to **Programs**, point to **F&AM Applications**, and then click **Fire Family Plus**.

Chapter 3. Working with FireFamily Plus

This chapter explains how to perform some common operations within FireFamily Plus. Topics include:

- Opening the sample database
- Creating a database
- Defining an Active Working Set
- Reviewing weather data and generating reports
- Working with Season Reports
- Reviewing fire occurrence data
- Using the Event Locator
- Using the NFDRS Calculator.

Opening the sample database

FireFamily Plus is shipped with sample database “FFPLUS.mbd.” It contains station catalogs “101028” and “240107” and the Special Interest Group “Sample SIG.”

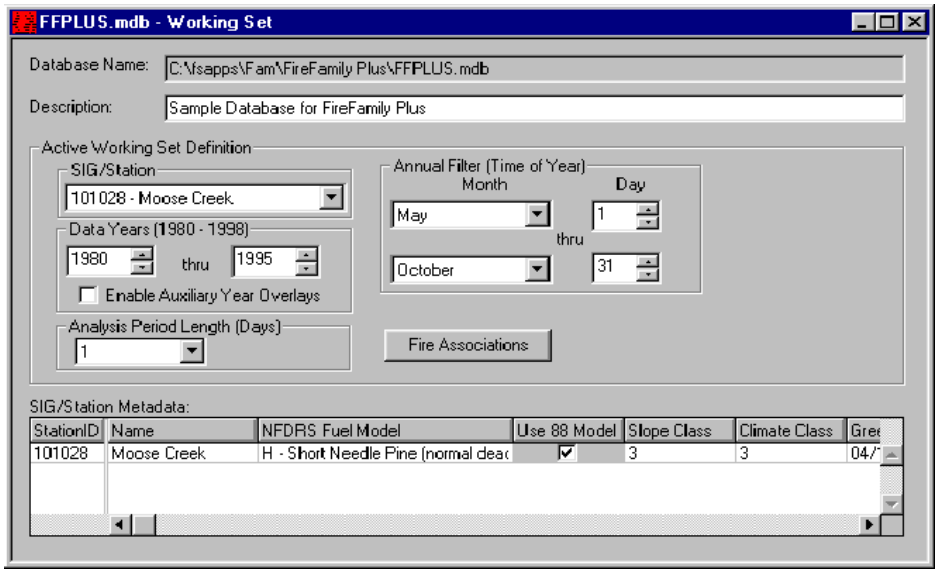
For more information about Special Interest Groups, see “Working with Special Interest Groups” later in this chapter.

To open the sample database

1 On the **File** menu, click **Open**.

2 Double-click **FFPLUS**.

The following diagram shows the sample database “FFPLUS” as it first appears on your screen.



For more information about the elements on this screen, see Chapter 2, “Introducing FireFamily Plus.”

Creating a database

This section explains how to create a FireFamily Plus database that you will populate with station catalogs and imported historical and fire occurrence data. Topics include:

- Retrieving and downloading data from KCFAST
- Importing your station catalogs, fire weather, and fire occurrence data.

You can create as many databases as required to suit your needs. Although you can keep many databases open at the same time during your FireFamily Plus session, only one database is "active" at a time.

Retrieving and downloading data from KCFAST

To begin, you must access KCFAST from the Fire and Aviation Management web page. First, retrieve historical fire weather data, fire occurrence data, and the station catalog information. Next, download the files from the ftp site to your personal computer.

For complete instructions about using KCFAST, see Appendix A, "Retrieving NIFMID data using KCFAST," in the back of this guide.

To retrieve historical fire weather data

1. From the **KCFAST Main Menu**, click **Weather**.
2. Click **Data Extract**, and then click **Historical**.
3. Type the **Station ID**, and then **Begin** and **End Date Range**.
4. Click **Raw Datafile - 1972 Data Format**.

   *To use diurnal functions or create files to support FARSITE, select Raw Datafile - 1972 Data Format, *.FW9.*

5. Select the email notification option of your choice, click **Submit**, then write down the file name.

To retrieve U.S. Forest Service fire occurrence data

1. From the **KCFAST Main Menu**, click **Fire**.
2. Click **Standard Extract**.
3. Type the two digit **Region** and two digit **Forest** numbers.
4. Type the **Begin Year** and **End Year Date Range**.
5. Click **NFMAS - PCHA (PC Historical Analysis)**.
6. Click **Raw Datafile**.
7. Select the email notification option of your choice, click **Submit**, then write down the file name.

To retrieve station catalog information for a single station

1 From the **KCFAST Main Menu**, click **Weather**.

2 Click **Station Catalog**, and then click **Station Information**.

3 Click **BY SINGLE STATION**, and then type the desired **Station ID**.

4 Click **Send file to FTP site.**

5 Select the email notification option of your choice, click **Submit**, then write down the file name.

To download a file from ftp.fs.fed.us

1 Start your Internet browser.

2 In the address box, type **ftp://ftp.fs.fed.us/incoming/wo_fam** then press ENTER.

3 Right-click the file name of your choice, click **Copy to folder,** then double-click the folder of your choice.

Importing your station catalogs, fire weather, and fire occurrence data

After saving the historical fire weather data, fire occurrence data, and the station catalog information on your personal computer, you can import the information into the newly created database.

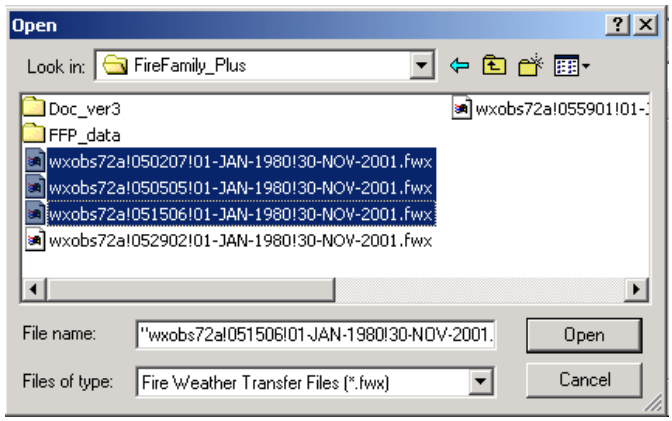
You can now import more than one station catalog, fire weather, and fire occurrence files to customize your database.

To open more than one file at a time

1 From the **Open** dialog box, press the SHIFT key, and then click the files of your choice.

2 When finished, click **Open**.

The following diagram shows the Open dialog box for selecting Old FWX files. Three fire weather transfer files are selected.

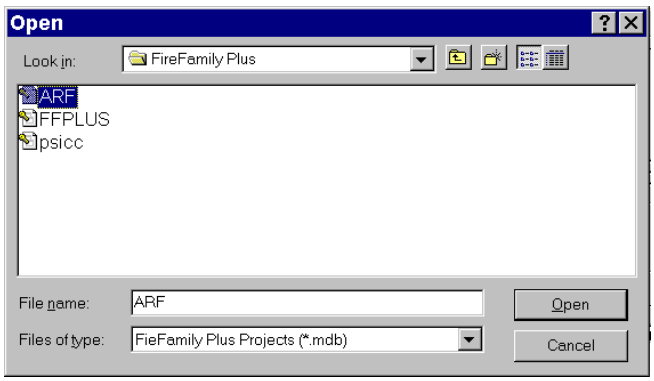


To create and save a new database

1 On the **File** menu, click **New**.

2 In the **File name** box, type the name of your new database, and then click **Save**.

The following diagram shows the "New FireFamily Plus Database" dialog box.



To import a station catalog

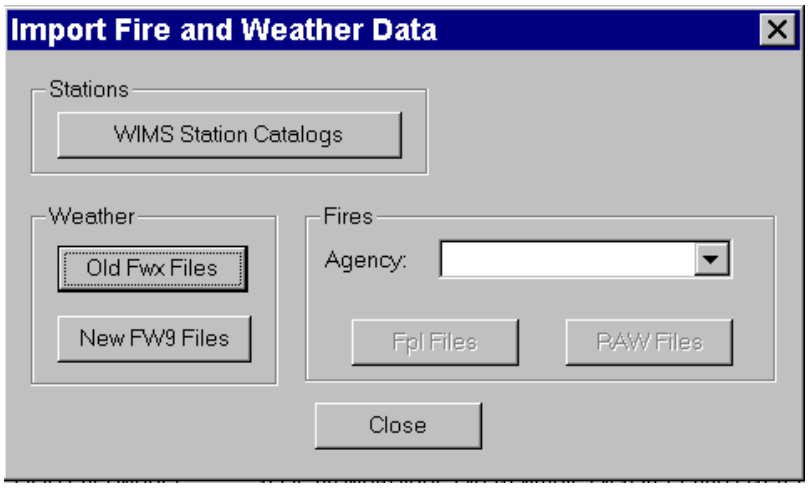
1 On the **Data** menu, click **Import**.

2 Click **WIMS Station Catalogs**, and then double-click the station catalog file(s) of your choice.

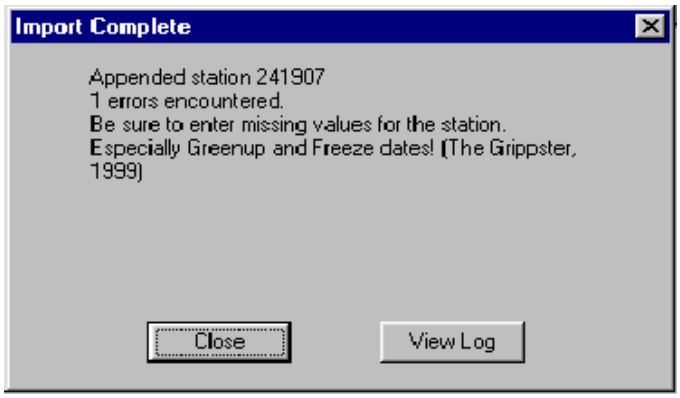
3 When finished click **Close**, and then click **Close** on the **Import Fire and Weather Data** dialog box.

4 To review the station catalog, click **Stations** on the **Data** menu, click the station ID of your choice, and then click **Edit**.

The following diagram shows the Import Fire and Weather Data dialog box.

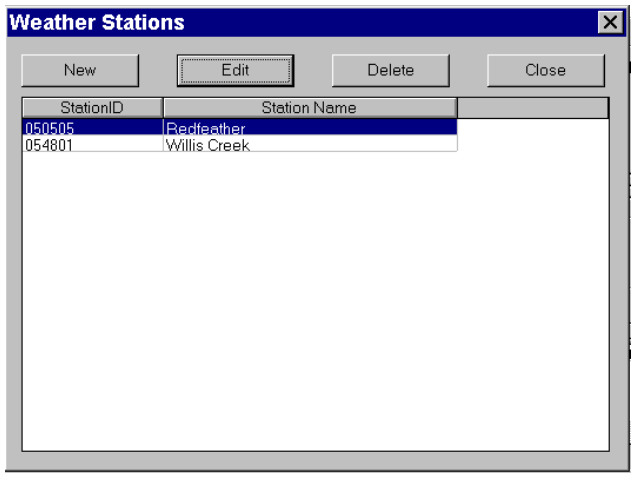


The following diagram shows the Import Complete dialog box.

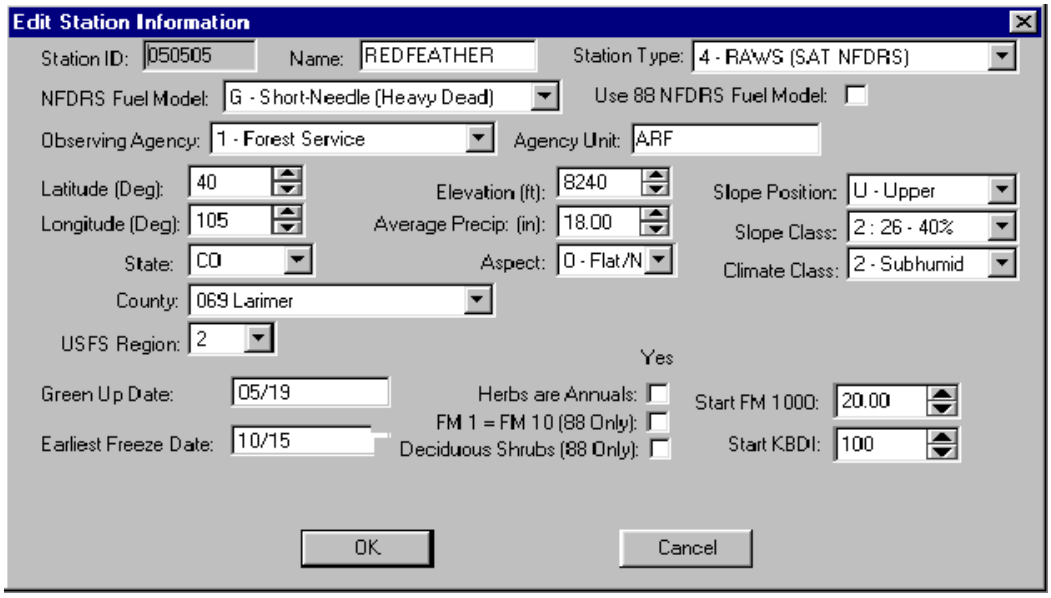


*To review, print, and/or save the error log, click **View Log**.*

The following Weather Stations dialog box lists all the station catalogs available in your working set database.



The following Edit Station Information screen shows station catalog "050505."



To import historical fire weather data - optional

1 On the **Data** menu, click **Import**.

2 Click **Old Fwx Fires**, and then double-click the historical fire weather data file(s) of your choice.

*To import historical fire weather data retrieved in the 1998 data format, click **New FW9 Files**.*

To import FS fire occurrence data

1 In the **Agency** box, type or select **USFS**.

2 Click **RAW** Files, and then double-click the fire occurrence file(s) of your choice.

3 When finished click **OK**, and then click **Close**.

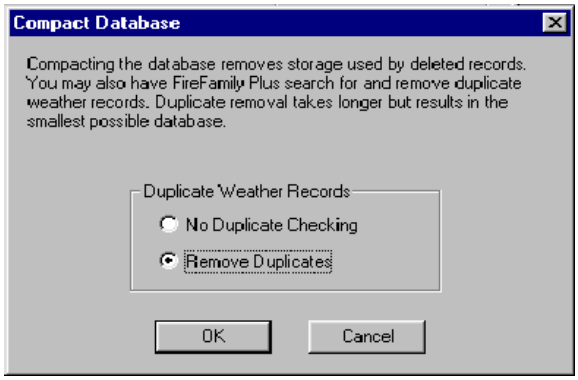
Since FS fire occurrence data is verified for duplicate records, this import process may require several minutes. For datasets containing more than 10,000 records, this process may require several hours!

To compact the database

1 On the **Data** menu, click **Compact**.

2 Select the **Duplicate Weather Records** option of your choice, and then click **OK**.

The following diagram shows the Compact Database dialog box. From here, you can remove extra storage due to records that you deleted from your database, or check for duplicate records.



Defining an active working set

This section explains how to define an active working set and how to set fire associations. Think of the "working set" as a filter of the active database. By filtering the database, you can use the data that pertains only to your specific fire danger analysis needs. For example, you may choose to analyze the potential for the fall fire season or determine the window for the spring prescribed fire season.

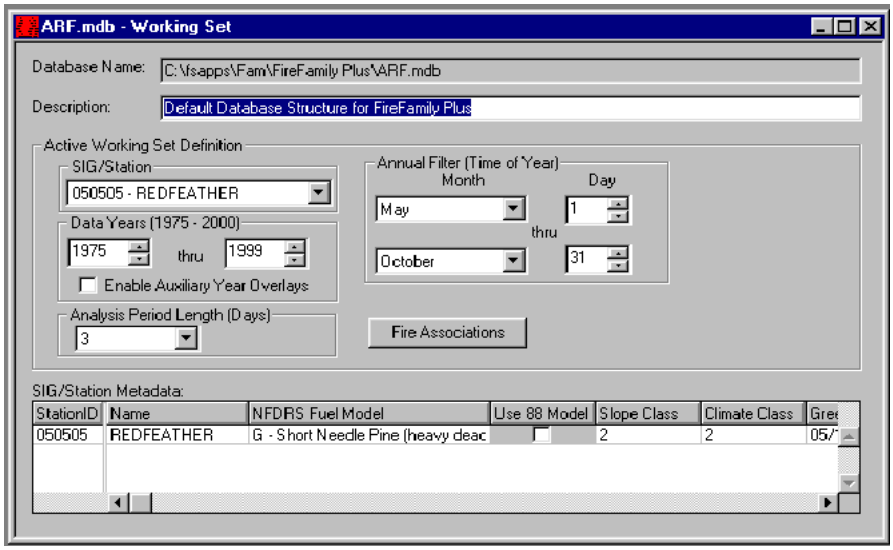
Setting fire associations allows you to define which fires are associated with the weather station or stations in the working set. You can also blend fires from different agencies.

Every output of FireFamily Plus directly relates to the configuration of the working set. Therefore, be sure that each of the eight elements in the working set accurately reflects your data requirements.

To define the Active Working Set

1. On the **SIG/Station** box, select the station ID of your choice.
2. Change the remaining Active Working Set Definition fields as needed.

The following diagram shows a sample Active Working Set Definition for station "050505."



To set fire associations

1 Click **Fire Associations**.

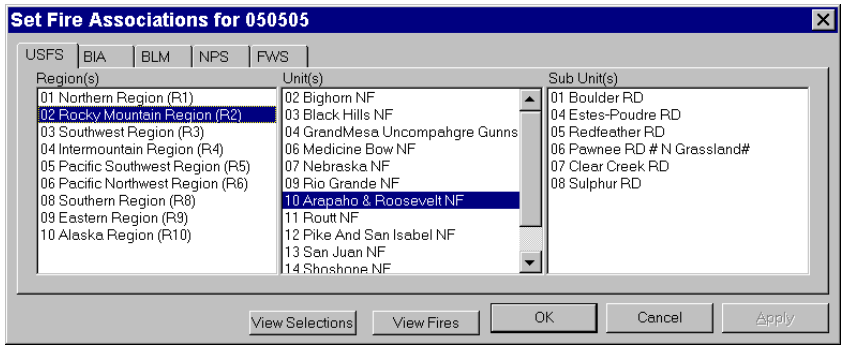
2 On the **Set Fire Associations** dialog box, click the **USFS** tab.

3 Select the **Region**(s), **Unit**(s), and **Sub Unit**(s) of your choice.

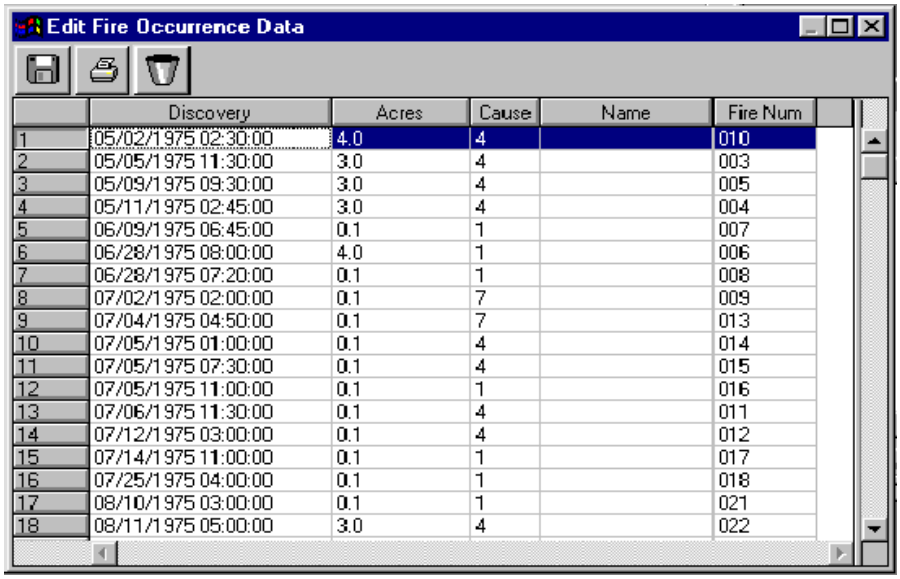
4 To verify your selections, click **View Selections**, then click **OK**.

5 To review fire data, click **View Fires**.

The following "Set Fire Associations for 050505" dialog box shows Region 02 and Unit 10 selected.



The following "Edit Fire Occurrence Data" screen lists all fires for station "050505" and based on the Active Working Set.



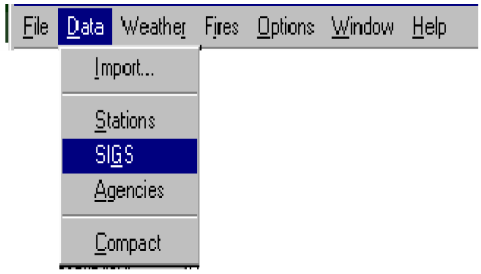
Edit Fire Occurrence Data

	Discovery	Acres	Cause	Name	Fire Num
1	05/02/1975 02:30:00	4.0	4		010
2	05/05/1975 11:30:00	3.0	4		003
3	05/09/1975 09:30:00	3.0	4		005
4	05/11/1975 02:45:00	3.0	4		004
5	06/09/1975 06:45:00	0.1	1		007
6	06/28/1975 08:00:00	4.0	1		006
7	06/28/1975 07:20:00	0.1	1		008
8	07/02/1975 02:00:00	0.1	7		009
9	07/04/1975 04:50:00	0.1	7		013
10	07/05/1975 01:00:00	0.1	4		014
11	07/05/1975 07:30:00	0.1	4		015
12	07/05/1975 11:00:00	0.1	1		016
13	07/06/1975 11:30:00	0.1	4		011
14	07/12/1975 03:00:00	0.1	4		012
15	07/14/1975 11:00:00	0.1	1		017
16	07/25/1975 04:00:00	0.1	1		018
17	08/10/1975 03:00:00	0.1	1		021
18	08/11/1975 05:00:00	3.0	4		022

Working with Special Interest Groups

A Special Interest Group (SIG) is a collection of weather station catalogs that you group together to analyze fire danger climatology. You can group as many stations as you wish, then weigh the importance of each station within the SIG. In this way, you can adjust the influence of each station when performing FireFamily Plus calculations.

FireFamily Plus creates new pseudo weather records for each day using all available data from every station in the SIG. If any station within the SIG has a data record for a day, the SIG will have a weather record for that day. If no stations have a data record for a particular day, the SIG will not have a weather record for that day.



To create a Special Interest Group

1 On the **Data** menu, click **SIGS**, and then click **New**.

2 In the **SIG Name** box, type a meaningful name for the SIG.

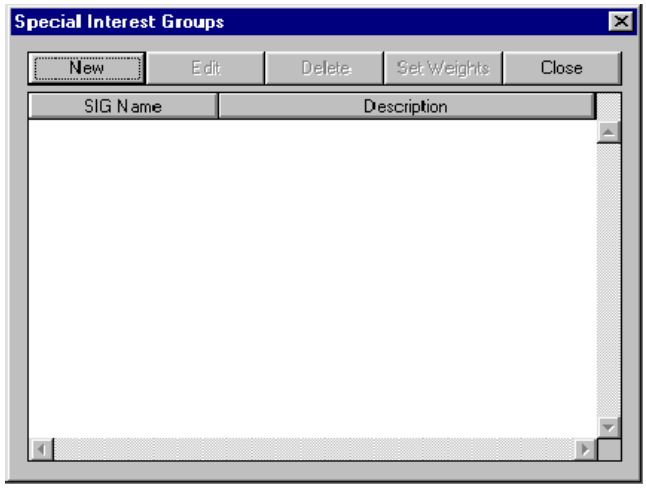
Although you can delete and recreate a SIG, once you save it you cannot change its name.

3 In the **Description** box, type a description that identifies the SIG and its purpose.

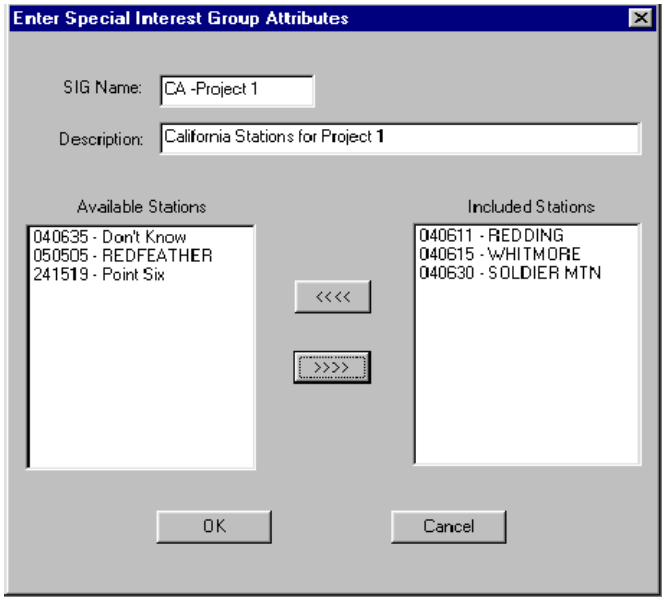
4 Under **Available Stations**, select the station of your choice, then click >>>> to include that station in the SIG.

5 When finished adding stations to the SIG, click **OK**.

The following diagram shows the Special Interest Groups dialog box.

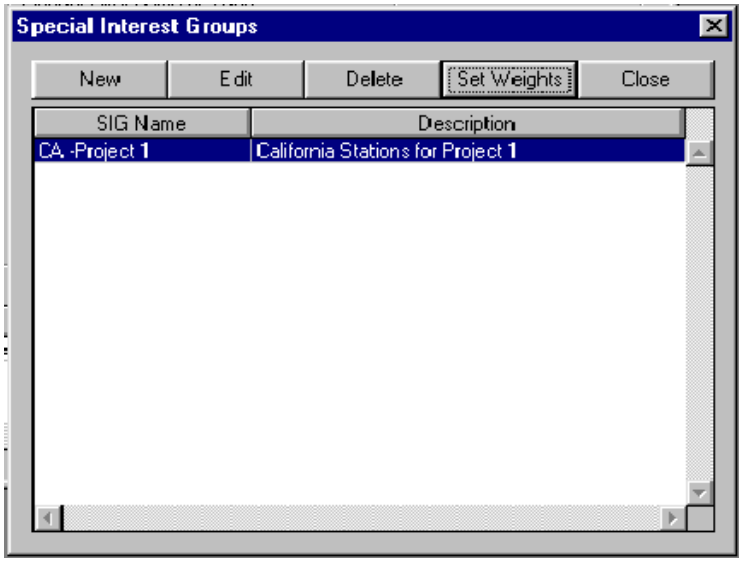


The following diagram shows the Enter Special Interest Group Attributes dialog box. From here, you can include or remove station catalogs in the SIG that have been imported into your database.



Only station catalogs imported into the database will display on this dialog box. To import additional station catalogs, see "Importing your station catalog and weather data," earlier in this chapter.

The following diagram shows the new SIG as it appears on the Special Interest Groups dialog box.

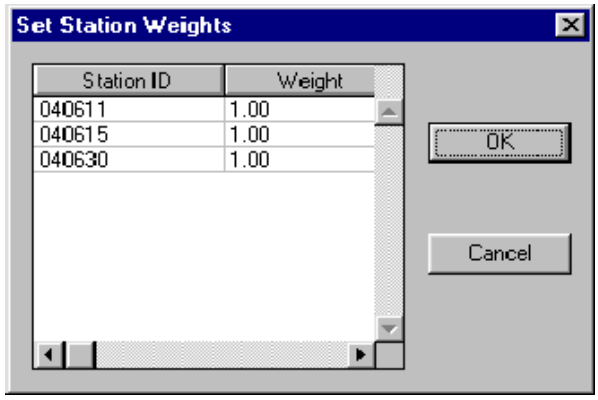


To set weights to stations in a SIG

Weight factors are relative in FireFamily Plus. Initially, every station in the SIG is assigned a weight factor of "1.0," denoting equal weight for all stations. To increase a station's importance for your analysis, simply increase its weight. For example, to double the importance of a particular station, enter "2.0" as its weight. To reduce the importance of a particular station by half, enter "0.5" as its weight.

1. From the **Special Interest Groups** dialog box, select the **SIG Name** of your choice, and then click **Set Weights**.
2. For each station, type the appropriate weight, and then click **OK** when finished.

The following diagram shows the Set Station Weights dialog box.



To save a Special Interest Group

1 When finished adding stations and setting weights to each station to the SIG, click **OK.**

2 To exit the **Special Interest Group** dialog box, click **Close**.

To edit a Special Interest Group

1 On the **Data** menu, click **SIGS**.

2 From the **Special Interest Groups** dialog box, select the **SIG Name** of your choice, and then click **Edit**.

3 Add and remove the station(s) of your choice, then click **OK** when finished.

4 Click **Set Weights**, type the appropriate weights for each station, then click **OK**.

5 To exit the **Special Interest Group** dialog box, click **Close**.

To delete a SIG from the database

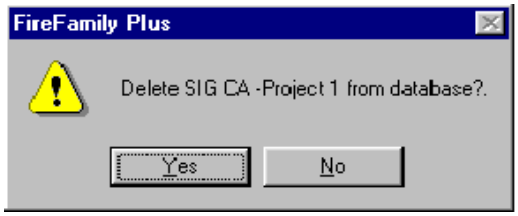
1 On the **Data** menu, click **SIGS**.

2 From the **Special Interest Groups** dialog box, select the **SIG Name** of your choice, and then click **Delete**.

3 Click **Yes** to confirm or **No** to cancel.

4 To exit the **Special Interest Group** dialog box, click **Close**.

The following diagram shows the delete confirmation dialog box.



Reviewing weather data and generating reports

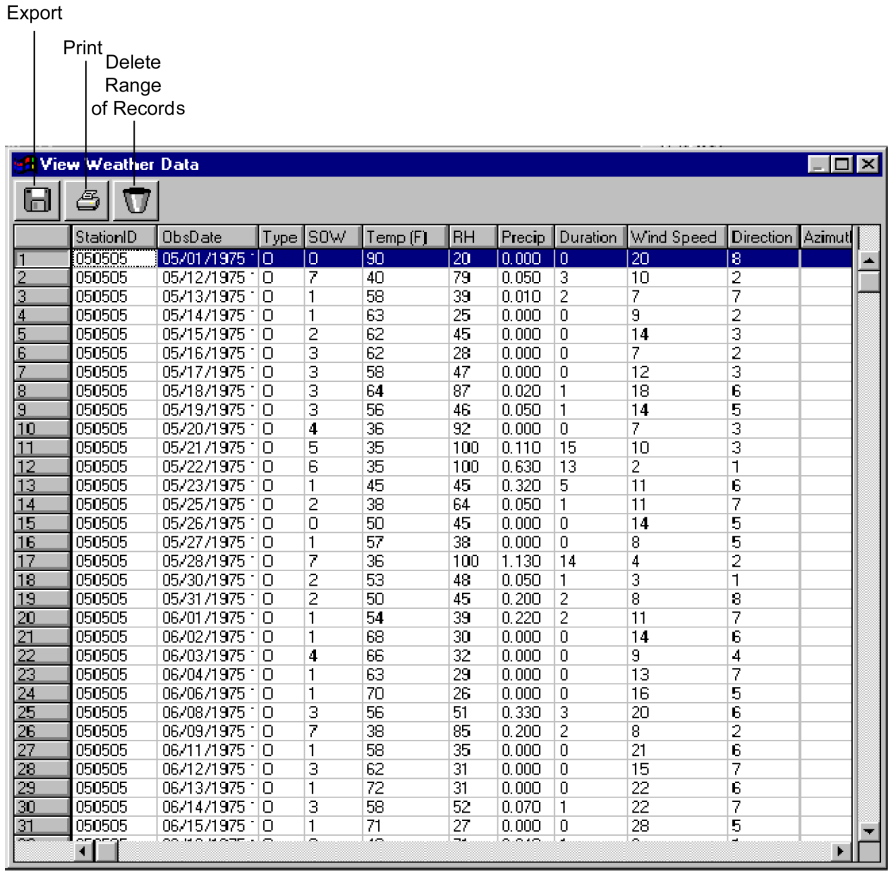
This section explains how to review weather data and generate Climatology statistical tables and graphs.

Merge is a new function on the Options menu. For more information, see "Merging graphs," later in this section.

To review weather observations

- On the **Weather** menu, point to **View Observations**, and then click **All**.

The following "View Weather Data" screen lists the weather observations for station "050505."



	StationID	ObsDate	Type	SOW	Temp (F)	RH	Precip	Duration	Wind Speed	Direction	Azimuth
1	050505	05/01/1975	O	0	90	20	0.000	0	20	8	
2	050505	05/12/1975	O	7	40	79	0.050	3	10	2	
3	050505	05/13/1975	O	1	58	39	0.010	2	7	7	
4	050505	05/14/1975	O	1	63	25	0.000	0	9	2	
5	050505	05/15/1975	O	2	62	45	0.000	0	14	3	
6	050505	05/16/1975	O	3	62	28	0.000	0	7	2	
7	050505	05/17/1975	O	3	58	47	0.000	0	12	3	
8	050505	05/18/1975	O	3	64	87	0.020	1	18	6	
9	050505	05/19/1975	O	3	56	46	0.050	1	14	5	
10	050505	05/20/1975	O	4	36	92	0.000	0	7	3	
11	050505	05/21/1975	O	5	35	100	0.110	15	10	3	
12	050505	05/22/1975	O	6	35	100	0.630	13	2	1	
13	050505	05/23/1975	O	1	45	45	0.320	5	11	6	
14	050505	05/25/1975	O	2	38	64	0.050	1	11	7	
15	050505	05/26/1975	O	0	50	45	0.000	0	14	5	
16	050505	05/27/1975	O	1	57	38	0.000	0	8	5	
17	050505	05/28/1975	O	7	36	100	1.130	14	4	2	
18	050505	05/30/1975	O	2	53	48	0.050	1	3	1	
19	050505	05/31/1975	O	2	50	45	0.200	2	8	8	
20	050505	06/01/1975	O	1	54	39	0.220	2	11	7	
21	050505	06/02/1975	O	1	68	30	0.000	0	14	6	
22	050505	06/03/1975	O	4	66	32	0.000	0	9	4	
23	050505	06/04/1975	O	1	63	29	0.000	0	13	7	
24	050505	06/06/1975	O	1	70	26	0.000	0	16	5	
25	050505	06/08/1975	O	3	56	51	0.330	3	20	6	
26	050505	06/09/1975	O	7	38	85	0.200	2	8	2	
27	050505	06/11/1975	O	1	58	35	0.000	0	21	6	
28	050505	06/12/1975	O	3	62	31	0.000	0	15	7	
29	050505	06/13/1975	O	1	72	31	0.000	0	22	6	
30	050505	06/14/1975	O	3	58	52	0.070	1	22	7	
31	050505	06/15/1975	O	1	71	27	0.000	0	28	5	

To sort by any field, right-click on the column heading of your choice. To adjust column width, drag the column heading to the desired width.

To remove duplicate records

1 On the **Data** menu, click **Compact**.

2 Click **Remove Duplicates**, and then click **OK**.

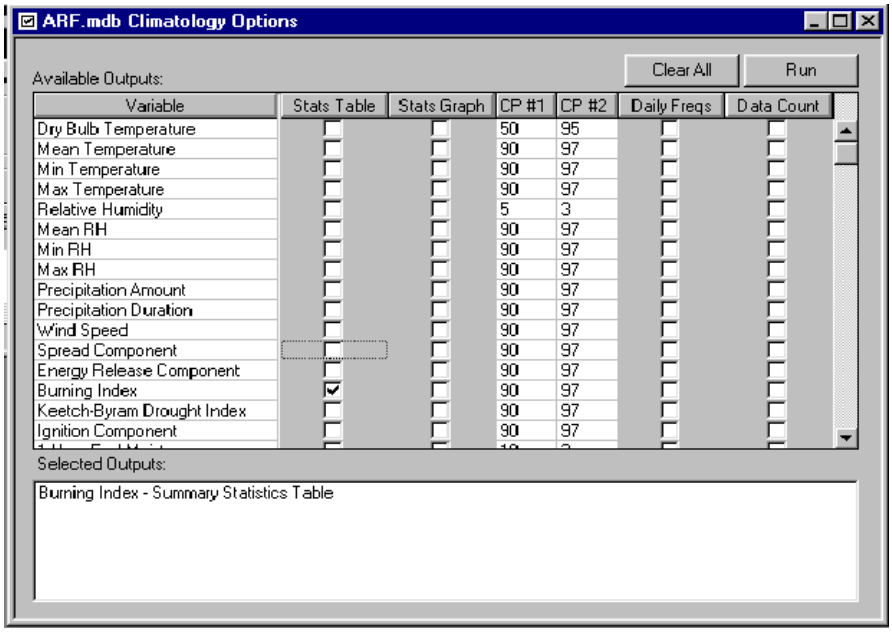
The following diagram shows the Compact Database dialog box.

To review weather data by generating a statistical table

1 On the **Weather** menu, click **Climatology**.

2 Select the **Stats Table** check boxes of your choice, and then click **Run**.

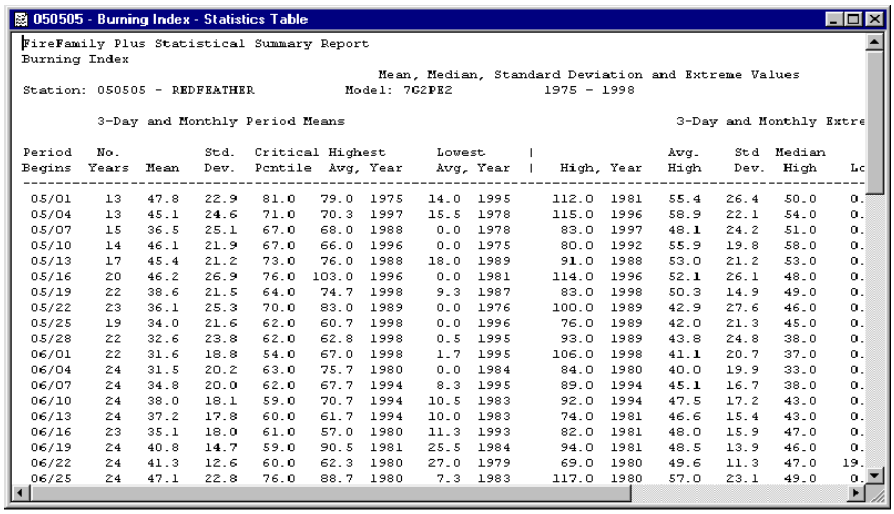
The following "Climatology Options" dialog box shows the statistical table, "Burning Index" selected.



The CP #1 and CP #2 columns identify the critical percentiles that are used when you generate statistical tables.

CP #1 and CP #2 are also used when generating percentile graphs, daily frequencies, and pocket cards.

The following screen shows the statistical table for Burning Index for station "050505." As shown in the previous diagram, the 90th critical percentile was used for this statistical table.



