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North Central Research Station

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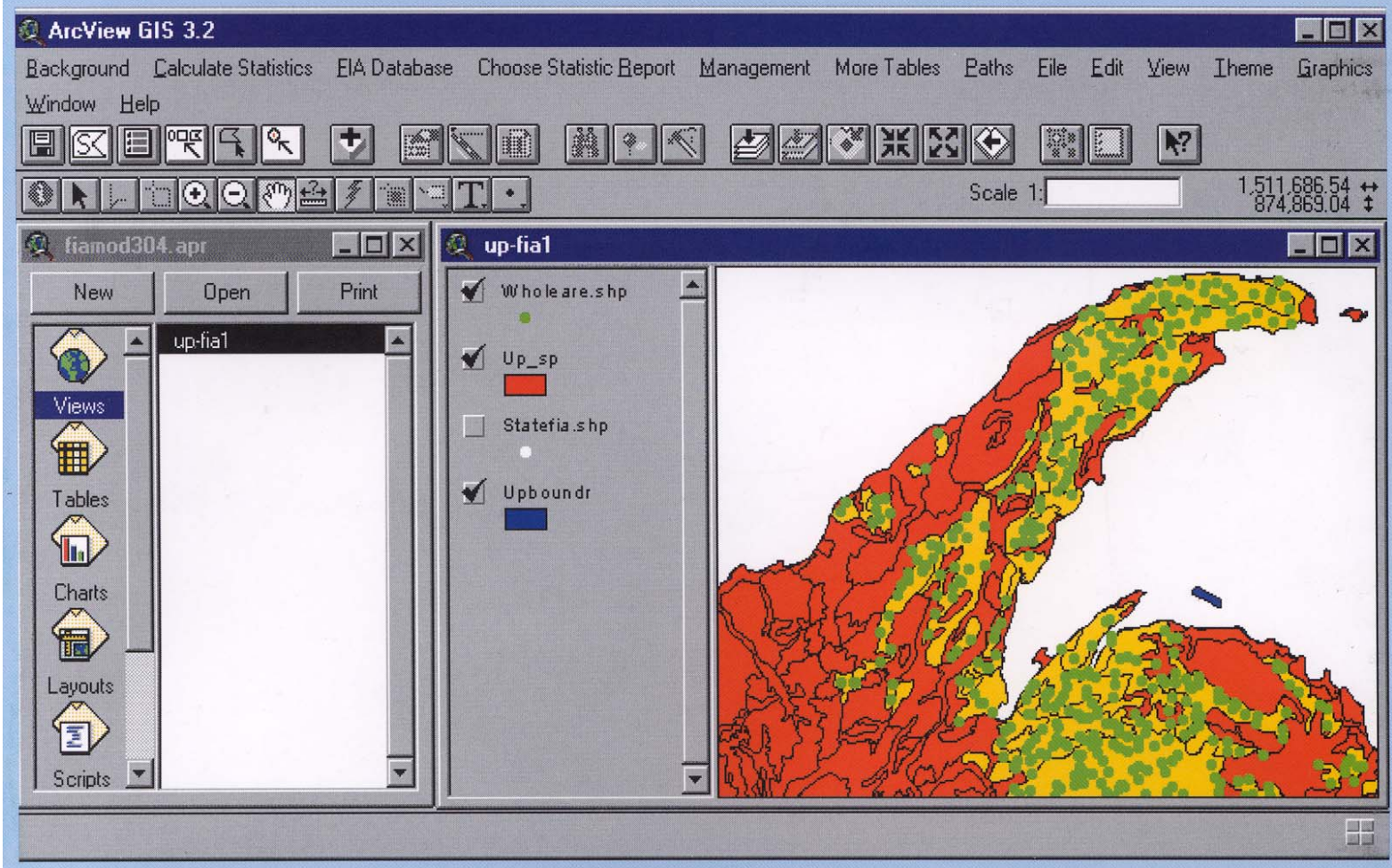
FIAMODEL: Users Guide Version 3.0

Scott A. Pugh, David D. Reed, Kurt S. Pregitzer, and Patrick D. Miles



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SUMMARY

FIAMODEL is a geographic information system (GIS) program that summarizes Forest Inventory and Analysis (FIA, USDA Forest Service) data. The model runsIfrom a project file in ArcView (ESRI 1997). ARC/INFO coverages, ArcView shapefiles, and lookup tables also contribute to the model. Current volumes, annual growth, annual mortality, annual net growth, annual removal, and annual net change of growing-stock can be summarized for any area within a particular State of interest (e.g., Wisconsin). County borders or FIA survey units (Hansen et al. 1992) do not confine users of the model. The model creates tables for single plots or selected combinations of plots. Plots in any geographic region can be selected. These regions can be selected manually via heads-up-digitizing or by using overlays of digital map layers such as soil coverages. The digital map layers can be displayed in conjunction with the selected plots. Selections can be limited to reserved timberland or timberland areas. Timberland is the standard land use class represented in the U.S. Department of Agriculture, Forest Service, Forest Inventory and Analysis (FIA) statistics (e.g., Thompson and Sheffield 1997). Selecting plots in specific forest cover types and/or ownership classes can narrow selections even further. In fact, selections can be narrowed using almost any of the FIA plot variables. Inventory summary tables can be produced for all or only selected species.

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FIAMODEL

Users Guide Version 3.0

Scott A. Pugh, David D. Reed, Kurt S. Pregitzer, and Patrick D. Miles

BEFORE YOU BEGIN

The FIAMODEL Users Guide contains detailed information about using geographic information system (GIS) techniques to derive timberland volume and structural information from Forest Inventory and Analysis (FIA) data. Any updated versions of FIAMODEL can be found at the Web address http://forestry.mtu.edu/data/fiamodel/.

System Requirements

Microsoft Windows 95 or newer; Microsoft Windows NT 4.0

ArcView 3.1 or 3.2 (ESRI 1997)

Memory:

The amount of hard disk space required depends upon the amount of data associated with the State in question. For example, the model for Minnesota requires approximately 52 MB of storage space. This does not count the additional space required when running the model. The model files will probably never require more than 60 MB of space. This does not include space for temporary files created when running the model. Temporary files will probably never occupy more than an additional 80 MB of space. ArcView and the model will run more efficiently if the appropriate amount of virtual memory is allocated. We recommend that the maximum amount of virtual memory be set to at least 200 MB. This amount is set in the Control Panel\System Properties\Virtual Memory. It means that the user needs at least 200 MB of hard disk space free in addition to the space required for the model files. ArcView recommends at least 32 MB of RAM. However, this is really insufficient when large areas are selected within the model. More RAM and faster processors will decrease the processing time of the model. As a gauge, remember that a 450 MHz machine with 132 MB of RAM takes about 7 minutes to calculate statistics for all 12,447 timberland plots in Minnesota, the State with the most plots.

Installation

There are various ways of installing FIAMODEL. Your choice will depend on the amount of space you have on your hard drive(s). All of the model files can be saved to the hard drive(s), or part of the model files may be saved to a hard drive and the rest left on the CD.

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Installing the entire program and database on a hard drive

a. Copy the FIAMODEL files. Choose Explorer or My Computer to copy the directory with all the FIAMODEL files to a hard drive with enough space. This directory is identified by the State abbreviation plus the inventory year and "fia" (e.g., the Michigan model files would be located in the "mi93fia" directory). The directory can be a primary directory on the hard drive, or it can be copied into an existing directory on the hard drive.

b. Remove the Read-only status. Remove the read-only file status from the directory that you just copied to the hard drive. Left click on the hard drive directory. Next, right click and choose Properties. Now remove the check on the Read-only status box. Next, remove the read-only file status from the subdirectory "amldef." Remove the read-only file status from the ArcView project file (e.g., mi93fia.apr). It is not necessary to remove the read-only file status from any more directories or files unless they are manipulated outside of FIAMODEL.

c. Create a FIAMODEL icon. Connect the FIAMODEL project file to the windows environment. Select the Start icon in the lower left corner of the screen and choose Settings and Taskbar & Start Menu.... Within the Taskbar Properties pop-up window, click the mouse on Start Menu Programs and choose Add. Choose Browse and select All Files for Files of Type. Maneuver to the "amldef" subdirectory within the main FIAMODEL directory and select the ArcView project file (e.g., mi93fia.apr). Within the Select Program Folder pop-up window, click the mouse on Desktop (under the heading "Select folder to place shortcut in:") and choose Next. Within the Select a Title for the Program pop-up window, type a name for the FIAMODEL icon and choose Finish. Within the Taskbar Properties pop-up window, select OK. The icon will now appear on the main window.

d. Initially Run FIAMODEL. Double clicking the icon will initiate the model. If ArcView is already running, you can initiate the model by opening the project file. In the latter case, activate the project window (see figure on page 4, ArcView with view document) and choose File. Now choose the Open Project item. Choose the project file in the "amldef" directory and click OK. The first time the model runs, it will prompt you for the path of the first working directory, the "amldef" directory for the State in question (e.g., using the D: drive and the Michigan model could result in a path like the following: d:\mi93fia\amldef). This directory contains lookup tables, the State boundary coverage, and associated attribute tables. Next, the program will prompt you for the path of the second working directory, the "fiapt" directory associated with the State in question (e.g., using the D: drive and the Michigan model could result in a path like the following: d:\mi93fia\fiapt). This directory contains the core lookup tables and the FIA point coverage. The model will shut down if you specify an invalid path. If this happens, run the model again and reenter the paths. The model checks to see if the directory paths exist and it tests if the "amldef" directory is writeable. Furthermore, the model checks to see whether each working directory contains an info subdirectory. If these conditions are met, then the model continues with the start-up. The model will open the boundary and plot coverages as themes. The model will fail and shut down if either the boundary or plot coverage is missing. In this case, place the correct coverages in the working directories and run the model again.

Installing the main program ("amldef" directory) on a hard drive and putting the database ("fiapt" directory) on another hard drive or leaving the database on the CD

a. Copy the "amldef" directory to a hard drive. The "amldef" directory contains the main program files: ArcView project file, the State boundary coverage, lookup tables, and an output directory for model output tables. It takes up less room than the "fiapt" directory and should be on a local hard drive for better performance. Use Explorer or My Computer and copy only the "amldef" directory to a hard drive with sufficient room. The "amldef" directory can be placed anywhere on the hard drive. It should be in a directory named with the State abbreviation plus the inventory year and "aml" to avoid confusion with models of other States. (Create the appropriate directory if it does not exist. For example, using the D: drive and the Michigan model could result in a path like the following: d:\mi93aml.) Remove the read-only file status from the "amldef" directory, its parent directories, and the project file within the "amldef" directory (see page 2, Remove the Read-only status). The model cannot run if the "amldef" directory is left on the CD because of the read-only nature of the CD.

b. Copy the "fiapt" directory to another local hard drive or leave it on the CD. As previously mentioned, the "fiapt" directory contains the core lookup tables and the FIA point coverage. This directory stores more information, so it may be necessary to place it on a different hard drive or access it from the CD. Only access it from the CD if it cannot fit on any local hard drive. The program will run faster if the "fiapt" directory is located on a local hard drive. Use Explorer or My Computer to copy the directory to another local hard drive. This directory can be placed anywhere. However, it should be placed within a directory named with the State abbreviation plus the inventory year and "pt" to avoid confusion (e.g., using the D: drive and the Michigan model could result in a path like the following: d:\mi93pt). It is not necessary to change the read-only file status of the "fiapt" directory and its contents unless the directory and its contents are manipulated outside of FIAMODEL. If the directory will be referenced from the CD, then leave the CD in the CD reader when running the model. The read-only file status of the "fiapt" directory cannot be changed if it resides on the CD.

c. Create an icon and run the model. As previously described on page 2, create a desktop icon for FIAMODEL and set the working directory paths during the initial run.

