1.7 ADDITIONAL TOOLS AND CUSTOMIZATION MODULE

The Additional Tools and Customization Module contained within the AWRD (Figure 1.101) provide users with a wide variety of additional functions, including locational referencing; river identification; selecting by themes; query building; adding basemap image to view; and calculating and reporting geostatistics. There are ten tool-sets that can be accessed via the menu options in the AWRD Tools menu and the View Theme menu, and ten tool-sets accessible from buttons on the Additional Tools and Customization Module box in the AWRD Interface. These tools functions are summarized in Table 1.30.

FIGURE 1.101
The Additional Tools and Customization Module

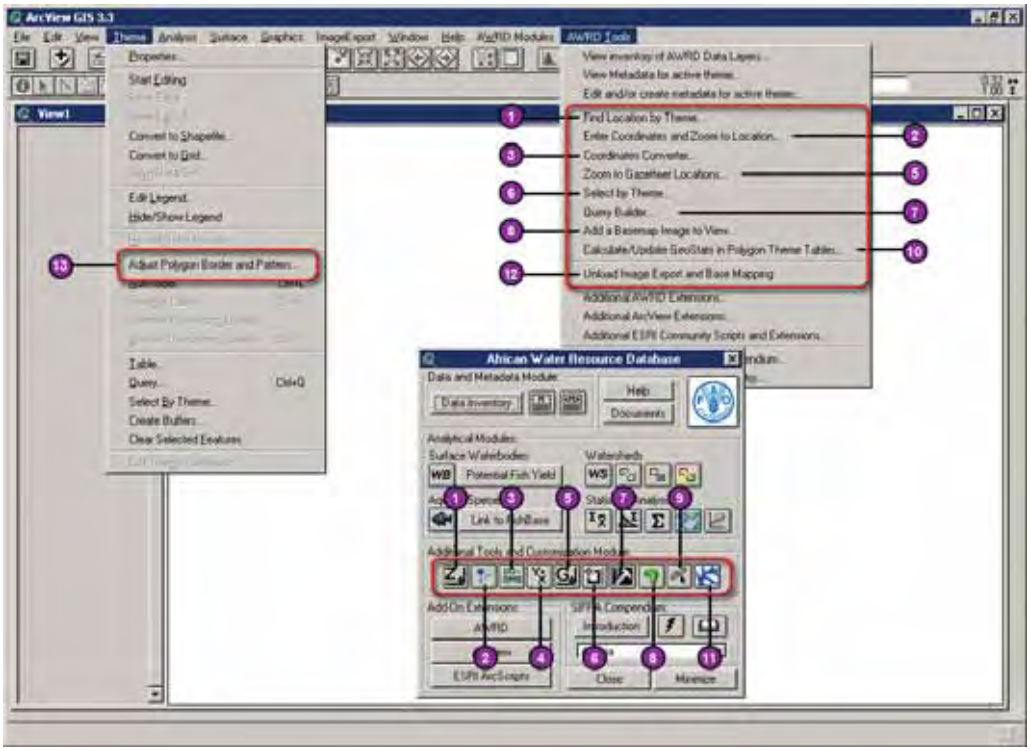


TABLE 1.30
Additional Tools and Customization Module buttons and menu items

Label (Fig. 1.101)	AWRD Interface button	AWRD Tools menu option	Action executed
1		*"Find Location by Theme..."*	*Find Location by Theme*: this tool allows you to find and zoom to particular features by selecting that feature from a list.
2		"Enter Coordinates and Zoom to Location..."	*Enter Coordinates and Zoom to Location*: this tool allows you to zoom directly to a location by entering the XY coordinates.
3	DD-DMS	"Coordinates Converter..."	*Coordinates Converter*: the Coordinate Conversion tool provides a way to convert coordinate values between several commonly-used coordinate formats, including Decimal Degrees, Degrees/Minutes, Degrees/Minutes/Seconds, and projected coordinates.
4		N/A	*Click on screen to get coordinates*: this Report Coordinates tool tells you the coordinates of a point on the screen, in both Decimal Degrees and Projected values.
5		"Zoom to Gazetteer Locations..."	*Zoom to Gazetteer Locations*: this tool allows you to search for locations using their Gazetteer coordinates. The Gazetteer database is an extremely large and detailed dataset of point locations.

6		*"Select by Theme..."*	***Select by Theme***: this tool provides a means to select features from one theme that have some type of proximity relationship (i.e. intersect with, are contained by, are within distance of, etc.) with the selected features of another theme.
7		*"Query Builder..."*	***Query Builder***: this tool provides a comprehensive way to either select or view features in a theme based on a complex query to the feature attribute table.
8		*"Add a Basemap Image to View..."*	***Add a Basemap Image to View***: this tool allows you to quickly and easily add a background image to a view. These images can be very useful for both aesthetic and analytical purposes.
9		N/A	***Report GeoStats for Lines or Polygons You Select***: this tool reports the length of line features, and the area and perimeter length of polygon features, using both projected and spherical coordinates.
10	N/A	"Calculate/Update GeoStats in Polygon Theme Tables..."	This function calculates or updates geostatiscal data in Polygon theme tables.
11		N/A	***Select Adjacent River of Same Level***: the River Identification tool allows you to select, and potentially set a name for, continuous reaches of river segments that are of the same order.
Image Export and Base Mapping Tool			
12	N/A	***"Unload Image Export and Base Mapping"*** or ***"Load Image Export and Base Mapping"***	This tool unloads/loads the Image Export and Base Mapping tool, comprised of a complex set of geo-referenced image output, View and Layout manipulation tools accessible trough a menu interface (i.e. ImageExport). It will load automatically when the AWRD extension is loaded; thereafter it can be loaded and unloaded by selecting the two alternative options in the AWRD Tools menu.
From View Theme Menu			
13	N/A	"Adjust Polygon Border and Pattern"	This tool simplifies the process of making attractive legends for polygon themes. It includes functions to modify or eliminate the polygon borders, and/or to set transparency patterns simultaneously for all classifications in a legend.

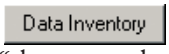
Locational referencing tools

Find locations by Theme

The Find Location by Theme tool offers several methods for locating particular features or zooming to coordinates. For example, if the user knows the name of a particular feature, they can quickly find and zoom to it using the Find Location by Theme tool. This tool is opened by clicking the  button available directly on the AWRD Interface or on the Surface Waterbodies Module and Watersheds Module dialogs, or by selecting the "*Find Location by Theme...*" menu option under the AWRD Tools menu.

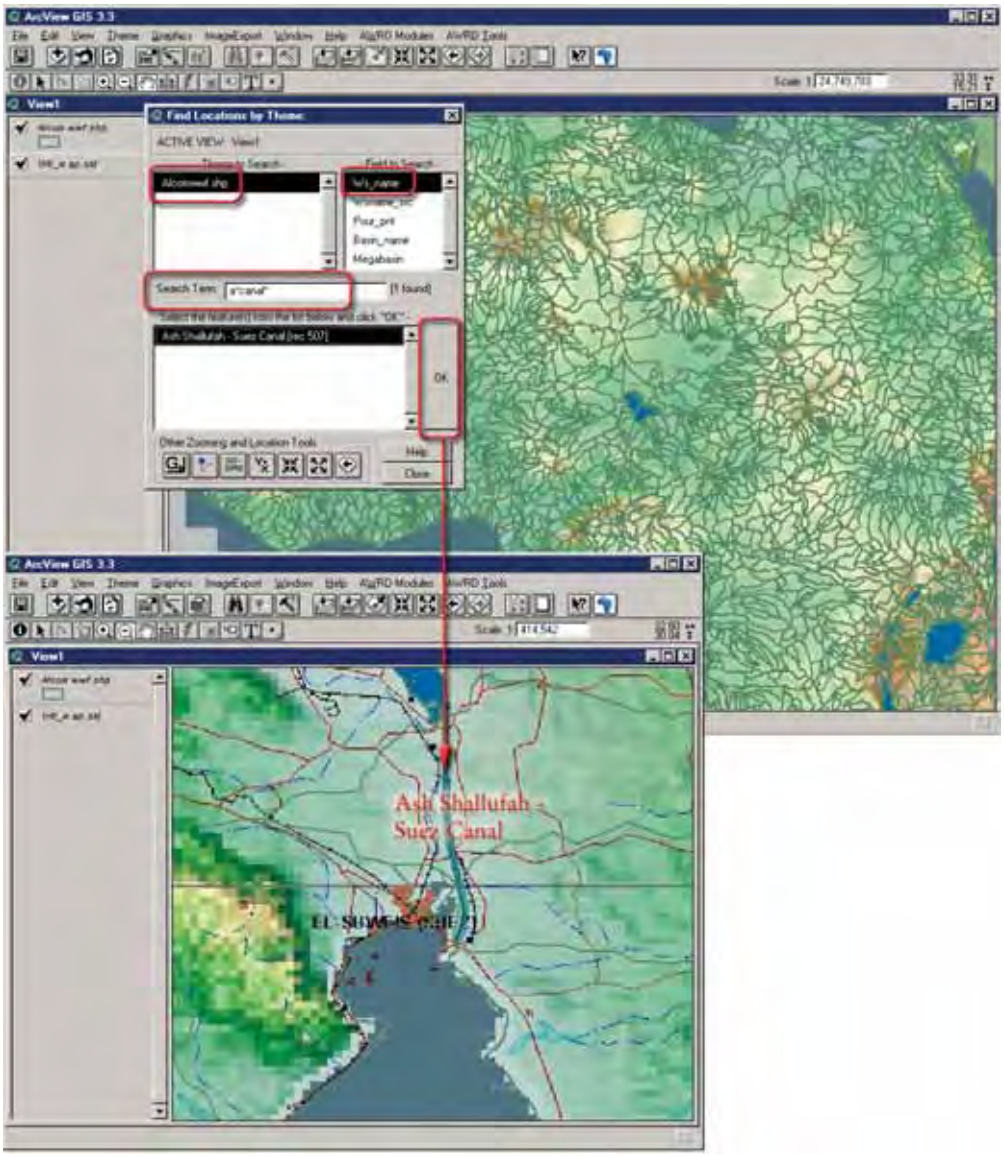
The Find Location by Theme Tool is designed to help users find a particular feature by name or alphanumeric value. When the tool is opened, it identifies all the point, line or polygon themes in the view and lists them in the "–Theme to Search–" list. When the user selects one of these themes, the "–Field to Search–" list fills up with the text fields in the theme. The user then selects the field containing the values to search by. After the user has identified a theme and a field, they can enter a search term in the "Search Term" box on the tool. As the letters are typed, the tool will attempt to identify all of the features meeting the search criteria for that "portion" of the search string. Any results returned will be listed in the box immediately below the search term, and the tool will also keep a running tally of how many features meet the current search criteria.

When names matching the criteria are identified and added to the list, the user needs only select the name associated with a feature displayed and click the "OK" button to zoom to the feature. For example, if a user was interested in locating the Ash Shallufah portion of the Suez Canal, but perhaps they can only remember that the name starts with "A" and in includes the word "Canal", they can simply enter "a*canal*" as the search string (Figure 1.102).

1. Click on the "Add Basemap Image to View" tool  to load one of the image backgrounds (e.g. "vrtl_map.sid") from the image database component folder. This background image is not necessary for proper functioning of this tool, but it makes it easier to locate your area of interest in the view.
2. Click on the "Data Inventory" button 

to load one of the Gazetteer themes (e.g. DCW gazetteer, or "dcw_gztr.shp") from the Gazetteer database component.
3. Open the "Find Location by Theme tool" by clicking the  button available directly on the AWRD Interface or on the Surface Waterbodies Module and Watersheds Module dialogs, or by selecting the "*Find Location by Theme…*" menu option under the AWRD Tools menu.
4. Enter "a*canal*" as the search string and then click "OK" (Figure 1.102).

FIGURE 1.102
Selecting the Theme, the field and the term to search and viewing the results of the Find Location by Theme tool



Notice that the search is not case sensitive so the user does not need to be concerned about what letters are capitalized. The user could then to select "Ash Shallufah - Suez

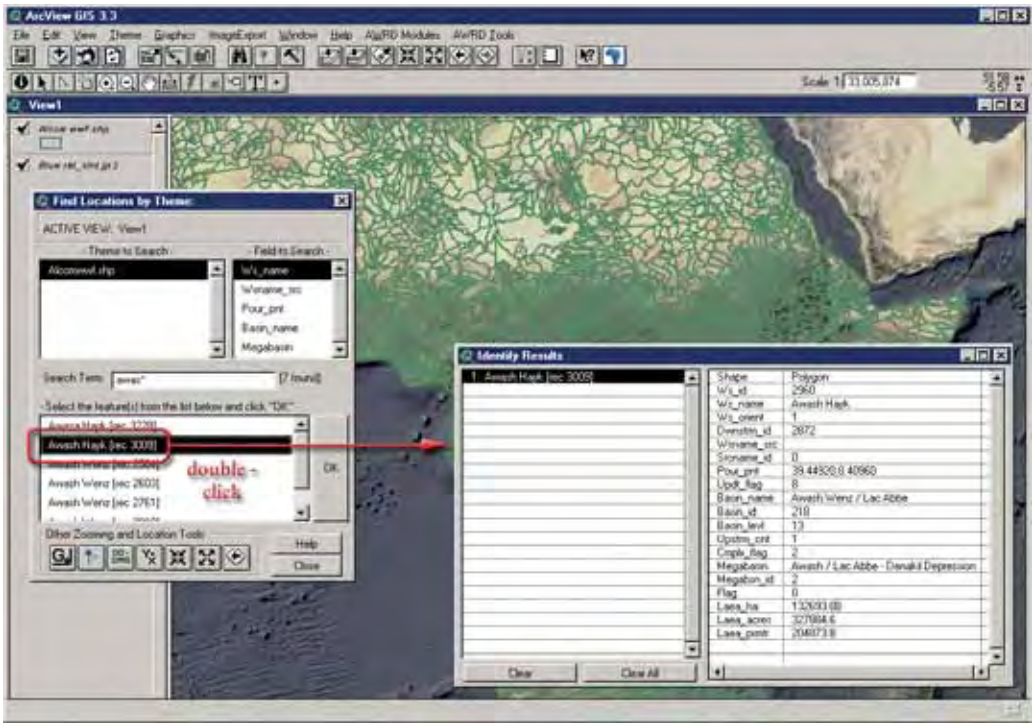
Canal" from the listbox and click the "OK" button and the view will automatically zoom to Ash Shallufah as displayed above.

This tool takes advantage of wildcard characters ("*" and "?") as it searches. These wildcard characters can take the place of unknown characters in the name. "*" takes the place of any number of unknown characters while "?" takes the place of a single unknown character.

For example, if the user was looking for a location called "Awash Hayk": The search string is "aw*", meaning any name of any length that starts with the letters "aw". If the search string was "aw?", then it would only search for 3-letter names starting with "aw". If the search string was only "aw", then it would only search for the name "aw". Furthermore, both of these wildcards can be used in the same search string (e.g. "*wash ha?k", and each of them can be used more than once (i.e. "*was? h??k").

In cases where duplicate or closely matching named results are returned, users can select multiple features from the list. In this example, if they were unsure whether they wanted "Awash Hayk" or "Awasa Hayk", they can select them both. In this case they will be "zoomed" to the extent of all the selected features. Alternatively, they can look at the attributes for either or both features by double-clicking on the name (Figure 1.103).

FIGURE 1.103
Looking at the attributes to screen duplicate or closely matching named results



If the user holds down the [SHIFT] key to select multiple features, and then double-clicks one of them while keeping the [SHIFT] key depressed, then the identity dialog will list the attributes for all the selected features.

Alongside of the Find Location by Theme tool, users may also access several other zooming and locational reference tools from this dialog. These tools allow users to zoom in to any Latitude/Longitude or projected coordinate reference at a specified scale. The tools also include: a conversion utility for converting between decimal degrees, degree/decimal minutes, and degree/minute/decimal seconds; a coordinate screen reporting function; and lastly, various modifications of the standard ArcView zoom and previous extent buttons.

Enter Coordinates and Zoom to Location tool

This tool allows users to specify X/Y coordinates and zoom to that location, and is opened by clicking on the  button on the AWRD Interface, on the Find Location by Theme tool dialog, or by selecting the "*Enter Coordinates and Zoom to Location…*" menu option in the AWRD Tools menu.

The tool is designed to allow the user to enter coordinates via a variety of formats, and then to zoom the specified coordinate reference at a scale which is also determined by the user. Users have the option to enter coordinates in decimal degrees, degrees/decimal minutes, degrees/minutes/decimal seconds, or in the projected coordinates of the active view.