050505 - Burning Index - Statistics Table

FireFamily Plus Statistical Summary Report
Burning Index
Mean, Median, Standard Deviation and Extreme Values
Station: 050505 - REDFEATHER Model: 7G2PE2 1975 - 1998

3-Day and Monthly Period Means 3-Day and Monthly Extre

Period Begins	No. Years	Mean	Std. Dev.	Critical Pcntile	Highest Avg,	Year	Lowest Avg,	Year	High,	Year	Avg. High	Std Dev.	Median High	Lc
05/01	13	47.8	22.9	81.0	79.0	1975	14.0	1995	112.0	1981	55.4	26.4	50.0	0.
05/04	13	45.1	24.6	71.0	70.3	1997	15.5	1978	115.0	1996	58.9	22.1	54.0	0.
05/07	15	36.5	25.1	67.0	68.0	1988	0.0	1978	83.0	1997	48.1	24.2	51.0	0.
05/10	14	46.1	21.9	67.0	66.0	1996	0.0	1975	80.0	1992	55.9	19.8	58.0	0.
05/13	17	45.4	21.2	73.0	76.0	1988	18.0	1989	91.0	1988	53.0	21.2	53.0	0.
05/16	20	46.2	26.9	76.0	103.0	1996	0.0	1981	114.0	1996	52.1	26.1	48.0	0.
05/19	22	38.6	21.5	64.0	74.7	1998	9.3	1987	83.0	1998	50.3	14.9	49.0	0.
05/22	23	36.1	25.3	70.0	83.0	1989	0.0	1976	100.0	1989	42.9	27.6	46.0	0.
05/25	19	34.0	21.6	62.0	60.7	1998	0.0	1996	76.0	1989	42.0	21.3	45.0	0.
05/28	22	32.6	23.8	62.0	62.8	1998	0.5	1995	93.0	1989	43.8	24.8	38.0	0.
06/01	22	31.6	18.8	54.0	67.0	1998	1.7	1995	106.0	1998	41.1	20.7	37.0	0.
06/04	24	31.5	20.2	63.0	75.7	1980	0.0	1984	84.0	1980	40.0	19.9	33.0	0.
06/07	24	34.8	20.0	62.0	67.7	1994	8.3	1995	89.0	1994	45.1	16.7	38.0	0.
06/10	24	38.0	18.1	59.0	70.7	1994	10.5	1983	92.0	1994	47.5	17.2	43.0	0.
06/13	24	37.2	17.8	60.0	61.7	1994	10.0	1983	74.0	1981	46.6	15.4	43.0	0.
06/16	23	35.1	18.0	61.0	57.0	1980	11.3	1993	82.0	1981	48.0	15.9	47.0	0.
06/19	24	40.8	14.7	59.0	90.5	1981	25.5	1984	94.0	1981	48.5	13.9	46.0	0.
06/22	24	41.3	12.6	60.0	62.3	1980	27.0	1979	69.0	1980	49.6	11.3	47.0	19.
06/25	24	47.1	22.8	76.0	88.7	1980	7.3	1983	117.0	1980	57.0	23.1	49.0	0.

Only data defined by the active working set is included in the table.

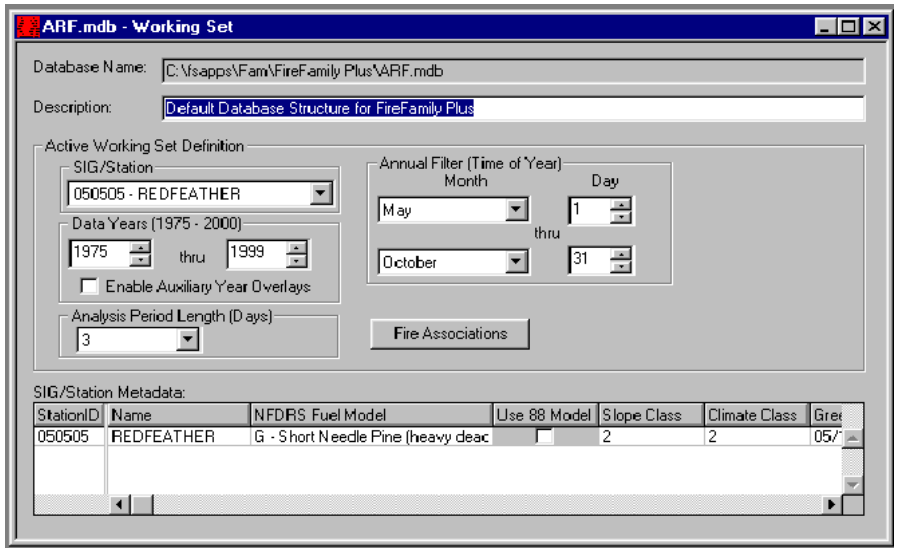
To review weather data by generating statistical graphs

1 On the **Weather** menu, click **Climatology**.

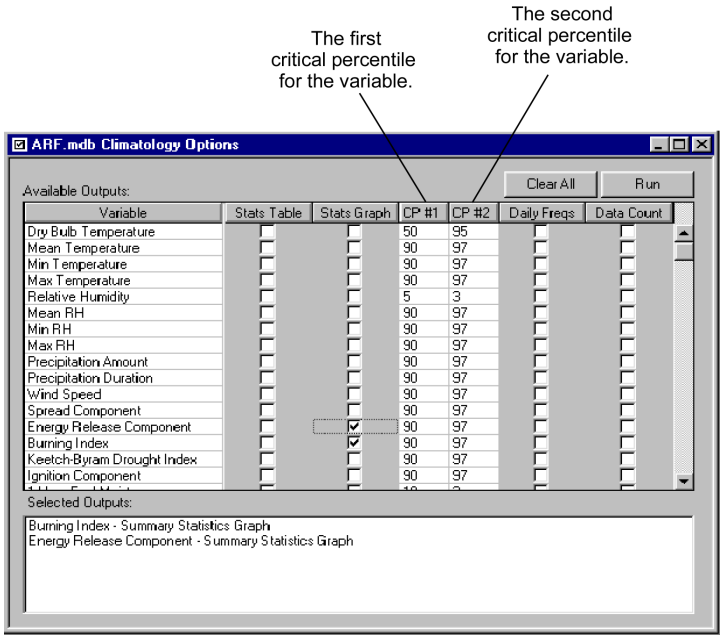
2 Select the **Stats Graph** check boxes of your choice, and then click **Run**.

Clear any check boxes in the Stats Table column.

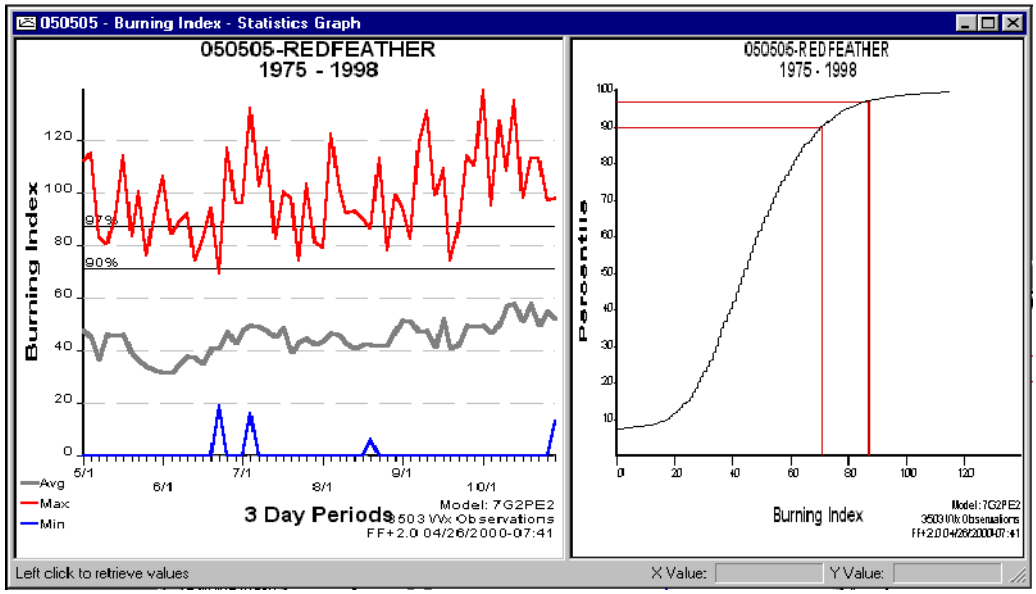
The following diagram shows a three-day Analysis Period Length (Days).



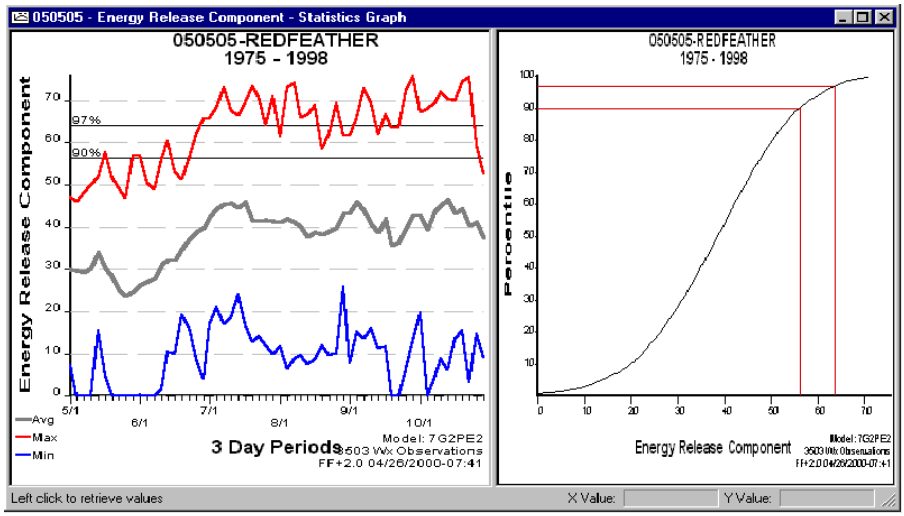
The following "Climatology Options" dialog box shows Energy Release Component and Burning Index variables selected. The critical percentile values for both the Energy Release Component and Burning Index are set to "90" for CP#1 and "97" for CP#2.



The following diagram shows the Burning Index statistics graph and weather percentile graph.



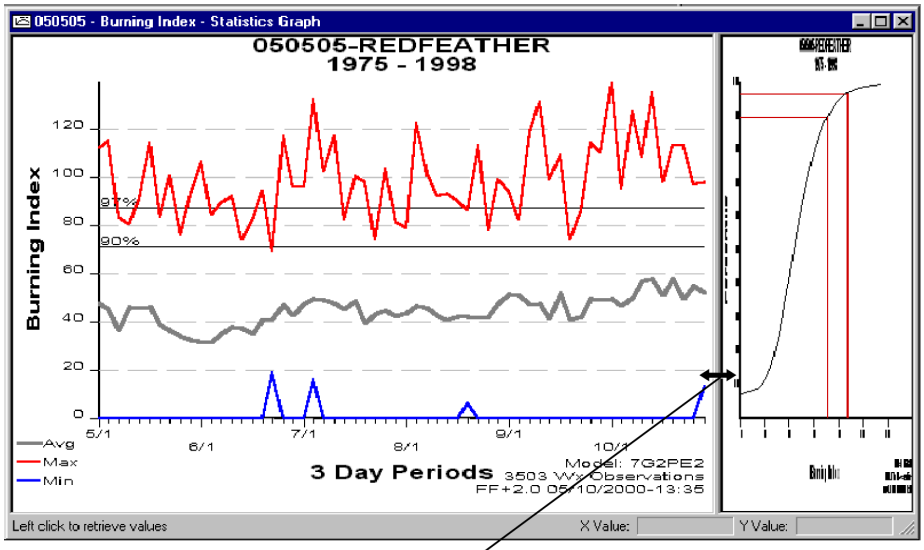
The following diagram shows the Energy Release Component statistics graph and weather percentile graph.



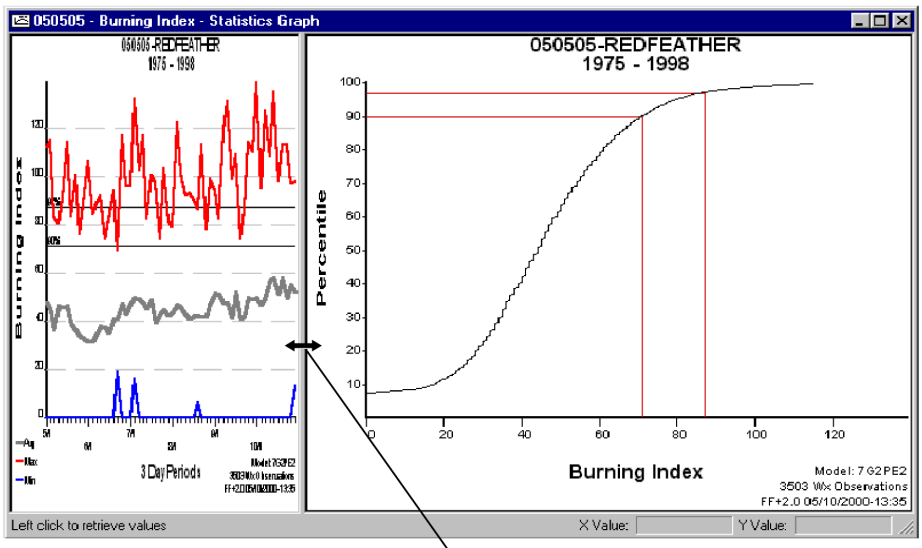
To resize a statistical graph

- To maximize the statistical graph of your choice, double-click anywhere on that graph.

The following diagram outlines how to adjust the size of the statistical graphs. You can click and hold the bar that separates the two statistical graphs, then slide the bar right or left to obtain the desired size.



click, hold, and slide bar to the right

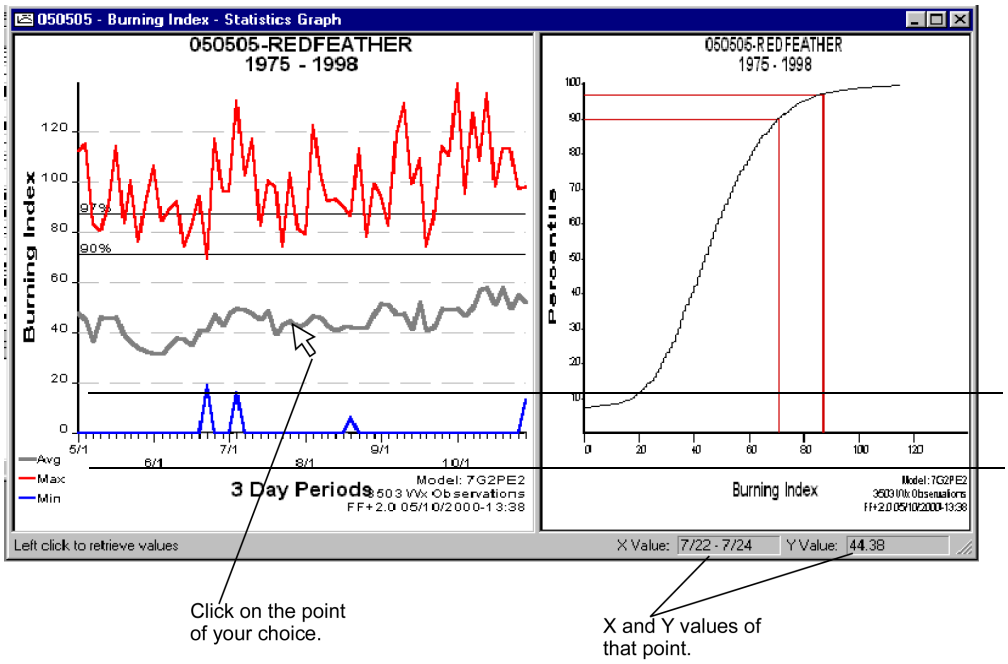


click, hold, and slide bar to the left

To determine a specific value on a statistical graph

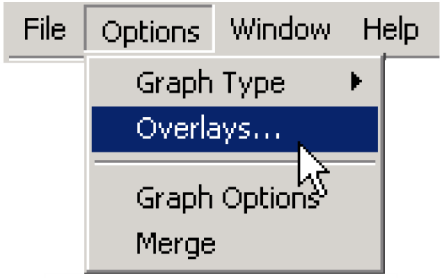
- Click the point of your choice.

The following diagram shows the X value and Y values of a particular point on a statistical graph.



Working with overlays

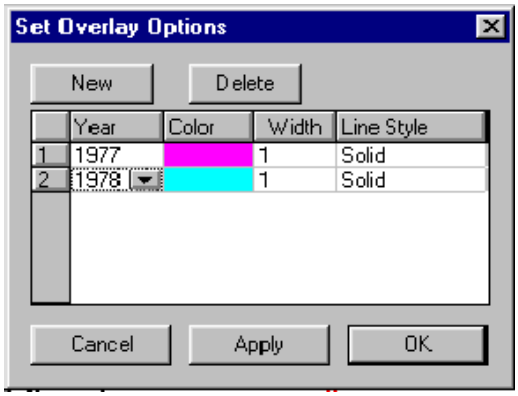
After you create a statistical table or graph, you can add an overlay to highlight specific years of interest.



To create an overlay on a statistical graph of your choice

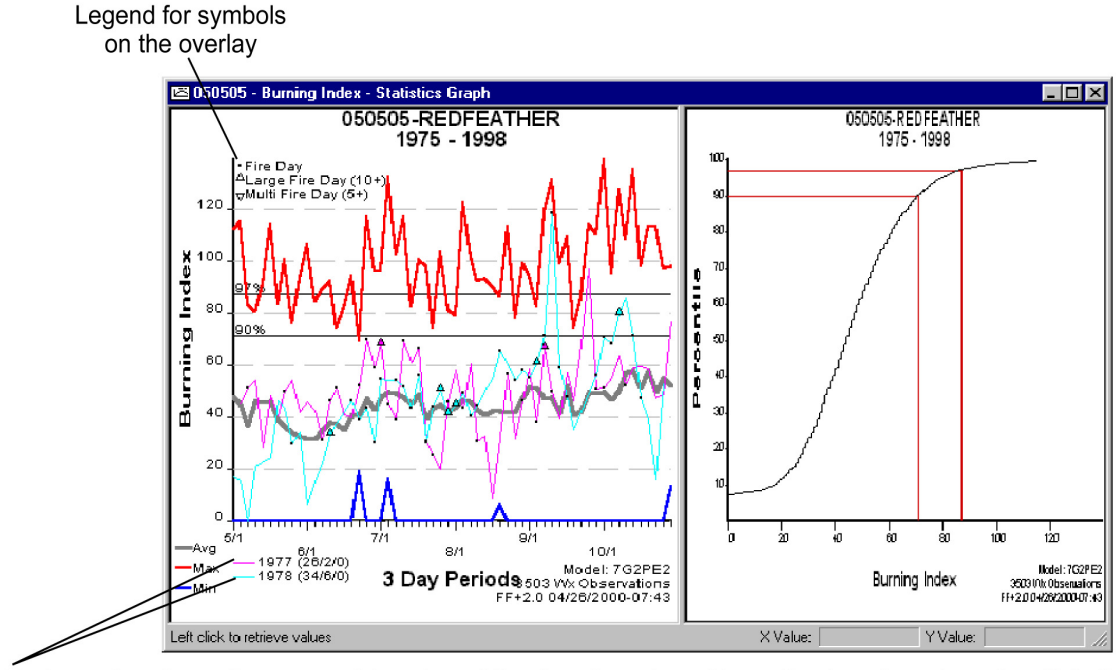
1. On the **Options** menu, click **Overlays.**
2. Click **New**, then select the **Year**, **Line Style**, and **Color** for the overlay.
3. To review the appearance of the overlay, click **Apply**.
4. When finished adding new overlays, click **OK**.

The following diagram shows 1977 and 1978 defined as overlays.



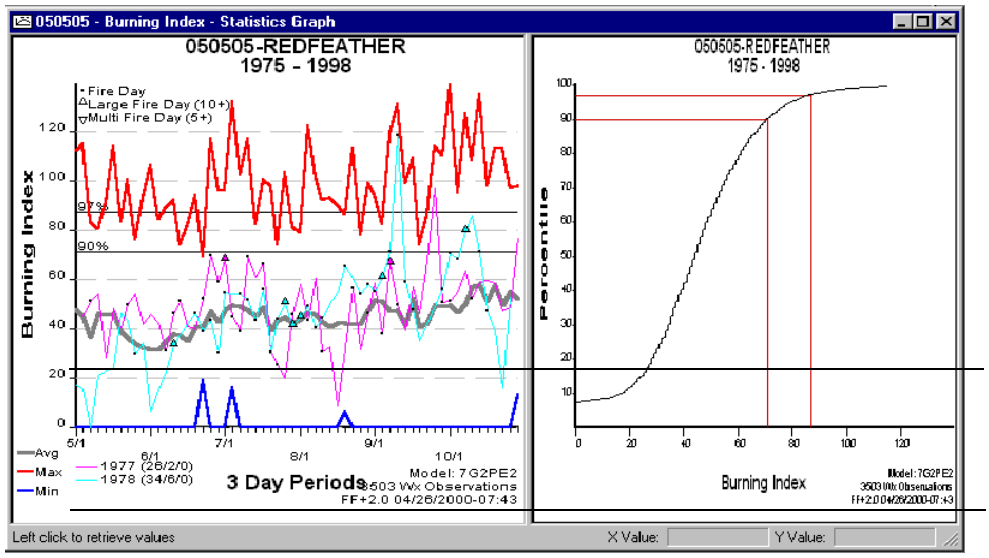
You can adjust the Color, Width, and Line Style to enhance the appearance of your statistical graphs.

The following diagram shows the Burning Index statistics graph and weather percentile graph. Note the added overlays for the 1977 and 1978.



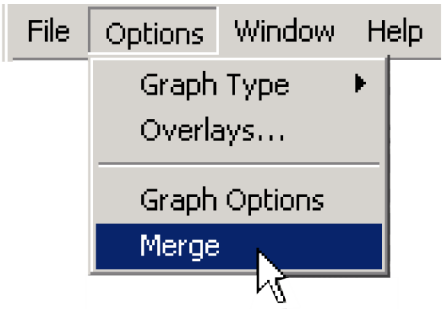
Each overlay shows the year and (number of fire days / number of large fire days / number of multiple fire days). In 1977, there were 28 fire days / 2 large fire days / 0 multiple fire days.

The following diagram shows the Burning Index statistics graph and weather percentile graph with added overlays for 1977 and 1978.



Merging graphs

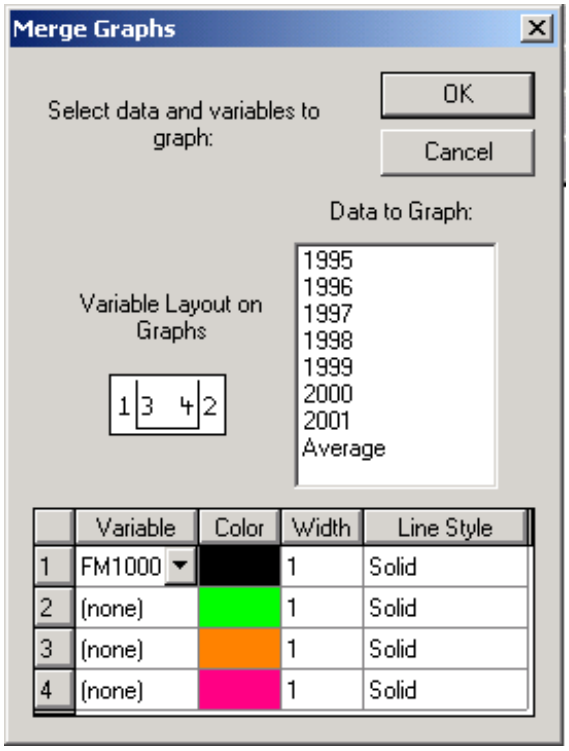
The Merge option on the Options menu allows you to merge up to three statistical variables onto your base graph.



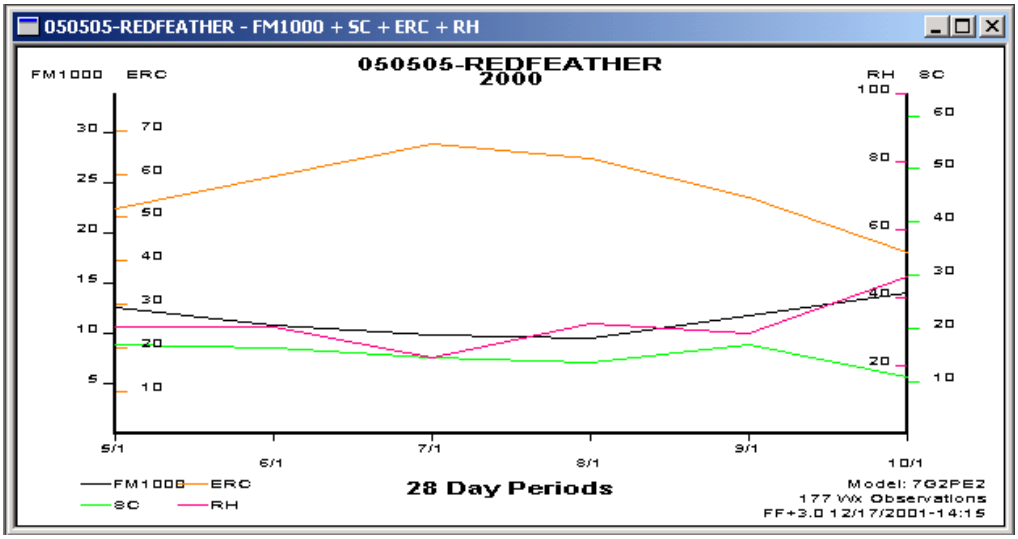
To merge additional statistical variables onto your base graph

1. On the **Weather** menu, click **Climatology**.
2. Select the **Stats Graph** check boxes of your choice, and then click **Run**.
3. On the **Options** menu, click **Merge.**
4. On the **Merge Graphs** dialog box, select the years of **Data to Graph**, and then select the **Variable**, **Color**, **Width**, and **Line Style** for each variable of your choice.
5. When finished, click **OK**.

The following diagram shows the Merge Graphs dialog box.



The following diagram shows a resulting merge graph for FM1000, SC, ERC, and RH.



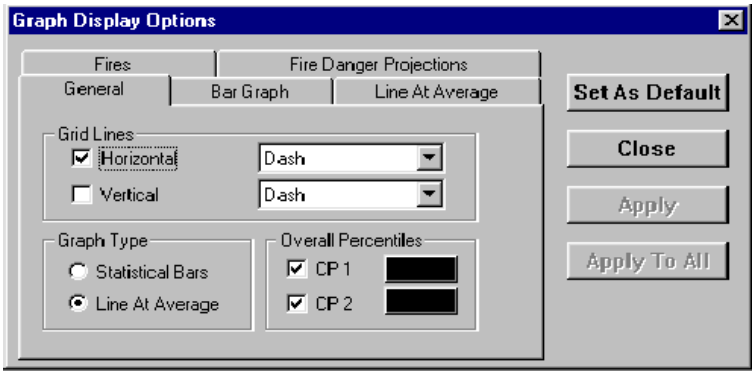
Changing the look of your statistical graphs

Graph Options on the Options menu displays a dialog box that allows you to modify the appearance of your statistical graphs.

The Graph Display Options dialog box contains the following tabs:

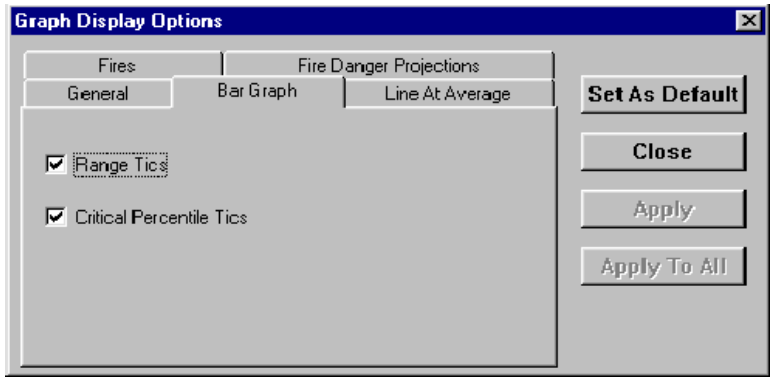
- The **General** tab allows you to change the grid line style, the type of graph you create, and the line colors for the Overall Percentiles, "CP 1" and "CP 2."
- The **Bar Graph** tab allows you to choose Range tics and/or Critical Percentile tics for your statistical bar graph.
- The **Line At Average** tab allows you to change the color and width of the Average, Minimum, Maximum, CP 1, and CP 2 lines. You can also clear the Minimum, Maximum, CP 1, and CP 2 check boxes to eliminate those lines from your statistical graphs.
- The **Fires** tab allows you to highlight the Fire Days, Large Fire Days, and Multi Fire Days, select which fire cause to display, and specify the number of acres for Large Fires and the number of Fires for a Multi Fire Day.
- The **Fire Danger Projections** tab allows you to modify the line color, width, and style of your fire danger projection.

The following diagram shows the settings available on the General tab.

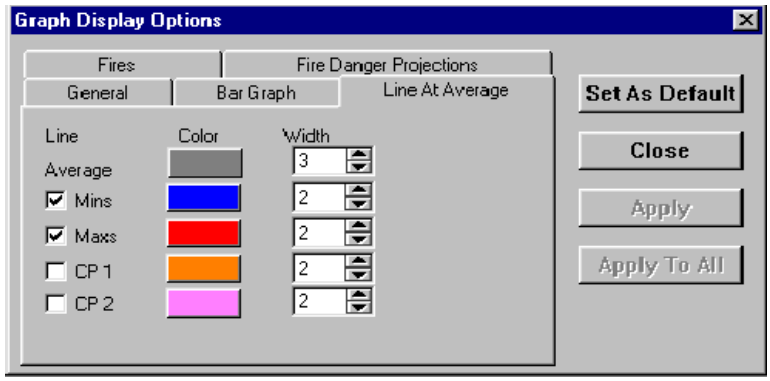


The CP 1 and CP 2 check boxes allow you to graph the critical percentile values that are defined on the "Climatology Options" dialog box. For more information, see the second diagram in "To review weather and fire data by generating statistical graphs," earlier in this chapter.

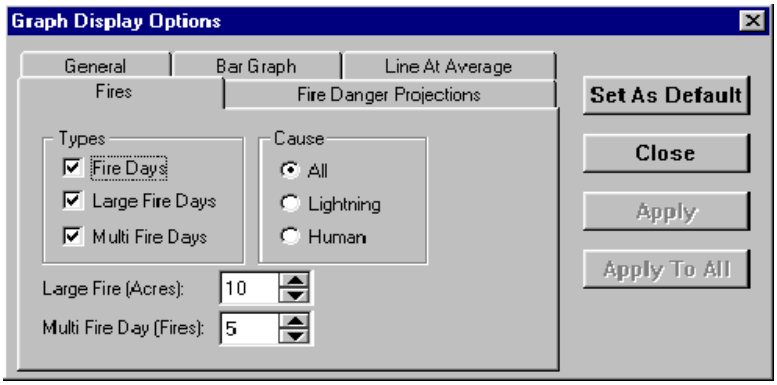
The following diagram shows the settings available on the Bar Graph tab.



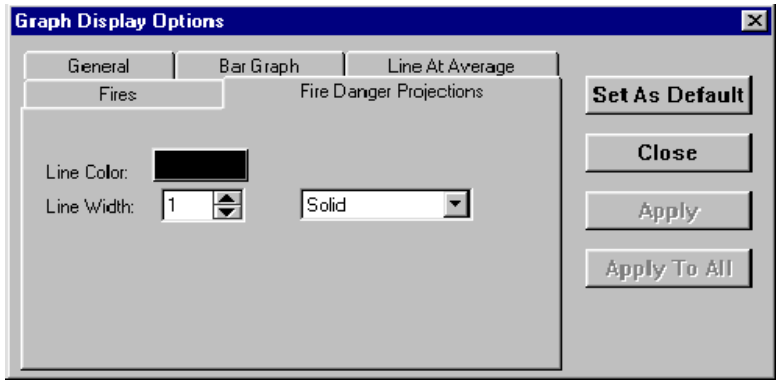
The following diagram shows the settings available on the Line Average tab.



The following diagram shows the settings available on the Fires tab.



The following diagram shows the settings available on the Fire Danger Projections tab.



For more information about the changing the graph options on this tab, see Chapter 6, "Working with fire danger projections" later in this guide.

To change the look of your statistical graphs

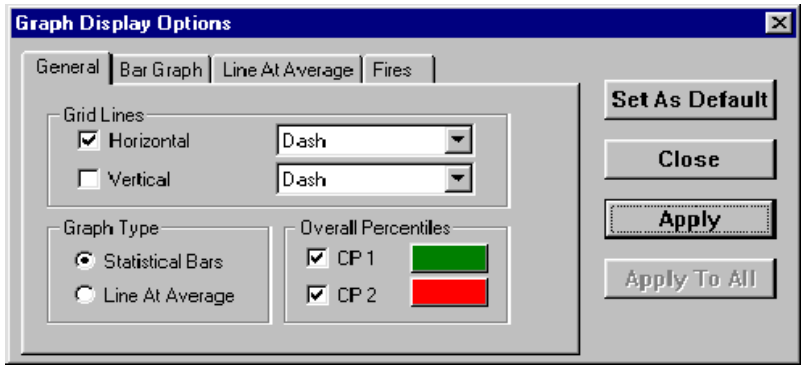
1. On the **Options** menu, click **Graph Options**, click the tab of your choice, and then change the settings as desired.
2. Click **Set as Default** to change your default settings, click **Apply** to change the settings to the current graph, click **Apply To All** to change the settings of all open graphs, or click **Close** to cancel.

To create a statistical bar graph

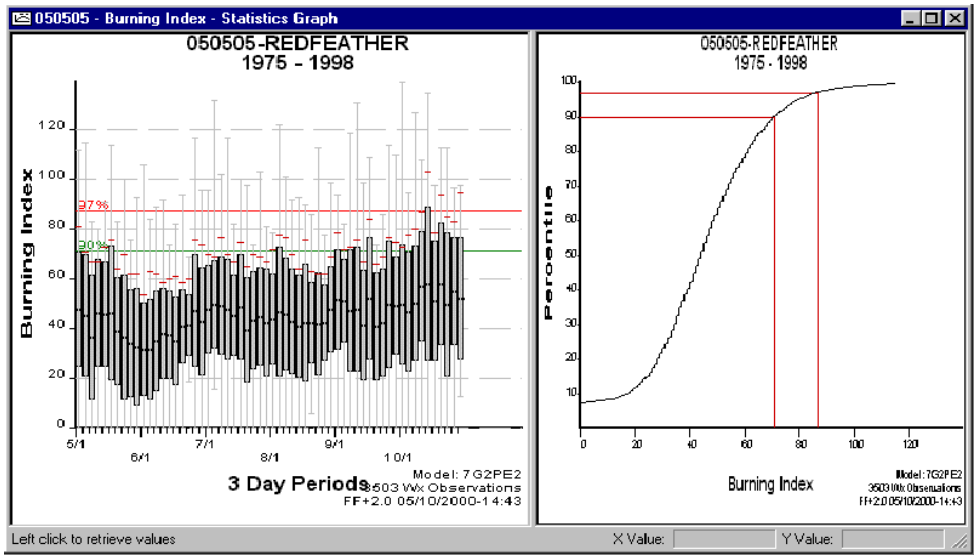
1 On the **Options** menu, click **Graph Options**.

2 Click **Statistical Bars**, select the colors for **CP 1** and **CP 2** of your choice, and then click **Apply.**

The following diagram shows the Graph Display Options dialog box to create a statistical bar graph.



The following diagram shows the resulting statistical bar graph.

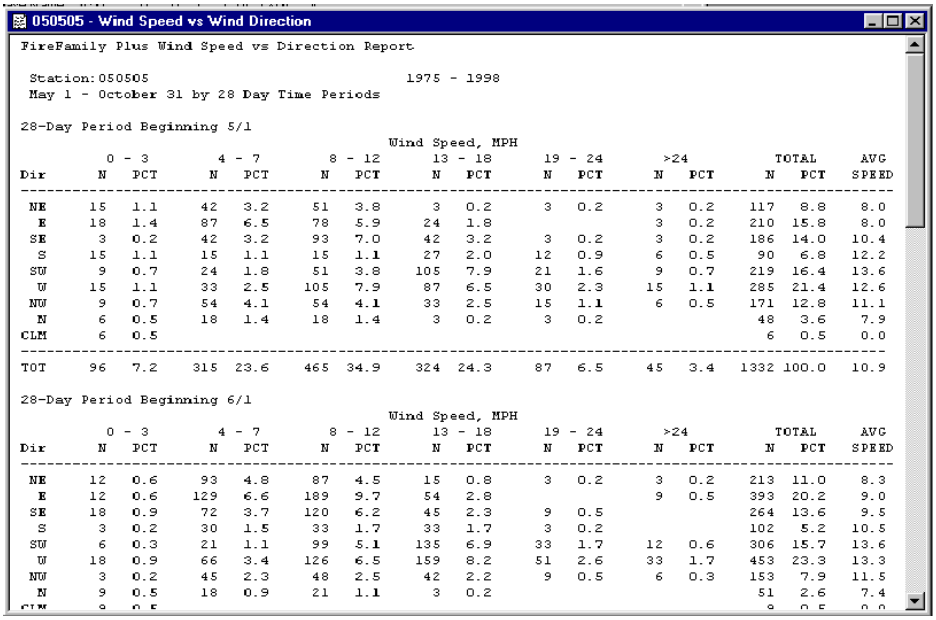


To generate a wind report by month

1 Change the **Analysis Period Length (Days)** to **28**.

2 On the **Weather** menu, click **Winds**.

The following "Wind Speed vs. Wind Direction" report shows the prevailing wind speed range and direction for May. Use the scroll bar to review other months.