Changing the Working Directory Paths

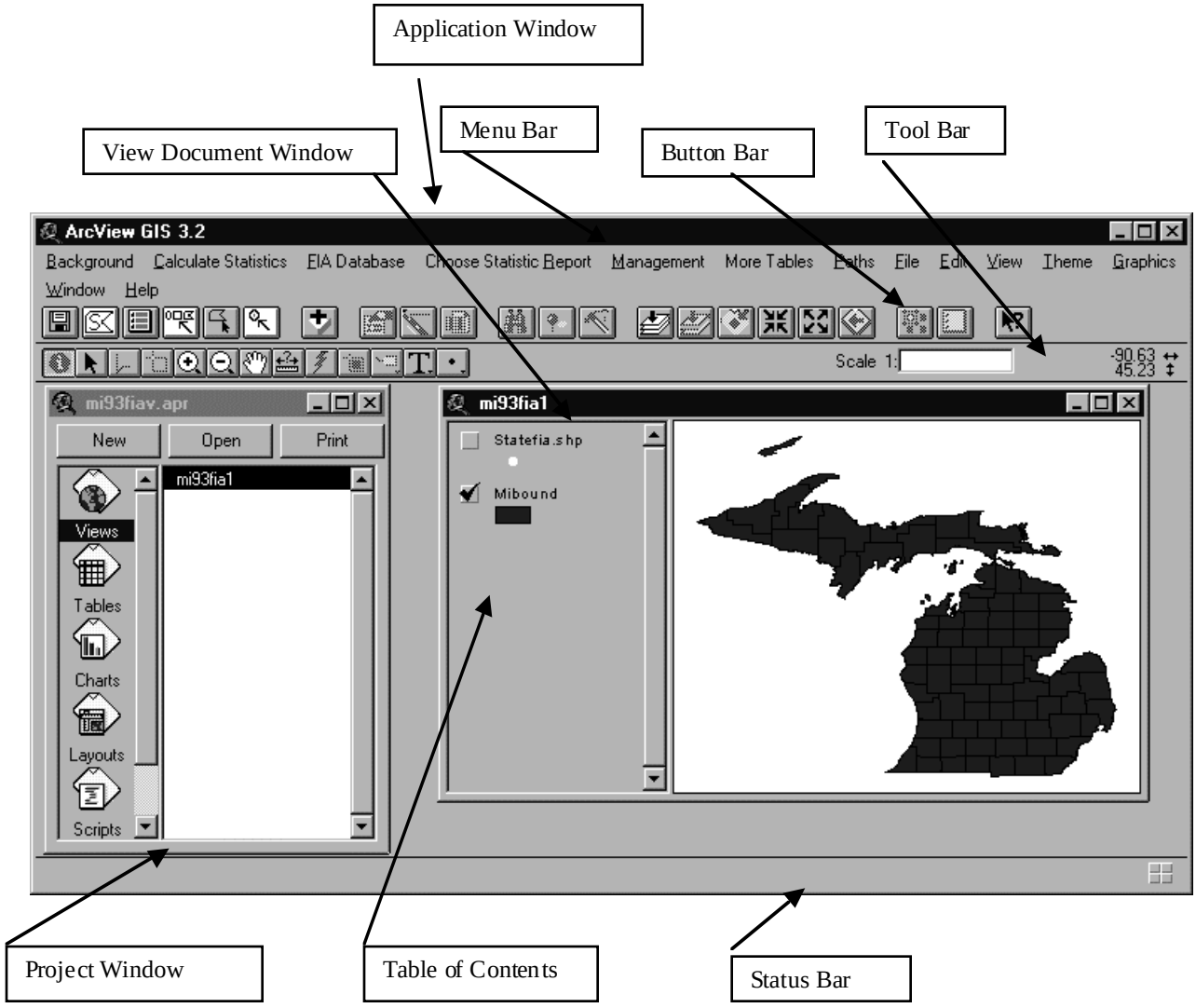
You may want to change the directory paths for various reasons. For example, you may want to move the working directories and their contents to a new location with more space. Or, you may want to keep a copy of the working directories and their contents in the current location, but run the model using the working directories in a new location. Whatever the case may be, two ways of changing the working directory paths should accommodate most situations. First, the working directory paths can be changed when the model is not running. This is done by moving the working directories to a new location. In this case, the model will shut down automatically after the next start-up because it cannot find the working directory files. After another start-up, the model will prompt the user for the new directory paths. Subsequent start-ups will not require any further prompts. The second way involves specifying the new directory paths while the model is running and then moving or copying the working directories and their contents before restarting the model. The model will know the new directory paths upon start-up and you will not have to enter them again. Specify new directory paths while the model is running with the

Paths menu associated with the view document (see page 11). Remember that the ArcView project file is located in the "amldef" directory. If the project file is moved, then the shortcut properties for the FIAMODEL icon will have to be changed. A right mouse button click on the icon will reveal the Properties item. Select this item and then select Shortcut. Change the Target and Start in paths to the new locations.

GETTING STARTED

Assuming the model has been started and the working directory paths have been specified, a message box will pop up requiring a Current Land Use Class Selection. Any further reselections will be from the chosen land use class. A view document will appear on the screen with accompanying menus, buttons, and tools (see figure below). Several of the menus and buttons are unique features of the model and the rest are native to ArcView. The first seven menus are unique features of the model. The help menu also has an item, About FIA Model, which displays information about the model. Buttons two through six inclusive are also unique to the model.

ArcView with view document

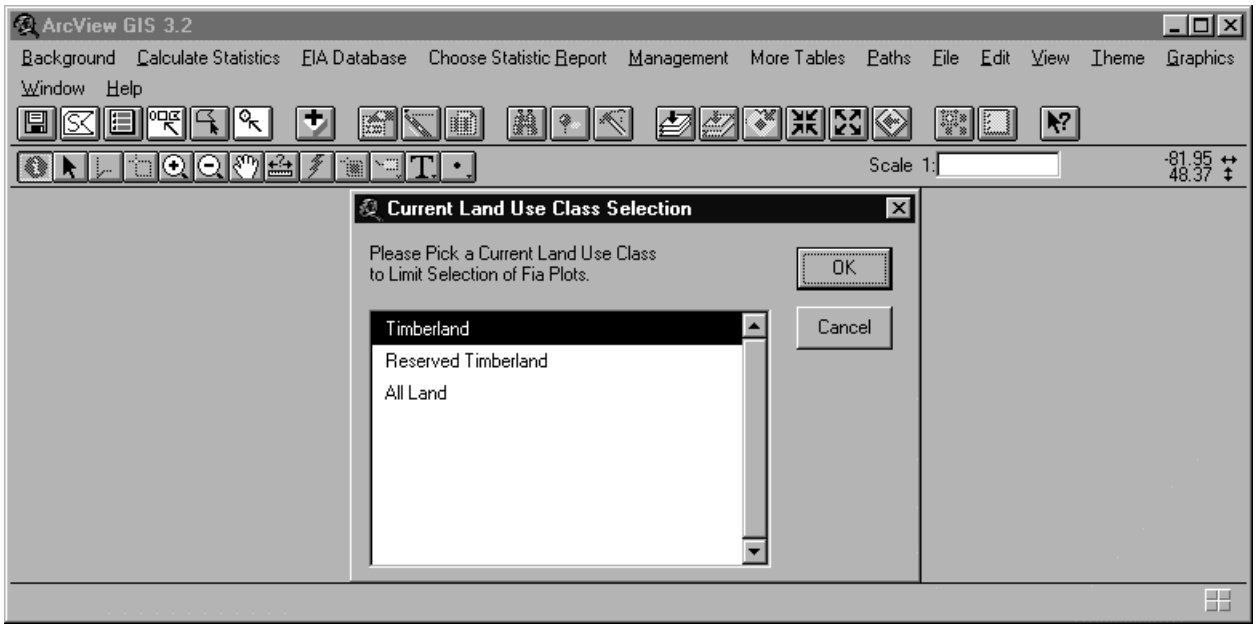


MENUS, ITEMS, BUTTONS, AND DIALOGS

The model structure is very autonomous, allowing many different FIA plot selection scenarios. The features of this model can be chosen in many different orders and used in conjunction with the native ArcView features. However, take care to choose the features in a logical manner. In most cases, the model will alert you when you have chosen an illogical order. The features unique to the model will be described in detail. Read the following descriptions carefully, making sure to understand what each item and button does before starting the exercises in the Tutorial section. The buttons and one of the items invoke dialogs that are also presented here.

Background

Sets up the view document.



Show Boundary: Allows the user to restart the model with a new view document. A warning message ("Choose YES to start over with a new view document.") appears prior to the Current Land Use Class Selection. This message allows you to cancel the new view document. If the model is restarted, then the existing view and its themes are removed. Next, a Current Land Use Class Selection must be made. The State and county boundaries are displayed with the boundary theme. The statefia theme is added to the view but it is not checked as visible. The statefia theme has all of the FIA plots that meet the Current Land Use Class Selection criteria.

Calculate Statistics

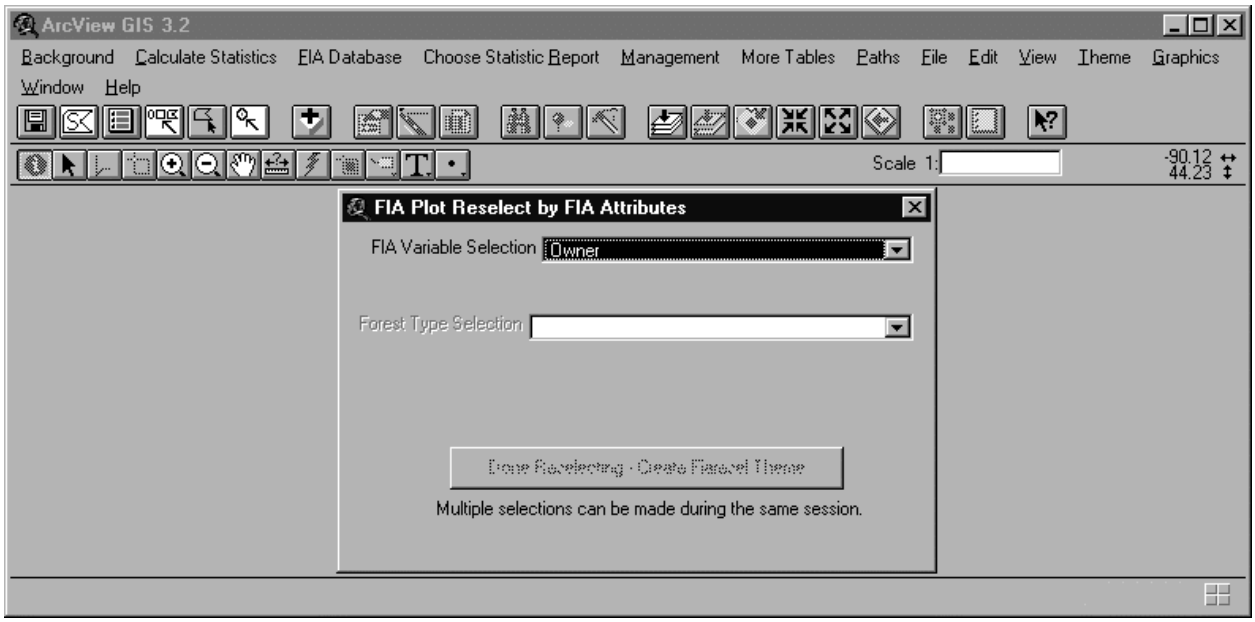
Calculates forest inventory variables that can be displayed in tables chosen within the Choose Statistic Report menu.

Run Wholeare Calculations: Calculates the current volume, annual growth, annual mortality, annual net growth, annual removal, and annual net change for the plots (all species combined) in the wholeare theme (see FIAMODEL Variable Formulas and Conditions on page 34). The wholeare theme is usually created in the initial plot selection using the select model buttons and their associated dialogs, which are presented later. Trees/acre by species are also calculated (FIAMODEL Variable Formulas and Conditions). The results of these calculations can be displayed using the Choose Statistic Report menu. A warning message will appear if there are no trees/acre data for the selected plots.

Run Fiaresel Calculations: Calculates the current volume, annual growth, annual mortality, annual net growth, annual removal, and annual net change for the plots (all species combined) in the fiaresel theme. The fiaresel theme is usually created in a reselection of plots from the wholeare theme. Plots within the wholeare theme are selected based upon chosen values of FIA plot variables (e.g., land ownership and/or forest cover type) and the result is the fiaresel theme. This is done in the FIA Database menu. Trees/acre by species are also calculated for the fiaresel theme. The results of these calculations can be displayed using the Choose Statistic Report menu. A warning message will appear if there are no trees/acre data for the selected plots.

FIA Database

Selects plots from the wholeare or statefia themes based upon chosen values of FIA plot variables and then creates the fiaresel theme with the selected plots.



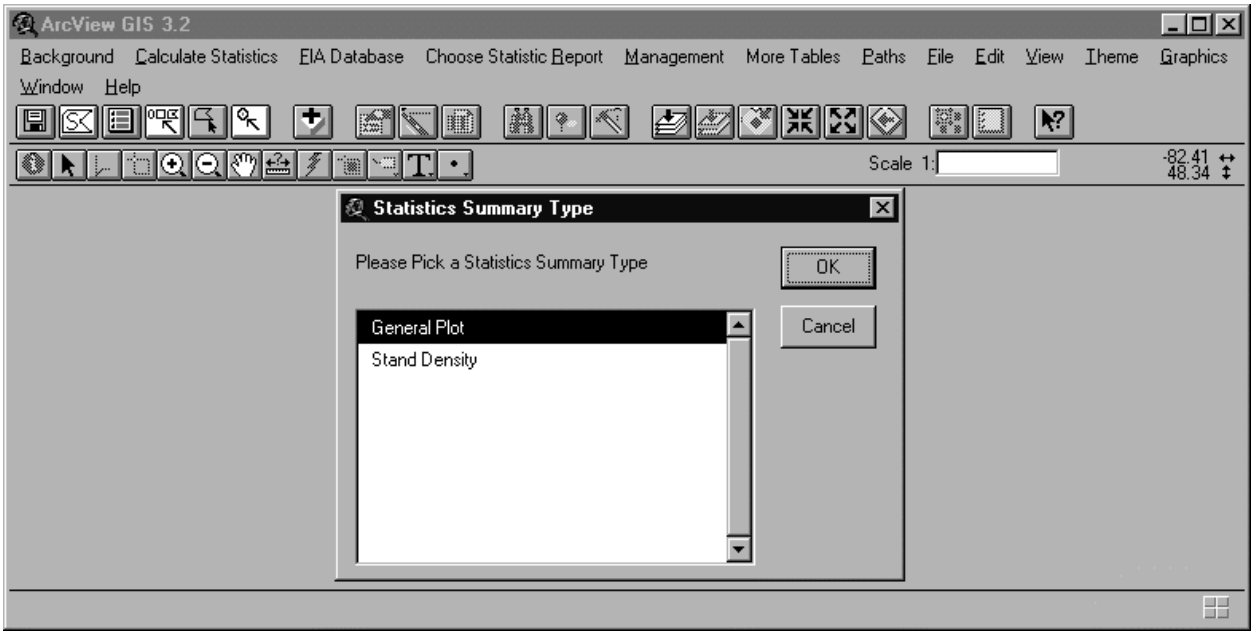
Reselect Based Upon FIA Attributes: If the wholeare theme has not been created, then selections are made from the statefia theme. The statefia theme has all of the plots that met the Current Land Use Class Selection criteria set when the model started or after initiating the Show Boundary item in the Background menu. Usually, the fiaresel theme is created from a selection of the wholeare theme plots.

