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GypsES
Decision Support and Project Management

User's Guide
Version 1.0

Developed by ***USDA Forest Service:***

Northeastern Forest Experiment Station
Northeastern Area, State and Private Forestry
Southern Region, State and Private Forestry

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Introduction / How To Use This Manual

GypsES System Overview

GypsES (**Gyps**y Moth **E**xpert **S**ystem) is a computerized decision support system developed by the USDA Forest Service for natural resource managers in federal, state, and local pest management programs. GypsES provides decision support tools that help you evaluate your pest management situation and make better decisions. GypsES' geographic information system (GIS) lets you create and analyze complex map sets as well as digitize maps using topographic map backdrops or aerial photography. GypsES operates under the WindowsNT® operating system. Although GypsES was developed to support gypsy moth management programs, it can be used for other pest and nonpest resource management programs. Some practical applications of GypsES include:

- Drawing treatment blocks using topographic map backdrops (Section 7)
- Editing or viewing egg mass or pheromone trap data (Section 10)
- Predicting defoliation (Section 10)
- Creating, editing, or viewing treatment block GIS layers (Section 11)
- Predicting insect development stage to determine a treatment schedule (Section 11)
- Predicting spray deposit, drift, and efficacy of treatment (Section 11)
- Uploading/downloading treatment blocks to and from aircraft navigation systems via GPS files (Section 11)
- Displaying spray lines over treatment areas (Section 11)
- Evaluating treatment effectiveness using defoliation, egg mass, or trap data (Section 11)
- Overlaying defoliation and treatment areas (Section 11)
- Overlaying pheromone trap data and treatment areas (Section 11)

The Geographic Information System

A **geographic information system** (**GIS**) provides an organized method of entering, developing, and displaying geographically referenced data in one or more **map layers**. A GIS gives you a visual representation of data because each map layer represents a data element that can be viewed as a picture rather than a table of values. A GIS also gives you the ability to create, edit, and delete geographically structured data, link locational data to data tables, analyze data from a geographical perspective, and visually display data.

GypsES uses formats from a GIS system called **GRASS** (Geographic Resources Analysis Support System). GRASS is a GIS system developed by the U.S. Army Construction Engineering Research Laboratories (USACERL). GypsES currently uses GRASS version 4.0, which was released in May 1991. Considerable enhancements have been made to the basic GRASS formats.

The Database

GypsES maintains database information in *.dbf files. These files can be created by many of the commonly used PC database systems including dBase™ , Microsoft Access™ and the ESRI ARC shape files. The GypsES database is capable of reading *.dbf files created internally or imported from an outside program.

How To Use This Manual

This manual has 11 sections that describe GypsES and its menu options. Section include an Introduction and How To Use This Manual (Section 1), Running GypsES in the WindowsNT® Environment (Section 2), Using GypsES (Section 3), The GypsES Main Screen (Section 4), GypsES Mapping Concepts (Section 5), and the six primary menu bar options (Sections 6-11). Each of the last six sections lists all functions in that option in the order that they appear within pull-down menus. For reference, there is also a standard names list (Appendix A), color chart (Appendix B), references (Appendix C), credits and acknowledgments (Appendix D), and a glossary and index.

User Tips

Shaded boxes containing ***User Tips*** that describe concepts and provide helpful tips occur throughout the manual. An icon in the left margin designates them. All ***User Tip*** titles are listed below in alphabetical order within each section:

Section 7 (The *Edit* Menu) **Page**

Section 8 (The *Window* Menu)

Section 10 (The *Survey* Menu)

Manual Conventions

- **Bold** text introduces words and phrases that are defined either in the Glossary or immediately following the use of the word or phrase. For example: **feature lines** and **volatile fraction**.

- ***Bold Italic*** text designates all GypsES primary menu bar options, pull-down menu buttons, and push buttons. For example: ***File***, ***File Control***, and ***Accept***.

- *Italic* text is used for dialog box titles and to emphasize important words. Notes to the reader are also in Italics. For example*: Graphics Output Setup* dialog box, *with caution*, and [*Note: GypsES only imports lines that intersect your current location's boundaries.*]

- Double quotation marks (" ") are used to indicate push button palette titles, messages from GypsES, headings within a GypsES dialog box, and occasional terminology. For example: "Trap Database" palette, "Congratulations! You have reclassed...", "Select SiteData File" and "cookie cutter," respectively.

- Characters to be typed are enclosed in box brackets [ ]. For example: Type [y].

- Keys and key sequences appear enclosed in angled brackets < >. For example: Press <Enter>.

Running GypsES in the WindowsNT® Environment

GypsES was originally developed under the UNIX operating system. At the beginning of the GypsES project in the early 1990's, UNIX was the only operating system that supported a public-domain GIS system (GRASS). By choosing UNIX, early GypsES developers hoped to avoid burdening GypsES users with the expense of purchasing a GIS system. For several years, GypsES was used on personal computers using a "dual-boot" environment. Users could run GypsES under UNIX or boot to Windows and use word processing, spreadsheet, and other PC productivity software. This was certainly an inconvenience, and as time went on, problems with obtaining drivers for new hardware in PC-based UNIX multiplied.

The Move to WindowsNT

By 1998, the GypsES program consisted of over 250,000 lines of programming code, compiled into a single executable file. To modify this code to execute in the native Windows environment would have been a massive job, taking years. GypsES developers therefore turned to a software tool from Data Focus, Inc. called Nutcracker. The Nutcracker system provides a development environment that enables programs written for UNIX to be compiled in WindowsNT, creating a Windows 'exe' file. When run in WindowsNT using the Nutcracker Operating Environment, GypsES behaves almost exactly as it did in UNIX. The Operating Environment (OE) provides dynamic link libraries and other mechanisms to handle such things as differences in path names, calls to system commands, etc.

The Nutcracker Operating Environment

When installed, the Nutcracker OE is started as a "service" within the NT system. It does not affect any other Windows applications. You will probably not be able to tell it is there. There is a Nutcracker icon in your WindowsNT control panel that, if clicked, gives you some version and status information, but you probably won't ever have to do anything with it.

The XVision X-Server

In addition to the Nutcracker service, GypsES must run with an X-Server because GypsES uses the X-Windows system to display graphics. Again, converting to native Windows graphics would entail an enormous programming effort, so an X-Server is necessary. We are presently distributing the X-Vision Server from Santa Cruz Organization (SCO) as part of the Nutcracker Operating Environment. Other X-Servers are available and, in theory, any one of them should work. Basically, an X-Server runs as a separate service in NT, much as it did in UNIX. The GypsES program passes commands to the X-Server, and the X-Server displays the GypsES Main Screen window and dialog boxes, passing both keyboard entry and mouse click responses you make back to GypsES. The X-Vision X-Server as installed usually starts up when you log on. You know that it is running if you see a green 'XV' next to the time display in the lower right-hand corner of your screen. If it isn't

running when you log on, it starts when you double-click the GypsES icon. All X-Servers require that the Network TCP/IP module be installed. When you set your NT system up, be sure to install Networking, even if you don't have a network card or a modem. (See the Appendix on Installation for more details.) Three icons in the WindowsNT control panel represent the X-Vision server controls. As with the Nutcracker icon, you probably won't need to do anything with them.

Directory and File Structure for GypsES in WindowsNT

GypsES is installed on one of your hard disks as a main directory, X:\Gypses, where X is the drive designation. A system variable, "GYPSES_DIR" is set to this path. There are two sub-directories in this directory (Fig. 2-1):

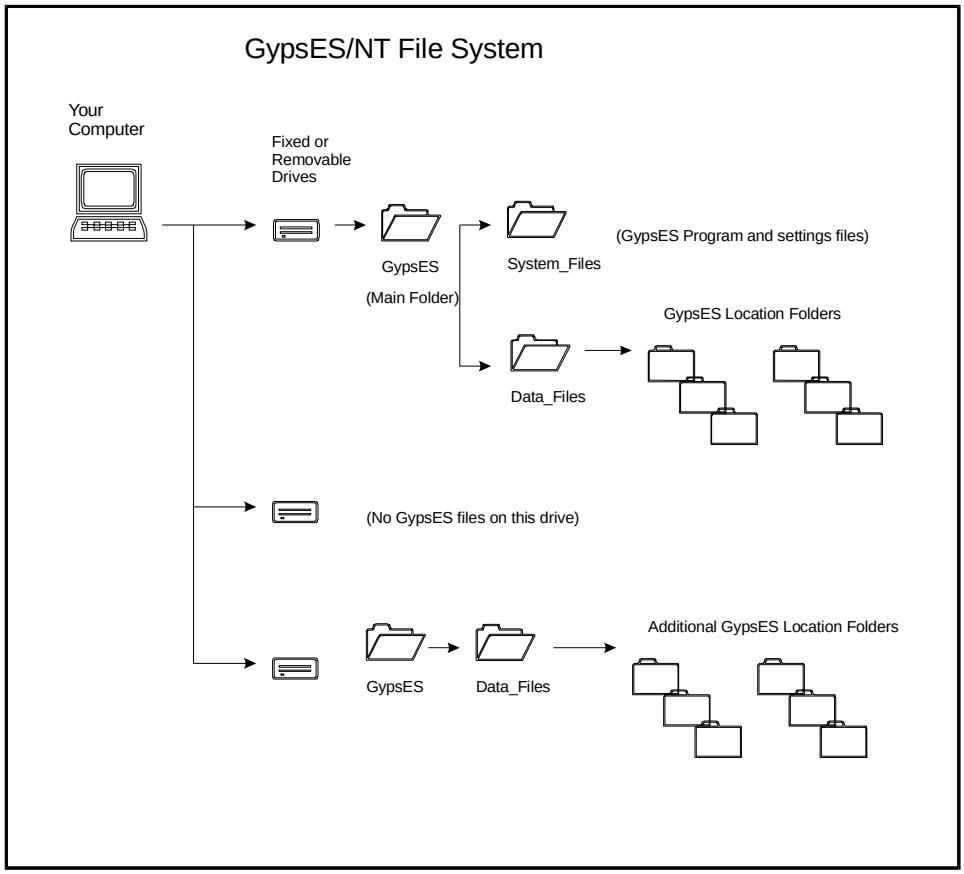


Figure 2-1. Illustration of the GypsES/NT file system.

- ***System_Files***: This directory contains all GypsES programs and control information for GypsES. You should normally not change anything in this directory. GypsES upgrades usually replace the contents of this directory.

- ***Data_Files***: This directory contains your GypsES GIS location data. Each location you establish in GypsES creates a sub-directory with the location name and all information for that location.

[Note: The terms "directory" and "folder" are used synonymously.]

You can store location data on other drives in your system, even removable volumes. GypsES checks all system drives for the directory path X:\GypsES\Data_Files. It automatically recognizes any location data contained on any drive with this path. When you establish a new location in GypsES, you are asked to designate a drive. If the drive you designate does not currently have a \GypsES\Data_Files directory, it is created. You can move location directories from one drive to another using the following procedure in Windows Explorer:

- If the drive you want to move location information to does NOT have a GypsES\Data_Files folder, you can make one. Just click on the drive, then click the ***File*** menu option and select ***New*** / ***Folder***. A folder will appear under the drive with the words "New Folder" highlighted. Just type [GypsES] and press <Enter>. Create the Data_Files folder the same way by clicking on the GypsES folder and then clicking on ***File***, ***New***, and ***Folder*** and typing [Data_Files].

- Once the GypsES\Data_Files folder is in the drive where you want your location folders, click on the location folder you are moving and drag it over to the Data_Files folder on the destination drive while holding the mouse button down. Be sure the Data_Files folder is highlighted before you lift your finger off the mouse button; Windows Explorer then moves the folder to the drive.

Be sure that the location directory gets moved to a X:\GypsES\Data_Files directory so that the information is available when you start GypsES. It is a good idea to NOT make changes within a location folder outside of GypsES. The file organization within the folder is somewhat complex, the files may be inter-related, and some of the data is in non-ASCII files.

There may be some special image directories within a GypsES Data_Files folder that do not show up as a location within GypsES. These directories are named 'ImagesZoneXX', where XX is a UTM zone designation. These directories contain backdrop images imported using the ***File*** menu / ***Import*** option / ***Import Image Backdrops*** option (see page 6-24 in Section 6). Images in these directories are available to any location whose UTM zone matches the zone and whose boundaries overlap images in the directory. Typically, smaller scale images, such as 1:250,000 backdrops, can be stored in these

directories and used by multiple locations. This is a more efficient use of disk space when your installation consists of several contiguous locations, such as multiple counties within a state.

Using WindowsNT

This manual cannot provide detailed information on using WindowsNT. In many ways, WindowsNT is similar to Windows 95/98. Many useful books that describe the WindowsNT operating system are available at bookstores or can be ordered through the Internet. The help system available from the Windows Start menu may provide some assistance. We have found that most software that runs on Windows 95/98 also runs under WindowsNT. You are most likely to encounter problems with hardware drivers. In most cases the hardware vendor can provide WindowsNT drivers that can usually be downloaded from the Internet. As Microsoft evolves their operating systems into Windows 2000 (which was renamed from WindowsNT 5.0), the problems with drivers should disappear.

Using GypsES

GypsES Startup

When you double-click the GypsES (tree) icon, an MS-DOS window first appears. This window displays a few startup messages before the GypsES window comes up. If GypsES doesn't start up, this window may indicate what the problem is. This initial window stays on the desktop while GypsES is active and is there when you exit with the message "Press any key to continue." When you select this window and press any key, it goes away. If GypsES hangs up, or if you want to abort GypsES in the middle of a long process, select this window and cancel GypsES either by typing <Control C> or by clicking the "x" box in the upper right hand corner. If GypsES aborts, a message in this window may indicate the problem. Please make a note of the message and what you were doing at the time and let a GypsES programmer know so that bugs can be tracked and fixed.

Main Screen

GypsES has a Main Screen for working with map layers and files, a primary menu bar across the top with pull down menus and sub-menus, and a status bar at the bottom of the screen that displays processing and informational messages. (See Section 5 for more information about the GypsES Main Screen.) When an option is selected in the primary menu bar, a pull-down menu of options (buttons) appears (e.g., ***File Control***, ***Create New***, and ***Save*** are some of the pull-down menu buttons that appear when the ***File*** option is selected). Some pull-down menu buttons contain other pull-down menus; these are indicated with a | (Fig. 3-1).

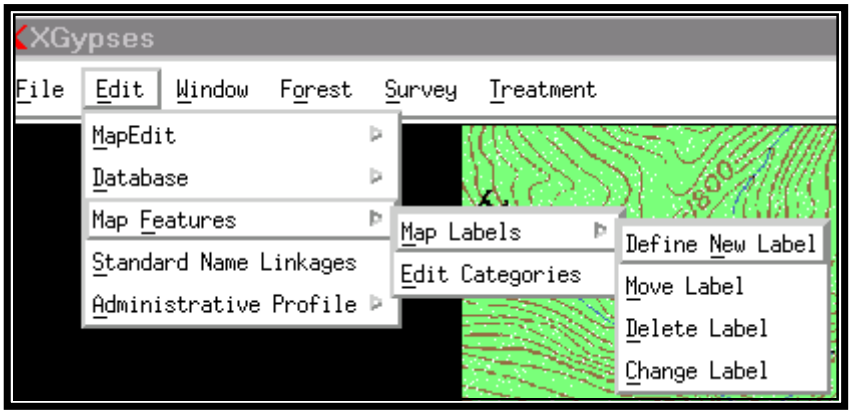


Figure 3-1. Illustration of pull-down menu buttons.

Dialog Boxes

Dialog boxes appear on the screen as you work with GypsES. A dialog box has two characteristics: (1) you can click on the bar at the top and drag it to another location by holding down the left mouse button, and (2) you must respond to or exit the dialog box before you can use other GypsES functions.

Some dialog boxes simply tell you about an action you need to take or condition that GypsES has encountered. More complex dialog boxes may contain several types of objects, including text entry windows, toggle buttons, push buttons, and choice buttons.

- ***Text Entry Windows***

  Text entry windows look like slightly indented rectangles (Fig. 3-2). To enter text, click inside the rectangle; this activates a blinking cursor (vertical I) that indicates where the next character you type will be inserted. To over-write text in the text entry window, first use the mouse pointer to highlight the text you want to over-write. Anything you type then replaces the highlighted text. The <Backspace> key deletes the character to the left of the cursor. The <Delete> key deletes the character to the right of the cursor. If text is highlighted, the <Delete> key deletes it. To insert text, place the cursor where you want to insert text and type. Note that there is usually a limit on the number of characters allowed in a text entry window. If you try to insert or add more text than allowable, you hear a computer "beep" and the text is not added.

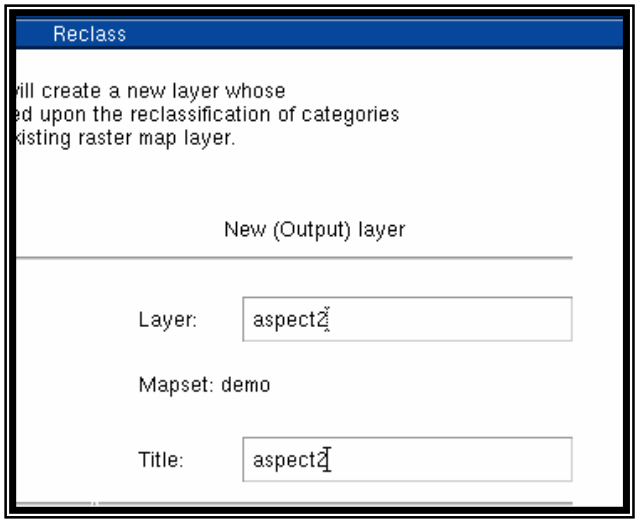


Figure 3-2. Illustration of text entry windows ("Layer" and "Title") in the *Reclass* dialog box.

- ***Toggle Buttons***
  Toggle buttons appear next to a text label describing a choice. The button appears to be "pushed in," or indented, when you choose the option. If only one option is available (the button is either clicked or not) (Fig. 3-3) or if *multiple* options can be chosen and processed (Fig. 3-4), the button appears as a square. If multiple choices are available but *only one* can be chosen and processed, the button is displayed as a diamond (Fig. 3-5).

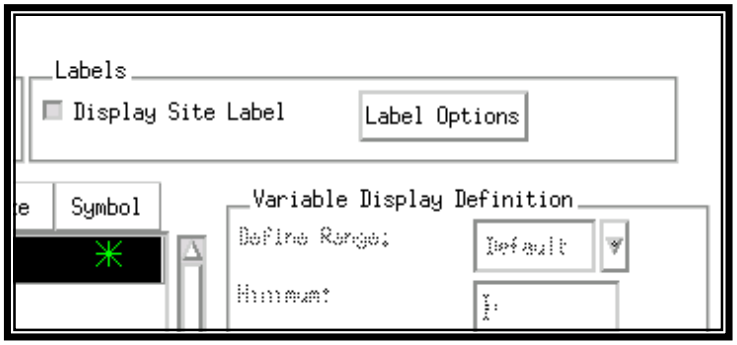


Figure 3-3. Illustration of a one-choice, square toggle button ("Display Site Label") in the *Site Display Options* dialog box.

Figure 3-4. Illustration of multiple choice, square toggle buttons in the *Raster Layer Area Report Definition* dialog box.

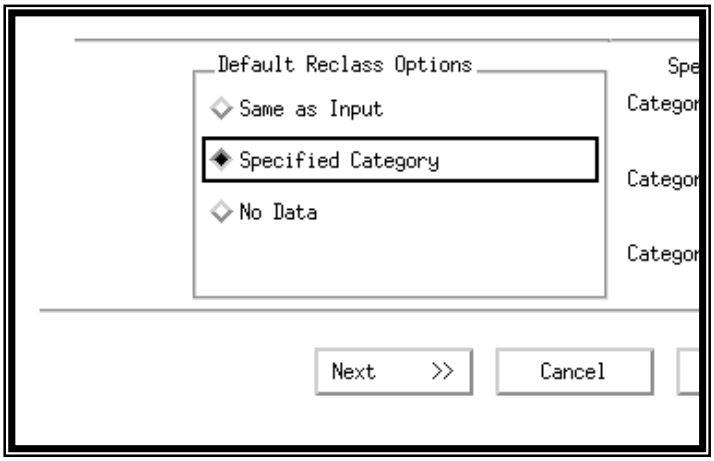


Figure 3-5. Illustration of diamond toggle buttons in the *Reclass* dialog box.

- ***Push Buttons***
  Push buttons are rectangles that appear to stand out from the dialog box and have one or more words describing the action that occurs if you click them (Fig. 3-6). A palette is a group of push buttons that remains on the GypsES screen while a specific GypsES function is being used (Fig. 3-7).

Figure 3-6. Illustration of push buttons at the bottom of a dialog box.

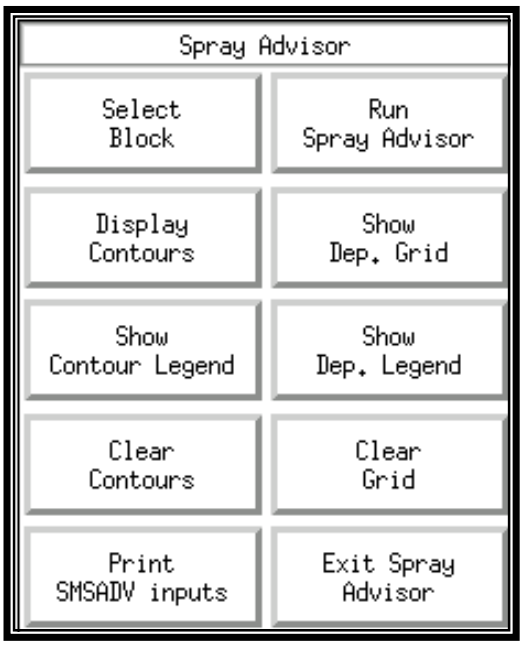


Figure 3-7. Illustration of the "Spray Advisor" palette of push buttons.

- ***Choice Buttons***
  Choice buttons are either downward-pointing arrows (for text choices) or small rectangles (for either text or color choices) (Fig. 3-8). When you click on the arrow or rectangle, possible choices are displayed in a list bar. Once you click on something in a list bar, the bar disappears and your choice is displayed in the dialog box.

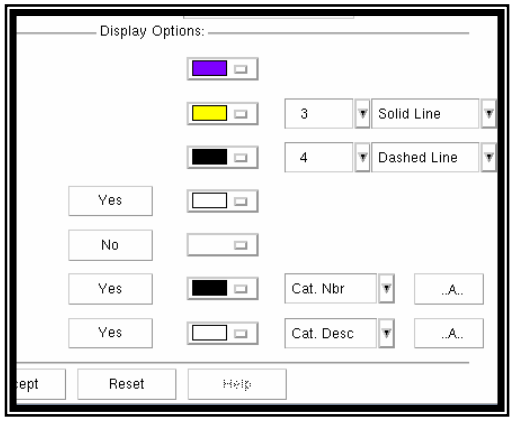


Figure 3-8. Illustration of both arrow and rectangle choice buttons in the *MapEdit: Vector Edit Options* dialog box.

GypsES File Names
GypsES file, mapset, and location names are limited to 14 characters. Database and SiteData file names are limited to 10 characters. If a file is created outside GypsES with more than 14 characters, it is NOT recognized.

GypsES Window Size and Color
These options can be changed using the ***Edit*** menu / ***Administrative Profile*** option / ***User Profile*** option / *Global* dialog box (see pages 7-40 and 7-41 for changing screen dimensions and background/text colors, respectively).

Backups
The ***Archive*** option has been removed from the GypsES ***File*** menu in the WindowsNT version. Use the WindowsNT operating system backup facility (***Start*** / ***Programs*** / ***Administrative Tools*** / ***Backup***) to back up your data onto tape (if you have a tape drive), copy your data to removable media using Windows Explorer, or utilize a network to make copies of your data folders on another system. The need to have a systematic backup process is essential; bad things happen at the least convenient times, and it is best to be prepared.

The GypsES Main Screen

The GypsES Main Screen has a primary menu bar across the top, a work area (Work Window) in the middle, and a status bar and information / settings bar across the bottom (Fig. 4-1). The primary menu bar has the following buttons: ***File***, ***Edit***, ***Window***, ***Forest***, ***Survey***, ***Treatment,*** and ***Help***. Each button is described in a separate section of this manual (with the exception of ***Help***, which is described later in this Section).

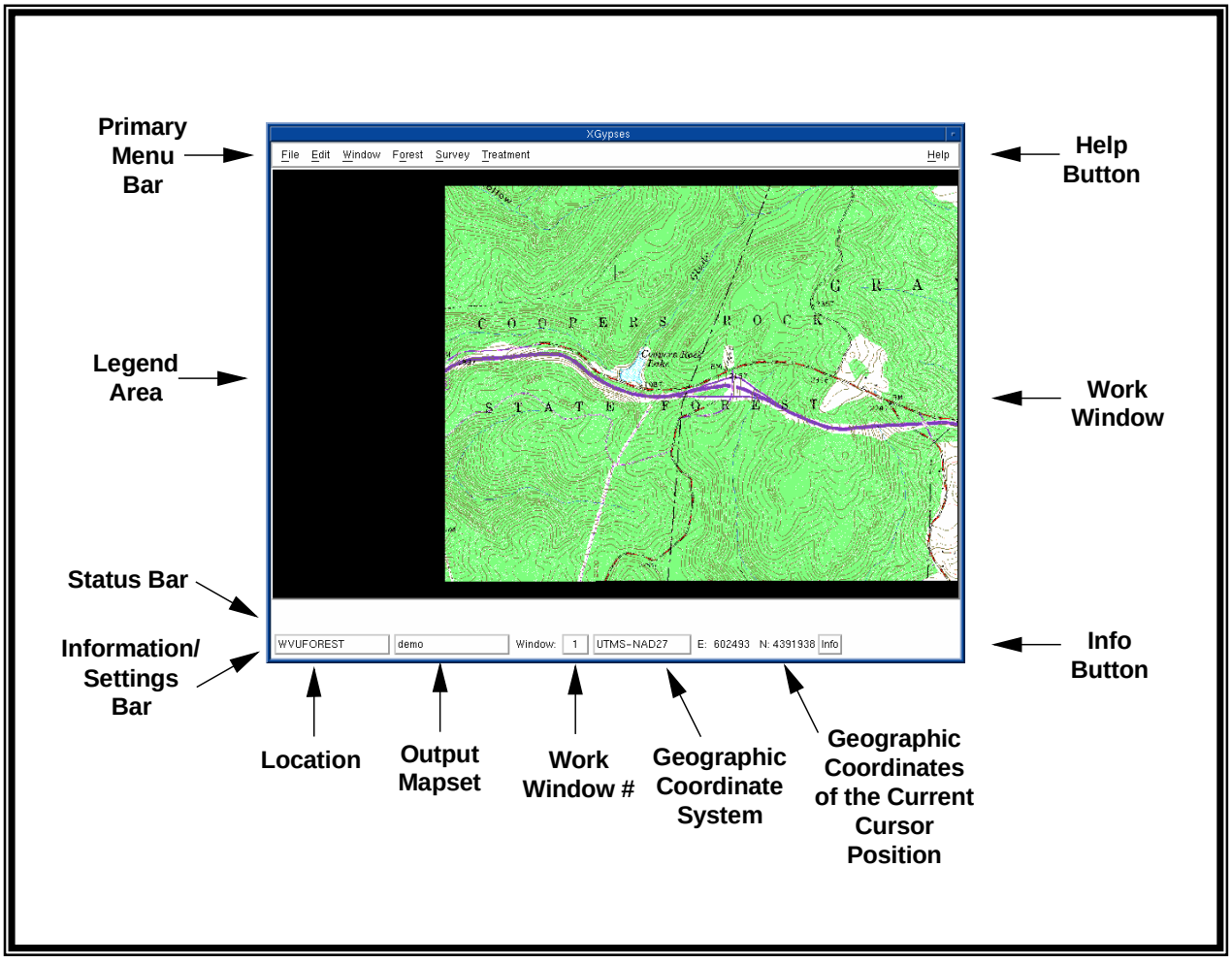


Figure 4-1. GypsES *Main Screen* components.

The status bar near the bottom of the screen is a message area that turns yellow when messages pertinent to what you are doing are displayed. The information / settings bar just below the status bar displays (from left to right) the current location and output mapset names and the Work Window number. It also displays the geographic coordinate system being used, the geographic coordinates of the current cursor position when the cursor is on a map in a Work Window, and the ***Info*** button. The location, mapset, Work Window number, and geographic coordinate system can be changed by clicking on the respective button in the information / settings bar and choosing the item you want from the list that appears in the dialog box. For location and mapset changes, click on ***Accept*** to complete the new selection or on ***Cancel*** to keep the current selection.

The Menus

To access any of the seven main functions in the primary menu bar at the top of the GypsES Main Screen, move the mouse pointer (arrow) to the button you want and click once. A pull-down menu of options appears. There are two types of menu option buttons:

- *Plain Menu Buttons* perform the function defined by the label.

- *Menu Buttons with a triangle* (|) to the right of the label produce another pull-down menu of options when clicked once.

There are times when certain menu buttons in GypsES are not available or should not be used until the current operation is complete. In these cases, the text in the menu boxes is "greyed out," or desensitized, so that you can not choose these options.

Info Button

This button displays information about a selected point in a **SiteData map layer** or **Raster map layer**. [*Note: If multiple SiteData and/or Raster data layers are displayed, you must choose what layer to use for an* ***Info*** *query*.] If you click the ***Info*** button once, a message in the status bar prompts you to select a point on the current map layer by clicking with the left mouse button. If you are working with a Raster map layer, a dialog box with the data point's location (Northing and Easting UTM coordinates) and category number and description appears. Click ***Continue*** to close the dialog box and choose another point. The right mouse button terminates the ***Info*** option. If you are working with a SiteData map layer, clicking on a point brings up a *Database* dialog box (see the ***Edit*** menu / ***Database*** option / ***Edit/View Data File*** option on page 7-24). By default, the data that first appears is for the selected data point; you can toggle to a spreadsheet view of the entire database of all points on the map layer. Point data includes Northing and Easting UTM coordinates and data values. Click on ***OK*** to close the dialog box and choose another data point. The right mouse button terminates the ***Info*** option.

Error Messages

When GypsES doesn't function as it should, there may be error messages explaining or indicating the problem. GypsES maintains an ongoing log for each session that includes error messages. You can review this log using the ***File*** menu / ***View GypsES Log*** option (see page 6-49). Check error messages from the crashed session by viewing the GypsES log using the ***Previous Log*** option. Checking for error messages and saving log files that contain error messages helps GypsES developers correct problems with the program. If GypsES does "crash" (i.e., is no longer running), re-start GypsES. There is no need to re-start the computer.

The Help Menu

The ***Help*** button is available throughout the GypsES session. The ***Help*** pull-down menu contains the following options: ***Context***, ***Help How-To***, ***File Menu***, ***Edit Menu***, ***Window Menu***, ***Forest Menu***, ***Survey Menu***, ***Treatment Menu***, ***Version,*** and ***Credits***. The pull-down menu options give you a starting point for finding information related to the current topic or related topics. Selecting any of the above options, excluding ***Version*** and ***Credits***, invokes the ***Help*** system.

- ***Context***
  This invokes the ***Help*** system with help text that is pertinent to what you are currently working on. For example, if you are currently editing a data table and click on ***Context***, the first page of help text you see refers to editing a data table.

- ***Help How-To***
  This option brings up a single dialog box of general information on using the ***Help*** system.

- ***Menu Buttons***
  Clicking on any of the following six options (***File***, ***Edit***, ***Window***, ***Forest***, ***Survey***, or ***Treatment***) brings up help text for that option. This allows you to quickly view help text for any menu while working anywhere within GypsES.

- ***Version***
  This option displays the current version of GypsES being used. When calling for technical support, please know the version number of the GypsES system. To display the version number, click the ***Version*** button; a message box is displayed in the center of the screen. Click the ***Continue*** button to remove the version message.

- ***Credits***
  This lists people involved in GypsES development. The first page lists the current developers, contributors, and initial users. Click on ***Copyright*** to read a Copyright Notice. Click on ***More*** to view a list of other contributing cooperators. Click on ***Software Credits*** for a listing of all software acknowledgments and copyrights. Click on ***Close*** to remove the *Credits* dialog box.

How to Use Help

Once an initial topic is selected in ***Help***, a *Help* dialog box is displayed (Fig. 4-2). Each *Help* dialog box has two sections: the menu bar along the top and a display area below to display the text for the selected help topic. Use the scroll bar on the left side to move up and down through the displayed text by clicking the arrows at the top and bottom of the bar. The *Help* menu bar contains five push buttons: ***Other Topics***, ***Next***, ***Prev***, ***Master List,*** and ***Exit Help***.

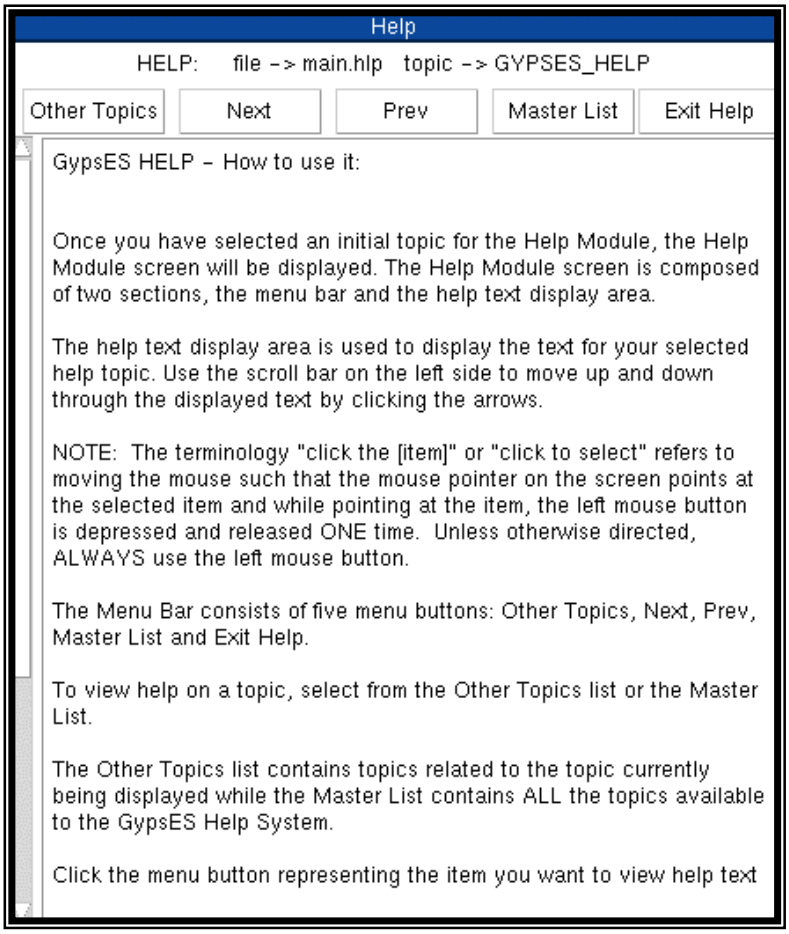


Figure 4-2. Sample ***Help*** menu dialog box.

- ***Other Topics***
  This push button lists topics that are related to the current topic. For example, if you are currently viewing help related to the ***File*** menu, the ***Other Topics*** list may have the names of each of the menu options available under the ***File*** menu. Click on a new topic from the ***Other Topics*** list to select it and new help text is displayed.

- ***Next*** and ***Prev***
  The ***Help*** system maintains a list of the help text pages you view. You can move through this list using the ***Next*** and ***Prev*** push buttons.

- ***Master List***
  This push button displays a menu of all major help topics outside the scope of the initial help topic. To change topics, click the ***Master List*** push button and select a new topic from the menu. The new help text is displayed.

- ***Exit Help***
  This push button removes the *Help* dialog box and returns you to the current GypsES Work Window.

GypsES Mapping Concepts

Locations and Mapsets

GypsES organizes data into locations and mapsets. A **location** is a specific area that you are responsible for, for example, a county or a ranger district. Geographically, the location represents a rectangular region on the Earth's surface defined by the **UTM** (**Universal Transverse Mercator**) **coordinates** of the four sides of the rectangle. You initially define a location by its latitude and longitude coordinates that GypsES then converts to UTM coordinates. GypsES can display the geographic coordinates of map locations using either system, however (see ***Geographic Projection and Coordinate Systems Used by GypsES*** on page 5-5 for more information). UTM coordinates are classified as either "Northing" or "Easting," which indicates how far north and east a point on the Earth is in meters relative to a grid system of zones that covers the Earth (see Table 5-1 listing UTM zones). Although you can move between several locations during a GypsES session, only one location can be worked with at a time.

Within a location, data layers are organized into **mapsets**. A mapset is a directory (or folder) used to organize data layers within a location. The PERMANENT mapset contains data that usually doesn't change and is available to all users working in the location, such as elevation, soil conditions, roads, and waterways. The PERMANENT mapset is automatically created when you set up a new location. You can create and name other mapsets at any time. Mapsets can be used for "what if" analysis to see what happens when certain parameters are changed or to separate data from different years. For example, if gypsy moth treatment projects occur regularly, mapsets can be used to keep annual egg mass counts, defoliation prediction, and spray block information separate for each spray season (Fig. 5-1).

While using GypsES, you work with a selected location and mapset. The mapset you are working with is known as the **output mapset** or **current mapset**; its name is always displayed in the information / settings bar. You can change output mapsets at any time by clicking on the output mapset button in the information / settings bar. Any files you create are written to the current mapset. You can modify or delete only those files that are stored in the output mapset. Information in mapsets other than the current mapset is available for display and copying during the GypsES session on a read-only basis.

Table 5-1. Zone numbers and longitude ranges for UTM zones. All values are in full degrees east (E) and west (W) of Greenwich (0 degrees).

ZONE NUMBER	RANGE IN LONGITUDE	ZONE NUMBER	RANGE IN LONGITUDE
1	180W – 174W	31	0 – 6E
2	174W – 168W	32	6E – 12E
3	168W – 162W	33	12E – 18E
4	162W – 156W	34	18E – 24E
5	156W – 150W	35	24E – 30E
6	150W – 144W	36	30E – 36E
7	144W – 138W	37	36E – 42E
8	138W – 132W	38	42E – 48E
9	132W – 126W	39	48E – 54E
10	126W – 120W	40	54E – 60E
11	120W – 114W	41	60E – 66E
12	114W – 108W	42	66E – 72E
13	108W – 102W	43	72E – 78E
14	102W – 96W	44	78E – 84E
15	96W – 90W	45	84E – 90E
16	90W – 84W	46	90E – 96E
17	84W – 78W	47	96E – 102E
18	78W – 72W	48	102E – 108E
19	72W – 66W	49	108E – 114E
20	66W – 60W	50	114E – 120E
21	60W – 54W	51	120E – 126E
22	54W – 48W	52	126E – 132E
23	48W – 42W	53	132E – 138E
24	42W – 36W	54	138E – 144E
25	36W – 30W	55	144E – 150E
26	30W – 24W	56	150E – 156E
27	24W – 18W	57	156E – 162E
28	18W – 12W	58	162E – 168E
29	12W – 6W	59	168E – 174E
30	6W - 0	60	174E – 180E

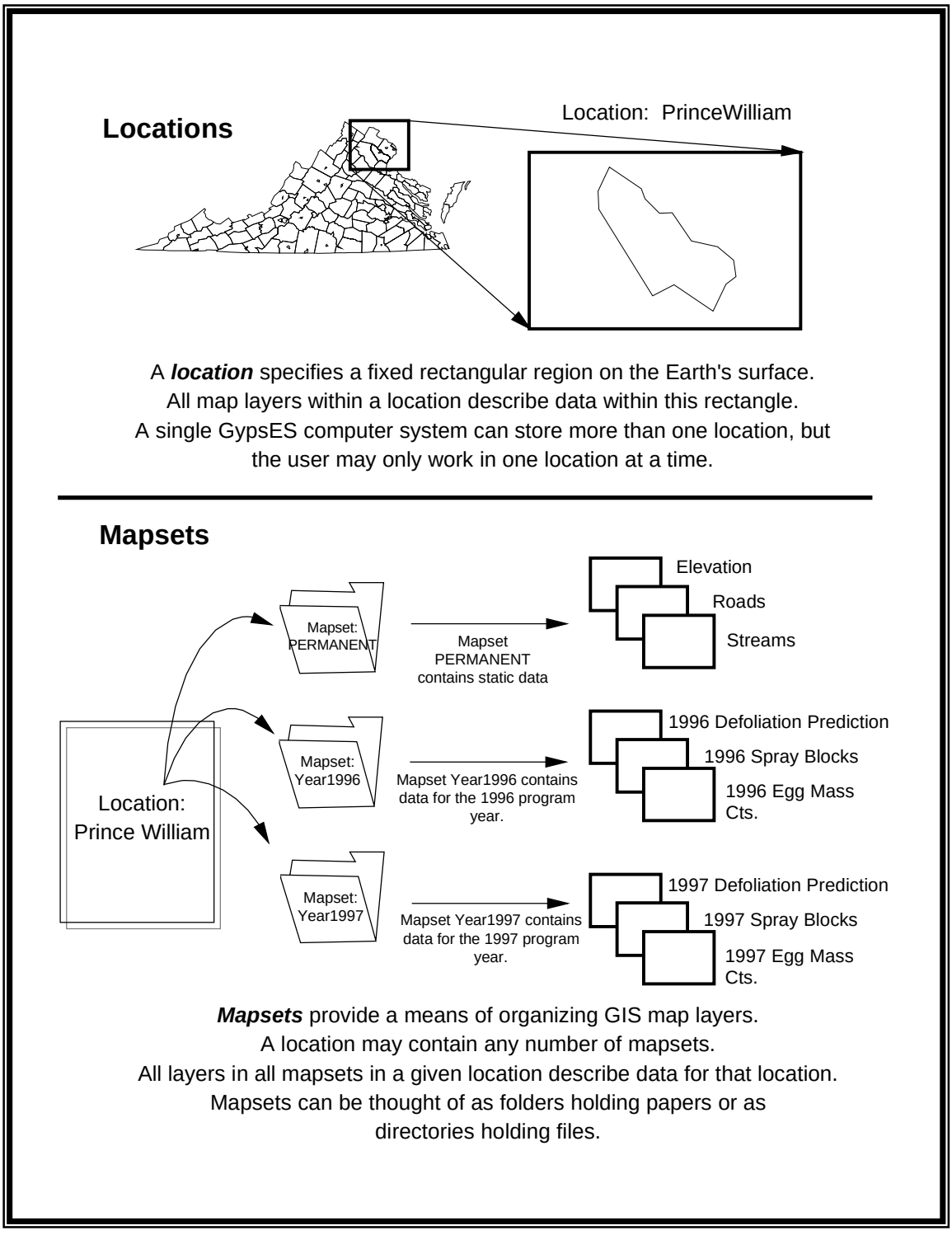


Figure 5-1. Organization of geographic data within the GypsES system.

The current location and output mapset names are displayed in the lower left corner of the GypsES Main Screen. (Fig. 5-2). The location or mapset can be changed either right on the screen (click on the location/mapset name button to change it) or within the ***File*** menu (see the ***File*** / ***Location*** / ***Mapset*** options listed on page 6-46).

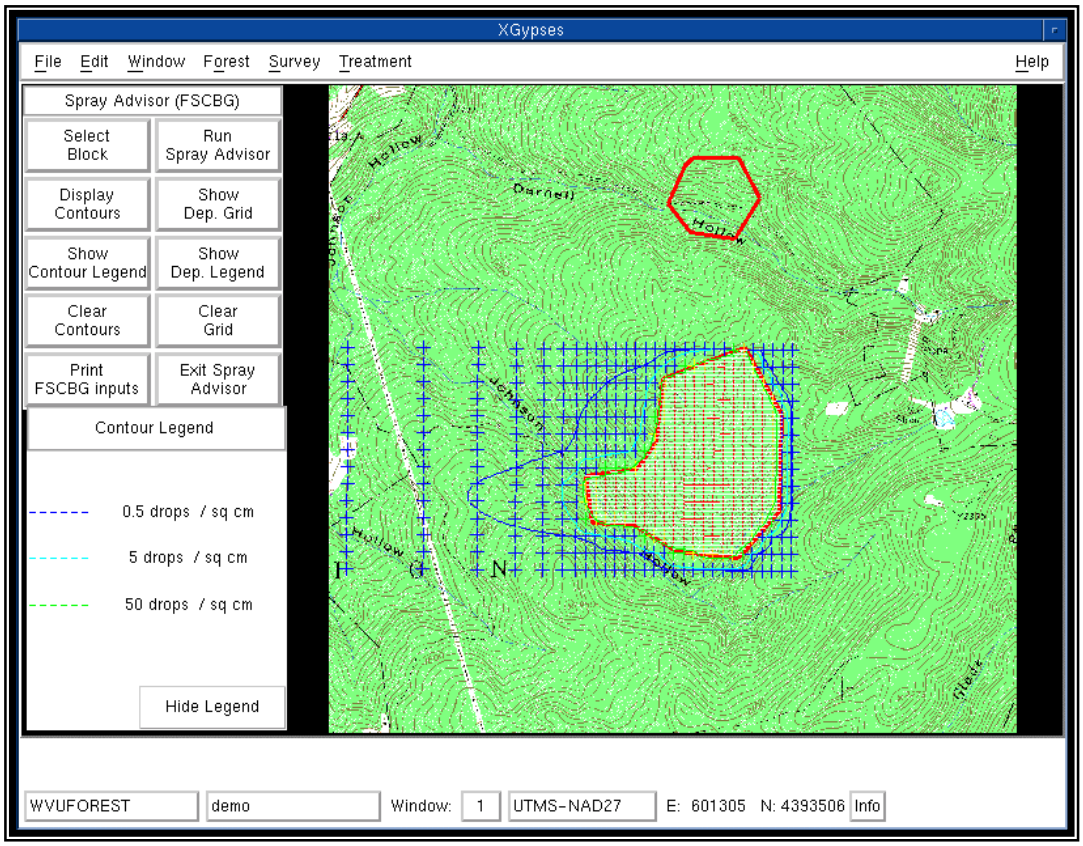


Figure 5-2. GypsES Main Screen illustrating current location (WVUFOREST") and mapset ("demo") names.

Geographic Views

You can either view the whole location (**full View**) or view selected portions using the ***Zoom In*** and ***Zoom Out*** capabilities of the GIS system. The current view of the location is a **Geographic View**. When you view a smaller area within the entire location, you can work with greater detail, precision, or both. Geographic views can be saved and retrieved so that they can be quickly redrawn later (see the ***File*** menu / ***Save*** option / ***View*** option on page 6-14 and the ***Window*** menu / ***Change View*** / ***Recall View*** option on page 8-1 for more information on saving and retrieving Views, respectively).

Geographic Projection and Coordinate Systems Used by GypsES

A geographic projection is a way to "flatten" the surface of the Earth so that some or all of it can be shown in two dimensions on a map. There are many ways of projecting the Earth's surface onto a map. To help you understand some of the terms you encounter when using GypsES, here are some brief definitions:

- ***Latitude / Longitude***

  When locating a point on the Earth's curved surface, we sometimes use the terms latitude and longitude. Latitude is the distance from the Earth's equator to both poles. It is represented as degrees north or south of the equator (0 degrees); the north and south poles are therefore 90 degrees north and south, respectively. Longitude is defined as the number of degrees east or west of an imaginary line running from the North Pole through Greenwich, England to the South Pole. This line is called the Greenwich, or Prime, Meridian and is defined as longitude 0 degrees. Longitude ranges from 0 degrees at the Greenwich Meridian to 180 degrees on the opposite side of the Earth.

  Latitude and longitude can be expressed using either decimal degrees or degrees, minutes, and seconds; there are 60 minutes in a degree and 60 seconds in a minute. The direction (East or West for longitude, North or South for latitude) should be specified using either format. Sometimes West longitude is expressed as a negative number.

- ***UTM System and UTM Zones***

  There are many systems for projecting latitude and longitude coordinates to flat surface coordinates so distances and areas can be calculated and a map can be drawn. One system that is used throughout the world and that is reasonably accurate is the Universal Trans Mercator Projection. This is the projection most commonly used for world maps. It divides the surface of the Earth into 60 North-South rectangular strips 6 degrees of longitude wide. These strips are called Zones and are numbered starting at longitude 180 degrees. Within each zone, every point on the Earth is represented by coordinate values X (Easting) and Y (Northing); these are usually expressed in meters. Table 5-1 on page 5-2 provides a complete listing of UTM Zones and associated longitude ranges.

  When a location in GypsES spans two UTM zones, the zone that covers the majority of the location's area is assigned to the location. Distance and area calculations using UTM coordinates should be reasonably accurate as long as the area covered by the location does not cover too many zones. To translate between latitude/longitude values and UTM meter coordinates, some estimate of the shape of the Earth is necessary, which brings us to another term used in geographic projection, the ellipsoid.

- ***Ellipsoid***
  The Earth is round, but not a perfect sphere. The distance around the Earth is greater at the equator than at the poles, so the Earth's shape can more accurately be described as an ellipsoid. When converting latitude and longitude values to flat coordinates for mapping, some assumption must be made about the shape of the ellipsoid, since the Earth is really not a perfect ellipsoid, either. There are many ellipsoid estimates available for use in projections, some of which work better for different parts of the Earth. Some ellipsoid estimates are actually less accurate because they were developed before the era of satellites, but are still used to provide continuity with existing maps. GypsES won't ask you about ellipsoids, but you need to be aware that they exist and are being used.

- ***Datum***
  A datum is a set of points that more precisely defines the shape of the Earth's surface by taking elevation into account. Since the Earth is not a perfect ellipsoid, using a datum further refines very precise conversion of latitude and longitude to UTM values. Latitude and longitude values vary with the datum you are using. GypsES recognizes and uses two North American Datums (NADS):

  - ***NAD27***: This datum is based on an ellipsoid developed by Alexander Ross Clarke in 1866 (Clarke66). It is the datum used for most topographic paper maps currently issued by the United States Geological Survey (USGS).

  - ***NAD83***: This datum is based on an ellipsoid developed using satellite data. It is more accurate and is used internally by GypsES. When importing data, GypsES asks you to describe the coordinate system used and automatically converts to NAD83.

  [*Note: It is very important to specify the datum correctly when importing or exporting data. Differences between coordinates can vary up to 300 meters in some parts of the United States*.]

Conversion of GIS Data Outside North America

If you attempt to import GIS data from outside North America and it is projected using either the WGS84 or the GRS80 Ellipsoid, set the Datum to NAD83 and the conversion should work properly. If another ellipsoid was used, you may encounter problems and should probably check with your GIS or GypsES coordinator.

Types of GIS Data Layers

- ***Raster Layers***

  A Raster layer is a map that is divided into rows and columns of cells, similar to the organization of a database spreadsheet. Each cell represents a square on the surface of the Earth. The dimension of this square is called the **resolution,** which in this case is expressed in meters. In a Raster layer, each cell is assigned an integer value. Using elevation as an example, the integer value represents the actual elevation within that square. In other cases, the integer value may be a code linked to a data table. Raster data is stored internally in a compressed form, but can be visualized as a very large spreadsheet with the rows and columns of cells representing the geographic location and the category number associated with that point representing the data.

User Tip: Categories in Raster Files

A **category number** is an integer "code" used to associate Raster file cells with descriptions, databases, and colors. Sometimes the category number itself has a meaning. For example, in a Raster elevation layer, each "category" represents the average elevation in meters in that cell. In this case, no description or database is necessary. In the case of elevation, colors are usually assigned in Acolor ramp≅ mode, so the changes from blue to green to yellow to red represent increasing elevation.

In some cases, for instance in **Hazard Rating**, a category number represents a degree of Hazard, for example, 5 = very high, 4 = high, etc. In this case, a cell coded 5 would indicate that the trees in that cell would be at considerable risk of mortality if there were a gypsy moth outbreak. A **category description** for each code would provide a legend for a map showing this Raster layer. Color assignment for this type of Raster map layer is standardized with very high assigned to red and very low to blue.

A third use of categories in Raster layers is for linking to a database. An example would be a National Forest stand. All cells contained in a stand are coded to a category number that is the stand number. For instance, Compartment 21 Stand 59 would be category 21059. A database containing information about the stand and containing a field with the stand number can be Alinked≅ to the layer, so that by clicking on the stand map, the database for the stand can be retrieved for viewing. Color assignment in this type of file, where there are a large number of categories, is usually established randomly.

In all cases, Raster categories and descriptions used in legends can be changed using the ***Edit*** menu / ***Map Features*** option / ***Edit Categories*** option described on page 7-36.

A key concept in working with Raster layers is that of resolution, or the size of the cells that GypsES uses for display and analysis of Raster information. The choice of resolution is dependent on the size of the location, the accuracy of the source data, and the accuracy required in the results. All Raster files in a location or mapset do NOT have to have the same resolution.

- The resolution of a Raster file is determined when it is created. If you are creating a new Raster layer using calculations within the GypsES system, the current resolution applies to the resulting layer. If the resolution is relatively large (i.e., the dimension of the region on the Earth represented by the Raster layer cell is relatively large), newly created layers look Aboxy.≅ If the resolution is very small, newly created layers look less boxy, but it takes longer to create a new layer because a larger array with more elements must be processed.

- A Raster file can be displayed in a resolution larger than the resolution at its creation. The file does not change; GypsES just regroups the data for display purposes. Setting the resolution smaller than the resolution when the file was created does NOT give a better resolution and does NOT reduce "boxiness." A map's resolution can be no smaller than what it was when it was created.

GypsES takes advantage of Raster layer data organization to produce new layers by analyzing the content of existing layers. For instance, the ***Hazard*** option in the ***Forest*** menu examines species composition and stand age information to produce a new map layer that predicts stand susceptibility. The data values in a given cell for each input (**antecedent**) layer are examined, then an algorithm or Arule≅ is used to produce a susceptibility rating code (1 = low, 2 = moderate, 3 = high, 4= very high) for that cell in the **resultant** layer.