050505 - Wind Speed vs Wind Direction

FireFamily Plus Wind Speed vs Direction Report

Station: 050505 1975 - 1998
May 1 - October 31 by 28 Day Time Periods

28-Day Period Beginning 5/1

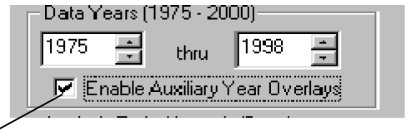
	Wind Speed, MPH															
	0 - 3		4 - 7		8 - 12		13 - 18		19 - 24		>24		TOTAL		AVG
Dir	N	PCT	N	PCT	N	PCT	N	PCT	N	PCT	N	PCT	N	PCT	SPEED
NE	15	1.1	42	3.2	51	3.8	3	0.2	3	0.2	3	0.2	117	8.8	8.0
E	18	1.4	87	6.5	78	5.9	24	1.8			3	0.2	210	15.8	8.0
SE	3	0.2	42	3.2	93	7.0	42	3.2	3	0.2	3	0.2	186	14.0	10.4
S	15	1.1	15	1.1	15	1.1	27	2.0	12	0.9	6	0.5	90	6.8	12.2
SW	9	0.7	24	1.8	51	3.8	105	7.9	21	1.6	9	0.7	219	16.4	13.6
W	15	1.1	33	2.5	105	7.9	87	6.5	30	2.3	15	1.1	285	21.4	12.6
NW	9	0.7	54	4.1	54	4.1	33	2.5	15	1.1	6	0.5	171	12.8	11.1
N	6	0.5	18	1.4	18	1.4	3	0.2	3	0.2			48	3.6	7.9
CLM	6	0.5											6	0.5	0.0
TOT	96	7.2	315	23.6	465	34.9	324	24.3	87	6.5	45	3.4	1332	100.0	10.9

28-Day Period Beginning 6/1

	Wind Speed, MPH															
	0 - 3		4 - 7		8 - 12		13 - 18		19 - 24		>24		TOTAL		AVG
Dir	N	PCT	N	PCT	N	PCT	N	PCT	N	PCT	N	PCT	N	PCT	SPEED
NE	12	0.6	93	4.8	87	4.5	15	0.8	3	0.2	3	0.2	213	11.0	8.3
E	12	0.6	129	6.6	189	9.7	54	2.8			9	0.5	393	20.2	9.0
SE	18	0.9	72	3.7	120	6.2	45	2.3	9	0.5			264	13.6	9.5
S	3	0.2	30	1.5	33	1.7	33	1.7	3	0.2			102	5.2	10.5
SW	6	0.3	21	1.1	99	5.1	135	6.9	33	1.7	12	0.6	306	15.7	13.6
W	18	0.9	66	3.4	126	6.5	159	8.2	51	2.6	33	1.7	453	23.3	13.3
NW	3	0.2	45	2.3	48	2.5	42	2.2	9	0.5	6	0.3	153	7.9	11.5
N	9	0.5	18	0.9	21	1.1	3	0.2					51	2.6	7.4

About the Enable Auxiliary Year Overlay check box

The Enable Auxiliary Year Overlay check box allows you to overlay years of data outside the Data Years. The following diagram shows the location of the Enable Auxiliary Year Overlays check box.



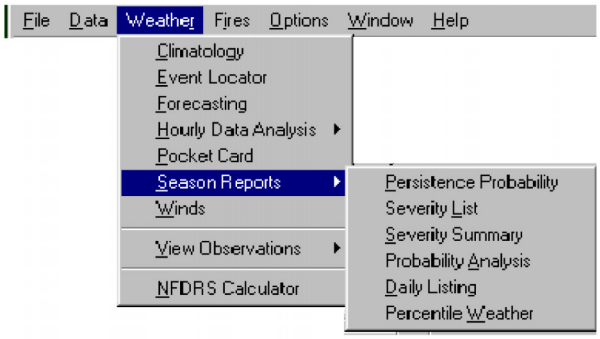
Click here to overlay data outside the Data Years.

*You must select the **Enable Auxiliary Year Overlays** check box on the Active Working Set screen before you can create an overlay from a data year that is outside the working set.*

Working with Season Reports

Season Reports summarize the seasonal variations of fuel moistures, NFDRS indices, and components. You can generate the following reports:

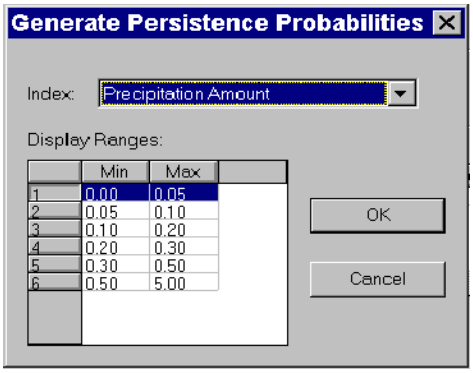
- **Persistence Probability**, which reports the chance that tomorrow's variable will be the same as today's. The higher the persistence, the less likely the weather will change.
- **Severity List**, which ranks each year at a fire weather station in terms of the burning index. The ranking accounts for how often and how much each day's Burning Index exceeds the 90th critical percentile.
- **Severity Summary**, which summarizes the Severity List.
- **Probability Analysis**, which shows how often you can expect values of your adjective class to occur, and provides detailed information that you need to perform fire management activities.
- **Daily Listing**, which identifies historical weather records that you can compare against your original weather records.



To generate a Persistence Probability report

1. On the **Weather** menu, click **Season Reports**, and then click **Persistence Probability**.
2. In the **Index** list, select the variable of your choice.
3. Type the **Display Ranges** values, and then click **OK**.

   The following diagram shows the Generate Persistence Probabilities dialog box for precipitation amount.



The resulting Persistence Probabilities report shows the probability and amount of precipitation to expect.

050505 - Precipitation Amount - Persistence Probabilities

FireFamily Plus Persistence Probability Report
Precipitation Amount

Station: 050505 - REDFEATHER 1975 - 1998
May 1 - October 31

28-Day Analysis Period

Tomorrow's Precipitation Amount

	0.00	0.05	0.10	0.20	0.30	0.50
Today's	-	-	-	-	-	-
	0.05	0.10	0.20	0.30	0.50	5.00
0.00 - 0.05	58	22	10	0	0	0
0.05 - 0.10	26	5	2	1	0	0
0.10 - 0.20	6	7	0	0	0	0
0.20 - 0.30	1	0	1	0	0	0
0.30 - 0.50	0	0	0	0	0	0
0.50 - 5.00	0	0	0	0	0	0

Conditional Probability Table (%)

0.00 - 0.05	64.44	24.44	11.11	0.00	0.00	0.00
0.05 - 0.10	76.47	14.71	5.88	2.94	0.00	0.00
0.10 - 0.20	46.15	53.85	0.00	0.00	0.00	0.00
0.20 - 0.30	50.00	0.00	50.00	0.00	0.00	0.00
0.30 - 0.50	0.00	0.00	0.00	0.00	0.00	0.00
0.50 - 5.00	0.00	0.00	0.00	0.00	0.00	0.00

Joint Probability Table (%)

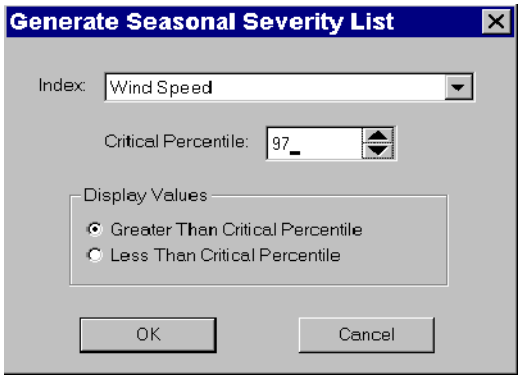
0.00 - 0.05	41.73	15.83	7.19	0.00	0.00	0.00
0.05 - 0.10	18.71	3.60	1.44	0.72	0.00	0.00
0.10 - 0.20	4.32	5.04	0.00	0.00	0.00	0.00
0.20 - 0.30	0.72	0.00	0.72	0.00	0.00	0.00
0.30 - 0.50	0.00	0.00	0.00	0.00	0.00	0.00
0.50 - 5.00	0.00	0.00	0.00	0.00	0.00	0.00

139 data pairs used. 3751 records processed.
FF+2.0 05/02/2000-11:48

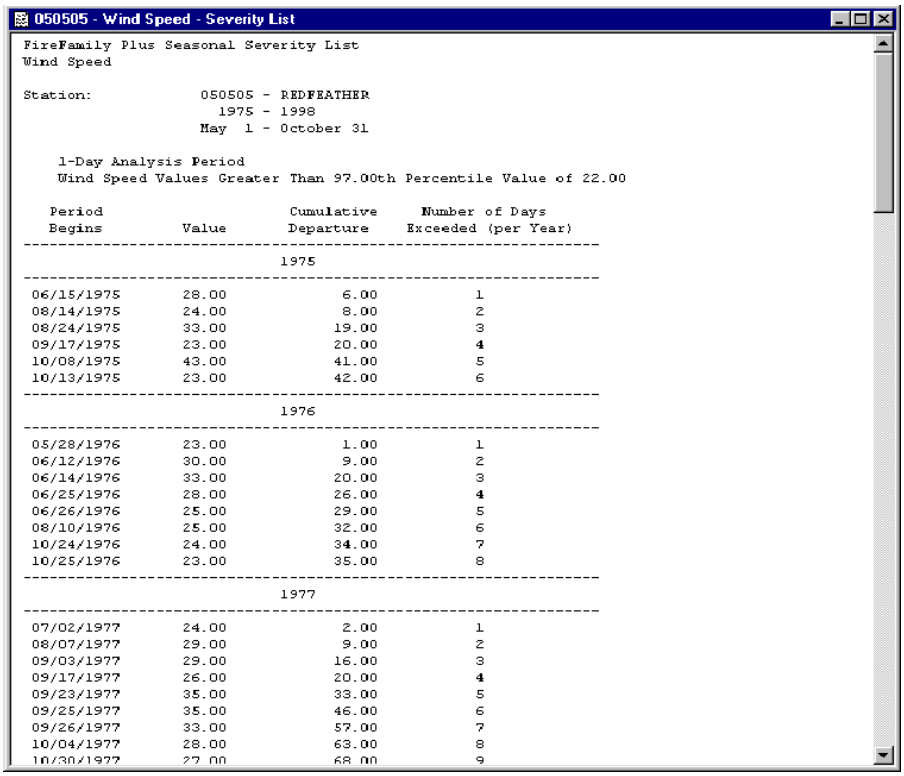
To generate a Severity List

1. On the **Weather** menu, click **Season Reports**, and then click **Severity List**.
2. In the **Index** list, select the variable of your choice.
3. Type the **Critical Percentile** value, select the appropriate **Display Values**, and then click **OK**.

   The following diagram shows the Generate Seasonal Severity List dialog box for Wind Speed above the 97th percentile.



The resulting Severity List report shows the number of years that had high winds during peak fire months.



050505 - Wind Speed - Severity List

FireFamily Plus Seasonal Severity List
Wind Speed

Station: 050505 - REDFEATHER
1975 - 1998
May 1 - October 31

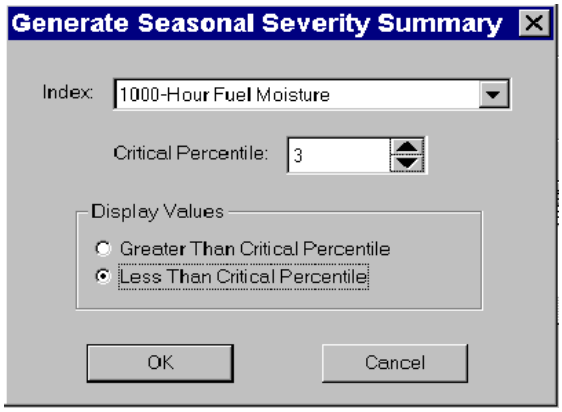
1-Day Analysis Period
Wind Speed Values Greater Than 97.00th Percentile Value of 22.00

Period Begins	Value	Cumulative Departure	Number of Days Exceeded (per Year)
		1975	
06/15/1975	28.00	6.00	1
08/14/1975	24.00	8.00	2
08/24/1975	33.00	19.00	3
09/17/1975	23.00	20.00	4
10/08/1975	43.00	41.00	5
10/13/1975	23.00	42.00	6
		1976	
05/28/1976	23.00	1.00	1
06/12/1976	30.00	9.00	2
06/14/1976	33.00	20.00	3
06/25/1976	28.00	26.00	4
06/26/1976	25.00	29.00	5
08/10/1976	25.00	32.00	6
10/24/1976	24.00	34.00	7
10/25/1976	23.00	35.00	8
		1977	
07/02/1977	24.00	2.00	1
08/07/1977	29.00	9.00	2
09/03/1977	29.00	16.00	3
09/17/1977	26.00	20.00	4
09/23/1977	35.00	33.00	5
09/25/1977	35.00	46.00	6
09/26/1977	33.00	57.00	7
10/04/1977	28.00	63.00	8
10/30/1977	27.00	68.00	9

To generate a Severity Summary

1. On the **Weather** menu, click **Season Reports**, and then click **Severity Summary**.
2. In the **Index** list, select the variable of your choice.
3. Type the **Critical Percentile** value, select the appropriate **Display Values**, and then click **OK**.

   The following diagram shows the Generate Seasonal Severity Summary dialog box for 1000-hour Fuel Moisture for days below the critical percentile of "3," the driest days.



The resulting Severity Summary report measures the number of days with large fuels below the critical percentile of "3."

050505 - 1000-Hour Fuel Moisture - Severity Summary

FireFamily Plus Seasonal Severity Summary
1000-Hour Fuel Moisture

Station: 050505 - REDFEATHER Model: 7G2PE2
1975 - 1998
May 1 - October 31

1-Day Analysis Period
1000-Hour Fuel Moisture Values Less Than 3.00th Percentile Value of 10.08

Departure Values Table
Cumulative Departure Values by Year by Month

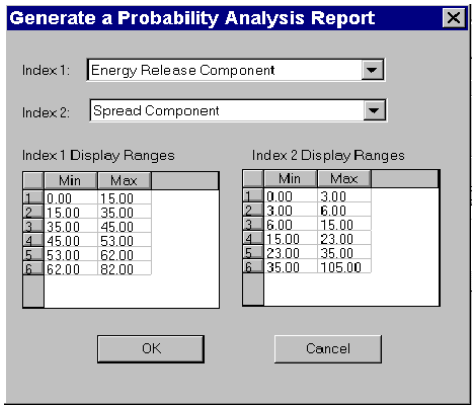
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1975	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.28	0.00	0.00
1976	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1977	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1978	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.73	9.37	0.00	0.00
1979	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1980	0.00	0.00	0.00	0.00	0.00	0.00	12.70	9.48	0.00	0.00	0.00	0.00
1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1983	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1985	0.00	0.00	0.00	0.00	0.00	0.00	0.63	0.00	0.00	0.00	0.00	0.00
1986	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1987	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1988	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	3.27	0.00	0.00	0.00
1989	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1991	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1992	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.25	0.00	0.00
1993	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1994	0.00	0.00	0.00	0.00	0.00	0.00	3.57	0.00	2.30	0.89	0.00	0.00
1995	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.95	0.00	0.00	0.00	0.00
1996	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1997	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1998	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Days of Departure Table
Number of Departure Days by Year by Month

To generate a Probability Analysis

1. On the **Weather** menu, click **Season Reports**, and then click **Probability Analysis**.
2. In the **Index 1** list, select the variable of your choice.
3. In the **Index 2** list, select the variable of your choice.
4. Type the **Index 1 Display Ranges**, type the **Index 2 Display Ranges**, and then click **OK**.

   The following diagram shows the Generate a Probability Analysis Report dialog box that determines the likelihood of a value of Energy Release Component given the value of Spread Component.



The resulting Probability Analysis report shows the probability of a high Spread Component value given a high Energy Release Component.

050505 - Spread Component - Probability Analysis

FireFamily Plus Probability Analysis Report
Energy Release Component vs Spread Component

Station: 050505 - REDFEATHER Model: 7G2PE2 1975 - 1998
May 1 - October 31

28-Day Analysis Period

Spread Component

Energy Release Component	0.00 - 3.00	3.00 - 6.00	6.00 - 15.00	15.00 - 23.00	23.00 - 35.00	35.00 - 105.00
0.00 - 15.00	0	2	2	0	0	0
15.00 - 35.00	0	10	38	3	1	0
35.00 - 45.00	0	1	50	1	0	0
45.00 - 53.00	0	0	16	8	0	0
53.00 - 62.00	0	0	5	4	0	0
62.00 - 82.00	0	0	0	1	0	0

Conditional Probability Table (%)

0.00 - 15.00	0.00	50.00	50.00	0.00	0.00	0.00
15.00 - 35.00	0.00	19.23	73.08	5.77	1.92	0.00
35.00 - 45.00	0.00	1.92	96.15	1.92	0.00	0.00
45.00 - 53.00	0.00	0.00	66.67	33.33	0.00	0.00
53.00 - 62.00	0.00	0.00	55.56	44.44	0.00	0.00
62.00 - 82.00	0.00	0.00	0.00	100.00	0.00	0.00

Joint Probability Table (%)

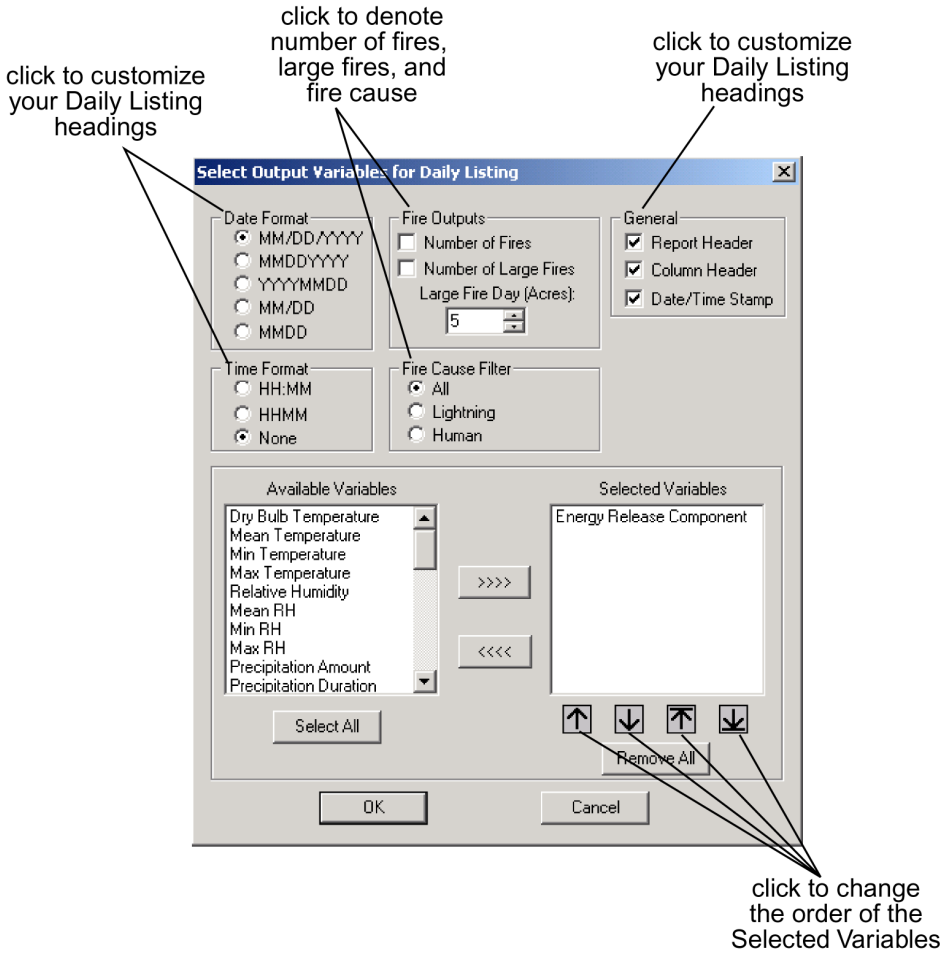
0.00 - 15.00	0.00	1.41	1.41	0.00	0.00	0.00
15.00 - 35.00	0.00	7.04	26.76	2.11	0.70	0.00
35.00 - 45.00	0.00	0.70	35.21	0.70	0.00	0.00
45.00 - 53.00	0.00	0.00	11.27	5.63	0.00	0.00
53.00 - 62.00	0.00	0.00	3.52	2.82	0.00	0.00
62.00 - 82.00	0.00	0.00	0.00	0.70	0.00	0.00

142 data pairs used. 3751 records processed.
FF+2.0 05/02/2000-11:59

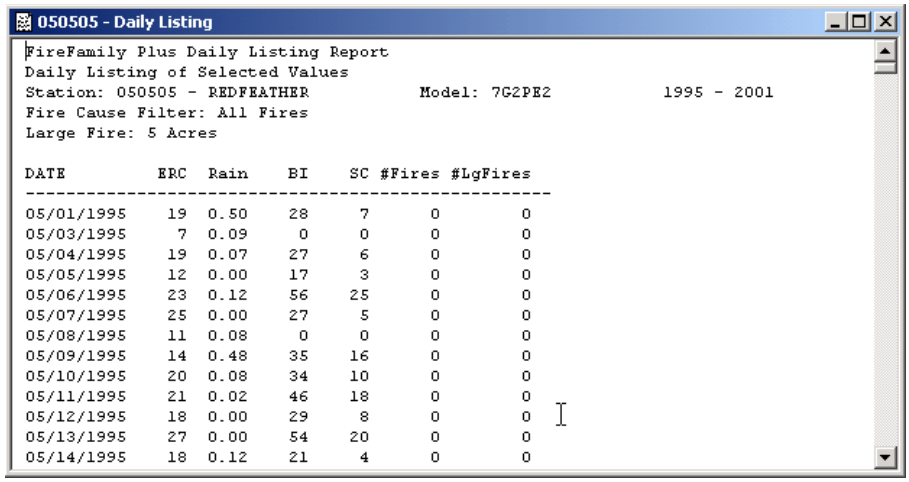
To generate a Daily Listing

1. On the **Weather** menu, click **Season Reports**, and then click **Daily Listing**.
2. Select the **General**, **Date Format**, and **Time Format** of your choice.
3. On the **Available Variables** list, highlight the variables of your choice, and then click >>>>.
4. When finished adding variables to the Selected Variables list, click **OK**.

The following diagram shows the selected variables for the Daily Listing.



The resulting Daily List shows the recorded/calculated values for the working set observations for Energy Release Component, Precipitation Amount, Burning Index, Spread Component, and number of fires and large fires.



050505 - Daily Listing

```
FireFamily Plus Daily Listing Report
Daily Listing of Selected Values
Station: 050505 - REDFEATHER          Model: 7G2PE2          1995 - 2001
Fire Cause Filter: All Fires
Large Fire: 5 Acres

DATE          ERC  Rain    BI    SC #Fires #LgFires
--------------------------------------------------
05/01/1995     19  0.50    28     7      0        0
05/03/1995      7  0.09     0     0      0        0
05/04/1995     19  0.07    27     6      0        0
05/05/1995     12  0.00    17     3      0        0
05/06/1995     23  0.12    56    25      0        0
05/07/1995     25  0.00    27     5      0        0
05/08/1995     11  0.08     0     0      0        0
05/09/1995     14  0.48    35    16      0        0
05/10/1995     20  0.08    34    10      0        0
05/11/1995     21  0.02    46    18      0        0
05/12/1995     18  0.00    29     8      0        0
05/13/1995     27  0.00    54    20      0        0
05/14/1995     18  0.12    21     4      0        0
```

You can save this as a .txt file and import it into spreadsheet and/or graphics software applications.

Reviewing fire occurrence data

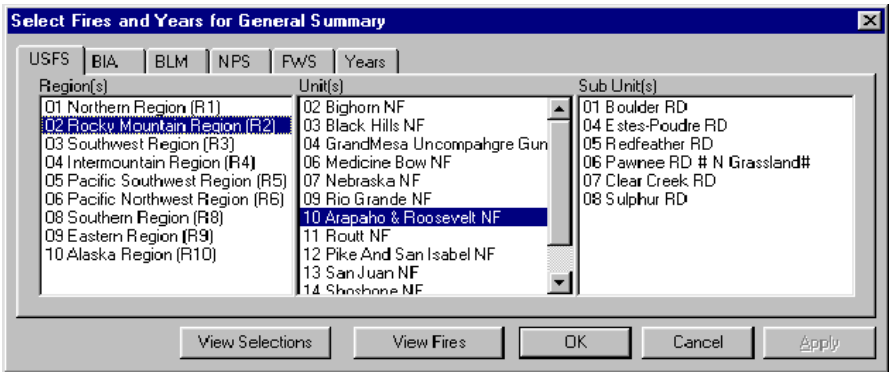
This section explains how to generate a summary graph of fire occurrence data. You can either generate a general summary graph of all imported fire occurrence data, or generate a working set summary graph of the fire occurrence data that is contained in your working set.

To review fire occurrence data by generating summary graphs

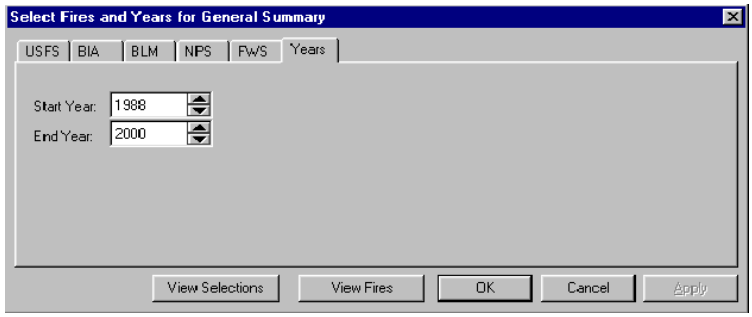
In this example, you will generate summary graphs from fire occurrence data not associated with the working set for years 1988 through 2000.

1. On the **Fires** menu, point to **Summary** and then click **General**.
2. Click the **USFS** tab, and then select the Region(s), Unit(s), and Sub Unit(s) of your choice.
3. Click the **Years** tab, then type the **Start Year** and **End Year** of your choice.
4. The review the fire occurrence data, click **View Fires**.
5. To generate the Fires Summary graphs, click **OK**.

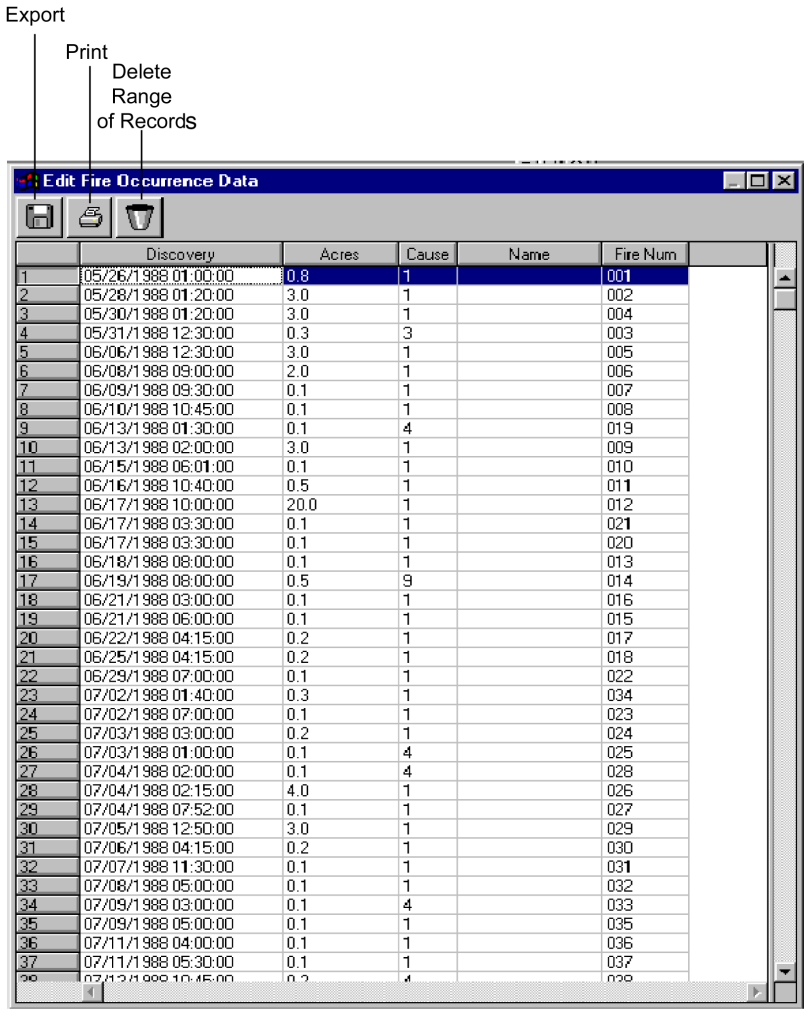
The following diagram shows the USFS tab of the Select Fires and Years for General Summary dialog box.



The following diagram shows the Years tab of the Select Fires and Years for General Summary dialog box.



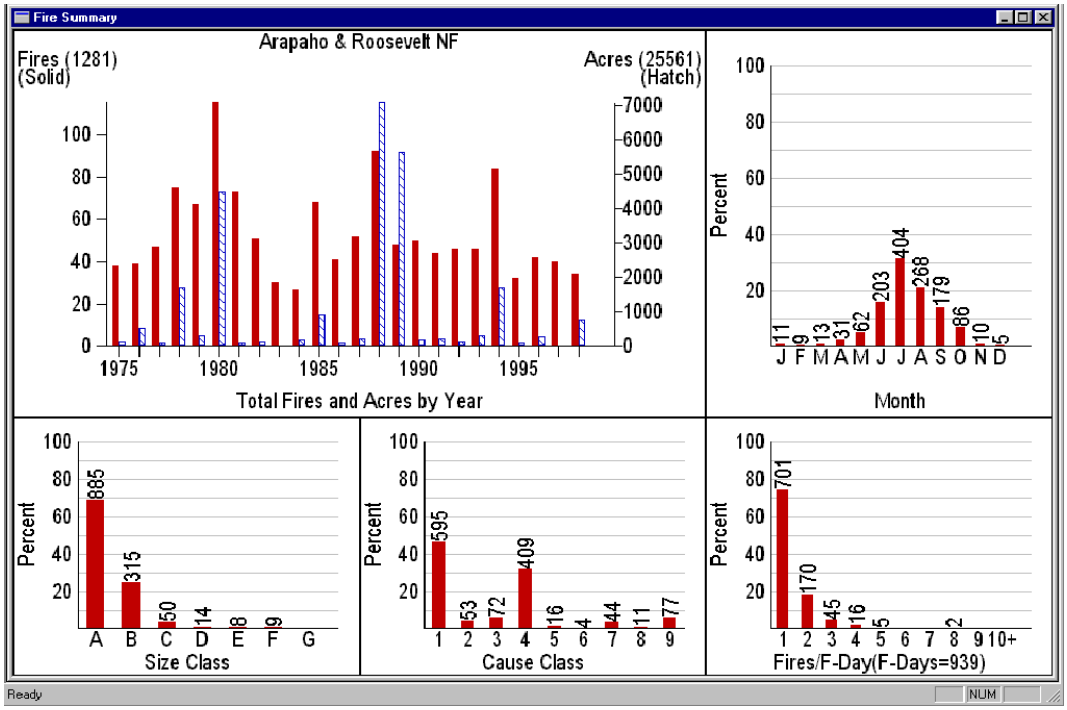
The following diagram shows the fire occurrence data for 1988 through 2000.



	Discovery	Acres	Cause	Name	Fire Num
1	05/26/1988 01:00:00	0.8	1		001
2	05/28/1988 01:20:00	3.0	1		002
3	05/30/1988 01:20:00	3.0	1		004
4	05/31/1988 12:30:00	0.3	3		003
5	06/06/1988 12:30:00	3.0	1		005
6	06/08/1988 09:00:00	2.0	1		006
7	06/09/1988 09:30:00	0.1	1		007
8	06/10/1988 10:45:00	0.1	1		008
9	06/13/1988 01:30:00	0.1	4		019
10	06/13/1988 02:00:00	3.0	1		009
11	06/15/1988 06:01:00	0.1	1		010
12	06/16/1988 10:40:00	0.5	1		011
13	06/17/1988 10:00:00	20.0	1		012
14	06/17/1988 03:30:00	0.1	1		021
15	06/17/1988 03:30:00	0.1	1		020
16	06/18/1988 08:00:00	0.1	1		013
17	06/19/1988 08:00:00	0.5	9		014
18	06/21/1988 03:00:00	0.1	1		016
19	06/21/1988 06:00:00	0.1	1		015
20	06/22/1988 04:15:00	0.2	1		017
21	06/25/1988 04:15:00	0.2	1		018
22	06/29/1988 07:00:00	0.1	1		022
23	07/02/1988 01:40:00	0.3	1		034
24	07/02/1988 07:00:00	0.1	1		023
25	07/03/1988 03:00:00	0.2	1		024
26	07/03/1988 01:00:00	0.1	4		025
27	07/04/1988 02:00:00	0.1	4		028
28	07/04/1988 02:15:00	4.0	1		026
29	07/04/1988 07:52:00	0.1	1		027
30	07/05/1988 12:50:00	3.0	1		029
31	07/06/1988 04:15:00	0.2	1		030
32	07/07/1988 11:30:00	0.1	1		031
33	07/08/1988 05:00:00	0.1	1		032
34	07/09/1988 03:00:00	0.1	4		033
35	07/09/1988 05:00:00	0.1	1		035
36	07/11/1988 04:00:00	0.1	1		036
37	07/11/1988 05:30:00	0.1	1		037

To sort by any field, right-click on the column heading of your choice. To adjust column width, drag the column heading to the desired width.

The following diagram shows the frequency distributions of Fires and Acres by year, Fires by month, Fires by Size Class, Fires by Cause Class, and number of Fires per Fire-Day for the Arapaho & Roosevelt National Forests.



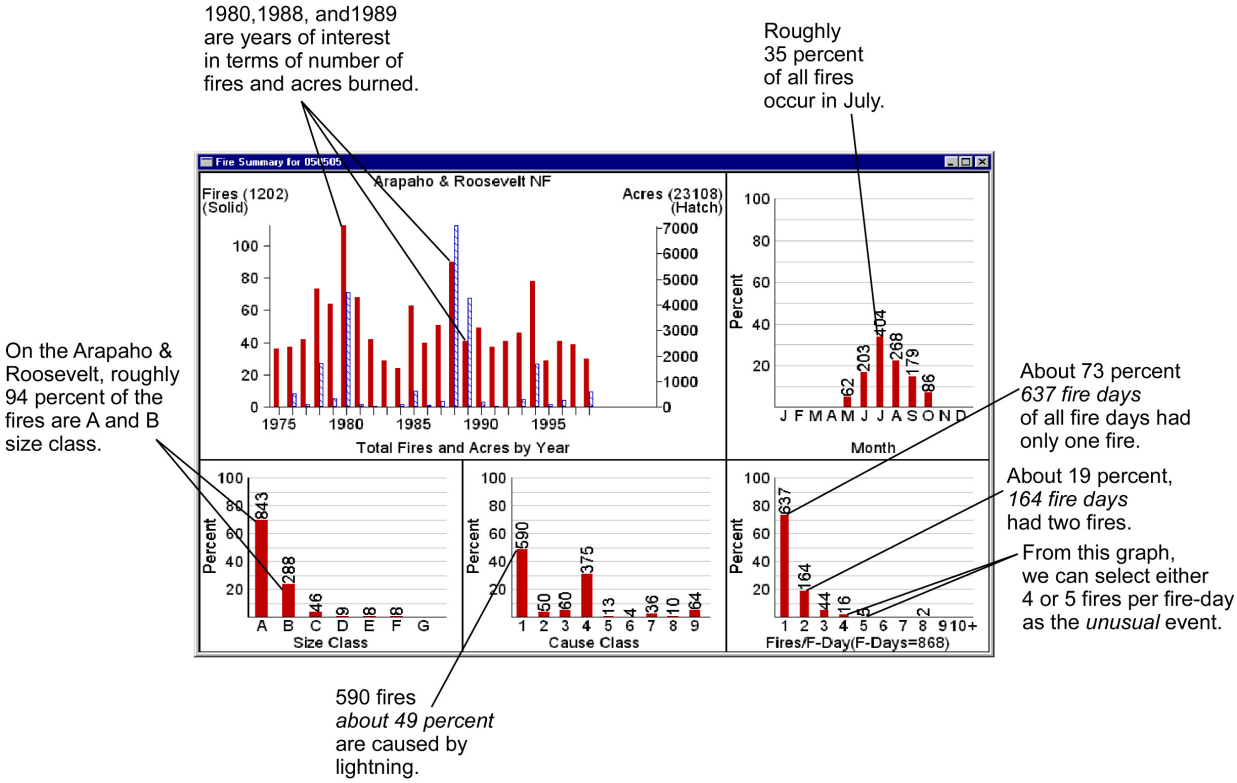
To review the working set fire occurrence data by generating summary graphs

In this example, you will review only fire occurrence data associated with your working set.

1. On the **FireFamily Plus** toolbar, click **Fires Summary Working Set**.
2. Click the **USFS** tab, and then select the Region(s), Unit(s), and Sub Unit(s) of your choice.
3. The review the fire occurrence data, click **View Fires**.
4. To generate the Fires Summary graphs, click **OK**.

The following diagram shows the FireFamily Plus toolbar and the Fires Summary Working Set button.

The following diagram shows the working set frequency distributions of Fires and Acres by year, Fires by month, Fires by Size Class, Fires by Cause Class, and number of Fires per Fire-Day.



Use the Size Class and Fires/Fire-Day graphs to determine large fire-days and multiple-fire days, which relate fire business to indexes.

Using the Event Locator

The Event Locator allows you to locate, count, and list dates of specified weather events that occur on a single day or over consecutive strings of days. As a fire manager, and with the help of local expertise, you must decide what kind of weather will stop fire spread.

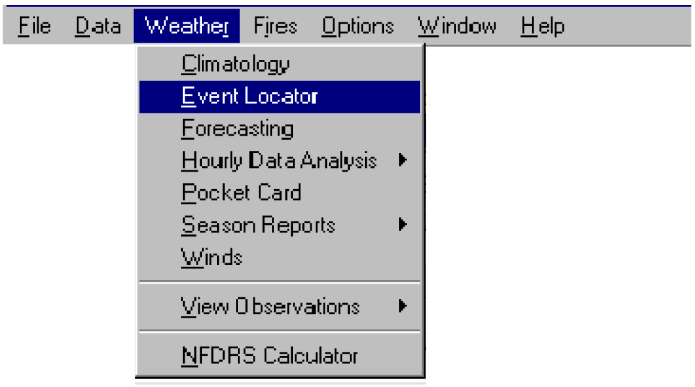
An event is a single or combination of weather and NFDRS parameters that meet your specified conditions. You can define these conditions as those that occur on a single day, or that occur over a string of consecutive days.

For example, the Event Locator allows you to:

- determine dry spells, such as periods of time when there was no rainfall
- inspect the database for suspect data, such as listing the days when the wind exceeded 50 miles per hour
- list five-day periods where .2 inches or more of rain fell, thus causing a fire-ending event.

The Event Locator allows you to use the following categories to identify particular values:

- **Avg.** The average of the variable for the period.
- **Sum**. The summed, or total, of the variable.
- **Min**. The minimum value in the string.
- **Max.** The maximum value in the string.
- **Daily.** The daily value in the string.