FIA Plot Reselect by FIA Attributes: Plots within the wholeare or statefia theme are selected and the fiaresel theme is created from these selections using the FIA Plot Reselect by FIA Attributes dialog. This dialog pops up when you choose Reselect Based Upon FIA Attributes. Select plots from the wholeare or statefia themes based upon the variable you chose under FIA Variable Selection. Most of the FIA plot variables are available as selection criteria. You can find definitions of the plot variables in The Eastwide Forest Inventory Data Base: Users Manual (Hansen et al. 1992). The manual can be found on the Web (www.srsfia.usfs.msstate.edu/ewman.htm). Multiple selections can be made in the same dialog. For example, you can add a forest type after selecting an ownership type. The FIA Reselection Type window permits different selection types (pops up after a FIA Variable Selection). The choices are New, Add, Select From Existing Set, and Add if Not Selected; Remove if Selected. In the prior example, you could have chosen New for the ownership query, which was the first query. Then, you could have chosen Add for the forest type query. The resulting selection would have included plots with the chosen ownership type or the chosen forest type. If you choose a variable other than forest type, then you can select a variable value or type from a list of those available in the Field Value Select window (pops up after choosing owner in the FIA Variable

Selection choice box). If forest type is chosen, then the available current and old forest types are shown in the Available Forest Types window. Old forest cover type codes are used if corresponding plots were previously included in a forested land use class, but are not currently included in a forested land use class. Plots like these, which previously belonged to a forested land use class like timberland or reserved timberland, can contribute to any of the forest variables except current volume. After the window is displayed, the Forest Type Selection choice box permits you to select one available forest type. After you select a value or class, the Done Reselecting – Create Fiaresel Theme button is enabled and you can click it to create the fiaresel theme. Or, you can make another selection from wholeare or statefia.

Choose Statistic Report

Displays summary tables of forest inventory variables calculated using the Calculate Statistics menu.



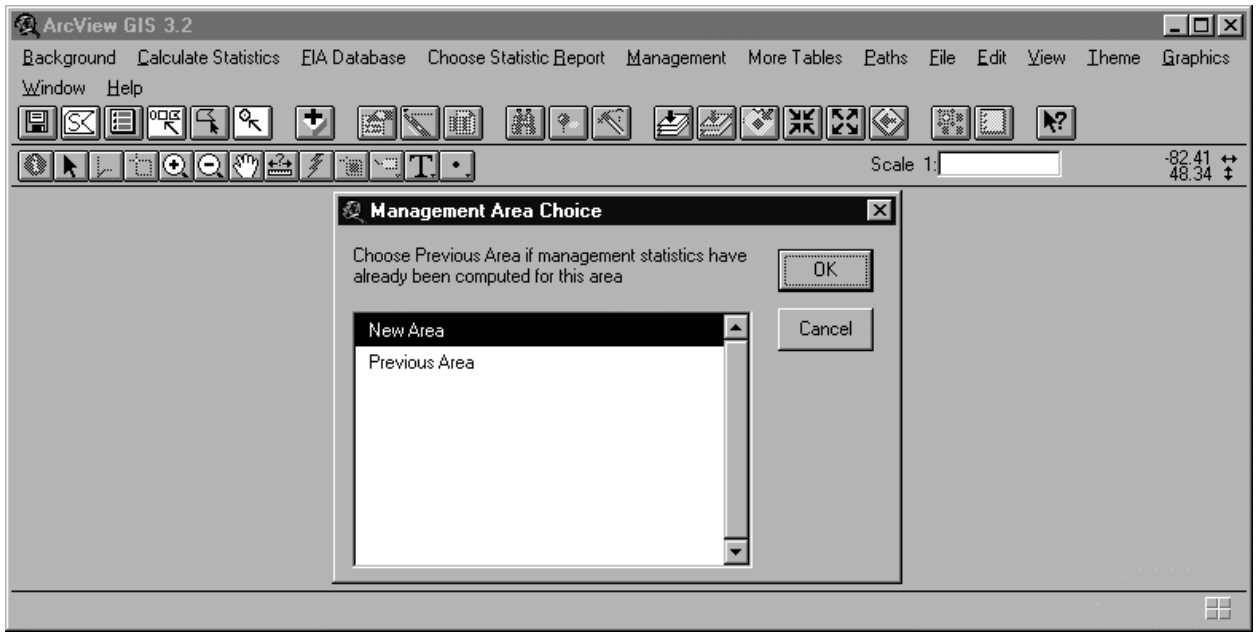
Whole Area Stats: Displays the resulting summary tables (General Plot Summary or Stand Density Summary) for the wholeare theme.

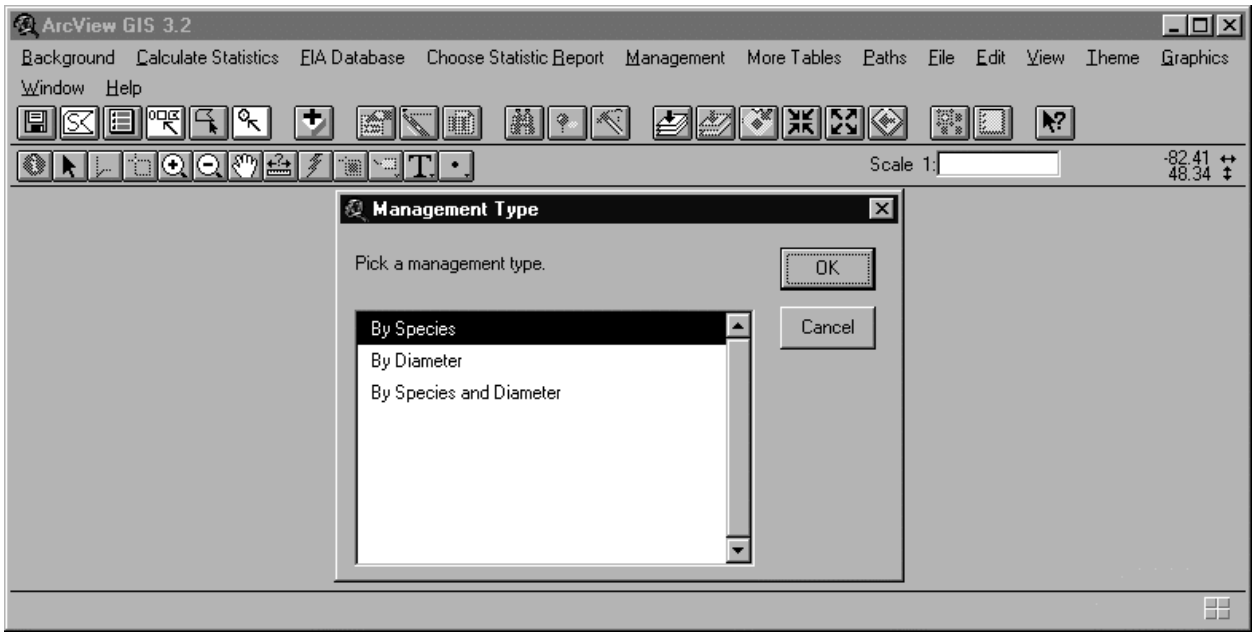
General Plot: Displays the current volume, annual growth, annual mortality, annual net growth, annual removal, and annual net change for the plots (all species combined). When available, standard errors are also expressed (see FIAMODEL Variable Formulas and Conditions). The acreage expressed in this table represents the selected plots. If timberland is selected as the land use class, then each of these plots may either be currently or previously timberland. The plots that were previously timberland are required to estimate annual variables. This also applies to acreage expressed in any of the other tables in this model.

Stand Density: Reports the combined species stand table for the area-weighted average number of trees/acre (rounded to nearest whole number) by species and diameter size class for the plots. In addition, the average basal area and volume per acre are provided. Basal area and volume per acre are area-weighted averages (see FIAMODEL Variable Formulas and Conditions). Volume should only be for live growing-stock trees in the 6-inch d.b.h. class or larger because the netcfvl variable in The Eastwide Forest Inventory Data Base: Users Manual (Hansen et al. 1992) is suppose to be 0 for trees in smaller d.b.h. classes.

FIA Reselect Area Stats: Displays the resulting stand tables (General Plot Summary or Stand Density Summary) for the fiaresel theme.

Management — Displays summary tables of forest inventory variables by species, diameter, or species and diameter.





Whole Area: Allows the user to obtain three different summary tables (By Species, By Diameter, or By Species & Diameter) for the wholeare theme.

New Area: Must be selected first in the Management Area Choice window to view a summary table for a newly created wholeare theme. A warning message appears if there is no species information available for the selected plots.

Previous Area: May be chosen after the New Area selection in the Management Area Choice window to view additional summary tables for the wholeare theme.

By Species: Displays the summary table listing the current volume, annual growth, annual mortality, annual net growth, annual removal, and annual net change by species.

By Diameter: Displays the summary table listing the current volume, annual growth, annual mortality, annual net growth, annual removal, and annual net change by 2-inch diameter class for all the species combined. Current volume, annual mortality, and annual removal should always be 0 for d.b.h. classes smaller than 6 inches because the netcfvl variable in the Eastwide Data Base should equal 0 for these classes.

By Species & Diameter: Displays the summary table listing the current volume, annual growth, annual mortality, annual net growth, annual removal, and annual net change by 2-inch diameter class for a single or group of selected species.

FIA Reselect Area: Allows the user to obtain the three summary tables (By Species, By Diameter, or By Species & Diameter) for the fiaresel theme.

New Area: Must be selected first in the Management Area Choice window to view a summary table for a newly created fiaresel theme. A warning message appears if there is no species information available for the selected plots.

Previous Area: May be chosen after the New Area selection in the Management Area Choice window to view additional summary tables for the fiaresel theme.

More Tables — Displays summary tables of forest inventory variables by forest type.

Wholeare Stats by Forest Type: Displays the plot count, acreage, current volume, annual growth, annual mortality, annual net growth, annual removal, and annual net change by forest type for the wholeare theme in a summary table.

FIA Reselect Stats by Forest Type: Displays the plot count, acreage, current volume, annual growth, annual mortality, annual net growth, annual removal, and annual net change by forest type for the fiaresel theme in a summary table.

Paths — Sets the paths or locations of the model, working directories.

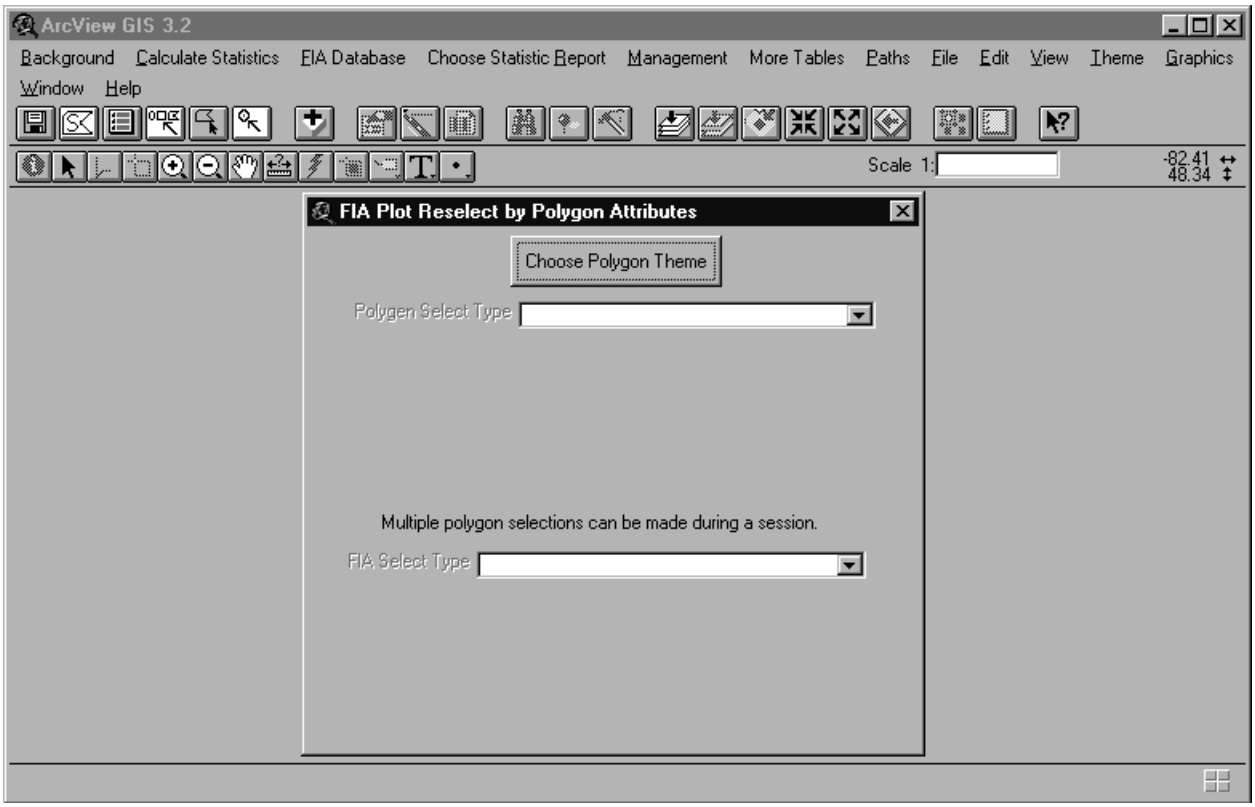
Change Working Directory Paths – ARE YOU SURE?: Allows the user to change the working directory paths while the model is running (Set First Working Directory Path window and Set Second Working Directory Path window pop up after the item is initiated). After closing the model, move the working directories to the new locations previously specified in the Paths menu. The next time the model starts, it will look for the working directories in their new locations. This is useful if you wish to work from a copy of the working directories. You can keep the working directories in their previous locations, but run the model from the copies in a new location.

Help Displays help items.

About FIA Model: Displays the FIAMODEL copyright information.