Although the process may seem complicated, it is actually quite intuitive, allowing the user to "switch" between these formats by simply clicking on the "Defaults" button.

Clicking this button opens a dialog which allows the user to set their standard preferences for the tool, or to change them quickly on-the-fly to accommodate a coordinate reference outside of their normal use parameters.

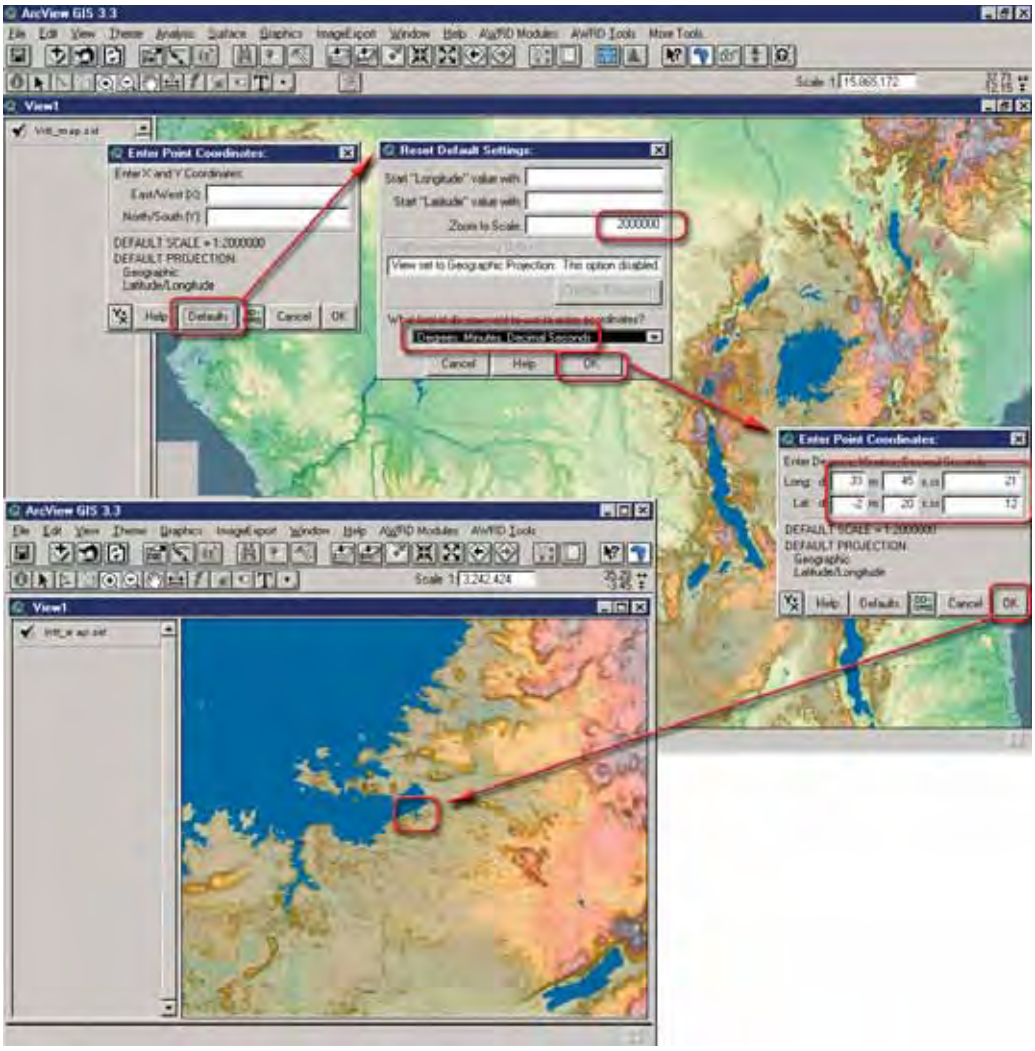
For example, if the user will primarily be working south of the equator, they may want to preset all of their "Latitude" value to have a negative sign (-), or some other set of initial values if they were always going to be working within a more narrow range. Perhaps more importantly, this Default Settings dialog allows users to specify a base scale at which the tool will "Zoom To" whenever they move to a location using the tool.

Example to begin actually referencing a coordinate location:

1. Click on the "Add Basemap Image to View" tool  to load one of the image backgrounds (e.g. "SRTM30_shdbath.jp2") from the image database component folder. This background image is not necessary for proper functioning of this tool, but it makes it easier to locate your area of interest in the view.
2. Open the "Enter Coordinates and Zoom to Location Tool" by clicking on the  button on the AWRD Interface, or by selecting the "*Enter Coordinates and Zoom to Location…*" menu option in the AWRD Tools menu.
3. Click "Default" from the "Enter Points Coordinates"dialog. Write 2 000 000 for the "Zoom to scale"option (i.e. equivalent to 1:2 000 00).
4. Choose one of the four available formats you want to enter coordinates (i.e. proyected x/y coordinates; decimal degrees; degrees, decimal minutes; degrees, minutes and decimal seconds). For this example, choose the degrees, minutes and decimal seconds option.
5. Once this is accomplished, the user can begin entering coordinates in their "preferred" format. Enter: 33° 45' 21" of longitude and -2° 20' 12" of latitude, then simply click on the "OK" button to be zoomed to the location and scale specified. In this case, the south-eastern shore of Lake Victoria (Figure 1.104).

In order to highlight the specified location, the tool will place a blue graphic ✚ sign at the exact coordinates entered by the user. It is important to note that unlike some of the other tools available through the AWRD, this symbol is an actual graphic shape that is written to the graphics plane of the active view. As such, it will remain on the view past the next screen refresh, until the user chooses to select and delete it. In later versions of the AWRD, it is anticipated that users will be given the option of setting their own marker symbol preferences, and detailing whether a graphic symbol is actually added to the active view each time the tool is utilized.

FIGURE 1.104
Entering coordinates in the preferred format and finding location based on a coordinate reference



Note In order to zoom to the correct scale, this tool must "know" what the units of the coordinate system for the active view are. These units are identified by checking the "Map Units" that are set under the View Properties for this view. If the map units are set to "unknown", then the tool will not be able to set the scale correctly and therefore will prompt the user to specify the correct map units before it opens the main dialog .

Coordinates Converter tool

The Coordinates Converter tool associated can be opened by clicking on the DD-DMS button on the AWRD Interface, on the Find Location by Theme tool dialog and on the Enter Coordinates and Zoom to Location tool dialog, or optionally by selecting the "*Coordinates Converter…*" menu option under AWRD Tools menu in any View.

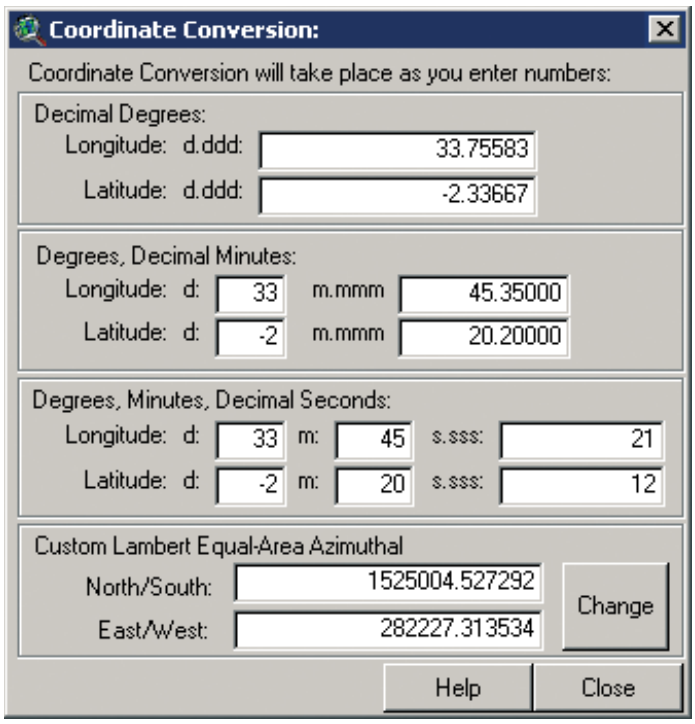
This tool provides a simple way to convert between Decimal Degrees, Degree/Decimal Minutes, Degree/Minute/Decimal Seconds and any projection system a user might be interested in. This tool can be very useful in cases where the user needs to locate a set of coordinates between the multiple views of a project that may be using different projection systems, or to find locations from a tabular dataset or report which are based on differing formats and/or projection system.

This tool is designed to automatically convert all numbers as they are entered by the user. Coordinates in Decimal Degrees (DD), Degrees/Decimal Minutes (DM) and Degrees/Minutes/Decimal Seconds (DMS) all lie between -180° and 180° Longitude and between -90° and 90° Latitude. DD coordinates are in pure decimal format. DM coordinates have integer Degree values and decimal Minute values. DMS coordinates have integer Degree and Minute values and decimal Second values. A degree is equal to $1/360$ of the earth's circumference, a minute is equal to $1/60$ of a degree and a second is equal to $1/60$ of a minute, or $1/3600$ of a degree.

When values are entered into any of various boxes, including the custom projection values at the bottom of the tool, the values in all the other boxes will automatically be adjusted to reflect the correct conversion. As an example:

1. Open the "Enter Coordinates Converter Tool" by clicking on the DD-DMS button on the AWRD Interface, or optionally by selecting the "*Coordinates Converter…*" menu option under AWRD Tools menu in any View.
2. The converter will convert between DD, DM and DMS, plus any projection the user is interested in. The first time the tool is opened, this projection will simply be geographic decimal degrees. If the user changes the projection, then the tool will remember that projection and use it the next time the tool is opened. In cases where it may be impossible to convert a set of coordinates to a particular custom projection, the coordinates in the "projected coordinates" box would be set to "Number Null".
3. Enter 33° 45' 21" of longitude and -2° 20' 12" of latitude, click on the "Change" button and select the desired projection (e.g. Custom Lambert Equal Area Azimuthal, with Central Meridian = 20 and Reference Latitude = -5). The converted coordinates are shown at the bottom of the dialog (Figure 1.105).

FIGURE 1.105
Coordinates Conversion tool



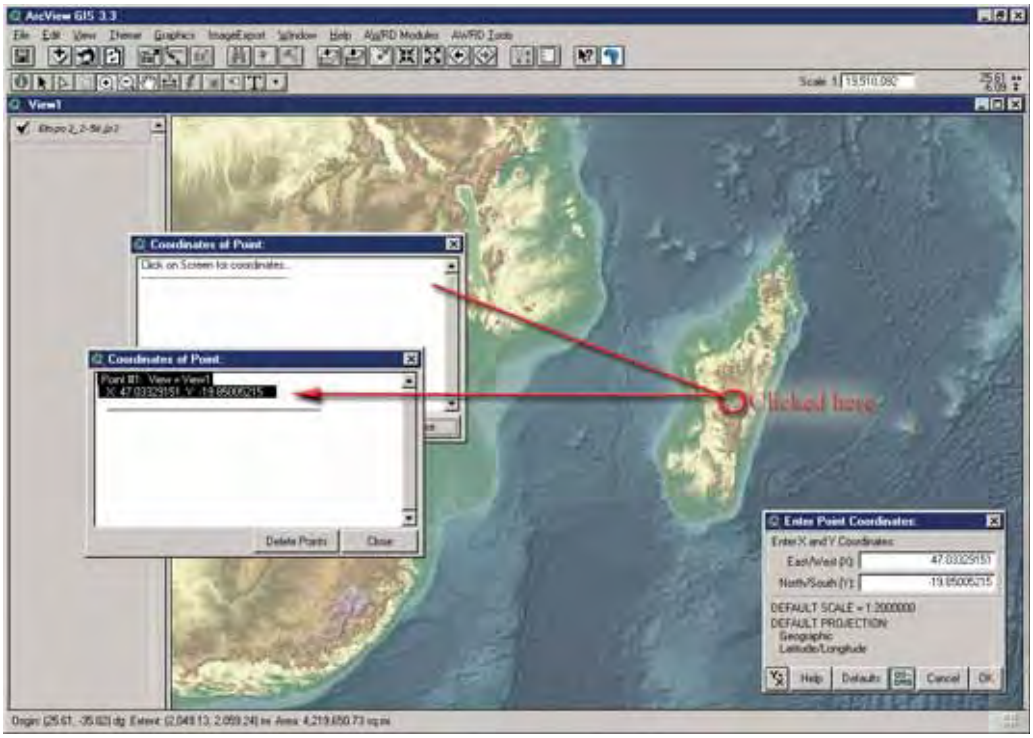
Report coordinates based on screen inputs

The Click on Screen to get coordinates tool may be accessed from either the AWRD Interface, the Find Location by Theme tool dialog or the Enter Coordinates and Zoom to Location tool dialog by clicking on the button. The tool allows users to click

on the screen and have the X/Y coordinates of that spot reported to a separate output dialog. The coordinates are returned in both latitude and longitude decimal degrees and in units reflecting the projection system for any projected view. Based on this report, the user may copy the coordinates and paste them into either the Enter Coordinates and Zoom To Location or into the Coordinates Converter tools of the AWRD, or to any other application via the report clipboard. Example:

1. Click on the "Add Basemap Image to View" tool  to load one of the image backgrounds (e.g. "Etopo 2-2.5d.jp2") from the image database component folder.
2. Open the "Click on screen to get coordinates" tool by clicking on the  button on the AWRD Interface.
3. Click on any desired location (e.g. the centre of the Republic of Madagascar).
4. Open the "Enter Coordinates and Zoom to Location Tool" by clicking on the  button on the AWRD Interface.
5. Copy the coordinates from the "Coordinates of points" dialog into the "Enter Points"dialog then click "OK" (Figure 1.106)

FIGURE 1.106
Getting X/Y Coordinates by clicking on the screen (the Republic of Madagascar)



After this tool is initiated, anytime the user directs a mouse click onto the active view, small green + symbols will appear at the point or along the route traced by the user. Again, as with the Enter Coordinates and Zoom to Location tool, these symbols are actual graphics written to the view which will stay there until they are selected and deleted or until the "Delete Points" button is clicked. As such, the graphics can also be copied and saved, or even translated into shapefile format for exchanging between views, users or institutional locations. Refinements to this tool expected for future implementations of the AWRD would include: giving users the option of setting their own marker symbol preferences, and the option of saving the report output into either a text or shapefile format. Use of this tool is terminated by clicking on the "Close" button.

Zoom to Gazetteer Locations tool

The Zoom to Gazetteer Locations tool is opened by clicking on the button in AWRD Interface or in the Find Location by Theme tool dialog, or by selecting "*Zoom to Gazetteer Locations…*" from the AWRD Tools menu of a View.

There are two Gazetteer database component layers (i.e. dcw_gztr.shp and gns_gztr.shp) currently available within the AWRD archive. The Zoom To Gazetteer Locations tool enables users of the AWRD to access these database components and effortlessly locate and spatially identify approximately 1.1 million locations distributed throughout Africa. As detailed below, the tool provides a method for locating and zooming to a named location based on a particular feature class and subtype, given that they "know" the name or even just a part of the name.

Because gazetteer databases tend to be very large, they also tend to take a long time to search. Therefore it is often desirable to limit the scope of any search to only a subset of features whenever possible. Such a pre-selection process is central to the design of the Zoom to Gazetteer Locations tool, where users are encouraged to restrict their searches to specific countries, feature classes and/or feature types. This is accomplished by selecting one or more of each of these options, and then by clicking the "Apply Options" button. After which, the tool will search only among those features meeting the characteristics specified by the user.