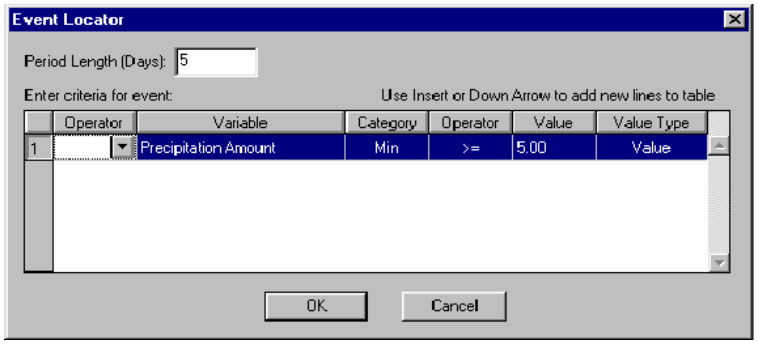


To search for erroneous data - an example

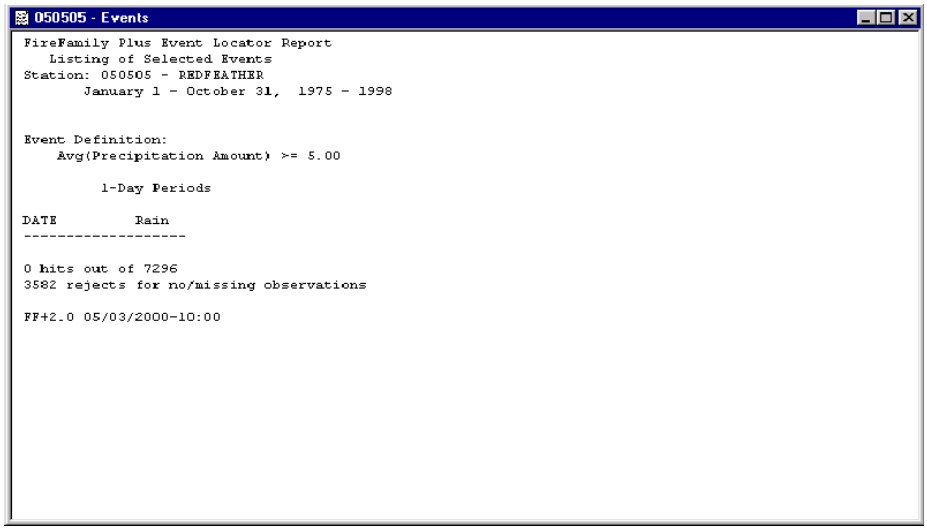
This example explains how to search for precipitation amounts greater than or equal to 5 inches per day.

1. On the **File** menu, click **Open**, and then select the Active Working Set Definition of your choice.
2. On the **Weather** menu, click **Event Locator**.
3. In the **Period Length (Days)** box, type **1** and then press TAB twice.
4. In the **Variable** box, select **Precipitation Amount**, and then press TAB.
5. In the **Category** box, select **Min**, and then press TAB.
6. In the **Operator** box, select >=, and then press TAB.
7. In the **Value** box, type **5.0** and then press TAB.
8. In the **Value Type** box, select **Value**, and then click **OK**.

The following diagram shows the Event Locator dialog box for searching for daily precipitation amounts greater than 5 inches.



The following diagram shows the resulting FireFamily Plus Event Locator Report Listing of Selected Events for weather station "050505."



To search for a fire-ending event - an example

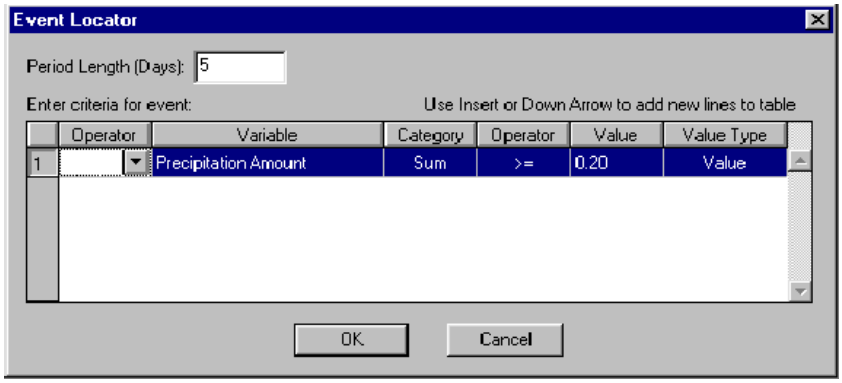
This example explains how to search for five-day periods with precipitation amounts greater or equal to .2 inches. The fire is assumed to start on August 5th on the Arapaho & Roosevelt National Forest, in an area that is well represented by the Redfeather weather station, "050505."

1. On the **File** menu, click **Open**, and then select the Active Working Set Definition of your choice.
2. In the beginning **Month** and **Day** boxes, select **August 6**.
3. On the **Weather** menu, click **Event Locator**.
4. In the **Period Length (Days)** box, type **5** and then press TAB twice.
5. In the **Variable** box, select **Precipitation Amount**, and then press TAB.
6. In the **Category** box, select **Sum**, and then press TAB.
7. In the **Operator** box, select >=, and then press TAB.

8 In the **Value** box, type **.20** and then press TAB.

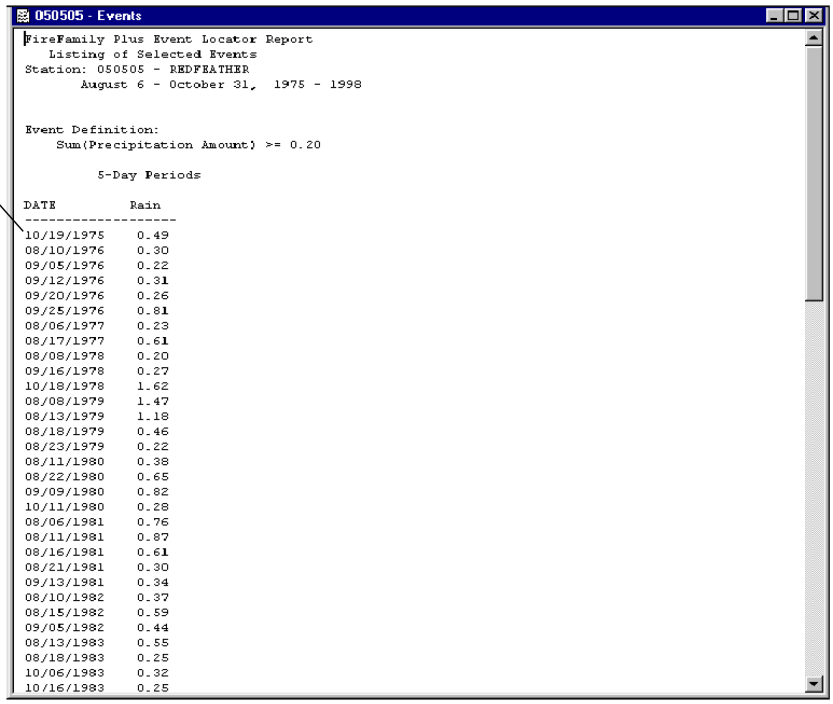
9 In the **Value Type** box, select **Value**, and then click **OK**.

The following diagram shows the Event Locator dialog box for determining five-day periods of precipitation amounts greater or equal to .2 inches.



The following diagram shows the resulting Event Locator Report

first day of the five-day period



```
050505 - Events
FireFamily Plus Event Locator Report
   Listing of Selected Events
Station: 050505 - REDFEATHER
       August 6 - October 31,  1975 - 1998

Event Definition:
    Sum(Precipitation Amount) >= 0.20

         5-Day Periods

DATE          Rain
-------------------
10/19/1975    0.49
08/10/1976    0.30
09/05/1976    0.22
09/12/1976    0.31
09/20/1976    0.26
09/25/1976    0.81
08/06/1977    0.23
08/17/1977    0.61
08/08/1978    0.20
09/16/1978    0.27
10/18/1978    1.62
08/08/1979    1.47
08/13/1979    1.18
08/18/1979    0.46
08/23/1979    0.22
08/11/1980    0.38
08/22/1980    0.65
09/09/1980    0.82
10/11/1980    0.28
08/06/1981    0.76
08/11/1981    0.87
08/16/1981    0.61
08/21/1981    0.30
09/13/1981    0.34
08/10/1982    0.37
08/15/1982    0.59
09/05/1982    0.44
08/13/1983    0.55
08/18/1983    0.25
10/06/1983    0.32
10/16/1983    0.25
```

The rain may have fallen all on the first day, all on the last day, or somewhere in between. Note that several season-ending events have occurred within a single year.

Be certain of your active working set. If it defines only a subset of your data, the computed percentile may not reflect what you really want.

To use the Event Locator on a data subset and a percentile-related value as your threshold criteria, generate a statistical table to determine that threshold, then enter it in the Value box in the Event Locator dialog box. For more information, see "Reviewing weather data and generating reports," earlier in this chapter.

To perform a more complex query - an example

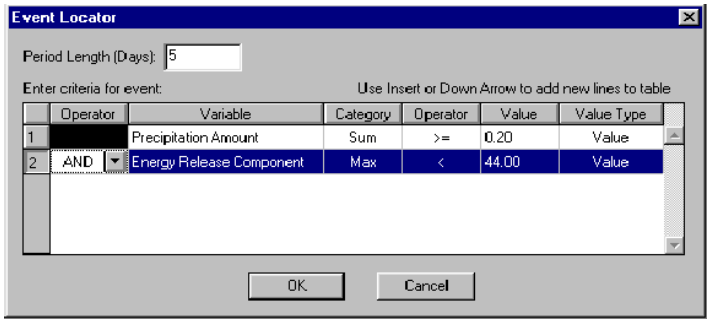
In this example, you will add ERC as a variable to check the season ending date, given the maximum ERC during that five-day period with rain remains below the 67th percentile.

For the Redfeather weather station, the 90th percentile for ERC in fuel model G is about 59. Looking at fire business, fire activity appears to accumulate at or above an ERC of about 44, or roughly at the 67th percentile.

1. On the **Weather** menu, click **Event Locator**.
2. In the **Period Length (Days)** box, type **5** and then press TAB.
3. Press ↓ (down arrow) to add a new line.

   To add a new row, press ↓ (down arrow) or INSERT. To delete a row, press DELETE.
4. Click the **Operator** arrow, select **AND**, and then press TAB.
5. In the **Variable** box, select **Energy Release Component**, and then press TAB.
6. In the **Category** box, select **Max**, and then press TAB.
7. In the **Operator** box, select <, and then press TAB.
8. In the **Value** box, type **44** and then press TAB.
9. In the **Value Type** box, select **Value**, and then click **OK**.

The following diagram shows the completed Event Locator dialog box that allows you to determine 5-day periods when ERC is no more than 44 and precipitation is .2 inches or more.



The following diagram shows the resulting Event Locator Report Listing of Selected Events for weather station "050505." Notice that this combination extends some of the season ending dates further into autumn. In 1982 and 1985 there are no season ending dates.

050505 - Events

```
FireFamily Plus Event Locator Report
   Listing of Selected Events
Station: 050505 - REDFEATHER            Model: 7G2PE2
       August 6 - October 31,  1975 - 1998


Event Definition:
    Sum(Precipitation Amount) >= 0.20
    AND Max(Energy Release Component) < 44.00

         5-Day Periods

DATE          Rain    ERC
---------------------------
08/13/1976    0.29  41.18
09/13/1976    0.31  38.71
09/20/1976    0.26  32.02
09/25/1976    0.81  21.25
08/06/1977    0.23  35.87
08/17/1977    0.61  26.90
08/08/1978    0.20  43.55
08/10/1979    2.08  41.13
08/15/1979    0.95  22.84
08/22/1979    0.21  27.35
09/09/1980    0.82  27.28
08/06/1981    0.76  41.96
08/11/1981    0.87  25.13
08/16/1981    0.61  32.00
08/21/1981    0.30  34.87
09/13/1981    0.34  35.95
08/13/1983    0.55  41.94
08/18/1983    0.25  34.74
08/10/1984    0.46  29.93
08/15/1984    0.90  20.67
08/20/1984    1.02  15.78
09/30/1984    0.45  25.50
08/20/1986    0.37  41.80
08/22/1987    0.26  29.99
10/13/1987    0.35  41.20
09/11/1988    0.71  43.13
08/06/1989    0.31  39.29
08/11/1989    0.86  27.77
09/08/1989    1.30  26.46
09/13/1989    0.35  42.13
```

If you are unsure whether the date represents the end of season or which date to use, generate an ERC graph and create an overlay of the year of your choice. If the ERC remains low, you have found the season ending date.

For more information about determining the ERC and weather percentile for the previous example, see Chapter 4, "Working with fire analysis tools," later in this guide.

Using the NFDRS Calculator

The NFDRS calculator is a tool that allows you to calculate NFDRS indexes based on the information you enter. Although you must have FireFamily Plus version 2.0 installed on your personal computer, you can use the NFDRS calculator by itself or in conjunction with other fire analysis software applications. The NFDRS calculator allows you to:

- perform NFDRS sensitivity analysis
- compare outputs between fuel models, such as comparing fuel model "A" against "B" or '78 against '88
- calculate KBDI
- review and compare parameters among fuel models.

To use the NFDRS calculator

1 Click **NFDRS Calculator** on the **FireFamily Plus** toolbar.

You can also click NFDRS Calculator on the Weather menu.

2 Select the **Fuel Model** and **Slope Class** of your choice.

3 Select the **Use 88 Model** check box if appropriate.

4 Type the **Temperature**, **20' Wind** and **SOW** text boxes as appropriate.

Remember that Temperature and SOW (State of the Weather) affect Ignition Component, while 20' Wind affects Spread Component and Burning Index.

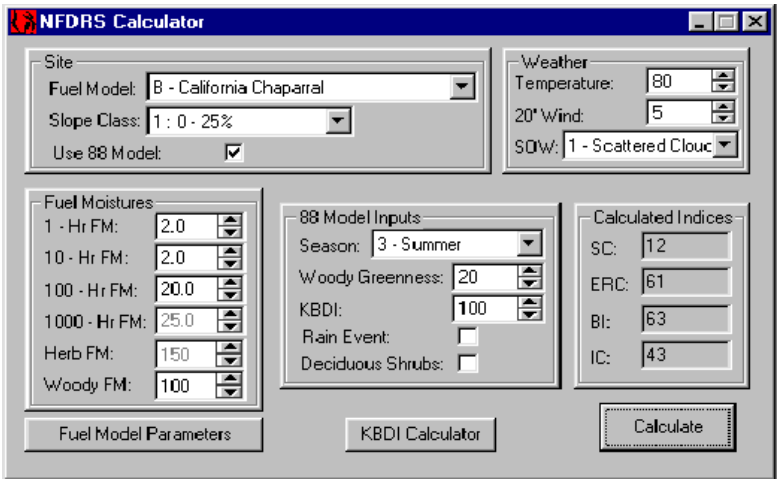
5 Complete the **Fuel Moistures** text boxes as appropriate for the selected fuel model.

Moisture classes that are unavailable for the selected fuel model appear dimmed.

6 Complete the **88 Model Inputs** if appropriate.

7 Click **Calculate**.

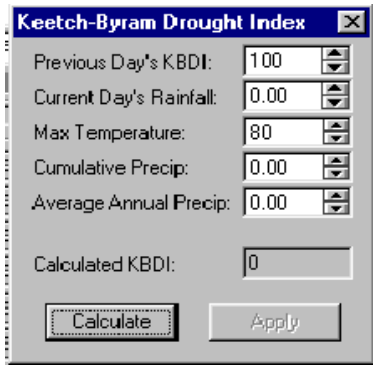
The following diagram shows the NFDRS Calculator.



To calculate the Keetch-Byram Drought Index for 88 Models

- Click **KBDI calculator**.

The following diagram shows the KBDI Calculator as it first appears on your screen.

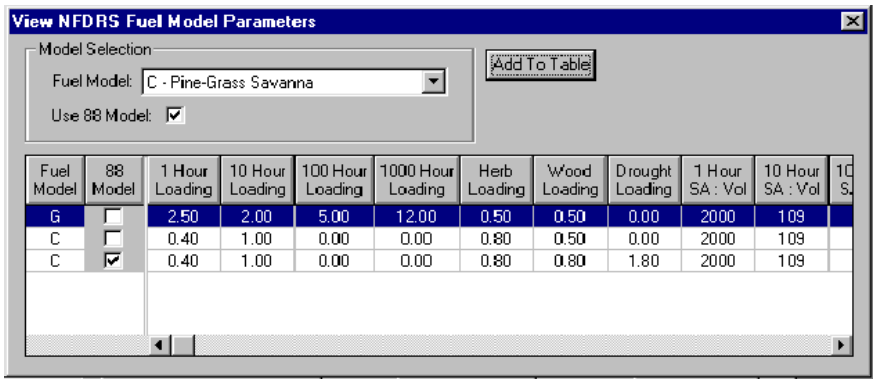


To compare parameters among fuel models

1. Click **Fuel Model Parameters**.
2. Select the **Fuel Model** of your choice, click **Use 88 Model** if appropriate, and then click **Add To Table**.
3. Add additional **Fuel Model(s)** of your choice, then click **Add To Table**.

To delete a Fuel Model from the table, click the row of your choice, and then press DELETE.

The following diagram shows the View NFDRS Fuel Model Parameters table.



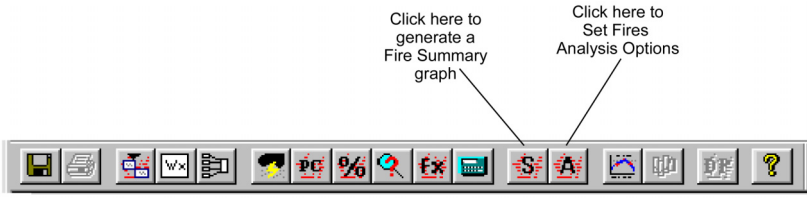
The following units are standard:

- *loads are measured in T/Ac*
- *surface area to volume ratios are measured in 1/ft*
- *heat content is measured in btu/lb*
- *depth is measured in feet*
- *moisture of extinction is measured in percent.*

Chapter 4. Working with fire analysis tools

This chapter explains how to view and interpret combined weather and fire occurrence data using the fire analysis and decision point tools of FireFamily Plus. These tools help you perform a variety of fire analysis functions, including:

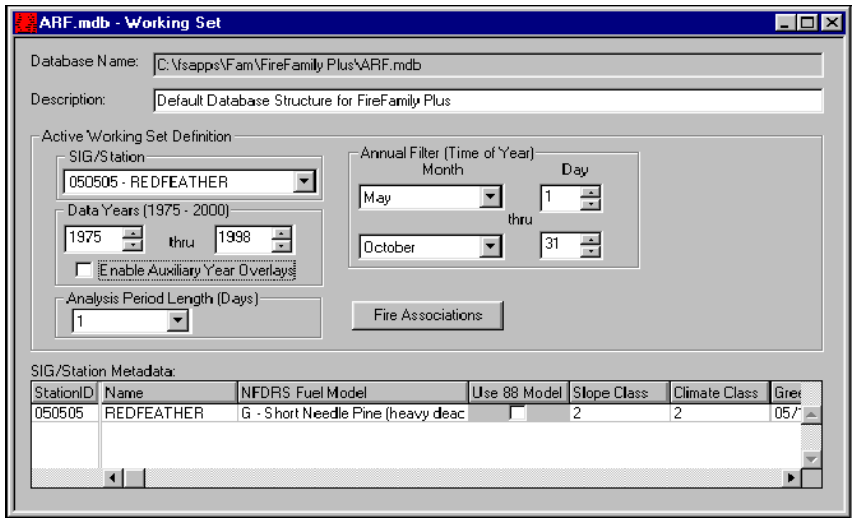
- Interpret danger indexes. You can relate danger indexes to fire activity based on a percentage or probability basis.
- Choose appropriate fuel model and index. FireFamily Plus tools offer an objective way to evaluate the many indexes and fuel models.
- Evaluate representative weather stations. By comparing fire activity in a management area to indexes that are based on weather data from several area stations, you can determine which stations are most representative of fire business.
- Set better decision thresholds. Historically, critical levels for an index have been defined from percentile levels without regard to fire activity. By integrating weather and fire activity, you can better determine percentile levels to suit a variety of fire management needs.



Topics in this chapter include:

- Performing cumulative and probability fire analysis
- Setting decision points.

The following diagram shows the active working set used for the examples in this chapter.



Performing cumulative and probability fire analysis

This section explains how to generate graphs using ERC, which reflects a good fire business indicator for the sample data set. Due to the speed and ease of generating graphs, use several fuel models and indexes when performing fire analysis on your own databases.

The Cumulative Fires Analysis window displays frequency distributions of four groups of weather days in two ways. The left panel shows frequencies as histograms, while the right panel shows cumulative distributions. The following four weather groups are identified in these graphs:

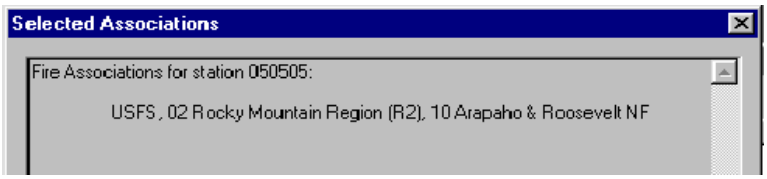
- all weather days regardless of fire activity - black
- only weather days with a reported fire - blue
- only weather days with large fires - purple
- only weather days with multiple fires - red.

Once you get the feel for what you are looking for, you may find that the best way to "screen" indexes is to perform the Cumulative Analysis first, and then perform the Probability Analysis on your best indexes.

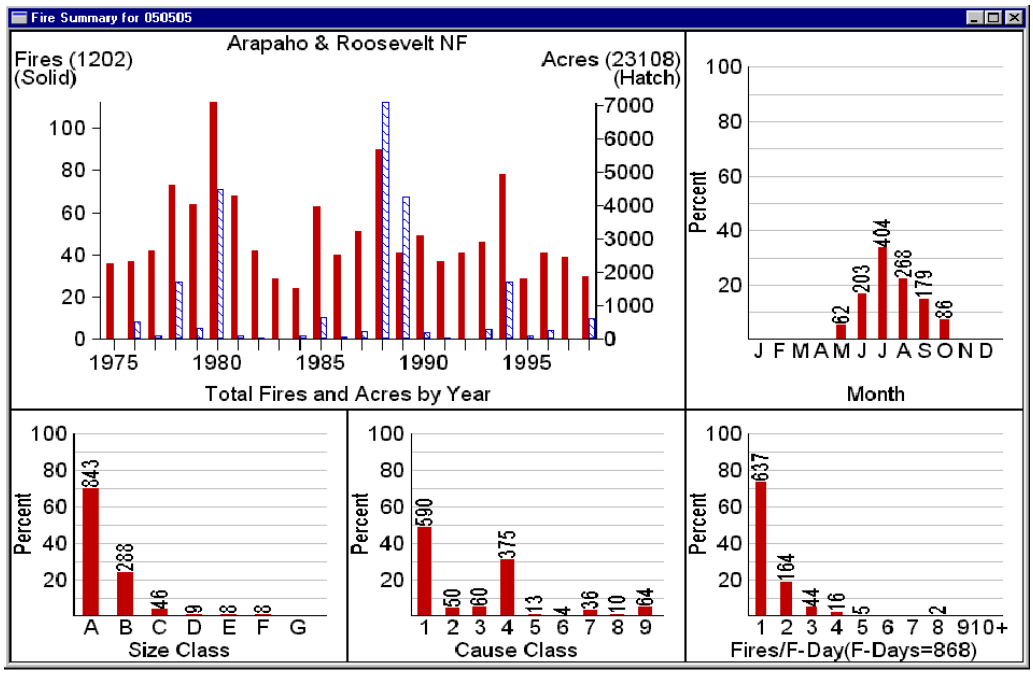
To review the Working Set for FS fire occurrence data

1. On the **FireFamily Plus** toolbar, click **Fires Summary Working Set**.
2. To verify that only the desired fire associations are selected, click **View Selections.**
3. To review the fire occurrence data, click **View Fires**.
4. To review the fire occurrence summary graphs, click **OK**.

The following diagram shows the selections for the Redfeather weather station.



The following diagram shows the Fire Summary for the Redfeather weather station. The Size Class graph located on the lower left allows you to determine what constitutes a larger fire in this analysis area. The Fires/F-Day graph located on the lower right allows you to determine the number of fires per fire-day that tax the suppression resources. Here, a Class C or larger fire defines a large fire-day and 5 fires per day defines the threshold for a multiple fire-day.



Your weather and fire occurrence data may or may not provide the same levels of success. For a brief narrative of this Fire Summary, see "To review the working set fire occurrence data by generating summary graphs," in Chapter 3, "Working with FireFamily Plus."

To narrow or exclude FS fire occurrence data for your analysis

- Change the **Data Years** fields of your working set to match the desired years of fire data coverage.

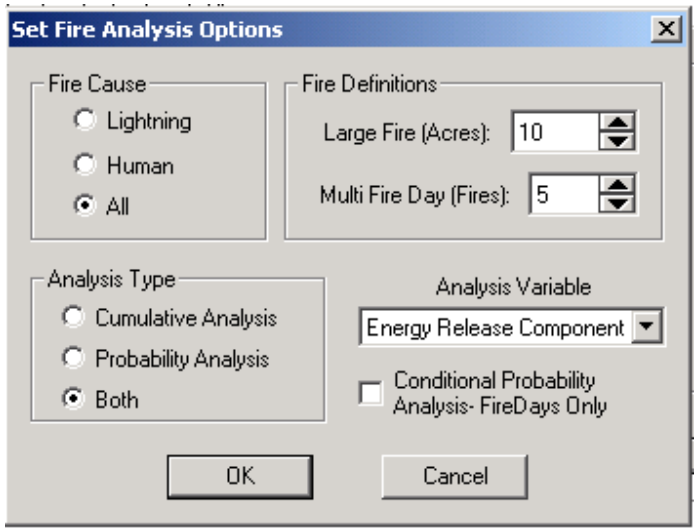
To perform Cumulative and Probability fire analysis using ERC

1. On the **FireFamily Plus** toolbar, click **Fires Analysis**.
2. Select the appropriate **Fire Cause** and **Analysis Type** option buttons.
3. Complete the **Fire Definitions** fields.

   Use your local experience and/or results from your fire occurrence graph.

4. In the **Analysis Variable** list, select **Energy Release Component**, and then click **OK**.

The following example shows the Set Fire Analysis Options dialog box.

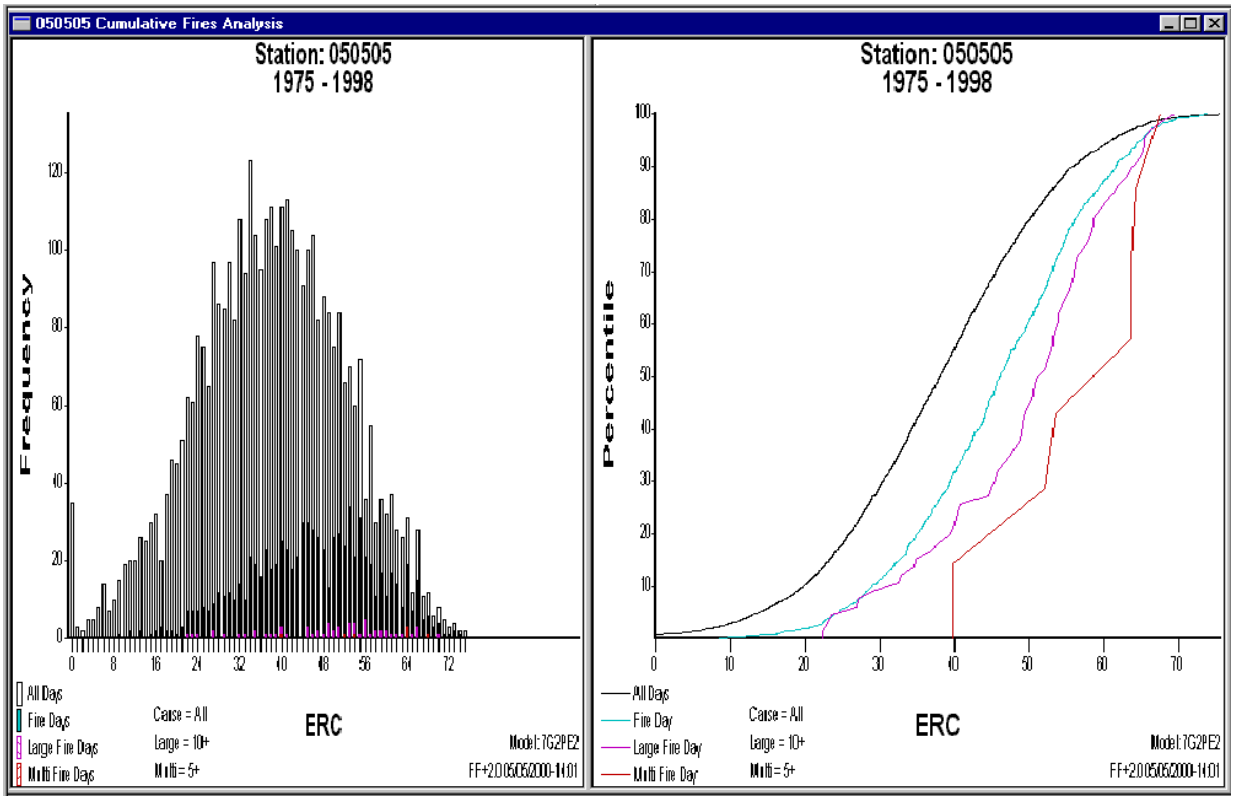


Evaluating Cumulative Fires Analysis graphs

Use the following principles to evaluate the frequency distributions of the four groups of weather days:

- When lines are horizontal, there are no weather days happening in that ERC range.
- When lines approach vertical, there are many days in that ERC group.
- If lines are drawn on top of each other, which denotes no difference in the four weather distributions, the particular index you are using contains no relevant information about fire business.
- If the lines are nicely spread out, which denotes a difference in the weather distributions, the fires and large fires occur on higher "danger" days.

The following diagram shows the Cumulative Fires Analysis graphs for ERC.



The left panel shows you that fire-days tend to occur on higher ERC days and multiple fire-days begin to occur when ERC is around 44.

The right panel shows that fire-days (blue line) start occurring slowly at ERC values from 8 to 22. The rate of occurrence picks up between 22 and about 34. Above 34 to just over 55, they occur at a steady rate.

Large fire-days are shown by the purple line. There were no large fires when the ERC was below 22 or 23. This is where the purple line comes off of the ERC X-axis. Large fire-days occur at a fairly steady rate from ERC values of about 45 or so. The point where ERC equals about 45, where the large fire-day line changes slope (the slope becomes steeper), is an important point on this graph, especially since the slopes of the all-day and fire-day lines **do not** change slopes through this point. You can interpret that while the rate of fire days was consistent through ERC of 45, the rate of large fire-days increase above that threshold level.

Multiple fire-days are shown by the red line. The jerkiness of this line indicates there were only a few multiple fire-days at our defined threshold of 5 fires per day. An ERC of 40 was the minimum ERC that a multiple fire-day occurred. From ERC of 40 to 60, there were probably 2 multiple fire-days, one at 52 and one at 53 or 54, and then the rest occurred at ERC values between 63 and 65 or so (where the line goes nearly vertical).

To determine the percentile value, you can cross-reference any of these threshold points we've identified to the percentile axis. An ERC of 50, for example, represents about the 75th percentile of all days, but only the 35th percentile of large fire-days.

Evaluating Fires Probability Analysis graphs

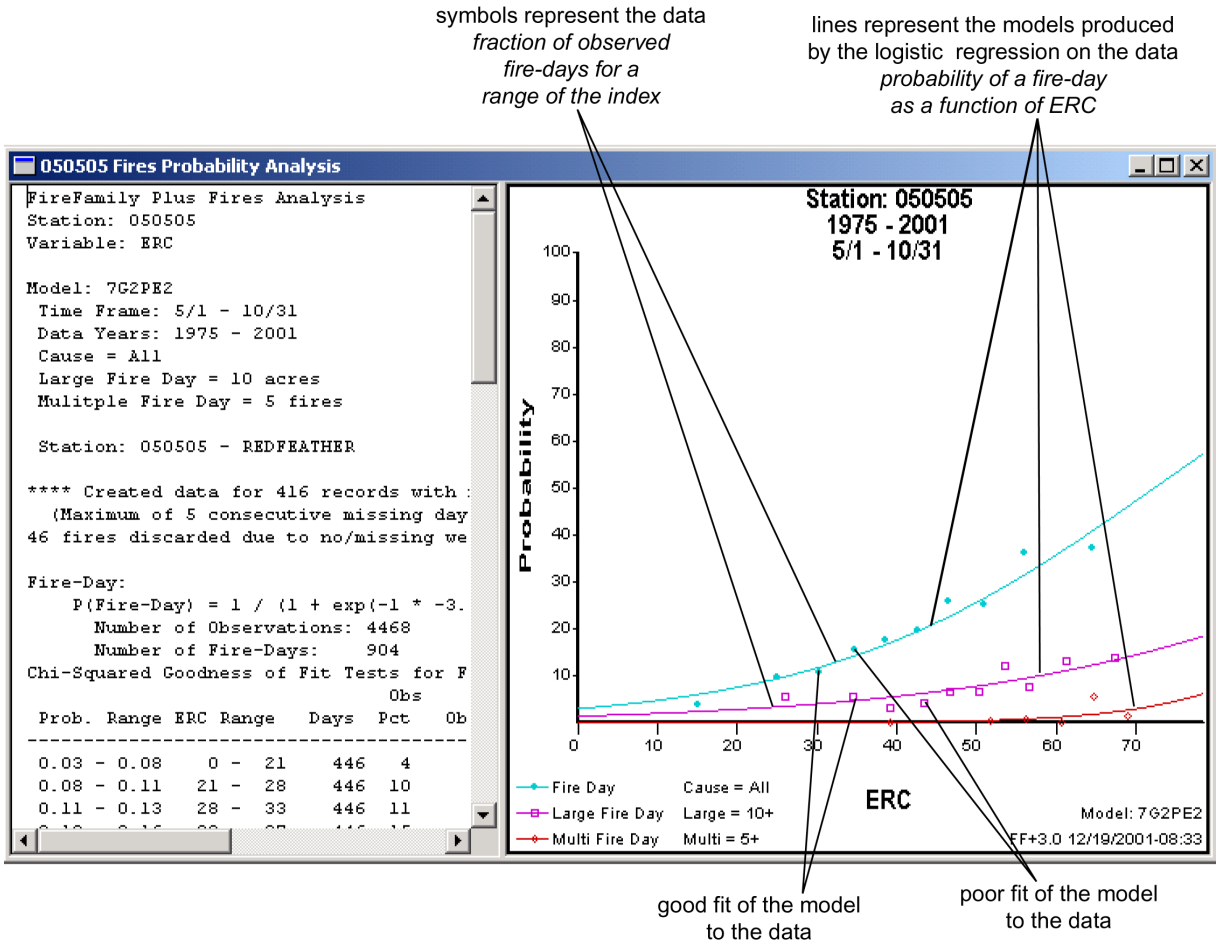
Based on your fire associations, Fires Probability Analysis takes every historical weather day, including date and index value, and assigns each day as a:

- fire-day (yes/no)
- large fire-day (yes/no)
- multiple fire-day (yes/no).

Logistic regression is performed for each fire-day type, producing charts and goodness of fit statistics. You can also perform conditional probability analysis for large fire and multiple fire days.

Logistic regression is ideal for "yes/no" types of data.

The following diagram shows the Fires Probability Analysis graphs for ERC.



When you review the Cumulative Fires Analysis graphs, remember that fire-days started picking up above an ERC value of 22. The logistic model reinforces this interpretation.

A horizontal line at 50 percent tells you that there are no occurrences of large fire-days or multiple fire-days in your analysis.

The final goal here is to discern a *good* index from a *bad* one in terms of its ability to describe fire business. To do this, we look at two qualities:

- Range of probabilities over the range of the predictor variable
  - 10 percent at the low end to 90 percent on the high end is very good.
  - 10 percent at the low end to 15 percent on the high end doesn't tell us much.
- Distribution of predictor variables
  - A wider range (0 - 100) allows more flexibility in setting levels.
  - A narrow range (12 - 22) may make setting levels harder.
  - Avoid 90 percent of observations in one/two classes.

When you've screened out all the *bad* indexes, use goodness-of-fit statistics to determine your *best* index.

There are two statistics to test goodness-of-fit:

- *Chi Square, where a lower value is better*
- *R-Squared, where a higher value is better.*

For a complete discussion of the analysis of indexes, refer to:

Andrews, Patricia L. and Larry S. Bradshaw. "FIRES: Fire Information Retrieval and Evaluation System - a Program for Fire Danger Rating Analysis" at

http://www.fs.fed.us/rm/pubs/int_gtr367/index.html.

Setting decision points

This section explains how to set action or danger class limits based on both fire weather and fire business in your danger rating area. Before you begin, be sure that your working set is correctly configured, including years, dates, and fire associations.

The Decision Points button on the FireFamily Plus toolbar is only available when displaying a Fires Probability Analysis graph.

The Class Lower Limits dialog box displays the initial breakpoints that divide the data into five classes. These initial breakpoints are set using roughly the same logic as setting the Adjective Classes in WIMS and allow you to adjust the breakpoints and add or delete classes.

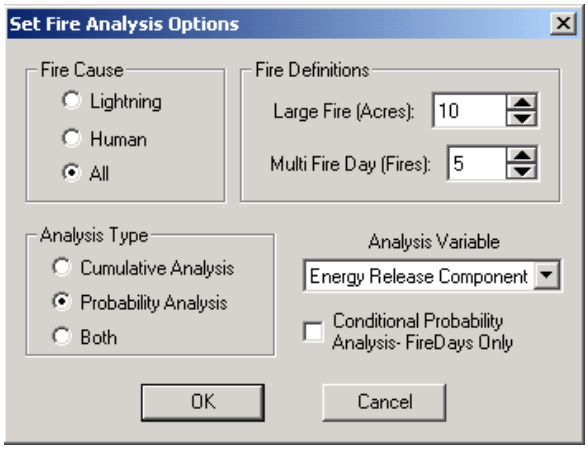
Class	Lower limit
1	Zero
2	¼ of the index's 90th percentile value
3	½ of the index's 90th percentile value
4	The index's 90th percentile value
5	The index's 97th percentile value

To set decision points

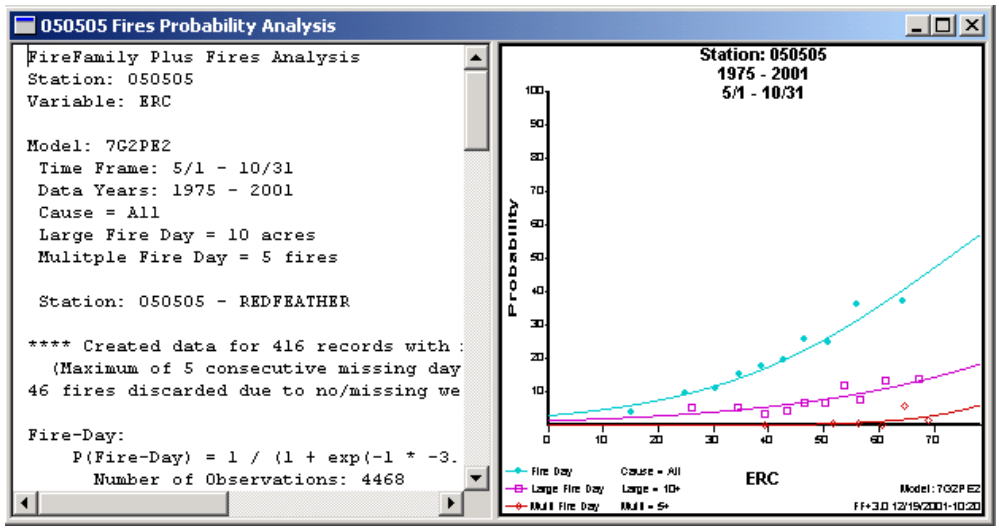
1. On the **Fires** menu, click **Fire Analysis**.
2. To generate the Fires Probability Analysis graphs, click **Probability Analysis**, select the **Analysis Variable** of your choice, and then click **OK**.
3. Click **Decision Points**.