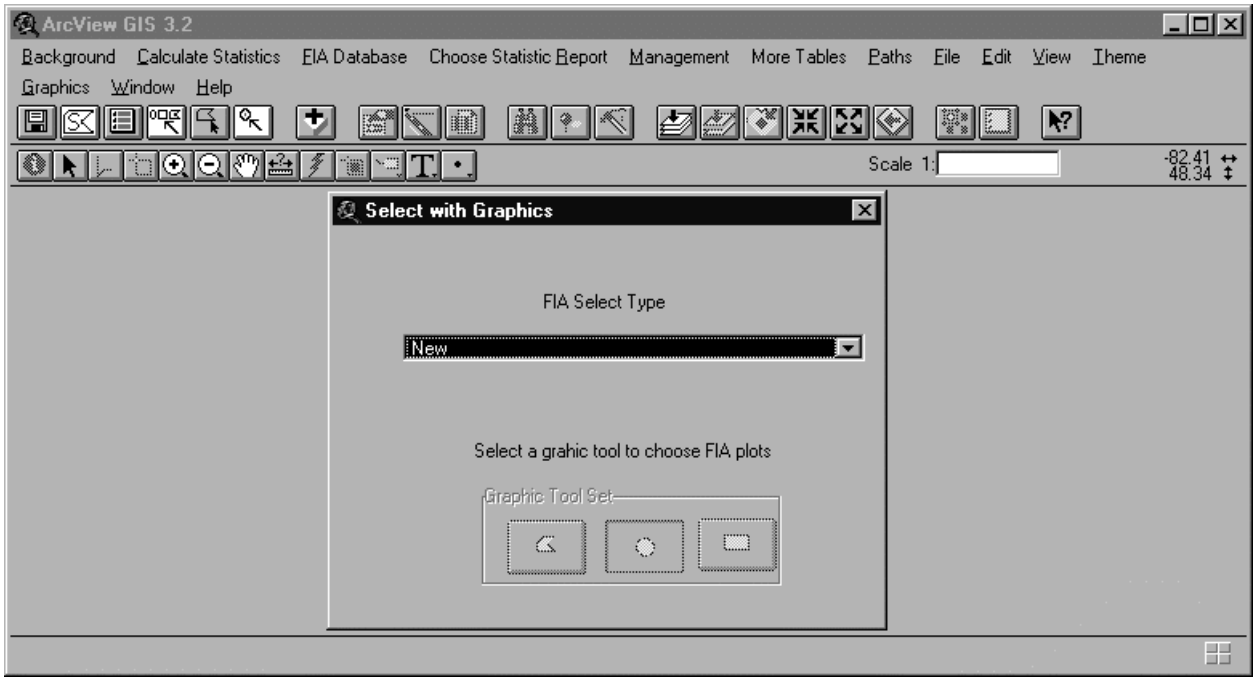
These select buttons allow the user to choose FIA plots and create the wholeare theme with the selections. The first button selects FIA plots occurring within polygons of interest belonging to an ancillary polygon theme. The next two buttons start dialogs that allow the user to select FIA plots interactively with selection tools. Next, the model creates the wholeare theme using the selected plots. You can choose these buttons and associated dialogs in any order and as many times as needed to identify the FIA plots of interest. The first time you enact one of the buttons to make the first selection of FIA plots, choose New or Add in the FIA Select Type choice box associated with each button's dialog. Choices made in the FIA Select Type choice box determine the way in which plots are selected from the statefia theme. After making an initial selection and creating the first wholeare theme, you can make another selection and the model will create a new wholeare theme. Add, Select From Existing Set, and Add if Not Selected; Remove if Selected would be appropriate choices after an initial selection. Otherwise, you can choose New to start with a totally new selection of FIA plots.

The button that starts the FIA Plot Reselect by Polygon Attributes dialog.



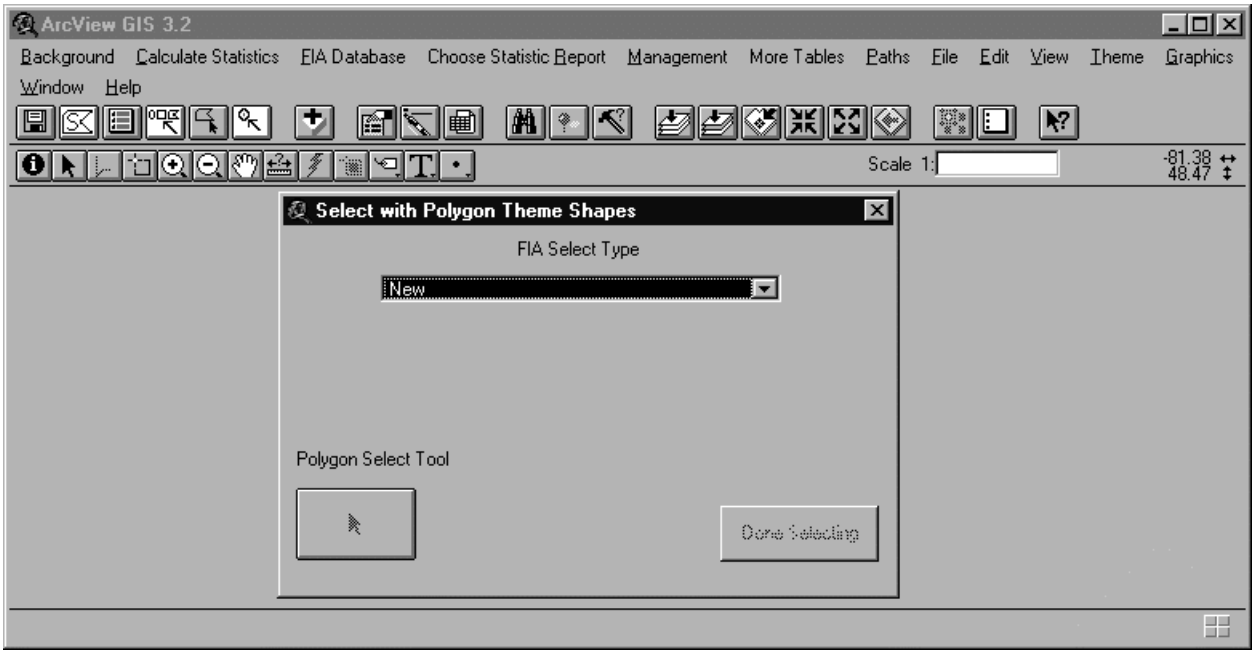
FIA Plot Reselect by Polygon Attributes: Dialog enabling the user to select FIA plots based upon polygon theme attributes. FIA plots occurring within polygons having selected attributes are chosen and a new wholeare theme is created. Choose the ancillary polygon theme with the Choose Polygon Theme button. The theme could be a polygon ARC/INFO coverage or a polygon shapefile (e.g., a soil polygon coverage). This polygon theme should exist in the latitude-longitude coordinate system. The FIA plots occur in this coordinate system. Choosing the polygon theme enables the Polygon Select Type choice box. Select from New, Add, Select From Existing Set, and Add if Not Selected; Remove if Selected. These selection types apply only to those selections that will be made upon the previously chosen polygon theme. After choosing the Polygon Select Type, choose a field or item from the Field Select window (pops up after choosing the Polygon Select Type) showing the available fields of the ancillary polygon theme. Next, the Field Value Select window pops up and a field value must be chosen. You can make multiple selections from the same polygon theme. Choose the Polygon Select Type choice box and select another field and value as many times as needed. After you are satisfied with the selection of ancillary polygon theme attributes, choose the FIA Select Type and the wholeare theme will be created. If a wholeare theme already exists, it will be replaced by a new wholeare theme.

The button that initiates the Select with Graphics dialog.



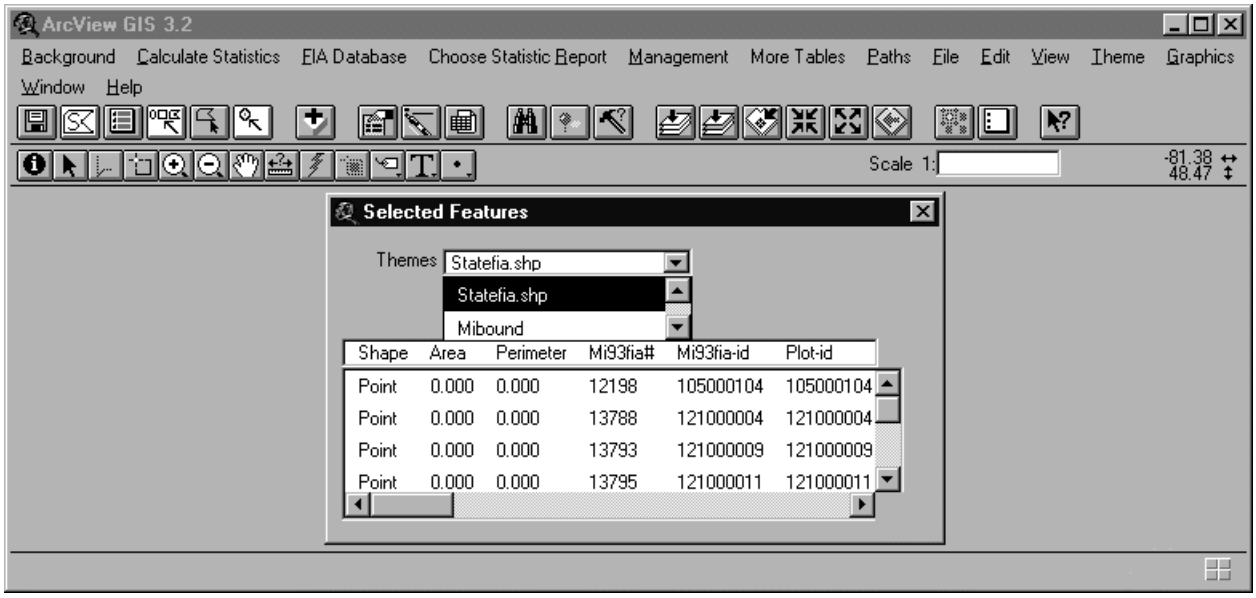
Select with Graphics: Dialog permitting the user to select plots within interactively drawn graphics. You must first make a choice in the FIA Select Type choice box. Then, the Graphic Tool Set is enabled and you can choose a graphic tool to select plots of interest. Based upon the FIA Select Type chosen, plots will be selected immediately after the graphic is drawn. Subsequently, the wholeare theme is created. If a wholeare theme already exists, it will be replaced by a new wholeare theme.

The button that initiates the Select with Polygon Theme Shapes dialog.



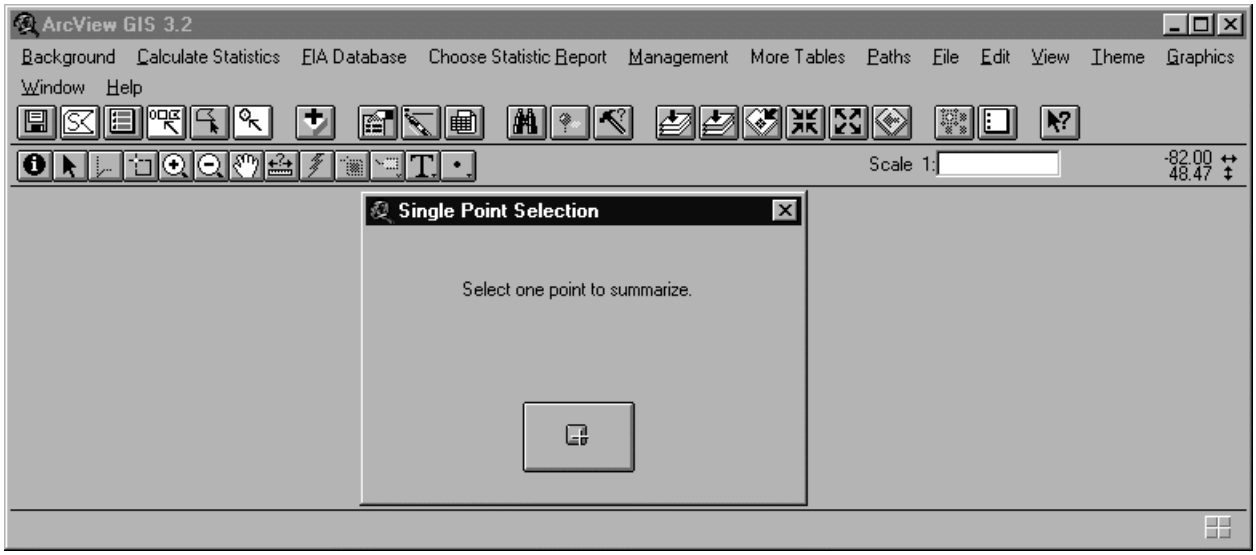
Select with Polygon Theme Shapes: Dialog allowing the user to select plots within interactively selected polygons of active polygon themes. You must first make a choice in the FIA Select Type choice box. Next, the Polygon Select Tool is enabled and you can pick a polygon or polygons of interest. Select polygons in any of the active themes by clicking the selection tool. Hold the shift key for multiple selections in different areas. Based upon the FIA Select Type chosen, plots occurring within the selected polygons will be selected after the Done Selecting button is chosen. Subsequently, the wholeare theme is created. If a wholeare theme already exists, it will be replaced by a new wholeare theme.

Button that starts the Selected Features dialog.



Selected Features: Displays records corresponding to selected features within themes. This is a modified version of an example dialog given in Using the ArcView Dialog Designer (ESRI 1997).

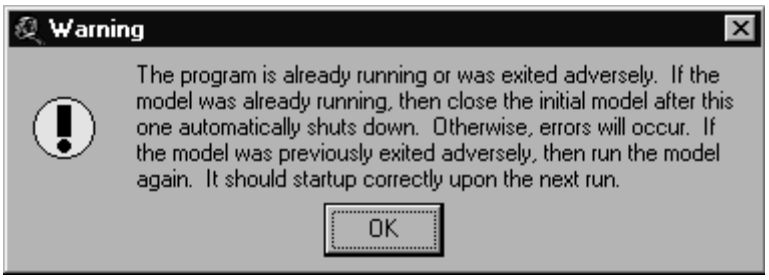
Button that starts the Single Point Selection dialog.