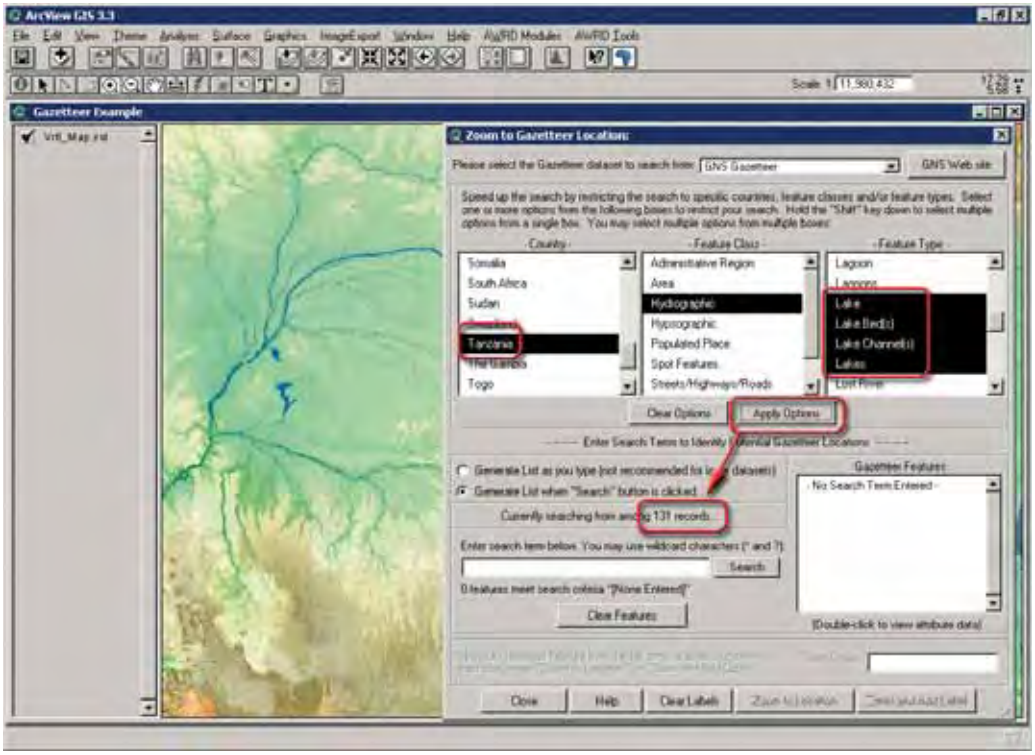
The GNS Gazetteer database, with 1.08 million locations in Africa, is divided up by both feature class and feature type. Selecting any of the "- Feature Class -" options will cause the "- Feature Type -" list to be regenerated with only those feature types from the selected classes. The DCW Gazetteer database, with approximately 20 000 locations in Africa, does not use feature classes, so users can only restrict their searches by country and feature type.

Restrictive searching

Overall, the speed of this tool-set is dependant on the search string entered and whether any restrictive options were "applied" by the user. Search times can still be slow, but they are still much faster than searching the entire database. For example, suppose a user is interested in locating a lake called Lake Mujunju, and the only information they have concerning the lake is that it lies somewhere in Tanzania. In order to constrain their search, the user would first select "Tanzania" from the list of countries, followed by all the "Lake" options from the list of feature types.

1. Click on the "Add Basemap Image to View" tool to load one of the image backgrounds (e.g. "Vrtl_map.sid") from the image database component folder. This background image is not necessary for proper functioning of this tool, but it makes it easier to locate your area of interest in the view.
2. Open the "Zoom To Gazetteer Locations tool" by clicking on the button in AWRD Interface.
3. Select the "GNS Gazetteer"dataset to search from.
4. Select "Hydrographic" feature class, this will cause the "- Feature Type -" list to fill with only hydrographic feature types.
5. Select "Tanzania" as the country and all the "Lake" options as the Feature types
6. Click on the "Apply Options"on the interface (Figure 1.107).

FIGURE 1.107
Constraining a search with the Zoom to Gazetteer Locations tool



In the example above, the total number of records available for query has dropped from 1 083 354 to 131, and the user has not yet begun entering their search string!

As with the Find Location by Theme tool, search strings are not case-sensitive so the user need not worry about capitalization. Also, the user can again use the "*" and "?" wildcard characters in their search. The "*" symbol specifies that any number of characters may be substituted for it. For example, since the user is not sure of the spelling of Lake Mujunju, but is confident that the name contains "Muj", then they may enter "*muj*" to identify all names that include the characters "muj".

The use of the "*" at the front also frees the user from specifying "Lake" in front of the name. This is useful in cases where a potentially matching name in the Gazetteer might include "Mujunju Pools" or "Mujunju Dam" rather than "Lake Munjunju".

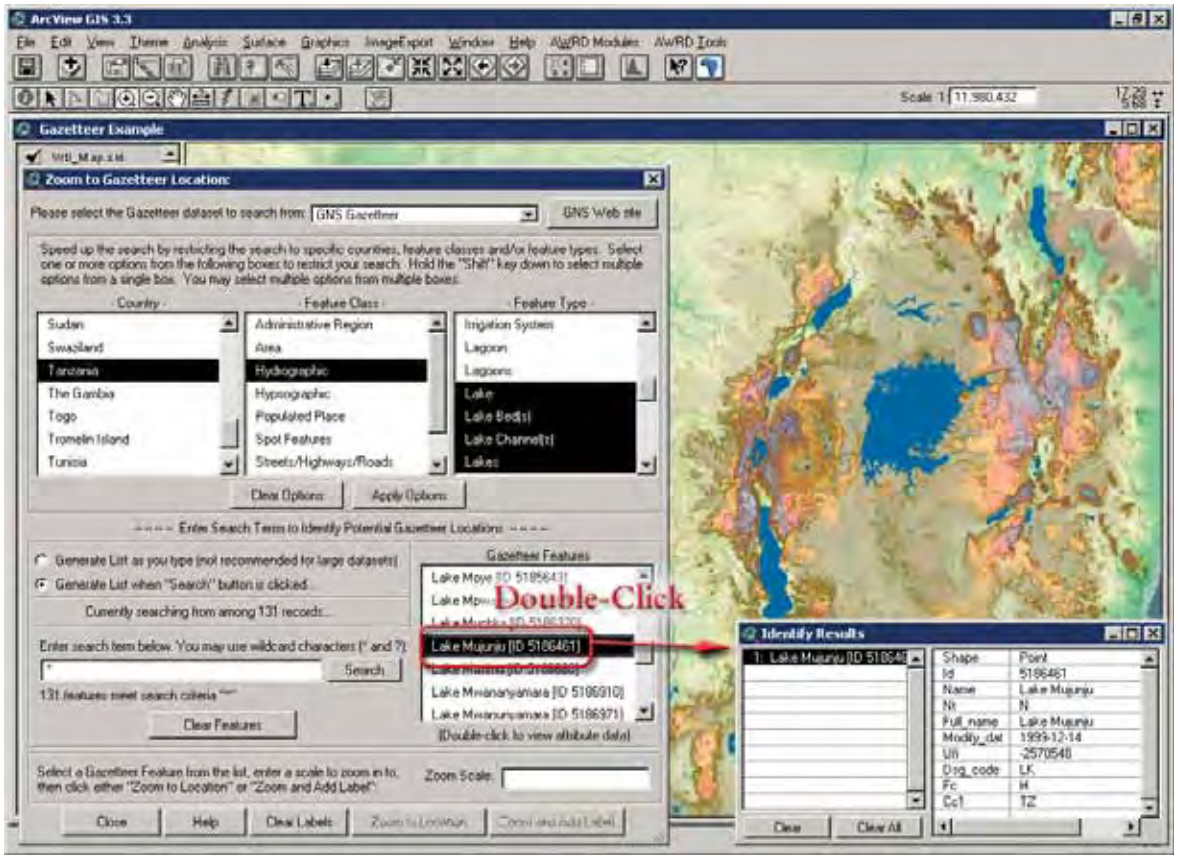
Note Users may choose between two different gazetteers upon which to base queries, both of which are based on NIMA's Geographic Name Server (GNS) database. The GNS Gazetteer database is a point shapefile with over 1 083 000 points in Africa and takes a little bit longer to search than the worldwide DCW Gazetteer shapefile with over 151 000 points (of which approximately 20 000 are in Africa). For more information concerning these gazetteers and the specific feature classes or types available please review the metadata associated with each data layer and/or alternatively visit http://earth-info.nima.mil/gns/html/index.html. This Web site can also be reached by clicking the "GNS Web Site" button on the top right of the Gazetteer dialog.

The user may choose the "?" symbol, in cases where they wish only one character to be substituted in their search criteria, or when they may be unsure of a single letter. For example, if the user again wanted to find the feature named "Lake Mujunju", but was not quite sure of the spelling, they could enter a search string similar to "Lake Muj?nju" or "Lake M?j?nju".

In cases where the user wants to list all the features that meet the general criteria (in this example, all the "lake"-type features located in Tanzania), they need only enter the single symbol "*" as the search term and then click the "Search" button. This will list all 131 Lake-type features located in Tanzania.

Before zooming in to an actual feature, it may be useful to review all of the attribute data associated with it to confirm that it is the feature the user is interested in. Double clicking on any of the names listed will open the "Identify Results" dialog with a list of all visible attributes for that feature (Figure 1.108).

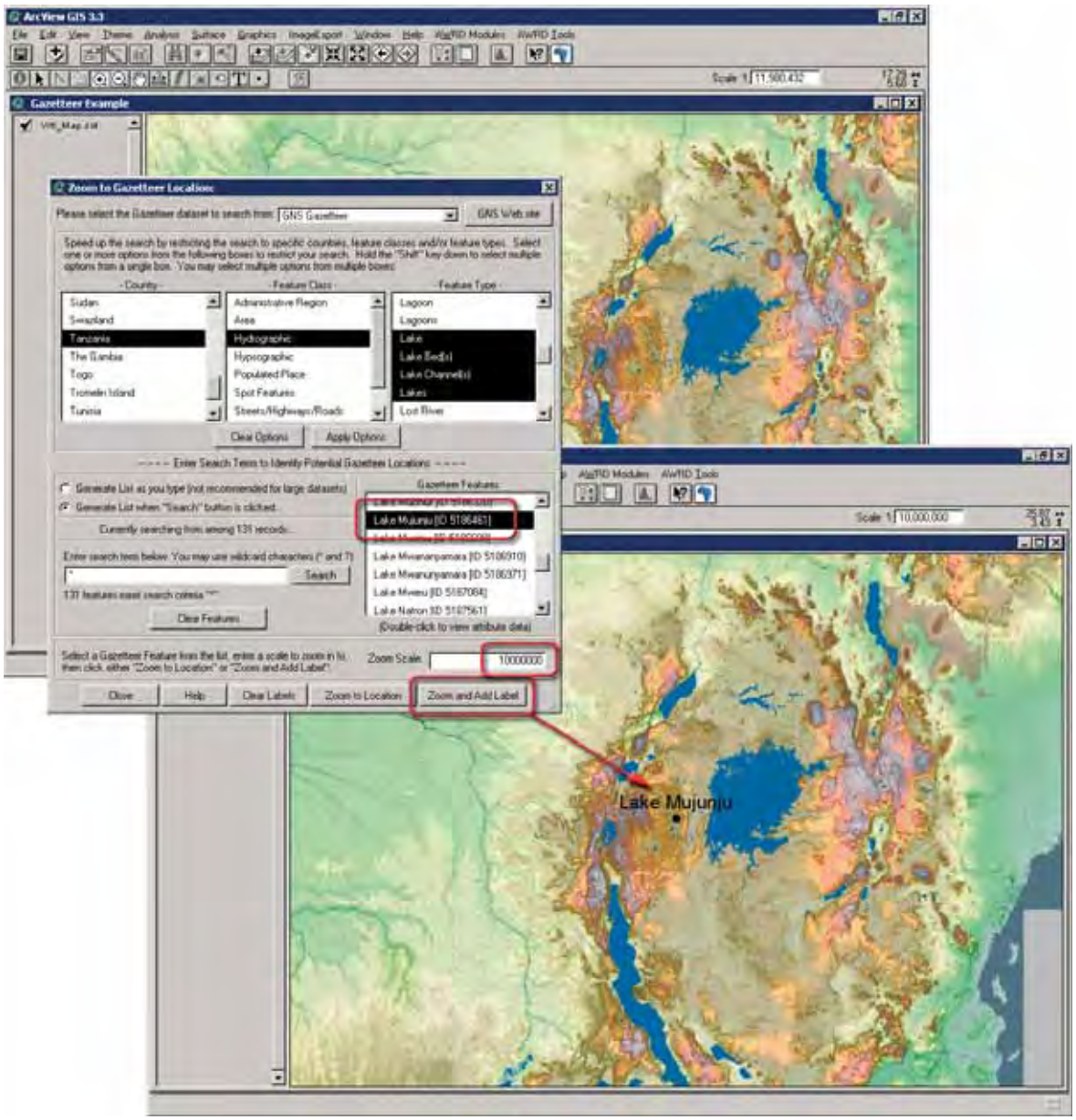
FIGURE 1.108
Reviewing all the attribute data associated with the selected feature



The user must specify a scale before the tool can "zoom" to the named location and draw it on an active view. In this example:

1. Enter 10 000 000 to specify a scale of 1:10 000 000.
2. Click the "Zoom to Location" button or the "Zoom and Add Label" button. For the purposes of illustration, in the following figure it has been assumed that the user chose to "Zoom and Add Label" to "Lake Mujunju" (Figure 1.109).

FIGURE 1.109
Searching by gazetteer locations



Automatic searching

The above example describes the use of the Zoom to Gazetteer Locations tool in what can best be described as manual mode. However, the example of "Lake Mujunju" was fairly straight-forward given the subset of "lake" feature-types that were available for Tanzania, and identifying a relevant named location within a country with hundreds or even thousands of similar feature-types may not always be so easy. Particularly, if the term "Mujunju" could have been associated with a dam, a spring, a waterhole, a pool, a well, a marsh, or possibly the confluence of two rivers. In these cases, constraining the search based on selecting all of the different "lake" feature-types might lead to a null selection set. In such cases, the user should broaden their criteria to include the entire "hydrographic" feature class. In cases where even this fails, however, the user should consider the likelihood that a relevant named location might be found within a different feature class or type, e.g. a population centre. It may even be possible that the country codes associated with a named location is incorrect.

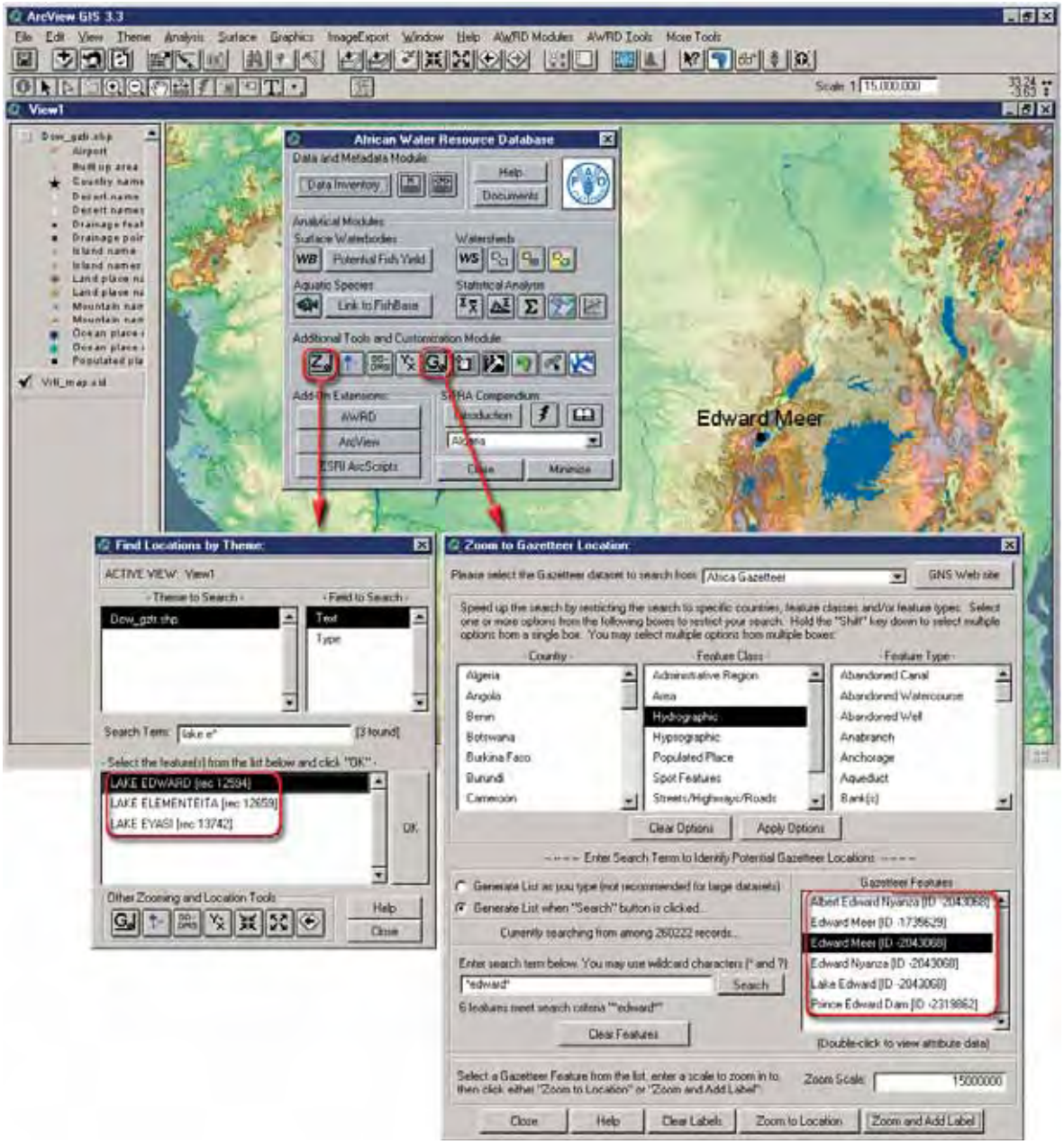
In any of these cases, while it may prove less responsive, it may be worthwhile for the user to consider using this tool in Automatic Mode. In automatic mode, the user can "force" the tool to conduct automatic searches by attempting to continuously update the possible selection results based on each character that is typed or deleted. In this mode, each character typed by the user triggers a new search so the list of features is continuously updated. This option makes it quicker and easier to try different spelling arrangements in cases where the user is unsure of the name for a location, or they have had no success using the manual mode. To use this tool in automatic mode, select the "Generate List as you type" option and start entering characters directly into the "search" field of the tool. Automatic mode can be use with or without previously setting any constraints.