- ***Vector Layers***

A Vector layer consists of **lines** defined by UTM coordinates. Each line is made up of one or more **points** (or vertices) connected by **segments**. The first and last points of a line are called **nodes** (Fig. 5-3). **Feature lines** represent features on the Earth (for example, roads, streams, and power lines), and **polygon lines** are boundaries of areas (for example, spray blocks, political boundaries, and forest stand boundaries). One or more lines can define polygons. If the lines bounding a polygon do not intersect and are joined at nodes with no gaps, the polygon is **closed**; if there is a gap between polygon line nodes or if lines intersect at non-node points, the polygon is **open** or **unclosed**. Vector layers can be imported from other systems, such as ARC/INFO or **U.S. Geological Survey DLG** files, or sketched with the mouse using ***MapEdit*** editing features. The GypsES System can convert vector information that defines polygons to Raster form for analysis. Vector files also utilize categories (see ***User Tip: Categories in Vector Files*** on the next page).

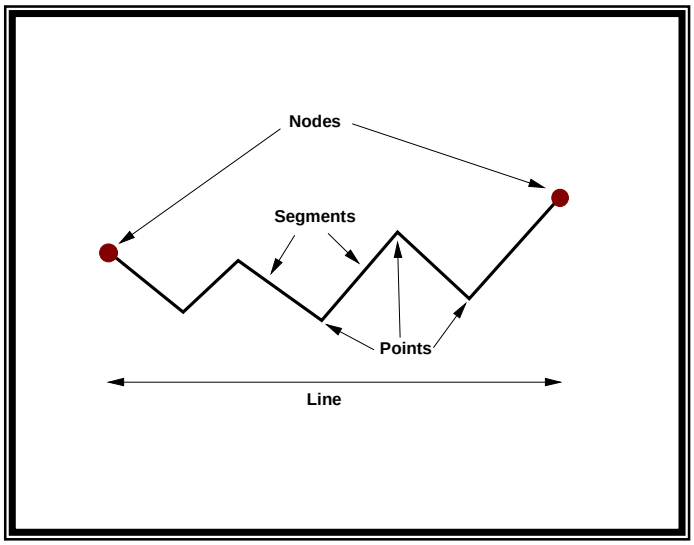


Figure 5-3. Components of a line.

User Tip: Categories in Vector Files

Categories are also used to assign descriptions and colors to Vector layer elements. The assignment of categories to Vector layers is referred to as "labeling" in *MapEdit*. Feature lines and polygons are handled somewhat differently. Categories for feature lines are assigned by choosing a point on the line to "attach" a label. The coordinates of the point and the category number are established as a part of the layer information. A description, color, or both can be assigned to the line. Categories for polygon lines are NOT established for each line, but for each polygon. A point within the polygon is selected, and a category number is associated with it. A description for the polygon can be established, but color assignment really has no meaning except when rasterizing the polygons. (See the ***Edit*** menu / ***MapEdit*** option / ***Convert to Raster*** option on page 7-15.) The reason for this is that a single polygon line can be used to define two or more contiguous polygons, so there would be no way of determining which color to draw the lines in.

- ***SiteData Layers***

  A SiteData layer is a database file that has as data fields geographically located points identified by UTM coordinates (Northing and Easting). Other fields in the data file can contain information about that point, such as egg mass count and ownership information. A SiteData layer can be displayed by itself or used to develop Raster layers that can be used for analysis. GypsES can extrapolate between individual data points to develop a **surface map layer** that estimates a given

parameter over the entire map (e.g., the average number of egg masses per acre) (see the ***File*** menu **/ *Create New*** option / ***Create Surface*** option on page 6-11).

- ***Composite Maps***
  A Composite map can have any combination of Raster, Vector, and SiteData layers with optional labels, backdrop images, **grids**, or **scales**. Once you have created a map that has multiple layers in a Work Window, it can be saved as a Composite file (see the ***File*** menu / ***Save*** option / ***Composite*** option on page 6-14 for more information). You can retrieve this composite file at any time in the current or future GypsES working sessions using the ***Window*** menu / ***Build/Update Map*** option described beginning on page 8-2.

Masks

A special kind of data layer, called a **Mask**, can be used as a Acookie cutter≅ to display only a selected portion of a location (the rest of the location appears in black). When a Mask is activated, not only is the selected portion of the map the only portion displayed, it is also the only portion used to perform calculations; this can be beneficial when the calculation is time consuming.

Any Raster map layer can be used as a Mask. A Mask can be activated or cleared using the ***Window*** menu / ***Change View*** option / ***Set Mask*** option described on page 8-11. When a map layer is selected as a Mask, those areas that are non-zero in the layer are selected. A Mask does not affect non-Raster map layers.

The File Menu

Use this menu option to work with files (***File Control***); create new GypsES layers (***Create New***); save composite files or views (***Save***); import data, vector, shape, and image backdrop files (***Import***); export data, SiteData, vector, and graphics files (***Export***); work with reports (***Reports***); produce graphics output (***Graphics Output***); select, change, create, and delete locations and mapsets (***Location/Mapset***); view the GypsES log (***View GypsES Log***); and quit GypsES (***Quit GypsES***).
Pull Down Menu:

I. ***File Control*** (***File***)

Use ***File Control*** to manipulate (delete, rename, copy, restore, shred, etc.) files that are stored *in the current location and output mapset only*. You can copy a file from another mapset *to* the current output mapset, but can delete or rename files within the current output mapset only. After clicking on ***File Control***, a *File Control* dialog box appears; the current location name is listed in the upper left corner below the ***File*** menu button (Fig. 6-1).

A list of all GypsES mapset files by type (***Raster***, ***Vector***, ***Composite***, ***Data***, ***SiteData,*** and ***View***) appears on the left side of the dialog box. Click the mouse on the folder icon just to the left of a file type name to produce a list of *mapsets* within that file type just below and indented to the right. [*Note: Only those mapsets that contain that file type are listed*.] Clicking on a mapset folder icon produces a list of all the *files of that type* within that mapset on the right side of the dialog box under the title "Contents of [Location: Mapset: File Type]." Use the ***Wastebasket*** (depicted on the left side of the dialog box by a wastebasket icon) to store, restore, and shred deleted files.

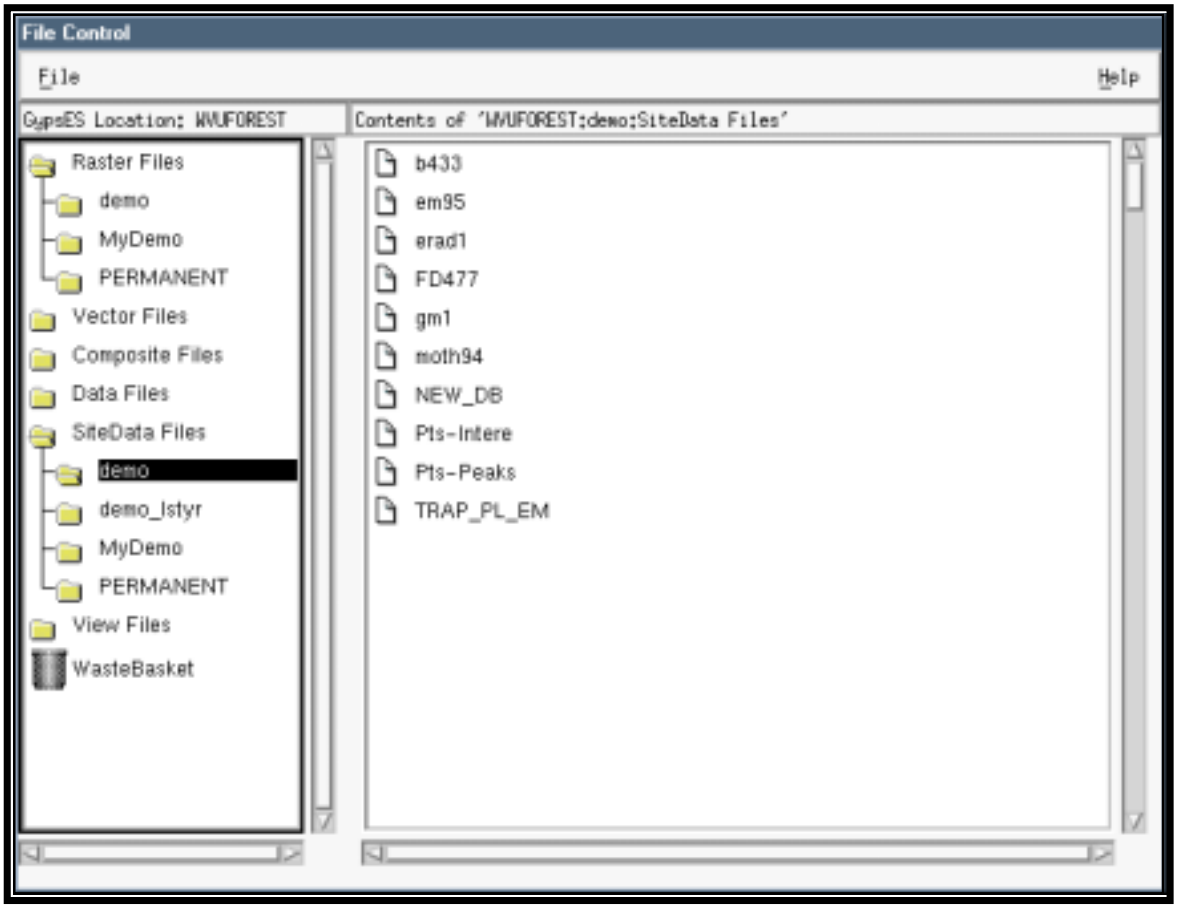


Figure 6-1. *File Control* dialog box.

To select a file to work with using ***File Control***, click once on the filename in the list on the right; the filename is highlighted. Once a file is selected, click once on ***File*** in the upper left corner of the dialog box to generate a menu of file options. These include:

A. ***Delete***

This option sends the selected file to the ***WasteBasket***. Click on ***Delete***; GypsES checks to see if that file has any dependencies (is linked to any other GypsES files). If dependencies exist, a message appears telling you that you cannot remove the file. If there are no dependencies, GypsES prompts you with the message: "ABOUT TO DELETE [filename]: Click Ok to confirm, Cancel to abort." Choose to delete the file or cancel the delete function. If you are working with a ***WasteBasket*** file, choosing ***Delete*** actually shreds the selected file; GypsES prompts you to confirm the deletion (click on ***Ok*** to shred or ***Cancel*** to stop the shred).

B. ***Rename***
Use this option to rename a file. After clicking on ***Rename***, a text entry window appears. Type in the new name and press <Enter> to accept the new filename.

C. ***Copy***
Use this option to copy a selected file *to the current output mapset*. A text entry window appears prompting you to type in the name for the [new] file being copied. Press <Enter> when the filename is typed in; GypsES responds if the copy function was successful.

D. ***Show Properties***
This option gives you information about GypsES files. A *Show Properties Dialog* dialog box appears with three dialog boxes: *General*, *Data Link*, and *Advanced*.

1. ***General***: This dialog box lists the filename; file type (Raster, Vector, Composite, View, Data, or Windows); location and mapset names; the owner (= the log-in name typed in); file size; resolution (if applicable); and the dates and times the file was created, modified, and last accessed.

2. ***Data Link***: This dialog box shows existing links between database files and *Raster files only* (see ***Show Data Link*** below).

3. ***Advanced***: This dialog box provides information on pathnames for ***WasteBasket*** *files only* that can be restored.

If you are working with a ***WasteBasket*** file, choosing ***Show Properties*** brings up the same *Show Properties Dialog* dialog box described; however, the *Advanced* dialog box now shows the pathnames for files stored in the ***WasteBasket***.

E. ***Show Data Link***
This option becomes available if a Raster file is selected. This option brings up the *Show Properties Dialog* dialog box and *Data Link* dialog boxes described above. If a data link has been defined for the selected file, it is described; GypsES tells you if no link exists.

F. ***Set/Unset Data Link***
This option becomes available if a Raster file is selected. This option brings up *a Data Link Selection* dialog box so you can set (or clear) a link between a data file and a Raster file. To select a data file to link to a Raster file, click on the box to the right of "Linked Data File;" you see a dialog box (*Choose Raster link file*) that lists all data files within each mapset. Choose the data file you want to link by clicking on the filename, then click on ***Accept*** to

select the file. The filename just chosen appears in the "Linked Data File" box. Choose the data field to link to the Raster layer by clicking on the choice button to the right of "Field." All data fields in the file are listed; choose the field to link by clicking with the mouse. Then click on ***Accept*** to set the link, on ***Clear Link*** to unset the link, or on ***Cancel*** to close the *Data Link Selection* dialog box.

User Tip: "Why use a data link?"

In order to associate (link) a database file with a Raster file, GypsES needs to know what field in the database represents the Raster category number used in the Raster layer. The data link is the way to establish this.

G. ***Empty Wastebasket***
This option becomes available when you click on the wastebasket icon. This option shreds *all* files in the ***WasteBasket***, not just a selected file.

H. ***Restore File***
This option becomes available when you work with files stored in the ***WasteBasket*** directory. This option puts a file back in its original mapset within the location.

I. ***Close***
This option closes the ***File Control*** menu and returns you to the GypsES Main Screen.

Several shortcuts have been built into the *File Control* dialog box.

- ***Multiple File Selection Shortcut***: To select multiple files, hold down the <CTRL> key and click on all the files you want to select. You can delete multiple files; however, you still have to confirm the deletion of each file separately.

- ***File Menu Options Shortcut***: If you have selected a file, you can quickly access the ***File*** menu options by clicking the right mouse button. A pop-down menu appears next to the cursor; select the action you want for the selected file(s).

II. ***Create New***

Use this option to create new Raster map layers by reclassifying categories (***Reclass***), merge Raster or Vector map layers (***Combine***), create a surface layer from a SiteData file (***Create Surface***), or create a Vector map layer of quadrangle map boundaries (***Create Quad Outline***). Pull Down Menu:

- Reclass (6-5)
- Combine (6-10)
- Create Surface (6-11)
- Create Quad Outline (6-14)

A. ***Reclass***

Use this option to create a new Raster map layer with reclassified categories. You can either (1) reclassify the categories of a Raster map layer for the first time, (2) modify a previous reclassification of a Raster map layer, or (3) create a new Raster map layer based on a reclassified map layer. For example, if you had a Raster map layer of egg hatch that was classified (color-coded) by week, the egg hatch data could be reclassified (regrouped) into monthly intervals (or any other time frame chosen by you). In a similar way, a Raster map depicting predicted defoliation could be reclassified to reflect different category groupings (i.e., defoliation levels).

When the ***Reclass*** option is chosen, a *Choose Raster File for Reclass* dialog box appears. Select the appropriate mapset on the left and Raster filename on the right to be reclassified.

1. ***First-Time Reclassification of a Raster Map Layer***: If a Raster map layer chosen is an original raster file (as opposed to a reclassified file), a *Reclass* dialog box appears for you to "create a new [Raster map] layer whose category values are based upon the reclassification of categories in an existing Raster map layer" (Fig. 6-2). Information about the "Existing (Input) layer" is listed on the left side of the dialog box, including the map layer name, mapset name, and title. Type in the new map layer name in the "Layer" text entry window on the right side of the dialog box under "New (Output) layer;" typing in a title is optional. [*Note: If the new Raster layer name already exists, a warning message appears asking if the file should be overwritten.*]

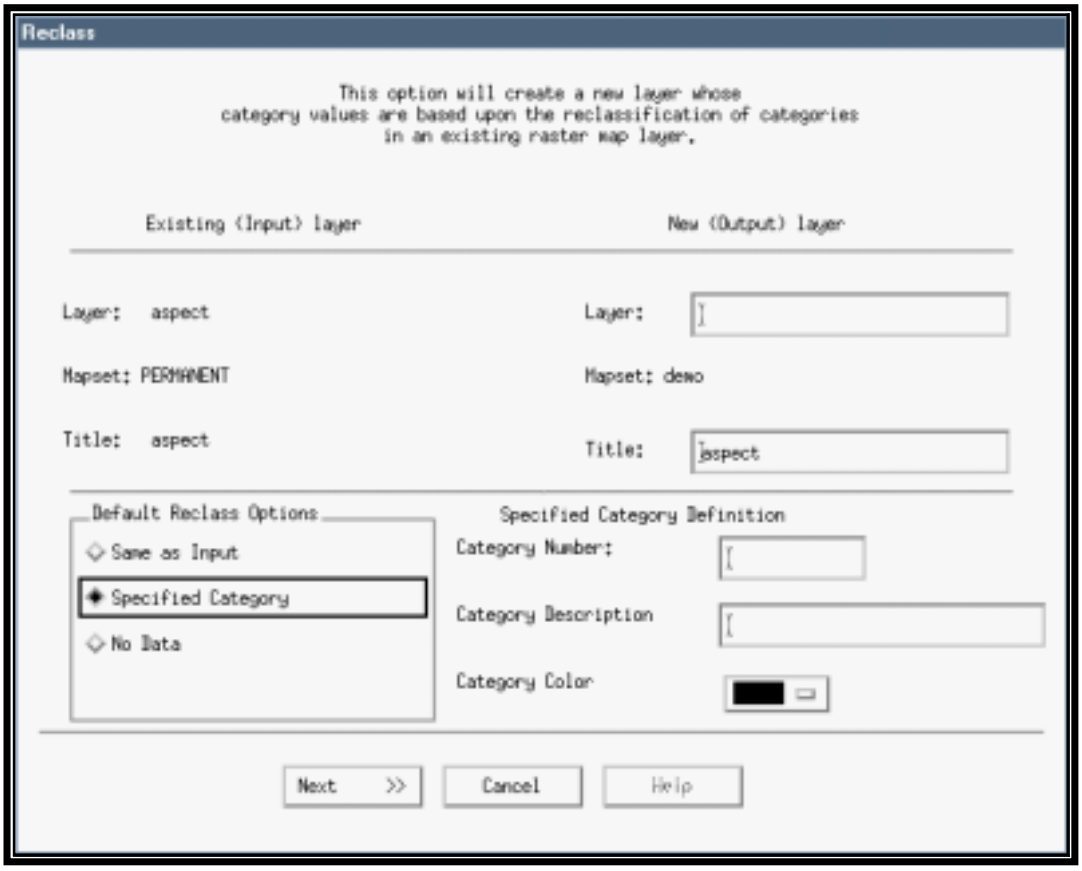


Figure 6-2. Opening *Reclass* dialog box.

Use the "Default Reclass Options" section in the lower left of the dialog box to choose between three different reclassification options:

a. ***Same as Input***: This option copies the exact same category numbers, descriptions, and colors defined in the existing Raster map layer to the new Raster map layer.

b. ***Specified Category***: This option sets the reclass definition so that *all* categories in the new layer are initially reclassed to a single category. This would be useful, for example, if you want to group many categories together and then reclassify relatively fewer categories in the following dialog box. Choosing this option activates a "Specified Category Definition" area to the right; enter or select the category number, description, and color that you want.

c. ***No Data***: This option essentially does the same thing as ***Specified Category***, except the "Specified Category" is the 0 ("No Data") category. You can then selectively choose specific categories from the new map layer to define and assign a color to; all other categories remain black ("No Data"). This provides a useful way for you to pull out specific areas of interest while leaving the rest of the map layer black (for instance, to create a Raster map layer that can be used as a Mask).

Click on ***Next*** to continue or on ***Cancel*** to cancel the reclassification process. If you chose ***Next***, a new dialog box appears (Fig. 6-3) with a list of category numbers, descriptions, and colors for the existing (input) Raster map layer on the left. A list of categories for the new (output) Raster map layer appears to the right. (New categories that appear depend on what reclassification option you chose in the opening *Reclass* dialog box.)

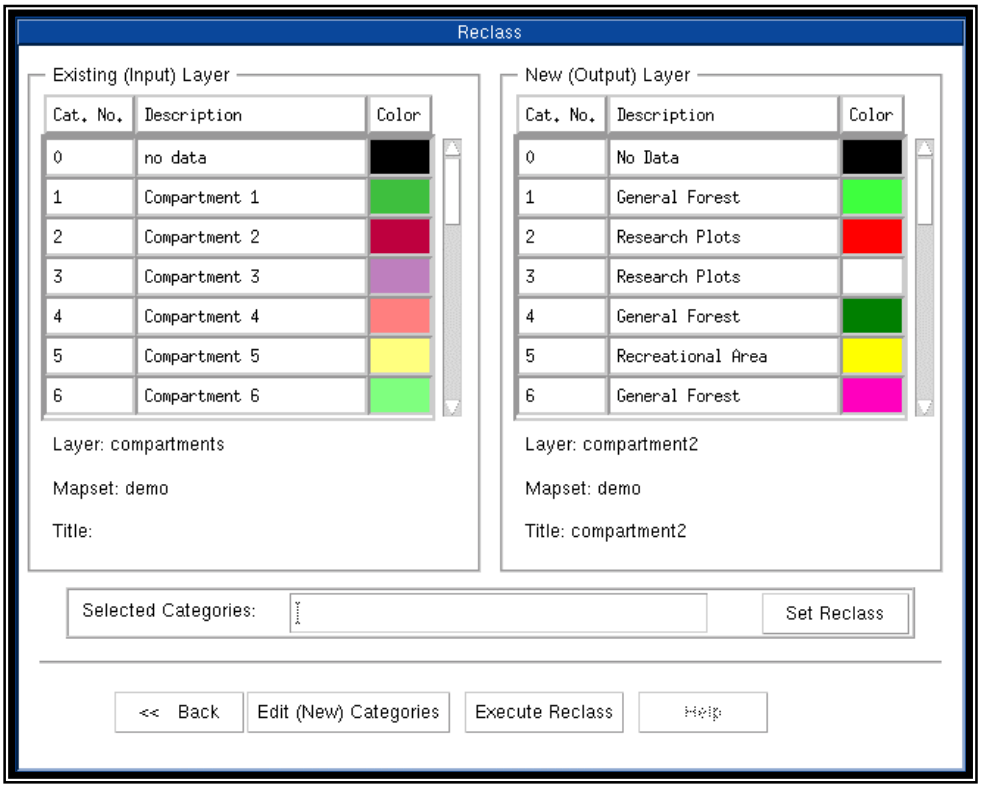


Figure 6-3. *Reclass* dialog box with all categories listed, both existing (left) and new (right).

Individually select categories to be reclassified by clicking once on the category description line itself; to deselect a category, just click on the category line a second time. As categories are selected, their category numbers are simultaneously listed at the bottom of the dialog box to the right of "Selected Categories." Categories can also be selected by typing in their numbers in this text entry window. [*Note: When doing this, be sure to separate the category numbers by semicolons; you can specify either individual category numbers or a range of numbers, for example, "1-4; 5; 12; 18-20."*]

Once a group of categories has been selected for reclassification, click on ***Set Reclass*** to the right of the "Selected Categories" text entry window. Another dialog box appears to define the new category number, description, and color (Fig. 6-4).

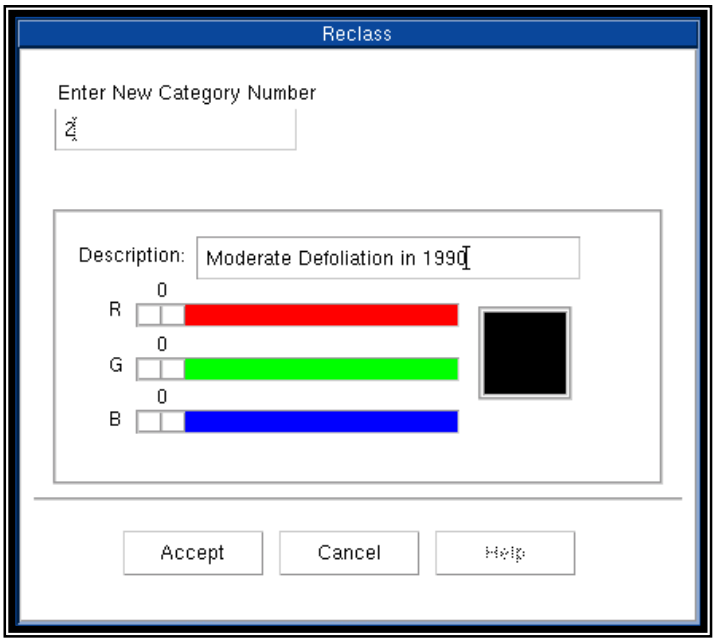


Figure 6-4. *Reclass* dialog box for modifying a given category.

To define a new category number, type in a new (or previously defined) number. If a category number is already established, the previously assigned description and color are displayed. Type a new category description in the text entry window to the right of "Description." Define the new color by sliding the double-cursor along each color bar to change the mix of red, green, and blue. (See ***Appendix B: Color Value Chart***, for sample colors.) Click on ***Accept*** to accept the edits or on ***Cancel*** to cancel any edits.

Use the ***Edit (New) Categories*** push button at the bottom of the *Reclass* dialog box (Fig. 6-3, page 6-7) to review all category attributes defined for the new Raster map layer. This dialog box is described under the ***Edit*** menu / ***Map Features*** option / ***Edit Categories*** option description starting on page 7-36.

Once all appropriate categories have been accurately redefined (reclassified), click on ***Execute Reclass*** to complete the Reclass function. If it worked, a message appears: "Congratulations! You have reclassed [existing Raster map filename] in mapset [mapset name] to [new Raster map filename] in mapset [current output mapset name]." By default, GypsES displays the newly reclassified Raster map layer; if you choose not to view the new map layer, deselect the square toggle button to the left of "Display New Reclass File?" so that it does not appear indented. Then click on ***Done***.

2. ***Reclassifying a Map Layer That Is Itself a Reclassification:*** If you choose to reclassify a Raster map layer that is itself a reclassification, there are two options: (1) modify the existing reclass of the original Raster map file, or (2) define a new reclassification based on the reclassified map layer. If this is the case, a message appears stating "[Raster map filename just selected] is a reclass of [original Raster map filename] in mapset [mapset name]. Do you want to *Modify* the reclass of [original Raster map filename] or define a *New* reclass of [Raster map filename just selected]?" Response options include ***Modify***, ***New***, ***Cancel***, or ***Help***. Choosing either ***Modify*** or ***New*** brings up the same *Reclass* dialog boxes as described on pages 6-6, 6-7, and 6-8. [*Note: If you choose to modify an existing reclass file, the Default Reclass Options are not displayed.*]

User Tip: Working With Reclassified Raster Map Layers

Once a Raster map layer is reclassified, the resultant Raster map layer can be worked with and displayed just like any other Raster file. However, it is important to remember that the new Raster map layer is always "tied" (referenced) to the Raster file from which it was created. Therefore, GypsES does not allow you to delete a Raster file that is the basis of a reclassification.

B. ***Combine |***
This function merges two or more Raster or Vector map layers.
Pull Down Menu:
- Raster (6-10)
- Vector (6-10)

1. ***Raster***: This option appends additional Raster data to the original Raster layer in those cells that have a "no data" value.

2. ***Vector***: This option appends line data.

Click on the ***Combine*** function to combine two or more Raster or Vector files. Any number of Vector files can be combined, but there is a limit of 10 files for a single combination of Raster files. A *Combine Raster (or Vector) Files* dialog box appears (Fig. 6-5); select the appropriate mapset name from the choices listed at the top left of the dialog box; this produces a list of associated files on the right.

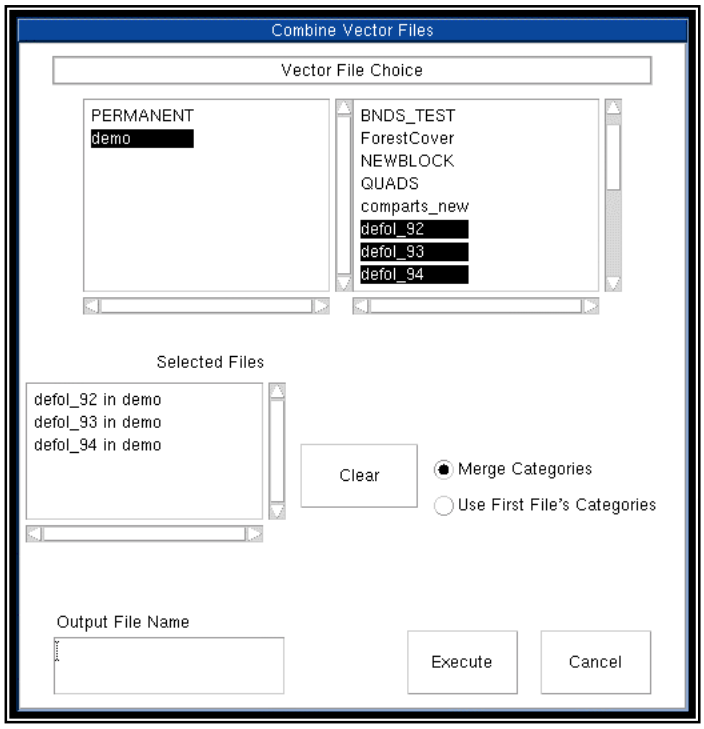


Figure 6-5. *Combine Vector Files* dialog box.

Clicking on a specific filename selects this file while simultaneously listing it under the "Selected Files" box below. Select as many files as you want. You can merge the categories of all selected files or use the categories of only the first file selected. (See ***User Tip: Merging Categories*** below). Click on ***Clear*** to clear all file selections. You need to specify an output filename before the combine function is executed. Click on ***Execute*** to combine the files or on ***Cancel*** to cancel the function.

User Tip: Merging Categories

Whether categories should be merged, or whether the categories for the first layer chosen should be used, really depends on the content of the layers being combined. If you were combining several layers of spray block polygons, and the polygons in each layer had already been labeled and had descriptions set up, you would want to merge the categories so as not to lose the descriptions. If you were merging elevation layers for different sections in a location, merging categories would not be necessary, since all category information is carried in the category number itself.

C. ***Create Surface***

This option generates a Raster surface (continuous layer) from a point file (SiteData file) by interpolating values between points for a specified database field. (See ***User Tip: "What is a surface?"*** on page 6-13.) Click on ***Create Surface*** to bring up a *Create Surface* dialog box (Fig. 6-6).

Figure 6-6. *Create Surface* dialog box.

First select a SiteData file to generate the surface layer from by clicking on the box to the right of "Select Site Data File;" this brings up a *Select SiteData File to make Surface From* dialog box. Select the mapset and SiteData file you want and click on ***Accept*** to accept the selection, on ***Clear*** to cancel any selections, or on ***Cancel*** to quit the selection process. When you have selected a file, the choice button next to "Database Fields:" is activated. Click once on this choice button to list all database fields; select a database field for generating a Raster surface layer. [*Note: Only database fields with numeric values are really appropriate for surface generation*.]

When you select a database field for creating a surface layer, GypsES scans the file to examine the data in that field. If any values in the selected database field contain decimals, a "Define Ranges for Surface Generation" box is activated (Fig. 6-7).

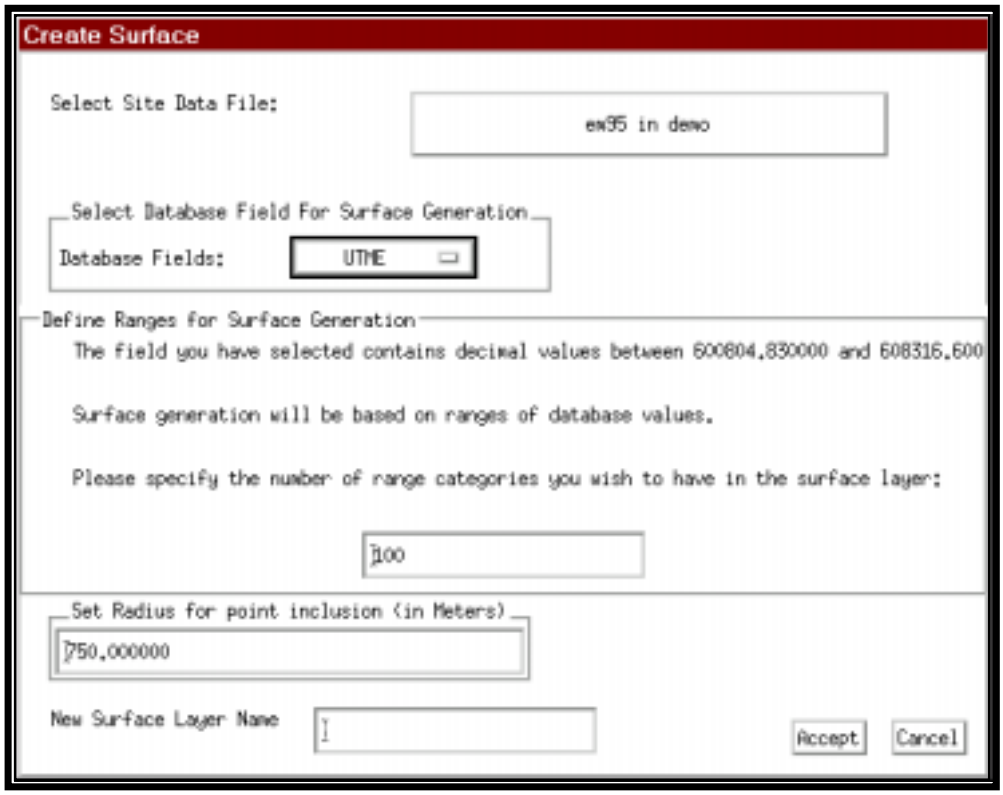


Figure 6-7. *Create Surface* dialog box: "Define Ranges for Surface Generation" box.

Because a raster layer must be based on integer categories, GypsES must develop a set of "categories" that relate to ranges of decimal values. The "Define Ranges for Surface Generation" block tells you what the highest and lowest values are for the selected database field. Choose how many categories you want the resultant raster layer broken into by modifying the value in the text entry window provided.

If the SiteData file contains only integer values in the database field you have chosen, the "Define Ranges for Surface Generation" box does not appear and the actual values in the database field are used as categories.

Use the "Set Radius for point inclusion" box to specify how far away data (sample) points can be and still affect the value in a given raster cell. To generate a surface layer, GypsES goes through the raster layer row by row and raster by raster. For each raster row/column, GypsES examines the values of the 12 closest data points. The radius value specifies a limit for this process. If no data points lie within the radius value you specify, the raster cell is set to "No Data."

Name the new surface layer in the text entry window to the right of "New Surface Layer Name." Then click on ***Accept*** to create the surface layer. [*Note: The current resolution determines both the resolution of the output surface layer and the time it takes to create the surface layer. The surface is created only for the current View, so if you want to create the surface layer for the entire location, be sure to be in Full View mode before you use the* ***Create Surface*** *option.*]

User Tip: "What is a surface?"

In many cases, pest management involves sampling (pheromone traps, egg mass counts, etc.) where a systematic sampling layout has been used over an entire area. This information can be used to make assumptions about an area. The conversion of point data (site data) to a Raster layer is called surface generation, and the Raster layer is called a surface. The raster cells that coincide with the sample points are assigned the values of the actual samples. The values of those raster cells that fall between sample points are estimated using a least squares interpolation method using all sample points surrounding them. Once a Raster surface layer has been generated, it can be used in conjunction with models (such as Defoliation Prediction) or rule bases (such as Risk).

D. ***Create Quad Outline***

This option creates a Vector map layer of the 7.5-minute quadrangle map boundaries in the location. If you choose this option, you are prompted to type in a name for the Vector quad outline file. Labels and names can be added using either the ***Edit*** menu / ***MapEdit*** option / ***Revise Existing Vector Layer*** option / "General Functions" palette / ***Edit Features*** option or the ***Edit*** menu / ***Map Features*** option / ***Map Labels*** option.

III. ***Save***

This option saves certain types of GypsES files to the hard drive.

Pull Down Menu:

- Composite (6-14)
- View (6-14)

A. ***Composite***

A Composite file is a saved list of map layers (for example, hydrology, flight lines, and spray block map layers). You can uniquely name Composite files when you save them; when you recall a Composite file, GypsES produces a Work Window that has all saved map layers. To recall a Composite file, click on the ***Window*** menu / ***Build-Update Map*** option / ***Composite Map*** option and choose from the list of Composite files. [*Note: The list of all map layers drawn in each of the four Work Windows is also automatically saved under the name Work_Window[x] where x is the Work Window number. If you change the Work Window content, the Work_Window[x] file is modified to reflect your changes. To copy the map layer content of one Work Window to another Work Window, use the* ***Window*** *menu /* ***Build-Update Map*** *option /* ***Composite Map*** *option and select the Work_Window[x] file that you want.*]

B. ***View***

A View file saves a specific "view" (rectangle) within a location. *A View file does not save map layers.* For example, if a location was defined as a county, you can define a view as a city within the county. You can uniquely name View files when you save them; when you recall a View file, GypsES produces a Work Window that has the saved view. To recall a View file, click on the ***Window*** menu / ***Change View*** option / ***Recall View*** option and choose from the list of View files. [*Note: The view in each of the four Work Windows is also automatically saved under the name Work_Window[x] where x is the Work Window number. If you change the Work Window view, the Work_Window[x] file is modified to reflect your changes. To copy the view of one Work Window to another Work Window, use the* ***Window*** *menu /* ***Change View*** *option /* ***Recall View*** *option and select the Work_Window[x] file that you want.*]

IV. ***Import***

Use this option to import data, DXF Vector files, Arc Info Shape files, and image backdrops into GypsES. If a database file contains UTM coordinate fields, it can be imported as a SiteData layer. While importing or creating a database, GypsES asks whether UTM coordinate fields exist and then classifies the file as a SiteData file, which makes it possible to display the information as a map layer.

Pull Down Menu:

- Import Data Files (*.dbf) (6-15)
- Import DXF Vector File (AutoCAD Drawing Interchange File) (6-16)
- Import Shape File (6-18)
- Import Image Backdrops (6-24)

A. ***Import Data Files***

Use this option to import database (*.dbf) files. An *Import Database File* dialog box appears (Fig. 6-8). To select one or more database files to import, click on ***Select File(s)***. A *File Selection* dialog box appears (Fig. 6-9).

Figure 6-8. *Import Database File* dialog box.

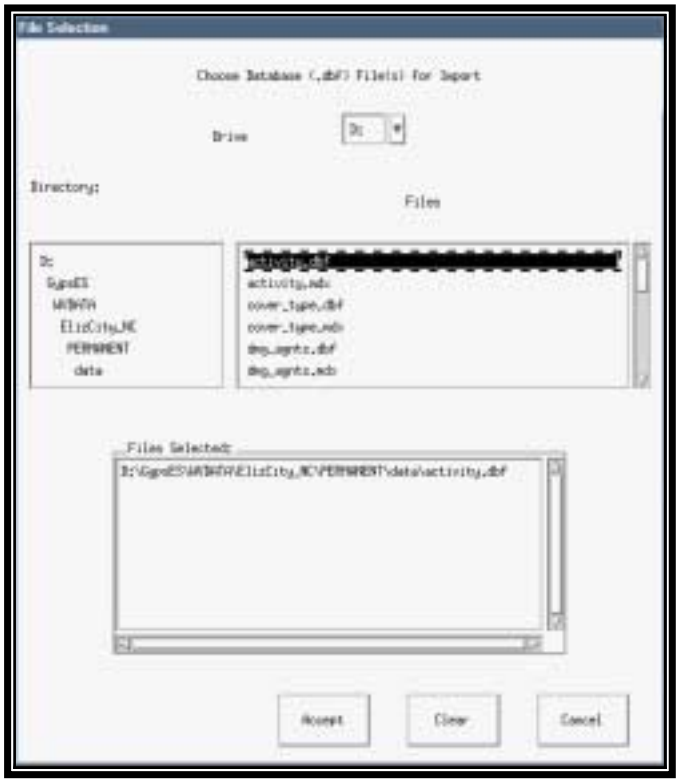


Figure 6-9. *File Selection* dialog box.

Select the appropriate drive(s) using the choice button and select the database file(s) you want to import by clicking on the filename under "Files." As you select files, they are listed below in the "Files Selected" box. Click on ***Accept*** once your selections are complete. The selected files now appear in the box under "Files to Import" in the *Import Database File* dialog box. Click on ***Accept*** to import the file(s) you have selected.

After a file has been read in, you are asked to choose the fields in the database file that represent the location (UTM Easting and Northing coordinates). If such fields exist, select them and click on ***Accept***. If the imported data file is not a SiteData file, click on ***Cancel***. [*Note: In the latter case, the file is imported as a data file. It can be viewed using the* ***Edit*** *menu /* ***Database*** *options, but not displayed as a map. See page 7-24 for a description of these options*.]

B. ***Import DXF Vector File***
Choosing this option brings up an *Import DXF Vector F*ile dialog box (Fig. 6-10). (See the ***User Tip: "What is a DXF file and how might it be used?"*** on page 6-18.)

Figure 6-10. *Import DXF Vector File* dialog box.

Click on ***Select File*** to bring up a *File Selection* dialog box to select a DXF file to import (Fig. 6-11). Click on the choice button to select a drive, then click on a filename to select it. The filename appears in the box below "File Selected." Click on ***Accept*** to complete the DXF Vector file selection.

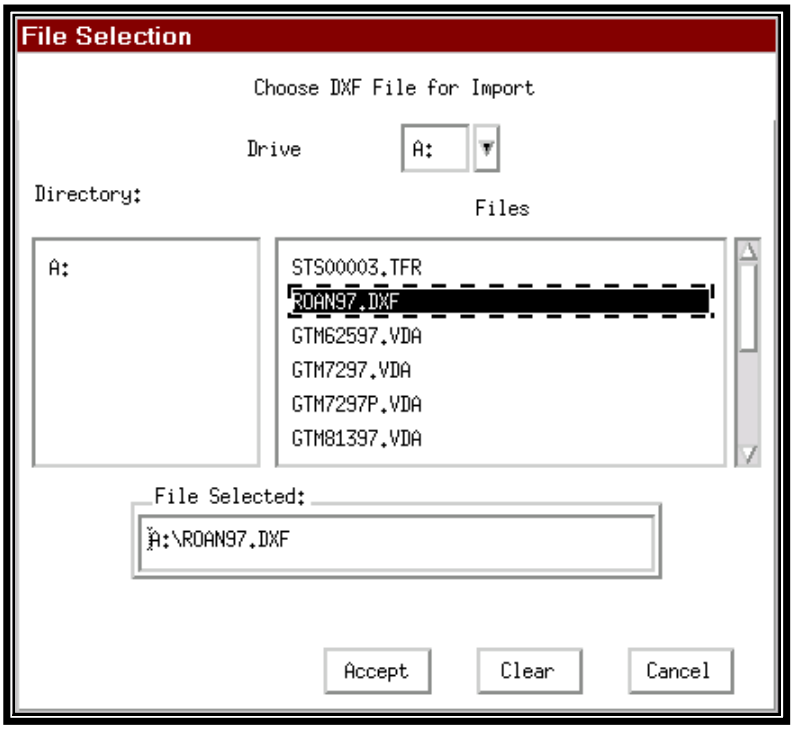


Figure 6-11. *File Selection* dialog box.

Once you select a DXF Vector file for importing, GypsES examines the file and lists all the line and label layers that make up that DXF Vector file. A DXF Vector file can have any number of line and label layers. Line layers that can be used to make a GypsES Vector file are listed in a choice box to the right of "Line layer in DXF." Layers that can be used to label a GypsES Vector file (if any exist) are listed in a choice box to the right of "Label layer in DXF." Manually choose the line and label layer you want from the respective lists to the right, select the line type of the new GypsES Vector file (polygon or feature), and name the Vector file you are creating. Click on ***Accept*** to import the DXF Vector file or on ***Cancel*** to quit.

User Tip: "What is a DXF file and how might it be used?"

DXF files contain graphical information in a standard file format used by CAD (Computer-Aided Drawing) programs such as AUTOCAD. Many GIS systems can read and create DXF files, so the DXF format is commonly used to transfer geographically referenced information between GIS systems. You may have a local GIS system that has vector (line) information that could be used in GypsES, such as roads, rivers, spray blocks, etc. The local system could create a DXF file on diskette that can then be imported into GypsES. Conversely, you may have created layers in GypsES (for example, spray blocks) that you decide to transfer to another GIS system. You can use the ***Export DXF Vector File*** option to put the information on diskette in order to transfer it to another system. In transferring to and from other systems, it is important that you check the projection and coordinate system for compatibility.

GypsES uses the UTM (Universal Transverse Mercator) system in meters. *[Note: At this time, the DXF Import / Export options in GypsES work only with line (Vector) files.*]

C. ***Import Shape File***

GypsES can import Arc Info Shape files into Vector (line or polygon) and SiteData (point) files. To import a shape file, select ***Import*** from the ***File*** menu and click on ***Import Shape File***. An *Import Arc Shape File* dialog box appears (Fig. 6-12):

Figure 6-12. *Import Arc Shape File* dialog box.

Click on ***Browse*** to select the shape file you want to import. [*Note: Shape files have the same prefix and three different suffixes: *.shp, *.shx, and *.dbf. Always click on the file with the *.shp suffix. GypsES imports *.shp files without the *.dbf and *.shx files. If the *.dbf files are missing, Vector files are imported without any labels, and SiteData (point) files will have no database information other than the record number*.]

1. ***Importing Arc Info Shape Line/Polygon Files***
   If the shape file describes either lines or polygons, the *Import Arc Shape File* dialog box changes depending on the object type (Fig. 6-13).

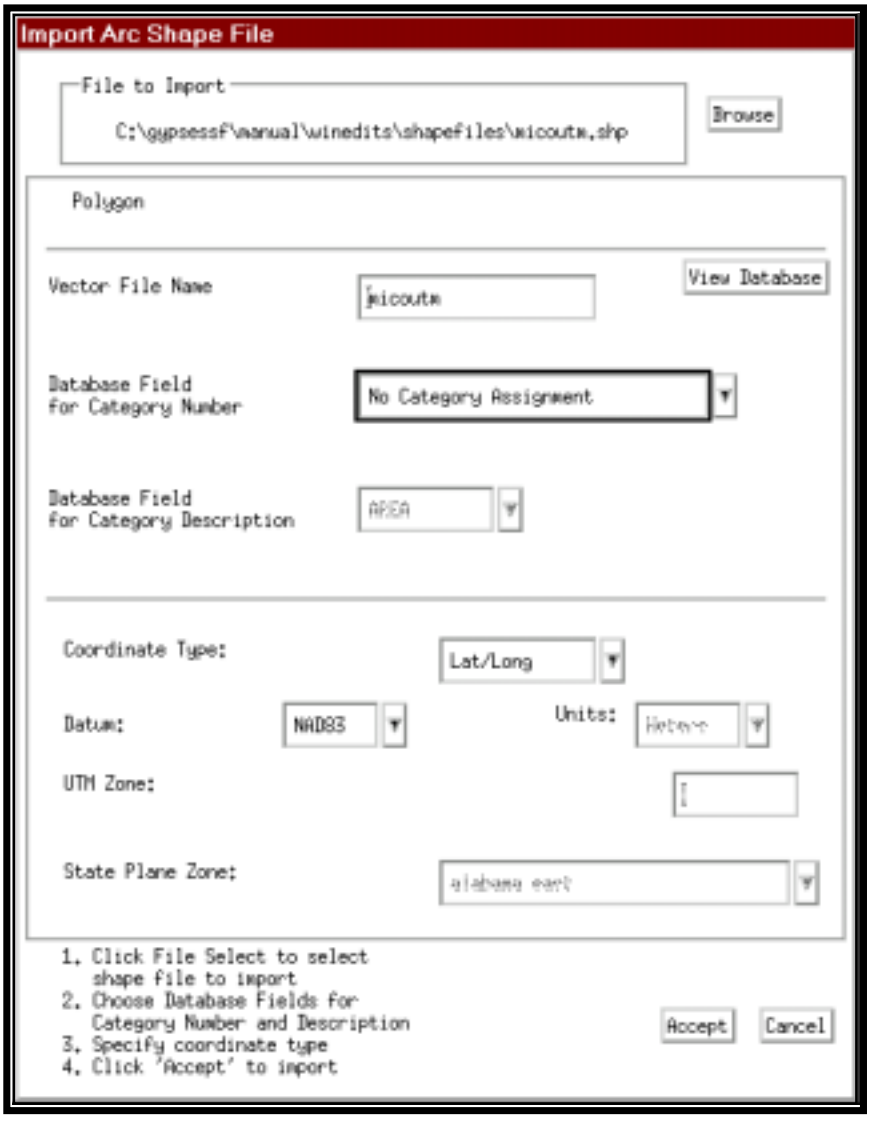


Figure 6-13. *Import Arc Shape File* dialog box: polygon file.

The first line in the box under the "File to Import" box tells you what type of objects were in the shape file. "Poly Line" indicates that the shape file contains lines that ARE NOT polygons (for example, roads). "Polygon" means that the shape file contains polygons (for example, spray blocks or county boundaries). You must use this dialog box to tell GypsES what coordinate types are in the shape file and how to set up the labeling of your imported Vector file. When you have selected a shape file, the dialog box changes to provide the options you need for the object type in the specified shape file.

a. ***Vector File Name***: Type the Vector filename in the text entry window provided. The default is the name of the shape file.

b. ***View Database***: Click this push button to view the database associated with this file. A database 'spreadsheet' dialog box appears (Fig. 6-14).

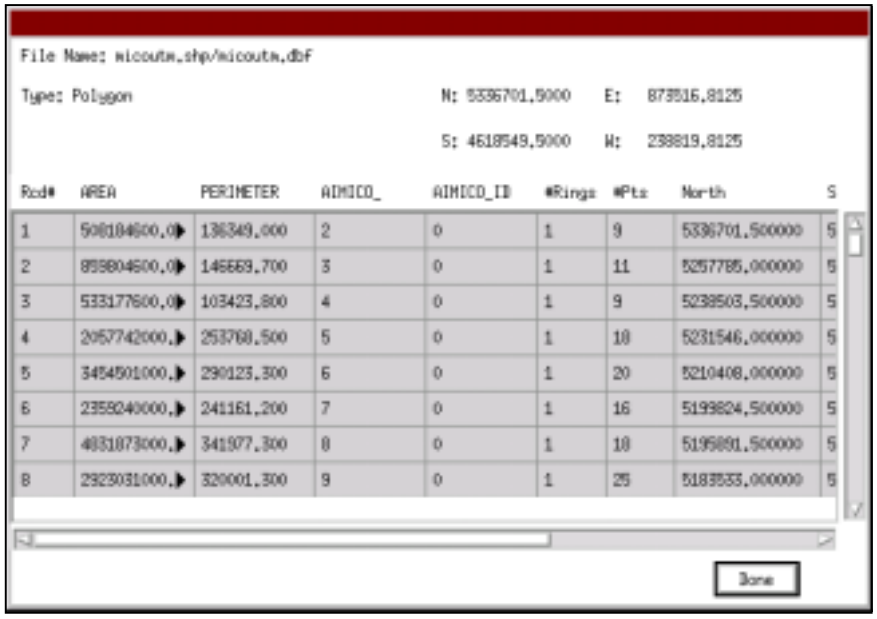
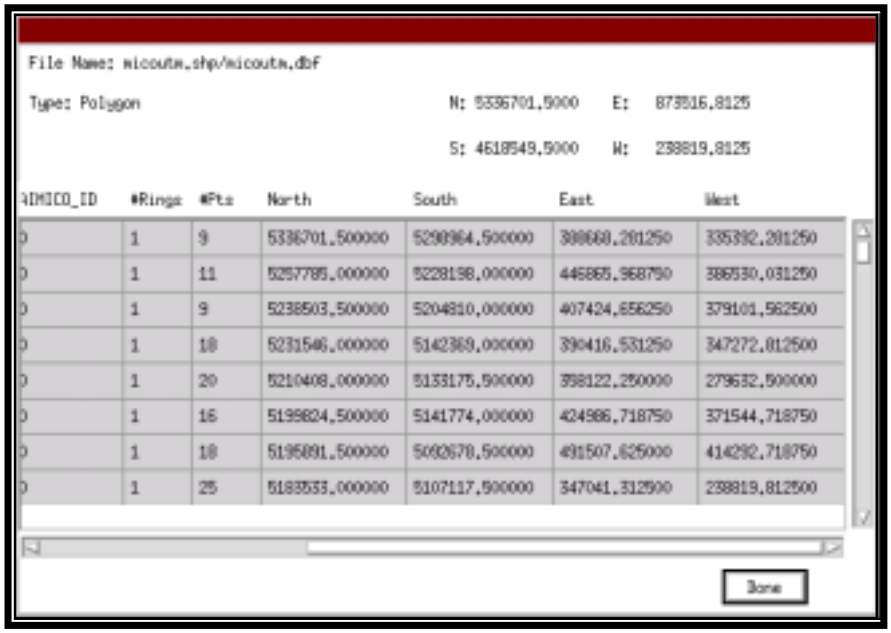


Figure 6-14. *Import Arc Shape File*: database spreadsheet dialog box (left side).

The N:/S:/E:/W: coordinates in the upper right-hand corner of the dialog box are the outermost boundaries for the shape file contents. This information helps you make sure that the shape file objects you are importing are completely within the boundaries of your current location. [*Note: GypsES does not import data that isn't located within your current location.*] In addition to displaying the contents of the

database, the coordinate boundaries of the line or polygon are in the right-hand columns of the spreadsheet (Fig. 6-15). This may help determine how to specify the coordinate system. When you are through viewing the database, click on ***Done***.



AIMICO_ID	#Rings	#Pts	North	South	East	West
0	1	9	5336701.500000	5290964.500000	388660.281250	335392.281250
0	1	11	5257785.000000	5228198.000000	446865.968750	386530.031250
0	1	9	5238503.500000	5204810.000000	407424.656250	379101.562500
0	1	18	5231546.000000	5142369.000000	390416.531250	347272.812500
0	1	20	5210408.000000	5133175.500000	358122.250000	279632.500000
0	1	16	5199824.500000	5141774.000000	424986.718750	371544.718750
0	1	18	5195891.500000	5092678.500000	491507.625000	414292.718750
0	1	25	5183533.000000	5107117.500000	347041.312500	238819.812500

Figure 6-15. *Import Arc Shape File*: database spreadsheet dialog box (right side).

c. ***Database Field for Category Number***: Use this option to specify a database field for category numbers. At this time, GypsES does not have database information associated with vector file objects. You can, however, assign a category number and category description for labeling each line or polygon. You can assign colors to feature lines. You have the following choices for assigning category numbers:

(1) ***No Category Assignment***: Use this option to import lines with no categories. You cannot show labels or assign colors.