Single Point Selection: Displays information about individually selected plots. View the stand table for a single FIA plot by selecting it with the single point selection tool. The tool is used to draw a circle around the plot of interest. The theme with the plot of interest must be listed first in the view, and be active, and visible. Only one plot is selected even if the circle is drawn around more than one plot.

SHUTDOWN

We recommend two ways to stop the model. The first way is to choose Close Project from the File menu (project window should be active). This method allows ArcView to continue running after the model is shut down. The second method shuts down the model and the ArcView application. Choose Exit from the File menu as the second method. These methods "clean up" temporary files and change some parameters so the model will start up properly the next time. Without being cautious, you can adversely shut down the model. Choosing the "X" button in the upper right hand corner of ArcView shuts down ArcView and the model. However, "clean up" does not occur. Upon the next start-up, the model will issue the following message:

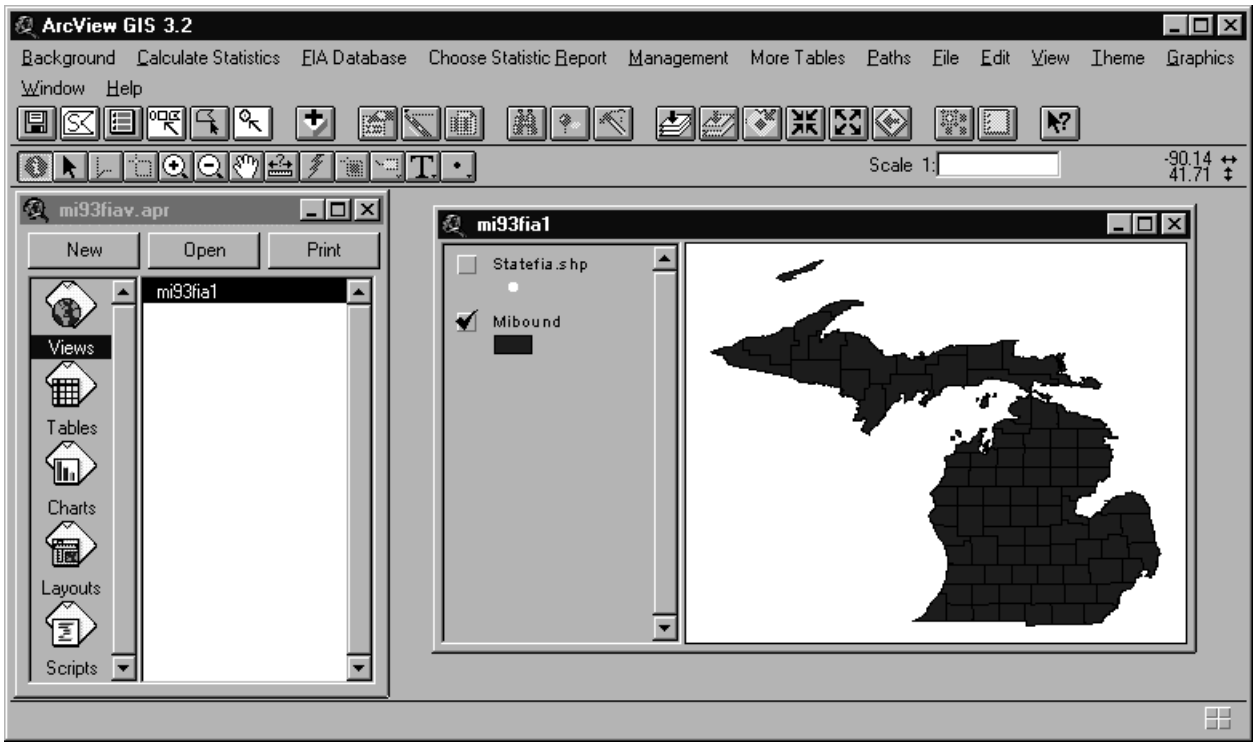


Next, the model will shut down and "clean up." As the warning indicates, the model will start up correctly upon the next run if it was exited improperly. The model could adversely shut down due to some uncontrollable events such as a power outage or an operating system failure. If this happens, the previous warning would be issued at the next start-up and the model would shut down. Again, the model should start up correctly in the following run. Starting the same model twice will result in the previous warning. The warning states that the initial model should be closed after the current one automatically closes. Otherwise unpredictable errors will occur. The model should start up fine in the next run.

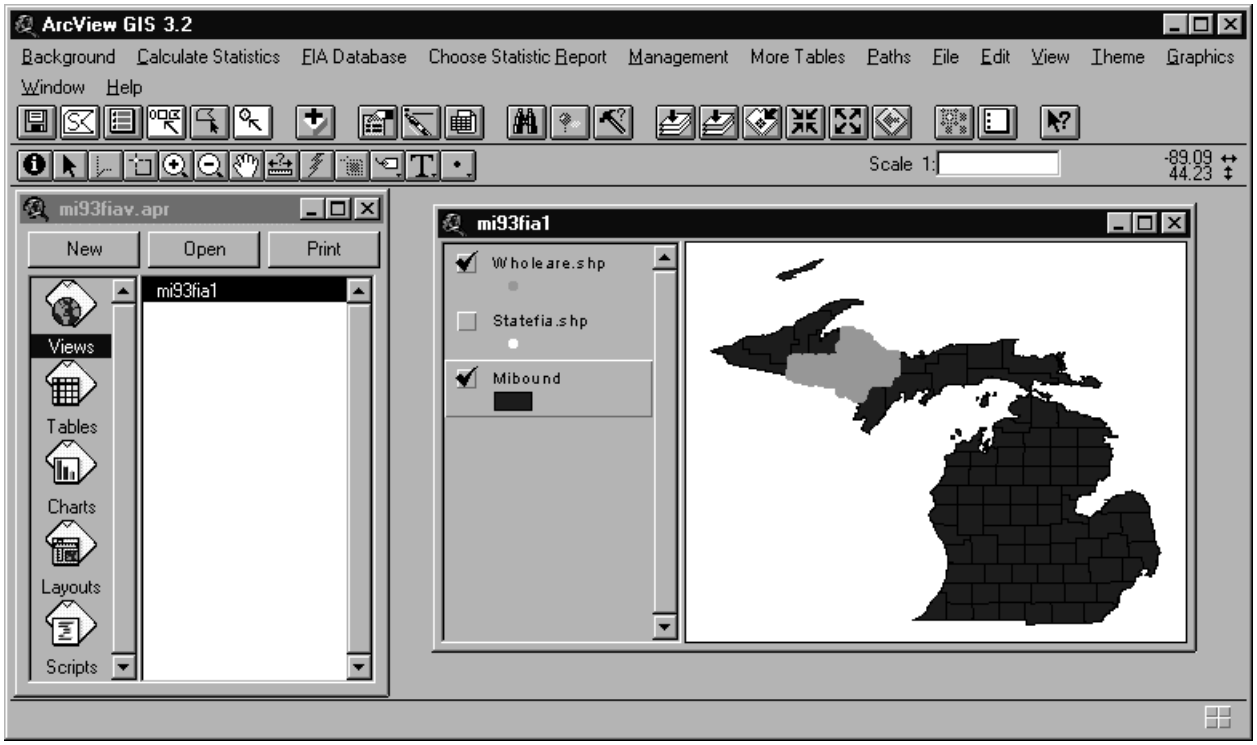
The following two examples are given to introduce you to the model and illustrate some of the model capabilities. There are many other scenarios besides these two. The example tables and figures are taken from the Michigan model, but these exercises are appropriate with any State. The second example requires an ancillary polygon coverage or shapefile.

Example 1: In this exercise, timberland plots will be selected using county boundaries and an interactively drawn graphic. Summary tables will be produced for these plots. In addition, a finer selection of plots will be chosen based upon land ownership and forest cover type. Summary tables will also be produced for the finer selection of plots.

1. Start the program by double clicking the FIAMODEL icon or by opening the FIAMODEL project file. A message box will pop up requiring a Current Land Use Class Selection. Any further reselections will be from the chosen land use class, which should be timberland for this exercise. A view document will appear with accompanying menus, buttons, and tools. The State boundary theme will be displayed in the view document window.



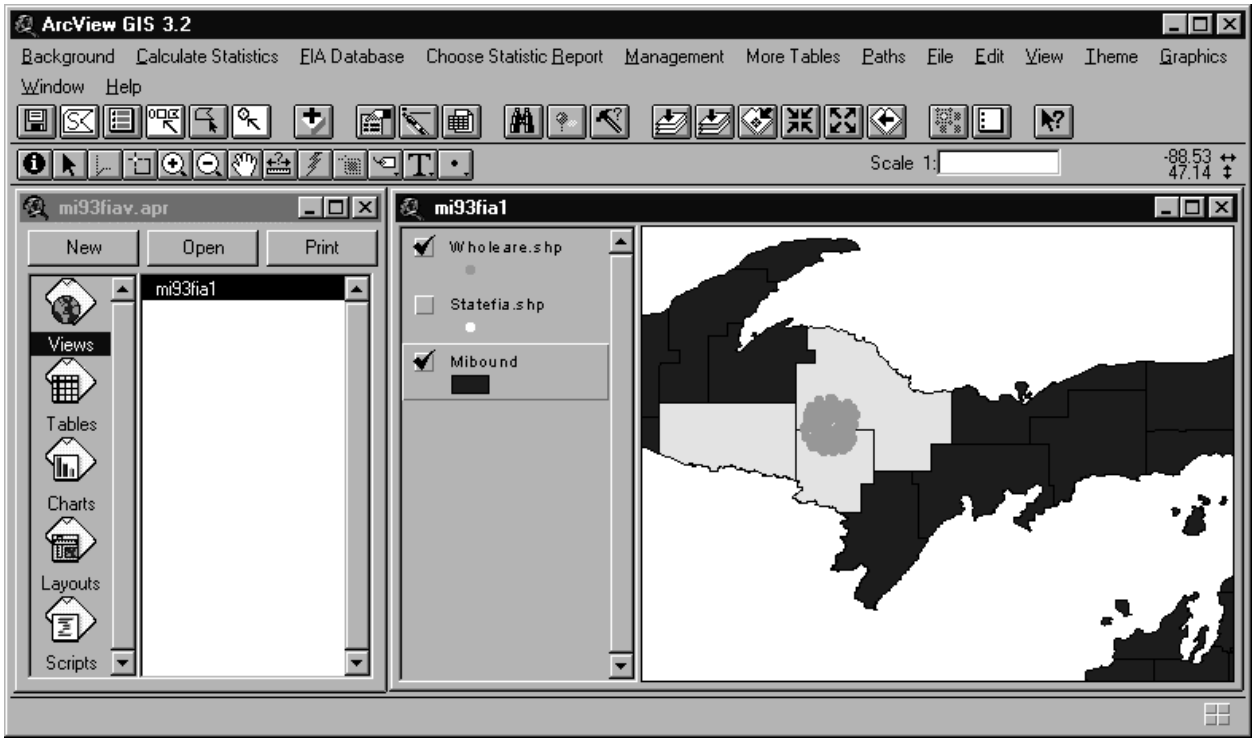
2. Plots will be selected using county boundaries. Select:  to display the Select with Polygon Theme Shapes dialog. Make sure the polygon boundary theme is active by clicking on it in the table of contents. Select the FIA Select Type by choosing New for this first selection. The Polygon Select Tool becomes active. Go into the view document window and select a county with a click of the left mouse button (Note: Multiple counties may be chosen by clicking the mouse button within each desired county boundary while holding the shift key.) Choose Done Selecting after making the selection. The wholeare theme is automatically created. The theme contains the FIA plots occurring in the selected county boundaries.



3. Next, a finer selection of plots will be acquired from within the previous selection.

   Select  to display the Select with Graphics dialog.

   Select the FIA Select Type by choosing Select From Existing Set for this second selection. The Graphic Tool Set becomes active. Choose a graphic to make a finer selection. Move the cursor somewhere in the selected counties. (It may be helpful to zoom in around the selected polygons with the Zoom In tool on the tool bar.) Click, hold, and drag with the left mouse button if you selected the circle or rectangle. If you selected the polygon, then create a polygon by left clicking the mouse to form vertices. Double click when the polygon is complete. A new wholeare theme is created with FIA plots selected from the previous selection.



4. Summary tables will be created for the FIA plots in the wholeare theme. Choose Calculate Statistics from the main menu and then select the Run Wholeare Calculations item. Statistics are calculated. These statistics can be displayed in the General Plot Summary and Stand Density Summary tables. If there are no trees/acre data available, a warning message will appear. In this case, the Stand Density Summary table will not be available. Next, choose the Wholeare Stats item within the Choose Statistic Report menu. The Statistics Summary Type choice box will appear. Choose General Plot. Make the desired choice in the General Plot Summary choice box. The General Plot Summary Window displays the General Plot Summary table (e.g., table 1). The Stand Density Summary table, a table similar to table 2, may be viewed by selecting Stand Density from within the Statistics Summary Type choice box, made available as previously described. If you save the summary tables and print them later, set the font type to courier and the size to eight point. This will maintain the correct table format.

Table 1.—General Plot Summary table for plots in wholeare theme (plots selected from Michigan using county boundaries and a circle graphic)

Current volume, annual growth, annual mortality, annual net growth, annual removal, and annual net change for growing stock in the selected area are reported in thousands of cubic feet. There are 150 plot(s) representing 214800 acres. There are 147 current timberland plot(s) representing 210000 acres. Errors (1 standard deviation) are given as percentages of these totals. Annual calculations are based upon the nominal interval from 1980 to 1993. Plots that did not exist in the prior inventory (nominal year 1980) were not used in the annual calculations.
WARNING: Percent error only applies if timberland was previously selected.