In addition to the gazetteer specific tool-set, the Zoom to Location tool-set provides an alternative method for users to identify and then spatially reference locations based on a name or any other text based search of an alphanumeric character field. In the example below (Figure 1.110), a search by a user for Lake Edward is presented using both: the Gazetteer tool-set based on a search "*edward*" of all hydrographic features in the GNS Gazetteer, yielding five direct results; and the Find Location by Theme tool based on a search for "Lake e*" in the DCW Gazetteer, which returned a large number of results. Although the DCW Gazetteer was chosen for the purposes of comparison, the Find Location by Theme tool could have been used to search for any string within any vector based theme having a similar "name" or text-based encoding attribute.

1. Click on the "Add Basemap Image to View" tool  to load one of the image backgrounds (e.g. "Vrtl_map.sid") from the image database component folder. This background image is not necessary for proper functioning of this tool, but it makes it easier to locate your area of interest in the view.
2. Click on the "Data Inventory" button 

to load one of the gazetteer themes (e.g. DCW_gztr.shp) from the Gazetteer database component.
3. Open the "Find Location by Theme tool" by clicking the  button available directly on the AWRD Interface.
4. Select "Dcw_gtzr.shp"as the Theme to Search; "Gztr_name" as the Field to Search and type: lake e* as the Search Term. Click "OK".
5. Open the "Zoom To Gazetteer Locations tool" by clicking on the  button in AWRD Interface.
6. Select the "Africa Gazetter" dataset to search from.
7. Select "Hydrographic" feature class, this will cause the "- Feature Type -" list to fill with only hydrographic feature types.
8. Select "Generate List when "Search" button is clicked.
9. Enter *Edward* as the search item.
10. Select "Lake Edward" from the list.
11. Click on the "Zoom and Add Label" n the interface (Figure 1.110)

FIGURE 1.110
Find location based on both a zoom-to-location and a gazetteer search



Based on this example, it can be seen that the use of either of these tool-sets would have produced similar results. The "Zoom and Add Label" tool of the Gazetteer tool-set was used to reference and place a label for Lake Edward.

Select by Theme tool

The Select by Theme tool is similar to the standard ArcView "*Select By Theme...*" function found in the "Theme" menu of a view, but with many added functions. It allows the user to select features from one theme based on their proximity to features from another theme. This tool will not be enabled if there are less than two feature themes present in the view. This tool is opened by clicking on the  button on the AWRD Interface or the menu option "*Select by Theme...*" of the AWRD Tools menu

to open tool dialog. For example, if the user was interested in selecting all the rivers that intersected a particular watershed:

1. Click on the "Data Inventory" button 

to load one of the watershed models (e.g. "Alcomwwf.shp") from the Watersheds database component.
2. Click on the "Data Inventory" button 

to load one of the river themes (e.g. HYDRO-1 Kilometer Flow Drainage Network, or "h1k_flow.shp") from the Watersheds database component.
3. Make the watershed model active by clicking the name in the view table of contents, and use the ArcView Select tool  to select the watershed to use as the basis for selecting intersecting rivers.
4. Open the "Select by Theme Tool" by clicking on the  button on the AWRD Interface or the menu option "*Select by Theme…*" of the AWRD Tools menu to open tool dialog. The dialog opens with two lists of all the feature themes in your view. In the top list, choose the theme that you wish to select from (Rivers dataset, H1k_Flow.shp, in this example). As soon as a theme is selected, that theme name will disappear from the list on the bottom, and the "Open Theme Table" and "Theme Statistics" buttons will become enabled.
5. Choose the watersheds model "Alcomwwf.shp" from the "selected features of" list.
6. Our purpose in this example is to select all the rivers that intersect the currently selected watershed, so we now select "Intersect" from the drop down list of proximity relationships, choose the option labelled "the selected features of", and then pick the Watersheds theme from the bottom list. Finally, click the "New" button to select the rivers. By doing this, you will see a report at the bottom of the dialog giving the number of rivers currently selected. For illustration purposes, the watershed in the image below has been manually unselected so that the river selection is easier to see (Figure 1.111).
7. Open Theme Table" button  to view the Rivers theme attribute table, the rivers selected will be highlighted in yellow, click on "Promote" button  to list them at the beginning of the attribute table.
8. Click on the Summary Statistics button  to open the Theme Summary Statistics tool dialog, from which you can calculate a wide variety of statistics on the currently selected rivers.

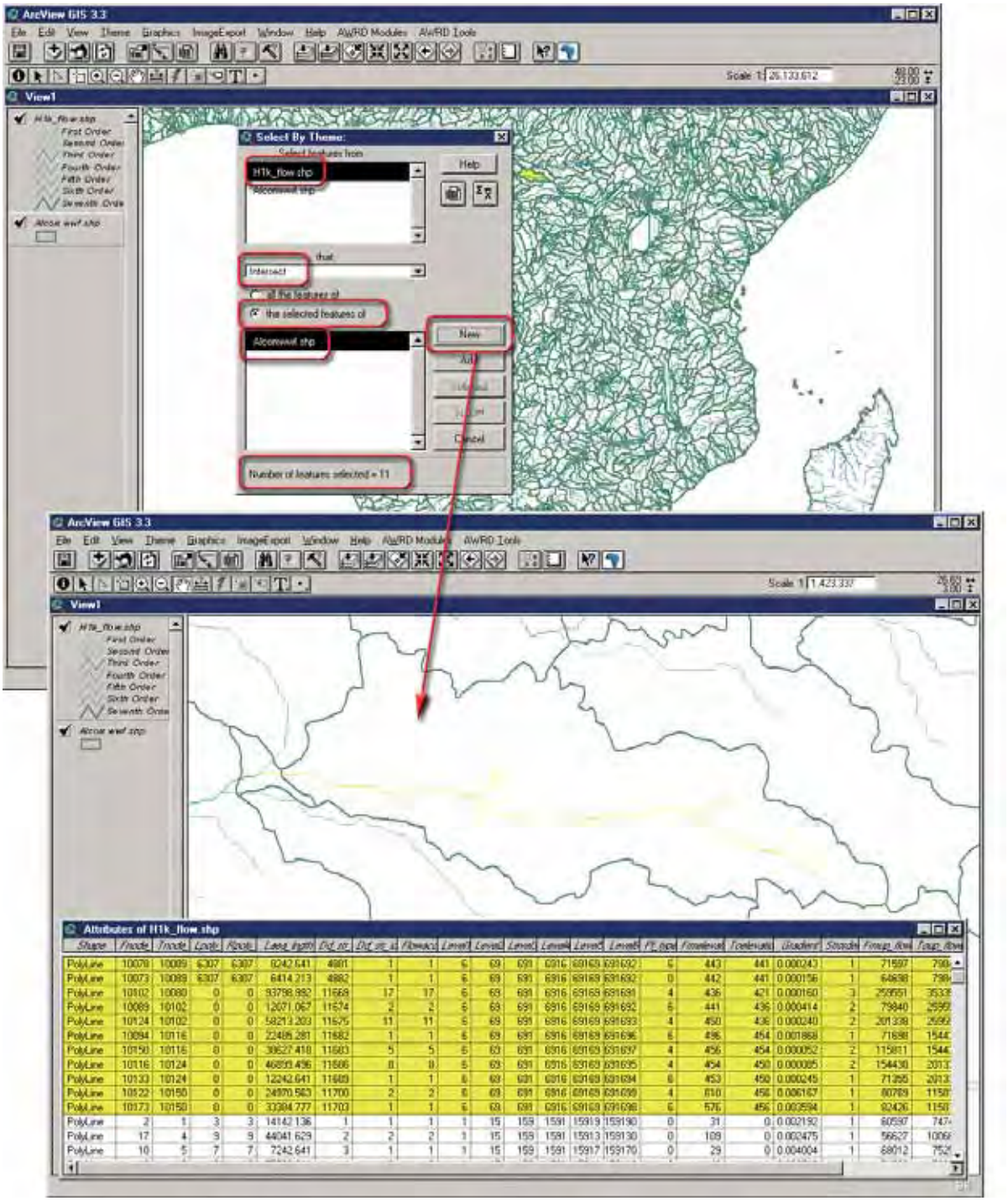
Proximity relationships

The drop down list contains a wide variety of proximity relationships, including options for "Intersect", "Completely Contain", "Are Completely Contained By", "Contain the Centers Of", "Have Centers Contained By", and "Within Distance Of". If the user chooses "Within Distance Of", then they will also be able to enter a distance value.

Selection types

The tool contains buttons for "New", "Add", "Subtract" and "Subset". The "New" button, as illustrated in the example above, clears any previous selection and creates a new selection which is based solely on the proximity relationship specified. The "Add" button will retain any previous selection and add new features that meet the proximity relationship. The "Subtract" button will identify all the features that meet the proximity relationship and unselect them if they are currently selected. The "Subset" button will unselect any currently selected features that do not meet the proximity relationship.

FIGURE 1.111
Using the Select by Theme tool to select all the rivers intersecting a particular watershed



Query Builder tool

The Query Builder tool is opened by clicking the  button on the AWRD Interface or on the Watersheds Module dialog, or by selecting "*Query Builder…*" from the AWRD Tools menu. This tool is similar to the standard ArcView Query Builder available in the View button bar, but with a variety of additional functions and features. This tool gives the user the ability to apply complex queries to the data to either select features or to apply a theme definition.

Theme definitions are normally set in the Theme properties and they identify particular subsets of the theme to show in ArcView. As long as a theme definition is set, only the features that meet that definition will show in the view or in the attribute table. Theme selections, on the other hand, identify subsets of data that the user might wish to analyse, and selection sets are often changed regularly as the user analyses different areas. The concepts are closely related, however, and this tool provides a simple way to do both.

The Query Builder dialog also offers two buttons that provide quick ways to view and analyse the attribute data for any of the themes in the view. The Open Theme Table button will open the attribute table for the currently selected theme, and the Field Summary Statistics button will open the Summary Statistics tool from which you can calculate a wide variety of statistics on your theme.

Setting Theme Definitions

Setting a theme definition is a powerful way to avoid being distracted by irrelevant data and to help you focus on your project or analysis. By setting a theme's definition, you tell ArcView to show you only the features that meet that definition. For example, the Terrestrial Watershed and Large Marine Ecosystem dataset from the Global International Waters Assessment is a medium-resolution dataset delineating both terrestrial and marine regions. Suppose that for our purposes we were only interested in the terrestrial portion of this dataset. We could set the Giwa_lme.shp theme definition using the Query Builder tool to show us only the land portions.

1. Click on the "Data Inventory" button Data Inventory to load one of the Gazetteer themes (e.g. GIWA Large Marine Ecosystem/Basin Delineation, or "Giwa_lme.shp") from the Watersheds database component.

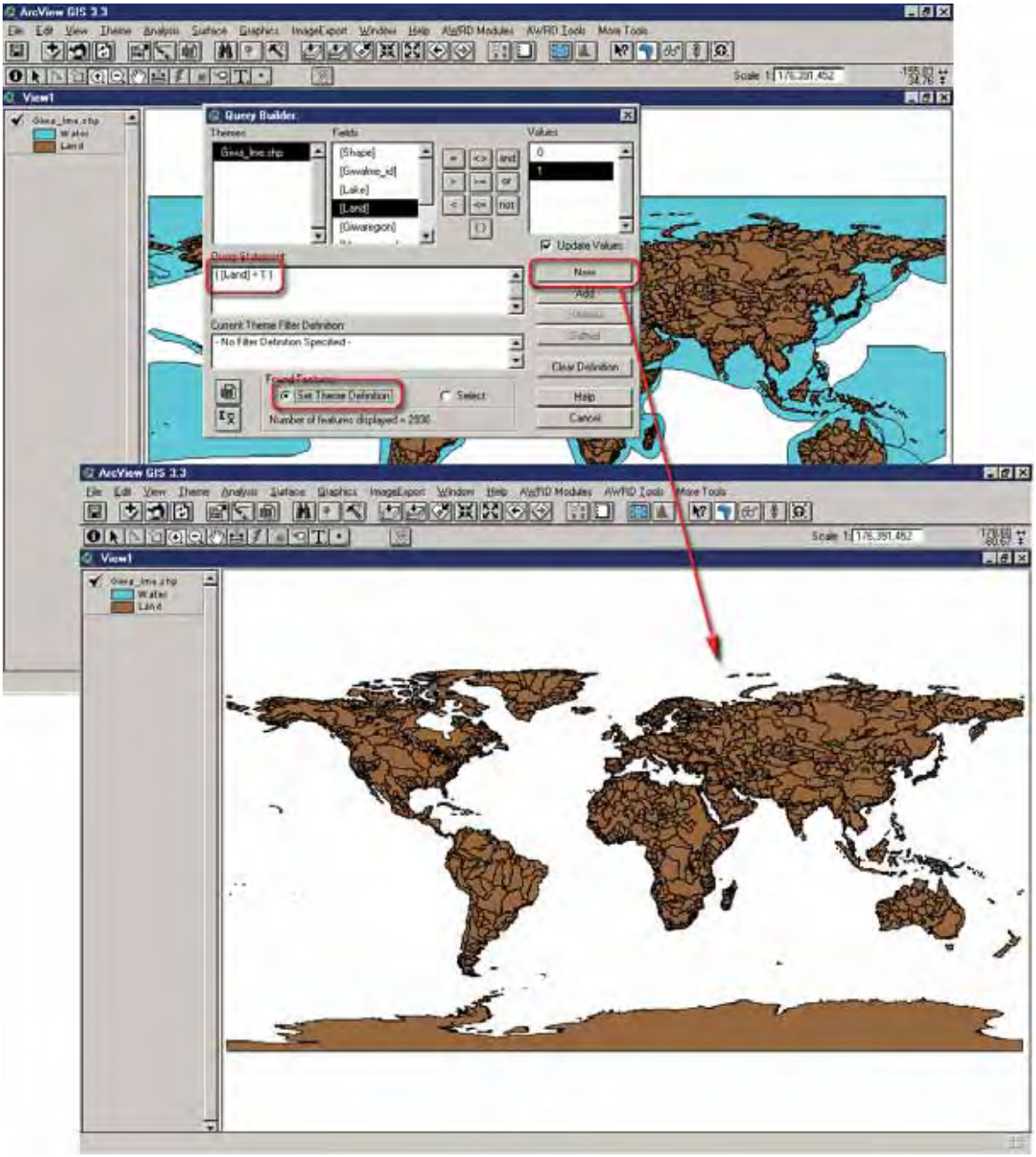
2. For this example, it may be visually helpful to manually change the legend of this theme so that it only shows "Land" vs. "Not Land" (i.e. set legend type to "Unique Value", and the value field to "Land").

3. Click on the button on the AWRD Interface to open the Query Builder tool.

4. The terrestrial regions are identified with a "1" in the Land field, and the marine regions are identified with a "0". Therefore we identify only the terrestrial regions by using the Query Builder tool to set the Query Statement to "([Land] = 1)". You can enter this query statement by double-clicking the "[Land]" field in the "Fields" list box, then clicking the "=" button, and then double-clicking the "1" value in the "Values" list box. The values in the "Values" list box will only be available if there are less than 32 500 features in the theme, and only if the "Update Values" checkbox is checked.