(2) ***Assign for Unique Descriptions***: With this option, GypsES generates category numbers for each unique value of the category description database field. Use this option when there is no database field that provides a number that is unique to each different value of the category description field.

(3) ***Database Fields***: Choose a database field that has numeric (integer) values.

d. ***Database field for Category Description***: Choose the database field for describing (labeling) your lines or polygons. If you have chosen a category number assignment such that the same category number has two or more different description values, GypsES alerts you and asks you to change your choices. This is because there is one and only one category description for each category number.

e. ***Coordinate Type***: You must tell GypsES what coordinate type was used when the shape file was created. You should consult the individual or company that provided the shape file to be sure you specify the information correctly. Choices include UTM coordinates, Latitude/Longitude coordinates, or State Plane coordinates.

f. ***Datum***: Choices include NAD83 or NAD27.

g. ***Units***: Choices include meters or feet. For Latitude/Longitude coordinates, this field is de-sensitized.

h. ***UTM Zone***: If your coordinate type is UTM, enter the numeric UTM zone used. For Latitude/Longitude coordinates or State Plane coordinates, this field is de-sensitized.

i. ***State Plane Zone***: If the coordinate type is State Plane, choose the zone from the list provided. For UTM and Latitude/Longitude coordinates, this field is de-sensitized.

When you have set the category assignments and specified the coordinates, click on ***Accept*** to import the file. [*Note: GypsES only imports lines that intersect your current location's boundaries. If GypsES doesn't find any lines in the file that can be imported into your current location, it tells you. In this case, you may not have specified the coordinate parameters properly*.]

2. ***Importing Arc Info Shape Point Files***
If the shape file describes points, the *Import Arc Shape File* dialog box (Fig. 6-16) changes. Arc Info shape point files are imported as GypsES SiteData files.

a. ***Point File Import***: You can choose to import all fields in the shape database (***Copy Shape Database***) or you can select only certain fields (***Select Data Fields***).

b. ***View Database***: As with Vector file imports, use this push button to examine the Arc Shape file database. In addition to the values in the database field, this display provides the X and Y coordinates associated with each point.

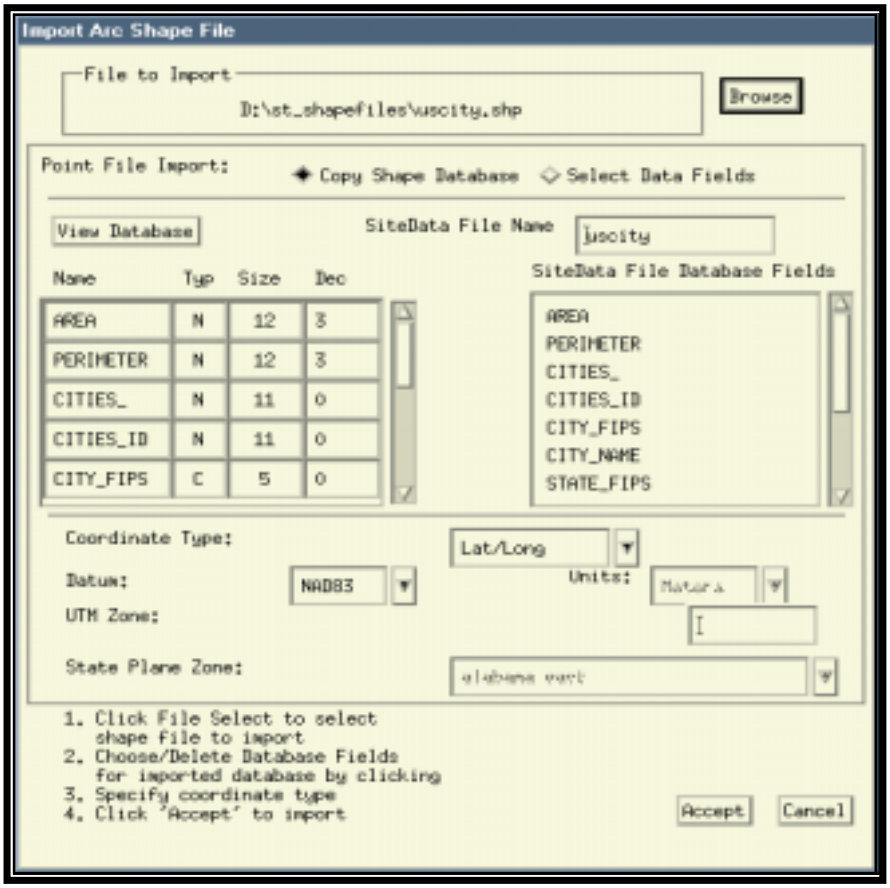


Figure 6-16. *Import Arc Shape File*: point file.

c. ***SiteData File Name***: Type the SiteData filename you want to give the imported shape file in the text entry window provided. The default is the name of the shape file. This name must be a standard DOS file name (8 characters or less and alphanumeric).

d. ***SiteData File Database Fields***: The middle section of the dialog box shows the SiteData file database fields (on the right) and their types and sizes (on the left). If you have elected to select what database fields to import, use the scrolling window on the right to click on those fields you want to include in your GypsES SiteData file database. GypsES automatically adds the UTMN and UTME fields and translates the coordinates in the shape file to UTM NAD83 values.

e. ***Coordinate Type***: You must tell GypsES what kinds of coordinates were used when the shape file was created. You should consult the individual or company that

provided the shape file to be sure you specify the information correctly. Choices include UTM coordinates, Latitude/Longitude coordinates, or State Plane coordinates.

f. ***Datum***: Choices include NAD83 or NAD27.

g. ***Units***: Choices include meters or feet. For Latitude/Longitude coordinates, this field is de-sensitized.

h. ***UTM Zone***: If your coordinate type is UTM, enter the numeric UTM zone used. For Latitude/Longitude coordinates or State Plane coordinates, this field is de-sensitized.

i. ***State Plane Zone***: If your coordinate type is State Plane, choose the State Plane zone from the list. For UTM coordinates and Latitude/Longitude coordinates, this field is de-sensitized.

When you have specified the database fields to import and the coordinate type, click on ***Accept*** to import the shape file as a GypsES SiteData file. [*Note: Only those points that lie within the boundaries of the current location will be imported*.]

D. ***Import Image Backdrops***

A new feature of GypsES/NT is the ability to do your own image imports. You can order map backdrops from Land Info or Vargis and import the images yourself. It is important to understand that importing images into GypsES usually involves some sort of re-projection of the image, and this takes time. For some types of imports, you may want to set the import up and let it run overnight. GypsES attempts to estimate how long it will take to import an image backdrop, but this ultimately depends on the speed of your processor, the amount of memory (RAM) you have, and the speed of your CD-ROM and hard disk.

To import an image, select ***Import Image Backdrops***; an *Import Image Backdrop* dialog box appears (Fig. 6-17). [*Note: The settings you select in this dialog box are extremely critical to getting a backdrop image that provides the correct geographic reference. GypsES expects all internal geographic data to use the Universal Transverse Mercator projection, NAD83 Datum. GypsES attempts to re-project the images based on the settings in this dialog box. If these settings do not represent the information in the source images, the imported image backdrops will not be properly geographically referenced and this will cause untold grief. Please read the information provided with your images and set this dialog box up accordingly before importing!]* The dialog box parameters include the following:

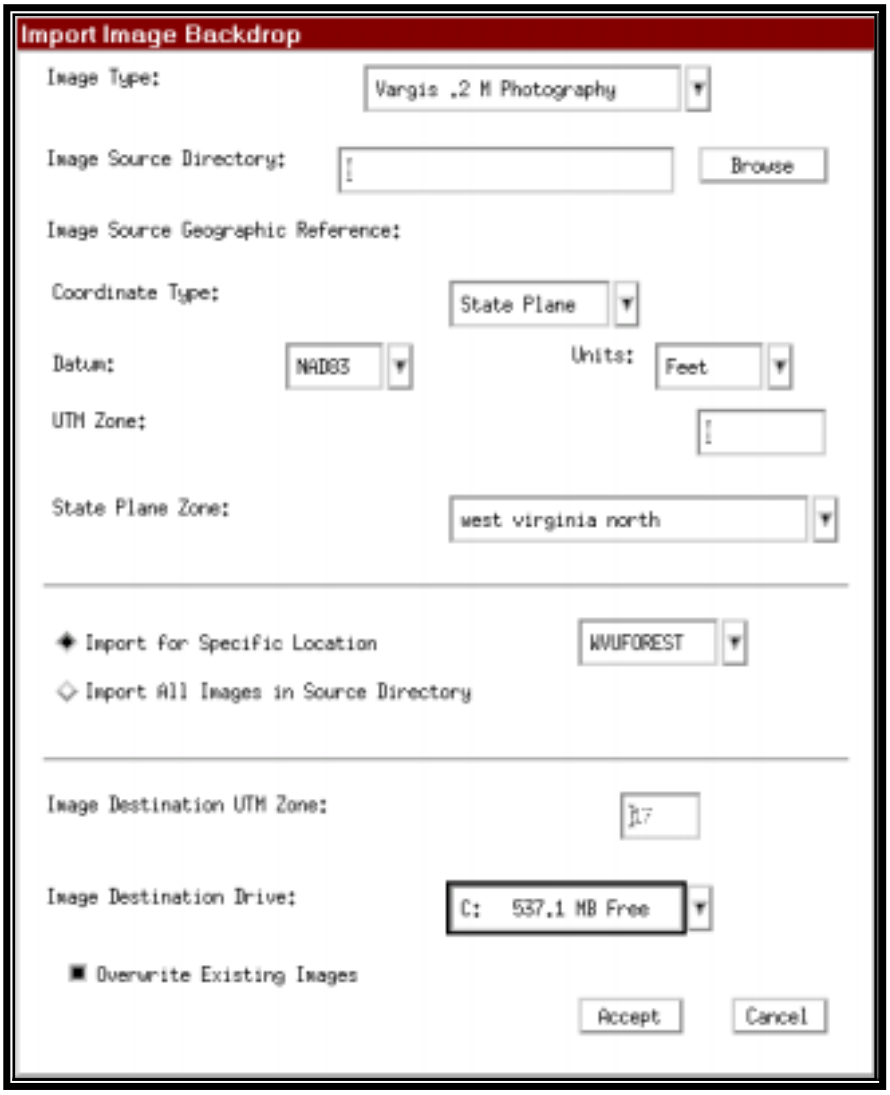


Figure 6-17. *Import Image Backdrop* dialog box.

1. ***Image Type***
   There are presently six types of images that can be imported.

   a. ***USGS 1:24,000 (Land Info)***: These are 16-color 7.5-minute quadrangle maps. Resolution is about 8 ft per pixel. Imported images require 2-8MB of hard disk space per quadrangle map, depending on the amount of detail in the image (urban areas take up more space). [*Note: In some areas, the 7.5-minute maps are of slightly different resolution (1:25,000, for instance). These are usually in a separate*

directory and can be imported separately and then merged with the 1:24,000 quadrangle maps.]

b. ***USGS 1:50,000 (Land Info):*** These are 16-color maps used in Canada. Resolution is 3.2 m (10.4 ft) per pixel. These images require 0.5-1MB of disk storage space for each 7.5-minute quadrangle map.

c. ***USGS 1:100,000 (Land Info)***: These are 16-color 30x60 minute quadrangle maps. Resolution is about 10 m (32.8 ft) per pixel. These images require 0.1-0.5 MB of disk storage space for each 7.5-minute quadrangle map, or 3.2-16MB for each 30x60 minute quadrangle map.

d. ***USGS 1:250,000 (Land Info)***: These are 16-color 1x2 degree quadrangle maps. Resolution is about 25.4 m (83.3 ft) per pixel. These images require 2-5MB of disk storage space for each 1-degree square, or 4-10MB for each 1x2-degree quadrangle map.

e. ***SPOT [Aerial] Photography***: These are black and white images. Resolution is about 10 m (32.8 ft) per pixel. Spot images require 1-3 MB of disk storage space for each 7.5-minute quadrangle map.

f. ***Vargis .2 Meter Photography***: This is color aerial photography distributed by Vargis Inc., of Herndon, VA. This is very high-resolution photography (0.2 meters (8 inches) per pixel). These images require 2-10 MB of disk storage space for each 30-second quadrangle map; that translates to 4-40MB of disk storage space for each 1-minute quadrangle map, or 225MB-562MB of disk storage space for each 7.5-minute quadrangle map.

We will probably be adding additional image types to this list. If you have geographically referenced images you would like to use in GypsES, please let us know.

2. ***Image Source Directory***
   This is the directory that contains the images you want to import. Click on ***Browse*** to bring up a dialog box to choose the drive and (sub)directory. The directory you specify should contain the images you want to import. LandInfo and Vargis images have files with *.tif and *.tfw suffixes. For SPOT images, there are directories with the scene names.

3. ***Image Source Geographic Reference***
   The entries you make in this section MUST mirror the information you receive with your images. When you choose an image type, GypsES attempts to set these fields to the most common settings for the image type. However, variations exist, so be sure to check!

   a. ***Coordinate Type***: This is specified with your source images. If you have any doubts, check with the image supplier. SPOT imagery always provides latitude/longitude coordinates, so all other coordinate specification fields are de-sensitized for SPOT. Coordinate type choices include UTM, State Plane and Latitude/Longitude. For UTM, the UTM zone must be specified. For State Plane, you must specify the State Plane Zone. The appropriate input fields are sensitized for the coordinate type selected. For ALL Coordinate types, the Datum should be set.

   b. ***Datum***: A datum is a set of points that describes the shape of the earth's surface for a given part of the earth. The NADXX Datum, for instance, is short for 'North American Datum'. A datum is associated with an ellipse or geoid that is a mathematical approximation of the shape of the earth. If you specify ***NAD83***, GypsES assumes that your image is already adjusted for a datum and projects it using the GRS80 ellipsoid, which is applicable to all parts of the earth. Most Land Info USGS maps are created using the NAD27 Datum, which should be specified so the image can be re-projected. Errors in specifying the datum can result in 200+ meter differences between the coordinates shown in GypsES and the readings you would get, for instance, from a GPS unit. [*Note: For locations outside the North American Continent, always specify NAD83. This will force NO datum shift*.]

   c. ***Units***: Some coordinates are supplied in meters, others in feet. Check the image specifications carefully to be sure the correct units are selected.

   d. ***UTM Zone***: If your coordinate type is UTM, enter the numeric UTM zone specified by the supplier of the images. For State Plane Coordinates, this field will be de-sensitized.

   e. ***State Plane Zone***: If your coordinate type is State Plane, choose the state plane zone from the list. Check with your supplier to be sure that you are using the right zone.

4. ***Import for Specific Location / Import All Images in Source Directory***
   This choice determines whether the images you are importing are placed within a specified location's folder (***Import for Specific Location***) or in a general folder of all

images for a specified UTM zone (***Import All Images in Source Directory***). In general, for higher resolution images, it is best to locate the images within the location. Then, if you want to transfer the location to another computer, the images are part of the location folder and you can just move the folder.

For lower resolution images such as the 1:100,000 and 1:250,000 USGS maps, there is some benefit to using the ***Import All Images in Source Directory*** option. The images are built seamlessly for the entire region or state and are available to all locations on the system after a single import. Because these images take up less disk space, the "imagesZoneXX" folder can also be moved to another machine. There is an exception to this; see ***Image Destination Drive*** below.

The choice of import method is something that must be evaluated for each installation and varies with how you are going to use the system. If you choose the ***Import for Specific Location*** method, choose the location to which you want to import your images in the choice box to the right. GypsES automatically picks up the UTM zone for that location and places it in the "Image Destination UTM Zone" text entry window. If you choose the ***Import All Images in Source Directory*** option, you must specify a destination zone in the "Image Destination UTM Zone" text entry window. [*Note: Images imported for a given zone are NOT available to a location that has been set up in another zone*.]

5. ***Image Destination Drive***
   Choose the disk drive on your system to place the images. [*Note: If you use the* ***Import for Specific Location*** *option but choose a drive other than where your location resides, the images are imported to an "imagesZoneXX" folder, where XX is the location's zone. GypsES does not allow a location to be set up on more than one drive in a single system. In this case, only those images that overlap the location boundaries are imported, but they are placed in the X:\Gypses\Data_Files\ImagesZoneXX folder.*]

When you have specified the image type, source directory, geographic reference information, import type and destination drive, click on ***Accept*** to start the import. GypsES first examines the files in the source directory. It then calculates the image tiles needed to cover the destination directory. It estimates how much disk space is needed and gives a warning message if it looks like the destination drive does not have enough space to import the tiles.

If everything looks OK, GypsES provides a very rough estimate of the time required to import. If you elect to continue, the import begins. A scrolling window shows the progress of the import (Fig. 6-18). It shows each tile being built, the sequence of the tile, and the source tiles being accessed to build it. [*Note: Image imports from source images with State Plane coordinates or UTM coordinates in another zone take MUCH longer. This is because to build an image row in the destination tile, multiple rows in the source tile must be read.*]

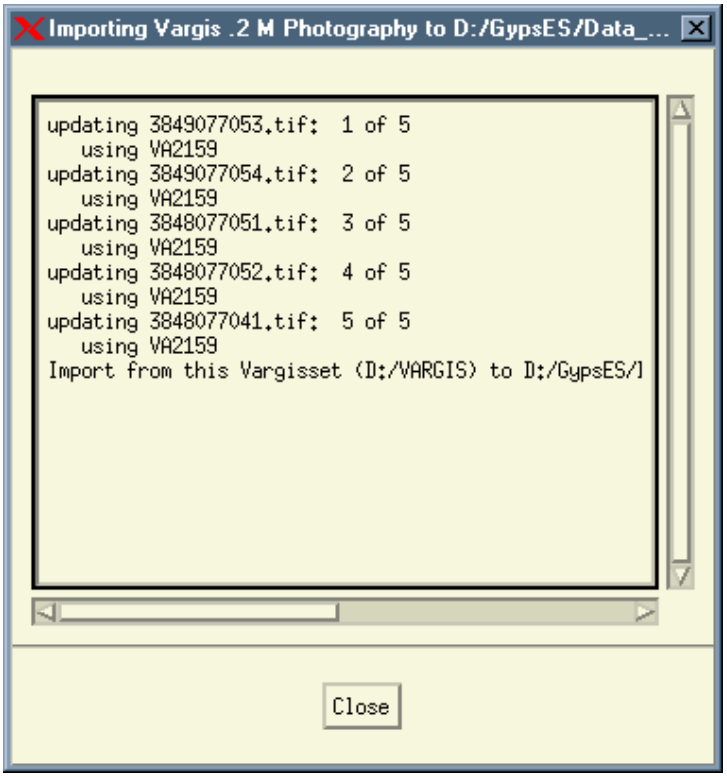


Figure 6-18. Sample scrolling window of an image backdrop being imported.

When the import is completed, a message is displayed in the scrolling window. Click on ***Close*** and then on ***Cancel*** to exit the *Import Image Backdrop* dialog box.

V. ***Export***

Use this option to export data, DXF Vector files, and graphics files. GypsES databases can be copied to other devices and/or folders on your computer using the ***Export*** option. You can place GypsES graphics files elsewhere in your system.

Pull Down Menu:

- Export Data Files (*.dbf) (6-30)
- Export SiteData File to Shape (6-32)
- Export DXF Vector File (AutoCAD Drawing Interchange File) (6-33)
- Export Vector File to Shape (6-35)
- Export Graphics File (6-36)

A. ***Export Data Files***

Selecting this option brings up an *Export Data Files* dialog box (Fig. 6-19). Under "Data File Choice," select the mapset (listed on the left) and database file (listed on the right) you want to export. [*Note: The file can be either a data file or a SiteData file; no distinction is made in the list.*]

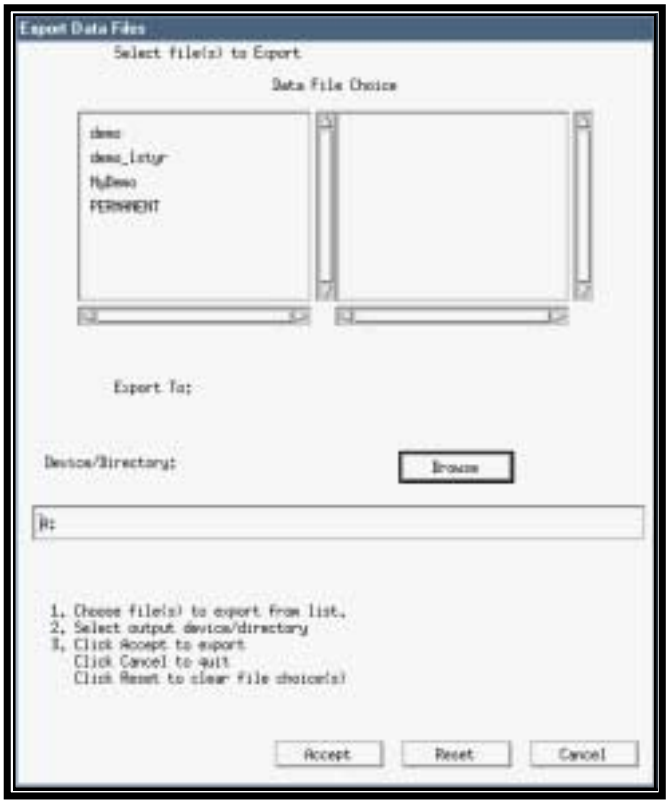


Figure 6-19. *Export Data Files* dialog box.

Then indicate the drive (device) and/or subdirectory where you want to put the exported data file. Do this by either typing the information in the "Device/Directory" text entry window or by clicking on ***Browse***, which brings up a *Select Device/Directory for Data File Export* dialog box (Fig. 6-20). Select the appropriate drive letter using the choice box to the right. The drive letter appears on the left under "Directory:" and all files and directories on this drive appear on the right under "Files." Double-click on a directory name to list subdirectories. As you choose a directory and subdirectories, they simultaneously appear to the left under "Directory." Click on ***Accept*** to return to the *Export Data Files* dialog box. The drive and directory chosen should appear in the "Device/Directory" text entry window. Click on ***Accept*** to export the data file.

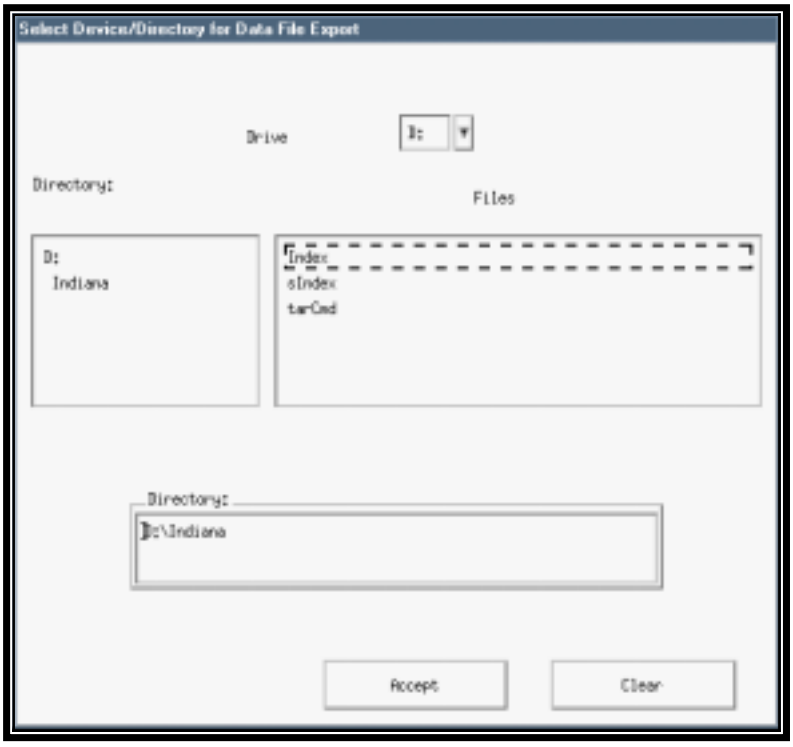


Figure 6-20. *Select Device/Directory for Data File Export* dialog box.

B. ***Export SiteData File to Shape***

SiteData files can be exported to Arc Info shape file format. This is a relatively simple process because both GypsES and Arc Info shape files utilize the same *.dbf database format. The shape file created using this process is almost the same as your GypsES SiteData file except that:

- The coordinate information is transferred to the *.shp file.
- The database fields that contained the UTM coordinate values in GypsES are not transferred to the *.dbf file created as part of the shape file set.

When you select the ***Export SiteData File to Shape*** option, an *Export SiteData to Arc Shape File* dialog box appears (Fig. 6-21).

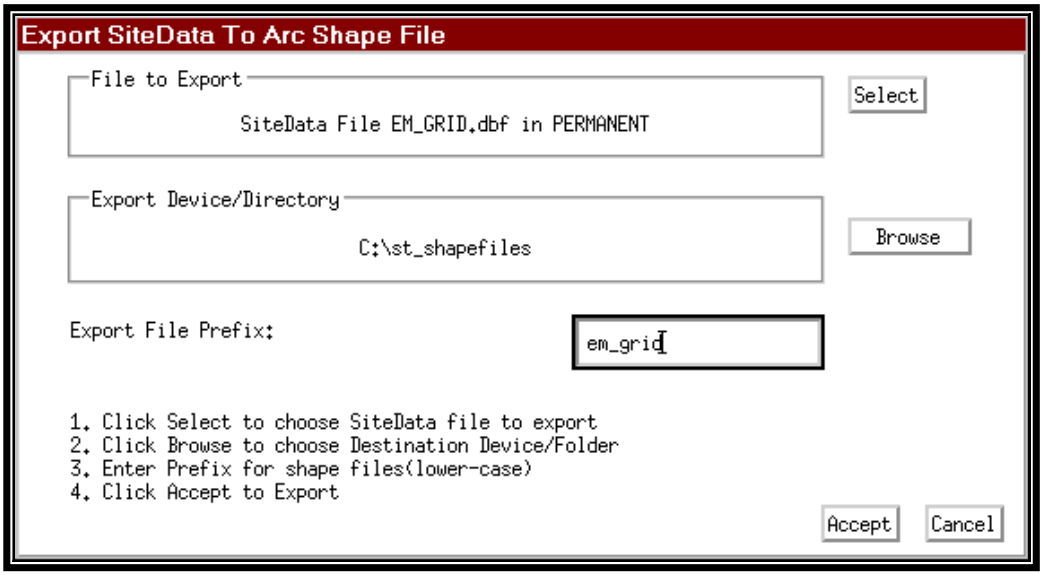


Figure 6-21. *Export SiteData To Arc Shape File* dialog box.

Click on ***Select*** to choose the SiteData file to export. The ***Browse*** push button brings up a *Select Destination Device/Directory for Shape File Export* dialog box. Choose the device (drive) and directory (folder) into which to export the shape file set. Enter a prefix for the exported shape files in the text entry window to the right of "Export File Prefix." [*Note: Arc Info shape file conventions require a DOS-compatible name in lower case. If you enter upper case letters, they are automatically changed to lower case when the file is exported.*]

Click on ***Accept*** to create the shape files. [*Note: Coordinates provided in shape Files created by GypsES are NAD83 Datum, UTM Meters, for the zone used by the location*.]

C. ***Export DXF Vector File***

Clicking on this option brings up an *Export Vector File to DXF* dialog box (Fig. 6-22). (See the ***User Tip*** on page 6-18 for information about DXF files.) Select a Vector file to export by first clicking on a mapset name (left side of the dialog box) and then on a Vector file within that mapset (right side of the dialog box). Clicking on a filename selects it for exporting. Type in a destination drive (device) and directory in the "Device/Directory:" text entry window or click on ***Browse*** to choose.

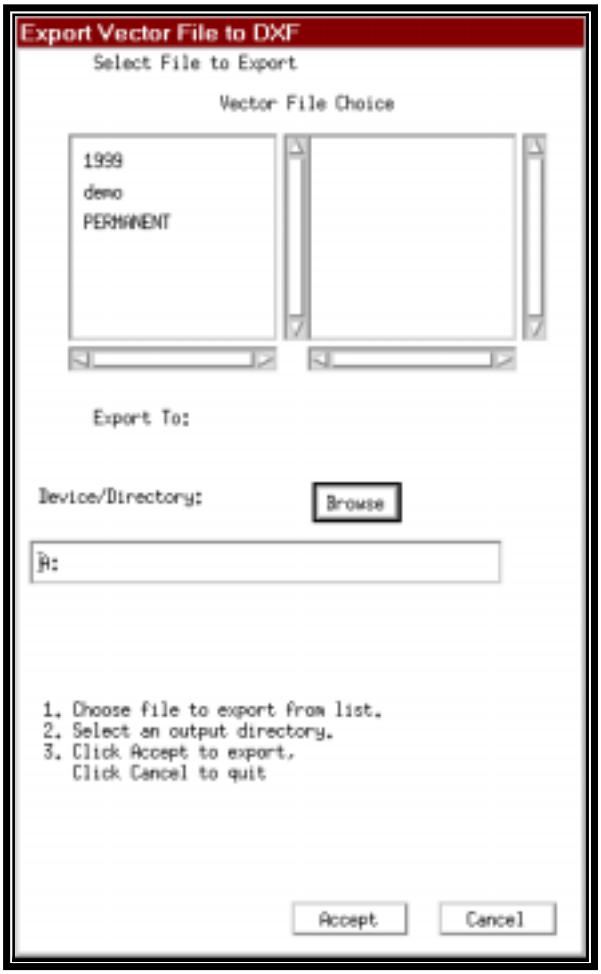


Figure 6-22. *Export Vector File to DXF* dialog box.

This brings up a *Select Destination Device/Directory for DXF File Export* dialog box (Fig. 6-23). Select the appropriate drive letter using the choice box to the right. The drive letter appears on the left under "Directory:" and all files and directories on this drive appear on the right under "Files." Double-click on a directory name to list subdirectories. As you choose a directory and subdirectories, they simultaneously appear to the left under "Directory." Click on ***Accept*** to return to the *Export Vector File to DXF* dialog box. The drive and directory you chose should appear in the "Device/Directory" text entry window. Click on ***Accept*** to export the Vector file or on ***Cancel*** to quit.

Figure 6-23. *Select Destination Device/Directory for DXF File Export* dialog box.

D. ***Export Vector File to Shape***

Choose this option to export a GypsES Vector or line file to Arc Shape file format. An *Export Vector To Arc Shape File* dialog box first appears (Fig. 6-24).

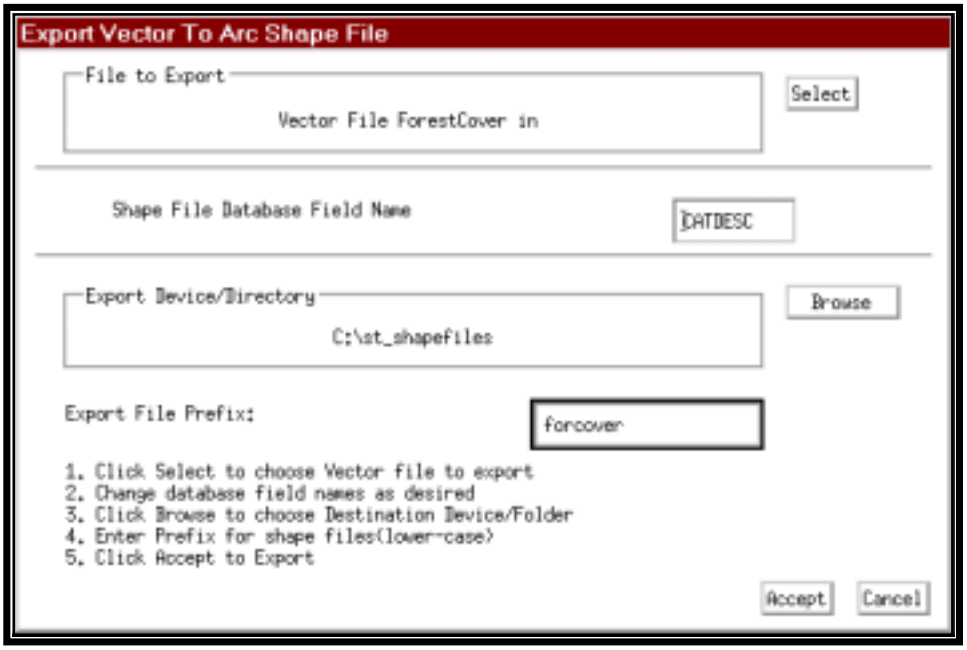


Figure 6-24. *Export Vector To Arc Shape File* dialog box.

First choose the Vector file to export by clicking on ***Select*** and using the *Select Vector File to Export* dialog box. GypsES Vector files do not have database information associated with them. There may be, however, a category description field that can be transferred to the shape database file along with the category number. Type the database field name in the text entry window to the right of "Shape File Database Field Name." Database field names are limited to 10 characters and must start with an alphabetic character.

Click on ***Browse*** to choose the device (drive) and/or directory (folder) in which to place the shape files. Enter a prefix name for your shape files in the text entry window to the right of "Export File Prefix." The exported files are <prefix>.shp, <prefix>.dbf and <prefix>.shx, where <prefix> is the name you type. This name must be a valid DOS file name with eight characters or less. When you have completed the setup, click on ***Accept*** to export your file. [*Note: Coordinate information in the shape files is NAD83 Datum, UTM Meters, for the zone used in the current location.*]

E. ***Export Graphics File***

Choosing this option brings up an *Export Graphics Files* dialog box (Fig. 6-25). You are prompted to select one or more graphics files to export from a list of graphics files stored in GypsES. Clicking on the appropriate mapset listed on the left produces a list of graphics files within that mapset on the right. Click to select one or more graphics files to export. Enter a directory path in the "Device/Directory" text entry window or click on ***Browse*** to select a file. This brings up a *Select Device/Directory for Graphics File Export* dialog box. Click on ***Accept*** to export the graphics files to the directory, on ***Reset*** to clear the graphics file choices, or on ***Cancel*** to quit.

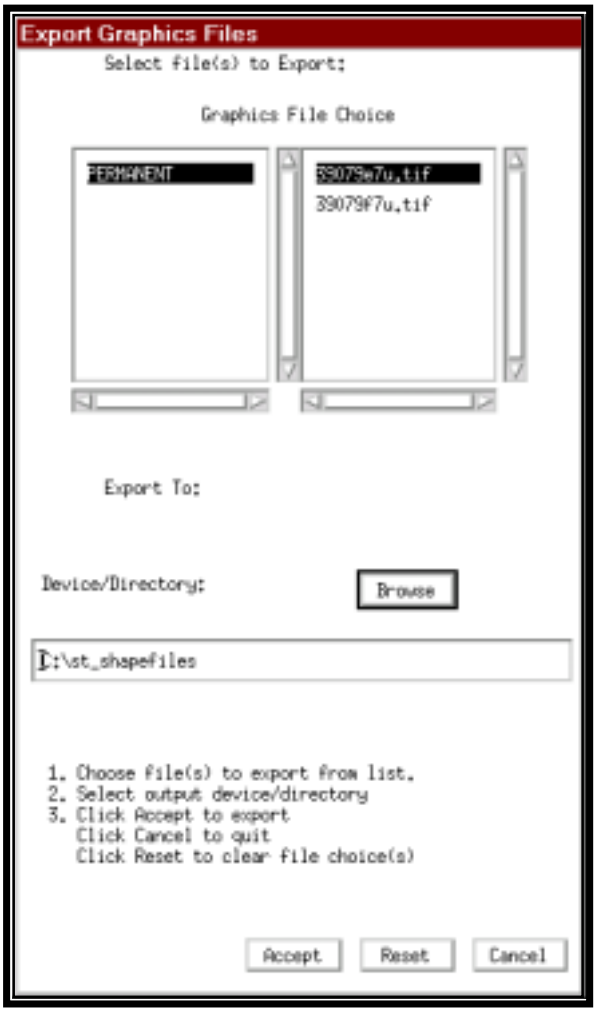


Figure 6-25. *Export Graphics Files* dialog box.

VI. ***Reports***

Use this option to create, view, print or delete Raster map layer area reports.

Pull Down Menu:

- Generate Raster (6-37)
- View Report (6-38)
- Print Report (6-39)
- Delete Report (6-39)

A. ***Generate Raster***

Use this option to choose a Raster map layer for which GypsES produces a summary report file of areas by category number. Clicking on the ***Generate Raster*** option brings up a *Raster Layer Area Report Definition* dialog box (Fig. 6-26). Select the Raster layer you want to summarize by clicking once on the box to the right of "Raster layer" and select the mapset and file you want from the lists. You can select a Mask map layer to exclude those areas in the Mask layer that are coded "No Data" from area calculations. Click on ***Accept*** to finish the file selection or on ***Clear*** to clear the selection. Choose one or more unit(s) of area measurement for the report under the heading "Choose columns for report" by clicking once on the unit of measurement you want (the square toggle button next to the unit is indented once you select it). Give the report a filename by clicking once in the text entry window to the right of "Report filename" and typing in the filename. Click on ***Execute*** to generate the Raster layer area report. This summary file can either be viewed on the screen or printed to the default printer, if any, that has been defined.

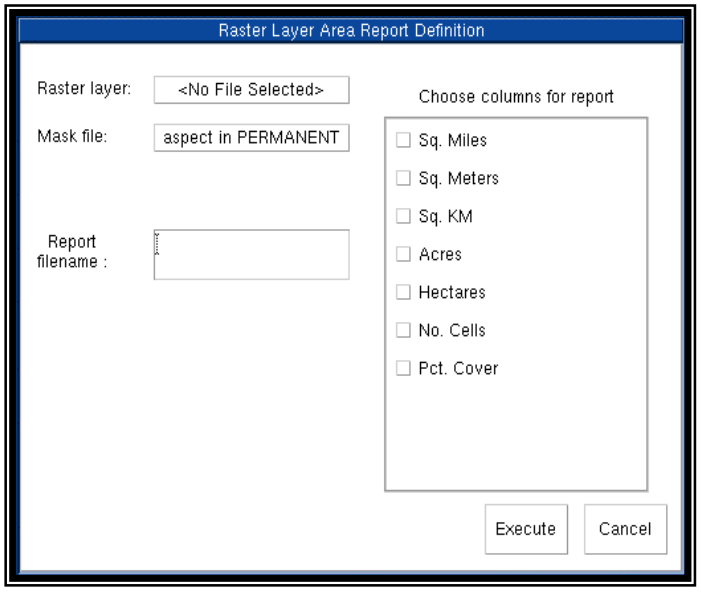


Figure 6-26. *Raster Layer Area Report Definition* dialog box.

User Tip: How A Mask Layer Might Be Used With Raster Reporting

Suppose you have two Raster layers: one is a layer that shows those areas of the location that contain trees (for example, "ForestCover"), and another layer contains spray blocks that have been rasterized. You can print a Raster report of the spray blocks using the "ForestCover" layer as a mask. The resulting report shows the area of each spray block that contains trees.

B. ***View Report***

Use this option to view a Raster layer area report that has been previously generated on the computer screen and saved. Click on ***View Report*** to bring up a *Select Report to View* dialog box. Select the appropriate mapset on the left and click on the report filename on the right. The area report is displayed on the screen (a sample is shown in Fig. 6-27). Click on ***Print*** to print the report or ***Exit*** to close the dialog box.

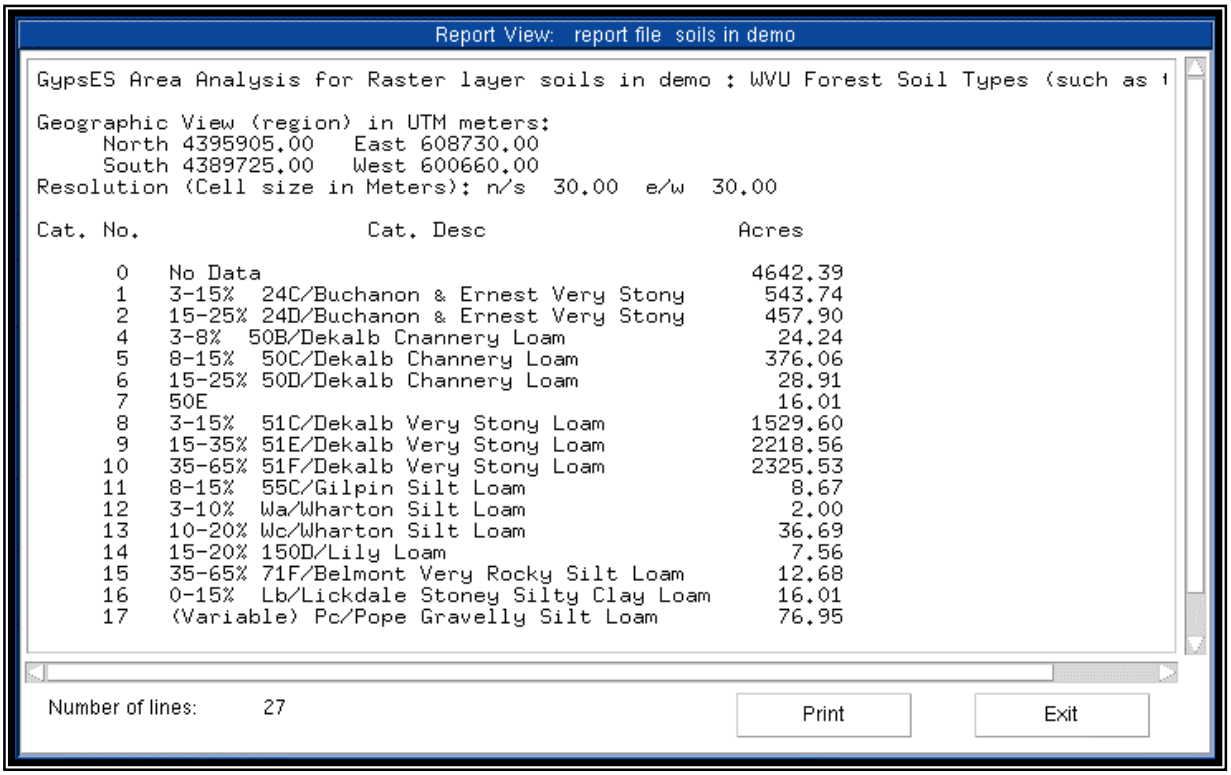


Figure 6-27. Sample Raster Layer Area Report viewed on the screen.

C. ***Print Report***
This option prints a previously generated Raster layer area report to the default printer.

D. ***Delete Report***
This option deletes an existing Raster layer area report. Highlight the name of the report and click on ***Accept*** to delete the report.

VII. ***Graphics Output***
This option prints the contents of a Work Window to a file or output device (printer). If you have never used this option in GypsES or have never saved a graphics output setup file, a *Graphics Output Setup* dialog box appears (Fig. 6-28).

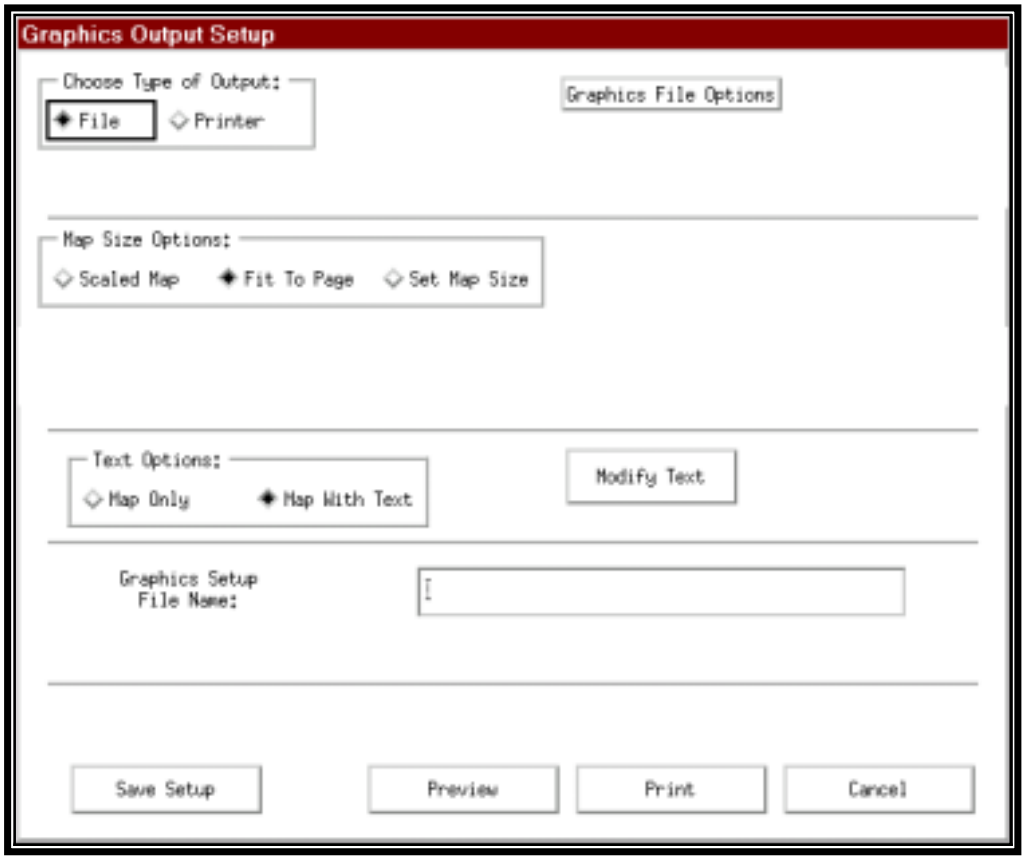


Figure 6-28. *Graphics Output Setup* dialog box: file output.

If you *have* saved a graphics output setup file, you can either use the default settings (shown in Figure 6-28) or choose a previously saved setup. If you choose a previously saved setup file, the *Graphics Output Setup* dialog box changes to reflect the settings you saved.

[*Note: The Graphics Output Setup dialog box options are somewhat different for creating graphics output files versus hard-copy maps, so they are described in different sections:* ***Graphics Output: File*** *and* ***Graphics Output: Printer****.]*

A. ***Graphics Output: File***

1. ***Choose Type of Output***: To create a graphics output file, click the diamond toggle button beside "File."

2. ***Graphics File Options***: Click on ***Graphics File Options*** to bring up a *Graphics File Output Options* dialog box (Fig. 6-29).

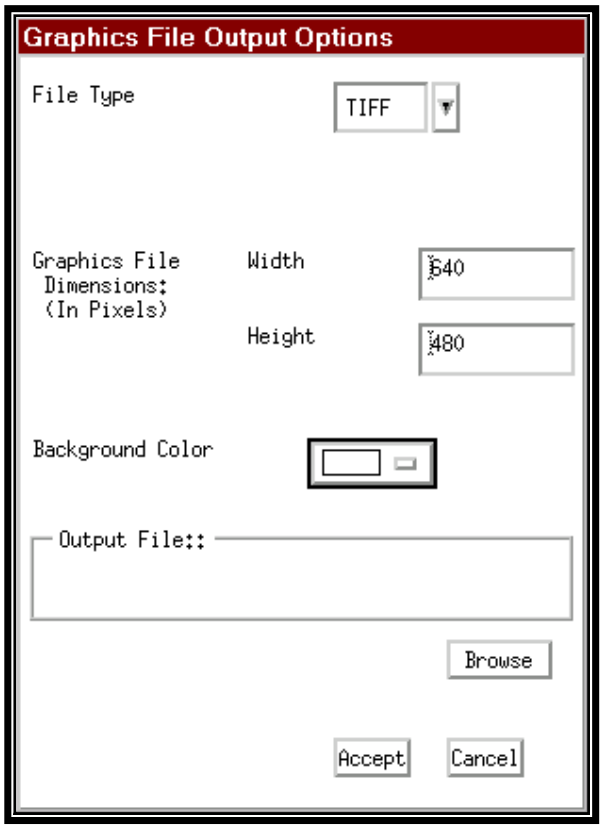


Figure 6-29. *Graphics File Output Options* dialog box.

a. ***File Type***: The output file type is either TIFF or JPEG (see ***User Tip: "What are TIFF and JPEG files?"*** below). Click on the choice button to the right of "File Type" to choose a file type.

User Tip: "What are TIFF and JPEG files?"

TIFF and JPEG are commonly used graphics file formats. A graphics file is basically an array of codes that represent colored pixels (squares). When these pixels are printed or displayed, they reproduce an image. Depending on the number of pixels used, and the size of the screen or paper used for display or printing, the image produced from a graphics file is sharper (higher resolution, more pixels) or more blurry (lower resolution, fewer pixels). As one might imagine, larger images with higher resolutions create very large files. TIFF and JPEG formats attempt to compress the images so that they take up less disk space. TIFF files are not as compact as JPEG files, but the TIFF format is more commonly used by standard PC graphics systems. The decision to use one or the other, as well as the image dimensions chosen, is really dependent on what you plan to do with the graphics file.

b. ***Graphics File Dimensions***: Type in the width and height (in pixels) of your graphics output file in the respective text entry windows. The default graphics output file size is 640x480 pixels.

c. ***Background Color***: Specify a background color for your file; the default is white.

d. ***Output File***: This is where you specify a path and filename for your graphics output file. Click on ***Browse***, select a directory to place the file in, and type in a filename. TIFF files normally have the suffix *.tif and JPEG files have the suffix *.jpg. GypsES does not supply a suffix, and the files can be created with other (or no) suffixes. It is then up to you to keep track of the file type.

Once you have specified the options in this dialog box, click on ***Accept*** to exit.

3. ***Map Size Options***: You can specify map size in three different ways.

a. ***Scaled Map***: You can use this option to relate the actual distance on the map to

pixels in your image. For example, if you decide that you want your map to be 500 pixels wide in the file image and the actual width of the area you are going to place in the image is 50,000 feet wide, the settings illustrated in Figure 6-30 could be used.

Figure 6-30. *Graphics Output Setup* dialog box*: Map Size Options, Scaled Map* option for file output.

b. ***Fit To Page***: This option is the easiest to use. GypsES takes into account the width and height of the image as well as text size (in pixels) and sizes the map to fit.

c. ***Set Map Size***: Use ***Set Map Size*** to specify the size of your map in pixels (Fig. 6-31). This should be compatible with the overall size of the graphics file you specified in the *Graphics File Output Options* dialog box. [*Note: GypsES always retains the relationship between map width and height, so the program sizes the output map to be as large as it can be and still maintain the width:height ratio*.]

Figure 6-31. *Graphics Output Setup* dialog box*: Map Size Options, Set Map Size* option for file output.

4. ***Text Options***: If you want just a map with no text in your output file, click the diamond toggle button next to "Map Only." If you want text (headings, legend, footings, etc.), click the diamond toggle button next to "Map With Text." To specify text content and

font size, click ***Modify Text***. A *Graphics Output Text Options* dialog box appears (Fig. 6-32).

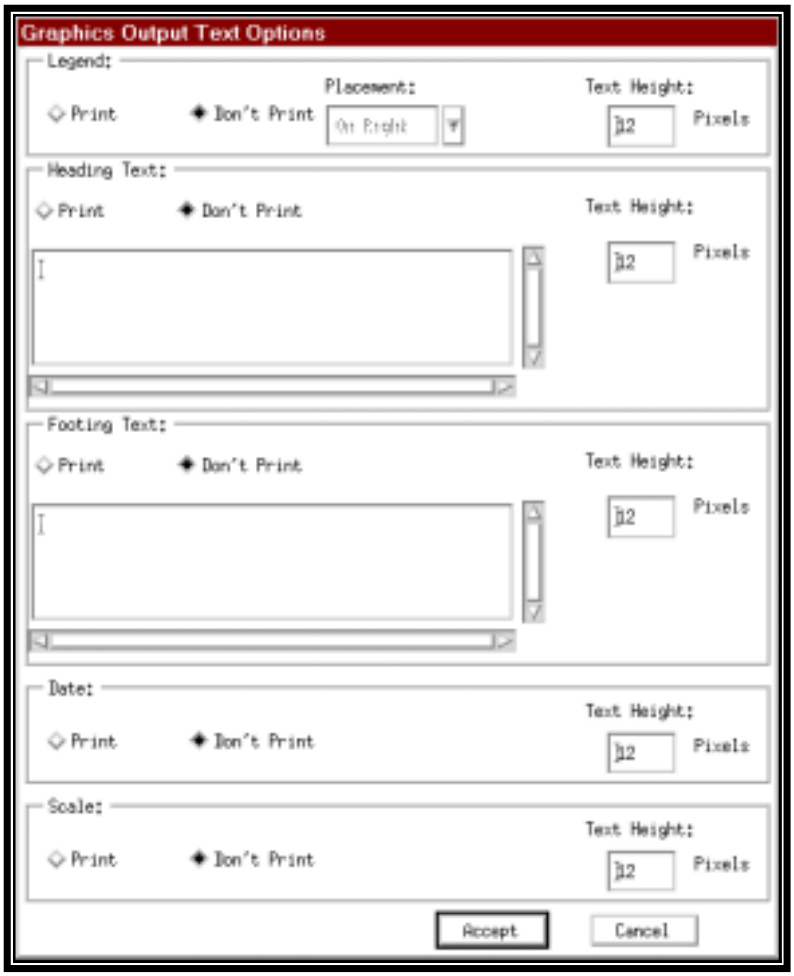


Figure 6-32. *Graphics Output Text Options* dialog box.

Choose whether to print any of the text items in this dialog box by clicking the diamond toggle buttons next to "Print" or "Don't Print." To specify text size, enter the height in pixels for those text elements you want to print.

a. ***Legend***: Legends can be printed on the left (***On Left***) or the right (***On Right***) side of the map.

b. ***Heading / Footing Text***: Enter heading and footing text by clicking in the text entry windows provided and typing. There is no limit to the number of lines you can have in headers and footings, but the total number of characters (including spaces) in either can't exceed 180 characters.

c. ***Date***: The date is printed below the scale and above the footing text.

d. ***Scale***: The scale, if specified, is printed below the map and above the date and/or footing (if specified).

Once the settings are complete, click on ***Accept*** to close the *Graphics Output Text Options* dialog box. [*Note: GypsES takes the font size specified into account when calculating the total size of the output*.]

B. ***Graphics Output: Printer***

1. ***Choose Type of Output***: To create a hard-copy map on a printer, click the diamond toggle button beside "Printer." The *Graphics Output Setup* dialog box changes for you to specify a printer and its settings (Fig. 6-33).