   You can also click Decision Points on the View menu.

The following diagram shows the Set Fire Analysis Options dialog box. Energy Release Component is selected as the Analysis Variable.

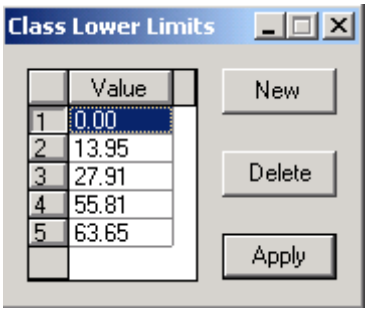


The following diagram shows the Fire Probability Analysis graph.

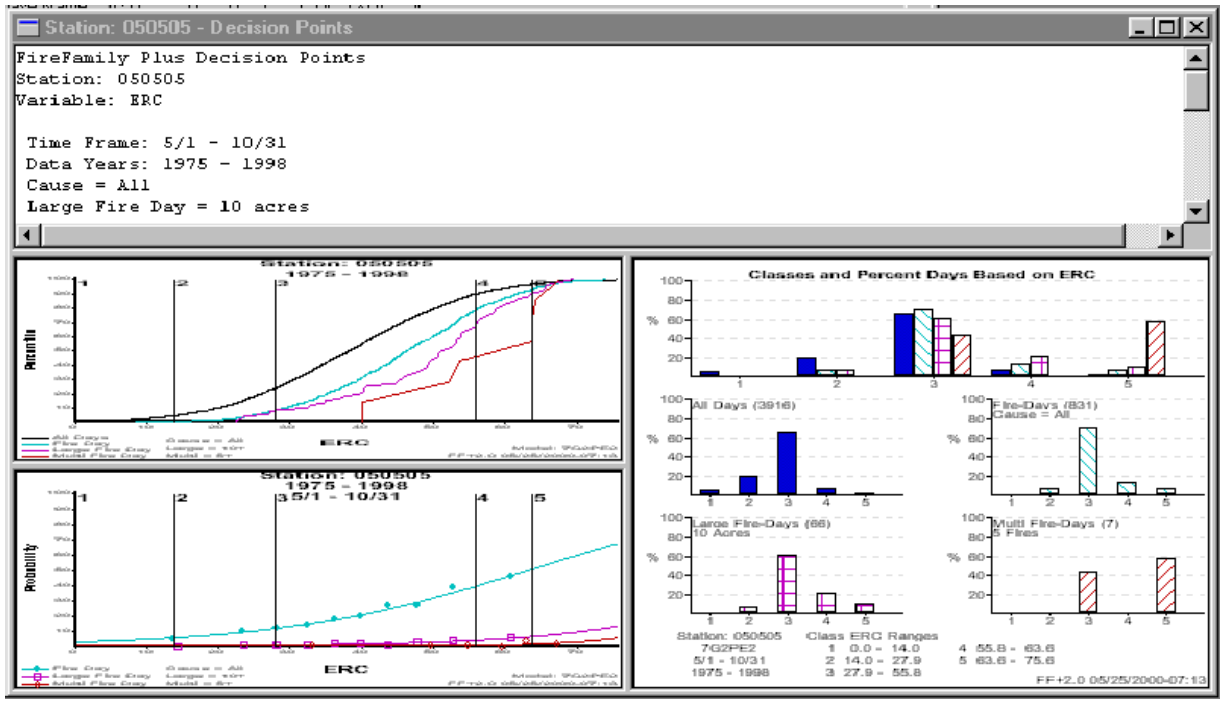


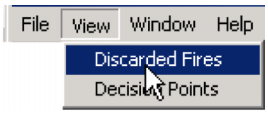
FireFamily Plus version 3.0 allows you to view fires rejected from the fire-day probability analysis as a separate window. For more information, see the next task, "To view rejected fires."

The following diagram shows the Class Lower Limits dialog box and the initial breakpoint values for each class.



The following diagram shows the Decision Points graphs for ERC. To expand the graph of your choice, click, hold, and slide the bars accordingly.

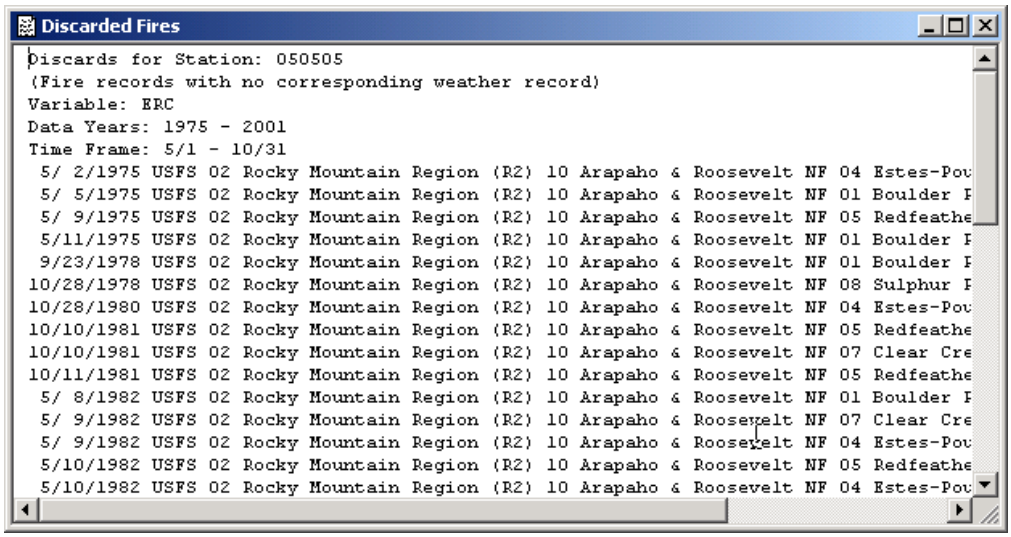




To view discarded fires

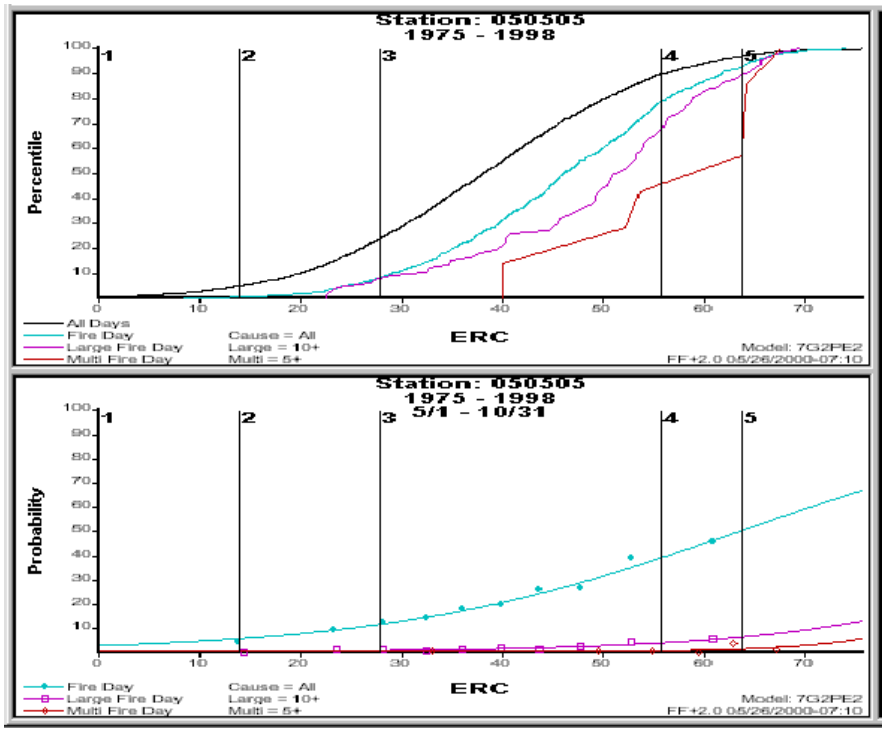
- From the **Fire Probability Analysis** graph, click **Discarded Fires** on the **View** menu.

The following diagram shows the Discarded Fires listing.



Reviewing the Decision Points graphs

The following diagram shows the Percentile and Probability graphs for ERC that are located on the lower left portion of the Decision Points window. The vertical lines show you where the class boundaries fall along the curves.



The following diagram shows the Decision Points table that is located on the upper left portion of the Decision Points window. You can modify this table and the Percentile and Probability graphs by applying new decision points.

These columns show tabular data that corresponds to the bar charts.

Five breakpoint classes

Station: 050505 - Decision Points

FireFamily Plus Decision Points
Station: 050505
Variable: ERC

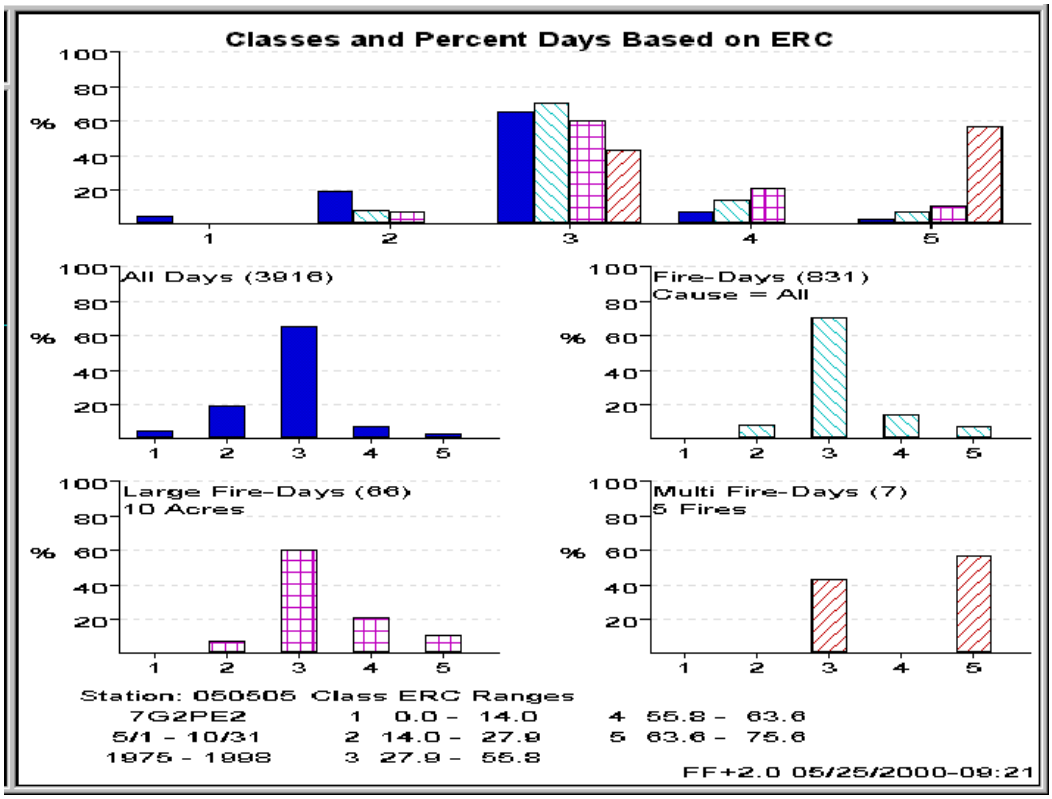
Time Frame: 5/1 - 10/31
Data Years: 1975 - 1998
Cause = All
Large Fire Day = 10 acres
Mulitple Fire Day = 5 fires

Station: 050505 - REDFEATHER Model: 7G2PE2

Cls #	Index Range	All-Days #	All-Days %	Fire-Days #	Fire-Days %FD	Fire-Days %AD	Large Fire-Days #	Large Fire-Days %LFD	Large Fire-Days %FD	Large Fire-Days %AD	Multi-Fire-Days #	Multi-Fire-Days %MFD	Multi-Fire-Days %FD	Multi-Fire-Days %AD	Model Probabilities (%) Fire Day	Large F-Day	Multi F-Day
1	0- 14	197	5	5	1	3	0	0	0	0	0	0	0	0	2- 5	0- 0	0- 0
2	14- 28	753	19	65	8	9	5	8	8	1	0	0	0	0	5- 11	0- 1	0- 0
3	28- 56	2573	66	585	70	23	40	61	7	2	3	43	1	0	11- 39	1- 4	0- 0
4	56- 64	274	7	116	14	42	14	21	12	5	0	0	0	0	39- 50	4- 6	0- 1
5	64- 76	119	3	60	7	50	7	11	12	6	4	57	7	3	50- 67	6- 13	1- 5
		3916		831			66				7						

Values in columns denoted by an * are displayed in the bar charts.

The following diagram shows the Classes and Percent Days Based on ERC bar chart that is located on the lower right portion of the Decision Points window. The chart shows the relative frequency of the four weather type days: All Days, Fire-Days, Large Fire-Days, and Multi Fire-Days. The bar chart on the top shows all day-types combined.



When reviewing the Decision Points graphs, consider the following:

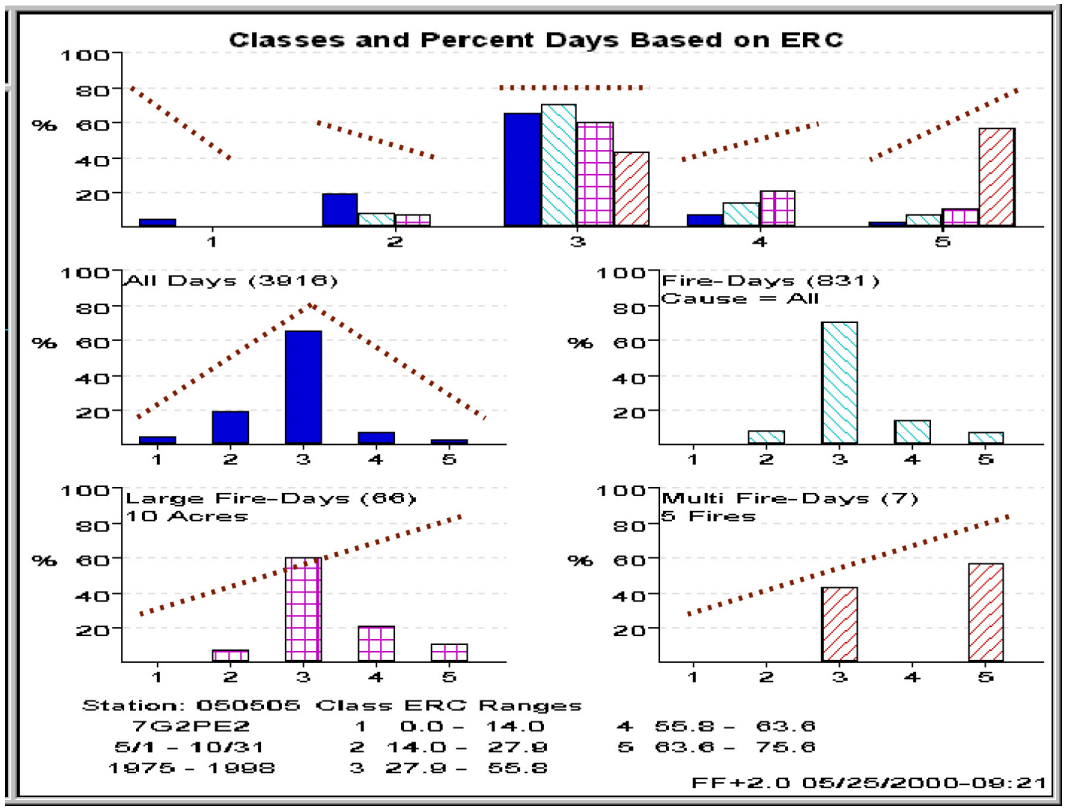
- *Differentiate each class from the class above or below it for different fire business.*
- *Ensure that each class has a significant increase of risk, perhaps even twice the risk.*
- *Obtain the minimum number of classes you need to support decisions and actions.*

Changing decision points to reflect fire business

Now that you have reviewed the Decision Points graphs, you can change the values in the Class LowerClass Lower Limits dialog box to adequately reflect fire business. The following list outlines how your bar charts should look and why:

- As fire danger moves from Class 1 to Class 5, you should see a steady increase in the risk of large and multiple fire days.
- As fire danger moves from Class 1 to Class 5, the ratio of days to large fire days should decrease.
- As fire danger moves from Class 3 to Class 4 and to Class 5, the percentage of large fire days and multiple fire days should not decline. Ideally, these fire days would increase.

The following diagram shows dotted lines above each bar chart to demonstrate the ideal trends.

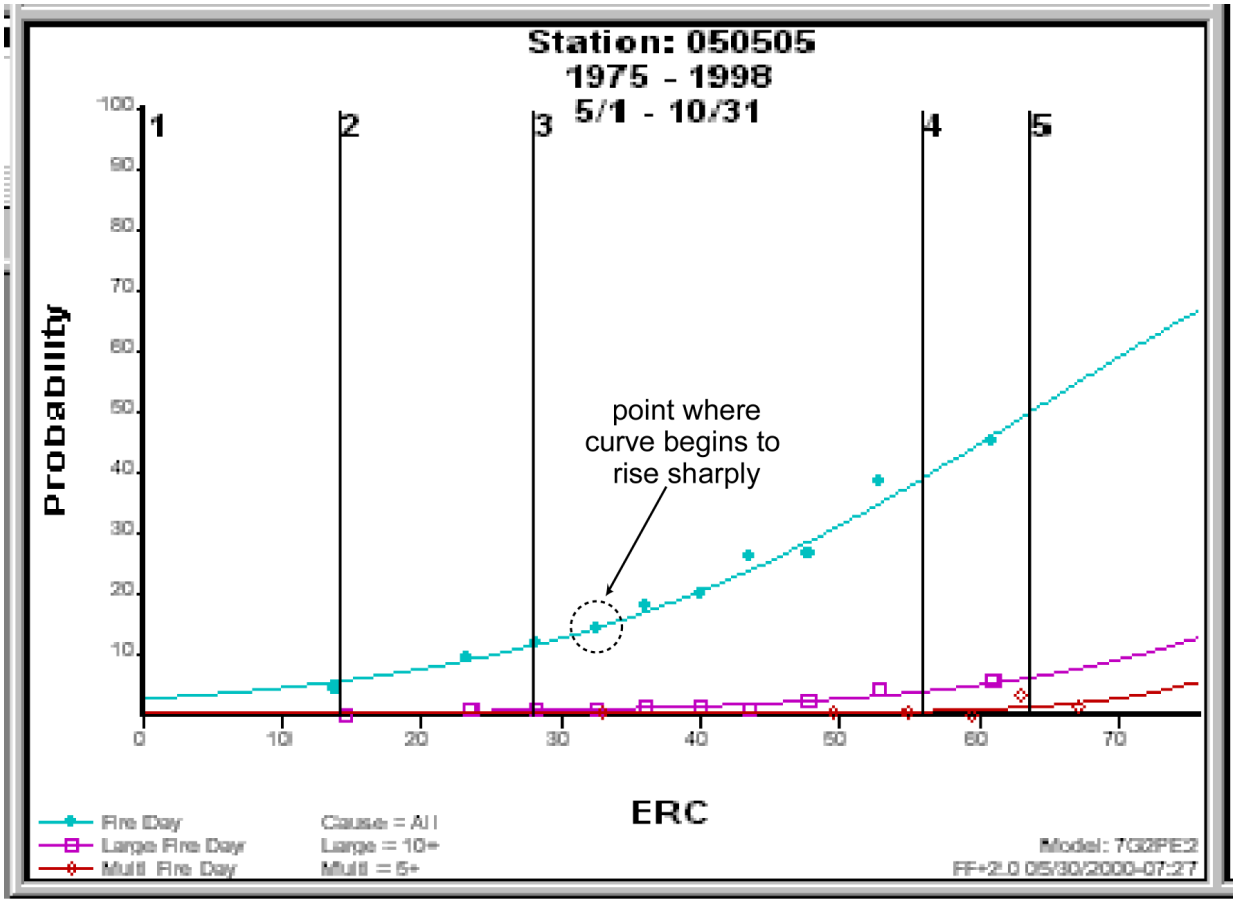


By comparing the dotted lines to each bar chart, you know that:

- The proportion of fire days in Class 3, at over 70 percent, is too high.
- The Large Fire-Days and Multi Fire-Days bar charts do not show an upward trend from low to high.

To determine how to change these class limits, you must review the Probability vs. ERC graph.

The following diagram shows the Probability vs. ERC graph. The arrow points to where the Fire Day curve begins to rise more steeply, indicating that the probability of a fire occurring increases faster as ERC rises. This is a good choice for changing the Class 3 lower limit.

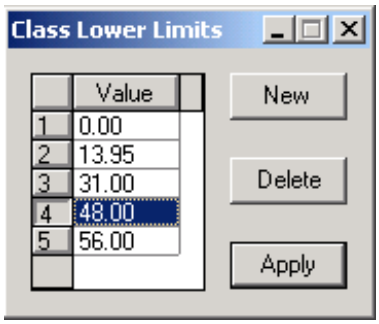


Notice that the Large Fire and Multi Fire curves just begin to show an upward trend. You may decide to include more Large Fire-Days and Multi Fire-Days in Classes 4 and 5.

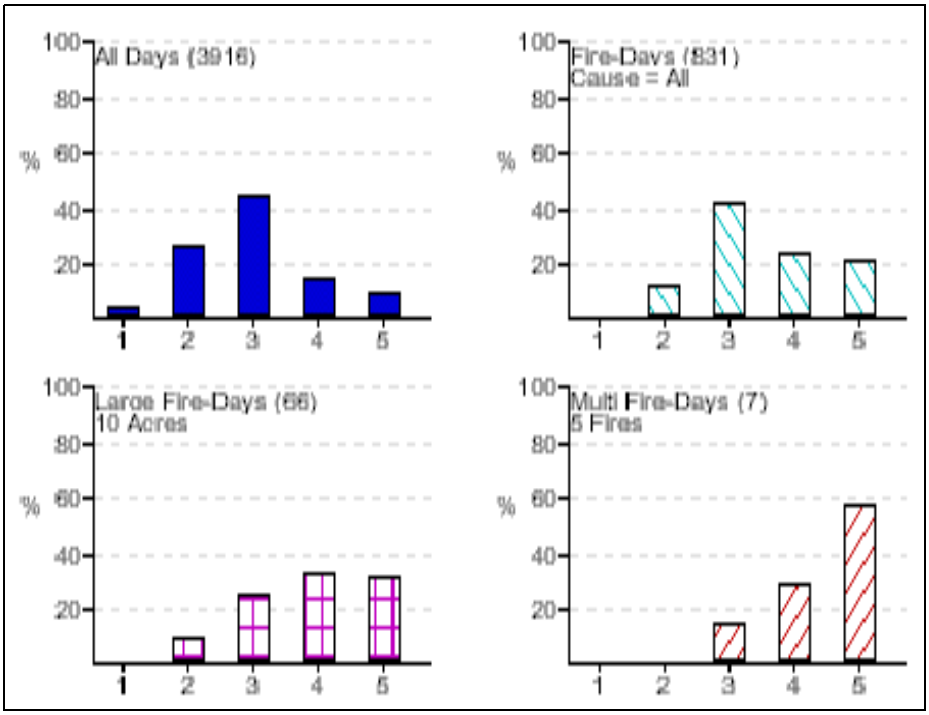
To change the Class lower limits

- On the **Class Lower Limits** dialog box, type or select the **Value** for each **Class**, and then click **Apply**.

The following diagram shows the new values for the Class Lower Limits dialog box. To reduce the lower limits, or decision points, the value of Class 3 was changed to "31," the value of Class 4 was changed to "48," and the value of Class 5 was changed to "56."



The following diagram shows the new Classes and Percent Days Based on ERC bar charts. Notice that these new bar charts have a more reasonable distribution of Fire-Days, Large Fire-Days, and Multi Fire-Days.



You can apply some other class values and review the changes in the bar charts. Add or delete classes using the New and Delete buttons on the Class Lower Limits dialog box. You can perform some interesting analysis using only two classes. Return to the section, "Performing cumulative and probability fire analysis," choose other analysis variables, and then perform additional analysis.

Chapter 5. Generating a pocket card

A pocket card is a safety tool that identifies key information about a specific fire danger area. And with Fire Family Plus, you can generate a pocket card at any time to increase firefighter awareness of the current local conditions.

Identifying the years of interest, fires, and index values

Use the climatology reports and fires analysis information generated in Chapter 3, “Working with FireFamily Plus,” to determine and define which two years of interest, indices, and thresholds you need to create a meaningful pocket card.

Based on prior examination of seasonal trends of various indexes and fires analysis, use the following information for the pocket card:

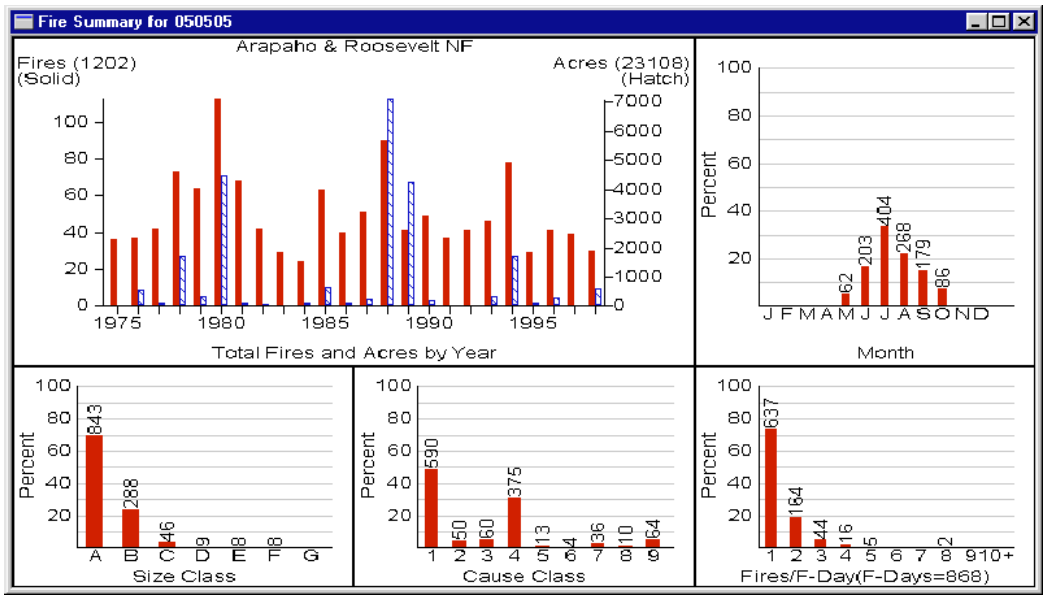
- ERC is selected as the NFDRS index value.
- Fuel model G is the primary fuel model for the Redfeather weather station.

BI is often used for staffing.

To determine the years of interest for comparison

1. Start **FireFamily Plus**.
2. On the **File** menu, click **Open**, then double-click **ARF.mbd**.
3. Edit the **Data Years** to include all available years of data, **1975** through **1998**.
4. Edit the **Annual Filter** to include the entire fire season, **May 1** through **October 31**.
5. On the **FireFamily Plus** toolbar, click **Fire Summary Working Set**.

The following diagram shows the Fire Summary for the Redfeather weather station, "050505."



Based on the Fire Summary graph, 1988 and 1989 have significant burned acres and are therefore selected at the "Years to Remember" for the pocket card.

Generating the pocket card

After completing the background analysis you can generate a meaningful pocket card to highlight local conditions.

To generate a pocket card

1. On the **FireFamily Plus** toolbar, click **Pocket Card**.
2. Type or select **Fire Danger Rating Area**, **Fire Danger Index**, and **Years to Remember**.

   If your working set does not include the current year, but there is current year data in the database, you can select the **Year to Date** *check box to enable a third overlay.*

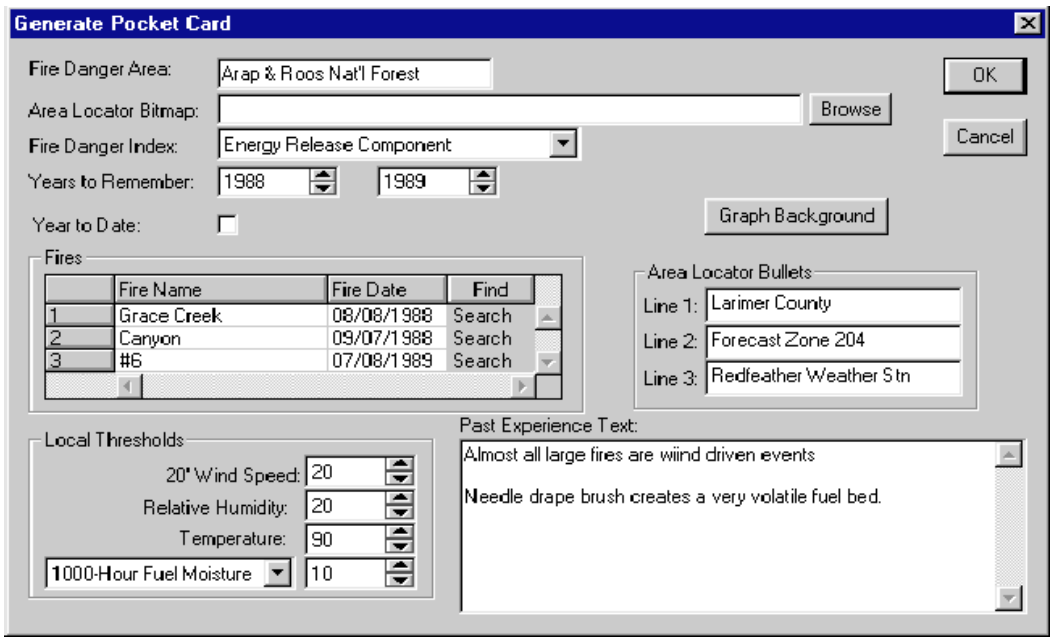
   If you have a bitmap graphic that shows the area location, click **Browse** *to locate the file.*
3. To select a fire for comparison, click **Search** in the appropriate **Fires** list, and then double-click the fire of your choice on the **Select a Fire** listing.

   You can select up to three fires for comparison, but they must have occurred during the Years to Remember.
4. Type or select the **Area Locator Bullets** and **Local Thresholds**.

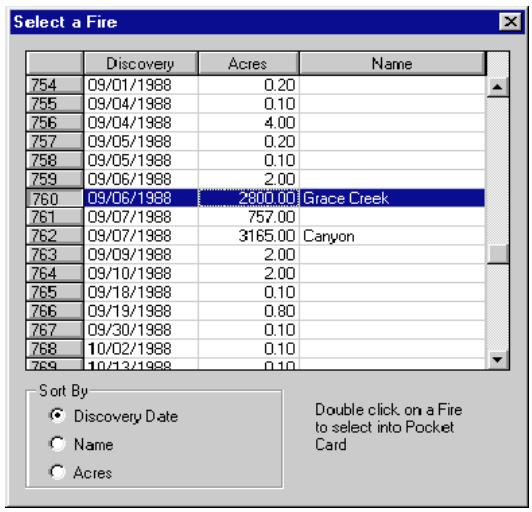
5 Type **Past Experience Text**. Include information specific to this area as well as any general and key points to remember.

6 When finished, click **OK**.

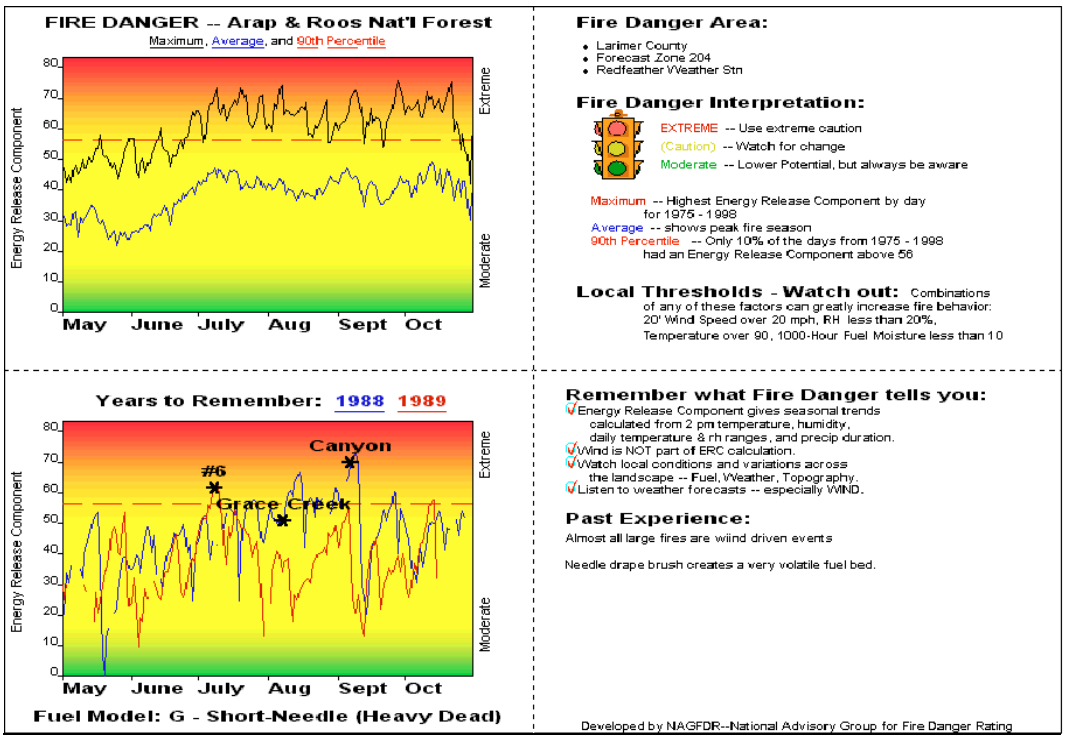
The following diagram shows a sample Generate Pocket Card screen.



The following diagram shows the "Grace Creek" fire selected on the Select a Fire listing.



The following diagram shows the generated pocket card.



To print a pocket card

1. On the **File** menu, click **Print**.
2. In the **Name** list, click the color printer of your choice.
3. To change the page orientation, click **Properties**, click **Landscape**, and then click **OK**.

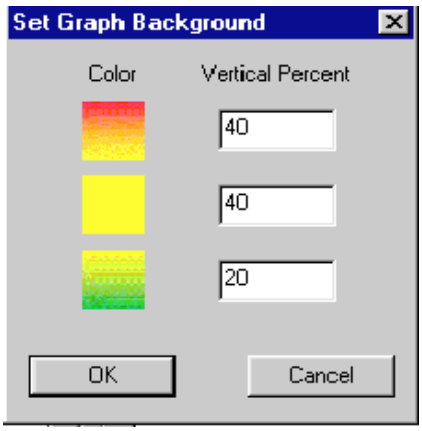
To change the background pattern of your pocket card graphs

This option allows you to change the visual appearance of your graph. Look carefully at the readability of the lines in your graph and what these background colors denote. For example, don't use red to denote the lower portion of your graph where the index value is low or moderate.

FireFamily Plus will invert the colors for humidity and fuel moisture graphs where low is a higher fire danger.

1. On the **Generate Pocket Card** screen, click **Graph Background**.
2. Change the **Vertical Percent** fields as desired, and then click **OK**.

The following Set Graph Background shows the background settings that were used to create the sample pocket card.



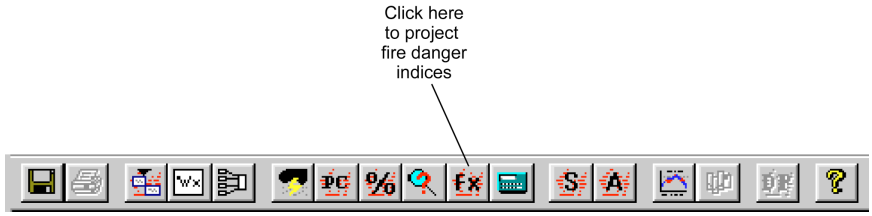
To save a pocket card

You can save the pocket card in bitmap, PNG, JPEG, and TIFF. Select the file format that suits your needs.

1. On the **File** menu, click **Save As**.
2. In the **File name** text box, type the file name of your choice, select the file format of your choice, and then click **OK**.

Chapter 6. Working with fire danger projections

This chapter explains how to generate medium range fire danger projections based on current year-to-date weather. It also outlines several techniques for developing fire weather scenarios.



You can create projected observations using one the following:

- blank fire weather observations
- persistence of the last year-to-date fire weather observation in the working set
- fire weather observations generated from climatological percentiles from your active working set, which includes stations, years, and annual filters.

To successfully create projected observations, you must have year-to-date observations in your active working set for the stations of interest. The current year must be part of your active working set. You can edit your projected observations, although these are not saved as part of your database.

Topics in this chapter include:

- Understanding generated fire weather records
- Reviewing the active working set
- Generating fire danger projections
- Generating reports and graphs.

Understanding generated fire weather records from climatological percentiles

Generated fire weather records use historical, ***individual daily*** percentiles of temperature, humidity, and wind speed. This differs from the percentile for the entire working set. For example, if your period length is one day there is one observation for each year in the working set. Therefore, a working set that contains 20 years of data contains 20 observations for each day from which to select the percentile. As compared to the overall critical percentile, this value is the same as plotting the **seasonal values** of critical percentiles on a statistical graph.