5. Next, notice that there is no current theme definition specified. Because of this, all 2 936 polygons are visible in the view. To apply our new definition, make sure that the "Set Theme Definition" option is clicked and then click the "New" button (Figure 1.112).

FIGURE 1.112
Setting new Theme Definitions to the Terrestrial Watershed and Large Marine Ecosystem dataset



Notice that the marine regions are no longer visible in the view and the number of features displayed has dropped to 2 788. The new theme definition has now been registered in ArcView and you can confirm this by clicking the "Theme" menu, then "*Properties…*", and looking in the Definition box. The attribute table will reflect this new definition as well. Open the theme attribute table by clicking the  on either the Query Builder dialog or the View button bar and notice that there are only 2788 records now in the table.

You may clear this definition using the "Clear Definition" button, and you can add to it by building another Query Statement and clicking the "Add", "Subtract" or

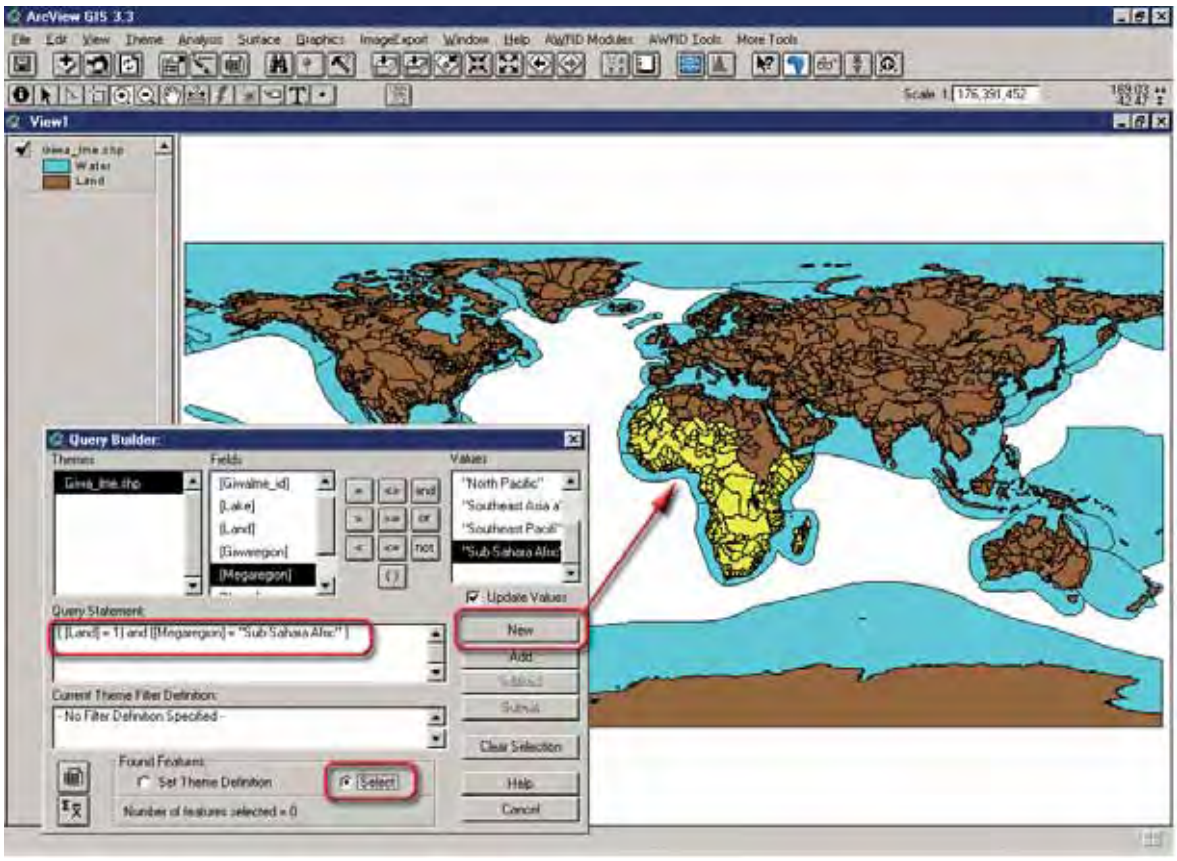
"Subset" buttons. The "Subtract" and "Subset" buttons will only be enabled if there is a current theme definition set, because otherwise there would be no definition to subract or subset from.

Selecting features from a Theme

You can select features from a theme using the same methods described for setting a theme definition. Simply change the option to "Select" rather than "Set Theme Definition", and then the Query Builder tool will use the query statement to select features. For example, if we wanted to select all Giwa_lme.shp regions that were both terrestrial and in sub-Saharan Africa, we would enter the Query Statement as follows and you can enter either type the Query Statement manually or enter it automatically by:

1. From the "Found Features" in Query builder tool choose "Select"
2. Double-click the "[Land]" field from the "Fields" list.
3. Click the "=" button.
4. Double-click "1" from the "Values" list.
5. Click the "and" button.
6. Double-click the "[Megaregion]" field from the "Fields" list.
7. Click the "=" button.
8. Double-click "Sub-Sahara Africa" from the Values list.
9. Click the "New" button (Figure 1.113).

FIGURE 1.113
Selecting features from a theme trough the query builder tool



Add a basemap image to a view

The AWRD Image database comes with a large number of basemap images of Africa at several resolutions, which provide high-quality backgrounds for both on-screen viewing and for printing maps. This tool offers a simple way to add these basemap images of Africa to the view.

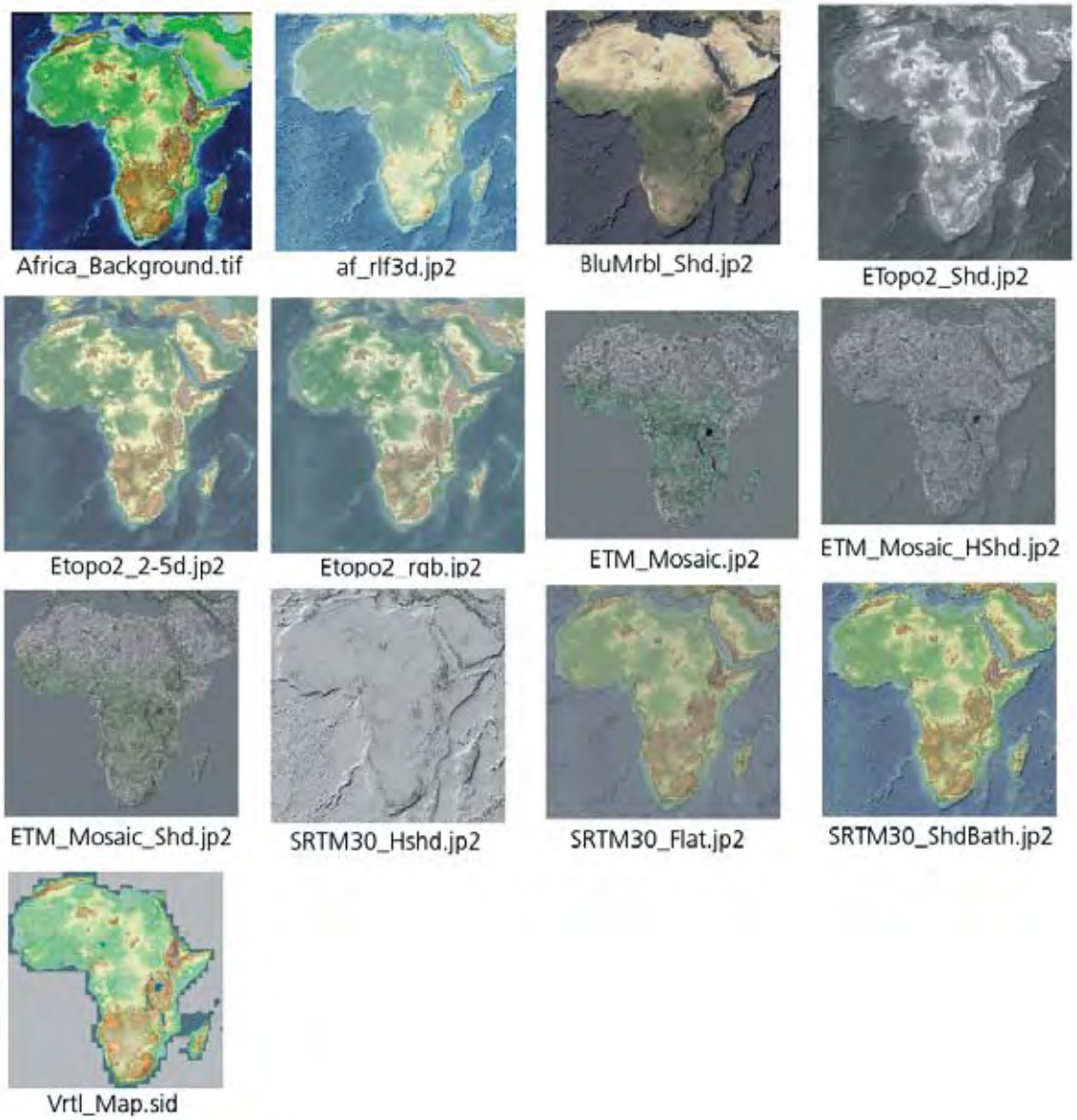
This tool is designed to let you choose from all images located in the "..\Data\aimg_dbc\.." directory, so you can easily add your own images to the list by putting them in that directory. The AWRD is currently written to display bmp, bsq, bil, bip, Erdas, Grid, Imagine, jpeg, MrSID, tiff and JPEG2000 images.

Click the Add a Basemap Image to View button on the AWRD Interface or select "*Add a Basemap Image to View…*" in the AWRD Tools menu to open the Image Selection dialog, and choose the image or images you would like to add.

1. Click on the button on the AWRD Interface to open the "Add a Basemap Image to View"
2. Select one of the 13 "images" from the "Ancillary Image and Map Graphic" database component folder installed in your hard-drive: "c:\wrd\data\aimg_dbc".

Figure 1.114, provides thumbnails of all the images available in AWRD.

FIGURE 1.114
Background images available in the AWRD



Tools for calculating and reporting GeoStatistics

The AWRD provides two methods for calculating area and perimeter lengths for polygons and lengths of lines. The "Report GeoStats for Lines or Polygons You Select" tool on the AWRD Interface  allows you to click on polygons or lines and generate an immediate report, while the "*Calculate/Update Geostats in Polygon Theme Tables…*" option in the AWRD Tools menu allows you to calculate the values directly to the theme attribute table.

Reporting GeoStatistics for selected lines or polygons

The "Report GeoStats for Lines or Polygons You Select" tool works on all active line or polygon themes in the view, so begin by activating all the themes of interest. To activate a theme:

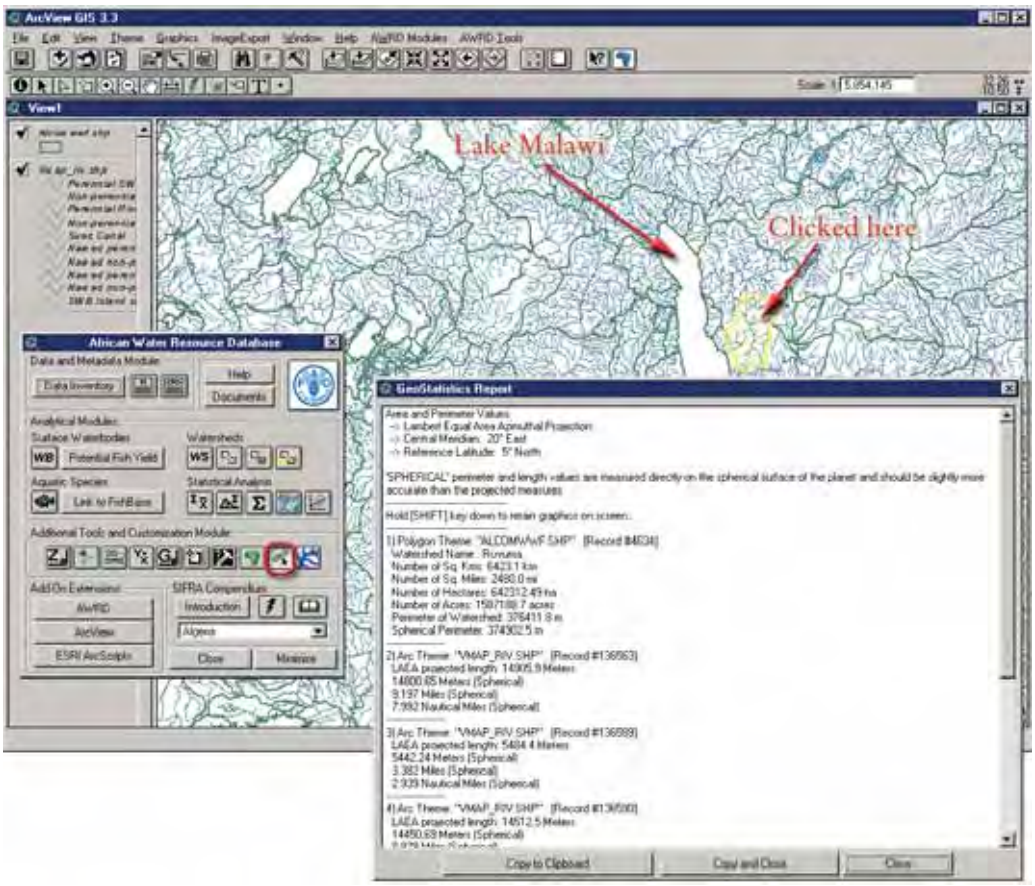
1. Click on the "Data Inventory" button  to add one of the river themes (Vmap_riv.shp) from the rivers database component.
2. Click on the "Data Inventory" button  to add one of the watersheds models (Alcomwwf.shp) from the watersheds database component.
3. Click on the theme name (i.e. Vmap_riv.shp) in the View table of contents listed on the left so that it appears to have a raised box around it.
4. Click the  tool on the AWRD Interface to activate the tool. The cursor should change to a ⊙ symbol while this tool is in use. Move the cursor to the river or line features of interest and click on them. The chosen rivers will become highlighted, and their length values will be reported in a script report.
5. Alternatively, click on the "Alcomwwf" theme name and click on the  tool. The cursor should also change to a ⊙ symbol while this tool is in use. Move the cursor and click on the desired watersheds or polygons of interest, and their area values will be reported in a script report.

In this example both the "Rivers" (Vmap_riv.shp) and "Watersheds" (Alcomwwf.shp) themes were both active, by using the [SHIFT] key on the keyboard, so the report displays information on both the river and watershed features that intersected the point (Figure 1.115).

Area and length values are very dependent on the projection being used, so the report begins by showing which projection was used for the calculations. If the data are in geographic coordinates and the view is not projected, then the tool will use the Lambert Equal Area Azimuthal projection centred at 20° Longitude by 5° Latitude. Otherwise the tool will use the projection of the view or data.

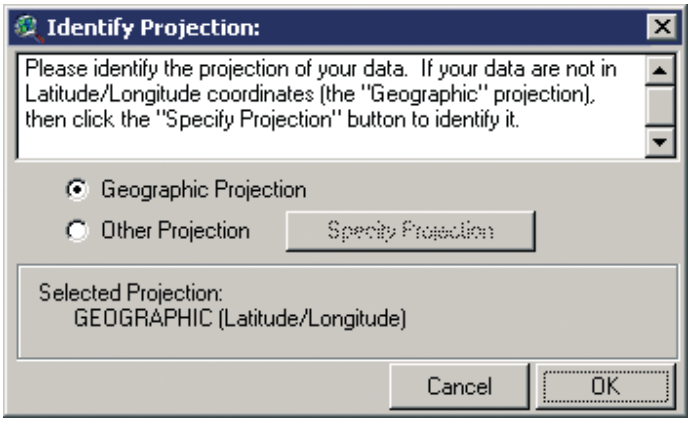
The tool also reports length values based on "Spherical" coordinates, meaning the lengths are measured as if they were draped over the surface of a sphere. These spherical measures should be slightly more accurate than the projected measures.

FIGURE 1.115
Reporting GeoStatistics for the selected features



The tool attempts to determine the projection of your data based on several conditions. If your view is projected, or if your view units are set to Decimal Degrees, or if the y-coordinates of all your data lay between -90 and 90 and the x-coordinates all lay between -180 and 180, then the tool will assume that your data are in geographic coordinates. If your data do not fit any of these conditions, then the tool must query you to identify the projection of your data. The tool must know the initial projection before it can calculate the spherical measures (Figure 1.116).