Volume/Error	Current volume	Annual growth	Annual mortality	Annual net growth	Annual removal	Annual net change
Volume (1,000 cu ft)	273030.8	10042.4	2880.7	7161.7	3323.7	3838.1
Error (percent)	5.39	undefined	undefined	7.67	38.26	undefined

Table 2.—Stand Density Summary table for plots in wholeare theme (plots selected from Michigan using county boundaries and a circle graphic)

The combined species stand table reports the average number of live growing-stock trees per acre for all plots in the selected area. The selected 150 plot(s) represent 214800 acres. There are 147 current timberland plot(s) representing 210000 acres. The stand table reports trees per acre only for current timberland plot(s). Dbh class 40 represents trees greater than or equal to 39 inches diameter at breast height.

DBH	BF	TAM	WS	BS	JP	RP	EWP	NWC	EH	RM	SM	YB	PB	BA	BP	BTA	QA	BLC	NRO	ABW	ELM	TOT
2	78	2	3	27	9	2	1	1	0	17	26	0	5	5	4	6	121	8	0	0	0	316
4	36	5	3	19	8	3	1	4	0	12	10	1	5	4	3	2	34	1	0	1	0	150
6	10	3	2	14	4	4	0	8	0	7	8	0	4	2	2	2	8	0	1	0	0	77
8	5	1	0	5	4	1	0	10	0	3	4	0	4	0	1	2	4	0	1	0	0	46
10	2	1	1	2	2	1	0	3	0	3	2	0	3	0	1	2	3	0	1	0	0	26
12	1	0	1	0	2	0	0	2	0	1	1	0	1	0	0	1	2	0	1	0	0	12
14	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	5
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	3
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOT	131	12	11	67	30	12	3	28	0	43	52	2	22	11	10	14	174	10	3	2	0	638

Average basal area: 86 square ft/acre. Average volume: 1300 cubic ft/acre.
Volume is for live growing-stock trees in the 6-inch dbh class or larger.
Basal area is for live growing-stock trees in all dbh classes.

Code	Species	Code	Species	Code	Species
BF	Balsam fir	TAM	Tamarack (native)	WS	White spruce
BS	Black spruce	JP	Jack pine	RP	Red pine
EWP	Eastern white pine	NWC	Northern white-cedar	EH	Eastern hemlock
RM	Red maple	SM	Sugar maple	YB	Yellow birch
PB	Paper birch	BA	Black ash	BP	Balsam poplar
BTA	Bigtooth aspen	QA	Quaking aspen	BLC	Black cherry
NRO	Northern red oak	ABW	American basswood	ELM	Elm
TOT	Total				

5. Management tables that summarize forest inventory variables by species, diameter, and a combination of the two will be displayed for the wholeare theme. Select Whole Area from Management on the main menu. Because this is the first management table to be displayed for the wholeare theme, choose New Area in the Management Area Choice box. A warning message will appear and management tables will not be created if there is no species information available. To display subsequent management tables for the wholeare theme, choose Previous Area in the Management Area Choice box. Define the management output table by choosing By Species (e.g., table 3), By Diameter (e.g., table 4), or By Species & Diameter (e.g., table 5) in the Management Type choice box. If you choose By Species & Diameter, then the management table may be displayed for any available species of interest. The species may be selected in the Management Multi-Species Selection choice box.

Table 3.—Management by Species table for the wholeare theme (plots selected from Michigan using county boundaries and a circle graphic)

Growing stock report for all diameter classes by species (unit: thousands of cubic feet) in the selected area (Whole Area, 214800 acres).

Species	Current volume	Annual growth	Annual mortality	Annual net growth	Annual removal	Annual net change
Balsam fir	18625.2	866.4	486.2	380.2	137.5	242.7
Tamarack (native)	6722.6	175.3	51.1	124.2	0.0	124.2
White spruce	8866.9	407.2	185.5	221.6	108.2	113.5
Black spruce	21762.9	606.3	464.5	141.8	136.3	5.6
Jack pine	23990.2	908.8	226.0	682.8	334.4	348.4
Red pine	12505.5	483.0	24.1	458.9	0.0	458.9
Eastern white pine	6664.1	195.5	20.4	175.1	76.7	98.4
Northern white-cedar	28404.2	688.6	66.2	622.3	0.0	622.3
Eastern hemlock	126.8	2.2	0.0	2.2	0.0	2.2
Red maple	19490.4	745.8	38.5	707.3	61.5	645.8
Sugar maple	23636.1	944.6	80.3	864.3	29.0	835.3
Yellow birch	2159.5	62.1	15.2	46.9	9.5	37.4
Paper birch	19652.7	552.0	230.3	321.7	1007.5	-685.8
Black ash	1899.5	84.8	15.3	69.4	0.0	69.4
Balsam poplar	6678.9	311.6	75.8	235.8	108.8	127.0
Bigtooth aspen	16677.4	732.5	106.1	626.4	476.4	150.0
Quaking aspen	37417.8	1830.7	633.5	1197.2	838.0	359.2
Black cherry	749.4	14.4	18.2	-3.8	0.0	-3.8
Northern red oak	10422.1	263.9	46.8	217.1	0.0	217.1
American basswood	6439.8	163.0	2.0	161.0	0.0	161.0
Elm	138.9	3.7	94.6	-90.9	0.0	-90.9
Total	273030.8	10042.4	2880.7	7161.7	3323.7	3838.1

Table 4.—Management by Diameter table for the wholeare theme (plots selected from Michigan using county boundaries and a circle graphic)

Growing stock report for all species by diameter (unit: thousands of cubic feet) in the selected area (Whole Area, 214800 acres). Dbh class 40 represents trees greater than or equal to 39 inches diameter at breast height.

Diameter class	Current volume	Annual growth	Annual mortality	Annual net growth	Annual removal	Annual net change
2	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	364.8	0.0	364.8	0.0	364.8
6	44351.7	2510.1	678.7	1831.4	677.5	1153.9
8	56093.7	2057.8	682.4	1375.4	1072.5	302.9
10	57595.0	2028.1	591.8	1436.3	649.0	787.3
12	41748.6	1141.1	357.0	784.1	203.5	580.5
14	26695.6	750.6	301.1	449.6	299.7	149.9
16	17530.2	481.8	153.3	328.4	373.0	-44.6
18	11870.5	363.0	40.6	322.4	35.8	286.6
20	6453.0	134.0	29.4	104.6	12.6	92.0
22	4837.7	94.6	30.5	64.1	0.0	64.1
24	2630.0	50.2	10.9	39.3	0.0	39.3
26	2013.5	42.2	4.8	37.4	0.0	37.4
28	718.1	13.3	0.1	13.2	0.0	13.2
30	493.3	10.8	0.0	10.8	0.0	10.8
Total	273030.8	10042.4	2880.7	7161.7	3323.7	3838.1

Table 5.—Management by Species & Diameter table highlighting quaking and bigtooth aspen in the wholeare theme (plots selected from Michigan using county boundaries and a circle graphic)

Growing stock report for quaking aspen, bigtooth aspen (unit: thousands of cubic feet) in the selected area (Whole Area, 214800 acres). Dbh class 40 represents trees greater than or equal to 39 inches diameter at breast height.

Diameter class	Current volume	Annual growth	Annual mortality	Annual net growth	Annual removal	Annual net change
2	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	66.0	0.0	66.0	0.0	66.0
6	5511.3	501.4	80.9	420.5	265.7	154.7
8	7762.9	460.5	181.4	279.1	260.4	18.7
10	12259.5	567.4	172.4	395.0	217.2	177.7
12	8144.6	309.3	99.7	209.5	103.3	106.3
14	6387.0	247.0	117.9	129.1	213.3	-84.2
16	5294.4	191.2	38.0	153.1	254.5	-101.3
18	4016.3	113.5	19.8	93.6	0.0	93.6
20	2602.0	64.7	10.0	54.7	0.0	54.7
22	598.4	8.1	19.4	-11.3	0.0	-11.3
24	984.3	22.3	0.0	22.3	0.0	22.3
26	534.5	12.1	0.0	12.1	0.0	12.1
Total	54095.1	2563.2	739.6	1823.6	1314.4	509.2

6. A general forest type summary table will be displayed for the wholeare theme. Choose More Tables from the main menu and then select Wholeare Stats by Forest Type. The General Forest Type Summary Window appears (e.g., table 6).

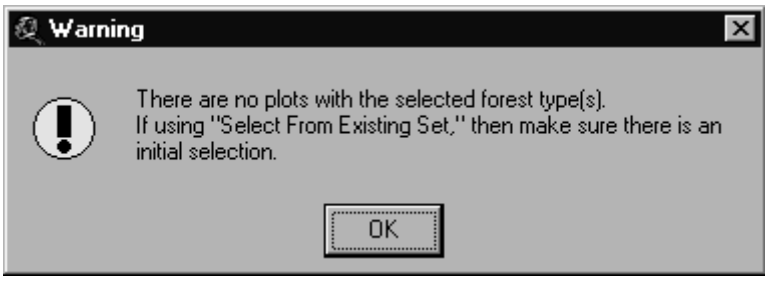
Table 6.—General Forest Type Summary table for plots in wholeare theme (plots selected from Michigan using county boundaries and a circle graphic)

Current volume, annual growth, annual mortality, annual net growth, annual removal, and annual net change for growing stock by forest type in the selected area are reported in thousands of cubic feet (214800 acres are represented). Annual calculations are based upon the nominal interval from 1980 to 1993. Plots that did not exist in the prior inventory (nominal year 1980) were not used in the annual calculations. Old forest types will not have any current volume by definition.

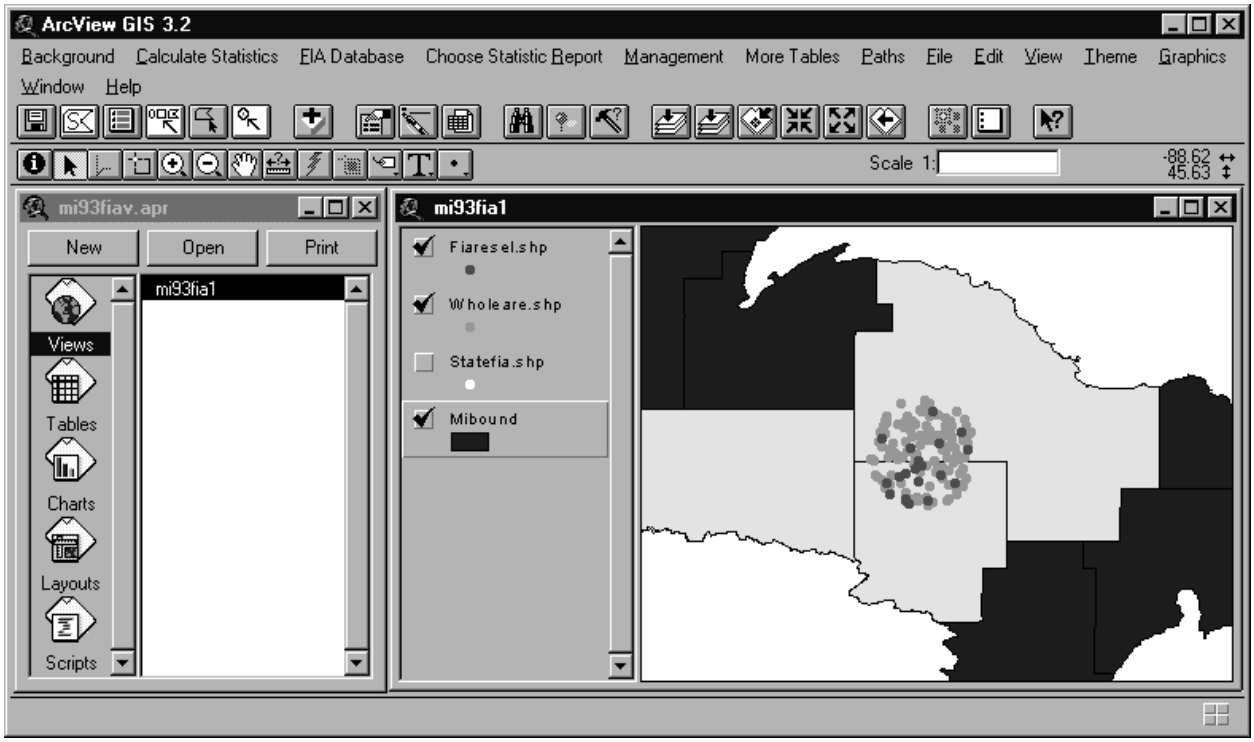
Current forest type	Plot count	Acreage	Current volume	Annual growth	Annual mortality	Annual net growth	Annual removal	Annual net change
Jack pine	14	20600	22819.4	880.1	211.5	668.5	0.0	668.5
Red pine	5	5800	12935.7	534.7	43.8	490.9	0.0	490.9
Balsam fir	15	19700	20540.0	828.6	273.2	555.4	172.9	382.4
Black spruce	20	27300	21610.0	701.7	280.2	421.4	0.0	421.4
Northern white-cedar	14	23700	40606.8	908.1	492.3	415.8	0.0	415.8
Tamarack	2	2500	1052.4	18.5	18.8	-0.3	0.0	-0.3
White spruce	2	2400	4505.5	108.3	30.3	78.0	0.0	78.0
Oak-hickory	3	4200	7795.5	153.9	49.7	104.3	0.0	104.3
Maple-beech-birch	26	36700	62284.0	2129.7	472.0	1657.7	258.2	1399.5
Aspen	36	54000	57860.8	2746.1	743.1	2003.0	2487.5	-484.5
Paper birch	7	8900	16736.3	653.4	171.0	482.4	0.0	482.4
Balsam poplar	3	4200	4284.5	284.4	94.7	189.8	0.0	189.8
Total	147	210000	273030.8	9947.6	2880.7	7066.9	2918.6	4148.3
Old forest type								
Jack pine	1	1800	0.0	50.6	0.0	50.6	177.9	-127.3
Aspen	1	1600	0.0	44.2	0.0	44.2	227.2	-182.9
Paper birch	1	1400	0.0	0.0	0.0	0.0	0.0	0.0
Total	3	4800	0.0	94.9	0.0	94.9	405.1	-310.2