To generate projected observations from the 60th percentile of temperature for July 1 to July 15, FireFamily Plus examines the working set for the 60th percentile for the observed dry bulb, maximum and minimum temperatures for each of the 15 days. By selecting the 10th percentile of humidity,

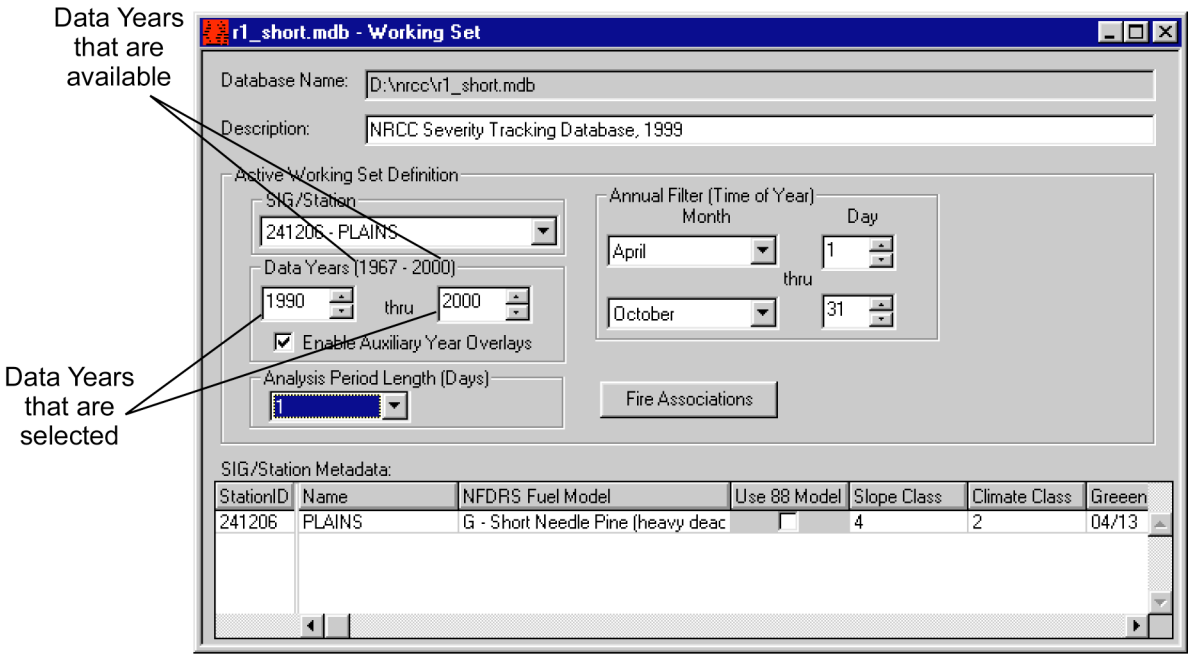
FireFamily Plus examines the working set for the driest 10th percentile of observed, maximum, and minimum relative humidities for each day. Similarly, by selecting 50th percentile winds, FireFamily Plus will calculate the median value of wind for each of those 15 days.

You can project hot dry conditions by selecting high percentile values for temperature and low percentile values for humidity.

Projected observations from percentile weather have precipitation amount, duration, and state of the weather initialized to "no precipitation" and "mostly sunny skies," where state of the weather equals "1." It is up to you to create precipitation events, if desired, for your medium range projections.

Reviewing the active working set

The following diagram shows the active working set used for the examples in this chapter. Notice that observation data for the current year 2000 is available and selected in the working set. Since there are no observations for year 2000 during the projections period, the projected observations you generate from historical percentiles will be based on daily observation data from 1990 through 1999. The analysis period length is one day.



You can project fire danger indexes for other analysis period lengths and for Special Interest Groups.

Generating fire danger projections

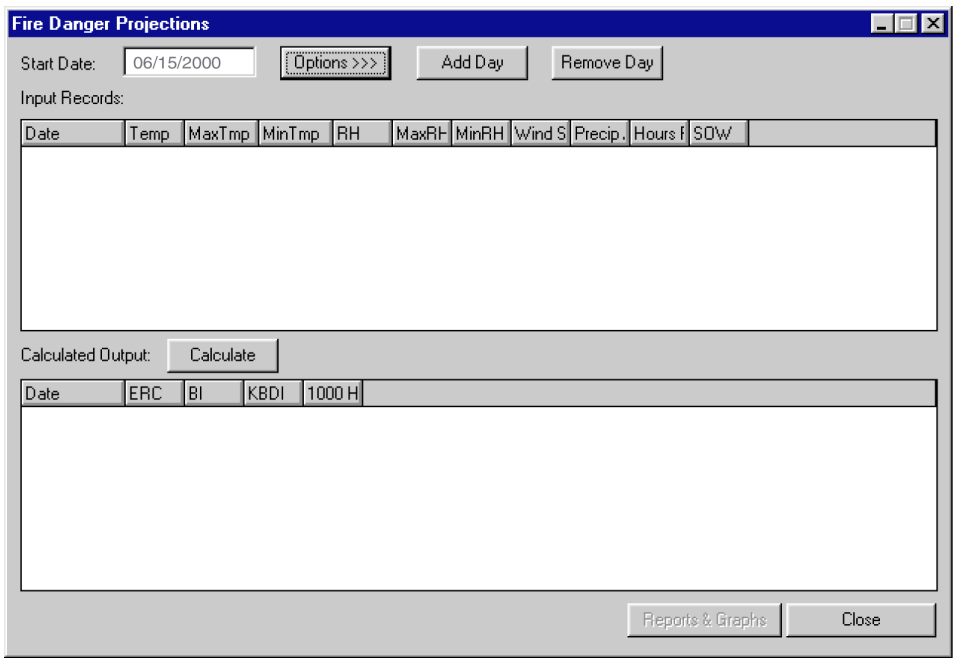
This section explains how to generate NFDRS indexes from your projected observations. You can also generate projections from climatology and obtain the percentile values for temperature, humidity, and wind.

To start the fire danger projection module

- On the **FireFamily Plus** toolbar, click **Fire Danger Projections**.

Just as when you generate a statistical table or graph, FireFamily Plus automatically synchronizes your active working set when you click Fire Danger Projections.

The following diagram shows the Fire Danger Projections dialog box. Notice the starting date in this example is June 15th, 2000, which tells you that your active working set has data for Plains through the 14th of June, 2000.

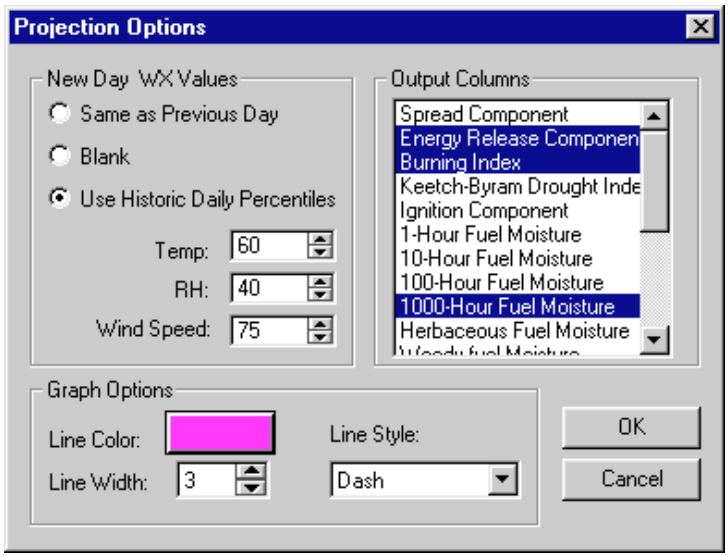


To select the fire danger projection options

1. Click **Options** >>>.
2. Based on the indexes you selected for your projection, select the **Output Columns** of your choice.
3. Modify the **Graph Options** as desired.

Graph Options allows you to distinguish the format of the projection line from the year-to-date and other overlays on the statistical season graph. You can also modify the projection line once you create the statistical season graph by clicking the Fire Danger Projections tab on the Graph Options dialog box.

The following diagram shows the Projection options dialog box.



The New Day WX Values option allows you to select the method for creating the observations, either "Same as Previous Day," "Blank," or "Use Historic Daily Percentiles." Although you can select only one New Day WX Values option at a time, you can create several days of persistence, and then switch to a climatology sequence before clicking the Calculate button.

In this example, you will generate the following projections:

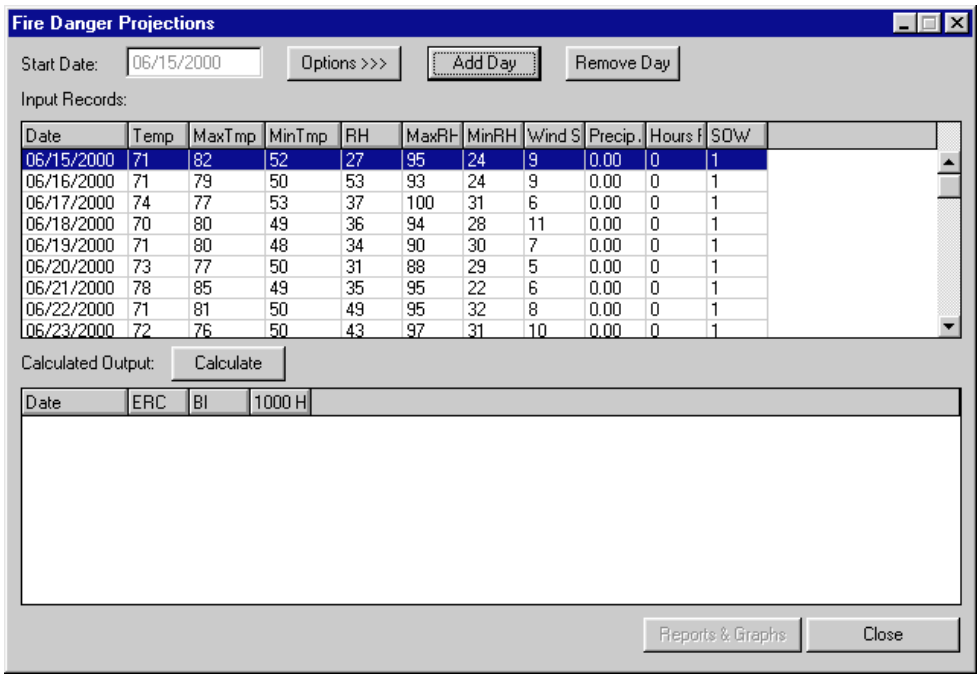
- temperature based on the 60th percentile, which is slightly above the median
- humidity at the 40th percentile, which is slightly below the median
- wind speed based on the 75th percentile.

For this example, if you selected the Same as Previous Day option, every new record would be the same as June 14th, 2000.

To add days of projected weather data

- Click **Add Day** for each day of projected weather data.

The following diagram shows the Fire Danger Projections beginning June 15, 2000. Notice that the daily observations vary slightly, there is no precipitation, and the State-of-the-Weather (SOW) are all set to "1."



Date	Temp	MaxTmp	MinTmp	RH	MaxRH	MinRH	Wind S	Precip.	Hours F	SOW
06/15/2000	71	82	52	27	95	24	9	0.00	0	1
06/16/2000	71	79	50	53	93	24	9	0.00	0	1
06/17/2000	74	77	53	37	100	31	6	0.00	0	1
06/18/2000	70	80	49	36	94	28	11	0.00	0	1
06/19/2000	71	80	48	34	90	30	7	0.00	0	1
06/20/2000	73	77	50	31	88	29	5	0.00	0	1
06/21/2000	78	85	49	35	95	22	6	0.00	0	1
06/22/2000	71	81	50	49	95	32	8	0.00	0	1
06/23/2000	72	76	50	43	97	31	10	0.00	0	1

Date	ERC	BI	1000 H

You can add days up to the end of the Annual Filter as defined in your working set.

State of the Weather codes include:

0	*clear (0.0 - 0.1)*	*5*	*drizzling*
1	*scattered clouds (0.2 - 0.5)*	*6*	*raining*
2	*broken clouds (0.6 - 0.9)*	*7*	*snow/sleet*
3	*overcast (100% obscured)*	*8*	*showering*
4	*foggy*	*9*	*thunderstorms in progress.*

To remove a record from your list of Fire Danger Projections

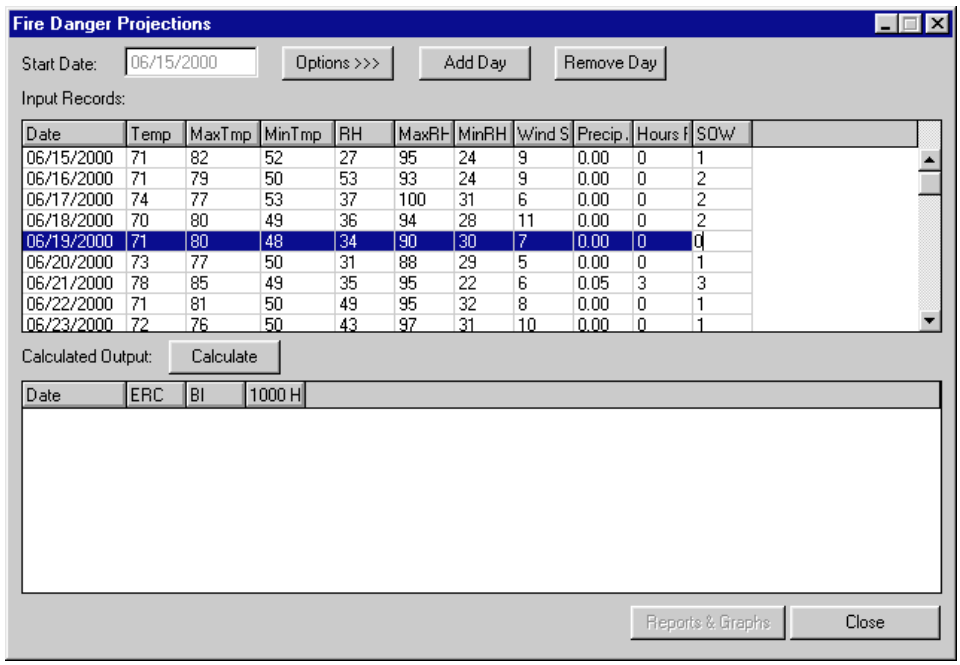
- Highlight the record of your choice and then click **Remove Day**.

To modify the weather for a specific date

1 Highlight the record of your choice, and then modify the appropriate fields as desired.

2 When satisfied with your projection strings, click **Calculate**.

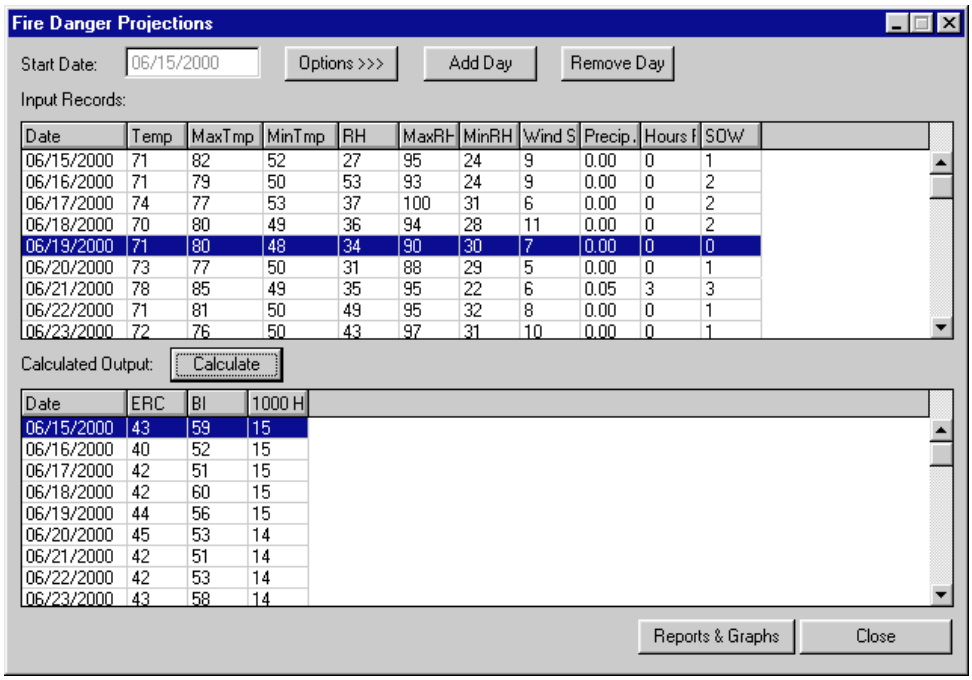
The following diagram shows cloudiness (SOW=2) for June 16th through 18th, and three hours of rain (0.05 inches) for June 21st.



Date	Temp	MaxTmp	MinTmp	RH	MaxRH	MinRH	Wind S	Precip.	Hours F	SOW
06/15/2000	71	82	52	27	95	24	9	0.00	0	1
06/16/2000	71	79	50	53	93	24	9	0.00	0	2
06/17/2000	74	77	53	37	100	31	6	0.00	0	2
06/18/2000	70	80	49	36	94	28	11	0.00	0	2
06/19/2000	71	80	48	34	90	30	7	0.00	0	0
06/20/2000	73	77	50	31	88	29	5	0.00	0	1
06/21/2000	78	85	49	35	95	22	6	0.05	3	3
06/22/2000	71	81	50	49	95	32	8	0.00	0	1
06/23/2000	72	76	50	43	97	31	10	0.00	0	1

Date	ERC	BI	1000 H

The following diagram shows the calculated outputs for your fire danger projections.



Date	Temp	MaxTmp	MinTmp	RH	MaxRH	MinRH	Wind S	Precip.	Hours F	SOW
06/15/2000	71	82	52	27	95	24	9	0.00	0	1
06/16/2000	71	79	50	53	93	24	9	0.00	0	2
06/17/2000	74	77	53	37	100	31	6	0.00	0	2
06/18/2000	70	80	49	36	94	28	11	0.00	0	2
06/19/2000	71	80	48	34	90	30	7	0.00	0	0
06/20/2000	73	77	50	31	88	29	5	0.00	0	1
06/21/2000	78	85	49	35	95	22	6	0.05	3	3
06/22/2000	71	81	50	49	95	32	8	0.00	0	1
06/23/2000	72	76	50	43	97	31	10	0.00	0	1

Date	ERC	BI	1000 H
06/15/2000	43	59	15
06/16/2000	40	52	15
06/17/2000	42	51	15
06/18/2000	42	60	15
06/19/2000	44	56	15
06/20/2000	45	53	14
06/21/2000	42	51	14
06/22/2000	42	53	14
06/23/2000	43	58	14

From here, you can change, delete, or add the projected observations and recalculate as desired. You can also change the projections options.

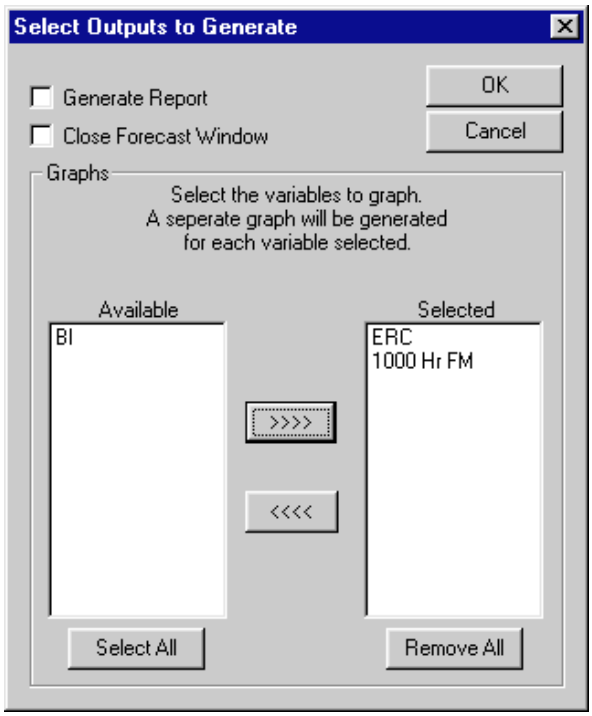
Generating reports and graphs

This section explains how to generate reports and graphs from your projections.

To generate reports and graphs from your projections

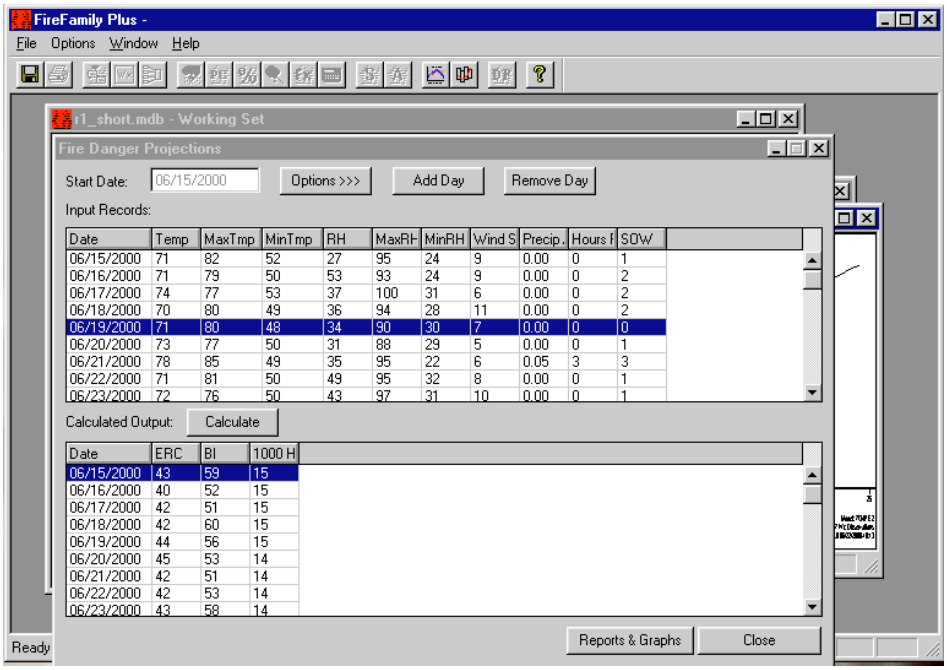
1. Click **Reports & Graphs**.
2. In the **Available** column, highlight the variable of your choice, and then click >>>> to move that variable to the **Selected** column. To generate a graph for every available variable, click **Select All**.
3. To generate a text file of the projected weather and indexes, click **Generate Report**.
4. To generate the reports and graphs, click **OK**.

The following diagram shows the Select Outputs to Generate dialog box. After generating the reports and graphs, you can return to the Fire Danger Projections dialog box and edit your projection strings.

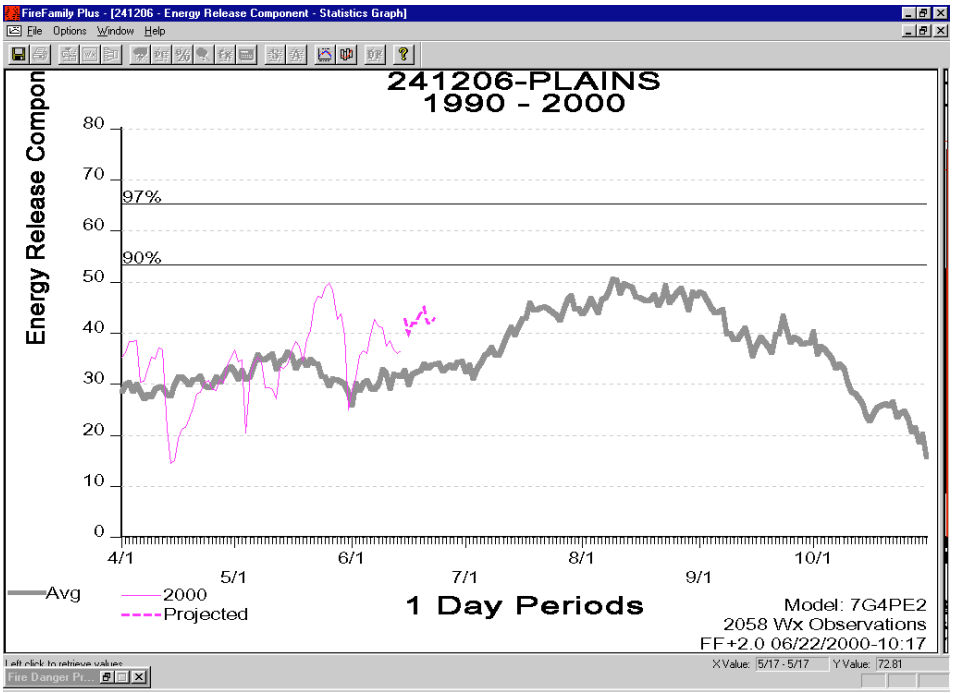


*If you select the **Close Forecast Window** check box, FireFamily Plus will end your current projection session and return to your active working set after you generate the reports and graphs. To continue to edit your projection strings without starting all over again, be sure to clear this check box.*

The following diagram shows the Fire Danger Projections window as it first appears after clicking OK. FireFamily Plus reprocesses the working set to obtain any potential overlay years and then displays a window for each graph object you selected. These windows appear behind the Fire Danger Projections window.



The following diagram shows the ERC graph window. Here, the heavy dashed line represents the projected ERCs based on your generated projection strings.



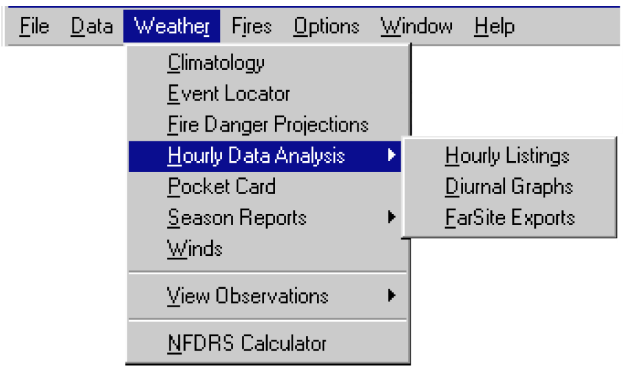
To create an overlay on your statistical projections graph

1. On the **Options** menu, click **Overlays**.
2. Click **New**, then select the **Year**, **Line Style**, and **Color** for the overlay.
3. To review the appearance of the overlay, click **Apply**.
4. When finished adding new overlays, click **OK**.

Chapter 7. Performing hourly data analysis

This chapter explains how to work with hourly weather data. Topics include:

- Generating hourly listings
- Generating diurnal graphs
- Exporting hourly weather data to FarSite
- Viewing hourly observations.



You can only import files from NIFMID that are in the standard FW9 format. The FW9 file format has several observation types, including:

- **O type.** A 1300 hour NFDRS record with State of the Weather.
- **R type**. An hourly weather observation record without State of the Weather.

If a station in your active working set contains “R” type observations, you will be able to choose from the Hourly Data Analysis options on the Weather menu. If no stations contain “R” type observations, these options appear dimmed.

FireFamily Plus version 2.0 does not import hourly RAWS data archived at the Western Region Climate Center due to the following:

- *the data is not available on the web*
- *the data is not in standard format*
- *the NFDRS station id is not associated with the weather observations, and is tracked by NESDIS ID.*

A future release of FireFamily Plus will accommodate this type of data and improve its diurnal graphing and data analysis capabilities.

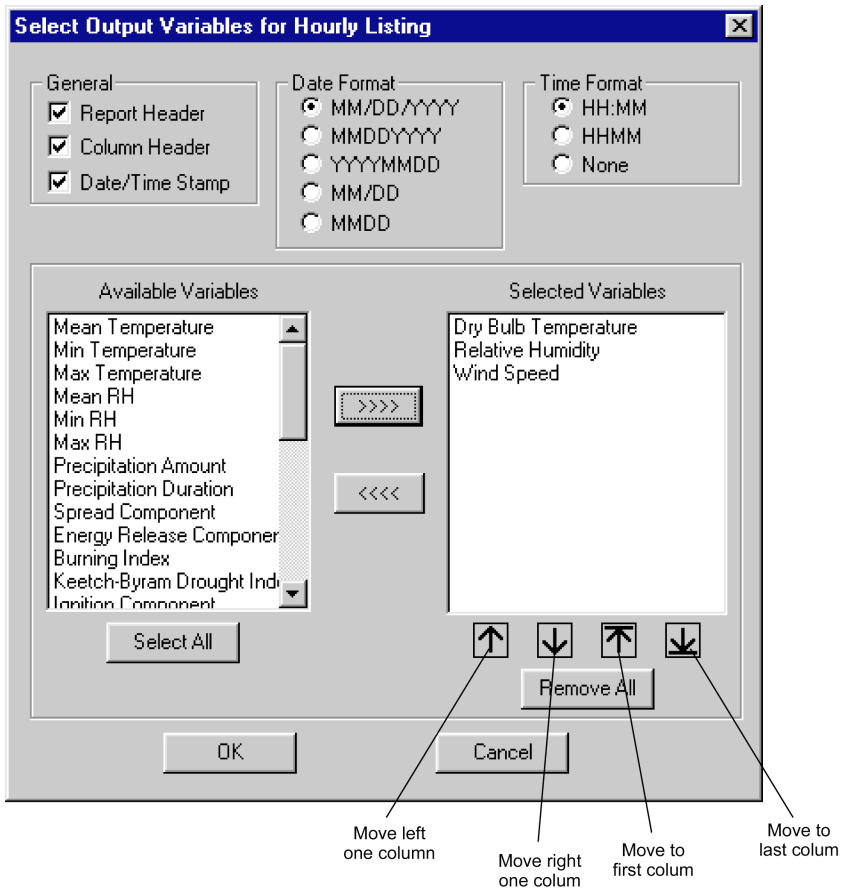
Generating hourly listings

Like everywhere else in FireFamily Plus, your hourly data analysis results are controlled by how you configure your active working set.

To generate an hourly listing

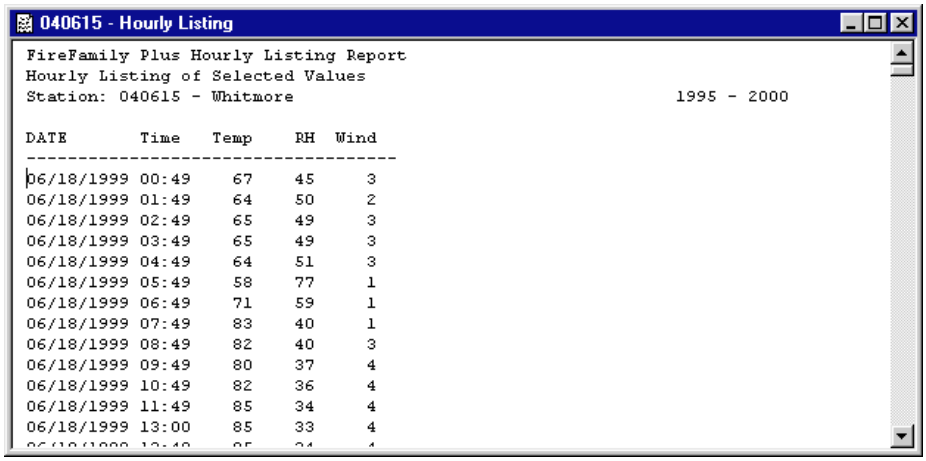
1. On the **Weather** menu, point to **Hourly Data Analysis**, then click **Hourly Listings**.
2. Select the **General** formatting, **Data Format**, and **Time Format** options of your choice.
3. In the **Available Variables** column, highlight the variable of your choice, and then click >>>> to move that variable to the **Selected Variables** column. To generate an hourly listing for every available variable, click **Select All**.
4. To generate the hourly listing, click **OK**.

The following diagram shows the Select Output Variables for Hourly Listing dialog box.



To change the order of your Selected Variables, highlight the Selected Variable of your choice and then click the up and down arrows to move it up or down.

The following diagram shows the resulting hourly listing for Dry Bulb Temperature, Relative Humidity, and Wind Speed.



040615 - Hourly Listing

FireFamily Plus Hourly Listing Report
Hourly Listing of Selected Values
Station: 040615 - Whitmore 1995 - 2000

DATE	Time	Temp	RH	Wind
06/18/1999	00:49	67	45	3
06/18/1999	01:49	64	50	2
06/18/1999	02:49	65	49	3
06/18/1999	03:49	65	49	3
06/18/1999	04:49	64	51	3
06/18/1999	05:49	58	77	1
06/18/1999	06:49	71	59	1
06/18/1999	07:49	83	40	1
06/18/1999	08:49	82	40	3
06/18/1999	09:49	80	37	4
06/18/1999	10:49	82	36	4
06/18/1999	11:49	85	34	4
06/18/1999	13:00	85	33	4

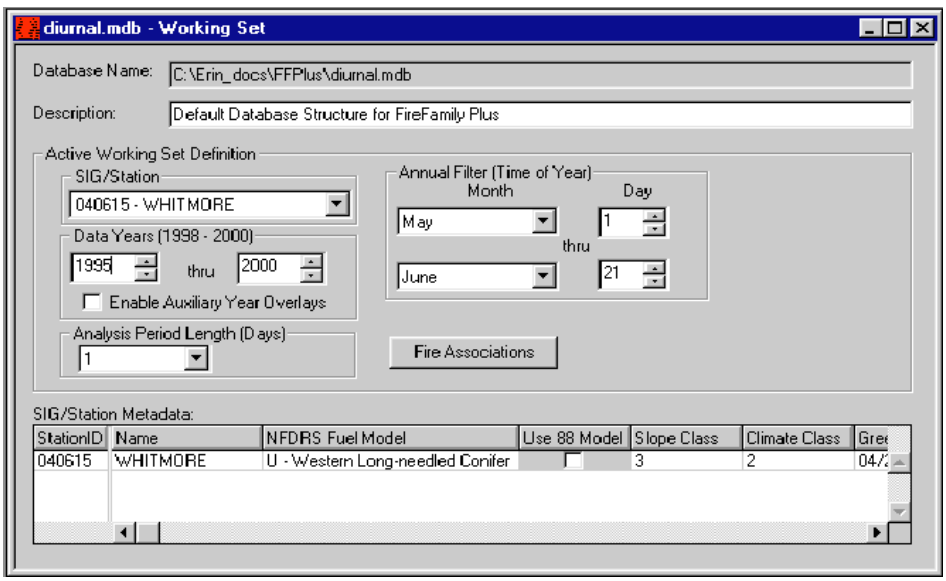
Generating diurnal graphs

The Diurnal Graphs option allows you to determine the hourly average value for all days in your active working set. It also allows you to generate a companion report of the average value for each hour for each day of the year, *not for **each** day of **each** year.*

Each variable you select will produce one graph. FireFamily Plus version 2.0 does not support multiple variables on a single graph.

There are no overlays or graphic configuration options for diurnal graphs.

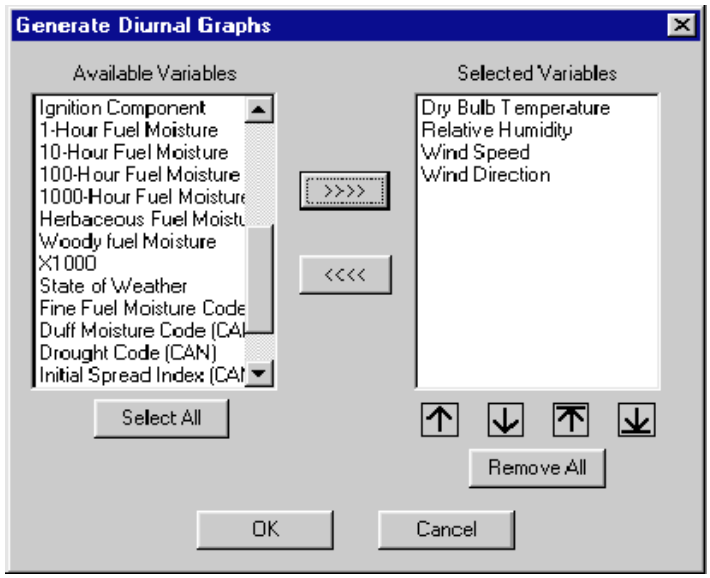
The following diagram shows the active working set used for the examples in this chapter.



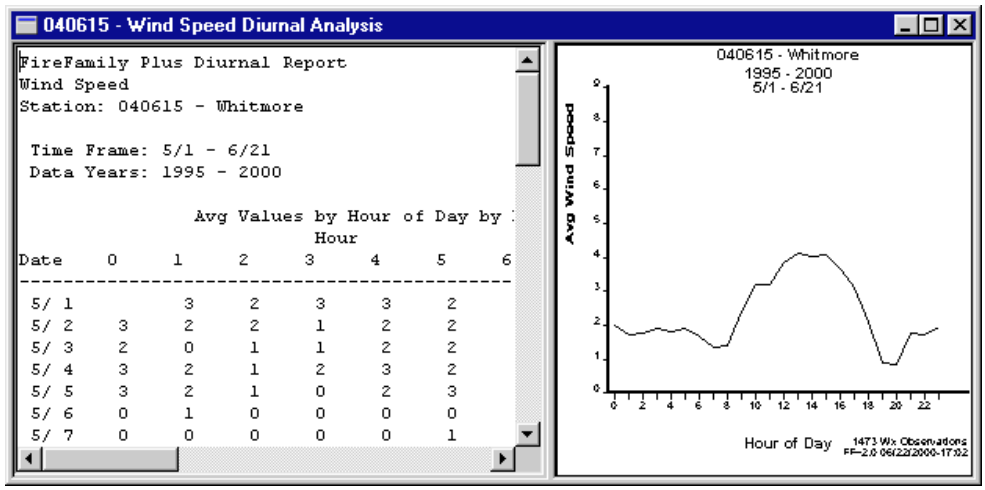
To generate an diurnal graph

1. On the **Weather** menu, point to **Hourly Data Analysis**, then click **Diurnal Graphs**.
2. In the **Available Variables** column, highlight the variable of your choice, and then click >>>> to move that variable to the **Selected Variables** column. To generate diurnal graphs for every available variable, click **Select All**.
3. To generate the diurnal graphs, click **OK**.

The following diagram shows the Generate Diurnal Graphs dialog box.



The following diagram shows the resulting Wind Speed Diurnal Analysis graphs.

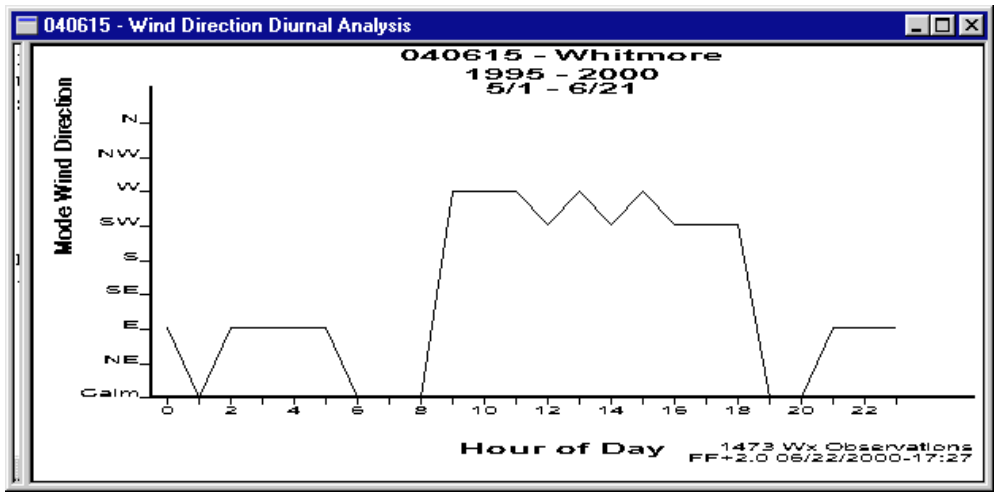


The report on the left displays the average value for each day in the working set. For example, on May 1st the average 0300 wind speed is 3 miles/hour for the years 1995 through 2000.

The graph on the right displays the "0000" through "2300" hourly averages for all days in the working set, which is essentially the average of each column in the report. For the years 1995 through 2000 for all days, May 1st through June 21st, the 0300 mean wind speed is about 2 miles/hour and rises to about 4 miles/hour at 1300.

The graph may not always display the precise average of each column in the report. The report does not display the number of observations for each day/ hour, which may vary from cell to cell.

The following diagram shows the resulting mode wind direction graph. Instead of a numerical average, the mode direction identifies the most often occurring direction.