FIGURE 1.116
Identifying the projection before reporting Geostatistics



Calculating/Updating GeoStatistics for Polygon Themes

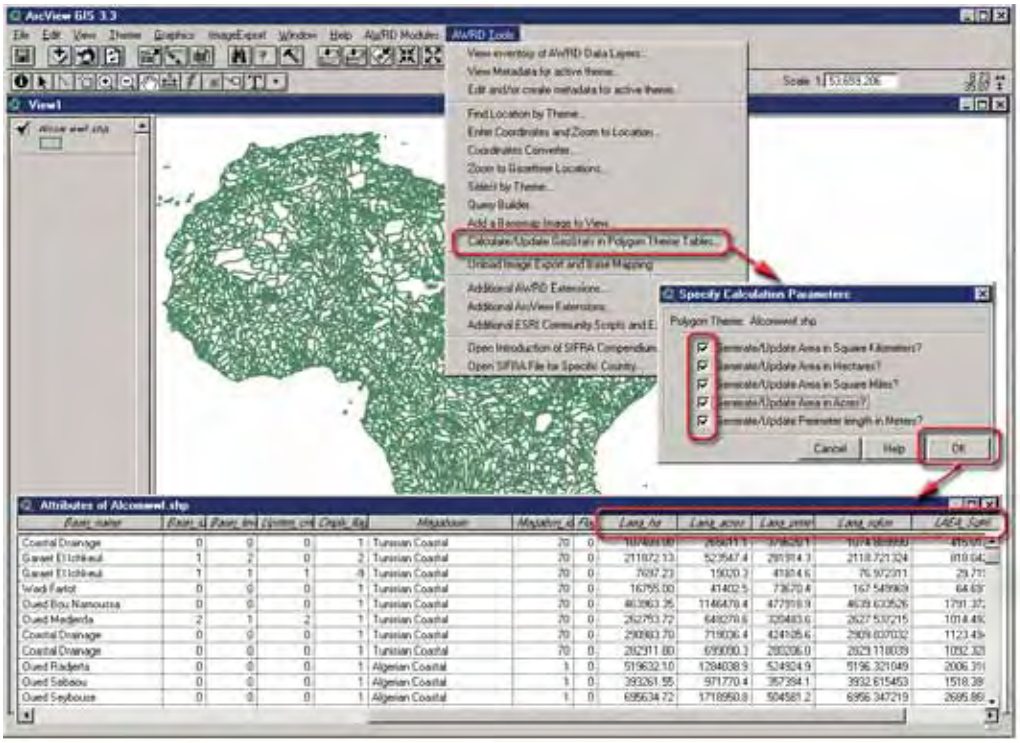
The "*Calculate/Update Geostats in Polygon Theme Tables…*" menu option in the AWRD Tools menu is intended to calculate areas and perimeter lengths for polygons based on the Lambert Equal Area Azimuthal projection centred at 20° Longitude by 5° Latitude, and add these values to fields in the theme attribute table. The tool can also be used to update existing values if the polygon shapes have changed.

This tool will work on the active polygon theme in the view and will be disabled if no polygon theme is active. If multiple polygon themes are active, the tool will ask the user to identify the theme to use.

As with the Report GeoStats tool, this tool attempts to identify the original projection of the data based on whether the view is projected, the view map units are set to Decimal Degrees, or if the y-coordinates all the themes in the view lie between -90 and 90 and the x-coordinates all lie between -180 and 180. If any of these conditions are not met, the tool will first ask the user to identify the projection. Once the projection has been identified, the tool will query the user for exactly which geostatistical values to calculate. The user may choose between Area values measured in square kilometres, square miles, hectares and acres, and perimeter values measured in metres.

1. Click on the "Add Theme" tool  to add a polygon theme to your view.
2. Select "Calculate/Update GeoStats in Polygon Theme tables"from AWRD Tools drop-down list.
3. Specify the Calculation parameters. In this example select all of them, then click "OK".
4. Open the theme attribute table for your polygon theme by clicking the  on either the Query Builder dialog or the View button bar. Scroll to the right of the Table and you will see the columns that were added with the statistics results (Figure 1.117).

FIGURE 1.117
Specifying geostatistics calculation parameters and viewing the results in the theme attribute table



River Identification tool

The River Identification tool is designed to allow the user to identify continuous sections of river which are at the same order level. This assumes that the river theme being examined has river segments ranked according to the standard river order system, such that smaller tributaries have lower values than larger tributaries. For example, the theme Wria_riv.shp contains river order values for each river segment in the "Rank" field.

The River Identification tool will give you an easy way to select, and potentially rename, all attached river segments of a particular order. "Select Adjacent Rivers of Same Level"  button on the AWRD Interface to start the process. This button will only be enabled if the user has a single river theme active in their view. The user will first be prompted to identify the Rank and Name fields for the river theme, and then the River Identification tool will stay open for as long as the user wishes to keep it open. When the River Identification tool has been opened, the cursor will turn into a ⊙ symbol. Use this symbol to click on a river segment of interest.

In this example, the smallest tributaries are identified with "1" values, and when two Level-1 tributaries come together they form a Level-2 river. Two Level-2 rivers merge to form a Level-3 river, etc.

1. Click on the "Data Inventory" button  to load one of the rivers datasets (e.g. Wria_riv.shp) from the Rivers database component.
2. Click on "Select Adjacent Rivers of Same Level"  button on the AWRD Interface. Select "Rank"as the River Level Field and "Wria_id"as the River Name Field. Click "OK".
3. The cursor will turn into a ⊙ symbol, use this symbol to click on a river segment of interest. Doing this will open the "Select River"dialog presenting the ID of the river selected. The text box labelled "River Name" tells us the name of the first selected segment, and the names of the other river segments. If we wished to, we could rename all three of these segments by clicking the "Rename" button and entering a new name.
4. Select "Theme" from ArcView Table of Contents (top menu bar) then select "Auto-label" use "Wria_id" as the Label Field (Figure 1.118).

If the user wished to select additional river segments along with the three that are currently selected, or if they wish to deselect one of the currently selected segments, then they could hold down the [SHIFT] key as they clicked on the rivers. Holding down the Shift key causes the tool to select or deselect individual segments without considering any adjacent segments.

FIGURE 1.118
Renaming the selected river segments

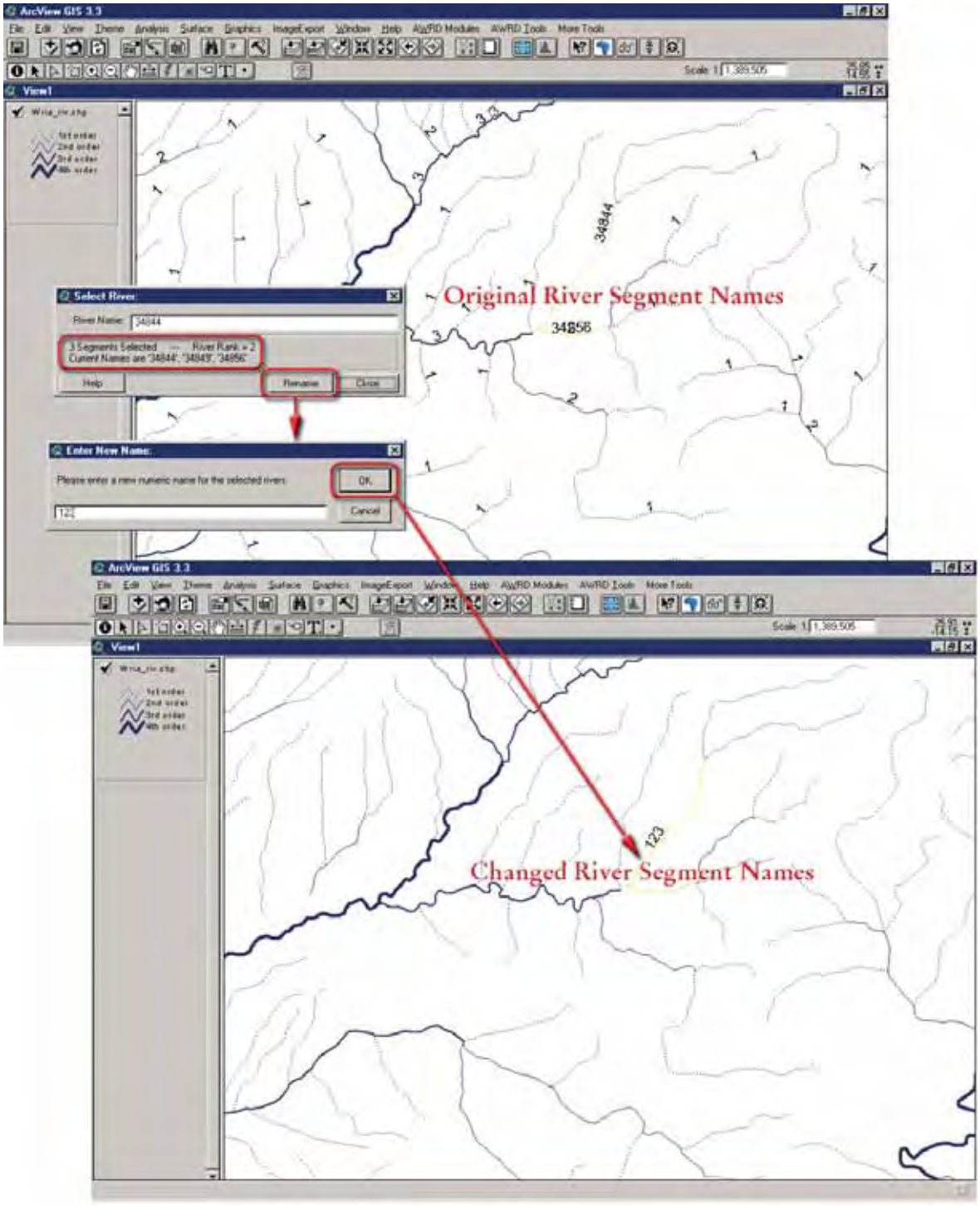


Image Export and Base Mapping Extension tool

The Image Export and Base Mapping (IEBM) tool-set of the AWRD is comprised of a complex set of geo-referenced image output, View, and Layout manipulation tools accessible through a menu interface. The base mapping functions of the tool-set are designed around the production of A4/Letter size page outputs, which – as determined by ArcView – are the largest outputs possible for publication quality graphics ranging from 300–600 dots-per-inch (DPI) using the tool.

The extension is centred around an ArcView scripting command named PixMap. The PixMap function provides the only method for producing output graphics which most faithfully reproduce the feature encoding and any complex polygon hatching, including semi-transparencies, designed by users to represent their data on Views and Layouts. Unfortunately, PixMap is not without its quirks and limitations.

The foremost limitations of the command are: the inability to export text/graphics placed on a View, so a layout is required; and, the need to scale the source View/Layout to its full pixel extents on the screen for outputs. In regards to size, PixMap has limitations closely matching the native ArcView export functions.

Outweighing these limitations are the faithful 24-bit reproduction of complex multi-layer polygon shading; the consistent export of geo-referenced images exactly matching the dimensions of views/layouts; and the almost complete control over the process – and therefore the outputs – that a user can achieve.

Loading and unloading the Image Export and Base Mapping Extension

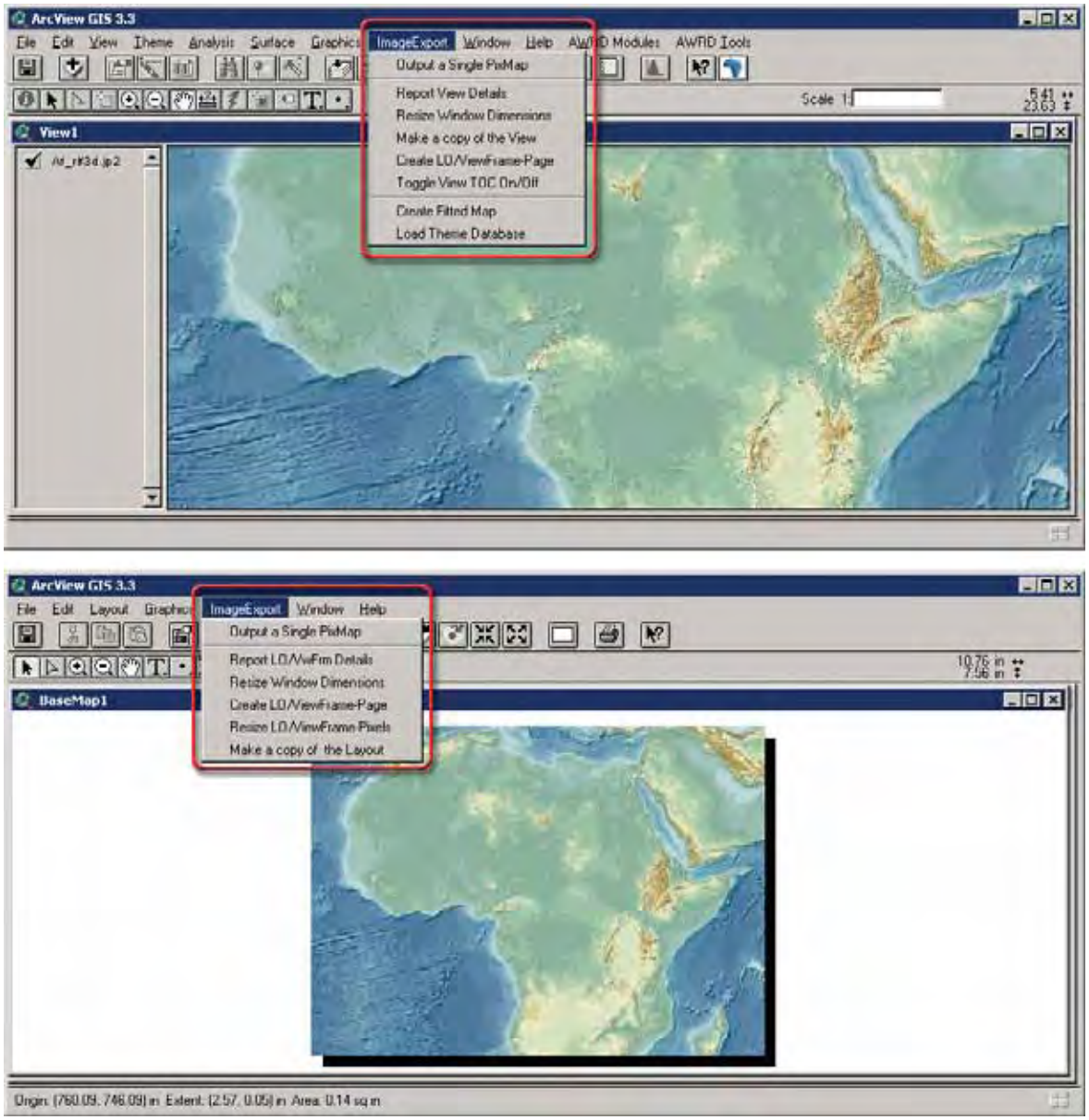
The IEBM extension will load automatically when the AWRD extension is loaded. Thereafter, the extension can be either loaded or unloaded by selecting the Image Export and Base Mapping options "Load Image Export and Base Mapping" or "Unload Image Export Base Mapping" from the AWRD Tools menu on any View.

When the extension is loaded, a new menu item (i.e. ImageExport) will be added to the main toolbar of both Views and Layouts in ArcView. The choices available to users from this new menu are fairly similar but will differ depending on whether a View or Layout is the source document (Table 1.31 and Figure 1.119).