7. A subset of the plots in the wholeare theme will be selected based upon FIA plot attributes. Plots will be reselected based upon their land ownership and forest type. First, a set of plots will be selected based upon a chosen land ownership type. Next, only plots within the chosen land ownership type will be selected based upon a chosen forest type. Choose the Reselect Based Upon FIA Attributes item in the FIA Database menu. The reselection will be made from the wholeare theme if it exists. It should exist at this point. The FIA Plot Reselect by FIA Attributes dialog will appear. Choose owner in the FIA Variable Selection box. Now choose New in the FIA Reselection Type choice box. Pick an ownership type from the Field Value Select choice box. The Field Value Select choice box always shows all of the variable values or types in the wholeare theme regardless of a previous selection in the FIA Variable Selection box. Now choose forest type in the FIA Variable Selection box. Pick Select From Existing Set in the FIA Reselection Type choice box. The Available Forest Types window will appear identifying the frequencies of the different types in the wholeare theme. This is not restricted to those forest types in the land ownership type you previously chose. Like the Field Value Select choice box, the Available Forest Types window always shows all of the forest types in the wholeare theme regardless of an earlier selection in the FIA Variable Selection box. Now

choose a forest type from the Forest Type Selection box in the dialog. The following message may appear if the selected forest type does not occur in the land ownership type previously selected:



If this occurs, choose another forest type by starting over with "Forest Type" in the FIA Variable Selection box. The formerly selected land ownership type still defines the existing selection set. After you select a forest type that occurs in the chosen land ownership type, the Done Reselecting – Create Fiaresel Theme button is enabled. Click the button to create the fiaresel theme.



8. Summary tables will also be created for the FIA plots in the fiaresel theme. This time, choose Calculate Statistics from the main menu and then pick the Run Fiaresel Calculations item. Create the General Plot Summary and Stand Density Summary tables (e.g., table 7 and 8, respectively) as previously described in step 4, but choose FIA Reselect Area Stats in the Choose Statistic Report menu.

Table 7.—General Plot Summary table for plots in the fiaresel theme (plots selected from State land occurring in an aspen forest cover type)

Current volume, annual growth, annual mortality, annual net growth, annual removal, and annual net change for growing stock in the selected area are reported in thousands of cubic feet. There are 20 plot(s) representing 30200 acres. There are 19 current timberland plot(s) representing 28600 acres. Errors (1 standard deviation) are given as percentages of these totals. Annual calculations are based upon the nominal interval from 1980 to 1993. Plots that did not exist in the prior inventory (nominal year 1980) were not used in the annual calculations.
WARNING: Percent error only applies if timberland was previously selected.

Volume/Error	Current volume	Annual growth	Annual mortality	Annual net growth	Annual removal	Annual net change
Volume (1,000 cu ft)	31360.9	1589.4	264.8	1324.5	1729.5	-405.0
Error (percent)	15.89	undefined	undefined	17.84	53.04	undefined

Table 8.—Stand Density Summary table for plots in the fiaresel theme (plots selected from State land occurring in an aspen forest cover type)

The combined species stand table reports the average number of live growing-stock trees per acre for all plots in the selected area. The selected 20 plot(s) represent 30200 acres. There are 19 current timberland plot(s) representing 28600 acres. The stand table reports trees per acre only for current timberland plot(s). Dbh class 40 represents trees greater than or equal to 39 inches diameter at breast height.

DBH	BF	TAM	WS	BS	JP	RP	EWP	NWC	RM	SM	YB	PB	BA	BP	BTA	QA	BLC	NRO	ABW	TOT
2	56	1	3	17	0	0	0	3	19	40	0	3	0	6	19	198	4	0	0	370
4	20	1	1	8	0	0	0	0	27	15	1	0	5	3	9	59	0	0	0	151
6	12	5	0	2	0	0	0	0	6	15	0	3	10	1	5	28	0	5	0	90
8	6	0	0	0	0	0	0	0	3	4	0	3	0	0	5	12	0	2	0	35
10	2	0	0	0	0	0	0	0	1	0	0	1	1	1	6	11	0	0	0	23
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0	7
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	3
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2
18	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	2
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOT	96	8	4	27	0	1	0	3	57	73	1	10	17	12	45	317	4	7	0	683

Average basal area: 76 square ft/acre. Average volume: 1097 cubic ft/acre.
Volume is for live growing-stock trees in the 6-inch dbh class or larger.
Basal area is for live growing-stock trees in all dbh classes.

Code	Species	Code	Species	Code	Species
BF	Balsam fir	TAM	Tamarack (native)	WS	White spruce
BS	Black spruce	JP	Jack pine	RP	Red pine
EWP	Eastern white pine	NWC	Northern white-cedar	RM	Red maple
SM	Sugar maple	YB	Yellow birch	PB	Paper birch
BA	Black ash	BP	Balsam poplar	BTA	Bigtooth aspen
QA	Quaking aspen	BLC	Black cherry	NRO	Northern red oak
ABW	American basswood	TOT	Total		

9. Management tables will also be created for the FIA plots in the fiaresel theme. Choose the FIA Reselect Area item in the Management menu. Again, choose New Area for the first of these management tables and Previous Area for subsequent output tables. Define the management table by selecting By Species (e.g., table 9), By Diameter (e.g., table 10), or By Species & Diameter (e.g., table 11) in the Management Type choice box.

Table 9.—Management by Species table for the fiaresel theme (plots selected from State land occurring in an aspen forest cover type)

Growing stock report for all diameter classes by species (unit: thousands of cubic feet) in the selected area (FIA Reselect Area, 30200 acres).

Species	Current volume	Annual growth	Annual mortality	Annual net growth	Annual removal	Annual net change
Balsam fir	2396.9	132.1	34.2	97.8	32.4	65.5
Tamarack (native)	408.9	13.9	0.3	13.6	0.0	13.6
White spruce	0.0	0.0	0.0	0.0	0.0	0.0
Black spruce	164.4	6.3	8.0	-1.6	0.0	-1.6
Jack pine	141.6	3.5	0.0	3.5	0.0	3.5
Red pine	1572.6	29.8	0.0	29.8	0.0	29.8
Eastern white pine	630.3	20.7	6.6	14.0	0.0	14.0
Northern white-cedar	0.0	0.0	0.0	0.0	0.0	0.0
Red maple	1801.1	80.9	0.0	80.9	50.5	30.4
Sugar maple	1551.5	95.7	0.0	95.7	29.0	66.8
Yellow birch	0.0	1.4	0.0	1.4	9.5	-8.1
Paper birch	1577.4	61.2	16.8	44.4	853.6	-809.2
Black ash	1200.5	80.0	0.0	80.0	0.0	80.0
Balsam poplar	1228.8	96.2	5.1	91.1	32.9	58.2
Bigtooth aspen	4666.3	248.5	37.4	211.1	14.2	196.9
Quaking aspen	12658.2	661.3	134.7	526.6	707.4	-180.8
Black cherry	0.0	0.0	0.0	0.0	0.0	0.0
Northern red oak	1219.8	53.9	21.8	32.1	0.0	32.1
American basswood	142.4	3.9	0.0	3.9	0.0	3.9
Total	31360.9	1589.4	264.8	1324.5	1729.5	-405.0

Table 10.—Management by Diameter table for the fiaresel theme (plots selected from State land occurring in an aspen forest cover type)

Growing stock report for all species by diameter (unit: thousands of cubic feet) in the selected area (FIA Reselect Area, 30200 acres). Dbh class 40 represents trees greater than or equal to 39 inches diameter at breast height.

Diameter class	Current volume	Annual growth	Annual mortality	Annual net growth	Annual removal	Annual net change
2	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	50.6	0.0	50.6	0.0	50.6
6	7039.0	555.1	79.5	475.6	491.7	-16.1
8	6201.6	283.4	61.8	221.6	573.3	-351.6
10	6805.4	298.4	73.1	225.3	456.0	-230.7
12	3168.3	141.4	19.4	122.0	125.0	-3.0
14	2155.3	82.2	12.4	69.8	29.6	40.2
16	1961.9	75.6	18.7	56.9	53.9	2.9
18	2166.8	55.8	0.0	55.8	0.0	55.8
20	488.6	10.1	0.0	10.1	0.0	10.1
22	484.7	8.4	0.0	8.4	0.0	8.4
26	259.1	7.7	0.0	7.7	0.0	7.7
28	302.9	10.3	0.0	10.3	0.0	10.3
30	327.4	10.4	0.0	10.4	0.0	10.4
Total	31360.9	1589.4	264.8	1324.5	1729.5	-405.0

Table 11.—Management by Species & Diameter table highlighting red oak in the fiaresel theme (plots selected from State land occurring in an aspen forest cover type)

Growing stock report for northern red oak (unit: thousands of cubic feet) in the selected area (FIA Reselect Area, 30200 acres). Dbh class 40 represents trees greater than or equal to 39 inches diameter at breast height.

Diameter class	Current volume	Annual growth	Annual mortality	Annual net growth	Annual removal	Annual net change
6	243.4	20.9	6.8	14.1	0.0	14.1
8	245.2	11.6	7.3	4.3	0.0	4.3
10	0.0	2.0	7.7	-5.6	0.0	-5.6
16	145.4	3.9	0.0	3.9	0.0	3.9
18	585.8	15.4	0.0	15.4	0.0	15.4
Total	1219.8	53.9	21.8	32.1	0.0	32.1

10. A stand density table will be created for a single FIA plot. Before selecting a plot, clear the selected features in the background theme. Choose the Clear Selected Features item in the Theme menu. This deselects any features in active themes (themes highlighted in the table of contents) and makes it possible to see a selected plot in yellow. Another prerequisite is to make sure the fiaresel theme, the theme of interest this time, is listed first in the view, active, and visible. At this time, your theme is probably not active. Make the fiaresel theme active by clicking on it. You should be able to successfully select a plot now. Select

to display the Single Point Selection dialog. Next, click

on the selection tool located in the dialog. Then, move the cursor near the plot of interest. Click, hold, and drag with the left mouse button to encircle the plot of interest. Only one plot is selected even if the circle is drawn around more than one plot. The Point Selection Stand Density Summary Window appears with a table similar to table 12. This procedure may be repeated a number of times.

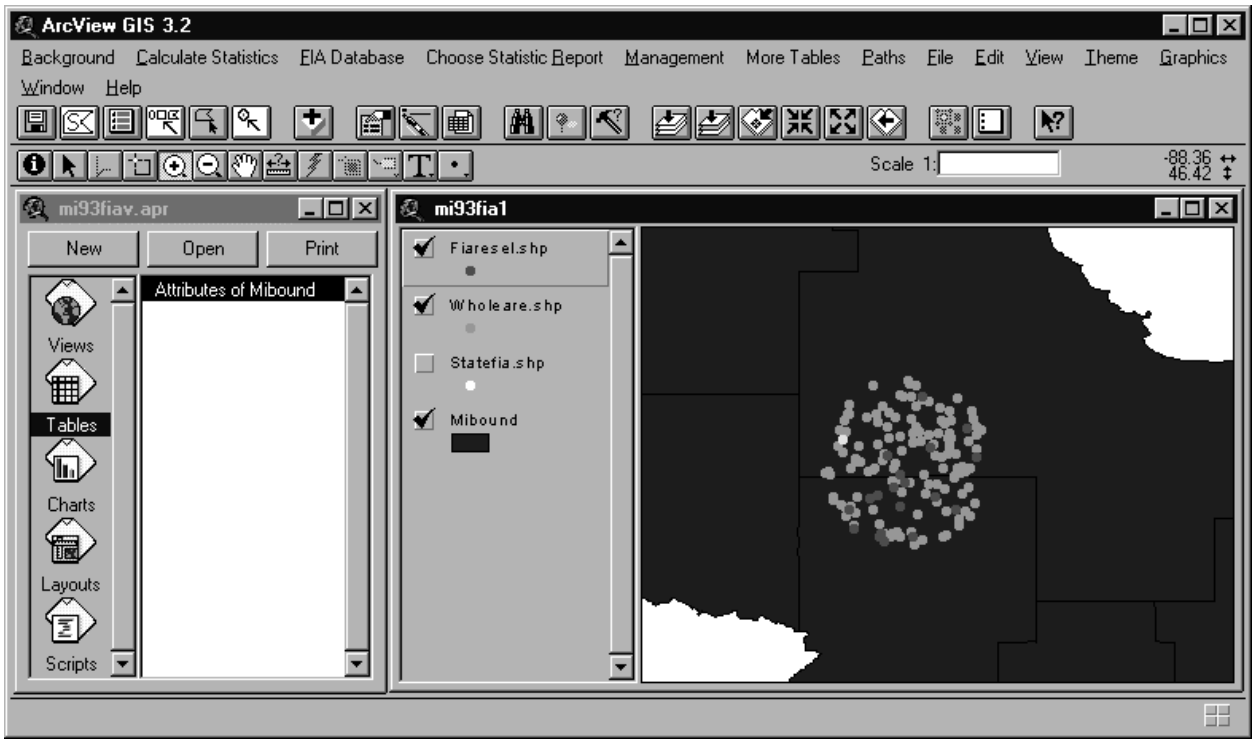


Table 12.—Single point selection table for a plot in the fiaresel theme

The species stand table for FIA plot 260502103000463 reports the number of live growing-stock trees per acre by dbh classes. This plot represents 1400 acres. The plot has a 270 degree aspect and a 2 percent slope. Aspen is the current forest type at an age of 43 years. State is the current owner. The current land use class is Timberland. Dbh class 40 represents trees greater than or equal to 39 inches diameter at breast height.