2. ***Choose Printer***: To specify printer output, you must have at least one printer installed on your computer. If you do not, GypsES gives you a warning message and changes back to the file output option when you attempt to specify printer output. The program looks up all printers that are installed on your system and lists them. The default printer is your system's default printer unless another printer was specified in a graphics output setup file that you recalled. To choose a printer, click on the choice button to the right of "Choose Printer" and select from the list of available printers.

3. ***Setup Printer***: Use this option to specify orientation (portrait or landscape), resolution (dots per inch) and paper size for the selected printer, among other options. The system setup dialog box for your printer appears. When you have completed your printer setup, click on ***OK*** to continue setup for your graphics output. GypsES retains your settings and formats the output based on them.

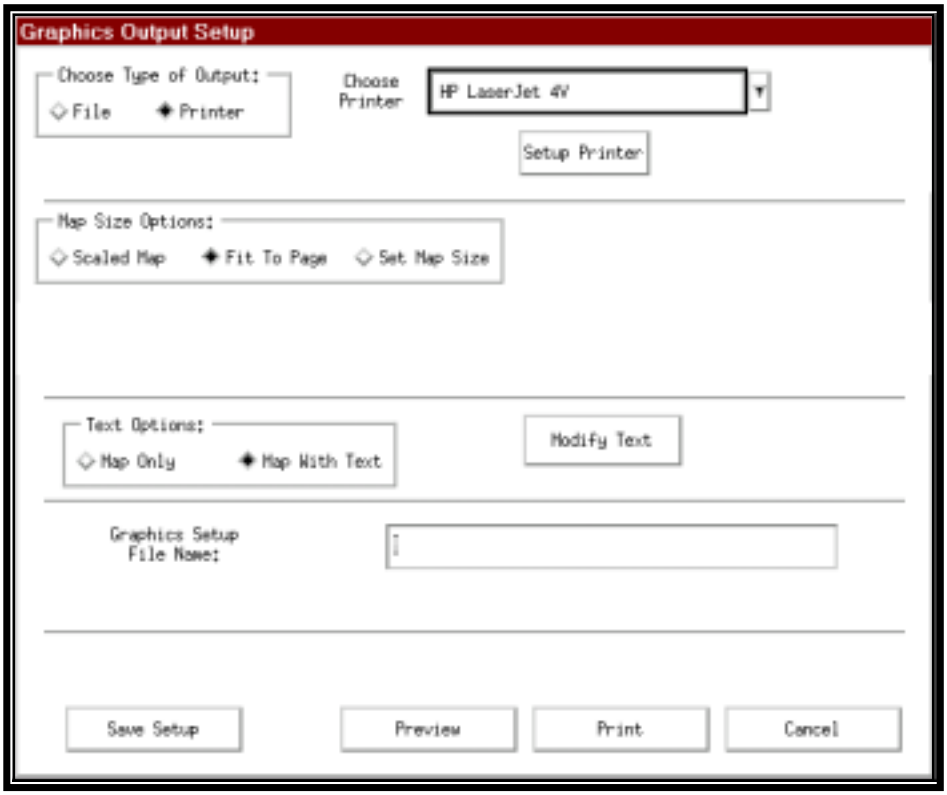


Figure 6-33. *Graphics Output Setup* dialog box: printer output.

4. ***Map Size Options***: These options are the same as those for graphics output files; however, map dimensions are expressed in distance units rather than pixels (Fig. 6-34).

Figure 6-34. *Graphics Output Setup* dialog box: *Map Size Options*, *Set Map Size* option for printer output.

5. ***Text Options***: These options are the same as those for the graphics output file section; however, font sizes are expressed in inches or centimeters.

C. ***Graphics Setup File Name***

Once you have set up the file or printer output, you should save your settings if you might use the same settings, map size options, and/or text options again. To do this, enter a filename in the text entry window provided and click on ***Save Setup***. The next time you select ***Graphics Output*** from the ***File*** menu, GypsES asks you to choose between using a saved setup file or using default settings.

D. ***Preview***

To view the graphics output you are going to print on a printer or send to a file, click on ***Preview***. The output is displayed in a dialog box. If you are creating a very large map, the preview function scales down the size so the computer doesn't use too much memory. If necessary, the dialog box has vertical and horizontal sliding bars for viewing the entire output. When you are finished with the preview, click on ***Done*** to go back to the *Graphics Output Setup* dialog box.

E. ***Print***

When you click on ***Print***, GypsES attempts to create the graphics output file or send the file to the printer. If the settings entered are not compatible with the file or printer paper size, you are asked to revise your settings. Otherwise, progress bars are displayed to let you know the progress of the output. [*Note: Working with large graphics output files and printing to large-scale printers takes a while*.]

F. ***Cancel***

To exit the *Graphics Output Setup* dialog box at anytime, click on **Cancel**. [*Note: Save your settings if you want to use them again because they are not otherwise retained*.]

VIII. ***Location / Mapset***

Use this option to work with mapsets and locations.

Pull Down Menu:

- Change Output Mapset (6-47)
- Make New Mapset (6-47)
- Delete Mapset (6-47)
- Change Location (6-47)
- Make New Location (6-47)

A. ***Change Output Mapset***

When changing locations, you are prompted to select the output mapset from a list of previously created mapsets. Work that is done during the current GypsES session is saved to that mapset. Thus, any spray blocks drawn, reports generated, maps edited, and Views or Composite files saved are saved to the designated output mapset. Select an existing Output Mapset name from the list on the dialog box and click ***Accept*** to complete this function. You can also change mapsets within the current location right on the Main Screen by clicking the mapset name button at the bottom of the screen and choosing a new mapset from the list of available mapsets. You are able to choose from a list of all available mapsets. **ONLY ONE OUTPUT MAPSET CAN BE DESIGNATED AT ONE TIME.**

B. ***Make New Mapset***

Use this option to create a new mapset. First enter a new mapset name, then press <Enter>. The new mapset is created and GypsES brings up a *User Profile* dialog box for that mapset. (See the ***Edit*** menu **/ *Administrative Profile*** option / ***User Profile*** option on page 7-39 for more complete information about the *User Profile* dialog box.)

C. ***Delete Mapset***

Mapsets can be deleted; however, you cannot delete a mapset if it is the current output mapset or mapset PERMANENT. Select the mapset to delete within the Select Mapset to Delete list and click on ***Accept*** to delete it. GypsES checks for the existence of files in the mapset and asks for confirmation of deletion if they exist.

D. ***Change Location***

A location is a user-defined rectangular region on the face of the Earth defined by latitude and longitude values for the sides of the rectangle. GypsES converts the latitude and longitude values to UTM coordinates but can display either type of coordinate. You can work with any previously defined location stored in GypsES. To choose a different location, highlight a location name from the "Choose Location" list and click on ***Accept***. You can also change the location right on the Main Screen by clicking the ***Location*** button at the bottom of the screen and choosing a new location from the displayed list of available locations.

E. ***Make New Location***

This option brings up a *Create New Location* dialog box (Fig. 6-35) to define a new location. Type in a location name, its UTM zone (see Table 5-1 on page 5-2 for a complete list), and the boundaries of the location in degrees, minutes, and seconds. Click on the choice button to the right of each boundary coordinate line to toggle between North/South or East/West. Use <Tab> to move from one entry field to the next.

Once you have specified the location's boundaries and UTM zone, click on ***Check Area and Dimensions*** to calculate the area of the location just created and make sure you have defined a valid location. If the boundaries have been incorrectly specified (for example, if the east boundary was placed west of the west boundary, or if the wrong UTM zone was used), GypsES displays a dialog box specifying the error and prompts you to correct the problem.

The area of the location appears to the right of "Area:". You can display the new location's area in either square miles or square kilometers by clicking on the choice button to the right of the area number. The North-South and East-West distances are also displayed below the area in either miles or kilometers (toggle between the two units using the choice button). Choose where to put the new location by clicking on the choice button to the right of the drive letter below "Put on Drive:" and selecting a drive from the list; then click on ***Accept***.

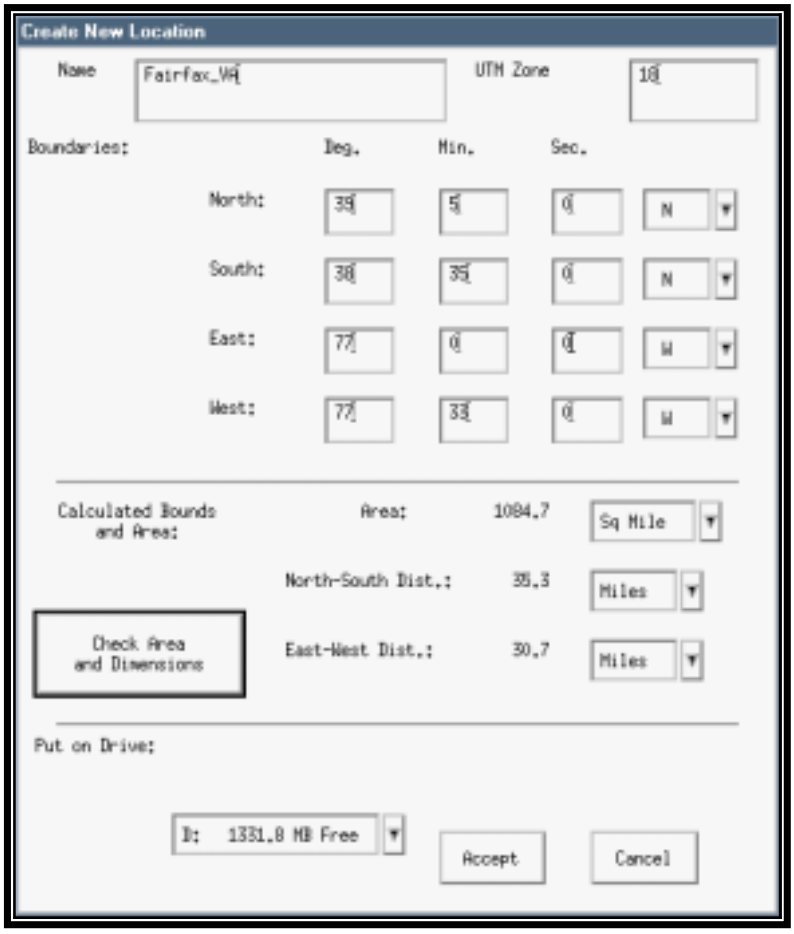


Figure 6-35. *Create New Location* dialog box.

User Tip: When to Make A New Location

You will want to make a new location when you want to manage an area not currently contained in a location available in the GypsES system. To determine the bounds of the new location, consult USGS or other maps. Remember that latitude gets larger from south to north, and longitude get smaller from east to west.

It is probably a good idea to make the location a little larger than the area you are managing -- for instance, make the bounds whole or half minutes. In some cases, you may want to expand an existing area. There are ways to do this, but not within the GypsES program. Check with GypsES user support personnel to expand a currently defined location.

[*Note: If the drive you specify does not contain any GypsES data, the directories (folders) X:\GypsES and X:\GypsES\Data_Files (where X: is the drive) are created. Your location will be a folder in X:\GypsES\Data_Files*.]

IX. ***View GypsES Log***: The GypsES log is an important trouble-shooting tool. Messages are saved to a log during every GypsES session. When there is a problem with the GypsES software, use this option to view or save either the current log or the log from the last (previous) session of GypsES (the log does not go back any farther than this). To save a log to a file, click on ***Save Log File***; GypsES prompts you to type in a name for the log file. If you do not specify a full directory path, your file is saved in the X:\GypsES folder, where X is the drive in which the main GypsES directory resides. Then press <Enter> to save the file. GypsES automatically adds a ".log" extension to the filename. (See ***Error Messages*** on page 4-3.) To print the log to the default GypsES printer, click on ***Print***. Click on ***Exit*** to close this dialog box.

X. ***Quit GypsES***: This option exits GypsES and returns you to the MS-DOS window that first appears when GypsES is started.

The Edit Menu

Use this menu option to work with map layers (***MapEdit***), edit databases (***Database***), define map features (***Map Features***), set Standard Name Linkages (***Standard Name Linkages***) and define your own user profile and management objectives (***Administrative Profile***).
Pull Down Menu:

- MapEdit (7-1)
- Database (7-24)
- Map Features (7-34)
- Standard Name Linkages (7-38)
- Administrative Profile (7-39)

I. ***MapEdit***

Use this option to create or edit (revise) Vector and SiteData map layers using ***MapEdit***, the GypsES map-editing tool.
Pull Down Menu:

- Create New Vector Layer (7-3)
- Create New SiteData Layer (7-20)
- Revise Existing Vector Layer (7-3)
- Revise Existing SiteData Layer (7-20)

MapEdit Overview

The ***MapEdit*** dialog box has a map display/work area on the left, a palette of functions on the right, and a status bar below the map display area for prompts and messages. A UTM geographic coordinate display (in meters) in the lower right-hand corner changes simultaneously as the mouse pointer is moved. A box showing the name of the layer being edited is in the top middle of the dialog box, and a help box is in the upper right corner (Fig. 7-1).

Some editing functions are the same for both Vector and SiteData map layers. These functions are grouped in the "General Functions" palette in the top right corner of the ***MapEdit*** dialog box. Functions that are unique to only one map layer type are in a separate palette below the "General Functions," i.e. ***Vector Edit Functions*** (described starting on page 7-11) and ***Site Edit Functions*** (described starting on page 7-22).

Working With Vector Map Layers

A Vector map layer consists of **lines** defined by UTM coordinates (points) (Fig. 7-2). Each line is made up of one or more **points** connected by **segments**. The first and last points

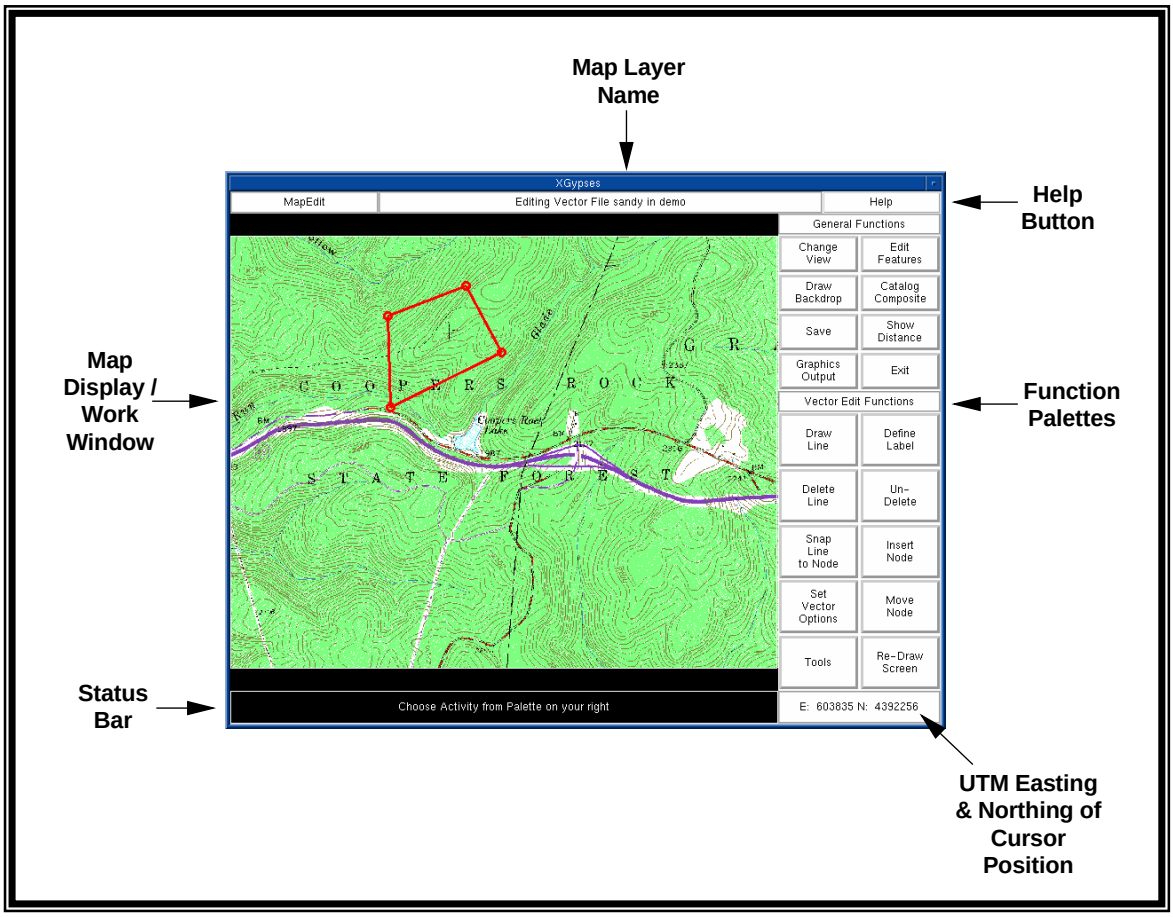


Figure 7-1. *MapEdit* dialog box components.

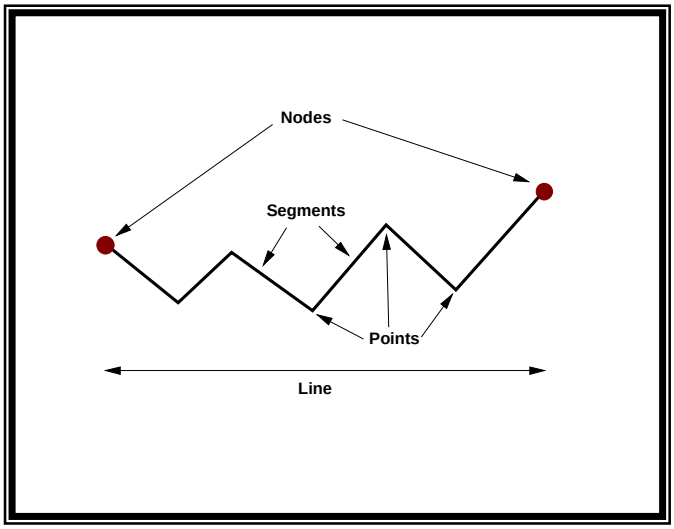


Figure 7-2. Components of a line.

of a line are called **nodes**. **Feature lines** represent features on the Earth (e.g., roads, streams, and power lines), and **polygon lines** represent boundaries of areas (e.g., spray blocks, political boundaries, and forest stand boundaries). One or more lines can define polygons. If the lines bounding a polygon do not intersect and are joined at nodes with no gaps, the polygon is **closed**; if there is a gap between polygon line nodes or if lines intersect at non-node points, the polygon is referred to as **open** or **unclosed**. ***MapEdit*** does not properly recognize polygons unless they have non-intersecting polygon lines joined at nodes.

You can label both feature lines and polygons. A label consists of two pieces of information. The first is a category number (integer) that may or may not have significance. The second is a line of text called a category description. Once you establish a link between a category number and a category description, ***MapEdit*** assumes that whenever that category number is used, you are referring to the previously assigned category description. You can modify category descriptions associated with category numbers by selecting the ***Edit*** menu ***/ MapEdit*** option ***/ Vector Edit Functions*** palette ***/ Tools*** palette / ***Edit Vector Categories*** option (see page 7-17).

A. ***Create New Vector Layer / Revise Existing Vector Layer***
Within the ***MapEdit*** menu, you have the option of either creating a new Vector map layer (***Create New Vector Layer***) or editing an existing layer (***Revise Existing Vector Layer***). Choosing to edit an existing Vector map layer brings up a *Select Vector File for MapEdit* dialog box; select the map layer you want and click on ***Accept***. Choosing to either create a new Vector map layer or edit an existing Vector map layer brings up a dialog box titled *MapEdit: Vector Edit Options* (Fig. 7-3). [*Note: Once the options in this dialog box are defined, click on **Accept** to move into **MapEdit**.]*

1. ***MapEdit: Vector Edit Options***
Use these options when working with Vector map layers.

When you select a Vector file for editing, you can change the Vector editing options prior to loading the Vector file. [*Note: You can also modify the options at any time during the editing process by clicking on **Set Vector Options** within the "Vector Edit Functions" palette; this returns you to the MapEdit: Vector Edit Options dialog box.*] GypsES retains the most recently used Vector edit option settings for each unique output mapset. If you use locations or output mapsets that do not already have these options defined, the default options appear in this dialog box.

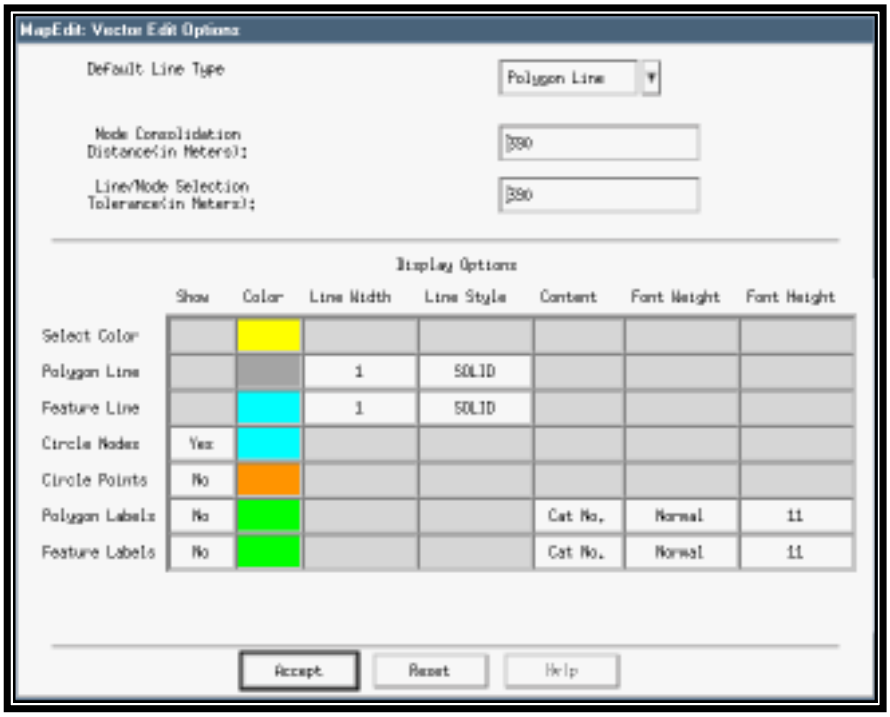


Figure 7-3. *MapEdit: Vector Edit Options* dialog box.

The edit option values that are defined before loading the map layer into ***MapEdit*** (especially the ***Node Consolidation Distance***) affect how the file is loaded and how the Vector layer is displayed on the screen. Options include:

a. ***Default Line Type***: Use this option to select the type of line to draw when using the ***Draw Line*** function within ***MapEdit***. Three options are available: ***Ask Each Time***, ***Polygon Line***, or ***Feature Line***. ***MapEdit*** needs this information so that it can identify polygons and determine whether they are closed. Polygon lines compose the sides of a polygon. Categories define what is inside the polygon (e.g., treatment block boundaries and spray block numbers). Feature lines cannot be part of a polygon and usually define some linear feature like roads or streams. The default is ***Polygon Line***.

b. ***Node Consolidation Distance***: This value is expressed in meters and allows ***MapEdit*** to consolidate nodes that are within this defined distance of each other as it loads the Vector file. If you are creating a new Vector file, the node consolidation distance is set to the same value as the ***Line/Node Selection Tolerance*** (see section c. on the next page for an explanation). If you are editing an existing file, the node consolidation distance value should be initialized to zero, which means that no **node**

consolidation is done when the file is loaded. It is recommended that you leave this value set to 0 when first loading an existing Vector file into ***MapEdit***; the value can be changed later. If an existing file is loaded with a non-zero node consolidation distance, the file may be corrupted. This can happen if you are editing a file that has been imported from another system (e.g., ArcInfo) and the geographic coordinates of the nodes are slightly different; the Vector layer may have open-ended polygon lines and unclosed polygons as a result. If the node consolidation distance is too large, information may be lost because ***MapEdit*** may collapse lines into points or join lines that should not be joined.

It is important to note that *consolidation of existing nodes occurs ONLY at load time*. If the Vector file is loaded into ***MapEdit*** and nodes are not being consolidated properly, exit ***MapEdit*** and re-load the file using a different node consolidation distance. Again, remember that ***MapEdit*** makes all its changes to a working copy of the original file, so the choice of an inappropriate consolidation distance does not change the original file UNLESS the file is saved under the same name prior to exiting. Anytime you change the node consolidation distance and have chosen ***Yes*** for the ***Circle Nodes*** or ***Circle Points*** options (see section f. on the following page for a description), the screen is re-drawn to reflect the new consolidation distance.

c. ***Line/Node Selection Tolerance***: This is the radius in meters around lines or nodes within which they can be selected when you click the mouse on a map layer. If a very small selection tolerance is being used and the area being edited is relatively large, you may have problems selecting lines or connecting newly drawn lines to existing nodes. This is because the screen coordinates delivered to ***MapEdit*** from a mouse click and converted to geographic coordinates may not be within the line/node selection distance of the line or node being selected. After a Vector file is loaded into ***MapEdit***, you can adjust the line/node selection distance at any time during the editing session to help draw new lines and select lines or nodes. To do this, click on ***Set Vector Options*** within the "Vector Edit Functions" palette within ***MapEdit***. This returns you to the *MapEdit: Vector Edit Options* dialog box that precedes the loading of a Vector file. Alternatively, use the ***Edit*** menu ***/ MapEdit*** option ***/ General Functions*** palette ***/ Change View*** option ***/ Zoom In*** option (see page 7-8).

d. ***Select Color***: This is the color used to highlight a selected object (e.g., line, node, point, polygon, etc.). Click on the square under the "Color" column and choose a color from the palette.

e. ***Polygon and Feature Line Specification***: Use this option to select colors, line width,

and line style for polygon lines and feature lines. Click on the square under the "Color" column to select a color, click on the text entry window under the "Line Width" column and type in a line width, and click on the text entry window under the "Line Style" column to choose either a solid or dashed line style.

f. ***Circle Nodes and Points***: To have all node and point locations highlighted with circles, click on the square under the "Show" column to toggle between ***Yes*** (show circles) or ***No*** (do not show circles). If ***Yes*** is selected for either nodes or points, select the circle color by clicking on the square under the "Color" column. The radius of the circle represents the node consolidation distance in meters.

g. ***Polygon and Feature Label Display***: Choose ***Yes*** or ***No*** to display category labels for all polygons and feature lines by clicking on the square under the "Show" column. [*Note: Each line type can have an assigned category value, or number, that must be numeric. Category numbers can be unique or repeated. Each category number is paired with a category description that can be an alphanumeric value*.] To choose a label color, click on the square under the "Color" column and select a color. Click on the square under the "Content" column to toggle between showing category numbers (***Cat No.***) or descriptions (***Cat Desc***.). Click on the square under the "Font Weight" column to choose either normal (***Normal***) or bold (***Bold***) label text. Click on the square under the "Font Height" column and type in the font size you want (in pixels).

2. ***General Functions***. These general editing functions apply to both Vector and SiteData map layers and are located in a palette in the top right corner of the ***MapEdit*** dialog box (Fig. 7-4).
   Palette Buttons:
   - Change View (7-7)
   - Edit Features (7-9)
   - Draw Backdrop (7-9)
   - Catalog Composite (7-9)
   - Save (7-9)
   - Show Distance (7-10)
   - Graphics Output (7-10)
   - Exit (7-10)

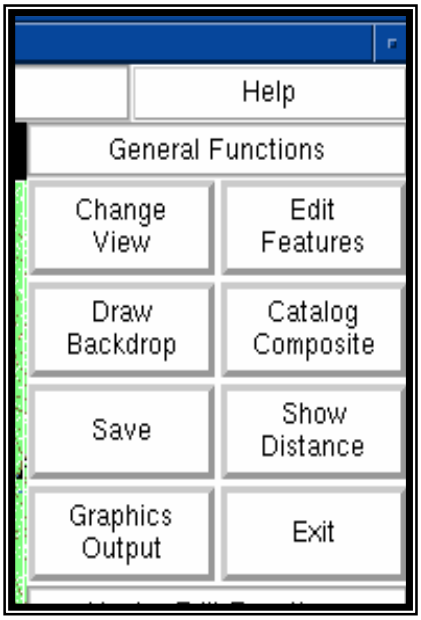


Figure 7-4. *MapEdit*: *General Functions* palette.

   a. ***Change View.*** When you click on this push button, another palette of push buttons titled "Change View Functions" appears below the "General Functions" section of the ***MapEdit*** dialog box.
      Palette Buttons:
      - Change Res[olution] (7-8)
      - Save View (7-8)
      - Full View (7-8)
      - Recall View (7-8)
      - Zoom In (7-8)
      - Zoom Out (7-8)
      - Previous View (7-9)
      - Set Mask (7-9)
      - Cancel Change View (7-9)

(1) ***Change Resolution***: There are two types of resolution: Raster File Resolution and Viewing (Screen) Resolution. Raster File Resolution is the resolution of the Raster map layer when created and is expressed in meters; it can never be smaller than what it was at the time of creation. Viewing (Screen) Resolution is the resolution of the map layer that is displayed on the screen and is also expressed in meters. See the ***Change Resolution*** option under the ***Window*** menu ***/ Change View*** option on page 8-12 for more information.

(2) ***Save View***: This option saves a View so that you can quickly return to a specified portion of the map. Views are saved in the current output mapset. After clicking ***Save View***, you are prompted to enter a name for the View. Saved Views can be retrieved with ***Recall View*** (see the description below). Once you have saved your View, you are returned to the "General Functions" and "Vector Edit Functions" palettes.

(3) ***Full View***: This option displays the map layer using the default View for the current location. Once you click on this push button, you are returned to the "General Functions" and "Vector Edit Functions" palettes.

(4) ***Recall View***: Use this option to select a View that you already saved. Clicking on this option brings up a *Select View File* dialog box to select a saved View file. Click on the View file you want, then click on ***Accept*** to draw this View on the screen. Once your View is recalled, you are returned to the "General Functions" and "Vector Edit Functions" palettes.

(5) ***Zoom In***: Use this option to zoom in on a particular section of the current View. Click once to establish a corner, release the mouse button, then stretch the box in any direction by moving the mouse pointer to the opposite corner to define the rectangle that represents the new View. When the mouse is clicked a second time, GypsES prompts you to accept or cancel the new View. If accepted, the current map is redrawn showing the area selected.

(6) ***Zoom Out***: See the ***Zoom Out*** option under the ***Window*** menu / ***Change View*** option on page 8-12 for a description of this function. Once you have zoomed out, you are returned to the "General Functions" and "Vector Edit Functions" palettes.

(7) ***Previous View***: This option changes the current View to the last defined View. Once this option is selected, you are returned to the "General Functions" and "Vector Edit Functions" palettes.

(8) ***Set Mask***: A special kind of data layer, called a Mask, can be used as a "cookie cutter" to display only a selected portion of a location while "hiding" the rest of the map layer. This function applies only to Raster layers. (See the ***Set Mask*** option under the ***Window*** menu / ***Change View*** option on page 8-11 for a description.)

(9) ***Cancel Change View***: This returns you to the "General Functions" and "Vector Edit Functions" palettes.

b. ***Edit Features***: This brings up a palette of push buttons ("Feature Functions") for creating and editing map labels. (See the ***Edit*** menu / ***Map Features*** option ***/ Map Labels*** option on page 7-34 for more information.) These functions do NOT label polygons or feature lines.

c. ***Draw Backdrop***: Use this option to choose what map layers, images, and other mapping options are in the background while working in ***MapEdit***. A *Build/Update Map* dialog box appears to build a backdrop from existing Raster, Vector, SiteData, and Composite map layers. (See page 8-2 for more information on using this dialog box.) The presence of additional layer data does not affect editing of the current file.

d. ***Catalog Composite***: This option saves the current map display as a Composite layer in the current output mapset. You are asked to enter a name for the Composite file. If the filename already exists in the mapset, you are asked if you want to overwrite the file or enter a new name. Once you type in a filename, the Composite file is saved. This file can now be used as an overlay in ***MapEdit*** or viewed in the Work Windows. [*Note: The file itself being edited is NOT saved as part of the composite*.]

e. ***Save***: This option saves the current work file. As with any data entry operation, if you are making a large number of changes, it is recommended to save the file often. The first time you click on ***Save***, GypsES prompts you for a filename. If the filename you type in already exists, GypsES warns you that the file will be overwritten. You can then confirm or cancel this function. The new file is stored in the current output mapset. After the first save, GypsES asks whether to save the file using the name previously specified or a new name.

f. ***Show Distance***: This option calculates the distance on a map between two selected points; you choose the unit of measure. A *Distance Calculation* dialog box appears (Fig. 7-5). You are prompted to click the left mouse button once on one point to start the distance calculation, then click on a second point. The "Current Distance" between these points appears in the dialog box. A "Cumulative Distance" is also displayed if you select more than two points. You can set all distance calculations to 0 by clicking on ***Reset***. To exit the ***Show Distance*** calculation, either click the right mouse button or click on ***Quit*** in the *Distance Calculation* dialog box.

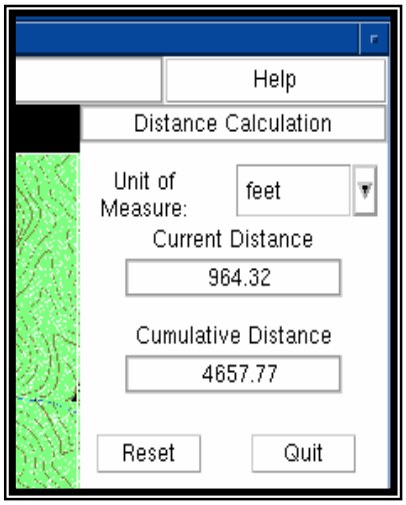


Figure 7-5. *MapEdit*: *Distance Calculation* dialog box.

g. ***Graphics Output***: This option displays a *Graphics Output Setup* dialog box (see the ***Graphics Output*** option under the ***File*** menu on page 6-39 for information about this dialog box).

h. ***Exit***: This option exits ***MapEdit*** and returns you to the GypsES Main Screen.

3. ***Vector Edit Functions***
Use these editing functions when working with lines, nodes, and other features of Vector files. These functions are located in a palette in the lower right corner of the ***MapEdit*** dialog box (Fig. 7-6).
Palette Buttons:
   - Draw Line (7-11)
   - Define Label (7-12)
   - Delete Line (7-13)
   - Un-Delete (7-13)
   - Snap Line to Node (7-13)
   - Insert Node (7-13)
   - Set Vector Options (7-13)
   - Move Node (7-14)
   - Tools (7-14)
   - Re-Draw Screen (7-19)

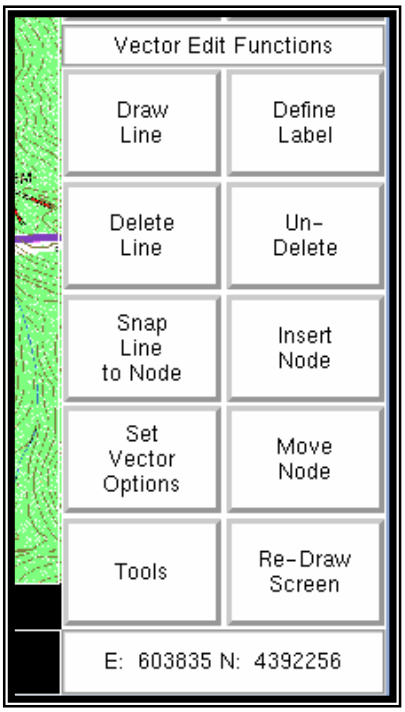


Figure 7-6. *MapEdit*: *Vector Edit Functions* palette.

a. ***Draw Line***: Use this function to draw polygon or feature lines. When you click on ***Draw Line***, you are asked what type of line is to be drawn if the ***Default Line Type*** option within the *Vector Edit Options* dialog box is set to ***Ask Each Time***. Once you select either feature or polygon, the line drawing function of ***MapEdit*** takes over; ***MapEdit*** interprets the movement of the mouse pointer and behaves accordingly.

   As long as the mouse pointer is in the map display window, you can click the mouse to establish points on the line. You can click the right mouse button at any time to open the "Draw Line Functions" palette that provides the following options:

(1) ***Accept Line - Continue Drawing***: Clicking this push button catalogues the line you just drew; GypsES assumes that you want to draw another line of the same type specified in the *Vector Edit Options* dialog box or when the ***Draw Line*** mode was first selected. The "Draw Line Functions" palette is removed, and you can begin a new line.

(2) ***Erase All Segments - Exit***: This option erases all segments you drew in the current line and exits the ***Draw Line*** function. The "Vector Edit Functions" palette is re-displayed.

(3) ***Erase Previous***: Clicking this push button erases the previously drawn segment, removes the "Draw Line Functions" palette, and lets you re-specify the last point.

(4) ***Continue Drawing***: This resumes the ***Draw Line*** operation. The "Draw Line Functions" palette is removed and you can keep drawing.

(5) ***Accept Line - Exit***: Clicking this push button catalogues the line you just drew and exits the ***Draw Line*** mode.

(6) ***Erase All Segments - Continue***: This option removes all segments in the last line being drawn and lets you try again.

b. ***Define Label***: Use this option to define a label (a category number and a line of text) for a polygon or feature line. You are prompted to click on the line or in the polygon you are labeling. You can exit the labeling function at any time by clicking the right mouse button. When a line or polygon has been selected, ***MapEdit*** highlights it and asks whether you want a label (e.g., "Label polygon 3?" or "Label Line 43?"). Confirm by clicking the left mouse button. GypsES then prompts you to type in a category number and category description.

Use the *Vector Edit Options* dialog box to choose between showing category numbers or category descriptions on the map layer. A GypsES message tells you what the current label is if the line or polygon is already labeled. [*Note: Even though you did not choose to display polygon or feature line labels in the Vector Edit Options dialog box, the label is displayed temporarily. You can remove it by clicking* ***Re-Draw Screen****.]*

c. ***Delete Line***: Use this option to delete lines. ***MapEdit*** asks you to click on the line to delete. ***MapEdit*** re-draws the line in the highlight color and asks if the highlighted line is the one you want to delete. Clicking the left mouse button or pressing <Enter> confirms the deletion selection. Clicking the right mouse button or pressing <Esc> cancels the selection and prompts you for another line. An additional right mouse click takes you out of "delete" mode. If no line becomes highlighted after clicking, ***MapEdit*** did not find a line within the line/node selection tolerance distance of where you clicked. Use either the ***Set Vector Options*** function to increase this distance or use the ***Zoom In*** function to make line selection easier.

d. ***Un-Delete***: This option restores the last delete.

e. ***Snap Line to Node***: Use this option to join a line to a node. When this is done, the selected line moves, but the node you snap it to does not. The line moves from the last point or vertex defining the line. This function is very useful to close polygons and join lines.

   To snap a line to a node, first click on ***Snap Line to Node***. ***MapEdit*** then asks you to select the line to snap by clicking on it with the mouse. Since every line has two ends, ***MapEdit*** assumes that the end that is snapped is the one closest to the place where you clicked it. Both the line and the node that change are highlighted, and you are prompted to select the node to which to attach the line. The selected node is then highlighted; if you confirm that it is correct by either clicking the left mouse button or pressing <Enter>, the line is snapped to the node. To end the ***Snap Line to Node*** option at any time, click the right mouse button.

f. ***Insert Node***: Use this option to insert a node in an existing line. This effectively creates two new lines and allows you, for instance, to join a third line to the new node at that point. ***MapEdit*** asks you to select a line by clicking on it. (As with the ***Delete Line*** function, you may need to adjust the geographic View or the line/node selection tolerance distance to select the line.) ***MapEdit*** then highlights the line and asks you to place the cursor on the new node location and click. Confirm the new node placement by clicking the left mouse button or pressing <Enter>. Clicking the right mouse button effectively erases the last left mouse click and eventually cancels the insert node operation.

g. ***Set Vector Options***: This option returns you to the *Set Vector Options* dialog box.

h. ***Move Node***: Use this option to move a node. Once this push button is selected, click the mouse once on the node you want to move. Release the mouse button and drag the mouse pointer (+) to the new node location (a highlight line moves with the pointer). Click the left mouse button when the move is done; confirm the move with another left mouse button click or press <Enter>. Clicking the right mouse button at any time exits the node move function. [*Note: Only the segments closest to the node move*.]

i. ***Tools***: ***MapEdit*** provides several tools to help make sure that the Vector layer is "clean." Clicking on the ***Tools*** option brings up a new palette of functions titled Vector Edit Tools in the lower right corner of the ***MapEdit*** dialog box (Fig. 7-7). Palette Buttons:

- Find Open Polygon Lines (7-15)
- Convert to Raster (7-15)
- Find Degenerate Line (7-17)
- Edit Vector Categories (7-17)
- Find Intersects (7-18)
- Calculate Polygon Area (7-18)
- Find One-Line Nodes (7-19)
- Save Labeled Lines (7-19)
- Find Un-Labeled Polygons (7-19)
- Re-Draw Screen (7-19)
- Re-Build Polygons (7-19)
- Exit Tools Menu (7-19)

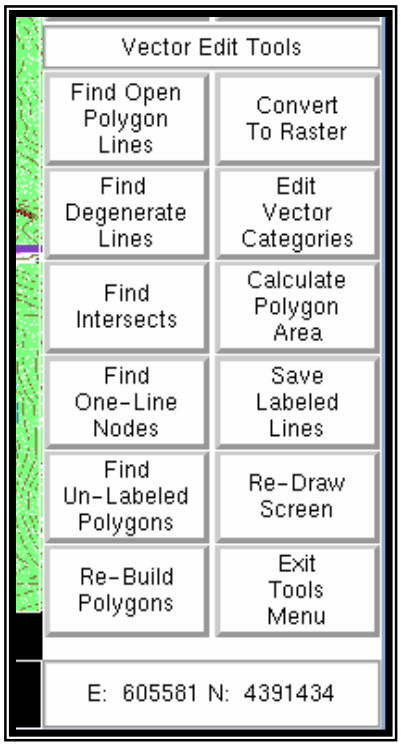


Figure 7-7. *MapEdit*: *Vector Edit Tools* palette.

(1) ***Find Open Polygon Lines***: An open polygon line does not have a closed polygon on either side of the line. When you select this option, GypsES highlights all open polygon lines in the selection color and tells you how many open polygon lines were found in the working View. Click on ***Re-Draw Screen*** in the ***Tools*** palette to clear the highlighting of open polygon lines. Sometimes it is difficult to see why a polygon is not closed:

(a) There may be a degenerate line at a node. You can ask ***MapEdit*** to identify any degenerate lines by clicking the ***Find Degenerate Lines*** option (see description on page 7-17).

(b) A node may not be connected to at least two lines. You can usually spot these by choosing the option to find one-line nodes. Any nodes with only one polygon line attached are circled in the selection color.

(c) There may be an intersection of lines with no node. You can find intersecting lines by clicking on ***Find Intersects*** within this ***Tools*** palette. Once the points of intersection are located (a circle in the selection color is displayed around each intersection), you must ***Zoom In*** to spot the problem. After zooming in, however, you need to prompt GypsES to highlight the line intersections again; this information does not carry over during the ***Zoom In*** function.

(2) ***Convert To Raster***: This push button converts polygons to Raster format. The first thing you should probably do when converting to Raster format is be sure that the proper geographic View is on the GypsES screen. The Raster conversion is only done for that part of the layer that is visible on the screen. You will usually want to be at Full View for Raster conversion.

User Tip: Changing the Resolution of A Raster File

The resolution of a Raster file you create can be modified using the ***Edit*** menu / ***MapEdit*** option / "General Functions" palette / ***Change View*** option / ***Change Res[olution]*** option (see pages 7-8 and 8-12 for more information).

When ***Convert to Raster*** is clicked, ***MapEdit*** first warns you if you are not at Full View. You can then choose to exit and change the View or to continue. ***MapEdit*** then checks for open area lines. These are lines that have been designated as polygon lines, but that are not recognized as a boundary for at least one polygon. If ***MapEdit*** finds any of these lines, it highlights them and refuses to proceed with the conversion. If this happens, you should carefully examine the highlighted lines, perhaps zooming in on their nodes. Sometimes saving the layer, exiting, and re-loading with a larger node consolidation distance cures the problem. Sometimes you need to use the ***Vector Edit Functions*** to attach lines. Use the ***Tools*** palette functions to highlight open polygon lines and degenerate lines. If changes have been made, use the ***Tools*** function to re-build polygons. This sometimes closes polygons properly.

Once all open polygon lines are resolved, ***MapEdit*** checks to be sure that you have labeled all polygons. If they are not labeled, unlabeled polygons are highlighted and you have three options:

(a) ***Specify Default***: If you select this option, you are prompted to specify a default category number and text for any unlabeled polygons.

(b) ***Treat as No Data***: This option labels any unlabeled polygons as "No Data" when converting them to Raster.

(c) ***Cancel***: This option cancels the Raster conversion function.

Once the labeling issue is resolved, ***MapEdit*** asks you about colors for the Raster file. You have the following options:

(d) ***Exit to Set***: This option gets you out of the ***Convert To Raster*** option. You can then set category colors for the Raster conversion using ***Edit Vector Categories*** in the "Vector Edit Tools" palette (see the description under section (4) on the following page).

(e) ***Use as Set***: If you have already set the colors, this tells ***MapEdit*** to use them.

(f) ***Random Colors***: ***MapEdit*** uses a random selection of colors for the categories established when the polygons were labeled.

Once you have specified color assignment, ***MapEdit*** asks for the name of the new Raster layer. The Raster layer can have the same name as the Vector layer, or a new name can be provided. When the conversion to Raster is complete, ***MapEdit*** asks if you want to display the Raster layer as a background. If ***Yes*** is selected, the Raster version of the Vector layer is drawn in the background.

(3) ***Find Degenerate Lines***: A degenerate line is one in which all points in the line are within the node consolidation distance of each other. Depending on how other lines connect to the degenerate line, its presence may prevent a polygon from being closed. Clicking on ***Find Degenerate Lines*** causes ***MapEdit*** to circle all degenerate lines in the selection color. In general, it is best to delete these lines. They serve no useful purpose and tend to be confusing.

(4) ***Edit Vector Categories***: Use the ***Edit Vector Categories*** option to change the text associated with an existing category number, to add a new category, and to set category colors for Raster map layer conversion. When you click ***Edit Vector Categories***, an *Edit Categories* dialog box appears on the screen. This dialog box can be used to:

(a) ***Add New Categories***: If you know that you are going to use certain categories to create polygons or feature lines, categories can be set up ahead of time. To add a category, click on ***New Category*** at the bottom of the dialog box. ***MapEdit*** prompts you for a category number and associated category description. The new categories are added to the bottom of the list.

(b) ***Change the Text Line Associated with an Existing Category***: Click on the line you want to change and type the new text in the text entry window in the "Description" column. Click on ***Accept*** to accept the new description text.

(c) ***Assign Colors to Existing Categories***: This has meaning only if you are about to convert to Raster. As you click on the box to the right of each category text line in the "Color" column, the red, green, and blue color bars at the bottom of the dialog box change to reflect the color mix. Slide these color bars back and forth until you get the color mix you want.

When you have edited the categories, click on ***Accept*** to save your edits or on ***Cancel*** to cancel your edits.

(5) ***Find Intersects***: This function locates any intersection of lines and circles them in the selection color. The intersection of feature lines may be perfectly legitimate, but the intersection of polygon lines inevitably causes problems. In the case of two lines intersecting where there should be a node, the problem is easily corrected by using the ***Insert Node*** function in the Vector Edit Functions palette on both lines. Sometimes an intersection is the result of a line draw operation that overshot a node. The intersection is very close to the node and is hard to see unless you use the ***Zoom In*** function. If this happens, you can insert a node on the line before the intersection and delete the part of the old line that is intersecting another line connected to the node. Then use the ***Snap Line to Node*** function (page 7-13) so that the line correctly ends at the node.

(6) ***Calculate Polygon Area***: This function can calculate both the area of a single polygon and the cumulative area of several polygons, similar to the ***Show Distance*** calculation described on page 7-10. *An Area Calculation* dialog box appears (Fig. 7-8); choose a unit of area measurement. Clicking inside a polygon displays its area within the "Current Area" section of the dialog box; you can calculate a cumulative polygon area by clicking on any number of polygons. Click on ***Reset*** to set all area calculations to 0. To get out of this dialog box, either click the right mouse button or click on ***Quit***.

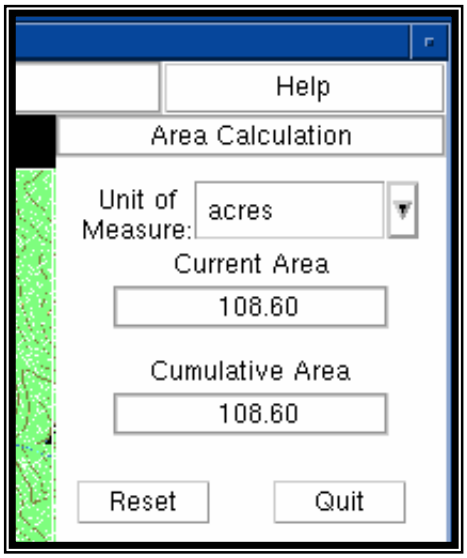


Figure 7-8. *MapEdit*: *Area Calculation* dialog box.

(7) ***Find One-Line Nodes***: This function locates polygon line nodes attached to only one line and highlights them as described on page 7-15 under ***Find Open Polygon Lines***. Once one-line nodes have been found, you can either delete the line or close the polygon using the ***Draw Line*** or ***Snap Line to Node*** functions.

(8) ***Save Labeled Lines***: Used in feature line mode, this function selectively saves a unique combination of feature line categories as a Vector layer. This subset of all feature lines can be retrieved and viewed at any time by adding the Vector layer to the current map.

(9) ***Find Un-Labeled Polygons***: This function highlights all polygons that are not labeled.

(10) ***Re-Draw Screen***: This function re-draws the GypsES screen. Although ***MapEdit*** attempts to re-draw the screen whenever major changes to the display have been made, the screen can be re-drawn at any time during the session.

(11) ***Re-Build Polygons***: This option causes ***MapEdit*** to re-build all polygons. This is useful if you have made many changes. As you draw and change individual lines, ***MapEdit*** does not always recognize that a polygon has been closed. The ***Re-Build Polygons*** function completely re-builds all polygon structures.

(12) ***Exit Tools Menu***: This function returns you to the Vector Edit Functions palette.

j. ***Re-Draw Screen***: ***MapEdit*** attempts to re-draw the screen whenever major changes to the display have been made. However, click this push button anytime you want to be sure that what is seen is what is really there. This function is particularly useful in clearing highlighted lines from some of the "Vector Edit Tools" options.

Working With SiteData Map Layers

SiteData files have a set of x,y geographic (UTM) coordinates that define points within a location; any database file can be formatted to create a SiteData file as long as it contains fields that have UTM coordinates. These points can represent trap sites or other sampling locations and may contain other data located at these points.

B. ***Create New SiteData Layer / Revise Existing SiteData Layer***
Within ***MapEdit***, you have the option of either creating a new SiteData layer (***Create New SiteData Layer***) or editing an existing layer (***Revise Existing SiteData Layer***). If you need to create a new SiteData layer, a *Select SiteData File to use as Template* dialog box appears for selecting a SiteData file. A useful template to use would be another SiteData file that has field definitions that are suited to the new SiteData layer. If such a template does not exist, one must be created. To create a database file, open the GypsES ***Edit*** menu and choose the ***Database*** / ***Create New Data File*** option. To make edits to an existing database file, open the ***Edit*** menu and choose the ***Database / Edit/View Data File*** option.

Choosing to edit an existing SiteData map layer brings up a *Select SiteData File for MapEdit* dialog box; select a map layer and click on ***Accept***. Choosing to either create a new SiteData map layer or edit an existing SiteData map layer brings up a dialog box titled *MapEdit: SiteData Edit Options* (Fig. 7-9). [*Note: Once the options in this dialog box are defined, click on* ***Accept*** *to move into* ***MapEdit****.]*

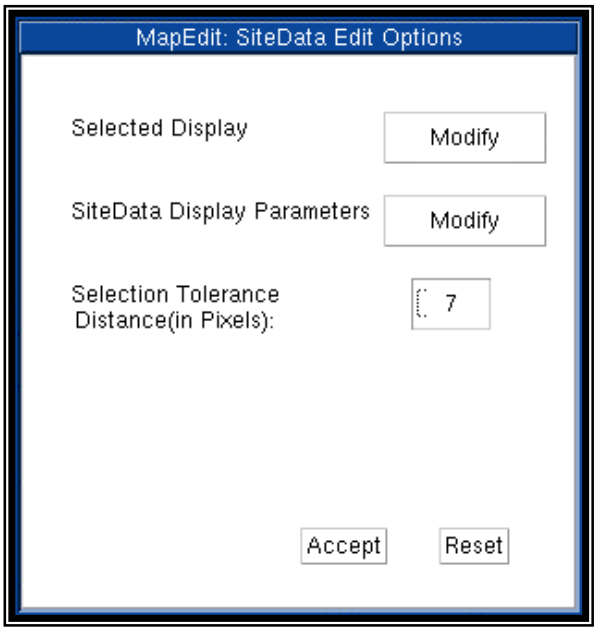


Figure 7-9. *MapEdit*: *SiteData Edit Options* dialog box.

1. ***MapEdit: SiteData Edit Options***
   Use these options when working with SiteData map layers.

   a. ***Highlight (Selected) Display***: Use this option to edit options for displaying information about *selected sites only* on the screen. Click on ***Modify*** to the right of "Selected Display" to bring up the *Site Display Options* dialog box. (See the ***Selecting a SiteData Map Layer*** option under the ***Window*** menu ***/ Build/Update Map*** option on page 8-6 for a description.) In general, the highlight display should be fixed, i.e., a single color, symbol, and size. The database field should be left as "UNASSIGNED." The labeling of selected sites is probably unnecessary.

   b. ***SiteData Display Parameters***: Use this option to edit options for displaying information about *all* sites on the screen. Click on ***Modify*** to the right of "SiteData Display Parameters" to bring up the *Site Display Options* dialog box. The options you select in this dialog box affect the display of all sites, not just those selected. (See the ***Selecting a SiteData Map Layer*** option under the ***Window*** menu ***/ Build/Update Map*** option on page 8-6 for a description.)

   c. ***Selection Tolerance Distance***: This is the distance in screen pixels within which a site is selected when you click the left mouse button once on a map layer; 5 is a recommended default value.