TABLE 1.31
Image Export and Base Mapping tools

IEBM Tool	View IEBM menu option	Layout IEBM menu option	Function
Outputting a Single PixMap	"*Output a Single PixMap*"	"*Output a Single PixMap*"	Output a geo-referenced image at user specified DPI
Reporting View/Layout Details-	"*Report View Details*"	"*Report Lo/VwFrm Details*"	Report the View Layout extents and projection parameters
Resizing Window Dimensions	"*Resize Window Dimensions*"	"*Resize Window Dimensions*"	Resize the window extent to exact pixel dimensions
Making a Copy of a View/ Layout	"*Make a copy of the View*"	"*Make a copy of the Layout*"	Create a copy of the source View or Layout
Creating Layout ViewFrame – Page	"*Create LO/ ViewFrame-Page*"	"*Create LO/ ViewFrame-Page*"	Create a Layout containing a ViewFrame fitting the exact dimension of the page size
Resizing Layout/ViewFrame – Pixels	N/A	"*Resize LO/ ViewFrame-Pixels*"	Resize the Layout extent to exact pixels dimensions
Toggling Table of Contents On/Off	"*Toggle TOC On/ Off*"	N/A	Set the View Table of Contents "On" or "Off"
Creating Fitted Map	"*Create Fitted Map*"	N/A	Based on View selection set, create a A4/Letter Layout with a fitted/ scaled ViewFrame
Importing Theme Database	"*Load Theme Database*"	N/A	Load precompiled theme sets into current/new View

FIGURE 1.119
The IEBM tools for views (top) and for layouts (bottom)



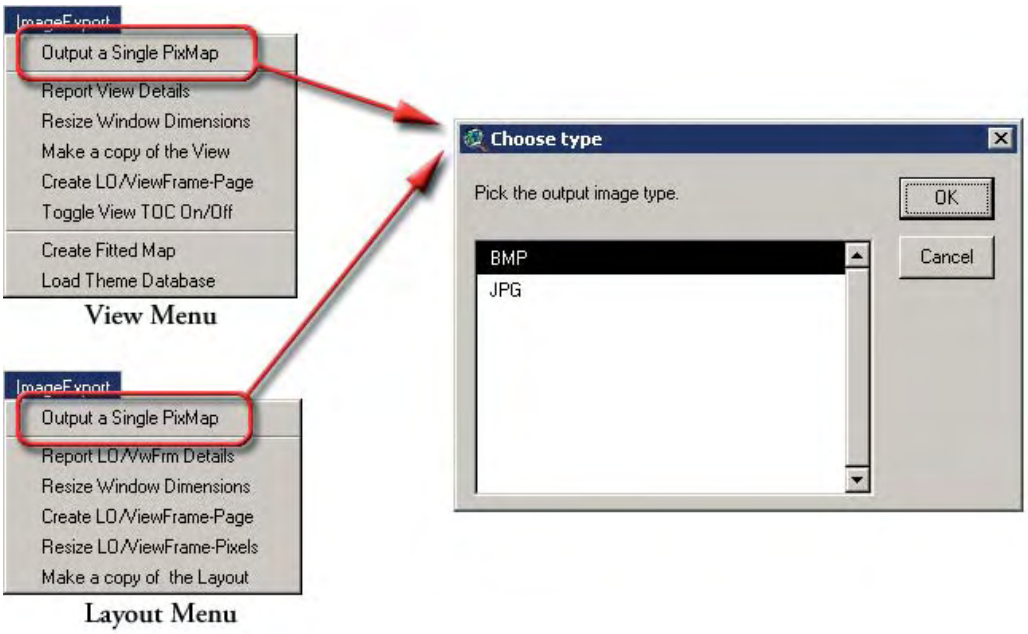
Tools common between Views and Layouts

As can be seen from both the View and Layout "ImageExport" menu, in common are the ability to: Output an image; Report the View or Layout extents and projection parameters; Resize the window extent to exact pixel dimensions; Create a Copy of the source View or Layout; and Create a Layout containing a ViewFrame fitting the exact dimensions of the page size selected by the user. The operation of each of these tools may vary slightly based on whether the source is a View or Layout, and are detailed in the following sections.

Output an image

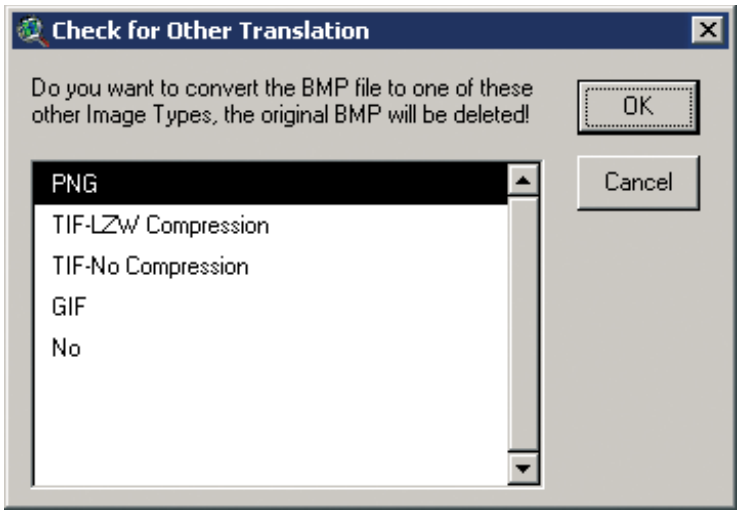
The "Output a Single PixMap" tool is accessible through the ImageExport menu option "*Output a Single PixMap*" available in both Views and Layouts. The function is fairly straightforward and will open with a prompt concerning whether the user wishes to output their image to either Bitmap or JPEG format (Figure 1.120).

FIGURE 1.120
Choosing the image type



If the user installed the IrfanView imaging software package contained in the DVD in the present publication, and the Bitmap option is selected, then the user will be prompted about whether they wish their final output to be in PNG, TIF, or GIF format, or left as a BMP (Figure 1.121). Additionally, when this software is installed, the DPI for any image output will be set into the image header for any images except the GIF format.

FIGURE 1.121
Checking for other image format translation

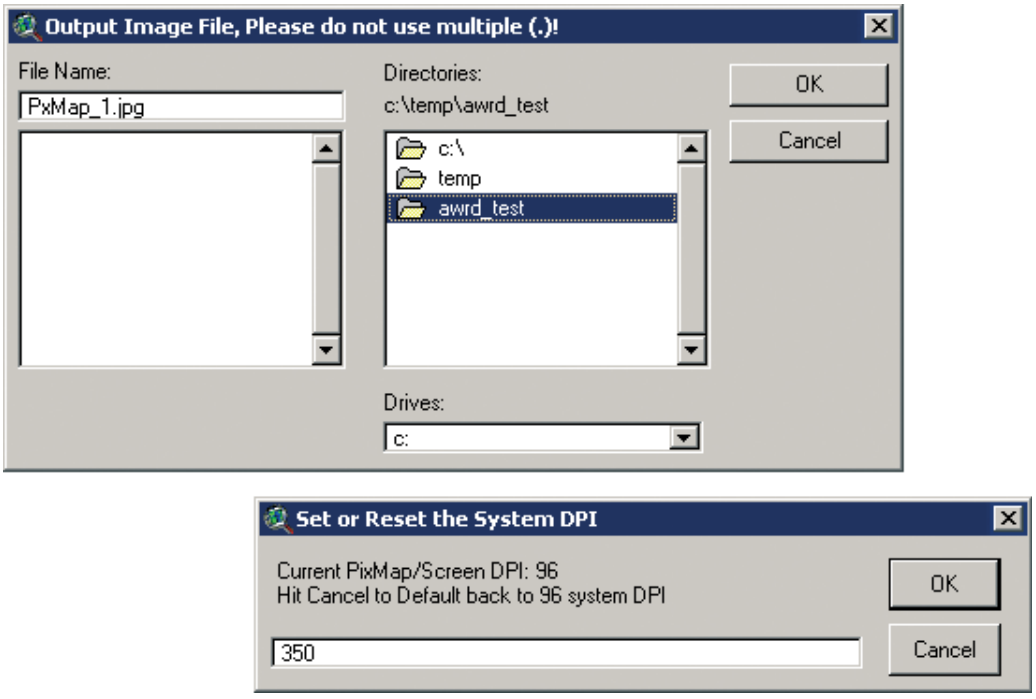


The PNG format offers the highest loss-less public-domain compression ratio for image storage and exchange, the TIF format the widest pre-press publication quality standard, and GIF the de-facto Internet 8-bit image distribution format. Although BMP and uncompressed TIF formats can result in rather large image sizes, these formats and the JPEG format can be geo-referenced seamlessly back into ArcView using the WorldFile output with each image.

After selecting an image output format, the user is next prompted for a name and directory location to place the output image into. The interface defaults to the user's working directory for placing images and to a file name PxMap_#, where the # is the next highest number of any existing file . The user will next be asked to specify an optional DPI for their output via a final prompt containing an estimate of the maximum DPI the interface can export the image at given the View or Layout size and the base system DPI. This number can range from a minimum of 50 dpi to a potential maximum of 1 270 dpi (Figure 1.122).-

1. Click on the "Add Basemap Image to View" tool  to load one of the image backgrounds (e.g. "africa_backgound_2.tif") from the "Ancillary Image and Map Graphic" database component folder..
2. From the Top ArcView menu bar Select "Image Export" then "Output a Single PixMap"
3. Pick the output image type (e.g. BMP).
4. Write the file name and save in working directory (e.g. "c:\temp")
5. Set the System DPI (e.g. 500); see Figure 1.122.

FIGURE 1.122
Selecting the name and directory location for the image



The true maximum allowable DPI is dependant on the user's system display parameters. The tool is written with error-checking routines that should prevent users from encountering any unexpected crashes during the process. However, if a "BackingStore" error is encountered, users should make note of the DPI and estimated size of the attempted output and exit ArcView immediately WITHOUT saving their project. Testing of the tool may be required to establish the safe maximums for the export of both views and layouts on the user's own systems.

In regards to guidelines for the output of images, users should consider that: the default system DPI, or 150 dpi, will in most cases be suitable for presentation quality outputs; a range from 200–450 dpi will be suitable for most publication quality requirements. It is rarely necessary to use the maximum allowable DPI setting.

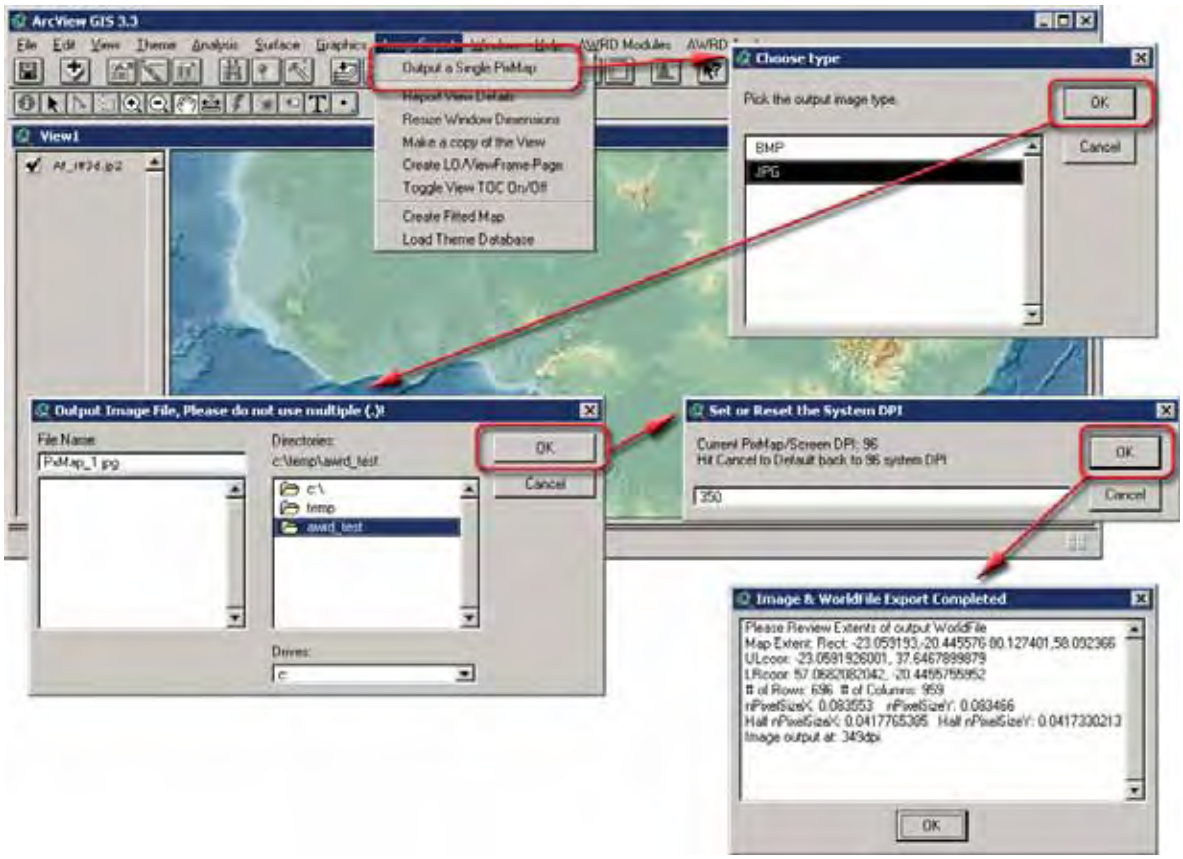
Additionally, testing has shown that the size of fonts, and perhaps other desktop settings or the version of the Windows OS, will influence estimates of the number of pixels and the measured extents reported via the tool-set. However, this and other testing do seem to indicate that users will need to establish and possibly adjust for any mis-reporting based on their own systems to achieve the exact results expected. Users should consider the output of test images first with only a minimum number of themes visible in the source view(s) to establish a range of DPIs which can be successfully output and any pixel adjustments need for the tool before proceeding with final outputs.

The chief difference between the View and Layout versions of this tool is that while Views are singular objects with a defined extent, scale, list of themes, etc., layouts can be quite complex containing multiple ViewFrames, i.e. depictions of maps based on different Views, and other map or poster elements such as: text, pictures, scale bars, and so forth.

View version

1. Click on the "Add Basemap Image to View" tool  to load one of the image backgrounds (e.g. "af_rlf3d.jp2") from the image database component folder.
2. From the ArcView menu bar, select "Image Export" and then "Output a Single PixMap".
3. Pick the output image type (e.g. BMP).
4. Write the file name and save in working directory (e.g. "c:\temp").
5. Upon completion the tool will generate a report notifying the user that a valid WorldFile (Figure 1.123).

FIGURE 1.123
Output reports from the export of Views



Layout version

1. Click on the "Data Inventory" button 

to load a background image; a SWB dataset; and a watersheds dataset (e.g. vrtl_map.sid; vmap_pt.shp and Alcomwwf.shp) from the relevant database component folders installed in your hard-drive: "c:\wrd\data\".
2. Select"Layouts" from the ArcView menu bar at the left.
3. From the Top ArcView menu bar Select "Image Export" then "Output a Single PixMap".
4. Pick the output image type (e.g. BMP).
5. Write the file name and save in working directory (e.g. "c:\temp").
6. Select ViewFrame1.
7. Select "PageSize as the Baseline to use for export (Figure 1.124).

FIGURE 1.124
Prompts and output reports from the Image Export tool in Layout mode

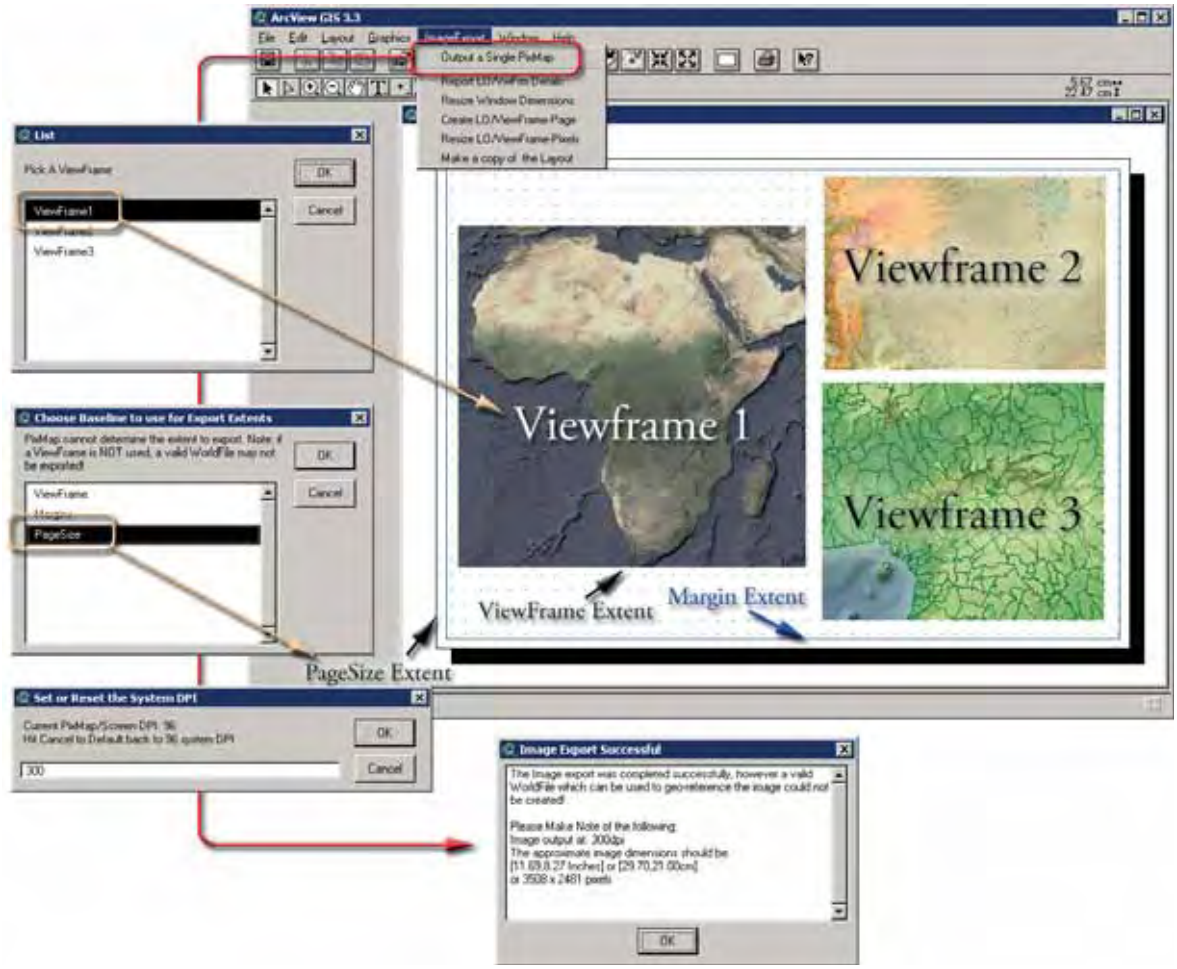


Figure 1.124 demonstrates how to export an image of a complex layout containing three ViewFrames. Since the PageSize is used as the export extent, rather than one of the ViewFrames, the tool will export the image without attempting to georeference it. Upon completion, the tool will generate a report with the DPI resolution of the output image, an estimate of the extent of the image in inches and centimetres, and a note that a valid WorldFile could not be created and that therefore the image was not georeferenced,

If the output was not created successfully, this will also be reported to the user. In these cases, particularly if a DPI other than the system default was attempted, the user should set the DPI well below the maximum listed in the prompt and try again.