DBH	BF	TAM	BS	RM	YB	PB	QA	TOT
2	240	30	60	0	0	0	0	330
4	60	30	60	0	30	0	0	180
6	20	78	17	0	0	0	0	115
8	0	0	0	0	0	13	0	13
10	0	0	0	8	0	0	24	32
TOT	320	138	137	8	30	13	24	670

Total basal area: 65 square ft/acre. Average volume: 680 cubic ft/acre.
Volume is for live growing-stock trees in the 6-inch dbh class or larger.
Basal area is for live growing-stock trees in all dbh classes.

Code	Species	Code	Species	Code	Species
BF	Balsam fir	TAM	Tamarack (native)	BS	Black spruce
RM	Red maple	YB	Yellow birch	PB	Paper birch
QA	Quaking aspen	TOT	Total		

11. To quit the model, choose Close Project from the File menu (make the project window active). Or, choose Exit from the File menu. The second method closes the model and the ArcView application.

Example 2: This exercise involves selecting plots in areas corresponding to polygons having specifically chosen attributes or item values within an ancillary coverage or shapefile. An ancillary polygon theme such as a soil coverage is required for this exercise. The ancillary theme should exist in the latitude-longitude coordinate system using decimal degrees.

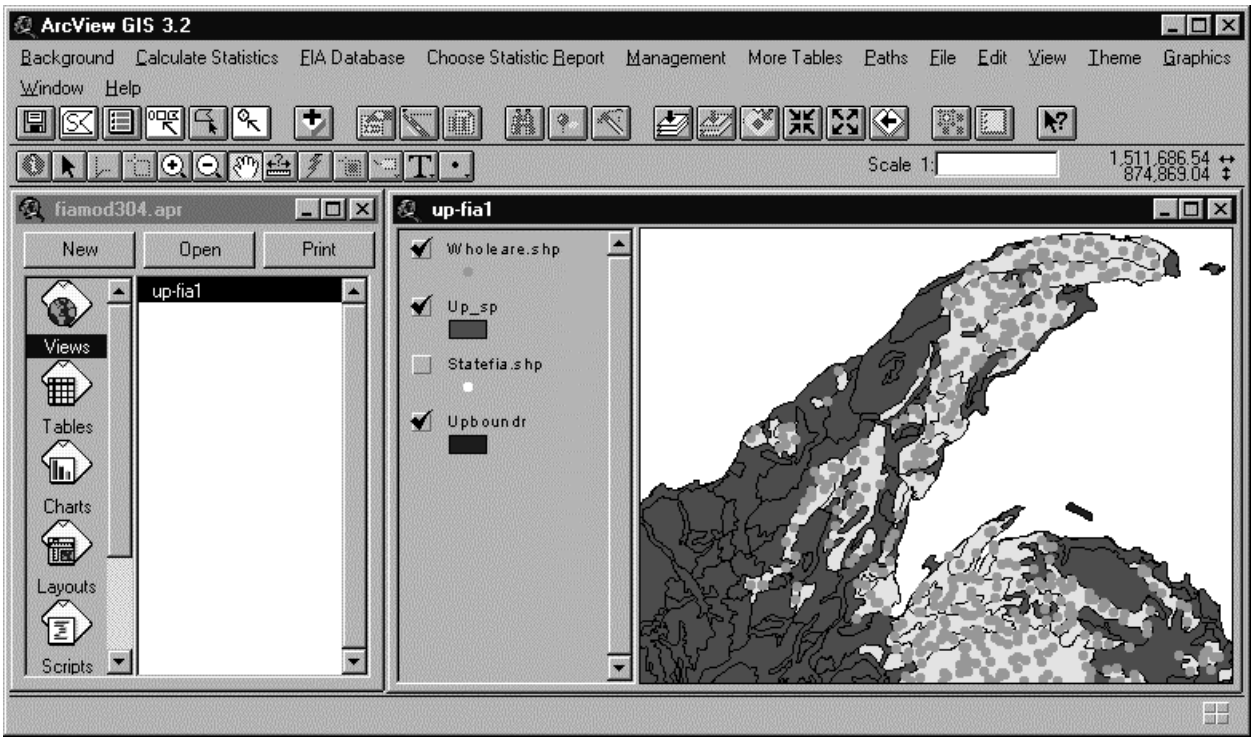
1. Start the program by double clicking the FIAMODEL icon. If the model is still running, start over by choosing Show Boundary in the Background menu. A message box pops up requiring a Current Land Use Class Selection. Any further reselections will be from the chosen land use class, which should be timberland for this exercise. A view document window appears with the State boundary theme.

2. Plots will be selected based upon polygon theme attributes. Select

to display the FIA Plot Reselect by Polygon Attributes dialog.

Select the ancillary polygon theme with the Choose Polygon Theme button. After you choose the polygon theme, the Polygon Select Type choice box is enabled. Choose New from the choice box. After choosing the Polygon Select Type, pick a field from the Field Select choice box. Next, the Field Value Select window pops up. Select a field value of interest. Polygons with the chosen attribute are selected and their corresponding areas will be used to select FIA plots. The ancillary polygon theme and selected polygons can be displayed by

clicking the visibility check box next to the ancillary polygon name in the table of contents. The selected polygons are highlighted in yellow. Choose the Polygon Select Type choice box and select another field and value; this can be done any number of times. Complete the selection process and choose New in the FIA Select Type choice box. The wholeare theme is created and displayed. The figure below shows FIA plots that were selected in the Upper Peninsula of Michigan based upon soil attributes from an ARC/INFO polygon coverage.

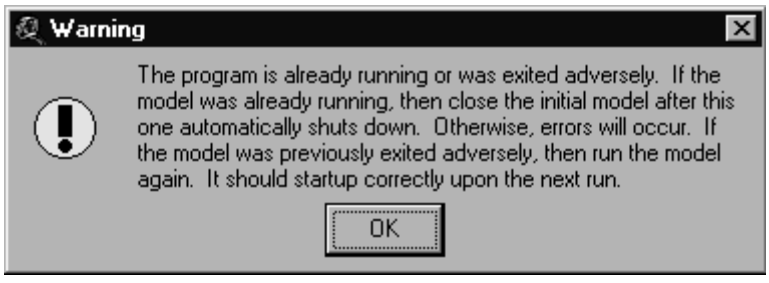


3. Tables can be derived and displayed for these plots as in the previous exercise. In addition, this selection of plots can be manipulated even further with any of the previously mentioned selection dialogs and tool.

TROUBLESHOOTING

Problems Starting the Model

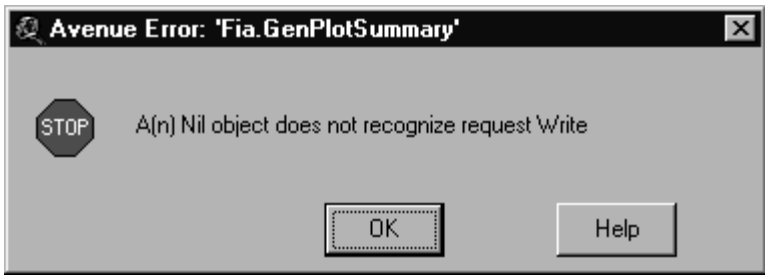
The following message may occur at start-up:



If this message occurs, refer to the SHUTDOWN section. If a message occurs at start-up asking for the location of a theme or a database, then select Cancel All. The model should continue the start-up and run correctly. Several unlikely scenarios could cause this.

Problems Running the Model

If the model issues unexpected error messages, then choose Exit from the File menu. This will shut down the model and ArcView, which is an extra precaution. Start the model again. A message similar to the following one may occur when displaying an output table:



This means that the model cannot write over an existing output table (e.g., plotsum.txt) that was previously saved in the output directory. The table could be open in another program such as a text editor. Either rename the existing output table or close the existing table in the other program. This will allow the model to save the current output table next time. If the previous output table still exists with the same name, the current output table will overwrite it.

If display problems occur, video display may need adjustment or the video memory may need an upgrade. Titles and messages may appear truncated. Fix this problem by adjusting the font size in the Control Panel of the operating system. If unusual events like the disappearance of menus or button bars occurs or the appearance of "ghosts" of previously closed windows stays on the screen, then video memory is insufficient. This problem can be solved by adding sufficient video memory.

FIAMODEL VARIABLE FORMULAS AND CONDITIONS

FIAMODEL Data

FIAMODEL estimates current volume, annual growth, annual mortality, annual net growth, annual removal, annual net change, and average number of trees/acre for growing-stock (not all live trees, rough trees, etc.). The formulas for estimating these variables on a per tree basis are provided below. These formulas and the variables used in the formulas were taken from The Eastwide Forest Inventory Data Base: Users Manual (Hansen et al. 1992). Keep in mind that more specific selections will require more selection parameters. For example, only plots on forest industry land are included in the calculations if forest industry is the only ownership type chosen in the FIA Plot Reselect by FIA Attributes dialog. The formulas for the average volume and average basal area of all selected plots are also presented on the next page. These variables are displayed in the Stand Density Summary window.

The final formula is used to estimate sampling errors associated with the reported volumes (volume, net growth, and removal). Errors are reported in the General Plot Summary window. This formula is a modified version of the formula commonly provided with the published summary bulletins (e.g., Thompson and Sheffield 1997). In this model, sampling errors for selected plots are estimated using unit, sampling errors provided in published bulletins. Usually, several units cover a single State. The sampling error for selected plots in each unit is weighted by the volume selected in the unit in relation to the volume selected in all units. This formula does not work with negative net growth values (volume and removal will always be positive or 0). Therefore, the model uses the absolute value of any negative net growth value when calculating sampling error for net growth. This can result in a poor estimate of the standard error if many plots have negative net growth. However, few plots will ever have negative net growth. Remember that this formula provides an estimate based on available information.

Positional accuracy of plots is dependent upon many factors. Locations of plots in many older inventories were not acquired with global positioning system units and inherently have error. Even locations of plots in more recent inventories are adjusted so that the true locations are not revealed. Each State has their own way of altering plot locations and the user is advised to contact FIA officials in the State of interest for further details on positional accuracy. Plot locations, expressed in decimal degrees, are in the latitude-longitude coordinate system.

The model also reports the acreage represented by the plots. It is important to note that this acreage is derived from the expacr (Hansen et al. 1992) variable. Expacr is the area expansion factor representing the number of acres that the plot represents for calculating areas for variables like ownership and cover type. Note: It is not correct to use the acreage in the output tables to derive other statistics associated with the forest variables. For example, volume/acre cannot be correctly calculated by dividing the current volume with any acreage indicated in the General Plot Summary Window. A different expansion factor, expvol (Hansen et al. 1992), is used with current volume calculations. In another example, multiplying average trees/acre by any acreage indicated in the Stand Density Summary Window does not correctly represent the total number of trees.

Formulas and Conditions

Current Volume of Growing Stock (single tree):

Selection Parameters:

Tree status is live.

Tree class is growing stock.

Formula:

current volume = netcfvl * volfac * expvol

Annual Net Growth of Growing Stock (single tree):

Selection Parameters:

Tree status is live.

Tree class is growing stock.

Formula:

annual net growth = netcfgr * volfac * expgro

Annual Mortality of Growing Stock (single tree):

Selection Parameters:

Tree class is growing stock.

Formula:

annual mortality = netcfvl * mortfac * expmor

Annual Removal of Growing Stock (single tree):

Selection Parameters:

Tree class is growing stock.

Formula:

annual removal = netcfvl * remvfac * exprem

Number of Growing-Stock Trees / Acre (single tree):

Selection Parameters:

Tree status is live.

Tree class is growing stock.

Formula:

average number of trees / acre = volfac * expvol

Annual Growth of Growing Stock:

Formula (calculated from previous variables):

annual growth = annual net growth + annual mortality

Annual Net Change of Growing Stock:

Formula (calculated from previous variables):

annual net change = annual net growth – annual removal

Average Volume of Growing Stock (all plots weighted by area expansion factor):

Selection Parameters:

Tree status is live.

Tree class is growing stock.

Formula:

$$\text{average volume} = \sum_{i=1}^{\#\,\text{plots}} \text{current volume}_i \,/\, \sum_{i=1}^{\#\,\text{plots}} \text{expvol}_i$$

Average Basal Area (all plots weighted by area expansion factor):

Selection Parameters:

Tree status is live.

Tree class is growing stock.

Formula:

Sampling Error:

$$\text{average basal area} = \left(\sum_{h}^{\#\,\text{plots}} \sum_{i=1}^{\#\,\text{trees}_h} \pi * \text{dbhcur}_i^{\,2} * \text{volfac}_i / 576 \right) / \sum_{i=1}^{\#\,\text{plots}} \text{expvol}_i$$

$$\text{sampling error} = \sum_{i=1}^{i = \text{total selected units}} \frac{\text{unit}_i \text{sampling error} \sqrt{\text{total volume of unit}_i}}{\sqrt{\text{selected volume of unit}_i}} * \frac{\text{selected volume of unit}_i}{\text{selected volume of all units}}$$

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Pugh, Scott A.; Reed, David D.; Pregitzer, Kurt S.; Miles, Patrick D. 2002. FIAMODEL: Users Guide Version 3.0. Gen. Tech. Rep. NC-223. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Research Station. 37 p.

FIAMODEL is a geographic information system (GIS) program used to summarize Forest Inventory and Analysis (FIA, USDA Forest Service) data such as volume. The model runs in ArcView and allows users to select FIA plots with heads-up-digitizing, overlays of digital map layers, or queries based on specific plot attributes.

KEY WORDS: FIA, GIS, ArcView, model, forest inventory, timberland.