2. ***General Functions Palette***: See the "General Functions" section starting on page 7-7 for a description of these functions.

3. ***Site Edit Functions*** (Fig. 7-10).
   Use these editing functions when working with SiteData map layers.
   Palette Buttons:
   - Add Site (7-22)
   - Edit Site Info (7-22)
   - Select Single Site (7-22)
   - Select Sites in Polygon (7-23)
   - Move Selected Sites (7-23)
   - Clear Selected Sites (7-23)
   - Delete Selected Sites (7-23)
   - Un-Delete (7-23)
   - Set Site Options (7-23)
   - Re-Draw Screen (7-23)

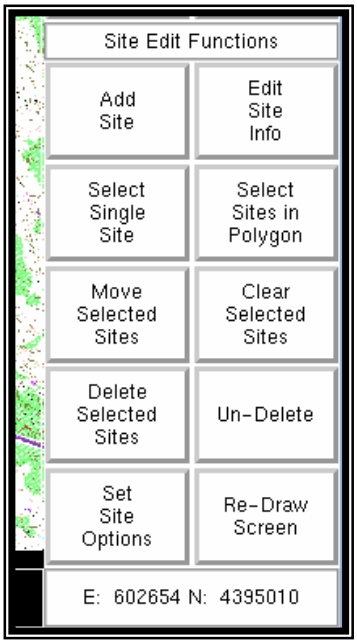


Figure 7-10. *MapEdit*: *Site Edit Functions* palette.

a. ***Add Site***: Use this option to add sites to a SiteData layer. To add a site, click on the new site location on the map; a *DataBase* dialog box appears with the new site's UTM coordinates that were detected when the site was clicked. Values for other fields in that database record can be added now or later; for instance, sampling locations for an egg mass survey might be established in ***MapEdit***, and survey information added later using the database update function.

b. ***Edit Site Info***: This option brings up the *DataBase* dialog box to view or change data associated with a site you have selected. Once the ***Edit Site Info*** option is selected, click on a site to select it and display its data. Clicking once with the right mouse button ends the ***Edit Site Info*** function.

c. ***Select Single Site***: Use this option to choose single sites by clicking on the site. Sites selected are highlighted with a set highlight color and symbol (see the ***Highlight***

(Selected) Display description on page 7-21). Be sure to make the selection tolerance distance small enough so that when the mouse button is clicked to select a site, the site closest to the mouse pointer is selected.

d. ***Select Sites in Polygon***: Use this option to draw a polygon around sites to select them as a group (similar to the "group selection" function in slide presentation software). Each click of the left mouse button defines a corner of a polygon drawn around sites you want to select; move the mouse pointer between corners. Click the right mouse button to end the selection process and highlight selected sites.

e. ***Move Selected Sites***: This option moves selected sites as a group. After selecting this option, place the mouse pointer anywhere on the map and hold the left mouse button down to move the group of selected sites; release the left mouse button to stop the move. GypsES prompts you to click ***Complete*** if the move is complete, ***Cancel*** to cancel the move function, and ***Continue*** to continue the move.

f. ***Clear Selected Sites***: This option deselects sites. After sites are cleared, none are considered "selected." Do not confuse this with ***Delete Selected Sites*** described immediately below; the ***Clear Selected Sites*** function only deselects selected sites, but does not delete them.

g. ***Delete Selected Sites***: This option deletes all selected sites (see the **Un-Delete** function to keep deleted sites after they have been deleted). Do not confuse this with ***Clear Selected Sites***; the ***Delete Selected Sites*** function actually deletes selected sites.

h. ***Un-Delete***: This option restores the SiteData layer to its status before the last delete.

i. ***Set Site Options***: This option brings up the *SiteData Edit Options* dialog box (see pages 7-20 and 7-21 for a description).

j. ***Re-Draw Screen***: This option refreshes the ***MapEdit*** screen with any changes you have made.

II. ***Database***

Use this option to edit, view, create or modify database files or to create a SiteData file from a database file.

Pull Down Menu:

- Edit/View Data File (7-24)
- Create New or Modify Existing Data File (7-26)
- Make SiteData File from Database File (7-33)

A. ***Edit/View Data File***

Use this option to edit or view a data file from within available mapsets. [*Note: The data file has to be located in the current mapset to edit the database. If a file is located outside the current mapset and you receive a GypsES message that the "Data Entry Mode [is] set to VIEW," then the data can be viewed but not changed*.] A *Select .DBF file to Edit/View* dialog box appears; select the appropriate mapset and file and click on ***Accept*** to accept the selection, on ***Clear*** to clear the selection, or on ***Cancel*** to end the selection process. A *Database* dialog box then appears with individual data records. Within the *Database* dialog box, you can toggle between viewing the entire spreadsheet ("Spreadsheet View," Fig. 7-11) or viewing individual records ("Record View," Fig. 7-12) by clicking on the appropriate tabs in the upper left corner of the dialog box. The database record number of the record currently highlighted (e.g., Record "x" of the total number of records) is listed in the lower left corner of the dialog box. Clicking on ***OK*** removes the *Database* dialog box. Options available within the database edit mode include:

1. ***Add New***: Click on this option to add a new database record (one click adds a new record to the bottom of the database).

2. ***Delete***: Choose this option to delete a database record; select the data record you want to delete and click once on ***Delete***.

3. ***Restore Field***: Use this option to restore the content of a data field cell that you erased.

4. ***Restore File***: Click on this option to restore the file by clearing all edits made since the file was opened for editing; GypsES warns you that all changes will be lost.

5. ***Modify Fields***: Choose this option to modify existing data fields; this brings up a *Create/Modify Database* dialog box described on page 7-28 under the ***Edit*** menu / ***Database*** option / ***Create New or Modify Existing Data File*** option ***/ Modify Existing Database*** option.

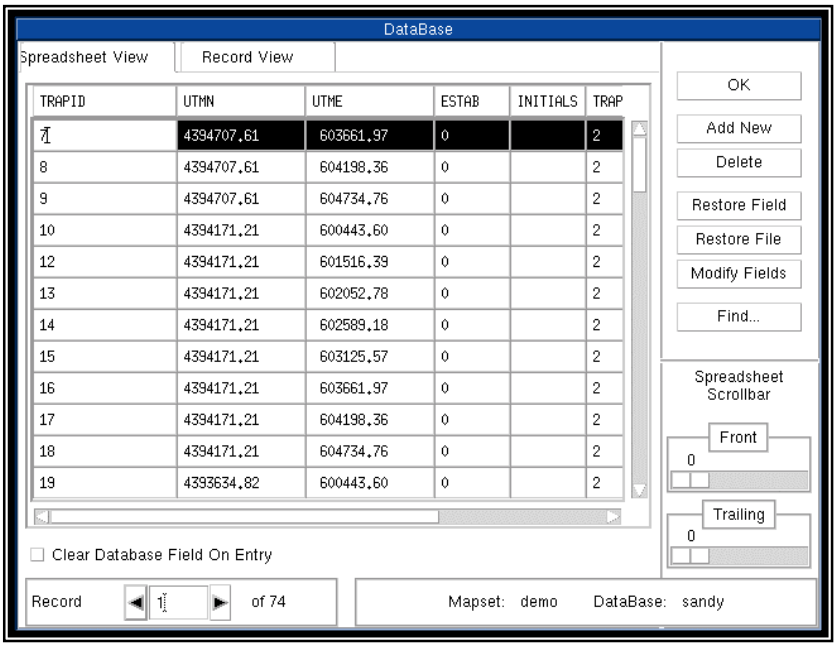


Figure 7-11. *Database* dialog box: *Spreadsheet View*.

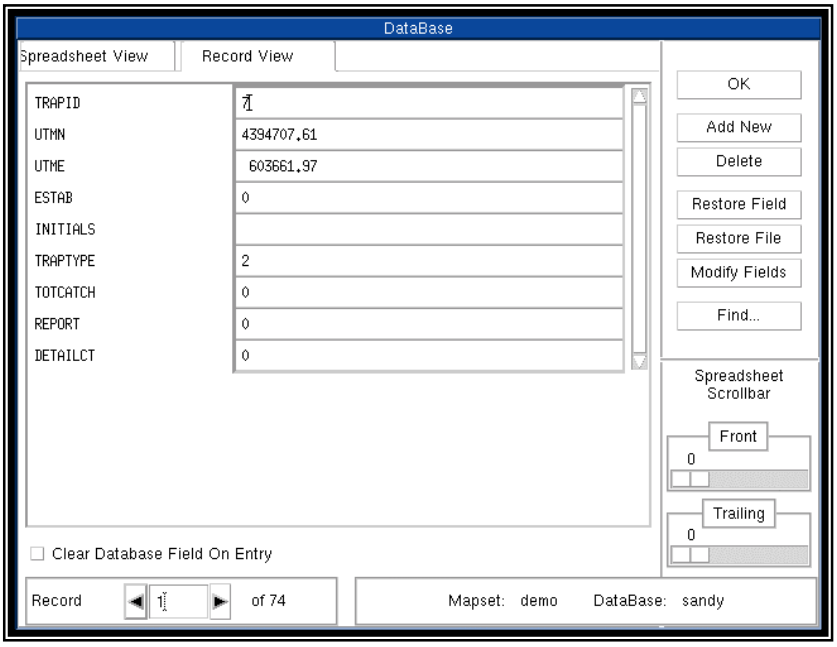


Figure 7-12. *Database* dialog box: *Record View*.

6. ***Find***: Use this option to find a specific data record within the database by either matching a whole word or by matching case.

7. ***Spreadsheet Scrollbar***: Use the spreadsheet scrollbar function to "freeze" (hold constant on the screen) a defined number of data fields when scrolling from the left side ("Front") and/or right side ("Trailing") of the database. The number of fields frozen is controlled by sliding the double-box cursor with the number above it to the right or left; the number that appears above this cursor is how many fields are frozen on the screen when scrolling through the database.

8. ***Clear Database Field on Entry***: Checking this option provides a shortcut that clears cell contents when you click on the cell to add new data.

B. ***Create New or Modify Existing Data File***
Use this option to create and modify both databases and templates.
Pull Down Menu:
- Create New Database (7-27)
- Modify Existing Database (7-28)
- Make New Database from Template (7-29)
- Create New Template (7-30)
- Modify Existing Template (7-31)
- Create Template from Database (7-32)

1. ***Create New Database:*** This option brings up a *Create/Modify Database* dialog box to create a new database from scratch (Fig. 7-13). Define new data fields in the "Field Properties" box in the lower left corner of the dialog box. For each field, type in the field name, select the data type (click on the choice button to the right of "Data Type" for an options list), and specify field size and the number of decimal places you want. Your choices simultaneously appear in the field name list above. Once these properties are defined, click on ***Next Field*** to define the next field. Edit data field entries by selecting the data field (click once on the data field line above) and editing the appropriate "Field Properties" cells.

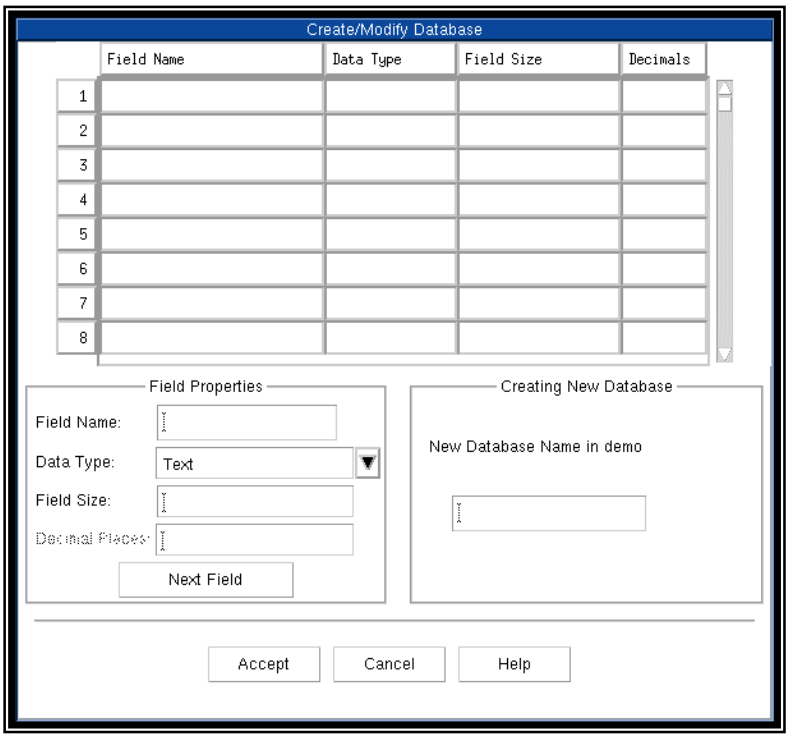


Figure 7-13. *Create/Modify Database* dialog box: *Create New Database*.

Scroll through the database field name list by using the down arrow key, clicking on ***Next Field***, or by clicking on the arrows on the right side of the field name box. A data field can be selected by clicking on its line once. To delete a selected data field, click once in the small cell just to the left of the field name cell; you are then asked, "Delete Current Field?" Click ***Yes*** to delete or ***No*** to retain the data field. Once the database is created,

type in a filename in the text entry window below "New Database Name in [mapset name]." Click on ***Accept*** to complete the database creation or on ***Cancel*** to abort the process.

2. ***Modify Existing Database:*** This option is used to add or delete fields in an existing database. A *Select Existing database file* dialog box first appears to select a mapset and database file. Click on ***Clear*** to clear the current selection, on ***Accept*** to complete the selection, or on ***Cancel*** to abort the selection process. The *Create/Modify Database* dialog box then appears (Fig. 7-14).

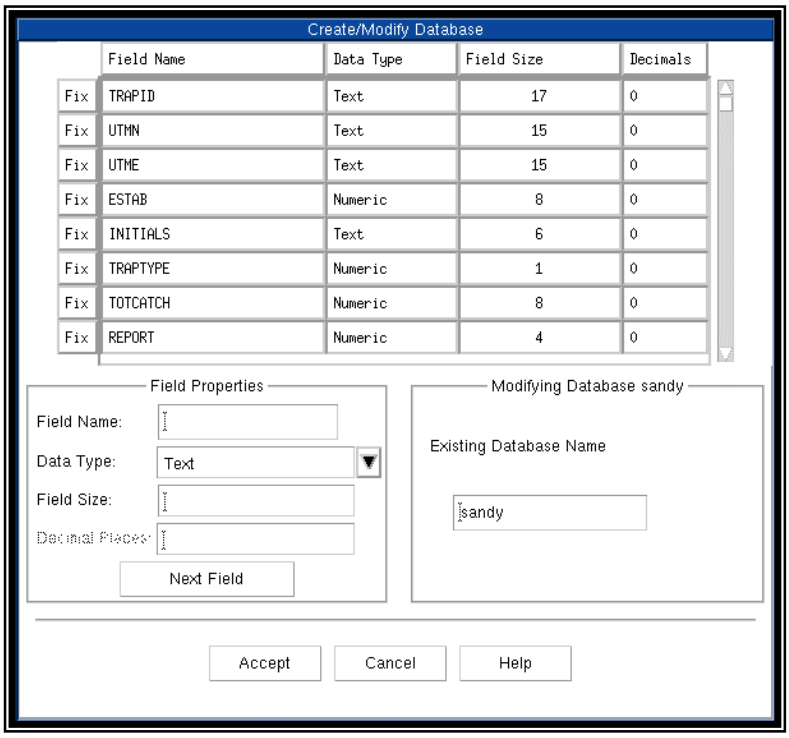


Figure 7-14. *Create/Modify Database* dialog box: *Modify Existing Database.*

New data fields can be added to the list (the word "Add" appears in the small cell to the left of the field name cell). To modify added data fields, click once on the data field line to select it, then click on the appropriate box in the "Field Properties" section to make changes (use the backspace key to delete text or highlight the entire entry and hit <Delete>). Delete existing data fields by first selecting the data field line; if data exists

in the field, "Del" appears in the square just to the left of the field name cell. If you click the data field line again, GypsES warns you that data does exist in the field and asks if the field and data should still be removed. If no data exists, GypsES simply asks "Delete Current Field?" Click on ***Yes*** to delete the field or on ***No*** to retain it. Once the database is modified, type in a filename in the text entry window below "Existing Database Name." Click on ***Accept*** to complete the database modification or on ***Cancel*** to abort the process.

3. ***Make New Database from Template:*** You can use a template to create a new database; a template is basically an empty database file stored in a location that protects it from being updated. This would be useful if you build the same database for every year (e.g., egg mass counts). A *Select Existing TEMPLATE file* dialog box first appears to select a mapset and template file. Click on ***Clear*** to clear the current selection, on ***Accept*** to complete the selection, or on ***Cancel*** to abort the selection process. The *Create/Modify Database* dialog box then appears (Fig. 7-15).

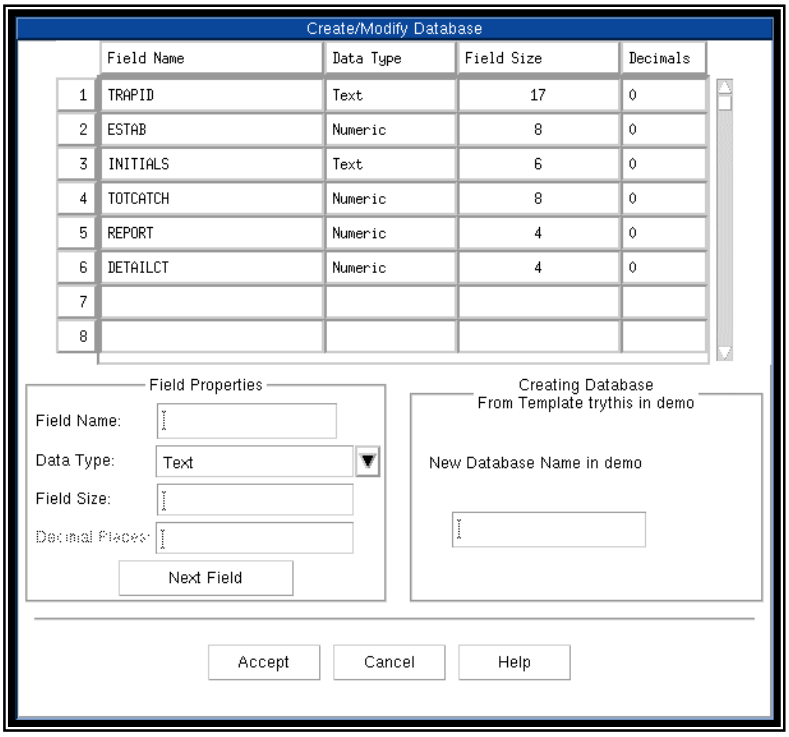


Figure 7-15. *Create/Modify Database* dialog box: *Make New Database from Template.*

You can add new data fields to the list (the word "Add" appears in the small cell to the left of the field name cell). Modify existing data fields by clicking once on the data field line to select it, then clicking on the appropriate box in the "Field Properties" section to make changes (use the backspace key to delete text or highlight the entire entry and hit <Delete>). To delete existing data fields, first select the data field line; after clicking again, GypsES asks "Delete Current Field?" Click on ***Yes*** to delete the field or on ***No*** to retain it. Once the database is created, type in a filename in the text entry window below "New Database name in [mapset name]." Click on ***Accept*** to complete the database creation or on ***Cancel*** to abort the process.

4. ***Create New Template:*** Use this option to create a template from scratch. The same *Create/Modify Database* dialog box described under ***Create New Database*** (page 7-27) appears (Fig. 7-16). After defining all data fields for the new template, type in a template filename in the text entry window below "New Template Name in [mapset name]. Click on ***Accept*** to complete the template creation or on ***Cancel*** to abort.

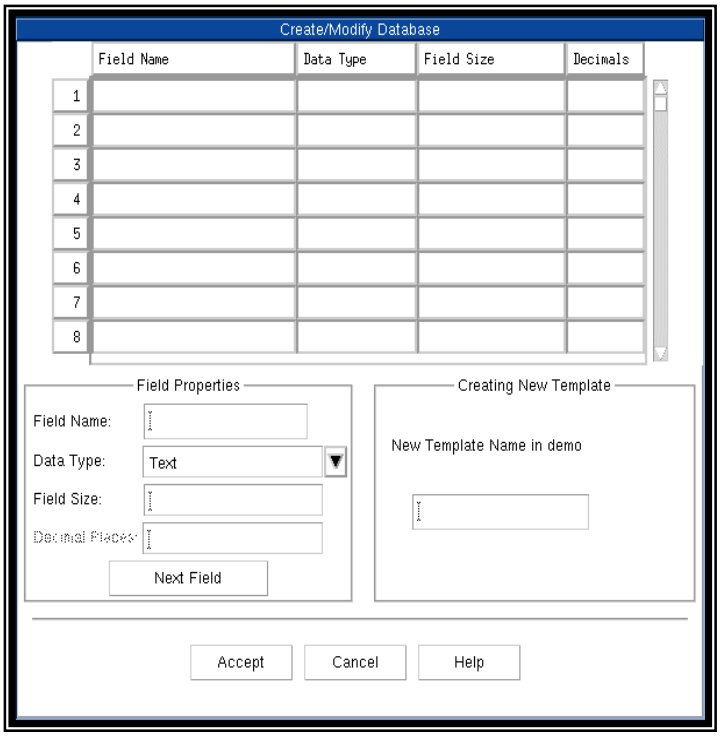


Figure 7-16. *Create/Modify Database* dialog box: *Create New Template.*

5. ***Modify Existing Template:*** Use this option to make changes to an existing template file. A *Select Existing TEMPLATE file* dialog box first appears to select a mapset and template file. Click on ***Clear*** to clear the current selection, on ***Accept*** to complete the selection, or on ***Cancel*** to abort the selection process. The *Create/Modify Database* dialog box then appears (Fig. 7-17).

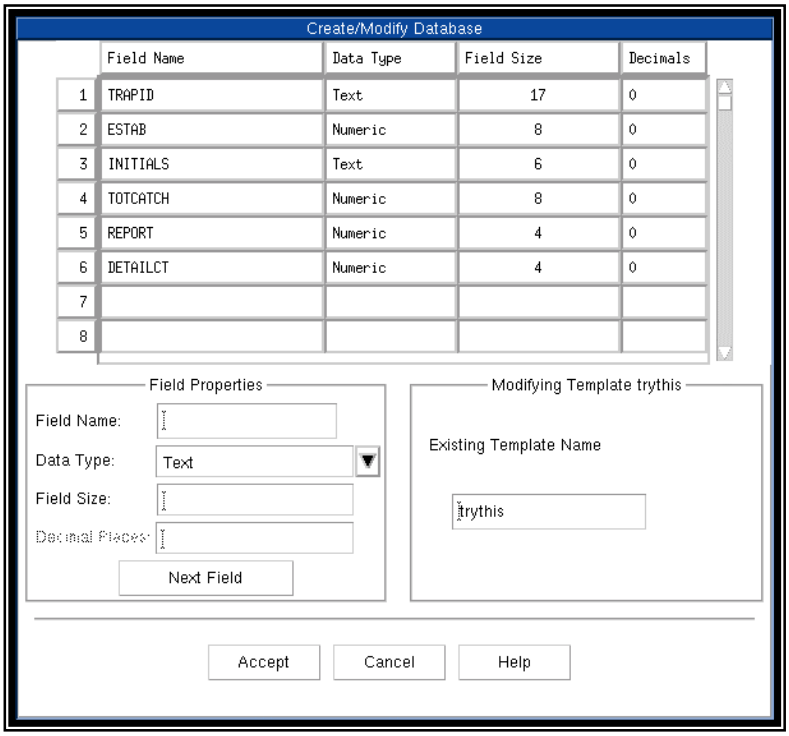


Figure 7-17. *Create/Modify Database* dialog box: *Modify Existing Template.*

You can add new data fields to the list (the word "Add" appears in the small cell to the left of the field name cell). Modify existing data fields by clicking once on the data field line to select it, then clicking on the appropriate box in the "Field Properties" section to make changes (use the backspace key to delete text or highlight the entire entry and hit <Delete>). To delete existing data fields, first select the data field line; after clicking again, GypsES asks "Delete Current Field?" Click on ***Yes*** to delete the field or on ***No*** to retain it. Once the template is modified, type in a filename in the text entry window below "Existing Template Name." Click on ***Accept*** to complete the template modification or on ***Cancel*** to abort the process.

6. ***Create Template from Database:*** Use this option to create a template from an existing database. A *Select Existing database file* dialog box first appears to select a mapset and database file. Click on ***Clear*** to clear the current selection, on ***Accept*** to complete the selection, or on ***Cancel*** to abort the selection process. *The Create/Modify Database* dialog box then appears (Fig. 7-18).

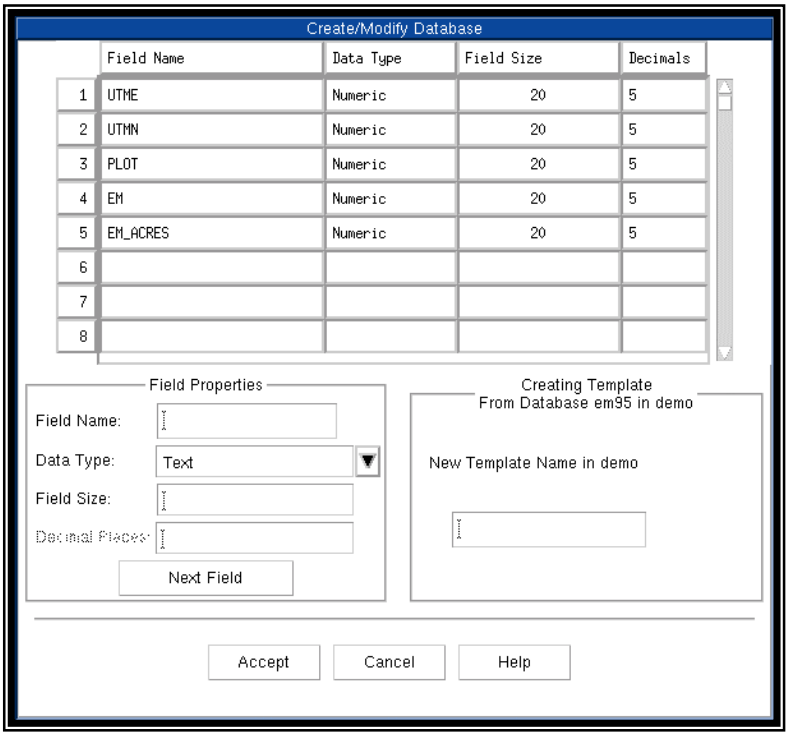


Figure 7-18. *Create/Modify Database* dialog box: *Create Template from Database*.

You can add new data fields to the list (the word "Add" appears in the small cell to the left of the field name cell). To modify added data fields, click once on the data field line to select it, then click on the appropriate box in the "Field Properties" section to make changes (use the backspace key to delete text or highlight the entire entry and hit <Delete>). To delete existing data fields, first select the data field line; after clicking again, GypsES asks "Delete Current Field?" Click on ***Yes*** to delete the field or on ***No*** to retain it. Once the template is created, type in a filename in the text entry window below "New Template Name in [mapset name]." Click on ***Accept*** to complete the template creation or on ***Cancel*** to abort the process.

C. ***Make SiteData File from Database File***

Use this option to create a SiteData file from a database file by specifying what database fields to use as geographic coordinates so that the file can be displayed on a map. This may be useful if you didn't already specify the coordinate fields when creating or importing a database file or if you need to correct improperly specified fields. A *Select Database [to] Convert to SiteData* dialog box appears; select the mapset and database file you want from the appropriate lists and click on ***Accept*** to select the file, on ***Clear*** to clear the selection, or on ***Cancel*** to terminate the selection and close the dialog box.

If a database file is selected, a *Site Data Fields Linkage* dialog box appears to select fields from the database file to use as UTM Easting and Northing coordinates (Fig. 7-19). A message appears at the top of the dialog box: "Select Fields from Data File: [x] in Mapset: [y] to use as coordinates." Click on the choice buttons to the right of "UTM Easting Field" and "UTM Northing Field" to view the list of available field names. Choose the fields you want and click on ***Accept*** to complete the selection or on ***Cancel*** to abort the process.

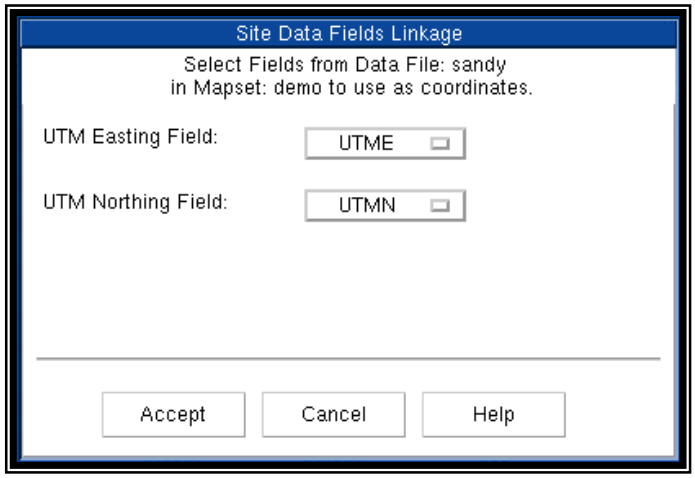


Figure 7-19. *Site Data Fields Linkage* dialog box.

III. ***Map Features*** : Use this option to add or modify text, labels, and other features within a Work Window.

Pull Down Menu:

- Map Labels (7-34)
- Edit Categories (7-36)

User Tip: What are the differences between labels and the label display options for Vector and SiteData files?

This map label option creates text that is displayed on the Work Window. It is geographically placed, i.e., the label's upper left corner is associated with a specific UTM Northing and Easting coordinate. Its size can also be tied to the geographic View by using a ***Resize on View Change*** option (see page 7-35). However, it is not associated with any geographic layer, and if you clear a Work Window, the labels drawn in it are removed. You can save labels by saving the Work Window as a composite file (see the ***File*** menu / ***Save*** option / ***Composite*** option described on page 6-14).

Labels displayed in conjunction with Vector or SiteData files are associated with category information (Vector) or a database (SiteData). The information displayed is part of the layer information and can be altered using the edit categories options of *MapEdit* (Vector) or by editing the database information (SiteData). To display these types of labels, you must select the display label option in the *Vector Display Options* dialog box (page 8-4) or *Site Display Options* dialog box (page 8-6).

A. ***Map Labels***

Use this option to add, move, delete or change labels on the Work Window screen. When you select an existing label for moving, deleting or changing, the label is first outlined by dashes; you are then asked if the outlined label is the correct label for that function. Click on ***OK*** to proceed with the label function or on ***No*** to cancel the selection. When you use the move and delete options, you are prompted for another label before exiting; when you use the change option, however, you are not prompted for another label before exiting.

Pull Down Menu:

- Define New Label (7-35)
- Move Label (7-36)
- Delete Label (7-36)
- Change Label (7-36)

1. ***Define New Label:*** After selecting this option, a *Label Definition* dialog box (Fig. 7-20) appears to create labels for any map layer. Options include:

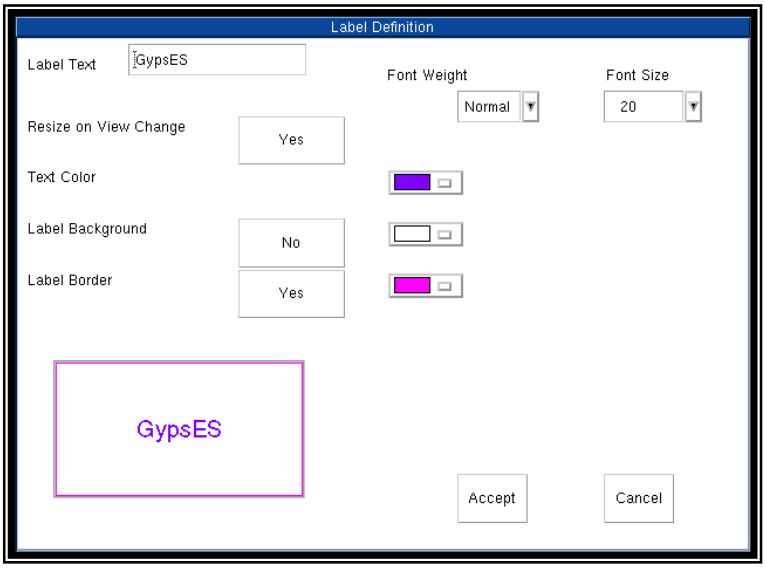


Figure 7-20. *Label Definition* dialog box.

a. ***Label Text***: Click once inside the text entry window to the right of "Label Text" to type in the new label's text.

b. ***Change Font***: Selecting this option brings up a *Label Font Selection* dialog box. You can define a font weight (normal or bold) and size for the label text. A "Font Preview" section of the dialog box previews the selected font. Click on ***Accept*** when the font selection is complete.

c. ***Resize on View Change***: You can decide whether to resize the label with each View change (***Yes*** or ***No***).

d. ***Text Color***: Click on the choice button to the right of the color cell to bring up a menu of color options from which to choose the label text color.

e. ***Label Background / Border****:* These are both ***Yes*** or ***No*** options; choose ***Yes*** to show a label background or border (click on the choice button to the right of the appropriate color cell to bring up color options for a label background, border, or both).

Click on ***Accept*** to close the *Label Definition* dialog box, then move the label to where you want it to go. By default, the new label is initially located in the upper left corner of the screen. Place the mouse pointer in this corner and hold the left mouse button down to drag the label to where you want it. Only the outline of the label is visible while it is being dragged across the screen, and even the outline may not be visible depending on what background color is being used. Release the left mouse button to stop the move. Click on ***Complete*** if the label is located correctly, click on ***Continue*** to continue moving the label, or click on ***Cancel*** to cancel the new label.

2. ***Move Label:*** To move a label, first select ***Move Label*** from the options list. Then click on the label you want to move to select it; clicking the right mouse button cancels the selection process. Once you have confirmed that you have selected the label you want to move, place the mouse pointer on the label and hold the left mouse button down to move the label to a new location; release the left mouse button to stop the move. Click on ***Complete*** if the move is complete, click on ***Continue*** to continue moving the label, or click on ***Cancel*** to cancel the label move.

3. ***Delete Label:*** To delete a label, first select ***Delete Label*** from the options list. Then click on the label you want to delete to select it; clicking the right mouse button returns you to the Work Window without deleting any labels. Once you have confirmed that you have selected the label you want to delete, click on ***OK*** to delete the label.

4. ***Change Label:*** To change label attributes, first select ***Change Label*** from the options list. Then click on the label you want to change to select it; clicking the right mouse button cancels the selection process. Once you have confirmed that you have selected the label you want to change, that label's definition dialog box appears for editing. Once changes are made, click on ***Accept*** or on ***Cancel*** to cancel any label attribute changes.

B. ***Edit Categories***

This option is used to create or edit category descriptions within a Raster or Vector layer of the (current) output mapset only. After clicking on ***Edit Categories***, you are prompted to select a file type (Raster or Vector) for category edits. This brings up a dialog box titled *Select Raster (Vector) File for Category Edit*; select the current output mapset name on the left and filename on the right. Click on ***Accept*** to complete the selection, on ***Clear*** to clear the selection, or on ***Cancel*** to end the selection process. An *Edit Categories -- Mapset: [x] File: [y]* dialog box appears (Fig. 7-21).

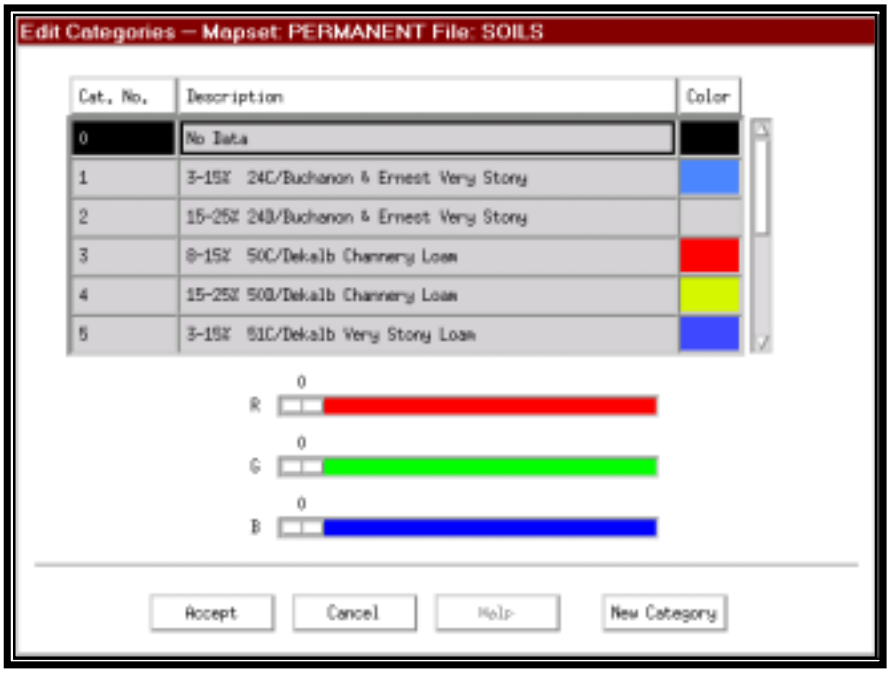


Figure 7-21. *Edit Categories – Mapset: [x] File: [y]* dialog box.

[*Note: A Vector file, when created, does not necessarily have categories associated with it. Feature lines are the only lines that can be labeled and color coded. In order to color code lines, each line must be labeled. This may already be done if GypsES support personnel have supplied a map layer, or you can add labels using* ***MapEdit*** *(see* ***Define Label*** *on page 7-12).*]

Each category is listed on a separate line; category number (far left column) lists all categories from the top of the dialog box to the bottom. To edit the category description label in the column immediately to the right of the category number, click inside the description cell and edit the description text. The current category color is displayed in the cell to the far right on the dialog box. There are three color bars below (R=Red, G=Green, and B=Blue) that contain a double-box cursor with a number on top. When a given category color is selected above, the cursor settings on each color bar below change to illustrate the unique mix of red, green, and blue that makes up the selected category color. To edit the category color, first click over one of the double-box cursors and hold the left mouse button down; the cursor can then be moved left or right along the color bar to edit the strength of that color in the resulting category color. As the color mix is edited for a category, the color cell on the category line above simultaneously changes.

User Tip: Creating and Changing Colors

You can make new colors or change existing ones using the red, green, and blue components of a color. Some key concepts include:

- Higher color values tend to give a lighter color; conversely, lowering all color values makes a color darker.
- The basic eight colors that can be mixed using the highest value of each color component include:

Red	Green	Blue	Resulting Color
255	255	255	white
255	0	0	red
255	255	0	yellow
255	0	255	magenta
0	255	0	green
0	255	255	cyan
0	0	255	blue
0	0	0	black

- Gray can be made in any hue from white to black by just choosing the same value for the red, green, and blue component.
- The same red, green, and blue combination may look different on different monitors.
- Colors do not always transfer well to hard copy. You may have to experiment to achieve acceptable colors for graphics output.

Appendix B shows color component values for a range of colors.

You can add new categories by clicking on ***New Category***. Select a category number and type in a text description for the new category in the *New Category* dialog box that appears. Click on ***Accept*** when the dialog box is edited to return to the *Edit Categories* dialog box. [*Note: The new category color is black by default; edit the category color as described above.*] Click on ***Accept*** to accept the category edits or on ***Cancel*** to cancel the editing function.

IV. ***Standard Name Linkages***

Selecting this option brings up a "Standard Name Linkage Edit" table. The purpose of this option is to link (associate) a GypsES map layer file (named by you) with a **Standard Name** within this table. A Standard Name is a unique filename that is used for specific internal calculations by GypsES; it is a specific type and does not change. If a map layer file is linked to a Standard Name, GypsES uses this file to perform the specific calculations. Each time GypsES performs an internal calculation that requires a specific file, GypsES can "look it up" in this linkages table (see Appendix A for a complete list of Standard Names). By setting the links here,

GypsES does not need to prompt you for a filename each time it performs internal calculations. The Standard Names listed down the left side of the dialog box represent data elements used internally by the GypsES system; linked GypsES map layer files are listed on the right. To select or change a map layer file to link to a given Standard Name, click on the box on the right side of the dialog box under "Map Layer" and select the map layer name you want. Click on ***Exit*** when edits to this dialog box are completed.

V. ***Administrative Profile***

Use this option to customize the GypsES session and define management objectives.
Pull Down Menu:

- User Profile (7-39)
- Management Objectives (7-43)

A. ***User Profile***

Use the *User Profile* dialog box to customize settings for your GypsES sessions at the global, location, and mapset levels. This dialog box has four dialog boxes to toggle between by clicking on the appropriate tabs: *Global*, *Location*, *Mapset*, and *Pest*.

1. ***Global***: Information in the *Global* dialog box (Fig. 7-22) applies whenever you run GypsES, regardless of what location or mapset is selected. The *Global* dialog box includes the following features:

   a. ***Initial Window Display Mode***: Use this option to specify how Work Windows are initially displayed when GypsES is started: ***Tiled Screen*** (all four Work Windows appear on the screen at the same time) or ***Full Screen*** (only one Work Window is displayed at a time). The Work Window display mode can be changed during a GypsES session using the ***Windows*** menu (toggle between ***Tile Work Windows*** and ***Make Work Windows Full Screen*** on the top line of the pull-down menu).

   b. ***Initial Display Map***: This option specifies what map is initially displayed when GypsES starts: ***Last*** (the last map drawn in the current location/mapset) or ***None*** (no map).

   c. ***Default Unit of Measure***: Choose the default unit of measurement (***English*** or ***Metric***) used by GypsES when displaying areas and distances.

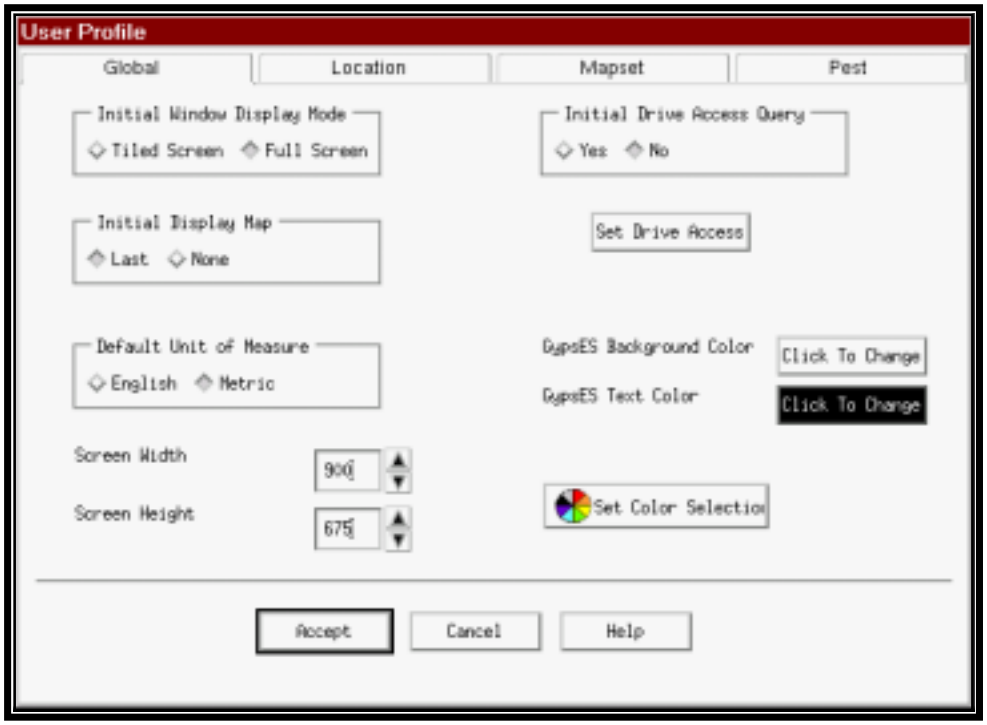


Figure 7-22. *User Profile* dialog box: *Global* dialog box.

d. ***Screen Width and Height***: Use this option to choose the size of the GypsES window in screen pixels. Click on the up (△) and down (▽) triangles to increase or decrease, respectively, the window size in each dimension. The GypsES screen always retains a width-to-height ratio of 4:3, so if you change one value, the other will automatically be adjusted. GypsES will not let you change the window dimensions to values greater than that of your computer screen.

e. ***Initial Drive Access Query***: GypsES default behavior in accessing data on computer systems with multiple disk drives (floppy, hard disk, CD-ROMs, etc.) is to allow access to (and attempt to read) all available drives on your system. For some lap-top computer systems where the floppy drives are swappable or can be plugged in (or not), this results in delays in starting GypsES because it takes GypsES a while to figure out the drive isn't there. To address this problem, the user profile now allows you to set what drives to access and, if desired, have GypsES query you for what disk drives to access when it starts up. If ***Initial Drive Access Query*** is set to ***Yes***, GypsES displays a *Set Drive Access* dialog box when GypsES starts up (Fig. 7-23). [*Note: You can also click the* ***Set Drive Access*** *push button in the Global dialog box to bring up the Set Drive Access dialog box at any time.*]

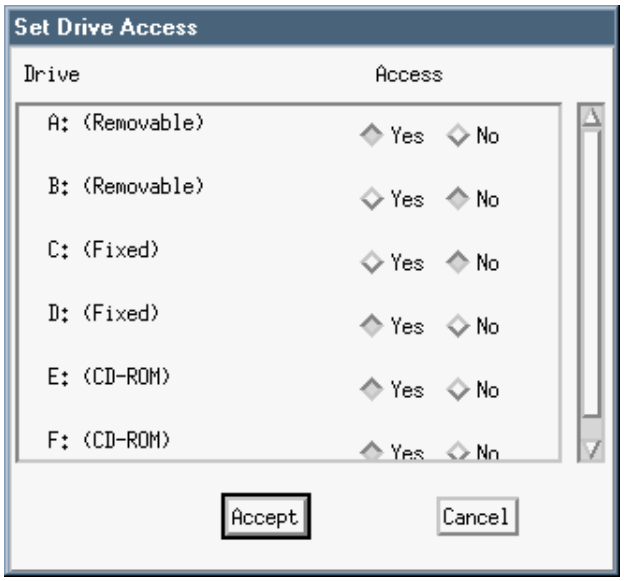


Figure 7-23. *Set Drive Access* dialog box.

The *Set Drive Access* dialog box lists all available drives on your computer on the left and ***Yes*** / ***No*** diamond toggle buttons on the right under "Access." Clicking the ***No*** diamond toggle beside a disk drive tells GypsES to ignore the drive; this drive will not appear as a drive choice in any file selection dialog box and there will be no delays in starting GypsES. You can also use this dialog box to avoid accessing or writing to specified drives on your computer system.

f. ***Set Drive Access***: You can set the access to drives on your computer system by clicking on this push button to bring up the *Set Drive Access* dialog box described under section e. above.

g. ***GypsES Background and Text Color***: Use the ***Click to Change*** push buttons to choose the background and text colors for GypsES menus, dialog boxes, etc. The currently selected color choice is illustrated in the button itself. When you click on the push buttons, a *Color Selection Dialog* dialog box appears with separate sliding bars for the red, green, and blue components of the color. By clicking on and sliding the color component bars back and forth, you can change the resulting color, which is previewed for you in a box in the upper left corner of the dialog box. Click on ***Accept*** to accept the new color or on ***Cancel*** to end the color selection process with no change.

h. ***Set Color Selection***: You can customize the 16 color choices available within GypsES menus by clicking on ***Set Color Selection***; this brings up a *Color Selection Dialog* dialog box that shows 16 colors in a "Custom Palette" in the upper right corner. Modify any of these colors by clicking on the color you want to change and adjusting the mix of red, green, and blue in the color bars below. Click on the double-square cursor and hold the mouse button down while dragging the cursor within each color bar to create the mix you want; the resulting color simultaneously changes in the preview box in the upper left corner of the dialog box. Click on ***Accept*** to save the customized color palette settings or on ***Cancel*** to quit with no color changes.

2. ***Location***: Enter a description of the location in the text entry window to the right of "Location Description."

3. ***Mapset***: Enter a description of the Mapset in the text entry window to the right of "Mapset Description." Enter the year the current mapset represents either by typing in the text entry window or by clicking on the up or down triangles to change the year incrementally.

4. ***Pest***: Use this dialog box to specify information for processing a specific pest (Fig. 7-24). Currently, the only choice is a Gypsy Moth Defoliation Prediction Model. [*Note: Pest information is global in nature and will affect all locations and mapsets on your system.*] You can specify what defoliation prediction method (***Montgomery*** or ***Gansner***) to use by clicking on the appropriate diamond toggle button.

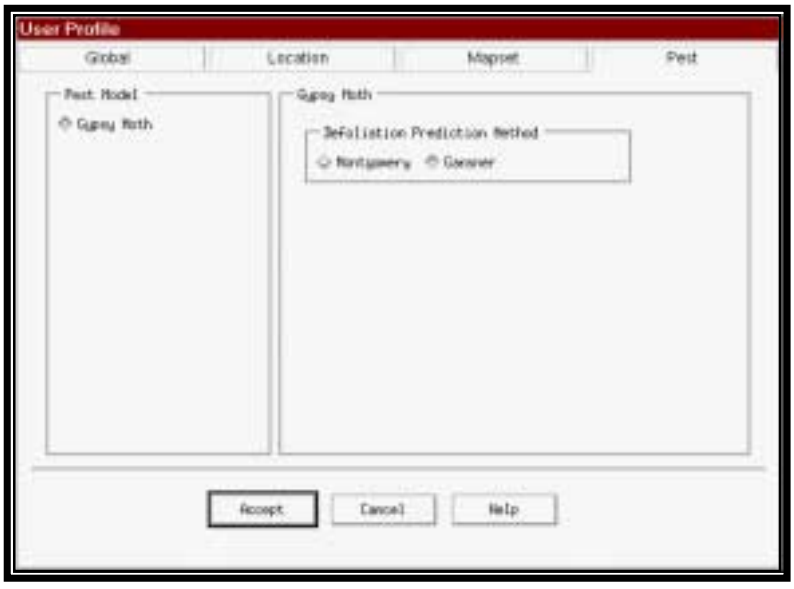


Figure 7-24. *User Profile* dialog box: *Pest* dialog box.

B. ***Management Objectives***

Use this option to describe and prioritize categories for managing land within the current location and mapset. A dialog box titled *Management Objectives: Location [x] Mapset [y]* appears (Fig. 7-25). Each numbered management objective can be described and may have one of the following treatment objectives: None, Prevent Mortality, Protect Foliage, Reduce Nuisance, or Minimize (Insect) Population. These can be prioritized according to the need for treatment by assigning a priority number next to that objective. Once this dialog box is edited, click ***Accept*** to accept the changes or on ***Cancel*** to discard any edits made.

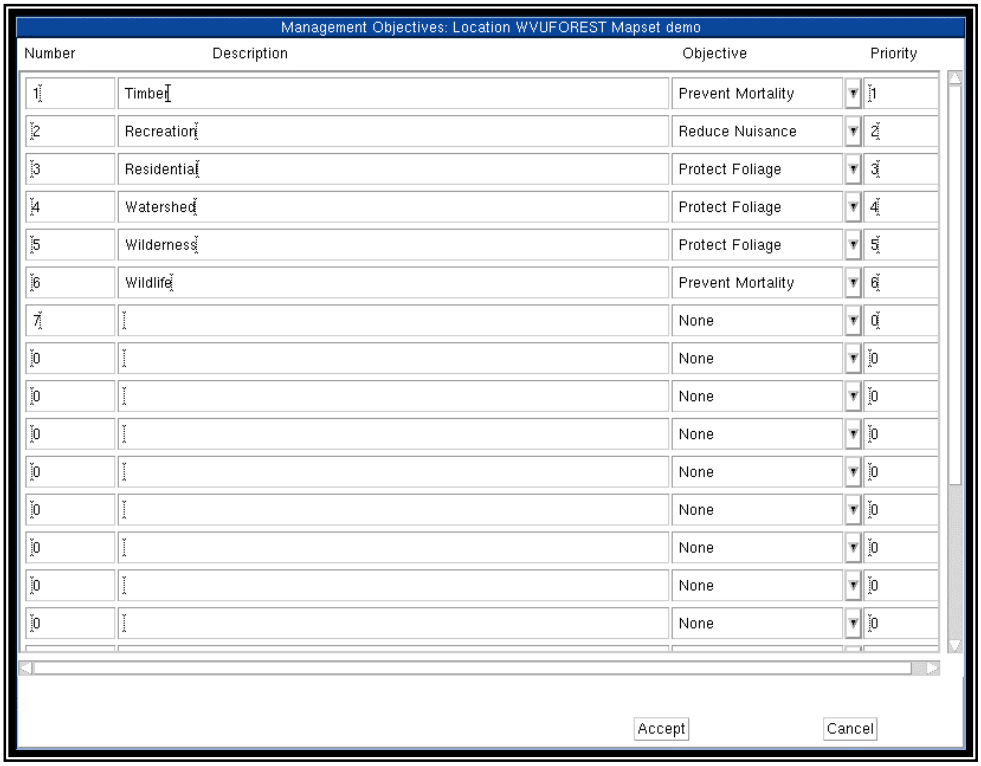


Figure 7-25. *Management Objectives: Location [x] Mapset [y]* dialog box.