Wind directions are classified to the eight standard wind directions in a fire weather observation, where 0 = Calm, 1 = NE, 2 = E and so on. In this example, the daytime prevailing wind direction is from the West or Southwest, while the night prevailing wind direction has an easterly component with a few hours of calm between 0600 and 0800.

Remember, this summary is based on your active working set.

To save your diurnal reports and graphs

1. On the **File** menu, point to **Save,** and then click **Report** or **Graph**.
2. Type a name of your choice and then click **Save**. Reports are saved using the .txt file extension. Graphs can be saved in a variety of file formats.

Exporting hourly weather data to FarSite

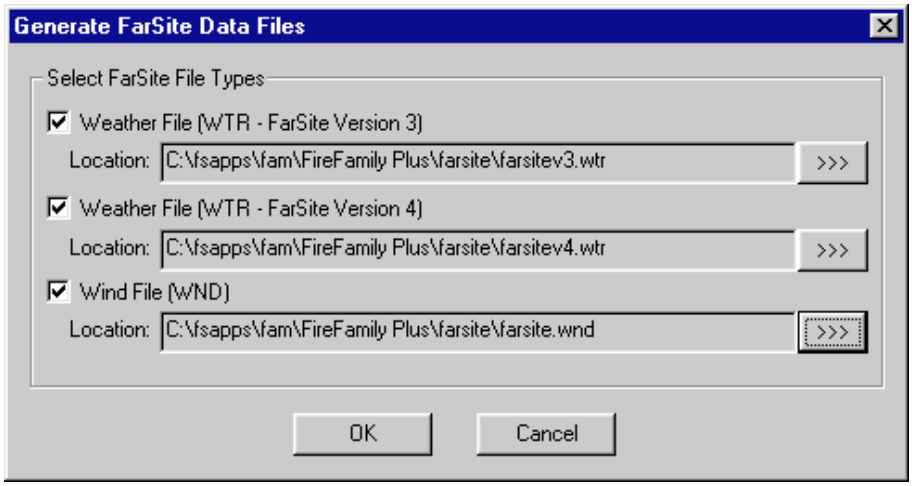
The FarSite Exports option allows you to automatically create FarSite export files from your active working set, one file for each day. These files are compatible to FarSite version 3 and version 4, which is due for release in the fall of 2000.

Generally, select a period from a specific year from your climatology analysis period of weather for your Farsite simulations.

To create a FarSite export file

1. On the **Weather** menu, point to **Hourly Data Analysis**, then click **FarSite Exports**.
2. Select the **FarSite File Types** check boxes of your choice, click >>>> to browse the folder location of your choice, and then type the **File Name** of each export file.

The following diagram shows the Generate FarSite Data Files dialog box.



You can save these export files in any folder you choose.

The following diagram shows the layout of the export weather file for FarSite version 3. This weather file has one summary record per day. The fields are month, day, precipitation amount, time of minimum temperature, time of maximum temperature, minimum temperature, maximum temperature, maximum relative humidity, minimum relative humidity, and station elevation.

C:\fsapps\fam\FireFamily Plus\farsite\farsitev3.wtr

```
7 1 0 549 1549 64 99 64 18 400
7 2 0 449 1449 56 90 70 16 400
7 3 0 449 1349 51 77 46 26 400
7 4 0 249 1549 49 82 55 18 400
7 5 0 449 1449 58 94 39 18 400
7 6 0 149 1349 59 93 59 18 400
7 7 0 449 1300 53 88 60 17 400
7 8 0 549 1449 66 96 32 18 400
7 9 0 549 1549 60 99 54 16 400
7 10 0 449 1549 62 106 46 13 400
7 11 0 49 1449 68 108 50 13 400
7 12 0 549 1049 74 101 41 23 400
7 13 0 549 1049 74 101 41 23 400
7 14 0 2349 1549 63 97 72 23 400
7 15 0 349 1449 59 90 76 30 400
7 16 0 449 1449 54 86 90 31 400
7 17 0 449 1649 52 85 83 25 400
7 18 0 249 1449 52 89 64 21 400
7 19 0 349 1649 56 87 57 23 400
```

The following diagram shows the wind export file. It contains an hourly listing for each day in the working set range and identifies month, day, hour/minute, wind speed, direction (azimuth), and cloud cover.

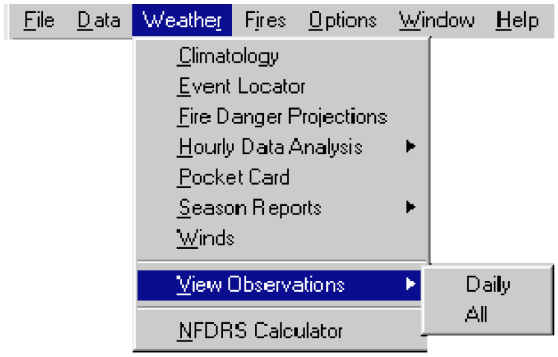
C:\fsapps\fam\FireFamily Plus\farsite\farsite.wnd

```
7 1 49 3 110 0
7 1 149 3 120 0
7 1 249 1 90 0
7 1 349 2 95 0
7 1 449 3 106 0
7 1 549 0 0 0
7 1 649 1 82 0
7 1 849 3 268 0
7 1 949 2 238 0
7 1 1049 2 179 0
7 1 1149 3 291 0
7 1 1300 3 266 0
7 1 1349 3 181 0
7 1 1449 4 218 0
7 1 1549 4 252 0
7 1 1649 2 278 0
7 1 1749 2 216 0
7 1 1849 2 179 0
7 1 1949 2 197 0
```

Cloud cover is "0" unless rain occurred during the hour. If rain occurred, it is set to "100." In this example, no rain occurred.

Viewing hourly observations

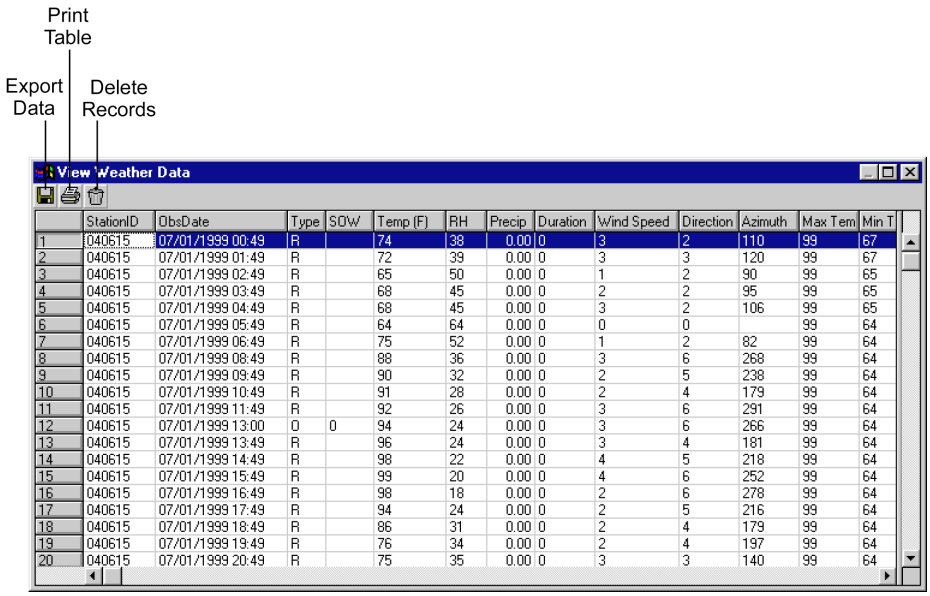
The View Observations option on the Weather menu allows you to view either daily observations (1300 NFDRS type "O" observations) or all observations in your active working set.



To view all observations in your working set

- On the **Weather** menu, point to **View Observations**, and then click **All**.

The following diagram shows all observations in your working set. Notice the buttons available on the toolbar.

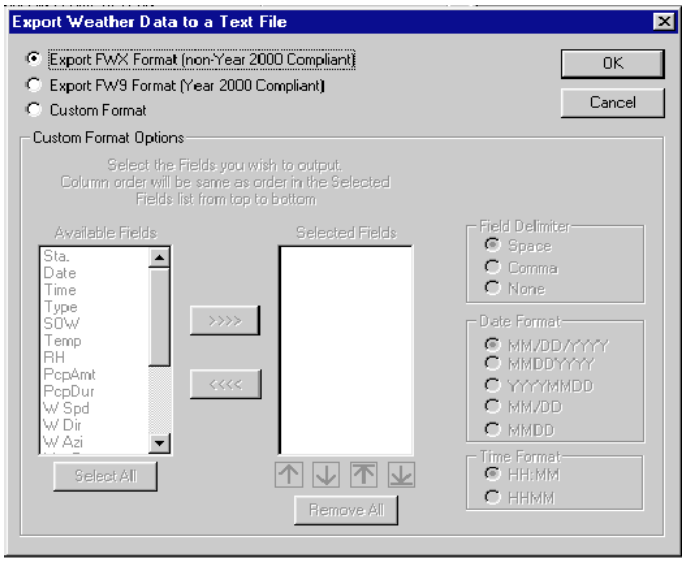


	StationID	ObsDate	Type	SOW	Temp (F)	RH	Precip	Duration	Wind Speed	Direction	Azimuth	Max Tem	Min T
1	040615	07/01/1999 00:49	R		74	38	0.00	0	3	2	110	99	67
2	040615	07/01/1999 01:49	R		72	39	0.00	0	3	3	120	99	67
3	040615	07/01/1999 02:49	R		65	50	0.00	0	1	2	90	99	65
4	040615	07/01/1999 03:49	R		68	45	0.00	0	2	2	95	99	65
5	040615	07/01/1999 04:49	R		68	45	0.00	0	3	2	106	99	65
6	040615	07/01/1999 05:49	R		64	64	0.00	0	0	0		99	64
7	040615	07/01/1999 06:49	R		75	52	0.00	0	1	2	82	99	64
8	040615	07/01/1999 08:49	R		88	36	0.00	0	3	6	268	99	64
9	040615	07/01/1999 09:49	R		90	32	0.00	0	2	5	238	99	64
10	040615	07/01/1999 10:49	R		91	28	0.00	0	2	4	179	99	64
11	040615	07/01/1999 11:49	R		92	26	0.00	0	3	6	291	99	64
12	040615	07/01/1999 13:00	O	0	94	24	0.00	0	3	6	266	99	64
13	040615	07/01/1999 13:49	R		96	24	0.00	0	3	4	181	99	64
14	040615	07/01/1999 14:49	R		98	22	0.00	0	4	5	218	99	64
15	040615	07/01/1999 15:49	R		99	20	0.00	0	4	6	252	99	64
16	040615	07/01/1999 16:49	R		98	18	0.00	0	2	6	278	99	64
17	040615	07/01/1999 17:49	R		94	24	0.00	0	2	5	216	99	64
18	040615	07/01/1999 18:49	R		86	31	0.00	0	2	4	179	99	64
19	040615	07/01/1999 19:49	R		76	34	0.00	0	2	4	197	99	64
20	040615	07/01/1999 20:49	R		75	35	0.00	0	3	3	140	99	64

To save (export) observation records to your personal computer

- Click **Export Data**, select the file format of your choice, and the save the file in a folder of your choice.

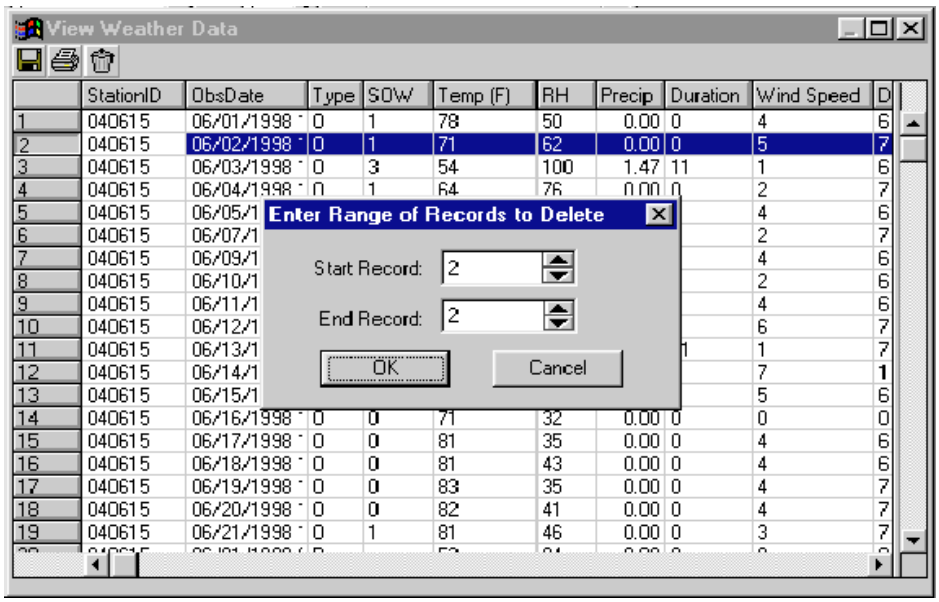
The following diagram shows the Export Weather Data to a Text File dialog box. From here, you can export weather data and save it in a variety of formats.



To delete a range of observations from your active working set

1. Select the record of your choice, and then click **Delete Records**.
2. In the **Start Record** box, type or select the first record of your choice.
3. In the **End Record** box, type or select the last record of your choice, and then click **OK**.
4. To confirm the delete, click **OK**.

The following diagram shows the Enter Range of Records to Delete dialog box.

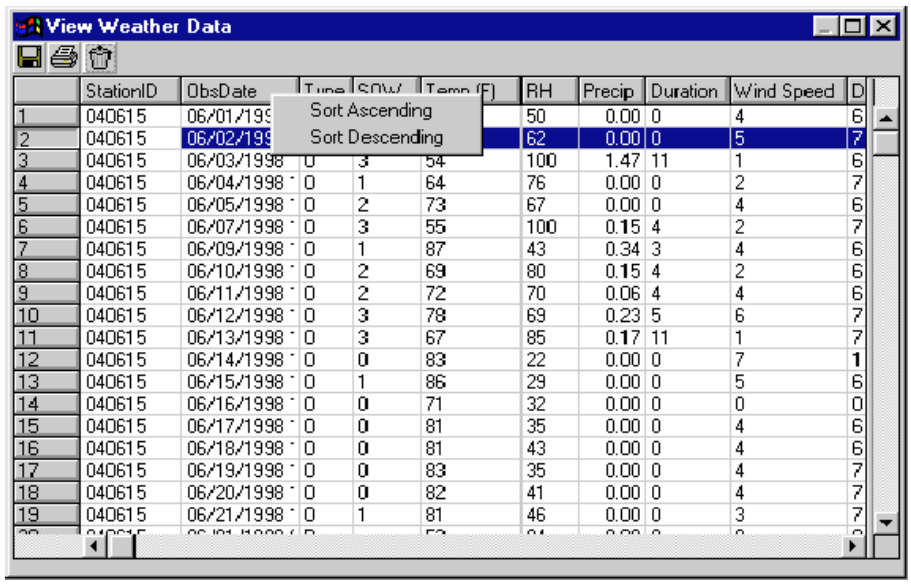


The following diagram shows the warning message for deleting weather observations from your active working set.

To sort the weather observations

- Right-click on the column of your choice, and then select either **Sort Ascending** or **Sort Descending**.

The following diagram shows the View Weather Data listing as it appears when you right-click on the ObsDate column.



	StationID	ObsDate	Type	SOW	Temp (F)	RH	Precip	Duration	Wind Speed	D
1	040615	06/01/199				50	0.00	0	4	6
2	040615	06/02/199				62	0.00	0	5	7
3	040615	06/03/1998	0	3	54	100	1.47	11	1	6
4	040615	06/04/1998	0	1	64	76	0.00	0	2	7
5	040615	06/05/1998	0	2	73	67	0.00	0	4	6
6	040615	06/07/1998	0	3	55	100	0.15	4	2	7
7	040615	06/09/1998	0	1	87	43	0.34	3	4	6
8	040615	06/10/1998	0	2	69	80	0.15	4	2	6
9	040615	06/11/1998	0	2	72	70	0.06	4	4	6
10	040615	06/12/1998	0	3	78	69	0.23	5	6	7
11	040615	06/13/1998	0	3	67	85	0.17	11	1	7
12	040615	06/14/1998	0	0	83	22	0.00	0	7	1
13	040615	06/15/1998	0	1	86	29	0.00	0	5	6
14	040615	06/16/1998	0	0	71	32	0.00	0	0	0
15	040615	06/17/1998	0	0	81	35	0.00	0	4	6
16	040615	06/18/1998	0	0	81	43	0.00	0	4	6
17	040615	06/19/1998	0	0	83	35	0.00	0	4	7
18	040615	06/20/1998	0	0	82	41	0.00	0	4	7
19	040615	06/21/1998	0	1	81	46	0.00	0	3	7

To increase a column width

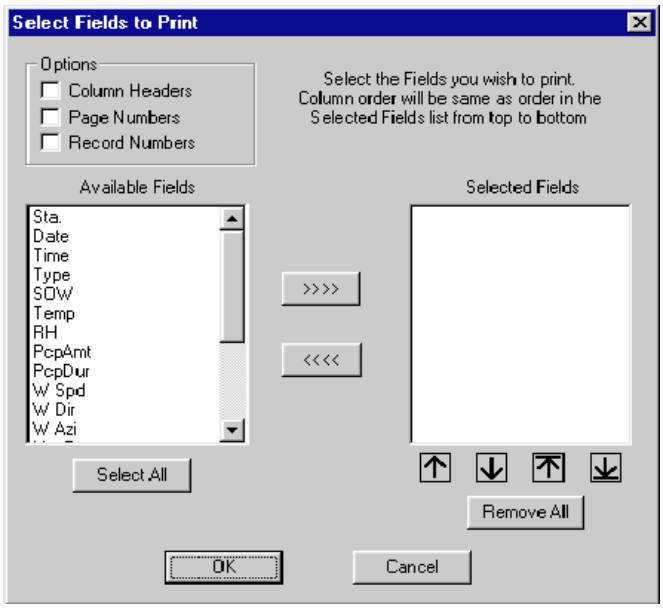
- Position the pointer in the column heading of your choice, and then drag to the right or to the left to increase or decrease the column width.

You can also increase or decrease the height of any row using this same method.

To print the weather observations in your working set

- Click **Print Table**, select the **Options** and **Available fields** of your choice, and then click **OK**.

The following diagram shows the Select Fields to Print dialog box.



Since you are dealing with hourly data, printing these files may require vast quantities of paper! Be sure that is what you want to do!

Appendix A. Retrieving NIFMID data using KCFAST

This chapter explains how to use the Kansas City Fire Access Software (KCFAST) to download information into FireFamily Plus. KCFAST allows you to extract weather and fire occurrence data and station catalog information from the National Interagency Fire Management Integrated Database (NIFMID). Topics include:

- Accessing KCFAST
- Retrieving weather, fire occurrence, and station catalog data
- Downloading files from the ftp site to your personal computer.

Accessing KCFAST

KCFAST is available on the Fire and Aviation Management web page

http://famweb.nwcg.gov.

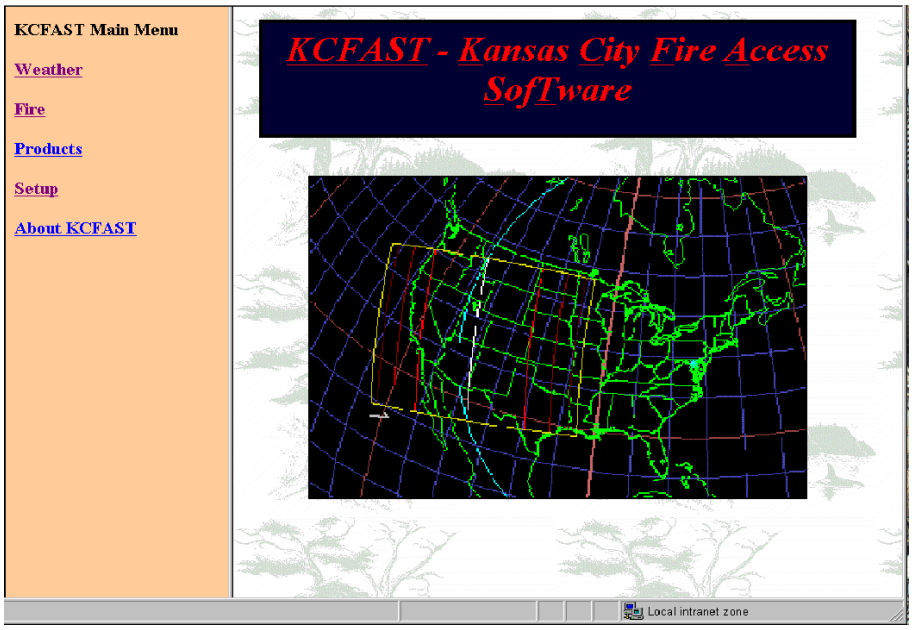
You must have a valid WIMS/NIFMID logon ID and password to retrieve data from NIFMID. For more information, send your request to ***fire_help@dms.nwcg.gov***

To access KCFAST from the Internet

1 Start your Internet browser.

2 In the address box, type **http://famweb.nwcg.gov** then press ENTER.

3 Click **KCFAST**.



After accessing this web page, you can save time later by adding this address to your browser as a bookmark.

To setup your WIMS/NIFMID logon ID for KCFAST retrievals

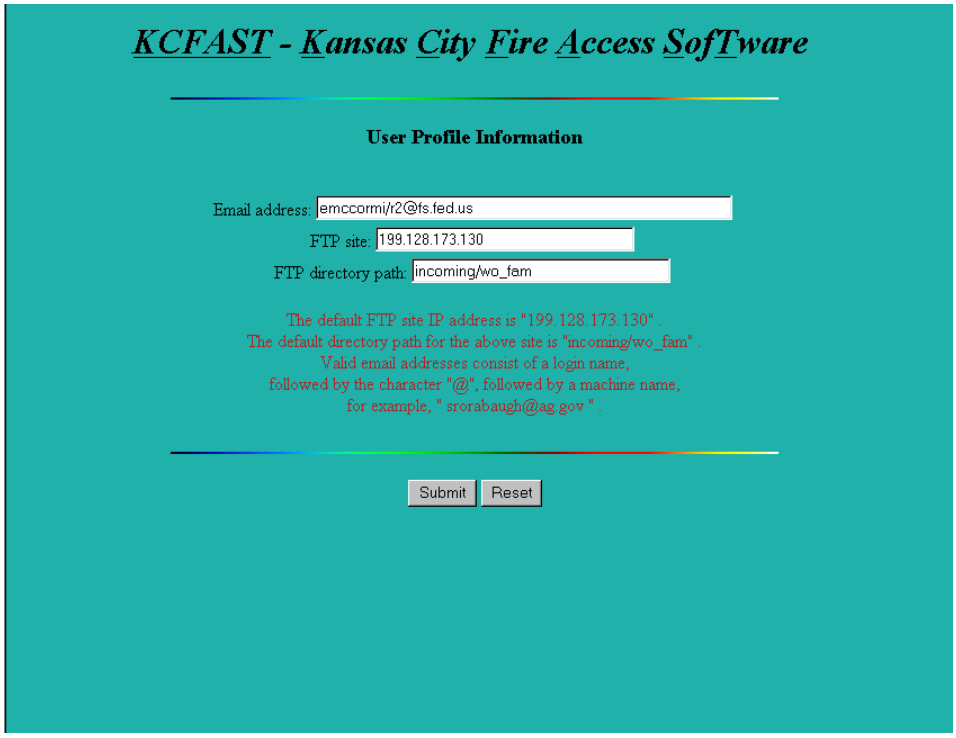
1 From the **KCFAST Main Menu**, click **Setup**.

2 Type your **Username** and **Password**, and then click **OK**.

Your Username is in the format:
ops$[WIMS/NIFMID logon id]
For example, "ops$fs1234" is a valid Username.

3 Type your **Email address**, and then click **Submit**.

The following User Profile Information screen shows a sample Email address.



Retrieving weather, fire occurrence, and station catalog data

There are three basic types of data that you can retrieve from NIFMID:

- Historical fire weather data identifies data collected from specific weather stations.
- Fire occurrence data identifies data collected from the U.S. Forest Service.
- Station catalogs identify key weather station information.

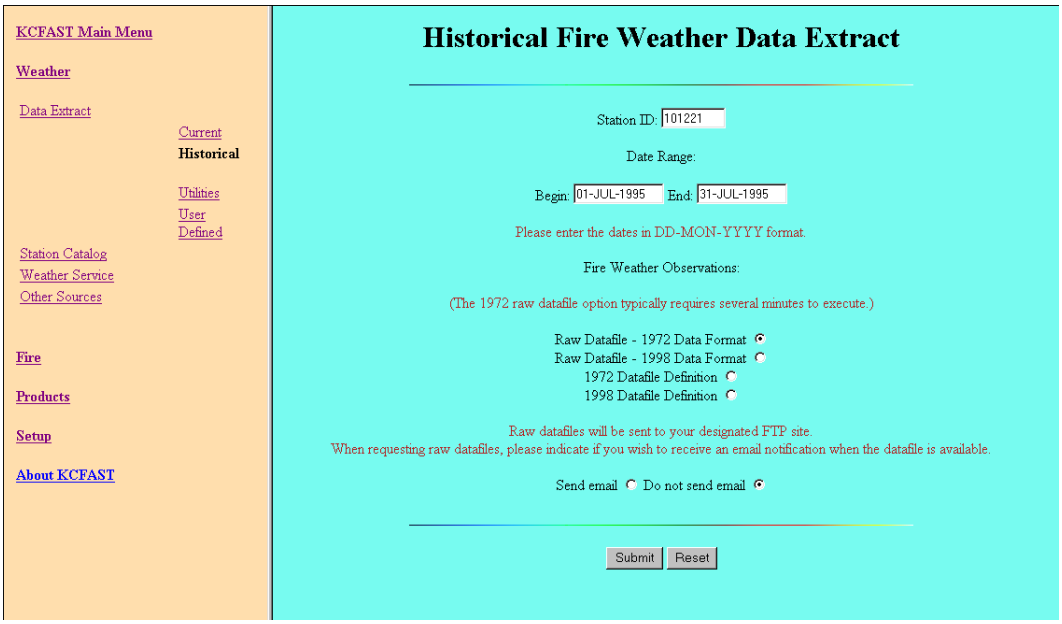
Be sure to select "Send file to ftp site" when retrieving weather data from KCFAST. Currently, FireFamily Plus does not reliably import raw fire occurrence files retrieved with a browser.

To retrieve historical fire weather data

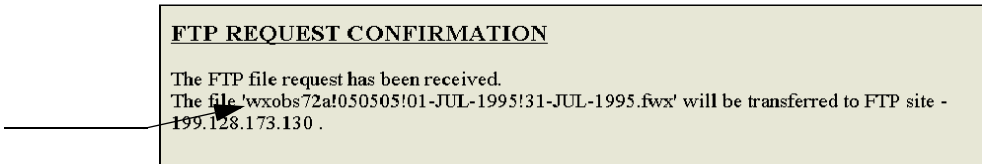
Although historical fire weather data is either saved in "72" format or "98" format, you will request most of your retrievals in the "72" format. For more information about these formats, see Appendix A, "WIMS file formats."

1. From the **KCFAST Main Menu**, click **Weather**.
2. Click **Data Extract**, and then click **Historical**.
3. Type the **Station ID**, and then **Begin** and **End Date Range**.
4. Click **Raw Datafile - 1972 Data Format**.
5. Select the email notification option of your choice, and then click **Submit**.

   The following Historical Fire Weather Data Extract screen shows a retrieval for station 101221 and spanning the month of July, 1995.



The following screen shows a sample FTP REQUEST CONFIRMATION message for station ID "050505."



6. Write down the file name so that you can locate this file when you access the site **ftp.fs.fed.us**.

To retrieve U.S. Forest Service fire occurrence data

1 From the **KCFAST Main Menu**, click **Fire**.

2 Click **Standard Extract**.

3 Type the two digit **Region** and two digit **Forest** numbers.

4 Type the **Begin Year** and **End Year Date Range**.

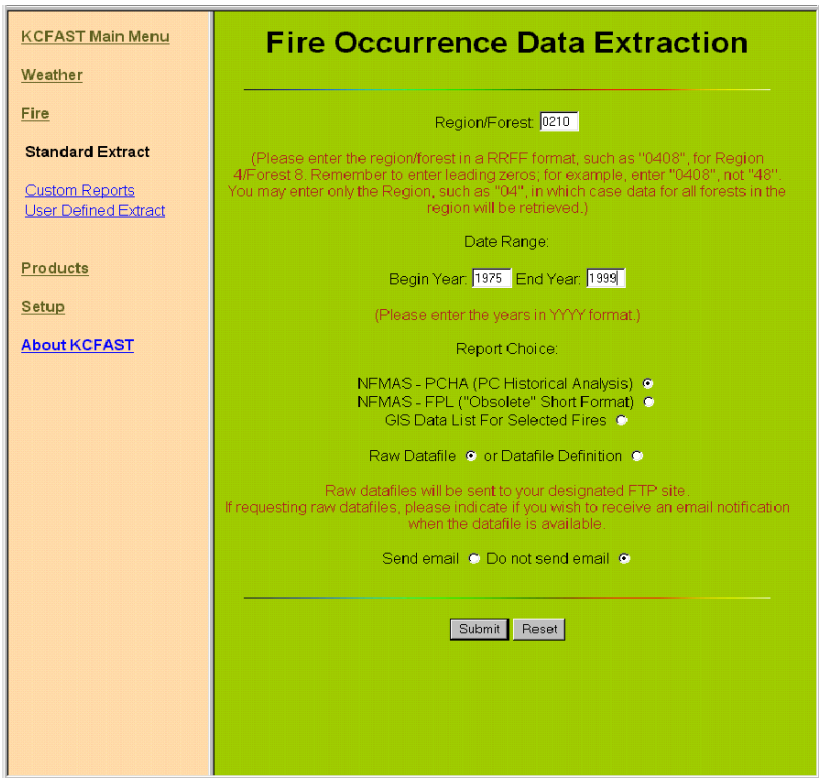
5 Click **NFMAS - PCHA (PC Historical Analysis)**.

6 Click **Raw Datafile**.

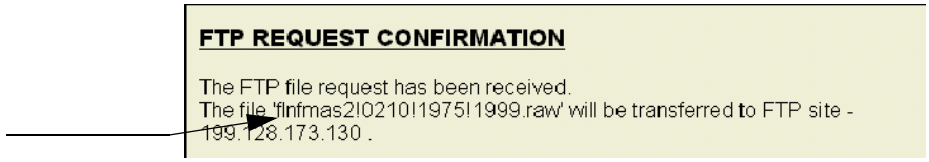
*For more information about RAW and FPL data layouts, click **Datafile Definition**.*

7 Select the email notification option of your choice, and then click **Submit**.

The following Fire Occurrence Data Extraction screen shows a retrieval for Region 02, Forest 10 and spanning the years 1975 through 1999.



The following screen shows a FTP REQUEST CONFIRMATION message.



8 Write down the file name so that you can locate this file when you access the site **ftp.fs.fed.us**.

To retrieve station catalog information for a single station

1 From the **KCFAST Main Menu**, click **Weather**.

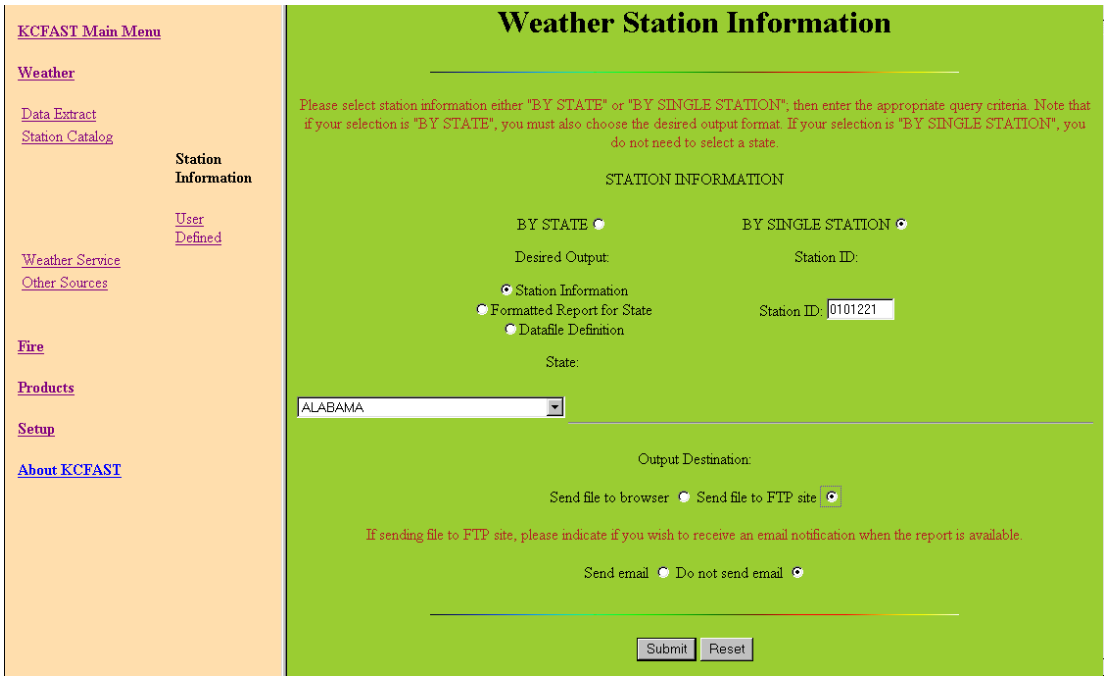
2 Click **Station Catalog**, and then click **Station Information**.

3 Click **BY SINGLE STATION**, and then type the desired **Station ID**.

4 Click **Send file to FTP site.**

5 Select the email notification option of your choice, and then click **Submit**.

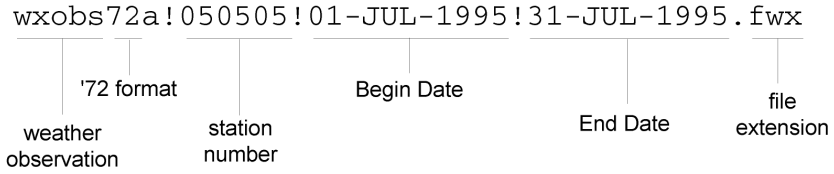
The following Weather Station Information screen shows a station information retrieval for station "050505."



6 Write down the file name so that you can locate this file when you access the site **ftp.fs.fed.us**.

Downloading files from the ftp site to your personal computer

In KCFAST, retrievals are named so that you can easily identify each file and its contents. For example, you can identify a KCFAST weather observation retrieval as follows:



If you choose, you can rename KCFAST retrievals when you download the file. Use the following list as a guideline:

- [forestname].fpl for fire occurrence files at the forest level, minus the fire name
- wx[stationID].fwx for weather observation files in the 72 format
- wx[stationID].fw9 for weather observation files in the 98 format
- [forestname].raw for fire occurrence files at the district level, including fire name, in the full FS5100-29 report format
- [name].txt for text files to be imported into FireFamily Plus.

*For record layouts of RAW and FPL files, follow the procedure outlined on page 2.4, "To retrieve U.S. Forest Service fire occurrence data." For step 6, click **Datafile Definition**.*

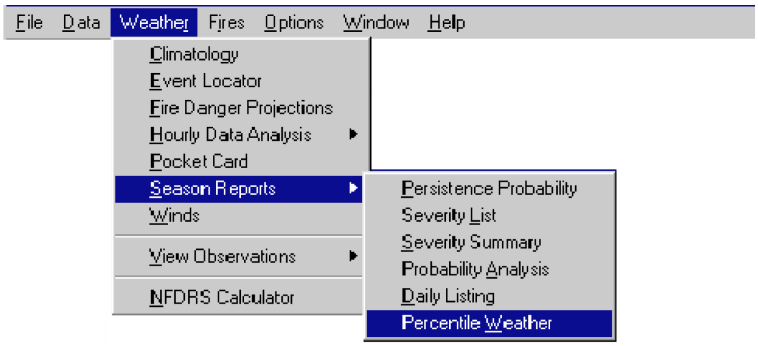
Before downloading fire weather, fire occurrence, and station catalog files, you can better organize your retrievals by storing them in separate folders. For example, to store weather observation files, create the folder "fsapps/fam/FireFamily Plus/FWX files." To store fire occurrence files, create the folder "fsapps/fam/FireFamily Plus/RAW files." To store a working set database, create the folder "fsapps/fam/FireFamily Plus/MDB files."

To download a file from ftp.fs.fed.us

1. Start your Internet browser.
2. In the address box, type **ftp://ftp.fs.fed.us/incoming/wo_fam** then press ENTER.
3. Right-click the file name of your choice, click **Copy to folder,** then double-click the folder of your choice.

Appendix B. Using FireFamily Plus with RERAP

The Percentile Weather report allows you to select a variable and select a wind direction for preparing a Rare Event Risk Assessment Program (RERAP) report.

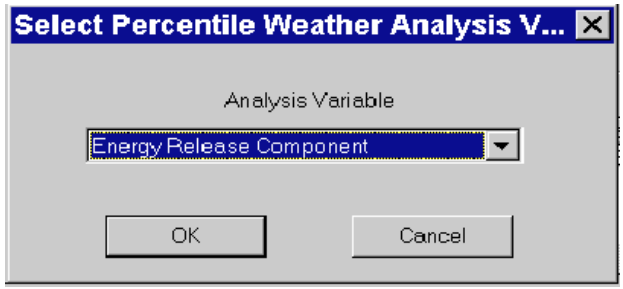


For example, given an ignition in an area approved for wildland fire use for resource benefits, you can use historical weather records, fuels, and weather conditions to calculate the probability of the fire being pushed to a particular point of concern.