The Window Menu

Use this menu option to select, view, and format map layers within GypsES Work Windows.
Pull Down Menu:

- Tile Work Windows (8-1)
- Work Window 1 (8-1)
- Work Window 2 (8-1)
- Work Window 3 (8-1)
- Work Window 4 (8-1)
- Build/Update Map (8-2)
- Change View (8-11)
- Clear Window (8-12)
- Redraw Window (8-12)

I. ***Tile Work Windows***

You can choose between two modes for displaying Work Windows each time a GypsES session is started. (1) The four Work Windows can be "tiled" (all four are displayed on the screen with the currently selected Work Window outlined in yellow), or (2) each Work Window can be individually displayed in a full screen. This mode is defined in the "Window Display Mode" section within the ***Edit*** menu ***/ Administrative Profile*** option ***/ User Profile*** option. If you have chosen ***Full Screen***, for example, the initial Work Window appears in a full screen. To tile the four Work Windows after starting GypsES, click on ***Tile Work Windows.*** To toggle back to the full screen mode, click on ***Make Work Windows Full Screen*** (this now appears in the top line of the ***Window*** pulldown menu where ***Tile Work Windows*** used to be). If you have chosen Tiled Screen, all four Work Windows appear initially in the tiled mode.

II. ***Work Window 1 - 4***

Work Windows are areas where image backdrops, Vector, SiteData, and Raster map layers can be displayed, saved as Composite files, or sent to a graphics output device. You are provided with four Work Windows that are numbered 1 through 4. Work Windows can contain one or more layers that are available within the current location. If you are working in the full screen mode, choosing a specific Work Window from this menu makes it the current window and displays the Work Window on the full screen. Any layers chosen are displayed in this Window. If you are working in the tiled mode, the newly selected Work Window is outlined in yellow. Change the current Work Window right on the GypsES main screen in either mode by clicking the current Work Window number button at the bottom of the screen and choosing a new Work Window number.

III. ***Build / Update Map***

Use this option to add, modify, or remove map layers and select mapping options within the current Work Window through an interactive screen display. When this option is selected, a *Build / Update Map* dialog box appears (Fig. 8-1).

Figure 8-1. *Build / Update Map* dialog box.

User Tip: Map Background Color

Before any map layer is drawn on a Work Window, GypsES fills the window with the map background color. The default for the background color is black. You can change the background color by clicking ***Modify*** on the Map Background Color line in the Current Map Content list.

You can build a map composed of any number of existing Raster, Vector, SiteData, and Composite map layers within the current location. The area on the right side of the dialog box (under "Current Map Content") lists all map layers actively selected for the map (including the default Map Background Color). To select a map layer of a given type (Raster, Vector, SiteData, or Composite), click on the push button for that type on the left side of the dialog box.

A. ***Selecting a Raster Map Layer***

When you click on ***Raster Layer***, a *Raster File Choice* dialog box appears. You can select one or more Raster map layer files from all available files by clicking on the filename. The filename is highlighted in black and also simultaneously appears in the "Current Map Content" list to the right. [*Hint:* To deselect the file, click the mouse button on the filename a second time.] Click on ***Done*** to close this dialog box. [*Note: If a Raster map is already drawn on the screen and another Raster map is selected, the new Raster map is drawn ONLY in the areas of the original map which are classified as "no data."*]

B. ***Selecting a Composite Map Layer***

The selection of a Composite map layer follows the same procedure used in selecting a Raster map layer.

User Tip: Work Window Composite Files

GypsES saves the content of each Work Window as a composite file in the current output mapset. The Work Window files are labeled WORK_WINDOW1, WORK_WINDOW2, etc. To copy the contents of one Work Window to another, just retrieve the Work Window composite file for the window. Note that if you have told GypsES to draw the contents of the Work Window last used each time you start GypsES (see ***User Profile*** options under the ***Edit*** menu / ***Administrative Profile*** option on page 7-39), GypsES draws these Work Window composite files. Also note that each mapset has its own set of composite Work Windows that are retained from the last time that mapset was the output mapset. You may have problems deleting a layer because GypsES says it is being used in a composite file. It may be that the layer is listed in a composite file for another mapset.

C. ***Selecting a Vector Map Layer***

When you click on ***Vector Layer***, a *Vector File Choice* dialog box appears. When a Vector map layer is chosen, one of two things can happen:

1. A *Vector Display Options* dialog box appears (Fig. 8-2). You can choose the Vector line width, color, and style, and whether or not to display Vector line labels.

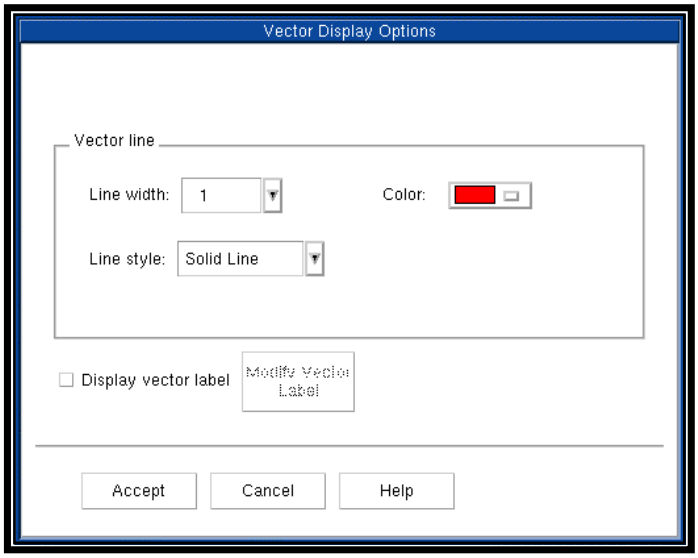


Figure 8-2. *Vector Display Options* dialog box.

If you want labels displayed, click on the square toggle button beside "Display Vector Label." A *Vector Label Definition* dialog box with two tabs (dialog boxes) appears:

a. ***Label Font*** (Fig. 8-3): Use this dialog box to edit the label font style, size, and color.

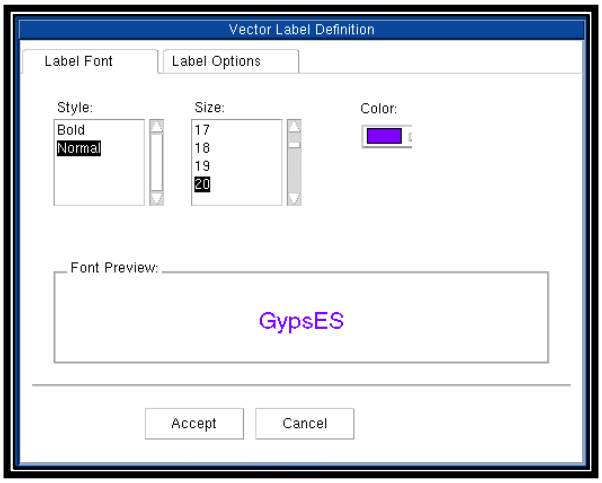


Figure 8-3. *Vector Label Definition*: *Label Font* dialog box.

b. ***Label Options*** (Fig. 8-4): Use this dialog box to choose the label type (polygon or feature) and content (category number or description).

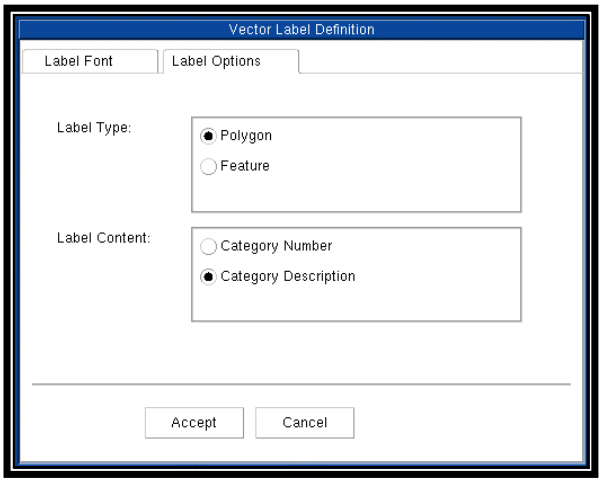


Figure 8-4. *Vector Label Definition*: *Label Options* dialog box.

Click on ***Accept*** to accept the display options in either the label font or options dialog box. If you want to change the vector label options once they're defined, click on ***Modify Vector Label*** to the right of "Display Vector Label" in the *Vector Display Options* dialog box. Then click on ***Accept*** to complete the edits or on ***Cancel*** to not make any changes.

2. If the Vector file chosen already has color-coded categories (i.e., its lines can be displayed in different colors that are already defined), GypsES displays a dialog box that states, "This Vector file has cataloged color assignment [...] Do you wish to modify?" If yes, click on ***Modify Colors*** to bring up the *Edit Categories* dialog box described starting on page 7-36 to change the color assignment. The line width and style (solid or dashed) can still be changed using the *Vector Display Options* dialog box described on page 8-4. Click on ***Just Display*** to display the chosen Vector file as is.

Click on ***Done*** to close the *Vector File Choice* dialog box and complete the selection of a Vector map layer.

D. ***Selecting a SiteData Map Layer***

When you click on ***SiteData Layer***, a *SiteData File Choice* dialog box appears. Once a SiteData file is chosen, a *Site Display Options* dialog box (Fig. 8-5) is brought up with the following options:

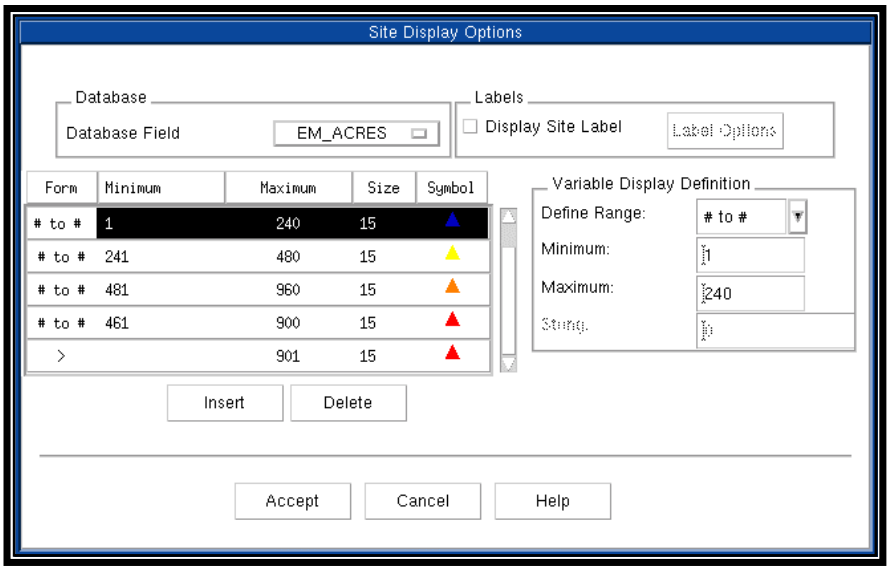


Figure 8-5. *Site Display Options* dialog box.

1. ***Database***: The "Database" section in the upper left corner of the dialog box lists all database fields within the file. Choose the field you want by clicking on the choice button to the right of "Database Field" (the current database field being used is shown in the dialog box). This field contains the data used to determine the shape, color, and size of the site symbol for that SiteData point.

2. ***Labels***: The "Labels" section in the upper right corner of the dialog box provides the option of displaying labels next to each site symbol. Click on ***Display Site Label*** (the square toggle button to the left appears indented) and the ***Label Options*** push button to the right becomes active. Clicking on ***Label Options*** brings up a *Site Label Options* dialog box that has three tabs: *Font*, *Label Source*, and *Orientation*. [*Note: Once these three dialog boxes are edited, click on* ***Accept*** *or* ***Cancel*** *to return to the Site Display Options dialog box.*]
   a. ***Font***: Use this dialog box to choose the site label font style (bold or normal), size, and color.

   b. ***Label Source***: Use this dialog box to specify the database field that contains the numbers you want displayed next to the site in a label. Click once on the choice button to the right of "Database Field," then select a field from the list of all available database fields. [*Note: The database field chosen may be different from that used to*

determine the site symbol.]

c. ***Orientation***: Use this dialog box to specify where the site label is printed (its orientation) with respect to the site symbol on the map. Select a site label orientation by clicking on one of the eight buttons arranged in a square on the left side of the dialog box. You can also specify how far the site label is offset from the site symbol by selecting a distance (in pixels) just to the right of "Site Symbol Offset."

The middle of the *Site Display Options* dialog box contains two sections: the area on the left lists all unique site symbols and their attributes, and the area on the right below "Variable Display Definition" is where you define the parameters for the site symbols listed.

User Tip: Fixed and Variable Site Display

Display of site data may be "fixed," i.e., a single symbol shape, color, and size is used to indicate the location of each record in the SiteData file on the map. This is the default mode when a SiteData file is displayed for the first time. If you want the color, shape, or size of the symbols to vary based on the content of the database, you must first select the database field you want. Clicking on ***Insert*** then changes site display to the variable mode. Note that any database records that do not meet the criteria in the variable site data specifications are displayed in the original shape, color, and size specified in the "fixed" mode. To make changes to the "fixed" (default) display of SiteData files, choose ***Default*** under the *"Variable Display Definition"* section **/ *Define Range*** option of the *Site Display Options* dialog box (described on page 8-9).

3. ***SiteData Symbols***: Each site symbol is listed on its own line. To change the site symbol size or style (illustrated below "Symbol"), click on the numbers in the line just below the "Size" and "Symbol" headers. Clicking in either place brings up the same dialog box (*Site Symbol Selection*, Fig. 8-6): choose the symbol style (click on the symbol illustration you want), color (click on the choice button to the right of the color bar and select a color), and size (in pixels, feet, or meters). Click on ***Accept*** to accept the edits or ***Cancel*** to remove the *Site Symbol Selection* dialog box with no changes.

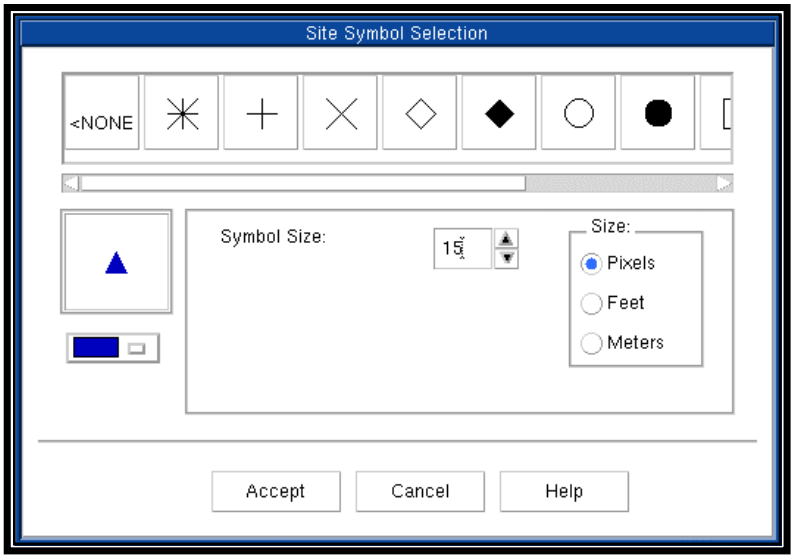


Figure 8-6. *Site Symbol Selection* dialog box.

Each unique site symbol represents a range of the data in the database field being used. The first three columns of each site symbol line ("Form," "Minimum," and "Maximum") refer to relational parameters that define what data are represented by that site symbol. For example, a site symbol may be defined as a solid red triangle that represents all pheromone trapping sites that have greater than 50 male moths per trap. The site symbol line (reading from left to right) would have a greater than (>) symbol under "Form," no value under "Minimum," a value of 50 under "Maximum," and a solid red triangle indicated.

Site symbol lines are selected by clicking on the line. Site symbol lines can be added or subtracted by clicking on ***Insert*** and ***Delete***, respectively.

4. ***Variable Display Definition***: This section is used to edit the parameters of either a newly inserted or existing site symbol. "Define Range" lists the relational parameters you can use to define a site symbol (click once on the choice box to the right of "Define Range" to produce a list). [*Note: Other boxes below "Define Range" are activated depending on which parameter is selected*.] Relational parameters include:

a. ***# to #*** : This specifies a range of values between two numbers (i.e., from 10 to 20); if this is chosen, the "Minimum" and "Maximum" boxes below are activated for entering the two numbers that define the range.

b. >= : This means greater than or equal to; if this is chosen, the box immediately below changes to "Grter-Equal" for entering the appropriate value.

c. <= : This means less than or equal to; if this is chosen, the box immediately below changes to "Less-Equal" for entering the appropriate value.

d. > : This means greater than; if this is chosen, the box immediately below changes to "Greater" for entering the appropriate value.

e. < : This means less than; if this is chosen, the box immediately below changes to "Less" for entering the appropriate value.

f. = : This means equal; if this is chosen, the box immediately below changes to "Equal" for entering the appropriate value.

g. ***Chr.eq.***: This means character equal; if this is chosen, the "String" box at the bottom becomes activated for you to type in the appropriate character string.

h. ***Chr.ne***: This means character not equal; if this is chosen, the "String" box at the bottom becomes activated for you to type in the appropriate character string.

i. ***Default***: Use this option to set a default [site symbol] shape, color, and size for any data value that is not covered by other definitions.

Clicking on a site symbol line's "Minimum" or "Maximum" value changes the "Variable Display Definition" boxes to the current setting of the site symbol parameters. After making any additions, deletions, and edits to this box, click on ***Accept*** to accept the option edits or click on ***Cancel*** to cancel the option edits. You are now back to the *SiteData File Choice* dialog box and can click on ***Done*** to complete the selection of a SiteData map layer.

E. ***Map Scale***

You can add a map scale by clicking on ***Scale*** in the upper left corner and selecting a color for display. The unit of measurement used for the scale (English or metric) is the same as what you specified in the ***Edit*** menu ***/ Administrative Profile*** option / ***User Profile*** option / ***Default Unit of Measure*** option described on page 7-39.

F. ***Map Grid***

You can overlay a grid of lines on the working map by clicking on ***Grid***. ***Grid*** options include grid line color (click on the choice box to the right of the color bar for color choices), placement (either the edge of the map or as specified by UTM Northing and Easting coordinates), and grid size (in meters).

G. ***Image Backdrop***

Click on ***Image Backdrop*** to add a 7.5-minute quadrangle topographic map or other image backdrop in the background of the GypsES Work Window. A *Select Image Type* dialog box appears (Fig. 8-7); select the backdrop you want and click on ***Done*** to exit this dialog box.

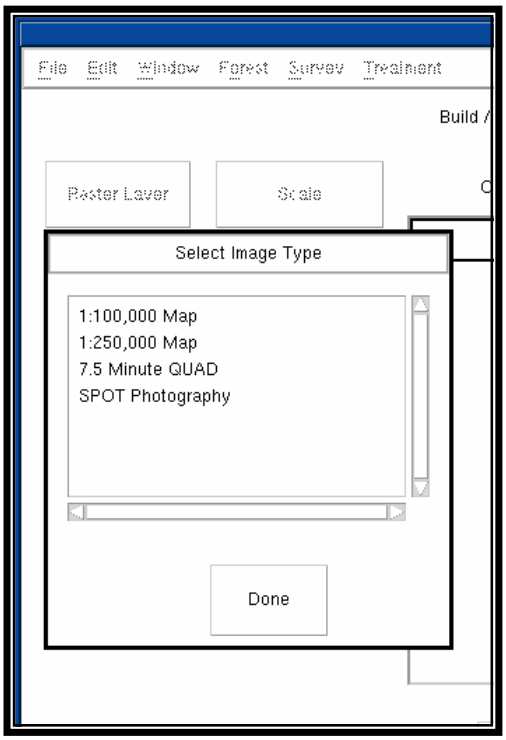


Figure 8-7. *Select Image Type* dialog box within the *Build / Update Map* dialog box.

Once all map layers and components are selected, click on ***Accept*** to re-draw the GypsES screen with the updated map, click on ***Reset*** to cancel the current edits, or click on ***Cancel*** to cancel the ***Draw / Update Map*** function.

IV. ***Change View***

Pull Down Menu:

- Set Mask (8-11)
- Full View (8-11)
- Zoom In (8-11)
- Zoom Out (8-12)
- Recall View (8-12)
- Change Resolution (8-12)

A. ***Set Mask***

A special kind of data layer, called a Mask, can be used as a "cookie cutter" to display only a selected portion of a location while "hiding" the rest of the map layer. This function applies only to Raster layers. When you have a Mask activated, not only is the selected portion of the map the only portion displayed, it is also the only portion used to perform calculations. This can be useful if, for example, you select a forest cover Mask in combination with a rasterized spray block layer; you can then generate a raster area report of acreage that is both forested and sprayed.

Once you click on ***Set Mask***, a *Select Raster file for Mask* dialog box appears. Click on a Raster file to use as a Mask; its filename is highlighted as well as appears under the "SELECTED" heading below. To remove a selected Mask, click on ***Clear*** and the filename is removed from the selection list. Click on ***Accept*** to accept the Mask file selection or ***Cancel*** to cancel the selection process.

B. ***Full View***

This option displays the map layer using the default View for the current location.

C. ***Zoom In***

Use this option to focus in on a particular section of the current View. Click once to establish a corner, release the mouse button, then stretch the box in any direction by moving the mouse pointer to the opposite corner to define the rectangle that represents the new View. When you click a second time, GypsES prompts you to accept or cancel the new View. If the new View is accepted, the current map is redrawn showing the area selected.

D. ***Zoom Out***

Use this option to "zoom out" to view a larger area of the current map layer. You see a blank screen representing the default View with a colored rectangle representing the current View. Click the first corner of the new View rectangle, then release the mouse button and drag the mouse pointer to the opposite corner of the new View. Click a second time; if this is the new geographic View you want, click on ***Yes***. [*Note: When zooming either in or out, GypsES prompts for confirmation that you want to change the View. In addition, GypsES asks you if the other three Work Windows should be changed with respect to the View. This feature gives you the same exact view in all four Work Windows.*]

E. ***Recall View***

Use this option to select a View that has previously been saved. Clicking on this option brings up a *Select View* dialog box to select a saved View file. Click on the View file you want, then click on ***Accept*** for GypsES to draw this View on the screen.

F. ***Change Resolution***

There are two types of resolution: Raster File Resolution and Viewing (Screen) Resolution. Raster File Resolution refers to the resolution of the Raster map layer as it is created (the dimension of each cell that represents a square on the Earth's surface) and is expressed in meters; it can never be smaller than what it was at the time of creation. Viewing (Screen) Resolution refers to the resolution of the map layer that is displayed on the screen and is also expressed in meters. It can be larger or smaller than the Raster File Resolution. Click on ***Change Resolution*** to specify the Viewing (Screen) Resolution value in meters. This comes into play when you convert a Vector map layer into a Raster map layer. When a new Raster layer is created by calculations in the GypsES system, the resolution of the resulting new layer is the same as the viewing resolution of the current layer. If the resolution is relatively large, newly created Raster layers look "boxy." If the resolution is very small, the look of the Raster layer is "smoother," but it also takes longer to create and draw a new layer since a larger number of cells must be processed in calculations.

V. ***Clear Window***

This function works in either the full-screen or tiled Work Windows mode. Selecting this option clears all map layers from the Work Window.

VI. ***Redraw Window***

This function redraws the GypsES screen.

The Forest Menu

This menu helps you predict damage following gypsy moth defoliation and calculate a hazard rating for forest stands in the path of gypsy moth.
Pull Down Menu:

- Hazard (9-1)

I. ***Hazard***

Use the ***Hazard*** option to define and calculate variables that GypsES uses to create a series of Raster map layers; a **Hazard Rating** layer for the location is then calculated using these variable layers. Variables used to calculate Hazard include tree species composition, forest vigor and health, and past forest disturbance history. These and other variables are used with user-defined management objectives to help identify where forest conditions occur that are conducive to extensive gypsy moth damage (and therefore may potentially require treatment). The Hazard Rating layer GypsES creates is used within the ***Survey/Suppression*** and ***Treatment*** menu options. To assure the most accurate Hazard Rating layer, all data values that you have should be assigned to the appropriate input layers for variable calculation; the more "real world" data you have, the more accurate the resulting Hazard Rating layer is. Hazard Rating layer variables include:

- Species Susceptibility (9-2)
- Stand Age (9-3)
- Susceptibility (9-3)
- Defoliation (9-4)
- Drought (9-5)
- Silviculture (9-5)
- Other Disturbance (9-6)
- Disturbance History (9-6)
- Site Factors (9-7)
- Stocking (9-7)
- Stand Condition (9-8)
- Vulnerability (9-8)
- Management Objectives (9-9)
- Hazard Rating (9-9)
- Risk (9-10)

Up to three functions are listed by clicking on the (>) to the right of each menu option; what

functions are listed changes depending on the nature of the map layer (i.e., whether it has been previously linked to a data file or previously calculated). These functions include ***View***, ***(Change) Link***, and ***(Re-)Calc***.

- ***View***: Use this option to view (look at) the map layer of interest. If a map layer is already drawn in the current GypsES Work Window, GypsES alerts you that this is the case; click on ***Replace*** to replace the current map or click on ***Cancel*** to retain the current map in the Work Window.

- ***(Change) Link***: Use this option to set, change, or view a link between a data file and the map layer of interest. Selecting ***(Change) Link*** produces a dialog box (*Set Link for [map layer name]*). What menu options appear at this point depends on whether a data file is already linked to the map layer. If a data file *is* already linked to the map, ***Change Link*** appears as a menu option and the file type and file selected for linking are displayed on the linking dialog box. You can change the linked data file by clicking on the box that has the filename on it to reach a listing of other data files available within GypsES for linking to that map layer. Click on ***Accept*** to set the link and click on ***Cancel*** to end the linking function. If a data file *is not* linked, the submenu reads ***Link*** only; the same linking dialog box described earlier in this paragraph can be used to establish a link.

- ***(Re-)Calc***: There are two types of layers within the ***Hazard*** function: (1) *input layers* (those layers that are supplied by you and can't be calculated), and (2) *calculated layers* (those layers that GypsES calculates using rule-based logic when combining input layers). Selecting the ***Calc*** option calculates a given map layer within ***Hazard***; if that layer has never been calculated for that location, only ***Calc*** appears in the submenu. If a given layer has been calculated before, then ***Re-Calc*** appears to allow you to re-calculate the map layer; this would be chosen if the map layers that made up the calculated layer contained new or different data.

A. ***Species Susceptibility***

The Species Susceptibility layer is the layer that depicts forest cover types (unique combinations of tree species). Some tree species are more *susceptible* (likely to be defoliated) than others; this map layer reflects feeding preferences by the gypsy moth based on what tree species are present in the forest. To use species susceptibility, you must create a forest cover type map. This can be done from previously identified and mapped forest types.

B. ***Stand Age***

Stand Age is defined as the year a stand was established. GypsES expects each stand to have

an establishment year. An algorithm (set of rules) within the system uses the establishment years to create the following Stand Age categories:

- No Data
- Less Than 5 Years
- 5 to 20 Years
- 21 to 40 Years
- Greater Than 40 Years

Younger stands are believed to be the least susceptible to gypsy moth defoliation. This could be due to inadequate structural features for gypsy moth shelter. Stands above the age of 40 are susceptible to gypsy moth defoliation but it is not yet known at what point between the ages of 20 and 40 years a forest stand makes the transition from resistant to susceptible (Gottschalk 1988).

C. ***Susceptibility***

The Susceptibility layer depicts the likelihood that a stand will be defoliated (Gottschalk 1986). It is derived from both the Species Susceptibility and Stand Age layers. Figure 9-1 illustrates a sample susceptibility map layer. Susceptibility layer categories include:

- No Data
- Very Low
- Low
- Moderate
- High
- Very High

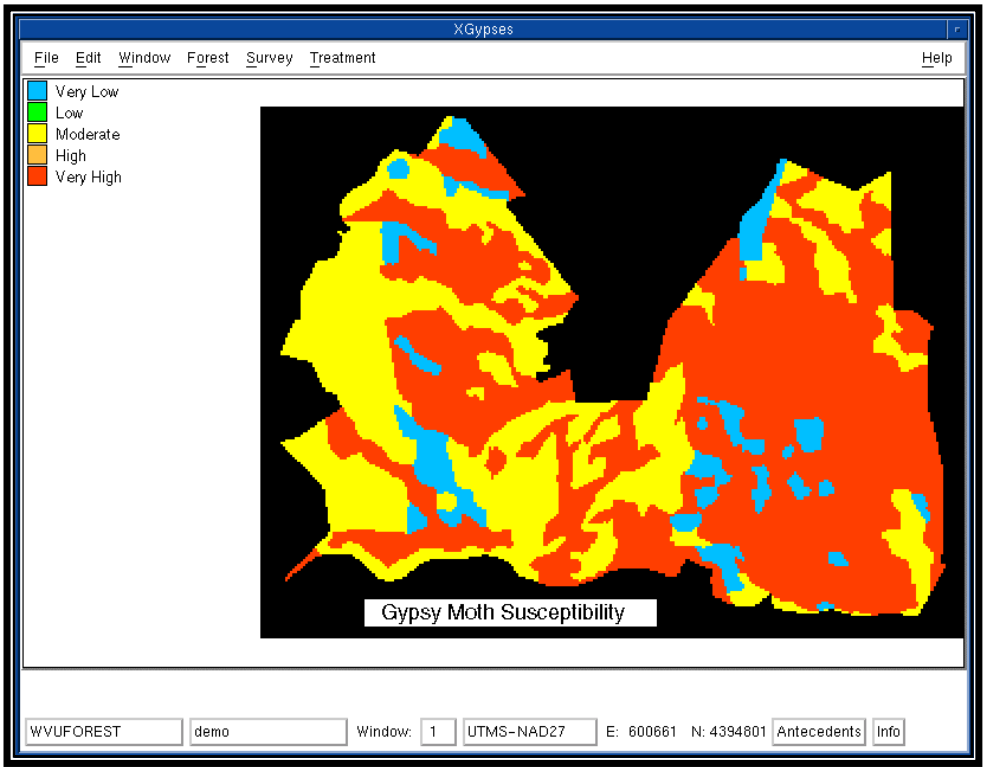


Figure 9-1. Sample *Susceptibility* map layer.

D. ***Defoliation*** Year 0 (yyyy)
Year 1 (yyyy)
Year 2 (yyyy)
Year 3 (yyyy)
Year 4 (yyyy)

Use this option to work with defoliation layers for the past 5 years. The *vulnerability* (the likelihood that mortality will occur given that defoliation has occurred) of a stand varies with the defoliation history of the stand. Defoliation of greater intensity or frequency results in higher vulnerability of the trees (Gottschalk 1986) as well as higher mortality of dominant and co-dominant trees. Defoliation stress can cause decline and dieback in an otherwise healthy tree (Houston 1981). After defoliation, there may be complete or partial recovery. Repeated defoliation (2 to 3 years in succession) causes increasing degrees of stress.

A stand's vulnerability can be decreased if defoliation events subside. In terms of growth, it takes about three (3) years for a stand to recover from a single year of defoliation (Twery 1991). Trees can recover from defoliation if other stress-related incidents are minimal and the trees are not subjected to secondary organisms (Houston 1981).

Insect defoliation alone may not be enough to kill a tree, but it predisposes trees to secondary organisms that can be fatal. Among others, *Armillaria* (shoestring root rot) and the two-lined chestnut borer (*Agrilus bilineatus*) are associated with weakened trees caused by gypsy moth defoliation. Although either of these organisms can exist within the tree prior to defoliation, their survival and growth is enhanced by the chemical and physical changes that occur after defoliation (Wargo 1981).

E. ***Drought*** Year 0 (yyyy)
Year 1 (yyyy)
Year 2 (yyyy)

Drought layers depict annual precipitation by stand. Drought layer categories include:

- No Data
- None
- Moderate
- Severe

Drought increases vulnerability by increasing the degree of tree stress (Gottschalk 1986). Severe drought by itself can cause or contribute to tree mortality (Tryon and True 1958). Drought and other adverse environmental conditions predispose trees to attack by secondary organisms (Hursh and Haasis 1931).

F. ***Silviculture***

The Silviculture layer represents any forestry activity that modifies existing forest conditions (thinnings, clear cuts, spraying, etc.). Each stand should be categorized by the year of its most recent silvicultural treatment event. GypsES then processes the stands and produces the following categories:

- No Data
- Treatment Within the Past Five (5) Years
- No Treatment Within the Past Five (5) Years

Silvicultural treatments, such as thinning and salvage operations, can increase vulnerability. Broken limbs, soil compaction, and bark destruction to residual trees caused by logging or other treatments can be a source of tree stress (Gottschalk 1986). Although silvicultural treatments increase stress, they may be important in controlling gypsy moth populations. Herrick (1982) summarized two objectives of silvicultural treatment:

- To modify the behavior and survival of gypsy moth larvae while increasing the effectiveness of their natural enemies.

- To create forest stands that are less vulnerable to mortality after defoliation.

G. ***Other Disturbance*** Year 0 (yyyy)
Year 1 (yyyy)
Year 2 (yyyy)
Year 3 (yyyy)
Year 4 (yyyy)

The Other Disturbance layers contain information about the occurrence of such events as ice storms, windstorms, and floods that may result in increased tree stress. There are separate layers for the past five (5) years. Other Disturbance categories include:

- No Data
- Undisturbed
- Disturbed

Other disturbances, such as ice and windstorms and flooding, cause increased stress and thus increased vulnerability to attack by secondary organisms (Manion 1981). Any such stress can cause dieback of trees, depletion of root starch, and production of small, off-colored leaves (Houston 1981). Because succession tends to create less susceptible stands, disturbances may set back succession, creating more susceptible stands (Gottschalk 1986).

H. ***Disturbance History***

The Disturbance History layer represents all events that could have caused a change in stand vulnerability (i.e., defoliation, drought, silviculture, flooding, ice storms and windstorms, etc.). Disturbance History categories include:

- No Data
- Low

- Moderate
- High
- Very High

The Disturbance History layer is calculated by GypsES using the past three (3) years of Drought History, the past five (5) years of Silvicultural activity, the past five (5) years of Defoliation History, and the past five (5) years of Other Disturbances. Defoliation History is the most important element of the Disturbance History calculation. The Disturbance History layer helps to determine the amount of pre-existing stress within a stand.

I. ***Site Factors***

The Site Factors layer depicts soil types by drainage class. Site Factors categories include:

- No Data
- Dry
- Good
- Wet

Site factors affect vulnerability by influencing the amount of stress. Dry ridges or sandy sites tend to produce susceptible forests of slow growing, scrubby oaks that, due to less than optimal conditions, contain a greater degree of structural features for gypsy moth life stages (Houston 1981, Montgomery 1991). In contrast, mesic sites tend to be relatively undisturbed areas that produce resistant stands with few structural features. The percentage of defoliation on ridge tops is 17 times greater than on mesic sites (Jones 1991). Although this seems to indicate that vulnerability would increase on adverse sites, studies reveal otherwise. Although susceptibility is higher on dry ridges, vulnerability tends to be higher in wet stands and on mesic slopes. This may be an indication of hardy survivors of extreme conditions on poor sites (Houston 1981).

J. ***Stocking***

The Stocking layer represents basal area and number of trees per acre. Stocking layer categories include:

- No Data
- Good (Less than 80 Percent Stocked)
- Fair (81 to 99 Percent Stocked)
- Poor (Greater than 99 Percent Stocked)

Pre-existing stand conditions are directly related to stand vulnerability. The purpose of the stocking map (which indicates a measure of stand density) is to determine the level of stress contributed by the condition of the stand prior to defoliation. If stocking is high (= Poor) and therefore the trees are more stressed because they have less growing space and other resources for growth and survival, stand vulnerability will be higher.

K. ***Stand Condition***

Stand condition refers to tree crown condition (vigor). If this layer is not available, GypsES assumes good crown condition.

L. ***Vulnerability***

The Vulnerability layer represents the probable degree of mortality given that defoliation has occurred (Gottschalk 1986, Mason and Gottschalk 1986). Figure 9-2 illustrates a sample Vulnerability map layer.

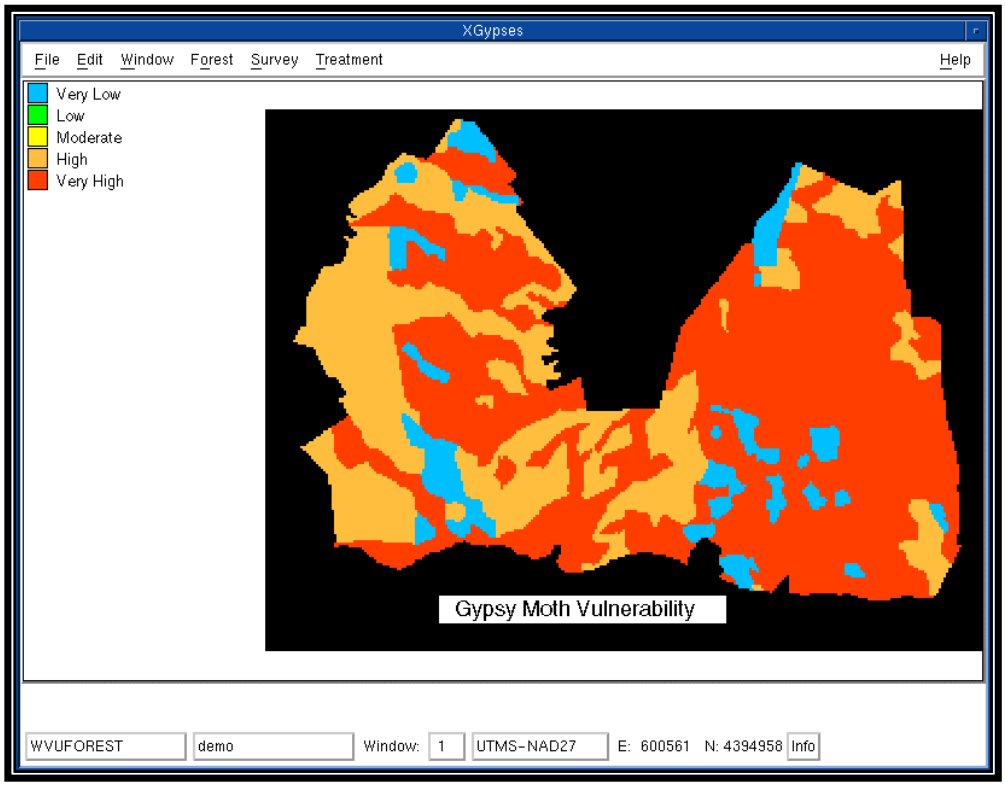


Figure 9-2. Sample *Vulnerability* map layer.

Vulnerability layer categories include:

- No Data
- Very Low
- Low
- Moderate
- High
- Very High

The Vulnerability layer is derived from the Susceptibility, Disturbance History, Site Factors, Stand Condition, and Stocking layers. The level of stress that a tree is subjected to is directly related to its level of vulnerability. Vulnerability can be affected by a number of variables, including drought, silvicultural activities and other disturbances, defoliation history, stocking, site factors, and susceptibility. Attack by secondary organisms (i.e., two-lined chestnut borer or *Armillaria*) may also increase vulnerability.

M. ***Management Objectives***

The Management Objectives layer represents the purposes for which an area is being managed. The categories in this map layer are defined by the resource manager using the land use codes and treatment objectives defined in the *Management Objectives* dialog box (see the ***Edit*** menu / ***Administrative Profile*** option / ***Management Objectives*** option described on page 7-43). Management objectives are weighted by priority in terms of treatment. Certain areas, such as residential or recreational areas, may have a greater need for treatment while other areas may be perceived as having less of a need.

N. ***Hazard Rating***

The Hazard Rating layer identifies gypsy moth hazards that exist when forest conditions prevail that are conducive to extensive damage from gypsy moth (Hicks 1991). The Hazard layer is calculated from the combination of the Management Objectives and Vulnerability layers. Hazard Rating layer categories include:

- No Data
- Very Low
- Low
- Moderate
- High
- Very High

The Hazard Rating system is designed to predict where gypsy moth infestations are likely to occur and the degree of potential damage. Hazard rating is based on the suitability of forest conditions as habitat for gypsy moth and is related to tree health and the purposes for which the trees are being managed.

O. ***Risk***

Combining the Hazard Rating layer with gypsy moth defoliation prediction derives the Risk layer; in essence, Risk adds a time factor for damage to a forest stand. If defoliation is imminent, then the Risk to a given area identified as high in the Hazard Rating layer is subsequently high. Risk layer categories include:

- No Data
- Very Low
- Low
- Moderate
- High
- Very High

When a map layer is drawn that has been created by combining one or more other layers (antecedents) using the ***Hazard*** option, an ***Antecedents*** push button appears on the bottom of the GypsES main screen just to the right of the geographic coordinate display. If you click on this box, GypsES prompts you to click on the map layer for antecedent information at that point and to click the right mouse button to quit the ***Antecedents*** function. Clicking on any part of the map layer brings up a dialog box (*Antecedent Display*) (Fig. 9-3) that breaks out all map layer values associated with the clicked point. For example, while looking at a Vulnerability layer, clicking on a point brings up a list of point values and color coded boxes related to each of the four map layers that comprise the Vulnerability layer: Disturbance History, Susceptibility, Stand Conditions, and Site Factors. Click on ***Show Another Antecedent*** to choose another set of antecedent values to view or click on ***Quit*** to end the antecedent display.

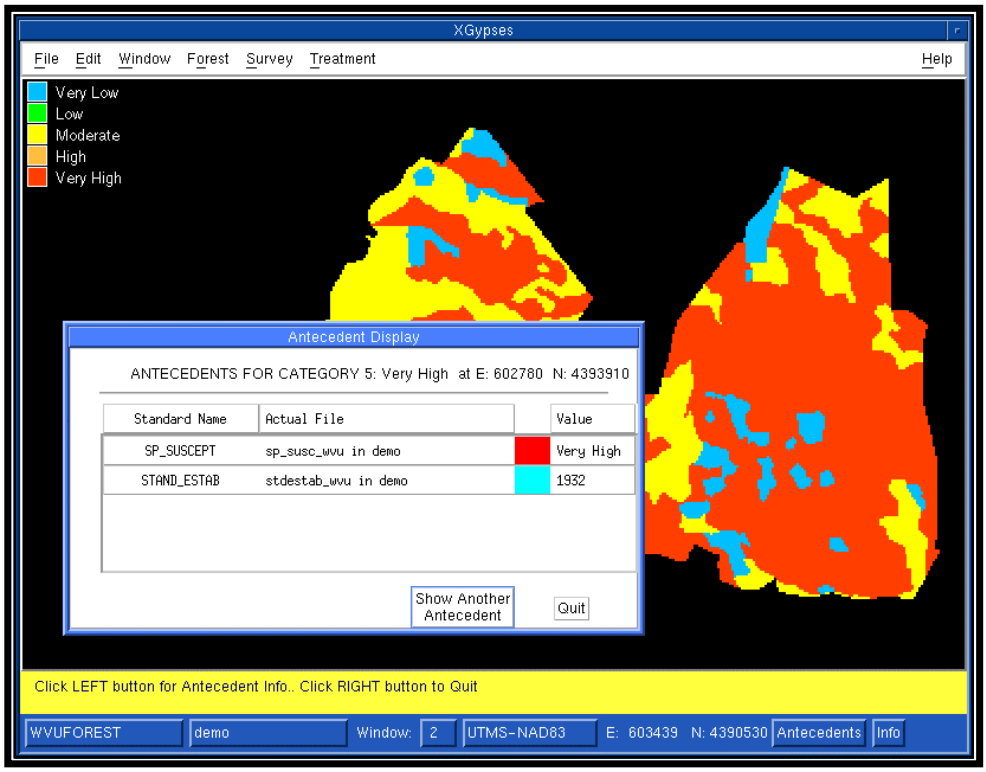


Figure 9-3. Sample *Antecedents* dialog box.

The Survey Menu

This menu aids you in the planning and data management of egg mass surveys ***(Suppression***), pheromone trapping (***Eradication***).
Pull Down Menu:

- Suppression (10-1)
- Eradication (10-3)

I. ***Suppression***

This option is designed for use in areas of high gypsy moth populations where defoliation prevention is a significant management objective. You can record and/or edit egg mass survey data and predict defoliation from that data.

Pull Down Menu:

- Egg Mass Survey Sites (This Year) (10-1)
- Defoliation Prediction (10-2)

A. ***Egg Mass Survey Sites (This Year)***

Use this option to view and/or edit egg mass survey data.

Pull Down Menu (variable):

If a datafile is linked: Change Link (10-1)
MapEdit (10-1)
Database Edit (10-1)
View (10-1)

If no datafile is linked: Link (10-2)

1. ***Change Link***: Use this option to change the linked file.

2. ***MapEdit***: If a datafile is linked to the Standard Name EM_SVSITES_YR0, GypsES automatically brings up the linked file within ***MapEdit*** if this option is chosen.

3. ***Database Edit***: If a datafile is linked to the Standard Name EM_SVSITES_YR0, GypsES automatically brings up the linked file within ***Database Edit*** if this option is chosen.

4. ***View***: The ***View*** option displays the linked file on the screen.

5. ***Link***: If no file is linked, you are prompted to choose a datafile for linking. A *Choose Egg Mass Data File* dialog box appears. Select the appropriate mapset on the left side of the dialog box under "Select Mapset" and select a file from the list on the right under "Select File." Click on ***Accept*** to close the dialog box, on ***Clear*** to clear the selection, or

on ***Cancel*** to end the egg mass data file selection process.

If the data is not in a file yet, first enter the data using the ***Edit*** menu ***/ Database*** option ***/ Create New or Modify Existing Data File*** option of GypsES. Then link this datafile to the Standard Name EM_SVSITES_YR0 (see the ***Edit*** menu ***/ Standard Name Linkages*** option description on page 7-38 for more information). Then edit the data in the ***Survey*** menu. If the database file selected contains no data, GypsES asks you if you want to add a data record. Clicking on ***Ok*** moves you into the database-editing environment (the *DataBase* dialog box appears). See the ***Edit*** menu ***/ Database*** option / ***Edit/View Data File*** option description on page 7-24 for information on how to work within the *DataBase* dialog box.

B. ***Defoliation Prediction***
Pull Down Menu:
- Egg Mass Surface (10-2)
- Defoliation Prediction (10-3)

User Tip: "What is a surface?"

In many cases, pest management involves sampling (pheromone traps, egg mass counts, etc.). Where a systematic sampling layout has been used over an area, this information can be used to make assumptions about the entire area. The conversion of point data (site data) to a Raster layer is called surface generation, and the Raster layer is called a surface. The raster cells that coincide with the sample points are assigned the values of the actual samples. The values of those raster cells that fall between sample points are estimated using a least squares interpolation method using all sample points surrounding them. Once a Raster surface layer has been generated, it can be used in conjunction with models (such as Defoliation Prediction) or rule bases (such as Risk).

1. ***Egg Mass Surface***
Pull Down Menu:
   - Re-Calc (10-3)
   - View (10-3)

   This option produces a Raster layer of egg mass values from SiteData map layer points.
   a. ***Re-Calc:*** This option re-calculates the Raster layer when egg mass values are changed (i.e., the linked database file changes). When you choose ***Re-Calc***, you are prompted to select the database field that represents egg mass counts per acre in the SiteData file currently linked as the Egg Mass Survey Sites (This Year).

b. ***View***: This option displays the egg mass Raster surface layer in the Work Window.

2. ***Defoliation Prediction***: This option produces a map layer of predicted defoliation based on egg mass counts using models developed by USDA Forest Service researchers David Gansner and Michael Montgomery. (See the ***Edit*** menu **/** ***Administrative Profile*** option **/** ***User Profile*** option / *Pest* dialog box description on page 7-42 for information about selecting a defoliation prediction model).
   Pull Down Menu:
   - Re-Calc (10-3)
   - View (10-3)

   a. ***Re-Calc***: This option re-calculates the defoliation prediction map layer with new egg mass survey data.

   b. ***View***: This option displays the defoliation prediction map layer in the current Work Window. [*Note: You must have generated the egg mass surface layer.*]

II. ***Eradication***

This option is designed for use in areas outside of the gypsy moth generally infested area where management goals include detection using pheromone traps and eradication.
Pull Down Menu:
- Create Trap Placement (10-3)
- Edit Trap Placement (10-5)
- Edit Trap Database (10-13)
- Last Year's (-1) Trap Data (10-21)

A. ***Create Trap Placement***

Use this option to create an eradication database (pheromone trapping) file for the current output mapset. This is a fixed database within GypsES with a Standard Name of TRAP_SITE_DATA. This file can *not* be edited within either the ***Edit*** menu **/** ***MapEdit*** option or the ***Edit*** menu **/** ***Database*** option; it can only be altered within the ***Survey*** menu **/** ***Eradication*** option **/** ***Edit Trap Placement*** option or ***Trap Database Display/Update*** option.

Pull Down Menu:
- Generate From Imported Database (10-4)
- Define Using Placement Edit (10-5)

1. ***Generate From Imported Database***: Use this option to create an eradication database file from an imported database (*.dbf) file by linking the imported file fields to those in a

standard eradication database file. At a minimum, the trap ID, UTM Easting, and UTM Northing fields must be available in the imported database file. In addition, the following information can be extracted from the imported database: the date the trap was set or a count was taken, the initials of the person setting the trap or taking the count, or the trap moth count. You can also assign default values to data fields for dates and trappers' initials by clicking on the appropriate text entry window and typing. To assign a default value for the trap type data field, click on the choice button to the right of "Trap Type" and choose either ***Delta*** or ***Milk Carton***.

Choosing this option brings up an *Import Trap Data From Database* dialog box (Fig. 10-1). The imported data file must first be selected by clicking on the box to the right of "Data File for Import." A new dialog box (*Choose Database file for Trap Import*) appears; select the appropriate mapset on the left under "Select Mapset" and filename on the right under "Select File." Click on ***Accept*** to finalize the selection, on ***Clear*** to clear the selection, or on ***Cancel*** to end the file selection process.
Once a file is selected, you need to link imported database fields to the new eradication file fields, generally listed on the left side of the dialog box. Click on the choice button to the right of the box beside each field to produce a list of all available fields within the *imported* database file. Click on the field you want to link it to the new file field. Click on ***Accept*** once the data field links are complete or on ***Cancel*** to cancel this function.

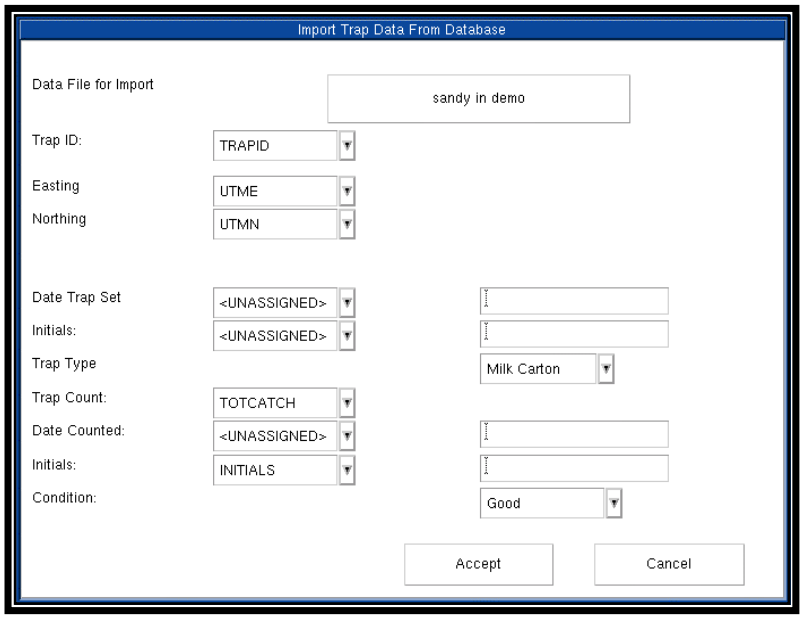


Figure 10-1. *Import Trap Data From Database* dialog box.

2. ***Define Using Placement Edit***: If you choose this option, GypsES first checks to see if an eradication database file has already been established (the Standard Name is TRAP_SITE_DATA). If one exists, GypsES then asks if the new information should be merged or if a new file should replace the current file. If no eradication database file has been established, GypsES prompts you for a filename, then displays the message TRAP_SITE_DATA linked to [filename]; Invoking Trap SiteData Edit with an empty trap file. This option invokes the "Trap Placement Edit" palette of functions.

B. ***Edit Trap Placement***

Use this option to either replace or overlay the currently displayed map with Eradication site data as well as add, delete, or change trap locations. A Trap Placement palette of options appears on the left side of the screen (Fig. 10-2) and includes:

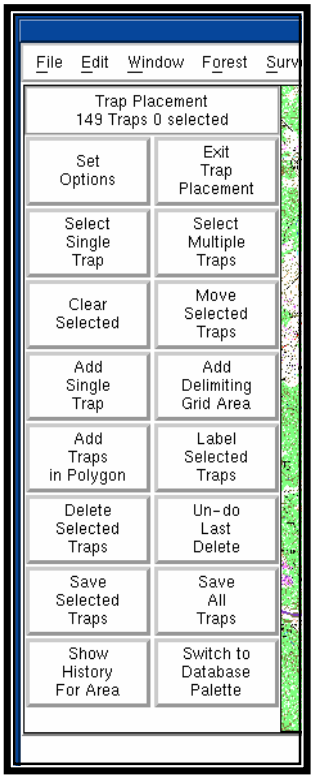


Figure 10-2. *Trap Placement* palette of functions.

- Set Options (10-6)
- Exit Trap Placement (10-7)
- Select Single Trap (10-8)

- Select Multiple Traps (10-8)
- Clear Selected (10-8)
- Move Selected Traps (10-8)
- Add Single Trap (10-8)
- Add Delimiting Grid Area (10-8)
- Add Traps in Polygon (10-11)
- Label Selected Traps (10-12)
- Delete Selected Traps (10-12)
- Un-do Last Delete (10-12)
- Save Selected Traps (10-13)
- Save All Traps (10-13)
- Show History for Area (10-13)
- Switch to Database Palette (10-13)

[*Note: A line indicating the total number of traps and the number of traps currently selected is located below the "Trap Placement" heading at the top of the functions palette.*]

1. ***Set Options***: Selecting this option brings up an *Eradication Edit Options* dialog box (Fig. 10-3) with the following options: [*Note: Once these options are defined, click on* ***Accept*** *to close the dialog box.*]

    a. ***Highlighted and Selected Traps***: Use this option to modify the display properties applied to highlighted and selected traps. Click on the box to the right labeled ***Modify Display*** to bring up the *Site Display Options* dialog box. (See the ***Selecting a SiteData Map Layer*** option under the ***Window*** menu / ***Build /Update Map*** option described on page 8-6 for more information about this dialog box).

    b. ***Trap Locations***: Use this option to modify the display properties applied to the entire eradication site data display (all trap locations). Click on the box to the right labeled ***Modify Display*** to bring up the *Site Display Options* dialog box. (See the ***Selecting a SiteData Map Layer*** option under the ***Window*** menu / ***Build /Update Map*** option described on page 8-6 for more information about this dialog box).