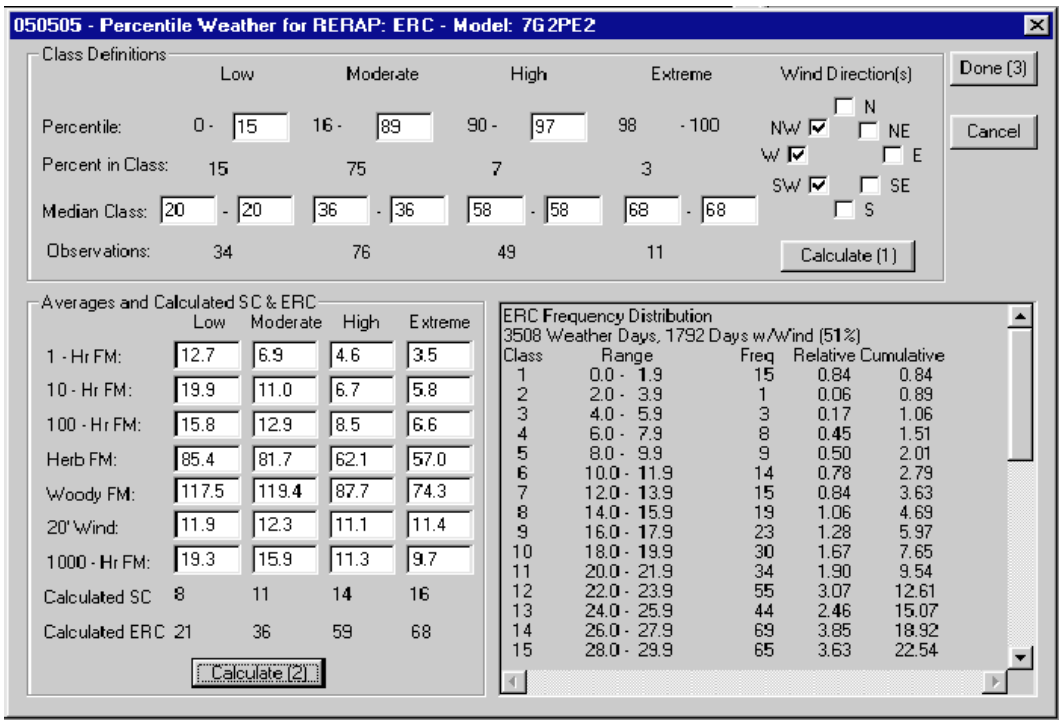
To generate a Percentile Weather report

1. On the **Weather** menu, click **Season Reports**, and then click **Percentile Weather**.
2. In the **Analysis Variable** list, select the desired variable, and then click **OK**.
3. Click the desired **Wind Direction(s)** that would head the fire toward the point of concern.
4. To calculate fuel moisture and wind speeds associated with the ERC values, click **Calculate (1)**.
5. To calculate an ERC and SC from the fuel moisture and wind speed values, click **Calculate (2)**.
6. To obtain a table and a printable report, click **Done (3)**.

The following diagram shows Energy Release Component selected as the percentile weather analysis variable.



The resulting diagram combines many RERAP calculations into one screen.



The following diagram shows the Percentile Weather for RERAP report.

050505 - Percentile Weather for RERAP: ERC - Model: 7G2PE2

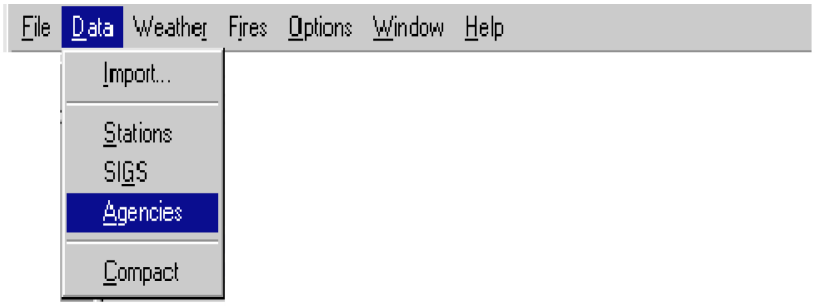
```
FireFamily Plus Percentile Weather Report for RERAP

 Station: 050505: REDFEATHER              Variable: ERC
 Model: 7G2PE2
         Data Years: 1975 - 1998
         Date Range: May 1 - October 31
Wind Directions: SW, W, NW

Percentiles, Probabilities, and Mid-Points
    Variable/Component Range        Low        Mod        High       Ext
            Percentile Range     0 - 15    16 - 89    90 - 97    98 - 100
       Climatol. Probability        15         75          7          3
          Mid-Point    ERC      20 -  20   36 -  36   58 -  58   68 -  68
            Num Observations        34         76         49         11
     Calculated Spread Comp.         8         11         14         16
               Calculated ERC       21         36         59         68

Fuel Moistures
        1 Hour Fuel Moisture      12.70       6.90       4.60       3.50
       10 Hour Fuel Moisture      19.90      11.00       6.70       5.80
      100 Hour Fuel Moisture      15.80      12.90       8.50       6.60
    Herbaceous Fuel Moisture      85.40      81.70      62.10      57.00
         Woody Fuel Moisture     117.50     119.40      87.70      74.30
               20' Wind Speed     11.90      12.30      11.10      11.40
     1000 Hour Fuel Moisture      19.30      15.90      11.30       9.70

 3508 Weather Records Used, 1792 Days With Wind (51.08%)
```

For more information about RERAP, refer to "RERAP-Rare Event Risk Assessment Process User's Guide."

Appendix C. Importing data from other agencies

This appendix explains how to create and save a custom agency within the active database and then import fire occurrence data from that custom agency. Like the agency definitions, you can define a one, two, or three tier hierarchy. Topics include:

- Defining a custom agency
- Importing data from your custom agency.

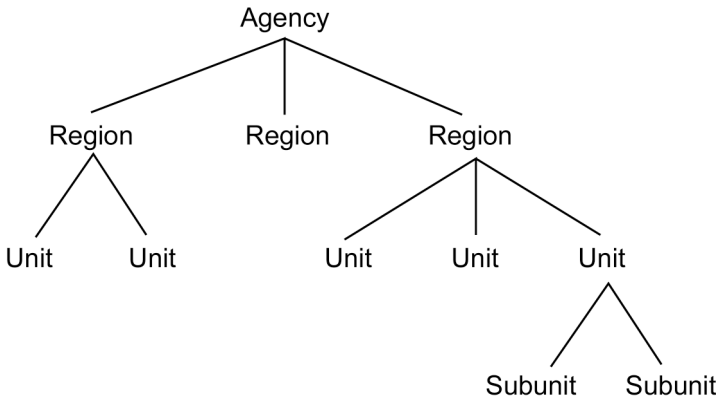


Defining a custom agency

A custom agency allows you to associate fires with a SIG or station. When you create a custom agency, you must know the following:

- the name of the units
- the codes of the units as found in the import files.

The following diagram shows the tree-like structure of an agency.



If your import files do not contain codes for regions, units, or subunits, assign a "dummy code" that allows you to select the region, unit, and/or subunit as the default for the entire file.

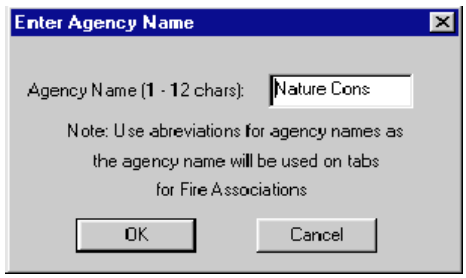
This section explains how to create a two-tier custom agency, including a region and unit. You must define a region as the first tier. However, you must only define unit and subunit tiers if these are required for your agency.

To create a custom agency

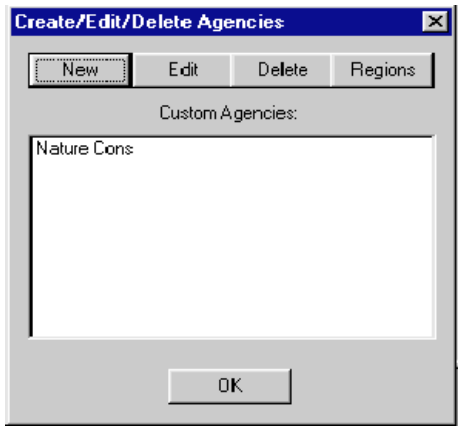
1 On the **Data** menu, click **Agencies**.

2 Click **New**, type the new agency name in the **Agency Name** box, and then click **OK**.

The following diagram shows the new agency name, "Nature Cons."



The following diagram shows the new agency displayed on the Create/Edit/Delete Agencies dialog box.

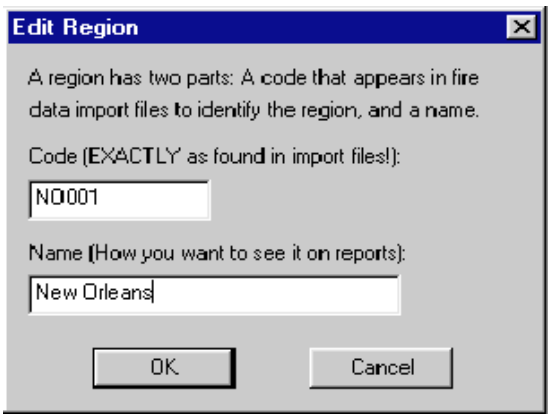


To define a region for your custom agency

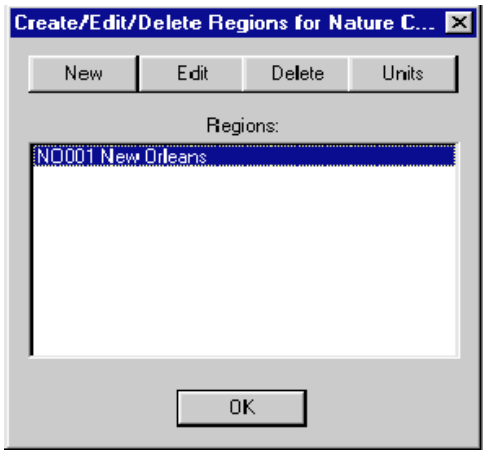
1 Click the custom agency of your choice, and then click **Regions**.

2 Type the **Code** and **Name** of the region and then click **OK**.

The following diagram shows the Edit Region dialog box.



The following diagram shows the new SouthWest District 1 region.



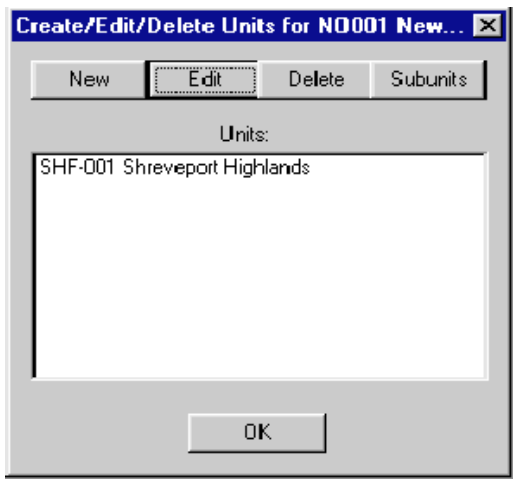
To define a unit for your custom agency

1 Click the region of your choice, and then click **Units**.

2 Type the **Code** and **Name** of the unit and then click **OK**.

The following diagram shows the Edit Units dialog box.

The following diagram shows the new Shreveport Highlands unit.



To define a subunit for your custom agency

1 Click the unit of your choice, and then click **Subunits**.

2 Type the **Code** and **Name** of the subunit and then click **OK**.

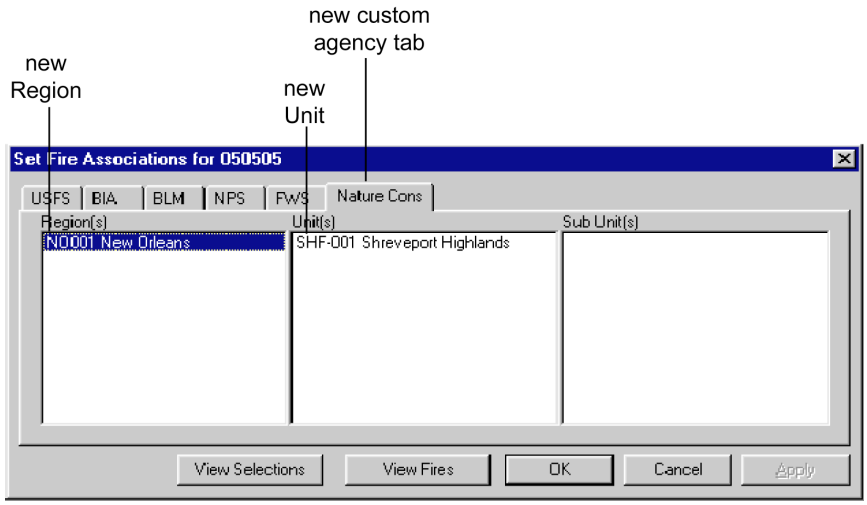
Subunits are created in the same manner as regions and units. The example in this appendix does not have any subunits defined for the custom agency.

To review the new custom agency structure

1 On the **Fires** menu, click **Associations**.

2 Click the custom agency tab of your choice.

The following diagram shows the new custom agency and hierarchy.



Importing data from your custom agency

This section explains how to define the import file format for your custom agency. Before you can define the import file format, you must first review the record layout of the data.

You may want to print out a copy of the import file, then use a ruler to delimit the columns.

To define the import file format for your custom agency

1 Review the record layout of the import file and determine the column number of the following fields

Region	Fire Number
Unit	Acres
Subunit, if any	Cause
Year, Month, and Day	Fire Name.

2 On the **Data** menu, click **Import**.

3 Select the **Agency** of your choice, then click **Fpl Files**.

Unless importing USFS files, which can be in either "fpl" or "raw" format, you can only select the Fpl Files button as the import file type.

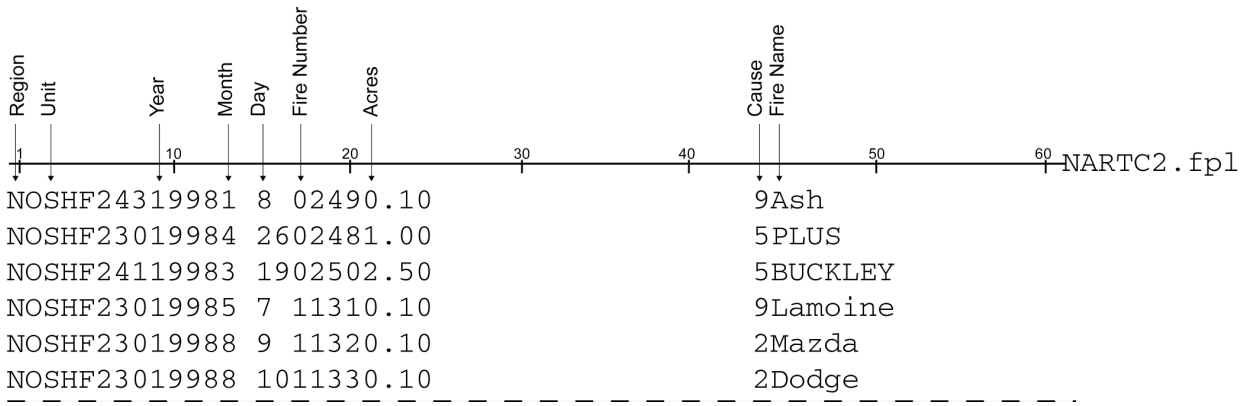
4 On the **Define Import File Format** dialog box, click the **Duplicate Checking** option of your choice.

5 Using the record layout from step 1, complete the **Record Layout** boxes.

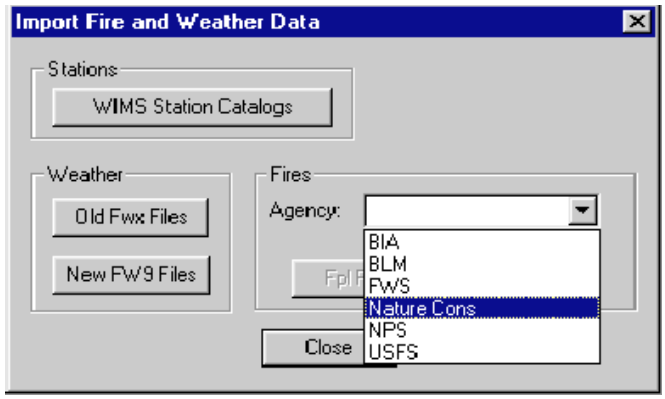
Type 0 (zero) for any field not defined in the import file.

6 When finished defining the record layout, click **OK**, then **Open** the import file of your choice.

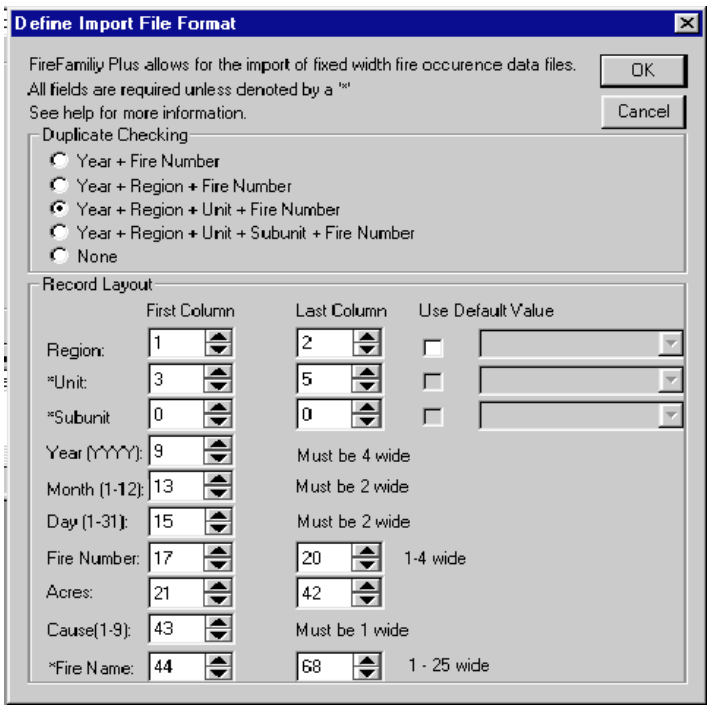
The following diagram shows the record layout and sample records for the file "NARTC2.fpl."



The following diagram shows the drop-down list box of available agencies.



The following diagram shows the Define Import File Format dialog box.



Appendix D. Adding missing subunits

This appendix explains how to add missing subunits to your FireFamily Plus template database. Once you complete this task, every subsequent database that you create will display these subunits.

Using a generic region/unit/subunit internal structure, FireFamily Plus blends fire data based on the different organizational structures of each agency. Since many Forest Service Districts have been consolidated over the years that is systematically impossible to track, you may find that you need to add missing subunits to your FireFamily Plus template database.

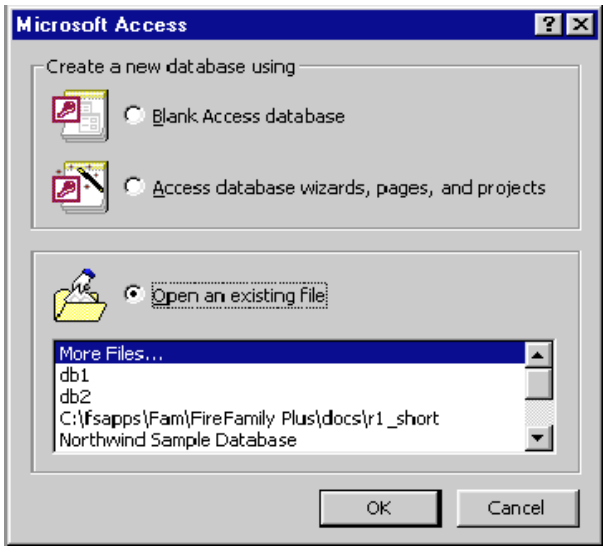
The tasks in this appendix explain how to use Microsoft Access 2000® to edit a FireFamily Plus template database previously created in Microsoft Access 97®. Exit FireFamily Plus before proceeding.

To open the template database

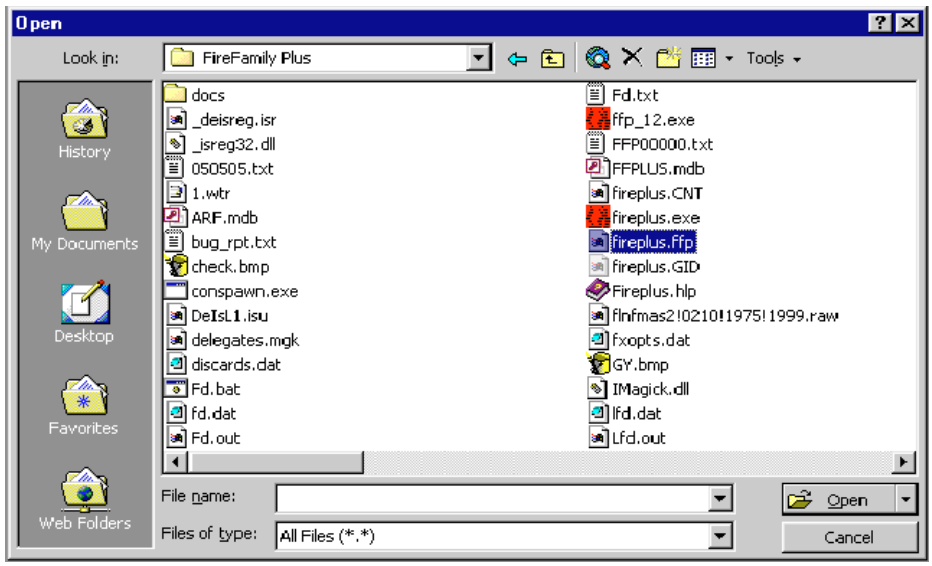
1. On the **Start** menu, point to **Programs**, and then click **Access**.
2. On the **Microsoft Access** dialog box, click **Open an existing file**, and then double-click **More Files**.
3. Open the **FireFamily Plus folder**.

   This folder is usually located in the "c:/fsapps/fam" folder.
4. In the **Files of type** box, select **All Files**, and then double-click **fireplus.ffp**.
5. In the **Convert/Open Database** dialog box, click **Open Database**, and then click **OK**.
6. Double-click **FireSubunits**.

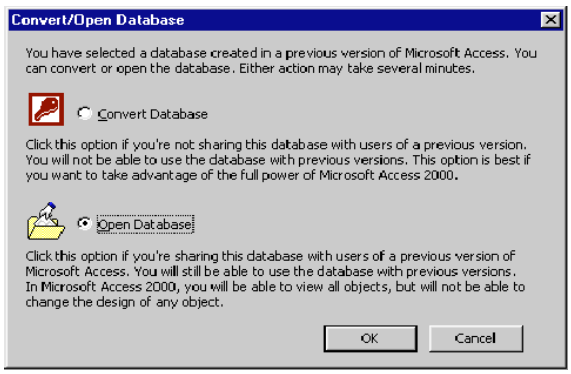
The following diagram shows the Microsoft Access dialog box.



The following diagram shows the location of the template database "fireplus.ffp."

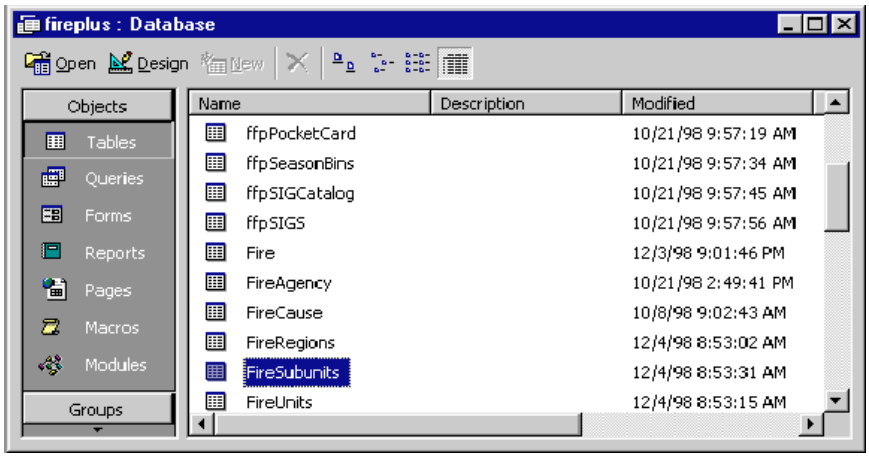


The following diagram shows the MS Access 2000 Convert/Open Database dialog box.



This dialog box does not display if you use MS Access 97 to update your template database.

The following diagram shows the "FireSubunits" table selected.



To add a subunit to the FireSubunits table - an example

This task explains how to add the missing subunit "38," district "07 Woodsey RD" to the last row "642" on the FireSubunits table.

1. Scroll down until you display the appropriate districts for your area, then review the FireSubunits table and determine if there are any missing subunits. Write down the Unit ID that pertains to any missing subunits.
2. Scroll down to the last entry in the FireSubunits table.
3. In the ***** (asterisk) row, click in the **SubunitID** column, and then type the next sequential number in the table.

   Watch for zeroes (0) that may be inadvertently inserted in the table! For example, be sure to type "642," not "6420."

4. In the **UnitID** column, type the unit identifier.
5. In the **Name** column, type the name of the missing subunit.
6. To save and exit the FireSubunits table, click **Exit** on the **File** menu.

The following diagram shows the FireSubunits table. Notice the missing subunit on the Boise National Forest.

SubunitID	UnitID	Name
182	32	03 North Kaibab RD
183	32	04 Tusayan RD
184	33	01 Smokey Bear RD
185	33	02 Cloudcroft RD
186	33	03 Guadalupe RD
187	33	04 Mayhill RD
188	34	01 Chino Valley RD
189	34	03 Bradshaw RD
190	34	05 Verde RD
191	35	01 Coyote RD
192	35	02 Cuba RD
193	35	03 Jemez RD
194	35	04 Las Vegas RD
195	35	05 Pecos RD
196	35	06 Espanola RD
197	36	01 Cave Creek RD
198	36	02 Globe RD
199	36	03 Mesa RD
200	36	04 Payson RD
201	36	05 Pleasant Valley RD
202	36	06 Tonto Basin RD
203	37	01 Flaming Gorge RD
204	37	02 Vernal RD
205	37	03 Roosevelt RD
206	37	04 Duchesne RD
207	38	01 Mountain Home RD
208	38	02 Boise RD
209	38	03 Idaho City RD
210	38	04 Cascade RD
211	38	05 Lowman RD
212	38	06 Emmett RD
213	39	01 Kemmerer RD
214	39	02 Big Piney RD
215	39	03 Greys River RD
216	39	04 Jackson RD
217	39	06 Buffalo RD
218	39	07 Pinedale RD
219	40	02 Soda Springs RD
220	40	03 Montpelier RD
221	40	04 Malad RD
222	40	05 Pocatello RD
223	41	01 Middle Fork RD
224	41	02 Challis RD
225	41	03 Yankee Fork RD
226	41	04 Lost River RD
227	42	01 Pine Valley RD

The following diagram shows the new subunit added to the end of the FireSubunits table.

FireSubunits : Table

SubunitID	UnitID	Name
610	116	02 Manchester RD
611	116	03 Hector RD
612	116	05 Rochester RD
613	117	01 Cheat RD
614	117	02 Gauley RD
615	117	03 Greenbrier RD
616	117	04 Marlinton RD
617	117	05 Potomac RD
618	117	06 White Sulphur RD
619	118	01 Ammonoosuc RD
620	118	02 Androscoggin RD
621	118	03 Evans Notch RD
622	118	04 Pemigewasset RD
623	118	05 Saco RD
624	119	10 Petersburg RD
625	119	20 Wrangell RD
626	120	03 Juneau RD
627	120	04 Admiralty Island Natl Mmt
628	120	10 Sitka RD
629	120	20 Hoonah RD
630	120	30 Juneau RD
631	120	50 Yakutat RD
632	121	10 Glacier RD
633	121	20 Cordova RD
634	121	30 Seward RD
635	122	01 Craig RD
636	122	02 Ketchikan RD
637	122	04 Thorne Bay RD
638	122	10 Craig RD
639	122	20 Ketchikan RD
640	122	40 Thorne Bay RD
641	122	50 Misty Fiords Natl Mmt
642	38	07 Woodsey RD
0	0	

This example shows you how to change the template database. To import new fire occurrence data, you must create a new database from the modified template database.

You can also modify an existing working database in the same manner, but you must re-import the fire occurrence data again to update the fires in the existing database. More than likely, these fires were rejected during the previous import process due to invalid subunits.

Glossary of fire terms

A

ambient. Surrounding, enveloping conditions. As it pertains to weather at the earth's surface, the conditions measured in the instrument shelter are considered ambient.

annual. A plant that lives for one growing season, starting from a seed each year.

aspect. Represents the aspect at the weather station site. Used in NFDRS calculations. Valid values are 1 - 8:

1 - N	5 - S
2 - NE	6 - SW
3 - E	7 - W
4 - SE	8 - NW

average precipitaiton. The historic average annual precipitation for the weather station. Used in NFDRS calculations.

average relative humidity. The arithmetic average of the maximum and minimum relative humidities measured at a fire-danger station from one basic observation time to the next.

B, C

base fuel model. The fuel model that best represents the fuels on the base area.

basic observation time. The time established to take the fire-dander observation. It should be at that time of day when the fire danger is normally the highest.

boundary conditions. The EMC commensurate with the temperature, relative humidity, and precipitation events of the preceding 24 hours.

brush. Scrub vegetation and stands of tree species that do not produce merchantable timber. *Not a synonym for slash.*

Burning Index (BI). A number related to the contribution of fire behavior to the effort of containing a fire.

climate class. Defines the drying and wetting rates for annuals, perennials, and woody plants.

D

dead fuels. Naturally occurring fuels whose moisture content is governed by relative humidity and precipitation.

deciduous. When checked, this flag signifies that trees at the weather station site are primarily deciduous. When unchecked, this flag signifies primarily coniferous trees at the weather station site. Used in NFDRS calculations.

dew point. The temperature at which a parcel of air being cooled reaches saturation (100 percent relative humidity).

diurnal. Pertains to daily cycles of temperature, relative humidity, and wind.

drought. A period characterized by a serious moisture deficiency, extensive in area and time.

dry bulb temperature. The temperature of the air.

duff. The partially decomposed organic material of the forest floor that lies beneath the freshly fallen twigs, needles, and leaves.

E

elevation. The elevation, in feet, of the weather station. Used in NFDRS calculations.

Energy Release Component (ERC). A number related to the available energy (Btu) per unit area (square foot) within the flaming front at the head of a fire.

Equilibrium Moisture Content (EMC). The moisture content that a fuel particle will attain if exposed for an infinite period in an environment of specified constant temperature and humidity. When a fuel particle has reached its EMC, the net exchange of moisture between it and its environment is zero.

escaped fire. A fire that has exceeded or is anticipated to exceed preplanned initial action capabilities, fire management direction, or selected appropriate suppression response.

extinction moisture content. The fuel moisture content, weighted over all the fuel classes, at which the fire will not spread.

F

fine fuels. The complex of living and dead herbaceous plants and dead woody plant materials less than one-fourth inch in diameter.

Fine Fuel Moisture (FFM). An adjustment to the 1-h TL FM that compensates for the presence of living plant material and the moisture content of that material. The FFM is used in the manual calculation of fire-danger ratings. It replaces the 1-h TL FM and the herbaceous fuel moisture.

firebrand. Any source of heat, natural or human-made, that is capable of igniting natural fuels.

fire-danger rating area. A geographical area within which the fire danger can be assumed to be uniform. It is relatively homogenous in climate, fuels, and topography.

fireline intensity. The rate of heat release per unit length of fire front. The most commonly used units in current fire literature are Btu/sec/ft.

fire management direction. Fire management standards, guidelines, and practices based upon land and resource management objectives. Fire management direction defines the kind, level, and timing of fire protection and use activities, including the appropriate suppression strategies that efficiently meet management objectives for each management area for the range of expected fire behavior conditions.

flaming front. That zone of a moving fire where the combustion is primarily flaming. Behind the flaming front the combustion is primarily glowing or involves the burning out of larger fuels (greater than about three inches in diameter.)

FM1 = FM10. When checked, this flag signifies that the 1-hour fuel moisture is equal to the 10-hour fuel moisture. Used in NFDRS calculations.

forecast area. The geographical area for which a fire weather forecast is specified.

freeze day of year. The day of the year (1 to 365) considered to be the historic average day for the first killing frost. Used in NFDRS calculations.

fuel class. A group of fuels possessing common characteristics. In NFDRS, dead fuels are grouped according to their timelag (1-, 10-, 100-, and 1000-hr TL). Living fuels are grouped by whether they are herbaceous (annual or perennial) or woody.

fuel model. A simulated fuel complex for which all the fuel descriptors required by the mathematical fire spread model have been specified.

fuel moisture analog. A device that emulates the moisture response of specific classes of dead fuels. Examples are basswood slats that represent the 1-h TL fuels and half-inch ponderosa pine dowels that represent the 10-h TL fuels. An analog may also be constructed of inorganic materials.

Fuel Moisture Content (also Fuel Moisture) (FM). The water content of a fuel particle expressed as a percent of the ovendry weight of the fuel particle.

fuel proportion. That length of the traverse distance on a segment, divided by the total length of the assessment line.

G, H

greenup. The beginning of a new cycle of plant growth. The greenup date may occur at different dates for different fuel models.

herb. A plant that does not develop woody, persistent tissue but is relatively soft or succulent and sprouts from the base (perennials) or develops from seed (annuals) each year. Included are grasses, forbs, and ferns.

herbaceous fuels. Undecomposed material, living or dead, derived from herbaceous plants.

herbaceous vegetation moisture content. The water content of a live herbaceous plant expressed as a percent of the ovendry weight of the plant.

holdover fires (also sleeper fires). Fires set by lightning but not discovered during the first burning period. In the NFDRS it is assumed that 25 percent of the fires are not discovered until succeeding burning periods.

Human-caused Fire Occurrence Index (HCOI). A value derived from the Human-caused Risk (HCR) sources in a rating area and the Ignition Component (IC). HCOI is interpretable in terms of expected numbers of fires on the rating area.

Human-Caused Risk (HCR). A number related to the expected number of human-produced firebrands capable of starting fires that a rating area will be exposed to during the rating period.

human-caused risk scaling factor. A number relating human-caused fire incidence to the Ignition Component (IC) on a rating area. The factor is a statistic based on three to five years of fire occurrence and fire weather data that adjusts the prediction of the basic human-caused fire occurrence model to fit local experience.

humidity. A measure of the water-vapor content of the air.

I

Ignition Component (IC). A rating of the probability that a firebrand will cause a fire requiring suppression action.

initial action. The prompt, preplanned response t a wildfire.

initiating fire. A fire that has recently started and is not crowning or spotting.

insolation. Solar radiation received at the earth's surface.

instrument shelter (also thermoscreen). A naturally or artificially ventilated structure used to shield temperature-measuring instrucments from direct sunshine and precipitation.

K, L

KCFAST, KCFAST/PC. A menu-based computer application that automatically builds and submits customized jobs from your personal computer to the IBM mainframe computer at the USDA National Information Technology Center in Kansas City.

lesser live fuels. Grasses and forbs; low nonwoody plants, annual and perennial.

Lightning Activity Level (LAL). A numerical rating of one to six, keyed to the start of thunderstorms and the frequency and character of cloud-to-ground lightning, forecasted or observed on a rating area during the rating period.

Lightning Fire Occurrence Index (LOI). A numerical rating of the potential occurrence of lightning-caused fires.

Lightning Risk (LR). A number related to the expected number of cloud-to-ground lightning discharges capable of staring fires that a rating area will be exposed to during the rating period.

lightning risk scaling factor. A factor derived from local thunderstorm and lightning-caused fire records that adjusts the predictions of the basic lightning fire occurrence model to local experience. It accounts for factors not addressed directly by the model such as susceptibility of local fuels to ignition by lightning, fuel continuity, topography, and regional characteristics of thunderstorms.

litter. The top layer of the forest floor, typically composed of loose debris such as branches, twigs, and recently fallen leaves or needles; little altered in structure by decomposition.

live fuels. Naturally occurring fuels whose moisture content is controlled by physiological processes within the living plant. The NFDRS considers only herbaceous plants and woody plant material small enough (leaves and needles, and twigs) to be consumed in the flaming front of a fire.

M

mobilization. Documented procedures in the National Interagency Mobilization Guide that defines two categories for equipment and supplies. E (equipment) requests include major firefighting items such as rolling stock, radios, telecommunications equipment, national caterers, national showers, cache vans ATMUs, and speciality items. S (supply) requests include most NFES cache items.

N, O

National Fire Danger Rating System (NFDRS). A uniform fire-danger rating system that focuses on the environmental factors that control the moisture content of fuels.

1-hour timelag fuels. Fuels consisting of dead herbaceous plants and roundwood less than one-fourth inch in diameter. Also included is the uppermost layer of litter on the forest floor.

1-hour Timelag Fuel Moisture. The moisture content of the 1-hour timelag fuels.

100-hour timelag fuels. Dead fuels consisting of roundwood one to three inches in diameter, and, very roughly, the forest floor from three-fourths inch to four inches below the surface.

100-hour Timelag Fuel Moisture. The moisture content of the 100-hour timelag fuels.

1000-hour timelag fuels. Dead fuels consisting of roundwood three to eight inches in diameter or the layer of the forest floor more than about four inches below the surface or both.

1000-hour Timelag Fuel Moisture. The moisture content of the 1000-hour timelag fuels.

P

perennial. A plant that lives fro more than two growing seasons. For fire-danger rating purposes, biennial plants are classed with perennials.

precipitation. Any or all the forms of atmospheric water, liquid, or solid that reach the ground. Usually measured to the nearest one-hundredth of an inch.

precipitation duration. The time, in hours and fraction of hours, that a precipitation event lasts. More precisely, for fire-danger rating purposes, it is the length of time that fuels are subjected to liquid water during the day.

R

Relative Humidity. The ratio of the actual amount of water vapor in the air to the amount necessary to saturate the air at that temperature and pressure. It is expressed as a percentage.

Remote Automatic Weather System (RAWS). A WIMS satellite station that automatically tracks and stores weather information.

residence time. 1. The time required for the flaming zone of a fire to pass a stationary point. 2. The width of the flaming zone divided by the rate of spread of the fire.

roundwood. Boles, stems, or limbs of woody material; that portion of the dead wildland fuels that are roughly cylindrical in shape.

S

shrub. A woody perennial plant differing from a perennial herb by its persistent and woody stem; and from a tree by its low stature and habitat of branching from the base.

slash. Branches, bark, tops, cull logs, uprooted stumps, and broken or uprooted trees left on the ground after logging; also debris resulting from thinnings or wind.

slope. Rise or fall (in feet) per 100 feet of horizontal measurement, expressed as a percentage.

Spread Component (SC). A rating of the forward rate of spread of a head fire.

standard drying day. A day producing the same net drying as a 24-hour period where the dry bulb temperature is maintained at 80° F and the relative humidity at 20 percent.

Staffing Index. A code that identifies the fuel model and forms the basis for fire-danger rating decisions.

statistical wildfire. A wildfire that burns uncontrolled in vegetative or associated flammable material and either requires suppression action to protect natural resources or values associated with natural resources, or is destructive to natural resources.

surface area-to-volume ratio. The ratio of the area of the surface of a fuel particle (square feet) to its volume (cubic feet). The higher the ratio, the *finer* the particle; for example, for grasses this ratio ranges above 2,000; for a half-inch fuel moisture stick it is 109.

T

10-hour timelag fuels. Dead fuels consisting of roundwood one-fourth to one inch in diameter and, very roughly, the layer of litter extending from just below the surface to three-fourths inch below the surface.

10-hour Timelag Fuel Moisture. The moisture content of the 10-hour timelag fuels.

U, V

unplanned ignition. A fire started at random by either natural or human causes, or a deliberate incendiary fire.

volatiles. Readily vaporized organic materials which, when mixed with oxygen, are easily ignited.

W

Weather Information Management System (WIMS). A comprehensive system that manages fire-weather information.

wildfire. An unwanted wildland fire not designated and managed as a prescribed fire and that requires appropriate suppression action.

windspeed. Wind, in miles per hour, measured at 20 feet above the ground or the average height of the vegetative cover, and averaged over at least a ten minute period.

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