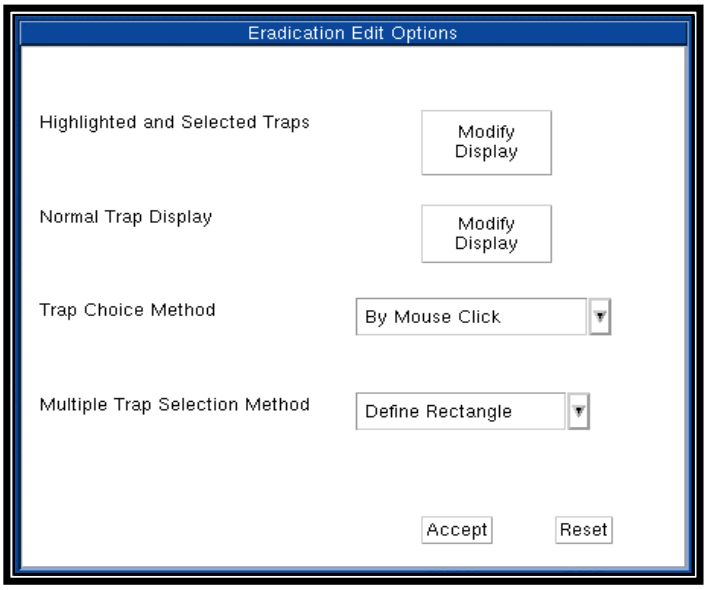


Figure 10-3. *Eradication Edit Options* dialog box.

c. ***Trap Choice Method***: There are two methods available to either select or add individual trap locations one location at a time: using a mouse click (***By Mouse Click***) or using the keyboard (***Enter Via Keyboard***). If the mouse click method is chosen, click on the trap location you want to select it; if the keyboard method is chosen, a text entry window appears for you to enter a trap ID. These two trap selection methods can also be used to select trap sites for viewing or editing database values (see the ***Trap Database Display /Update*** function within the "Trap Database Palette" described on page 10-19).

d. ***Multiple Trap Selection Method***: There are two methods available to select multiple trap locations: by defining either a rectangle (***Define Rectangle***) or a polygon (***Draw Polygon***) around the traps of interest. (See ***Select Multiple Traps*** on the following page for an explanation of both options.)

2. ***Exit Trap Placement***: This option closes the "Trap Placement" palette and returns you to the GypsES main screen Work Window. Upon exit, you are asked whether you want to save any changes made. If you respond ***Yes***, then GypsES lists the current eradication database filename, if it exists. Choose either ***Save*** to use the same filename or click on ***New Name*** to specify a new eradication database filename.

3. ***Select Single Trap***: You are prompted to use a left mouse click (or to type in a trap ID if using the keyboard selection option) to select traps one trap location at a time. A right

mouse click (or <ENTER> when no trap ID is entered) ends the selection process; all trap locations selected up to that point are highlighted as specified in the *Eradication Edit Options* dialog box.

4. ***Select Multiple Traps***: There are two modes to select multiple trap locations: by defining a rectangle or drawing a polygon around the traps of interest. If traps are being selected using a rectangle (***Define Rectangle***), GypsES prompts you for a click of the left mouse button to establish a corner, then prompts you to move the mouse to the opposite corner of the rectangle. Another left mouse click defines the rectangle and selects all traps that fall within it. If traps are being selected using a polygon (***Draw Polygon***), GypsES prompts you for left mouse button clicks to define nodes of a polygon. A right mouse click after three or more left mouse clicks closes the drawn polygon and highlights all trap locations that fall within it.

5. ***Clear Selected***: This option *de-selects* all traps currently selected.

6. ***Move Selected Traps***: To move all selected traps, GypsES first prompts you to click and hold the left mouse button down while dragging the mouse; this moves the traps as a group. A "shadow" image of all selected traps moves as the mouse moves. Releasing the left mouse button causes a message to appear asking if the move is complete. The move can be completed (click on ***Complete***), continued (***Continue***), or canceled (***Cancel***).

7. ***Add Single Trap***: This option adds single trap locations using either the mouse or keyboard modes. After selecting this option in the "mouse click" mode, you are prompted to click the left mouse button on the screen where you want the new trap. GypsES prompts you for a trap ID, then draws the new trap in the highlight color. If you are in the "keyboard" mode, GypsES prompts you to enter the UTM Easting coordinate, UTM Northing coordinate, and the trap ID. Clicking on the right mouse button stops the ***Add Single Trap*** option in either mode.

8. ***Add Delimiting Grid Area***: Use this option to add a grid of traps in the Work Window.

User Tip: "What is a delimiting grid?"

The purpose of a delimiting grid is to determine if an infestation is present and the size of the infestation. This is accomplished by laying out a systematic sampling grid of pheromone traps based on previous years' trap catch information. When no previous survey has been done, but the presence of the pest is suspected, a Detection Grid, usually involving a fairly low density of traps over a large area, can be used.

Choosing this option brings up a *Define Delimiting Grid* dialog box (Fig. 10-4):

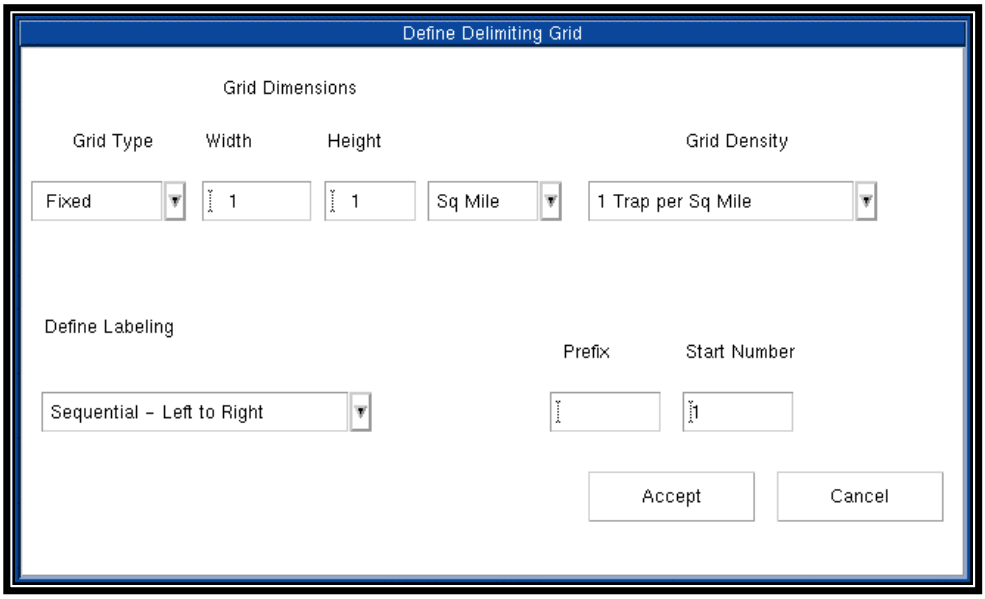


Figure 10-4. *Define Delimiting Grid* dialog box.

a. ***Grid Type***: This can be either a fixed grid (a single trap density for the entire area) or a variable grid where you specify different trap densities within a single grid definition.

b. ***Grid Dimensions (Width & Height)***: Specify a grid width and height in either square miles or square kilometers.

c. ***Grid Density***: If you chose a fixed grid type, choose a grid density by clicking on the choice button to the right under "Grid Density." A list of available densities is displayed; click to select the trap density you want. If you chose a variable grid type, the box below "Grid Density" changes to an ***Edit Variable Grid*** push button; clicking on this brings up a *Variable Grid Definition* dialog box (Fig. 10-5). [*Note: This option works only if the* ***Grid Dimensions*** *are defined at greater than 1 x 1 square mile or kilometer.*]

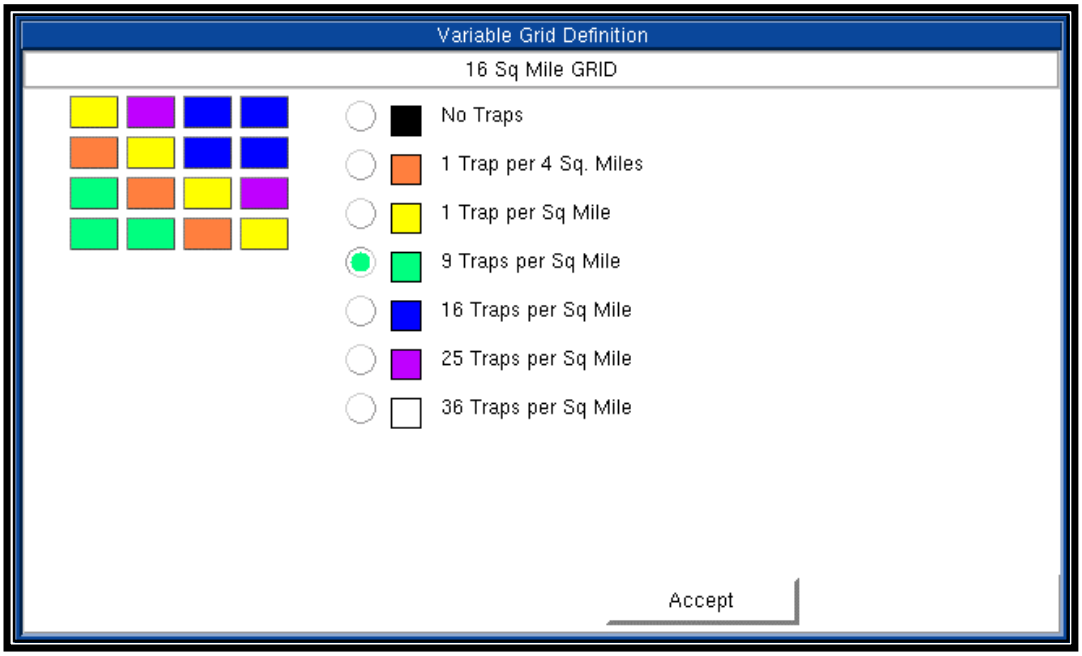


Figure 10-5. *Variable Grid Definition* dialog box.

A group of squares representing the entire grid appears in the upper left corner of the dialog box; for example, if you have chosen grid dimensions of 5 x 5, then a grid of 5 x 5 (25) squares is illustrated. To assign a grid density to a given square within the grid, first click on the density you want in the list to the right, then click on the grid square. The square is highlighted in the appropriate density color. When all grid square densities are selected, click on ***Accept*** to close the dialog box.

d. ***Define Labeling***: Once the grid is defined, you can specify the following options:

(1) ***Labeling Sequence***: This option is used to define the order used to number

(label) traps. The labeling sequence is defined in the box below "Define Labeling." Options include ***Sequential - Left to Right*** (traps are labeled from left to right), ***Sequential - Serpentine*** (traps are labeled in a serpentine (back and forth) fashion), and ***Sequential - As Selected*** (traps are labeled in the order in which they were selected).

(2) ***Label Prefix***: Use this option to specify a label prefix. Using trap label prefixes is optional, but it may make it easier for you to keep track of different blocks of trapping sites (e.g., the traps within one block can be labeled A-1, A-2, and A-3, and traps in the next block can be labeled B-1, B-2, B-3, etc.).

(3) ***Label Start[ing] Number***: Use this option to specify the starting number for labeling trap locations. *There cannot be duplicate trap ID's in the same eradication file.* If any newly defined trap label numbers are already in use, GypsES warns you that "Adding this grid would duplicate trap ID's - Please change labeling options and re-try."

When ***Accept*** is clicked, you are prompted to place the grid on the Work Window by holding the left mouse button down and moving the grid outline from the upper left corner of the Work Window to where you want it. As with the ***Move Selected Traps*** function, you are asked after releasing the left mouse button if grid placement is complete, with options to continue or cancel.

9. ***Add Traps in Polygon***: Use this option to place traps within an irregular area at a specific density. First, GypsES prompts you to define a polygon with the left mouse button. If three or more points have been specified when the right mouse button is clicked, GypsES closes the polygon and displays a dialog box (*Add Traps in Polygon: define density & Trap ID's*, Fig. 10-6).

   Sections of this dialog box include "Grid Unit" (select square miles or kilometers), "Grid Density" (select the number of traps per square unit area), and "Define Labeling" (select the label sequence type, prefix, and starting number). Clicking ***Accept*** adds traps to the Eradication database as specified. ***Cancel*** aborts the ***Add Traps in Polygon*** option.

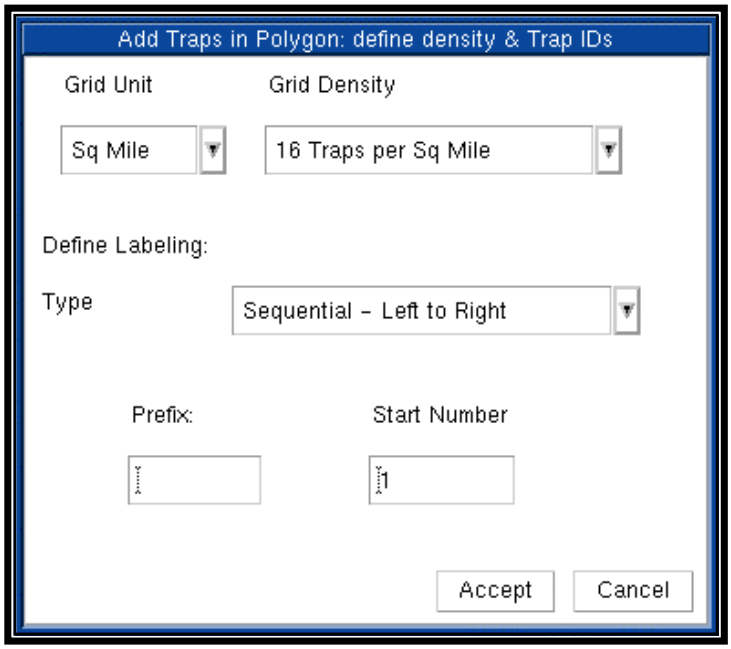


Figure 10-6. *Add Traps in Polygon: Define Density & Trap ID's* dialog box.

User Tip: Trap ID Duplication

For this and all other Add operations, if a trap ID (label) specified duplicates an existing trap's ID, an error message appears and the trap(s) will NOT be added.

10. ***Label Selected Traps***: Use this option to re-assign trap ID's using a *Trap Label Definition* dialog box. [*Note: To display the current trap ID label to see labeling changes, modify the SiteData layer within the* ***Window*** *menu /* ***Build/Update Map*** *option to display site labels; see* ***Labels*** *on page 8-6 for more information.*]

11. ***Delete Selected Traps***: This option *deletes* any selected traps.

12. ***Un-do Last Delete***: This option restores the traps last deleted in the current GypsES session.

13. ***Save Selected Traps***: This option saves currently selected traps in a database file. You are prompted to provide a filename for this file. [*Note: This is a simple SiteData file. The*

detail information associated with the Eradication database is not saved (e.g., the traps' master record and activity information.] Once you have saved the selected traps, GypsES brings up a dialog box that states "[x] selected traps copied to SiteData file [y]. Note: detail NOT copied."

14. ***Save All Traps***: This option saves all work done to that point for the entire database of traps, including all detail information. You are given the option of using the current filename (if one exists) or entering a new one. If a new name is entered, that name becomes the linked Eradication database filename.

15. ***Show History for Area***: This option displays past years' positive trap counts in different colors by year.

16. ***Switch to Database Palette***: This option toggles you to the "Trap Database" palette (see Section C below for a description of available functions).

C. ***Edit Trap Database***

Selecting this option brings up a "Trap Database" palette on the left side of the screen (Fig. 10-7). This group of functions for editing the trap database includes the following:

- Set Options (10-14)
- Exit Trap Database Edit (10-14)
- Trap Setup Entry (10-14)
- Trap Count Entry (10-15)
- Update Setup From Imported File (10-17)
- Update Count From Imported File (10-18)
- Trap Database Display/Update (10-19)
- Show History (10-20)
- Highlight No Reports (10-20)
- Highlight No Setup (10-20)
- Save Highlighted Traps (10-20)
- Save All Traps (10-21)
- Clear Highlighted (10-21)
- Switch to Edit Trap Placement (10-21)

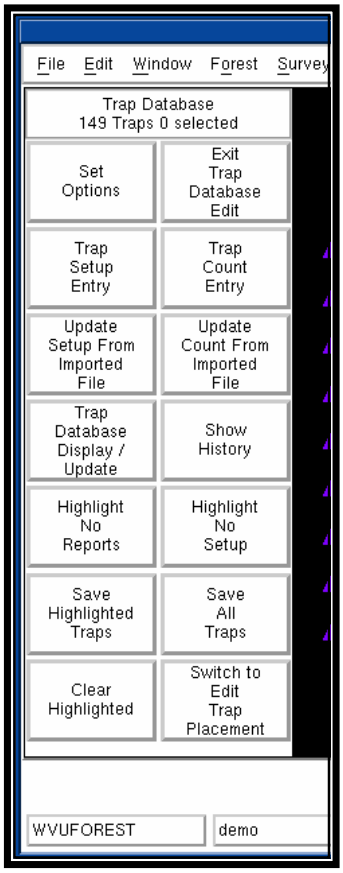


Figure 10-7. *Trap Database* palette of functions.

1. ***Set Options***: See the description for ***Set Options*** starting on page 10-6.

2. ***Exit Trap Database Edit***: See the description for ***Exit Trap Placement*** on page 10-7 (substitute Database for Placement).

3. ***Trap Setup Entry***: Clicking this push button brings up a *Trap Setup Entry* dialog box (Fig. 10-8). Use this dialog box to enter trap setup information one time (e.g., the date the trap was placed, the trap type, and the trapper's initials). Assuming these setup data do not change, you need to only enter the trap ID and press <ENTER> to bring up the same setup information for other trap locations. [*Note: If any setup data changes, just edit the appropriate values and continue to enter the trap ID information; the new setup information will appear in the database dialog box.*] A scrolling window displays the last 20 traps entered. The database records are updated immediately.

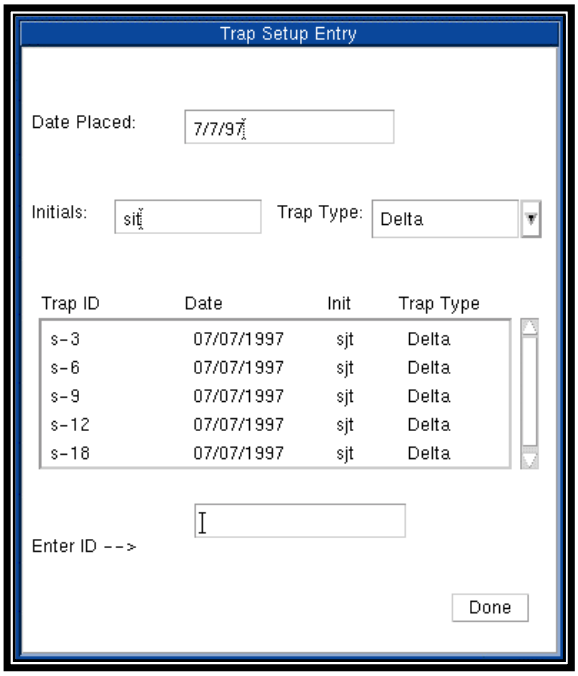


Figure 10-8. *Trap Setup Entry* dialog box.

4. ***Trap Count Entry***: Clicking this push button brings up a *Trap Count Entry* dialog box (Fig. 10-9).

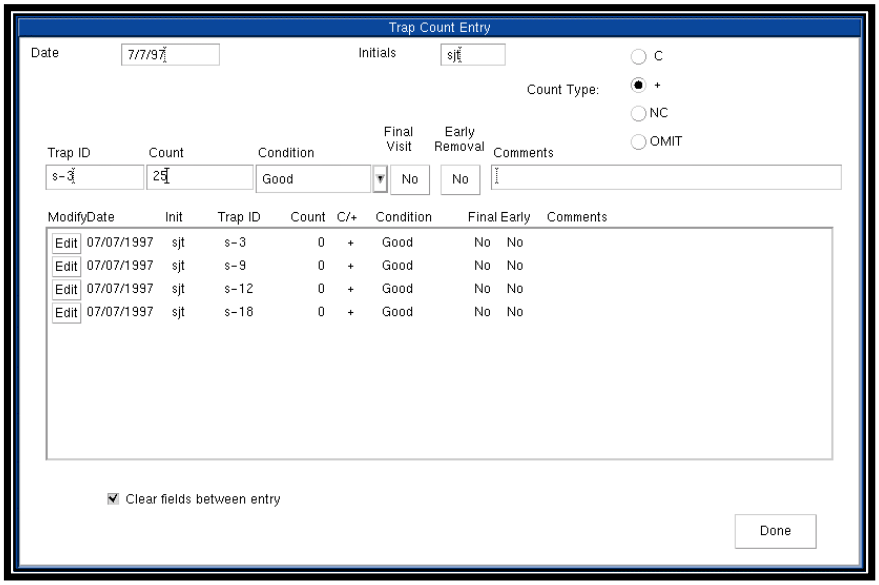


Figure 10-9. *Trap Count Entry* dialog box.

This dialog box makes it easier to enter trap count data for many traps; each trap location's data appears on its own line below the data entry fields in a scrolling window. Data entry fields include:

a. ***Trapping Date***: This is the date the trap was checked.

b. ***Initials***: These are the initials of the trapper.

c. ***Count Type***: Trap counts can be of four types, described below:

(1) **C**: This indicates that the data entry represents a *cumulative* count; any count data entries *replace* prior trap count information.

(2) **+** : This indicates that the data entry represents an *additive* count; any count data entries *increment* prior trap count information.

(3) **NC**: This indicates that the data entry is informational, and the trap does not have a report.

(4) **OMIT**: This indicates that the trap has been omitted; although the trap does not have a report, it is not flagged as a missing report.

d. ***Trap ID***: This is the trap ID number (GypsES prompts you if the trap ID is unrecognized).

e. ***Count***: This is the male moth count for that trap location.

f. ***Condition***: This is the trap condition. Enter the condition of the trap by clicking on the choice button to the right of the "Condition" box and choosing the appropriate condition; choices include ***Good***, ***Damaged***, ***On Ground***, ***Missing***, ***Inaccessible***, or ***Full of Moths***.

g. ***Final Visit***: This field indicates whether this trap check was a final visit (options include ***Yes*** or ***No***).

h. ***Early Removal***: This field indicates whether this trap was removed early (options include ***Yes*** or ***No***).

i. ***Comments***: This field is for any comments associated with the trap location.

The <TAB> keys move you from data field to data field. The <Enter> key records the whole entry; you should not press <Enter> until all fields have been entered. The last 20 trap data entries are shown in the scrolled window below. As default, GypsES does not clear the data fields between data entries. Checking the toggle button to the left of "Clear fields between entry" causes all fields on the entry line (except the date and trapper's initials) to be cleared when <ENTER> is pressed following a data entry.

You can edit a previous data entry by clicking ***Edit*** next to the entry in the scrolled window (this button appears under the title "Modify"). This brings up a *Modify Trap Catch Detail* dialog box to edit any data fields. [*Note: The "C/+" heading refers to the Count Type*.] After making the edits you want, click on ***Accept*** to update the database and return to the *Trap Count Entry* dialog box, click on ***Delete*** to delete the data entry line for that trap, or click on ***Cancel*** to cancel the Modify function.

5. ***Update Setup From Imported File***: Selecting this option brings up an *Update Trap Setup from Imported Database File* dialog box (Fig. 10-10) for updating GypsES eradication records using data from a *.dbf file created elsewhere (e.g., on a remote PC).

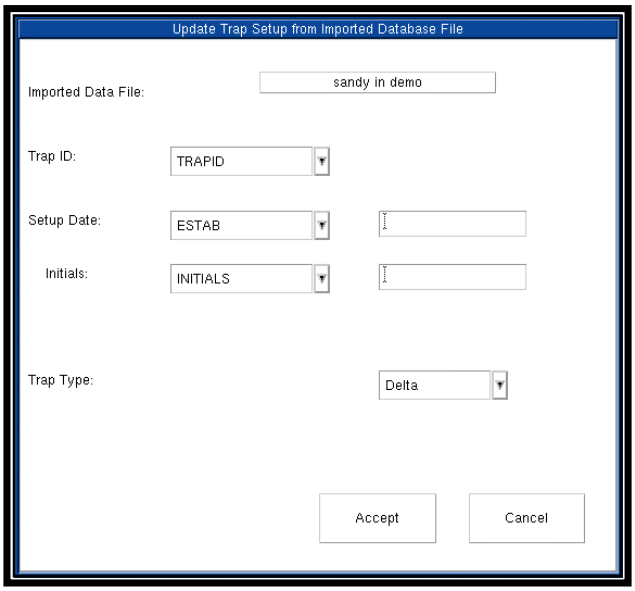


Figure 10-10. *Update Trap Setup from Imported Database File* dialog box.

The database file must have been previously imported using the ***File*** menu ***/ Import*** option ***/ Import Data Files*** option (see page 6-15 for more information). To select a file,

click on the box to the right of "Imported Data File" to bring up a *Choose Database File for Trap Import* dialog box. Select the appropriate mapset and file, then click on ***Accept*** to return to the previous dialog box. Once the file has been selected, you can link the Eradication data fields for Trap ID, Setup Date, and Initials with fields names in the selected database. Alternatively, you can set the date and/or initials to a constant value. Click on ***Accept*** to complete this function or on ***Cancel*** to cancel.

6. ***Update Count From Imported File***: Selecting this option brings up an *Update Trap Counts from Imported Database File* dialog box (Fig. 10-11). Use this option to update GypsES eradication records using data from a *.dbf file created elsewhere (e.g., on a remote PC).

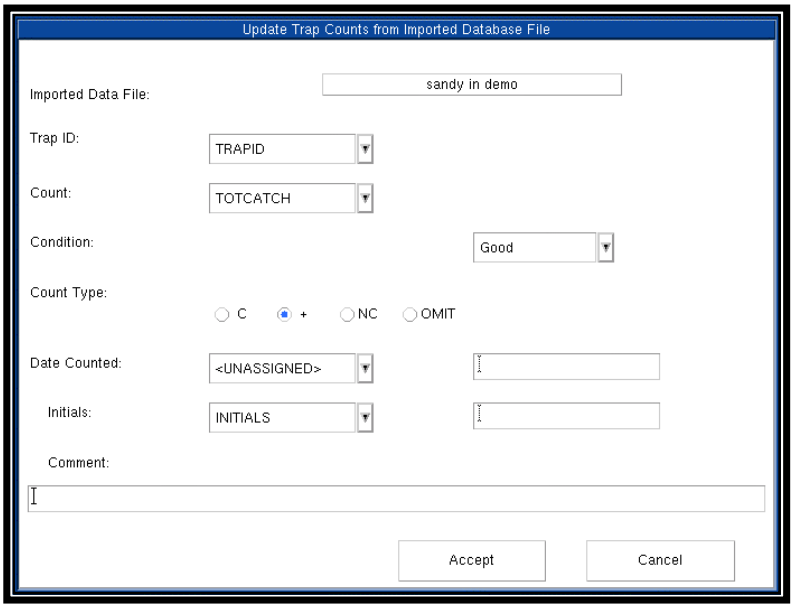


Figure 10-11. *Update Trap Counts from Imported Database File* dialog box.

The database file must have been previously imported using the ***File*** menu / ***Import*** option / ***Import Data Files*** option (see page 6-15 for more information). To select a file, click on the box to the right of "Imported Data File" to bring up a *Choose Database File for Trap Import* dialog box. Select the appropriate mapset and file, then click on ***Accept*** to return to the previous dialog box. Once the file has been selected, you can link the Eradication data fields for Trap ID, Count, Date Counted, and Initials with field names in the imported file. Alternatively, the date counted and initials fields can be set to some constant value. The Count Type, Trap Condition, and Comments fields can be set, and

apply to all matched entries in the database file. Click on ***Accept*** to complete this function or on ***Cancel*** to cancel.

7. ***Trap Database Display/Update***: When you click this push button, GypsES either prompts you to click on a trap or requests trap ID entry via the keyboard (depending on the trap selection option chosen). Once a trap is identified, a *Trap Database Information* dialog box appears (Fig. 10-12) with information pertaining to that trap. You can either edit individual data entries using the ***Edit*** push button in the scrolled window or create a new entry by clicking on ***Enter Trap Data*** in the lower left corner of the dialog box. To exit the record and save changes, click on ***Accept***. To restore the trap information to its previous content prior to selection, click on ***Cancel***.

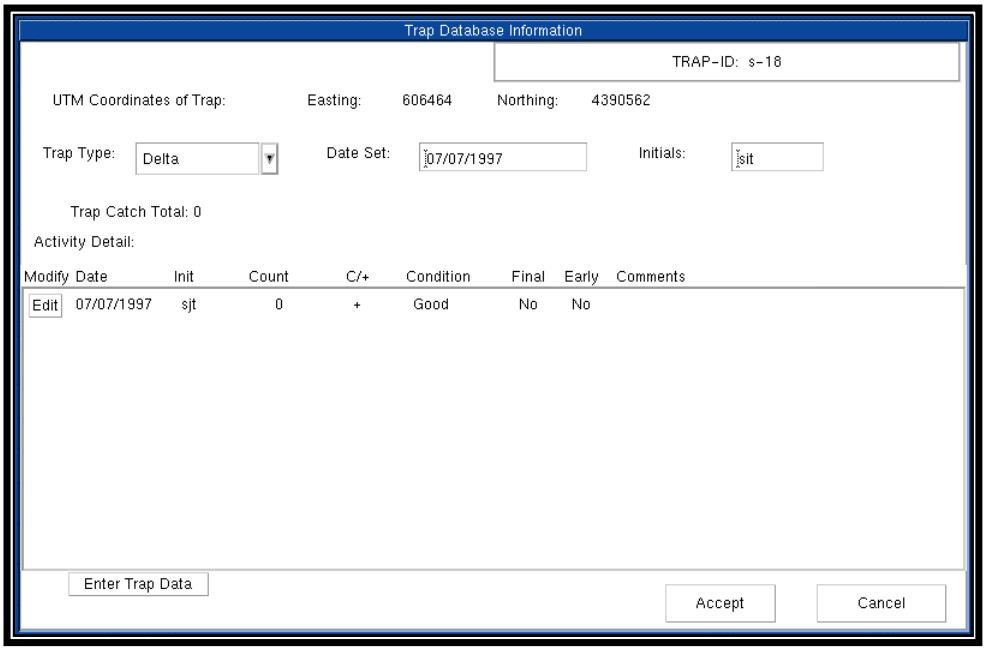


Figure 10-12. *Trap Database Information* dialog box.

GypsES continues to prompt you for another trap until either the right mouse button is clicked (if the selection by mouse click option is being used) or <ENTER> is pressed without entering an ID (if the selection via the keyboard option is being used).

8. ***Show History***: If trapping information for any of the prior 4 years is available, it is displayed. GypsES tries to locate the information by checking the current output mapset's Standard Name linkage for the four standard names:

- TRAP_SITES_YR1 (previous year)
- TRAP_SITES_YR2 (2 years ago)
- TRAP_SITES_YR3 (3 years ago)
- TRAP_SITES_YR4 (4 years ago)

If linkage exists, AND the linked files exist and are in the proper eradication file format, history information on all Positive (non-zero) trap catches is extracted from these files and displayed. The shape and color for the initial history display is as follows:

- Previous year: Red Open Circle
- 2 years back: Blue Plus Sign
- 3 years back: Green "X"
- 4 years back: Yellow Open Triangle

In addition, the counts are displayed in red.

The history data are displayed in a temporary work file named E~ Hnnnn, where "nnnn" is a number unique to this particular session of GypsES. You can modify the display characteristics by choosing the ***Window*** menu ***/ Build/Update Map*** option and clicking on ***Modify*** for this file.

9. ***Highlight No Reports***: This option highlights traps that have not had a count entry.

10. ***Highlight No Setup***: This option highlights traps that have no trap setup information recorded.

11. ***Save Highlighted Traps***: This option saves highlighted traps (traps with no reports or setup) in a database file. [*Note: This is a simple SiteData file. The detail information associated with the Eradication database is not saved (e.g., the trap's master record and activity information).*] Once you have saved the highlighted traps, GypsES brings up a dialog box that states "[x] selected traps copied to SiteData file [y]. NOTE: detail NOT copied."

12. ***Save All Traps***: This option saves all work done to that point for the entire database of traps, including all detail information. You are given the option of using the current filename (if one exists) or entering a new one. If a new name is entered, that name becomes the linked Eradication database filename.

13. ***Clear Highlighted***: This option clears all highlighted traps (e.g., those highlighted using options # 9 and # 10 described just above).

14. ***Switch to Edit Trap Placement***: This option toggles you to the "Edit Trap Placement" palette of functions.

D. ***Last Year's (-1) Trap Data***: This option displays last year's trap data if the file is linked through the Standard Names linkage table.
Pull Down Menu:
- Link (10-21)

1. ***Link:*** After selecting this option, a *Set Link for Last Year's (yyyy) Trap Data* dialog box appears ("yyyy" refers to last year). The file type and selected file for linking (if one exists) are listed. To change or set a linked file, click on the box to the right of "Selected File;" this brings up a file selection dialog box. Select the appropriate mapset and filename for linking. Click on ***Accept*** to set the link, on ***Clear*** to clear the file selection, or on ***Cancel*** to cancel the linking function.

The Treatment Menu

Use this menu to manage aerial spray operations, including planning the timing of aerial spray, laying out spray lines, and evaluating spray results.
Pull Down Menu:

- Spray Blocks (11-1)
- Phenology (11-10)
- Spray Modeler (11-14)

I. ***Spray Blocks***
Pull Down Menu:

- Import Vendor Block Files (11-1)
- Export Treatment Blocks (11-3)
- Import Flight Lines (11-8)
- Post Treatment (Egg Mass Difference) (11-9)

A. ***Import Vendor Block Files***

If you are using either AgNav or SatLoc spray block file formats (NO1 and JOB files, respectively), use this option to bring spray block information into the current GypsES output mapset as vector files. When you click on ***Import Vendor Block Files***, an *Import Vendor Spray Block File(s)* dialog box appears (Fig. 11-1).

First choose the vendor file format being imported (AgNav or SatLoc) by clicking on the diamond toggle button next to the vendor name. Then click on ***Select Files*** to bring up a *File Selection* dialog box (Fig. 11-2). Select the drive(s) the spray block files are stored on by clicking on the choice button to the right of the drive box. A list of all files on that drive appears in the box below "Files." Select files to import by clicking on the filename; selected files are highlighted with a black bar the first time they are selected. To de-select a file, click on it again. Filenames are listed in the "Files Selected:" box as you select them. Click on ***Accept*** to close the dialog box and keep your selections, on ***Clear*** to clear your selections, or on ***Cancel*** to abort the file selection process.

Now type in a filename for the GypsES vector file being created in the text entry window to the right of "Output File Name." All imported spray blocks are grouped into a single output vector file. Click on ***Accept*** to import or on ***Cancel*** to quit the import process.

Figure 11-1. *Import Vendor Spray Block File(s)* dialog box.

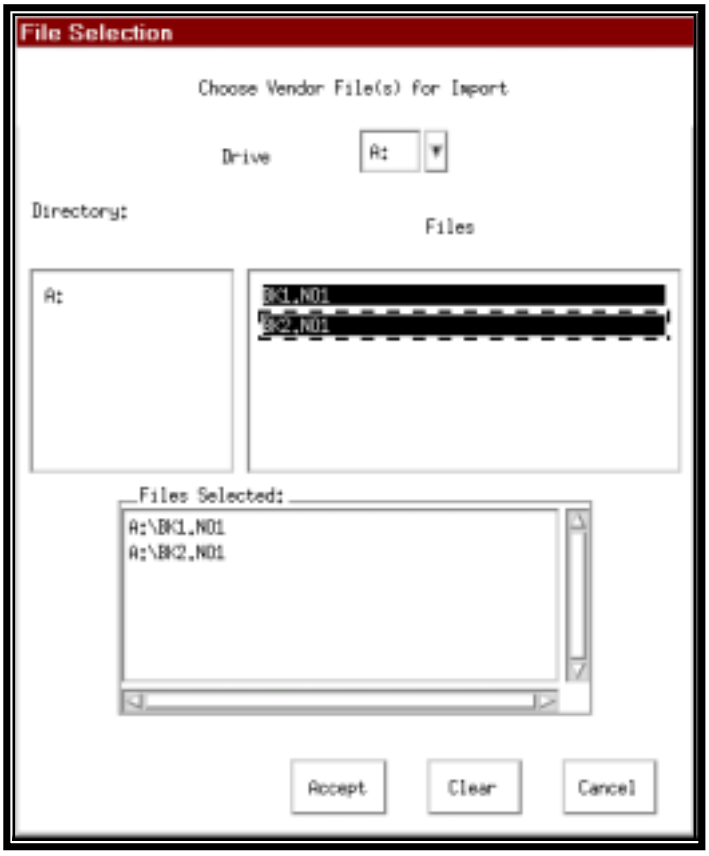


Figure 11-2. *File Selection* dialog box.

GypsES imports spray blocks in the files specified, including any exclusion areas. [*Note: Exclusion areas are defined within the Satloc JOB file. They exist as separate XXX.XCL files associated with XXX.NO1 files within the AgNav NO1 file. Both types of exclusion polygons are imported automatically. You do not need to select the AgNav *.XCL files.*] GypsES assigns a sequential category number to imported blocks. The category description for the imported blocks is the name of the file they were imported from. For SatLoc JOB files that contain more than one block, the block number and the JOB filename appear in the description. Exclusion areas are imported with no label.

For AgNav NO1 files, only the Clarke_1866 and WGS_84 ellipsoid types (line 20) are accepted at this time. GypsES handles either Latitude/Longitude or UTM coordinates in AGNAV files. The information in Lines 1 (Coordinate System) and 20 (Ellipsoid) are used to determine the coordinate conversion. SatLoc JOB files always use Latitude/Longitude.

B. ***Export Treatment Blocks***

This option specifies a spray block layer file to export to the GPS system of a spray aircraft. [*Note: **GPS** stands for Global Positioning System, a satellite-based navigational tool used by pilots to keep track of where the plane is over the Earth's surface. **DGPS**, or Differential Global Positioning System, is a GPS system that uses a ground station or satellite signal to correct for selected availability (a scrambled signal) so the pilot knows precisely where the plane is while spraying. Because GypsES receives a DGPS record for aerial spraying, all aircraft must use DGPS.*] If a spray block layer has been selected for export in a previous session, GypsES produces a message box that lists the spray block layer filename as the source of spray block information. Click on ***Yes*** to accept the filename or on ***Choose*** to choose another map layer. If you select ***Choose*** or no file has been chosen for export, a *Select Spray Block Layer for Export* dialog box appears. Select the appropriate mapset and filename; click on ***Accept*** to select the file, click on ***Clear*** to clear the selection, and click on ***Cancel*** to cancel the selection.

Choosing ***Yes*** brings up a *Vector Display Options* dialog box. You can specify the Vector line width, color, and style as well as specify the Vector line label display (check the "Display Vector Label" square toggle button and then fill out the *Vector Label Definition* dialog box that appears). Click on ***Accept*** to close the dialog box once edits are completed, click on ***Reset*** to cancel all edits since the last save, and click on ***Cancel*** to cancel the function.

As the spray block Vector layer is then re-drawn in the Work Window, a dialog box appears on the left side of the Work Window titled *Export Spray Blocks to GPS* (Fig. 11-3). There are several functions within this dialog box to guide you in exporting spray block boundary information for use by pilots. These include:

1. ***Select Block***: If this option is chosen, GypsES prompts you to select spray block(s) for exporting by clicking once inside the blocks. You are then prompted to enter a block number and descriptor for each block. As blocks are selected, they are simultaneously listed in an area in the middle of the box by block descriptor and acreage. A running total acreage is also tallied just below the block selection list. De-select selected spray blocks by clicking inside the block a second time. Click the right mouse button to end the selection process. [*Note: Spray blocks can be removed individually from the selection list by clicking once with the left mouse button on the spray block line itself.*] Spray block polygons should be labeled with *unique* block numbers. If a block is not labeled, GypsES prompts for a number.

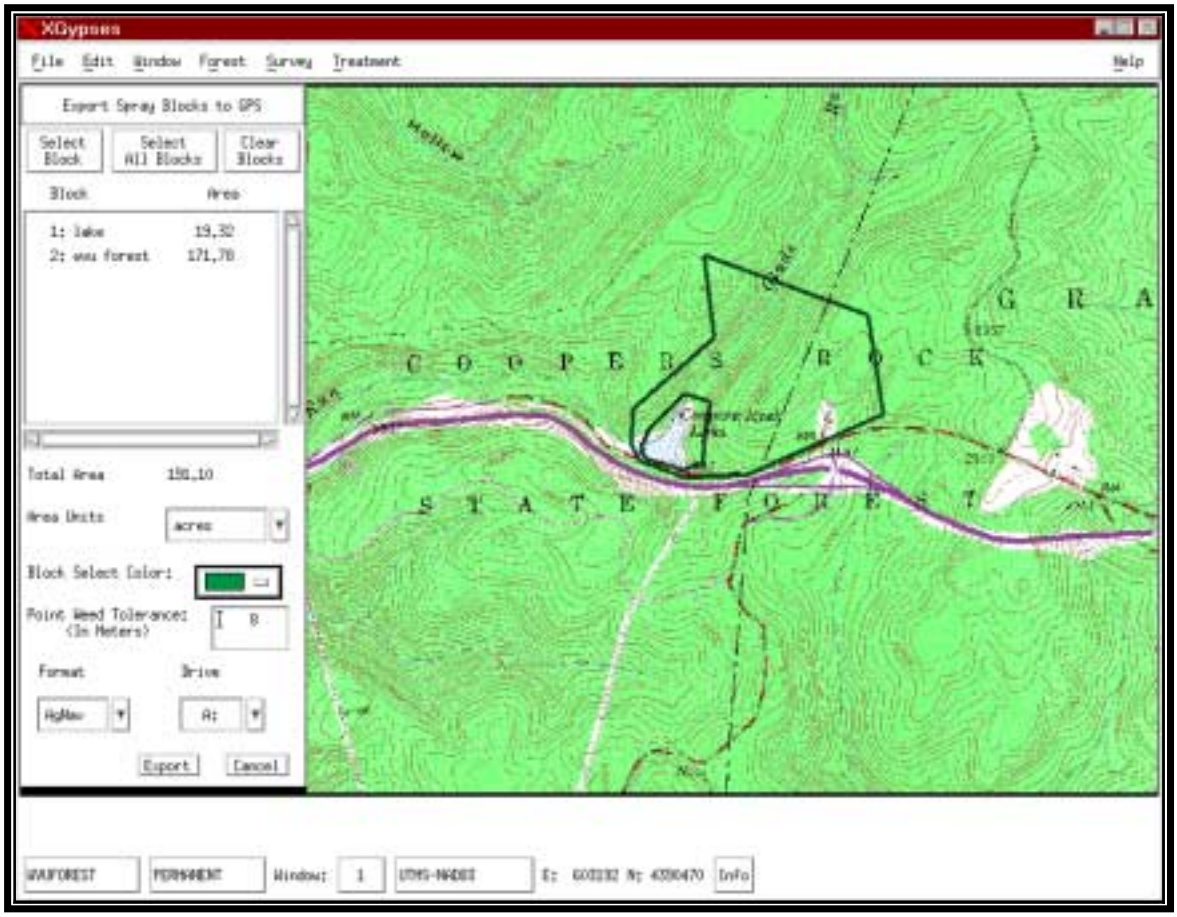


Figure 11-3. *Export Spray Blocks to GPS* dialog box.

2. ***Select All Blocks***: This option selects (and lists) all spray blocks in the file.

3. ***Clear Blocks***: This option clears all spray block selections.

4. ***Area Units***: This is the spray block area unit of measurement. This is initially set to either acres or square kilometers depending on the default unit of measure settings in the ***Edit*** menu / ***Administrative Profile*** option / ***User Profile*** option (see page 7-39). To choose another area unit of measurement, click on the choice button to the right and choose between square kilometers, square meters, square miles, acres, or hectares.

5. ***Block Select Color***: This option sets the color of selected spray blocks.

6. ***Point Weed Tolerance***: Use this option to modify the Point Weed Tolerance (expressed in meters). GypsES can only export a fixed number of points within a spray block line.

When a spray block is exported that contains curved boundary lines, for example, there may be more points along the curved line than the system can deal with. To reduce the number of spray line points exported, GypsES draws a line from one point to a third point. If the perpendicular distance between the line drawn between these two points and the point in between is less than the point weed tolerance value, the point is eliminated, or "weeded out" (Fig. 11-4). If the perpendicular distance is greater than the point weed tolerance value, the point is retained.

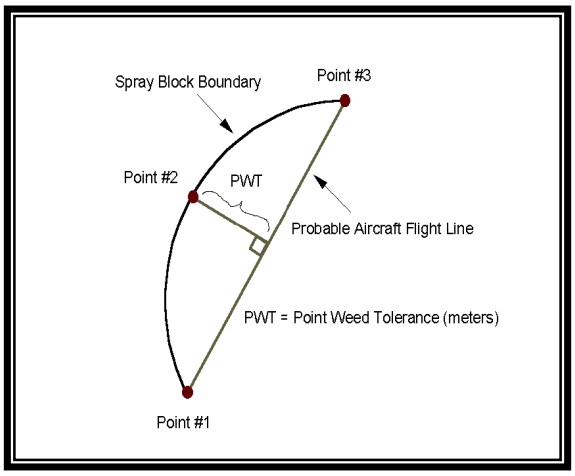


Figure 11-4. Illustration of the *Point Weed Tolerance* concept.

7. ***Format***: This is the commercial DGPS data format used by pilots for navigation. Options include AgNav, SatLoc, SoftNav, and Trimble. GypsES prompts you for all information required to use each data format chosen. If you choose the AgNav export format and click on ***Export***, you are then asked if you want to change the AGNAV parameters. If you click ***Yes***, an *AgNav Spray Block Setup Parameters* dialog box appears (Fig. 11-5).

   Entering information in this dialog box may provide additional information formerly provided by the "ENTRY.NEW" file and possibly eliminate further editing of the AGNAV "NO1" block files that GypsES creates. GypsES edits the values entered in this dialog box and displays error messages in the empty box below the parameter values. When you accept the AgNav parameters, the values are saved **for that output mapset** and are used the next time you export in the AgNav format in that output mapset.

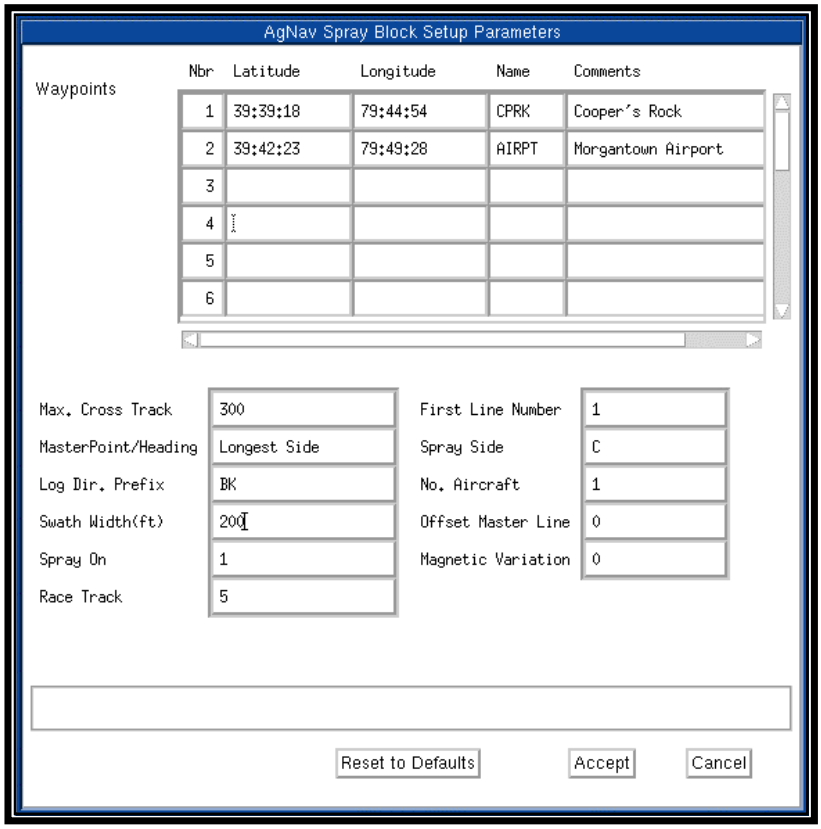


Figure 11-5. *AgNav Spray Block Setup Parameters* dialog box.

The following describes each of the AgNav parameters: [*Note: For most parameters listed, consult the AGNAV User's Manual. The explanations provided here define the defaults and the editing GypsES performs on them.*]

a. ***Waypoints:*** You can enter as many as 19 waypoints in the scrolling window provided. Enter the Latitude and Longitude as degrees:minutes:seconds. If you do not provide a name and/or comments for a waypoint, GypsES assigns a name "WPT# " and a comment, "Way Point # ", where # is the waypoint number. Waypoint names and comments can not contain commas or the pipe (|) symbol. The first waypoint placed on each block (NO1) file is the first corner of the block. The first corner of any block is always the point first digitized. To clear a waypoint, just blank out the Latitude field; it will not be used.

b. ***Max[imum] Cross Track:*** Any number is accepted; the default value is 300.

c. ***First Line Number:*** The default value is 1.

d. ***MasterPoint [and Grid] / Heading:*** This is a toggle between "Longest Side" (the master point and heading are automatically assigned as the longest side of each block) and "Set for Each Block" (GypsES prompts you for the master point and heading as the blocks are created).

e. ***Spray Side:*** Valid entries are C (center), L (left), and R (right); the default is C.

f. ***[Spray Line] Log Dir[ectory] Prefix:*** GypsES uses the 2-character code supplied here as a prefix for the name of the directory where spray line files are placed. The actual directory is <PFX>NNN, where NNN is the block number.

g. ***No. [of] Aircraft:*** The number of aircraft to be used; the default is 1 and the maximum is 10.

h. ***Swath Width (ft):*** This is the swath width of the aircraft in feet. No default is provided, but this **must** be entered or the parameters are not accepted. The maximum value is 1000.

i. ***Offset [of] Master Line:*** Valid entries are 0 (no offset) and 1 (half-line offset); the default is 0.

j. ***Spray On [Option]:*** Valid entries are 1 or 2; the default is 1.

k. ***Magnetic Variation:*** Valid entries are between -50 and 50; the default is 0.

l. ***Race Track:*** Entries can be negative; the default is 5.

When you have set up your parameters, click ***Accept*** to have GypsES create your spray block files. If you have specified the "Set for each Block" option for the master point and heading, you are prompted to click to provide a master point, and again to provide a heading for each block. GypsES then asks you to put a diskette in the drive and places the block files on it. If you click on ***Reset to Defaults***, the waypoints are cleared and the parameter values are reset to the specified default values. If you click ***Cancel***, the export operation is aborted and the parameters are **not** saved.

8. ***Drive***: This is the drive to which the DGPS spray block data are sent (exported); choices include ***A:*** and ***B:***.

When the *Export Spray Blocks to GPS* dialog box options are set, click on ***Export*** to export the spray block data. GypsES prompts you to insert a diskette in the specified drive.

C. ***Import Flight Lines (from DGPS)***

Use this option to import spray flight line data from an aircraft's DGPS system into GypsES after aerial spraying is completed. An *Import Spray Lines from GPS System* dialog box appears on the left (Fig. 11-6) and has the following options:

1. ***Format***: This is the DGPS data format used by the pilot for navigation; options include AgNav, SatLoc, SoftNav, and Trimble.

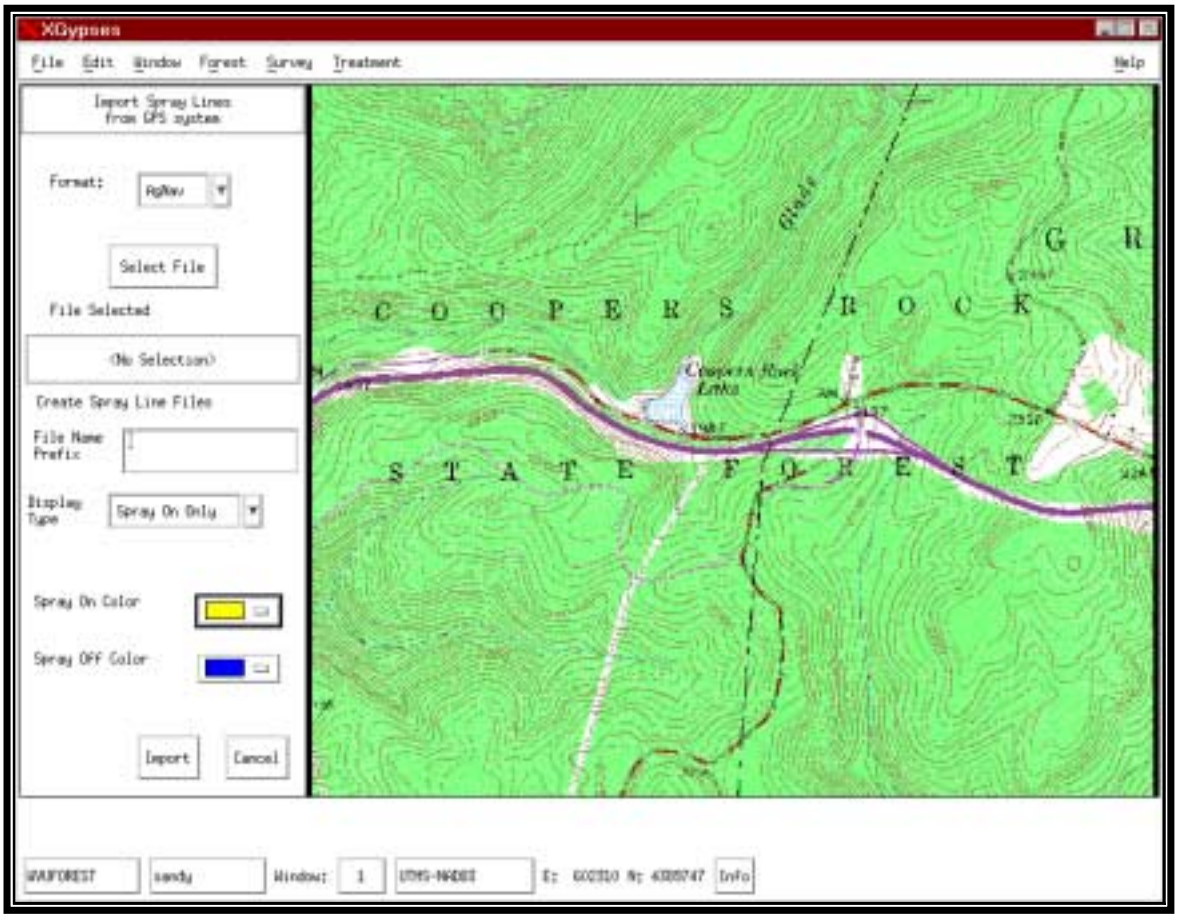


Figure 11-6. *Import Spray Lines from GPS System* dialog box.

2. ***Select File***: This option is used to select a spray line file ("source file") for importing into GypsES. A *File Selection* dialog box appears; choose the appropriate drive letter and file you want to import. Click on ***Accept*** to complete the selection or on ***Clear*** to clear the selection. You are then returned to the *Import Spray Lines from GPS System* dialog box; the selected file is listed in a box just below "File Selected."

3. ***File Name Prefix***: Click on the text entry window to the right of this option to specify a prefix for the GypsES filename. The prefix can be up to 10 characters long. If you are importing many files, it helps to be systematic in naming files so that you can easily identify and retrieve files in GypsES. For example, your file naming system might include references to the pilot, the tail number of the plane, the date and time sprayed, etc., to help you keep track of what imported spray line file belongs to what spray block. GypsES imports both "spray on" and "spray off" flight line data. GypsES automatically adds an *.spy extension to the filename for "spray on" flight line data only, and adds an *.all extension for all spray data (both "on" and "off").

4. ***Display Type***: This option specifies which flight lines are displayed on the GypsES screen: ***Spray On Only*** (displays only those flight lines during which the spray nozzles were on and dispensing spray material) or ***Spray On/Off*** (displays all flight lines, including those where the spray nozzles were off).

5. ***Spray On/Off Color***: These options are used to specify flight line screen display colors for both ***Spray On*** and ***Spray Off***. Click on the choice buttons to the right to pick a color.

Once these options are set, click on ***Import*** to complete the import process or click on ***Cancel*** to end the process.

D. ***Post Treatment (Egg Mass Difference)***

Use this option to evaluate treatment efficacy and compare egg mass differences between years. This option takes the egg mass surface layers from the past two years and subtracts them, producing an egg mass difference layer. The difference layer is displayed with negative values beginning in blue and positive values ending in red, showing the decrease and increase, respectively, in egg masses over areas that may or may not have been treated. Link the first (current) year egg mass surface file in the Standard Names table to EM_PA_SURF_YR0; link the second (previous) year file to EM_PA_SURF_YR1.

Pull Down Menu:

- Re-Calc (11-10)
- View (11-10)

1. ***Re-Calc***: This option recalculates the egg mass difference layer if new egg mass surface data are available (and linked).

2. ***View***: Use this option to view an egg mass difference layer if egg mass surface files exist for the last two years.

II. ***Phenology***

This option contains variables to calculate gypsy moth phenology using GMPHEN, the gypsy moth phenology model developed by researchers at U.S. Forest Service laboratories. (For more information about the model, see Sheehan 1992.) Phenological prediction is potentially valuable for timing spray applications and other gypsy moth management activities.

Pull Down Menu:

- Elevation (11-10)
- Temperature (11-11)
- Observed Egg Hatch (11-12)
- Target Event (11-13)
- Phenology (11-13)
- Group Phenology (11-13)

A. ***Elevation***

Elevation refers to the elevation layer for the current location; you can either select a data layer to represent the elevation for the location or display the currently selected layer.

Pull Down Menu:

- Link (11-10)

1. ***Link***: Selecting the ***Link*** option brings up a *Set Link for Elevation* dialog box that lists the file type and file selected for linking (if one is linked). To set or change a link, click on the box to the right of "Selected File." Select the appropriate mapset and filename, then click on ***Accept*** to complete the selection, click on ***Clear*** to clear the selection, and click on ***Cancel*** to cancel the selection. GypsES alerts you if a map is already drawn in the Work Window with options to either re-draw the Work Window with the selected (elevation) map layer or retain the current map layer.

B. ***Temperature***

Use this option to enter minimum and maximum temperature data for the current year on the right side of a *Temperature Data* dialog box (Fig. 11-7). Select the temperature scale (Fahrenheit or Celsius) you want in the upper right corner of the dialog box.

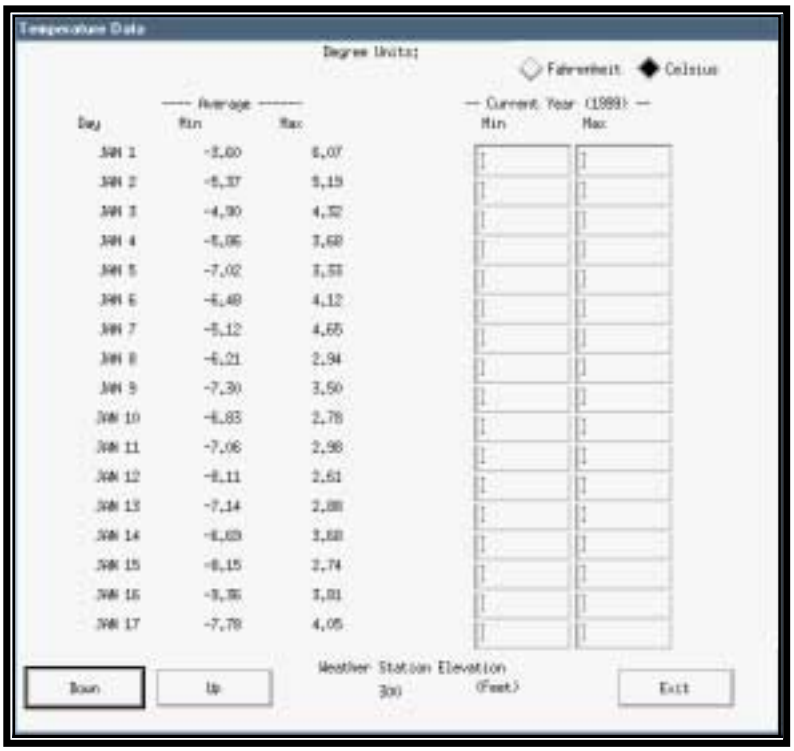


Figure 11-7. Temperature Data dialog box.

All days in the calendar year are listed for reference on the left side of the dialog box with historical average temperature data for each date (the temperature scale chosen is reflected in these average temperature data as well). The historical average temperature data displayed reflects a 30-year average; however, this average temperature data can be edited in mapset PERMANENT to reflect the best historical data for the weather station being used.

To scroll through the database one page at a time, click on ***Down*** or ***Up*** in the lower left corner. The elevation (in feet) is displayed at the bottom center of the dialog box. [*Note: It is important to make sure that the same weather station (and therefore elevation) is used for both the average temperature data and new temperature data you enter.*] To enter temperature data, click on the appropriate cell within the temperature table and enter the number. The <Tab> key moves you through the table. Click on ***Exit*** when data entry is complete. GypsES prompts you to save changes if any have been made by clicking on ***Save***; the dialog box then closes. Click on ***Cancel*** to close the dialog box without retaining any

edits.

C. ***Observed Egg Hatch***
Choosing this option brings up a dialog box (*Observed Egg Hatch Data*, Fig. 11-8) for entering information about gypsy moth egg hatch.

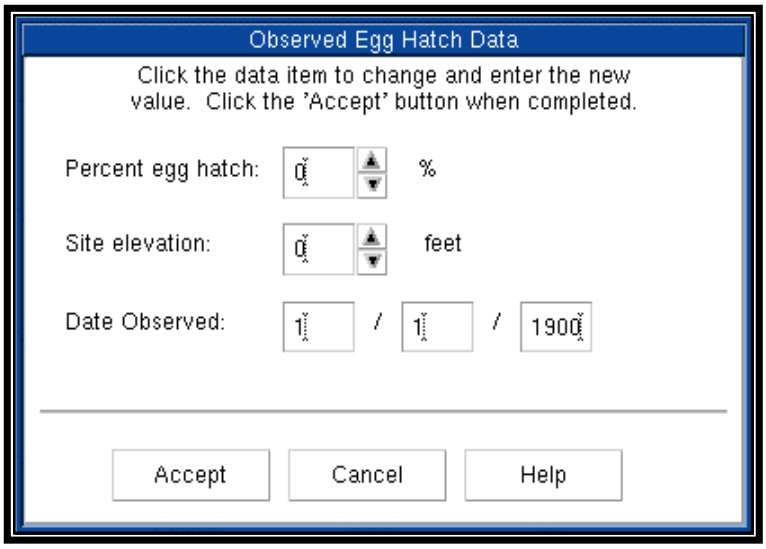


Figure 11-8. *Observed Egg Hatch Data* dialog box.

1. ***Percent Egg Hatch***: This is the percentage of egg hatch within egg masses already considered "hatched."

2. ***Site elevation***: This is the elevation of the site in feet.

3. ***Date Observed***: This is the date the egg hatch observation was made.

Click on the box(es) to the right of the appropriate category to edit its value. Click on ***Accept*** when all edits are made or on ***Cancel*** to cancel any edits.

D. ***Target Event***
Choosing this option brings up a dialog box (*Larval Instar Target Event*) for indicating the larval instar target (1 through 4) you want and percentage of the population in that instar. Click on the box to the right of the appropriate category to edit its value. Click on ***Accept*** when all edits are made.

E. ***Phenology***

Pull Down Menu:

- Re-Calc (11-13)
- View (11-13)

1. ***Re-Calc***: The ***Re-Calc*** option re-calculates the gypsy moth phenology Raster map layer using the temperature data file. The Standard Name in the linkage table is PHENOLOGY. If the data within the temperature file changes, click on ***Re-Calc*** to have the phenology map layer re-calculated and displayed.

2. ***View***: Use this option to view the gypsy moth phenology Raster map layer. If a Raster file of gypsy moth phenology is linked to the Standard Name PHENOLOGY, it is drawn in the Work Window when the ***View*** option is chosen.

F. ***Group Phenology***

Pull Down Menu:

- Re-Calc (11-13)
- View (11-13)

Gypsy moth phenology is calculated on a daily basis; the ***Group Phenology*** function can be used to group daily phenology data into specified time intervals (e.g., one week). The Standard Name of the grouped phenology map layer in the linkage table is PHEN_GROUP.

1. ***Re-Calc***: Use this option to change the number of days used for grouping, then enter a new grouped phenology filename. This file then becomes the linked file to PHEN_GROUP.

2. ***View***: Use this option to view the currently linked grouped phenology file.

III. ***Spray Modeler***

Use the ***Spray Modeler*** option to predict spray deposition within treatment blocks (or from actual spray flight lines) under specified meteorological conditions and with specified aircraft, spray systems, and spray materials. The ***Spray Modeler*** option brings up a "Spray Advisor" (Spray Model System Advisor, or SMSADV). SMSADV uses a verified near-wake computer model called AGDISP (Version 7.0) (for more information, see Bilanin and others 1989.) AGDISP predicts spray dispersion and deposition. Spray material from every nozzle on the aircraft is tracked by its own set of equations from release to groundfall. The spray material is divided into discrete drop size categories (drop size distribution) and each drop is followed as it is influenced by the wake of the aircraft, the ambient crosswind, and evaporation.

When ***Spray Modeler*** is clicked, you are first prompted to indicate whether spray blocks or spray lines will be used for the analysis:

- If the *spray blocks* option is chosen, GypsES checks to see if any Vector files are drawn in the current Work Window, then asks you if you want to use the file drawn as a source of spray blocks (***Yes***) or choose a spray block layer (***Choose***). Clicking on the latter option brings up a dialog box titled *Select Spray Block Layer for Spray Deposit*. Select the appropriate mapset and filename, then click on ***Accept*** to select the file, click on ***Clear*** to clear the selection, or click on ***Cancel*** to cancel the selection process. You are then prompted to choose the display parameters for that layer in the *Vector Display Options* dialog box; when these have been set and accepted, the chosen Vector layer is drawn in the Work Window.

- If the *spray lines* option is chosen, GypsES asks you to select one or more spray line files for analysis in a *Select spray line file(s) for analysis* dialog box. Select the appropriate mapset and filename(s), then click on ***Accept*** to select the file(s), click on ***Clear*** to clear the selection, or click on ***Cancel*** to cancel the selection process. [*Note: At this time the deposition analysis only works with a single set of lines which are contiguous and all in the same direction.*]

The "Spray Advisor" palette now appears in the upper left corner of the Work Window (Fig. 11-9). Its functions include:

Figure 11-9. *Spray Advisor* function palette.

A. ***Select Block***
This option is activated only if spray blocks are being analyzed. When this push button is clicked, GypsES prompts you to click inside the block you want to analyze (it must be a closed polygon); the selected block is then highlighted.

B. ***Run Spray Advisor***
After you have selected a spray block, use this option to specify a flight direction. [*Note: If flight lines are being analyzed, you are not prompted to specify a flight direction*.] Click once on the screen and then click again in the appropriate direction from the first click to show the direction of the flight lines you want to analyze. [*Note: As the mouse cursor is moved to the second point, a line is simultaneously drawn between the first point and the mouse pointer to indicate the flight line*.] Clicking the right mouse button cancels the flight direction function. Click on ***Accept*** to confirm the correct flight direction or on ***Cancel*** to cancel the flight direction function. If the flight direction is correct, the *Spray Advisor (SMSADV)* dialog box appears (Fig. 11-10). Spray block data are transferred to SMSADV from GypsES in a separate filename beyond your control. This file contains both the flight line direction and spray block boundaries (and exclusion zones) or details GPS flight line data.

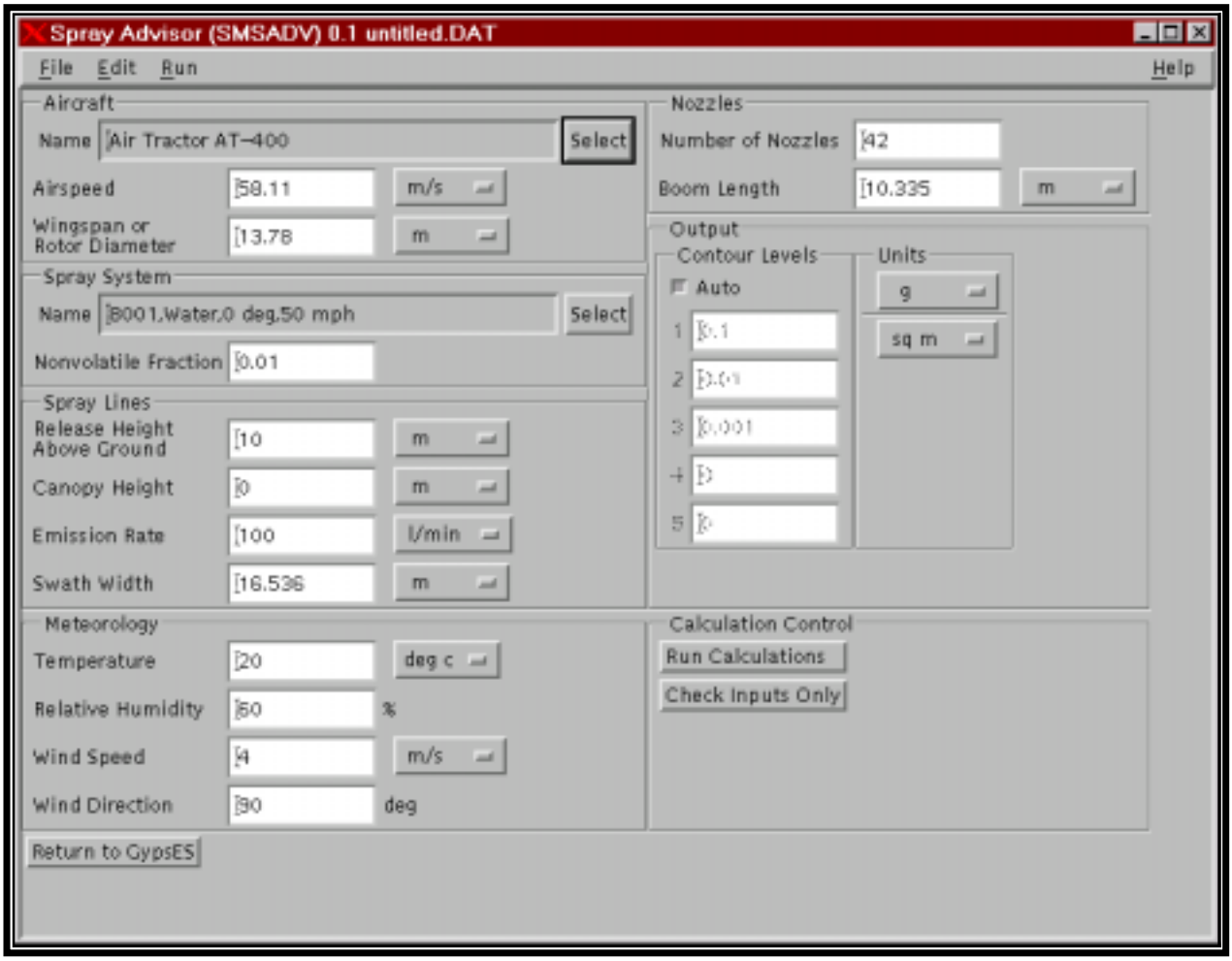


Figure 11-10. *Spray Advisor (SMSADV)* dialog box.

Following a brief explanation of aerial application definitions (starting on page 11-17), each section of the *Spray Advisor (SMSADV)* dialog box is described.

- Aircraft (11-18)
- Spray System (11-19)
- Spray Lines (11-19)
- Meteorology (11-20)
- Nozzles (11-20)
- Output (11-21)
- Calculation Control (11-22)
- Return to GypsES (11-22)
- Spray Advisor Menu Bar Options (11-23)

1. ***Aerial Application Definitions***: SMSADV assumes that you have a basic knowledge of

aerial application theory and practices, including some understanding of aircraft and forests. For a point of common reference, the following definitions and concepts used in SMSADV are summarized:

a. **Aircraft**: helicopter or fixed wing.

b. **Canopy**: the vegetative material (trees, shrubs, crops, etc.) that captures a portion of the released material before it intercepts the ground.

c. **Default Values**: current input variables (from SMSADV or an input file) before being modified by you.

d. **Deposition:** amount of spray material per unit area collected.

e. **Dispersion:** spreading of the released material due to atmospheric turbulence and wind.

f. **Flight Line:** spray path of the aircraft.

g. **Isopleth:** line of constant value (in the case of spray deposition, an isopleth would represent a constant value of deposition).

h. **Near Wake:** the AGDISP aircraft wake model used to calculate spray swath widths.

i. **Receptor Grid:** points at which spray deposition is predicted. As a general rule, this grid should encompass and extend beyond the flight lines, especially downwind in those model runs where a crosswind is used.

j. **Release Height:** aircraft height measured from the ground when spray material is released.

k. **Swath Width:** anticipated width of the spray swath to achieve the amount of spray material you want on the ground.

2. ***Aircraft***

   a. ***Aircraft Name***: The name of the aircraft currently selected is shown in the box to the right of "Name." Clicking on ***Select*** brings up a library of applicable aircraft names accessed by SMSADV in a *Select Aircraft* dialog box (Fig. 11-11). These data are arranged in alphabetical order by aircraft name. Your selection brings in all input parameters needed to run AGDISP, including the wingspan (or rotor diameter), swath width, boom length, and the vertical position of the spray boom relative to the wingtips (for a fixed-wing aircraft) or rotor plane (for a helicopter).

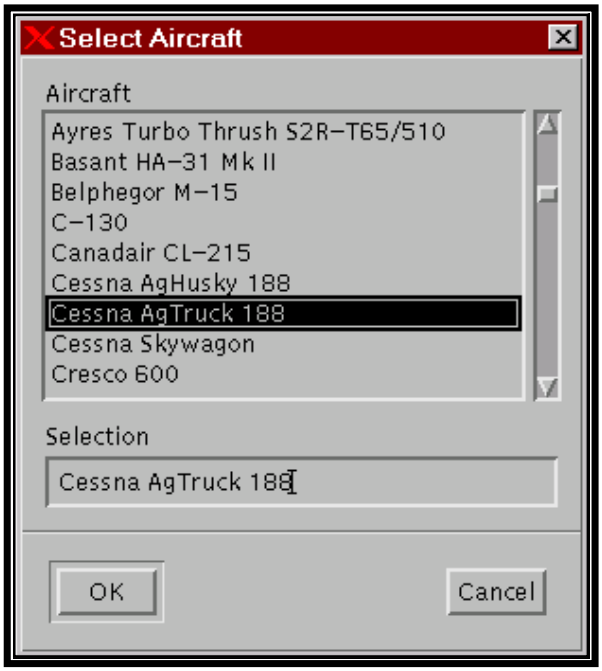


Figure 11-11. *Select Aircraft* dialog box.

   b. ***Airspeed***: The flight speed of the aircraft is shown to the right of "Airspeed." Choose the unit of measurement you want by clicking on the choice box to the right and selecting a unit.

   c. ***Wingspan or Rotor Diameter***: The wingspan (or rotor diameter) is shown to the right of "Wingspan or Rotor Diameter." This value describes the size of the aircraft and can be adjusted by the user *with caution*. Choose the unit of measurement by clicking on the choice box to the right.

3. ***Spray System***

   a. ***Spray System Name***: The spray system name is shown to the right of "Name." Clicking on ***Select*** lists a library of applicable spray systems accessed by SMSADV in a dialog box (Fig. 11-12). A selection includes (from left to right) nozzle type, spray material, nozzle angle to the wind stream (or atomizer rpm), and aircraft speed (mph). All data in this library are arranged in alphabetical order by nozzle type first and then by the other variables. Each selection has its own spray drop size distribution needed to run AGDISP, including the nonvolatile fraction (see below for a description).

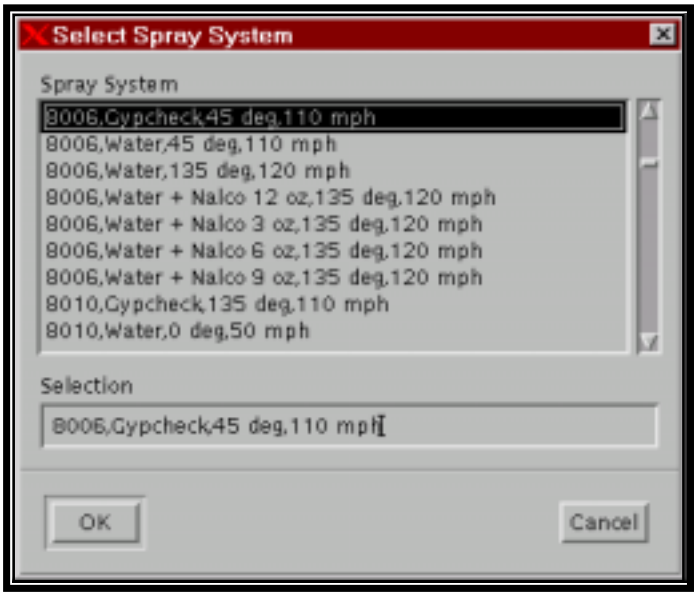


Figure 11-12. *Select Spray System* dialog box.

   b. ***Nonvolatile Fraction***: The nonvolatile fraction is shown to the right of "Nonvolatile Fraction." The nonvolatile fraction is the fraction of tank mix that cannot evaporate; values range from 0.0 to 1.0. It is an extremely important parameter. Changing the nonvolatile fraction value inserted from the spray system library should be done by the user *with caution*.

4. ***Spray Lines:*** Use this section to set flight line information for spraying. Each variable has a text entry window for entering the appropriate number for that variable. A choice box for selecting a unit of measurement is to the right of the text entry window.

a. ***Release Height Above Ground***: This is the flying height of the aircraft; it is measured from the ground to the spray boom.

b. ***Canopy Height***: Canopy height is measured from the ground to the top of the canopy. AGDISP calculations stop when the canopy height is reached. An entry of 0 gives you information about deposition on the ground.

c. ***Emission Rate***: This is the total system flow rate through all nozzles on the spray boom. Changing measurement units in this variable does not change the value of the emission rate entered because conversion between units of measurement depends on other inputs that may be changed before AGDISP calculations are invoked.

d. ***Swath Width***: This is the distance between spray lines (sometimes called lane separation or bout width). This variable is used to set the number of flight lines needed to spray the block transferred to the Spray Advisor from GypsES. This value is automatically written in as 1.2 times the wingspan or rotor diameter when an aircraft name is selected.

5. ***Meteorology***

a. ***Temperature***: This is the average temperature during spraying. Choose either the Fahrenheit or Celsius degree scale.

b. ***Relative Humidity***: This is the average relative humidity during spraying expressed as a percentage.

c. ***Wind Speed***: This is the average wind speed during spraying presumably recorded 2 m above the ground. Choose the unit of measurement to the right of the choice box.

d. ***Wind Direction***: This is the average wind direction during spraying expressed as degrees. Wind direction is measured from north, i.e., a wind blowing from the north would be entered as "0" degrees and from the south as "180" degrees. This variable is also presumably recorded 2 m above the ground.

6. ***Nozzles***

a. ***Number of Nozzles***: This is the number of nozzles on the spray boom. Nozzles are equally spaced along the boom length.
b. ***Boom Length***: This is the length of the spray boom. This value is written in as 75

percent of the wingspan or rotor diameter when an aircraft name is selected. Choose a unit of measurement by clicking on the choice box to the right.

7. ***Output***

   a. ***Contour Levels***: This is where you specify the contour levels for spray deposition results calculated by AGDISP. There are two options for defining spray deposition contour levels. If the choice box by "Auto" is selected (indented), SMSADV automatically generates three deposition contours at 0.1, 0.01, and 0.001 of the maximum value predicted within the spray block. When Auto is *not* selected, five contour level text entry windows are activated and you must enter deposition contour levels consistent with the units specified (Fig. 11-13). You can specify up to five contour levels, although using more than three levels may clutter your deposition contour plot.

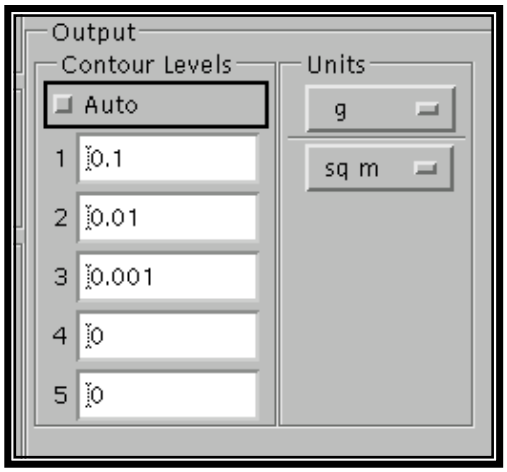


Figure 11-13. *Spray Advisor (SMSADV)* dialog box: *Output* section, user-defined contour deposition levels.

   b. ***Units***: Select the units for displaying deposition contours predicted by AGDISP by clicking on the choice boxes and selecting the units you want (for example, grams per square meter, or g/sq m). The numerator choice box is on top and the denominator choice box is below. The predicted deposition includes all released spray material that has not evaporated and generally contains more material than just the nonvolatile amount because some water binds to the nonvolatile material. Nonvolatile mass/volume and drops are conserved by the calculation.

8. ***Calculation Control***

   a. ***Run Calculations***: This push button starts the AGDISP prediction model; inputs to the model and program status are displayed in an *SMSADV Calculations* dialog box (Fig. 11-14). The model generates spray deposition for a single flight line, then overlays this information for multiple flight lines on a grid designed to predict deposition within the spray block and downwind of the flight lines.

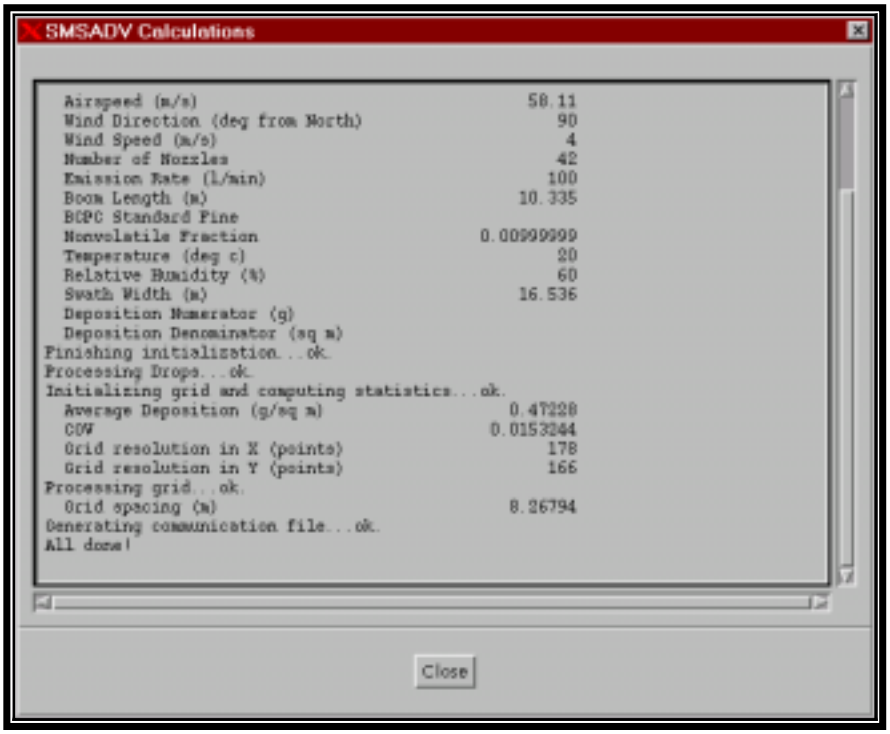


Figure 11-14. Sample *SMSADV Calculations* dialog box: *Run Calculations* option.

   b. ***Check Inputs Only***: This push button checks all inputs to the AGDISP model and displays them in an *SMSADV Calculations* dialog box (Fig. 11-15).

9. ***Return To GypsES***: If you have not run the model, this option returns you to GypsES. If you have run the model, this option writes the predicted deposition results into a file for recovery and plotting by GypsES, then takes you back to GypsES.

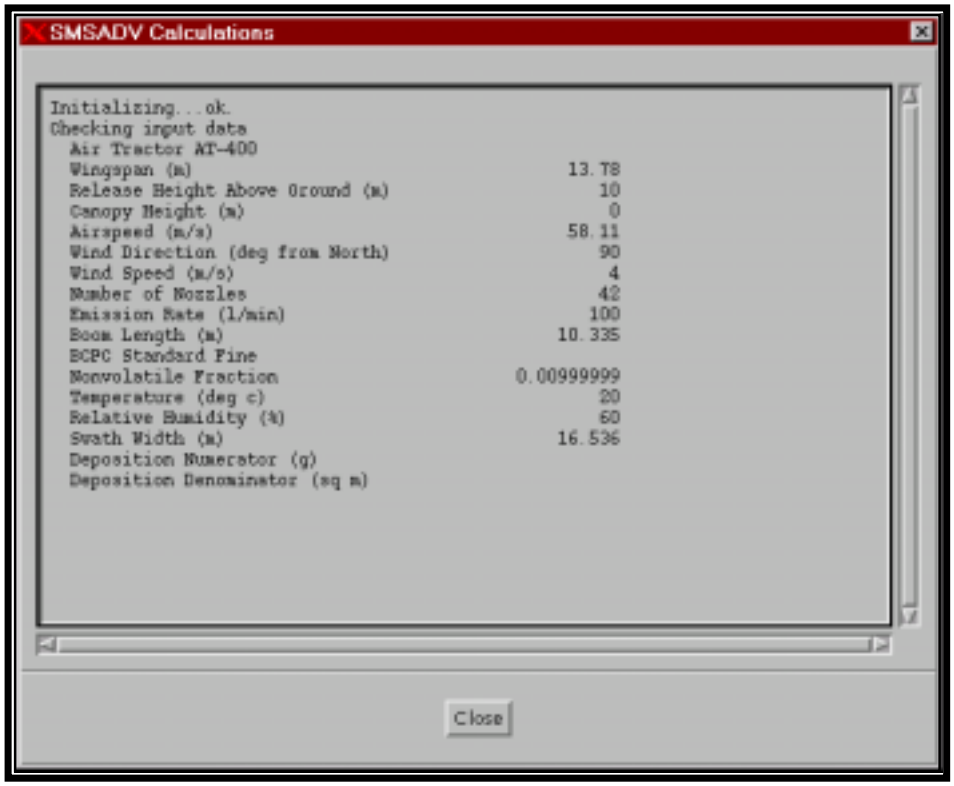


Figure 11-15. Sample *SMSADV Calculations* dialog box: *Check Inputs Only* option.

10. ***Spray Advisor Menu Bar Options***

    a. ***File***

        (1) ***New:*** Use this option to select a set of default data that is built into the program.

        (2) ***Open:*** This option opens a previously saved set of input data needed to run AGDISP. This brings up an *Open* dialog box to choose a directory and data file to bring into SMSADV (Fig. 11-16).

        (3) ***Save:*** This option saves the present input data in the current file.

        (4) ***Save As:*** Use this option to save the current input data under a new filename. A *Save* dialog box appears (Fig. 11-17).

Figure 11-16. *Open* dialog box.

Figure 11-17. *Save* dialog box.

(5) ***Exit and Return to GypsES***: This option exits SMSADV and returns you to GypsES whether or not you have run the model. GypsES automatically saves the last SMSADV setup information in the active mapset. SMSADV brings up the last setup information used for a given mapset each time you run it. Deposition results files are automatically saved in memory and ready to be displayed in GypsES. When you exit SMSADV, you are asked if you want to save either the spray contour lines or spray deposition grid (see ***Exit Spray Advisor*** on page 11-26 for more information).

b. ***Edit***: Use these functions to cut, copy, paste and clear the contents of individual text entry windows.

(1) ***Cut***: This option deletes highlighted data and stores it in the Windows clipboard.

(2) ***Copy***: This option leaves highlighted data in the text entry window but also stores it in the Windows clipboard.

(3) ***Paste***: This option pastes data from the Windows clipboard to a text entry window.

(4) ***Clear***: This option clears highlighted data from a text entry window and does not store it in the Windows clipboard.

c. ***Run***

(1) ***Run Calculations***: This is the same option as described on page 11-22.

(2) ***Check Inputs Only***: This is the same option as described on page 11-22.

d. ***Help***: This provides the version number of SMSADV.

After the model has been run and you have clicked on [***Exit and***] ***Return to GypsES,*** the remaining push buttons in the "Spray Advisor" palette now apply (Fig. 11-9 on page 11-15):

C. ***Display Contours***: This option displays spray deposition contour lines, color coded for different levels of deposition in the units specified in the *Spray Advisor (SMSADV)* dialog box. A temporary file for the deposition contour display is listed in the ***Window*** menu / ***Build/Update Map*** option in the "Current Map Content" list as "SiteData [x] in [mapset y]." Click on ***Modify*** to change the symbol, symbol color, or data ranges for each symbol (see a description of the *Site Display Options* dialog box starting on page 8-6 for more information).

D. ***Show Dep[osition] Grid***: This option displays a grid of SiteData points, color coded for different levels of spray deposition. A temporary file for the deposition grid display is listed in the ***Window*** menu / ***Build/Update Map*** option in the "Current Map Content" list as "SiteData [x] in [mapset y]." Click on ***Modify*** to change the symbol, symbol color, or data ranges for each symbol (see a description of the *Site Display Options* dialog box starting on page 8-6 for more information).

E. ***Show Contour Legend***: This option displays a legend for the spray deposition contour lines below the "Spray Advisor (SMSADV)" palette. You can remove it by clicking on ***Hide Legend*** in the lower right corner of the legend.

F. ***Show Dep[osition] Legend***: This option displays a legend for the SiteData deposition grid points below the "Spray Advisor (SMSADV)" palette. You can remove it by clicking on ***Hide Legend*** in the lower right corner of the legend.

G. ***Clear Contours***: This option removes any currently drawn contour lines.

H. ***Clear Grid***: This option removes any currently drawn grid.

I. ***Print SMSADV Inputs***: This option sends SMSADV input information to the GypsES system default printer.

J. ***Exit Spray Advisor***: This option exits the ***Spray Advisor*** option. Upon exiting, GypsES asks you if you want to save either the spray contour lines (if displayed) as a Vector file or the spray deposition grid before closing the ***Spray Advisor*** function. In either case, click on ***Yes*** and a text entry window appears to type in the new filename. Click on ***No*** to exit without saving.

Appendix A: Standard Names List

The following table lists the Standard Names used by the GypsES system. Descriptions and explanations of each Standard Name as well as the menus in which it is used are included. If a Standard Name represents a file that is created by GypsES, it is designated.

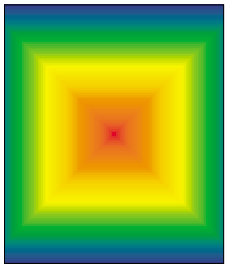
Standard Name	Description	Explanation	Reference Menu
CROWN_COND	Crown Condition	Raster layer used to determine Stand Condition.	Forest/Hazard
DEFHIST_YRn	Defoliation History for Year n (n=0-4); n = 0 for current year, 1 for previous, etc.	Raster layer used to determine Disturbance History.	Forest/Hazard
DEFOL_PRED	Predicted Defoliation	Raster layer calculated from Egg Mass Site Data. Also used with the Hazard layer to calculate Risk.	Survey/Suppression/ Defoliation Prediction Forest/Risk
DISTURB_HIST	Disturbance History	Raster layer calculated from Defoliation History, Drought and Other Disturbance layers.	Forest/Hazard
DROUGHT_YEARn	Drought for Year n (n=0-3); n = 0 for current year, 1 for previous, etc.	Raster layer used to determine Disturbance History.	Forest/Hazard
ELEVATION	Elevation	Raster layer where categories represent elevation (m). Used to estimate temperature over a landscape from a single temperature monitoring location.	Treatment/Phenology
Standard Name	**Description**	**Explanation**	**Reference Menu**

EM_PA_SURF_YR0	Egg Mass per Acre Surface Layer	Raster layer calculated from the current Egg Mass Site Data file (EM_SVSITES_YR0). Used in calculation of Defoliation Prediction.	Survey/Suppression/Defoliation Prediction
EM_PA_SURF_YR1	Previous Year's Egg Mass per Acre Surface Layer	Raster layer used in calculating the Egg Mass Difference layer. Usually linked from the previous year's Egg Mass Surface layer.	Treatment/Spray Blocks/Post-Treatment
EM_PACRE_DIFF	Egg Mass Difference Layer	Calculated at each cell as: EM_PA_SURF_YR0 - EM_PA_SURF_YR1	Treatment/Spray Blocks/Post-Treatment
EM_SVSITES_YR0	Egg Mass Site Data Layer	Site Data layer of Egg Mass information for the current year. Used in calculating the Egg Mass Surface layer.	Survey/Suppression
HAZARD_RATING	Hazard Rating Layer	Raster Layer calculated from the Vulnerability and Management Objective layers.	Forest/Hazard
MANAGE_OBJ	Management Objectives Layer	Raster layer whose categories are tied to the Management Objectives information in the Administrative Profile/Management Objectives screen (MAN_OBJ_DATA).	Forest/Hazard
MAN_OBJ_DATA	Database file which is tied to MANAGE_OBJ	Raster layer.	Edit/Administrative Profile
Standard Name	**Description**	**Explanation**	**Reference Menu**

OTHR_DIST_YRn	Other Disturbance for Year n (n=0-4)	Raster layers describing other disturbances: n = 0 for current year, 1 for previous year, etc.	Forest/Hazard
PHENOLOGY	Phenology Layer	Raster layer calculated from temperature and elevation data in which categories represent dates of estimated user-defined target events.	Treatment/Phenology
PHEN_GROUP	Grouped Phenology	Raster layer calculated from PHENOLOGY; groups phenology for a user-specified number of days so that categories represent a period of time rather than a single date.	Treatment/Phenology
RISK_ASSESS	Risk Assessment	Raster layer calculated from the Hazard and Defoliation Prediction layers.	Forest/Hazard
SILVICULTURE	Silvicultural Activity	Raster layer in which categories represent years in which silvicultural activity occurred. Used in calculating Disturbance History.	Forest/Hazard
SITE_FACTORS	Site Factors	Raster layer describing soil types. Used in calculating the Vulnerability layer.	Forest/Hazard
SPECIES_COMP	Species Composition	Raster layer which is linked to a stand database. Used only in conjunction with National Forest databases at this point.	Forest/Hazard
Standard Name	**Description**	**Explanation**	**Reference Menu**
SP_BLKS_VECT	Current Year's	Vector layer of spray	Treatment/Spray

	Spray Blocks	block polygons.	Blocks
SP_BLKS_DATA	Database for Spray Blocks		Treatment/Spray Blocks/Data Entry
SP_SUSCEPT	Species Susceptibility	Raster layer representing Species Susceptibility to gypsy moth. Used in calculation of Susceptibility.	Forest/Hazard
STAND_COND	Stand Condition	Raster layer calculated from the Crown Condition and Stocking layers. Used to calculate Vulnerability.	Forest/Hazard
STAND_ESTAB	Date of Stand Establishment	Raster layer with categories representing the year a stand was established. Used in calculating Stand Age, which is used in calculating Susceptibility.	Forest/Hazard
STAND_MAP	Stand Map	Raster layer in which categories represent stand numbers which are tied to a stand database. Used only with National Forest Databases.	Forest/Damage Prediction
STOCKING	Stocking	Raster layer representing tree density. Used in calculating Stand Condition.	Forest/Hazard
SUSCEPTIBILITY	Susceptibility	Raster layer calculated from Species Susceptibility and Stand Age. Used in calculating Vulnerability.	Forest/Hazard
Standard Name	**Description**	**Explanation**	**Reference Menu**
TRAP_SITE_DATA	Trap Site Data	Site Data layer used for traps in the Eradication	Survey/Eradication

		Module.	
TRAP_SITES_YRn	Trap Site Data for nth Previous Year (n=1-4)	Usually linked from the previous year's eradication file. Used in displaying history information.	Survey/Eradication
VULNERABILITY	Vulnerability	Raster layer calculated from Susceptibility, Disturbance History, Site Factors and Stand Condition. Used in calculating Hazard Rating.	Forest/Hazard



Appendix B: Color Values Chart

Each square in the color chart below lists the values (from top to bottom) of red, green, and blue to create the color illustrated. Sixteen colors are available; you can select and/or customize these using the ***Edit*** menu / ***Administrative Profile*** option/***User Profile*** option / ***Global*** dialog box / ***Set Color Selection*** option described on page 7-42.

255 255 255	255 255 175	255 255 125	255 255 75	255 255 0	255 175 255	255 175 175	255 175 125	255 175 75	255 175 0	255 125 255	255 125 175
255 125 125	255 125 75	255 125 0	255 75 255	255 75 175	255 75 125	255 75 75	255 75 0	255 0 255	255 0 175	255 0 125	255 0 75
255 0 0	175 255 255	175 255 175	175 255 125	175 255 75	175 255 0	175 175 255	175 175 175	175 175 125	175 175 75	175 175 0	175 125 255
175 125 175	175 125 125	175 125 75	175 125 0	175 75 255	175 75 175	175 75 125	175 75 75	175 75 0	175 0 255	175 0 175	175 0 125
175 0 75	175 0 0	125 255 255	125 255 175	125 255 125	125 255 75	125 255 0	125 175 255	125 175 175	125 175 125	125 175 75	125 175 0
125 125 255	125 125 175	125 125 125	125 125 75	125 125 0	125 75 255	125 75 175	125 75 125	125 75 75	125 75 0	125 0 255	125 0 175
125 0 125	125 0 75	125 0 0	75 255 255	75 255 175	75 255 125	75 255 75	75 255 0	75 175 255	75 175 175	75 175 125	75 175 75
75 175 0	75 125 255	75 125 175	75 125 125	75 125 75	75 125 0	75 75 255	75 75 175	75 75 125	75 75 75	75 75 0	75 0 255
75 0 175	75 0 125	75 0 75	75 0 0	0 255 255	0 255 175	0 255 125	0 255 75	0 255 0	0 175 255	0 175 175	0 175 125
0 175 75	0 175 0	0 125 255	0 125 175	0 125 125	0 125 75	0 125 0	0 75 255	0 75 175	0 75 125	0 75 75	0 75 0
0 0 255	0 0 175	0 0 125	0 0 75	0 0 0	Red Green Blue	Red, Green, Blue color values for selecting colors in GypsES					

Appendix C: References

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Appendix D: Credits and Acknowledgments

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GRASS:

A product of the U.S. Army Corps of Engineers Construction Engineering Research Laboratory (USACERL). GypsES utilizes many GRASS file formats and the GRASS file organization for GIS data. GypsES also uses GRASS executable programs for file manipulation.

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Glossary

Antecedent: The category value or map layer used to calculate the currently displayed/selected category value. Antecedent values are retrieved from the map layers used to create the current map layer and can be displayed using the ***Antecedents*** button in GypsES.

Back-Up: A copy of (a) files for sake keeping in case the original file is lost or damaged. Back-up copies should always be stored away from the original computer.

Category Description: A data value or text description associated with a category number.

Category Number: An integer value associated with a geographic object. For Raster files, the "object" is a cell. For Vector files, the "object" may be a polygon or a feature line. Associated with the category number is a line of text or a data value (the category description).

Cell: A square within a Raster map layer. Each cell represents an area on the surface of the Earth and all cells are arranged in rows and columns.

Closed Polygon: A polygon that is bounded by lines joined ONLY at nodes.

Composite Map: A special type of map layer that may contain multiple map layers, labels, and other displayed attributes, including grids and scales.

Contours: After the FSCBG model is run, GypsES can display the spray deposition results for an area by use of color-coded contour lines.

Current (Output) Mapset: The selected mapset in the location in which you are working. All files created will be stored in this mapset. You can only modify files from this mapset.

Degenerate Line: A line whose individual points (and associated segments) are all within the node consolidation distance of each other.

Deposition Grid: A grid of SiteData points, color coded by spray deposition levels.

DGPS: Refers to Differential Global Positioning System, a GPS system that uses a ground station or satellite signal to correct scrambled satellite signals so that the pilot knows where the plane is while spraying.

Dialog Box: A box on the computer screen that explains information and/or prompts you to choose options for carrying out a function in GypsES. Dialog boxes can be moved around the screen, but you cannot continue with the GypsES session until the dialog box prompts have been completed and the box is closed.

Feature Line: A line that represents a linear feature, such as a road, power line, river, etc.

Font: A set of printable images specified by a collection of attributes.

FSCBG: An aerial spray deposit and drift model; its acronym comes from a combination of the agency responsible for funding the model (USDA **F**orest **S**ervice) and the names of the primary developers (**C**ramer, **B**arry, and **G**rim).

Full Screen Mode: A window display mode where the current Work Window is displayed on the entire creen; other Windows are only visible when they are made the current Window.

Full View: A view of the entire location.

Geographic Coordinate: A pair of numbers that identifies a specific point on the Earth.

Geographic Information System (GIS): A system for preparing, presenting and interpreting data that pertain to the surface of the Earth. GypsES uses a version of GIS called GRASS.

Geographic Layer: A single map file representing specific data. A geographic layer is much like a conventional map, a flat drawing indicating the nature, form, and relative position and size of selected conditions, but a geographic layer displays only one characteristic. A geographic layer can be stored in Raster, Vector, or SiteData format.

Geographic View: Either the entire location or a specified portion of a location that you have defined for viewing.

GPS: Refers to Global Positioning System, a navigational tool used by pilots to keep track of where the plane is over the Earth's surface; satellite signals are scrambled and therefore uncorrected.

Graphical User Interface (GUI): The communication link between you and a software program. You decide what to do and communicate this to the computer by moving the mouse pointer (arrow) over the option you want on the computer screen and clicking once with the left mouse button.

GRASS: This is the GIS used by GypsES; it is a public-domain GIS system under development by the U.S. Army Construction Engineering Research Laboratories (USACERL).

Grid: A network of uniformly spaced lines drawn over a map layer to aid you in locating positions.

Hazard (Rating): The probability that forest conditions exist that would result in damage if [gypsy moth] defoliation occurred.

Iconify: To reduce the contents of a window to a symbolic representation (icon) located at the bottom of the screen. Once a window is iconified, double click on the icon to restore the window.

Image Backdrop: An image that is drawn in the background of a Work Window to provide a reference point (i.e., a 7.5-minute quadrangle topographic map may be added to help you locate points and areas within the location).

Label: Labels can have text, numbers, or both, and are used to display information about polygons or feature lines within a map layer. Labels can also be used in a map layer to label points of interest.

Layer: A logical collection of mapped information according to theme for a given location.

Legend: The part of the map that defines the meaning of the symbols, colors, or both, that are used to represent map layer elements.

Line: A line is defined by two or more points; lines consist of segments connected by points.

Location: Geographically, a location represents a rectangular region on the Earth's surface, defined by the UTM coordinates of the four sides of the rectangle. You can work with any number of map layers within a given location.

Map Layer: See **Layer**. Map layers may be of four types: Raster, Vector, SiteData, or Composite.

Mapset: A working directory within a location. The PERMANENT mapset for every location contains static data (data that is not likely to change), such as elevation, soils, roads, waterways, etc. Other mapsets contain more dynamic data and can be set up by user, year, etc.

Mask: A special kind of data layer that is used as a "cookie cutter" to display only a selected portion of a location (the rest of the location appears in black). When a mask is activated, not only is the selected portion of the map the only portion displayed, it is also the only portion used to perform calculations.

Menu: A list or series of options in a computer software program from which you select the action you want.

Node: A node is the first or last point of a line.

Node Consolidation: The consolidation of nodes that are within the node consolidation distance of each other.

Node Consolidation Distance: The node consolidation distance is a linear distance used by the Vector functions in MapEdit to determine when two nodes are close enough that they should be treated as the same node. When a Vector layer is first loaded into MapEdit, nodes are consolidated if they are within this distance. This helps close polygons, but if the distance is too large, you may have a loss of precision. The proper distance to choose must be determined for each layer, usually by experimentation.

Open (Unclosed) Polygon: A polygon bounded by lines that end in a node with no other lines attached.

Output Mapset: See **Current (Output) Mapset.**

Overlay: An overlay allows you to display more than one Raster map layer on the screen at a time. Once the first Raster layer is drawn, the next layers will be drawn ONLY in those areas where the first map layer was coded as having "no data."

Pixel: The computer screen, like a Raster map layer, is divided up into very small cells called pixels. *Pixel* is an acronym for Picture Element.

Point: A point represents a specific location on the surface of the Earth. It is defined by a geographic coordinate.

Polygon: A polygon is an area on the surface of the Earth defined by one or more lines. For the polygon to be closed, the lines must attach to each other at their end points (nodes) and must NOT intersect anywhere else.

Polygon Line: A line used to define a closed area on the surface of the Earth.

Raster: The raster (cell) is the basic unit used by the GRASS GIS when working with Raster map layers. It represents a square on the surface of the Earth; the dimension of this square is called the resolution.

Raster Map Layer: This is a map made up of a regular array of cells (representing rows and columns of the display).

Reclass: This is a new Raster map layer based on the association of categories from an existing Raster map layer to new category values. The new Raster layer is stored as a reference to the original layer with references between the new and old categories.

Record: A set of related data in a data table; each record contains all defined data fields.

Resolution: This is the dimension of a raster (cell). Resolution represents a measure of image sharpness.

Resultant: A Raster map layer that results from the combination of input (**antecedent**) Raster map layers.

Risk: The probability that stand damage will occur due to defoliation.

Scale: A representation of the relationship between the size of elements on a map and the real world.

Segment: A segment is a part of a line that falls between two points. A segment is always a straight line.

Silviculture: The art and science of tending forest crops; this includes any forestry activity which modifies existing forest conditions, i.e., thinning, clearcutting, spraying, etc.

SiteData Map Layer: A map layer that has data values associated with points.

Stand: A forested area that is managed as a unique entity; stands may be delineated by tree species, age, forest structure, disturbance history, or management objectives, among other criteria.

Standard Name: A unique filename that is used for specific internal calculations by GypsES; its name does not change. If a map layer file is linked to a Standard Name, this file is used by GypsES in performing calculations**.**

Surface Map Layer: A surface map layer is a Raster layer created from a SiteData layer by assigning Raster category values that correspond to SiteData values at or near the Raster cell.

Susceptibility: The likelihood that a forest stand will be defoliated.

Tile Mode: A Work Window display mode where each of the four Work Windows are simultaneously displayed on one quarter of the work area and the current Window has a yellow outline around it.

US Geological Survey DLG: Refers to US Geological Survey Digital Line Graphs, which are digital representations of cartographic information. Features include roads, hydrology, and rail lines; these graphs are free via downloading from the Internet.

UTM (Universal Transverse Mercator) Coordinates: UTM coordinates are often referred to as "Northing" and "Easting." They represent the distance north and east, respectively (in meters) from the corners of a series of rectangular zones on the face of the Earth.

Vector Map Layer: A map layer that contains lines (feature and polygon).

View File: This is a file that saves a specific geographic view for you; the view file may be retrieved later within GypsES.

Volatile Fraction: The fraction of spray material that can evaporate; values range from 0.0 to 1.0.

Vulnerability: The likelihood of mortality given that defoliation has occurred.

Zoom: The capability for enlarging or reducing the scale of the map layer being displayed.

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