In cases where the image output will be based on a ViewFrame from a Layout or a View, then the user be advised at the end of the process whether the output was successful and if a valid WorldFile could be created (Figure 1.125).

FIGURE 1.125
Sample Report for a successful output with accompanying WorldFile

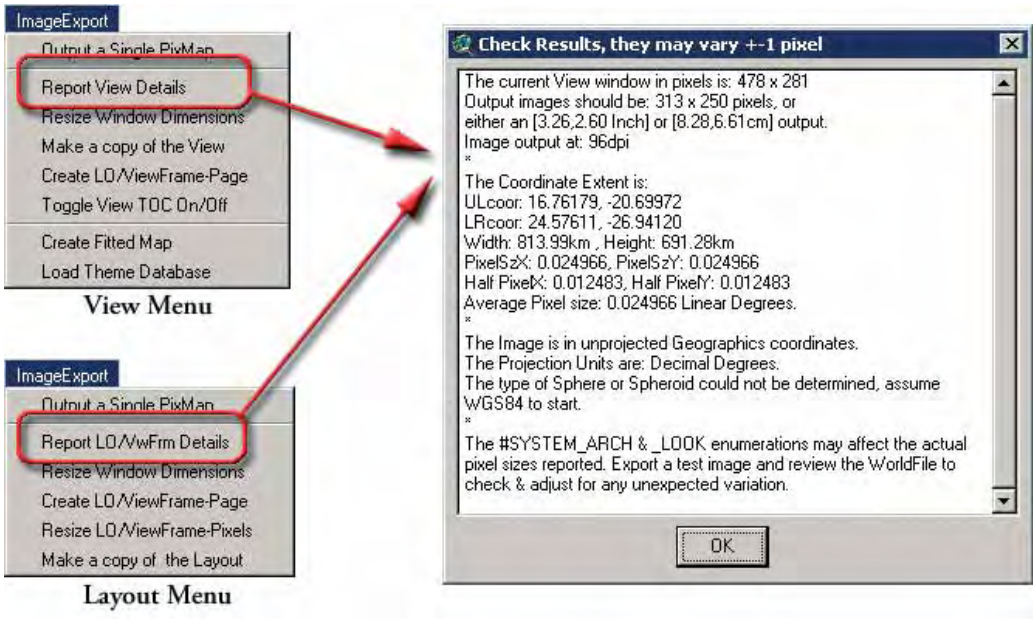
A number of checks are built into the tool-set to inform users of potential problems which might arise during the output of an image.

Note If the WinXP "smooth fonts effect" is turned on, then text exported as integral to a View or LO will also be "smoothed". The unfortunate effect of this is that the text on the graphics will be degraded somewhat similar to what generally happens to text and linear features under Jpeg. Unfortunately, with this effect turned on in WinXP, this will also now happen to BMP's, TIFFs, PNGs and GIFs. To solve this problem, use a Right Mouse-Click on an open area of your screen, select "Properties" from the resulting Menu Pop-Up, then use a Left Mouse-Click on the "Effects" Tab of the Display Properties dialog and in the resulting window make sure the Check-Box for "Smooth edges of screen fonts:" is NOT checked. Any graphics exported will now have the text clean and clear subject to the DPI chosen for the export. Use the same method to reset WinXP's display parameters after completing your exports.

Report the View or Layout extents and projection parameters

The "Report View and/or Layout Details" tools are simple tools providing a wealth of information to users about the current source document and any potential outputs based on this source. They can be accessed via the menu options "*Report View Details*" and "*Report LO/VwFrm Details*" on Views and Layouts respectively (Figure 1.126).

FIGURE 1.126
The Report View/Layout Details tools



Because the View is an effective container for the "map", the estimates reported – including any adjustments required based on the user's desktop settings – should be valid within ± one pixel when the default system DPI is used for an export. Table 1.32 presents a cross-tabulation table to assist users in estimating output pixel sizes based on pre-set DPIs. For Views, the "Resize Window Dimensions" tool can also be used in conjunction with this tool to adjust any outputs to a fixed pixel size and DPI recursively.

The "Resize LO/ViewFrame-Pixels" tool provides the same functionality for layouts. The main difference between the reporting of parameters for Views and

Layouts is that multiple ViewFrames can exist in a Layout. In regards to the reporting for a Layout, this will influence the report in two ways. First, the page size and margin extents can differ widely from those of any individual ViewFrame(s). Second, the tool needs to look behind the ViewFrame at the source View in order to report any geo-referencing parameters.

Additionally, the source Layout must contain at least one ViewFrame linked to a view to enable the export and reporting functions. In cases where a single ViewFrame has been fit exactly to the PageSize/Margins using the other IEBM tools, the reporting will closely match that reported for views.

Estimating output pixel sizes

Table 1.32 provides a quick reference that can be used to determine either potential window or output image sizes before users employ selected tools of the Image Export and Base Mapping extension. The table uses a simple formula based on dividing the Output DPI values in the left most column by those for the current system DPI across the top.

Based on this table, if the user's default system DPI is 96, and they have a layout with the dimensions of 500 x 700, and wanted to output this image at 300 dpi, the user needs only to find the intersection of the column labelled 96 and the row labelled 300 to identify a multiplier of 1.125. Then, using this multiplier, determine an expected output of 500*3.125 and 700*3.125 to determine an approximate output pixel extent of 1563 x 2188. Again, testing will likely be required to account for specific Windows OS desktop settings.

TABLE 1.32
Estimating the output pixel sizes based on pre-set DPIs

	Downward multiplier to use for adjusting relative pixel dimensions									
	72	**96**	**120**	**144**	**150**	**300**	**450**	**600**	**750**	**1270**
72	1	0.75	0.6	0.5	0.48	0.24	0.16	0.12	0.096	0.057
96	1.333	1	0.8	0.667	0.64	0.32	0.213	0.16	0.128	0.076
120	1.667	1.25	1	0.833	0.8	0.4	0.267	0.2	0.16	0.094
144	2	1.5	1.2	1	0.96	0.48	0.32	0.24	0.192	0.113
150	2.083	1.563	1.25	1.042	1	0.5	0.333	0.25	0.2	0.118
300	4.167	3.125	2.5	2.083	2	1	0.667	0.5	0.4	0.236
450	6.25	4.688	3.75	3.125	3	1.5	1	0.75	0.6	0.354
600	8.333	6.25	5	4.167	4	2	1.333	1	0.8	0.472
750	10.417	7.813	6.25	5.208	5	2.5	1.667	1.25	1	0.591
1270	17.639	13.229	10.583	8.819	8.467	4.233	2.822	2.117	1.693	1

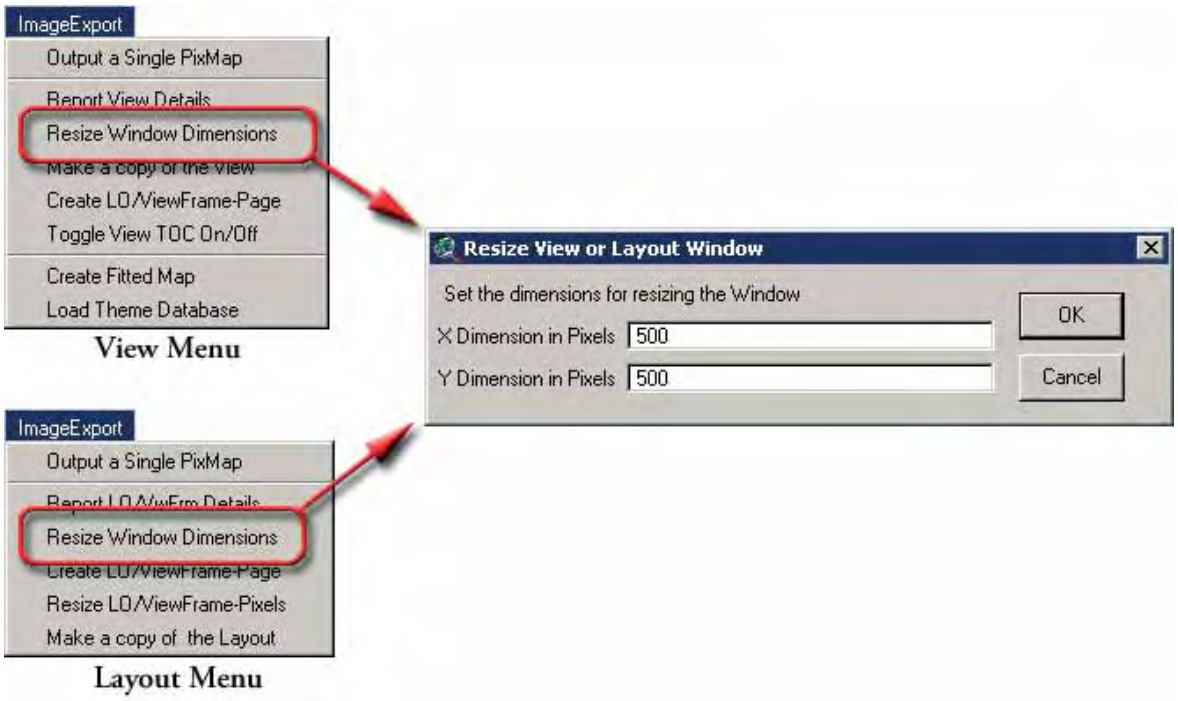
Resizing View or Layout windows exact pixel extents

The "Resize Window Dimensions" tool is accessible through the ImageExport menu option "*Resize Window Dimensions*" available both in Views and Layouts.

This tool allows users to set the size of windows containing either Views or Layouts to specific window dimensions. For Views, the tool is particularly useful for setting the source document to a size matching any anticipated image outputs via either the standard ArcView export commands or the Image Export and Base Mapping tool-set; assuming that the default system DPI is chosen for any export.

When opened, the tool reports the current size of the window in pixels (minus the window frame and the current TOC, if the source document is a view). If a user wanted to output a source View with current dimensions of 313 x 250 pixels at a fixed image size of 500 x 500 pixels, then this tool could be used to reset the dimensions to 500 x 500 Figure 1.127).

FIGURE 1.127
The Resize Window Dimensions tool



For layouts, the tool is slightly less useful as it only influences the dimensions of the screen display for Layout window container and not the actual page size.

Checks are built into the tool in order to prevent a user from setting too large of window extent, but users should employ common sense concerning the dimensions attempted as this can cause ArcView to crash. On the base system used for the development of this and the other tools in the Image Export and Base Mapping extension, the maximum safe dimensions which could be consistently obtained were 4 300 x 4 300 pixels for views and 3 850 x 3 850 for layouts.

Make a copy of the source View or Layout

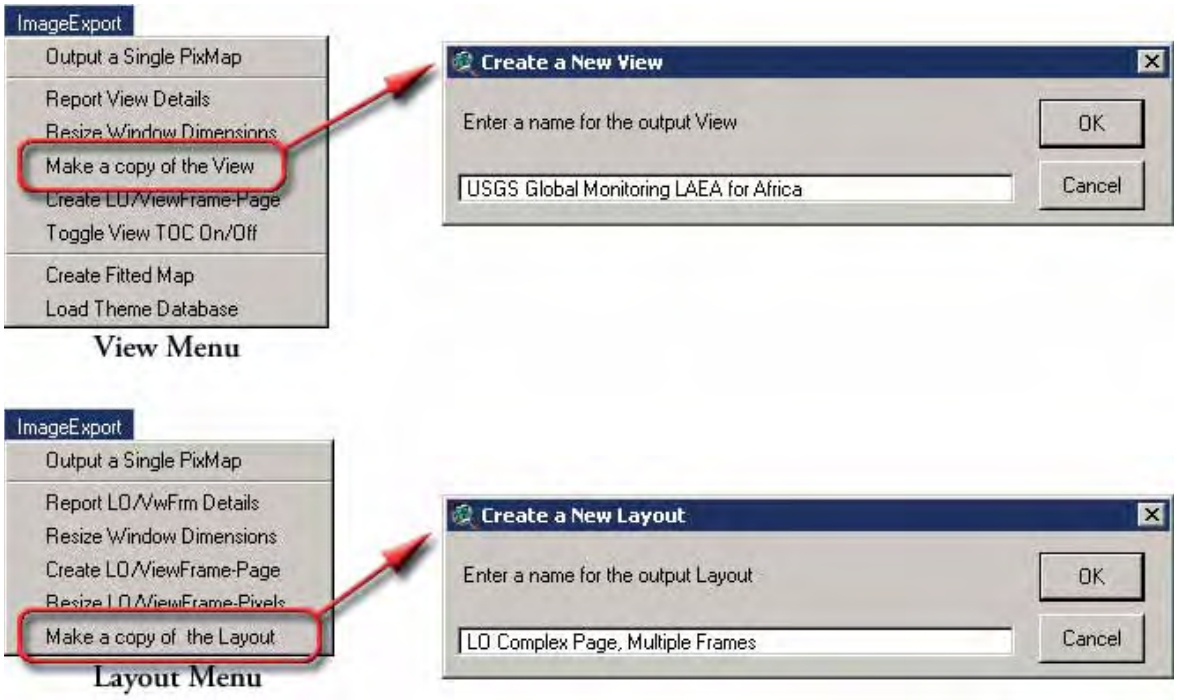
The function of the Make a Copy of a View or Layout tools is exactly the same between both Views ("*Make a Copy of the View*") and Layouts ("*Make a Copy of the Layout*"). The tool provides a simple mechanism for creating an exact duplicate of the source View or Layout, based on adding an iterative number to the end of the name derived from the source. If the user chooses to input an already existing name, they will be prompted to select another, otherwise the new View/Layout will have a duplicate name (Figure 1.128).

Create Layout with ViewFrame fitted to exact PageSize dimensions

The "Create LO/ViewFrame-Page" tool is accessible through the ImageExport menu option "*Create LO/ViewFrame-Page*" available both in Views and Layouts.

This tool provides a simple and rapid way for users to create a Layout of any size, in whatever units. At the end of the process a ViewFrame containing the source View is added into the Layout created with its extent fit exactly to the resulting page extent. The margins will be set to zero in the resulting Layout. The only difference between the View and Layout versions of the tool is that if the tool is run from a Layout, the user will be prompted to select a View from a list of views contained in the current project.

FIGURE 1.128
The Make a copy of a View/Layout tools



For example, if a user was required to produce "overview" graphics at a size of 21 by 29.7 cm (size A4) they would use the following steps (Figure 1.129).
If the "*Report Layout/VwFrm Details*" tool is used after creating the new Layout, it would report that based on the users default system DPI, e.g. 96 dpi, the dimensions of any images output from the Layout would be 1123 x 794 pixels and match a standard A4 output size.

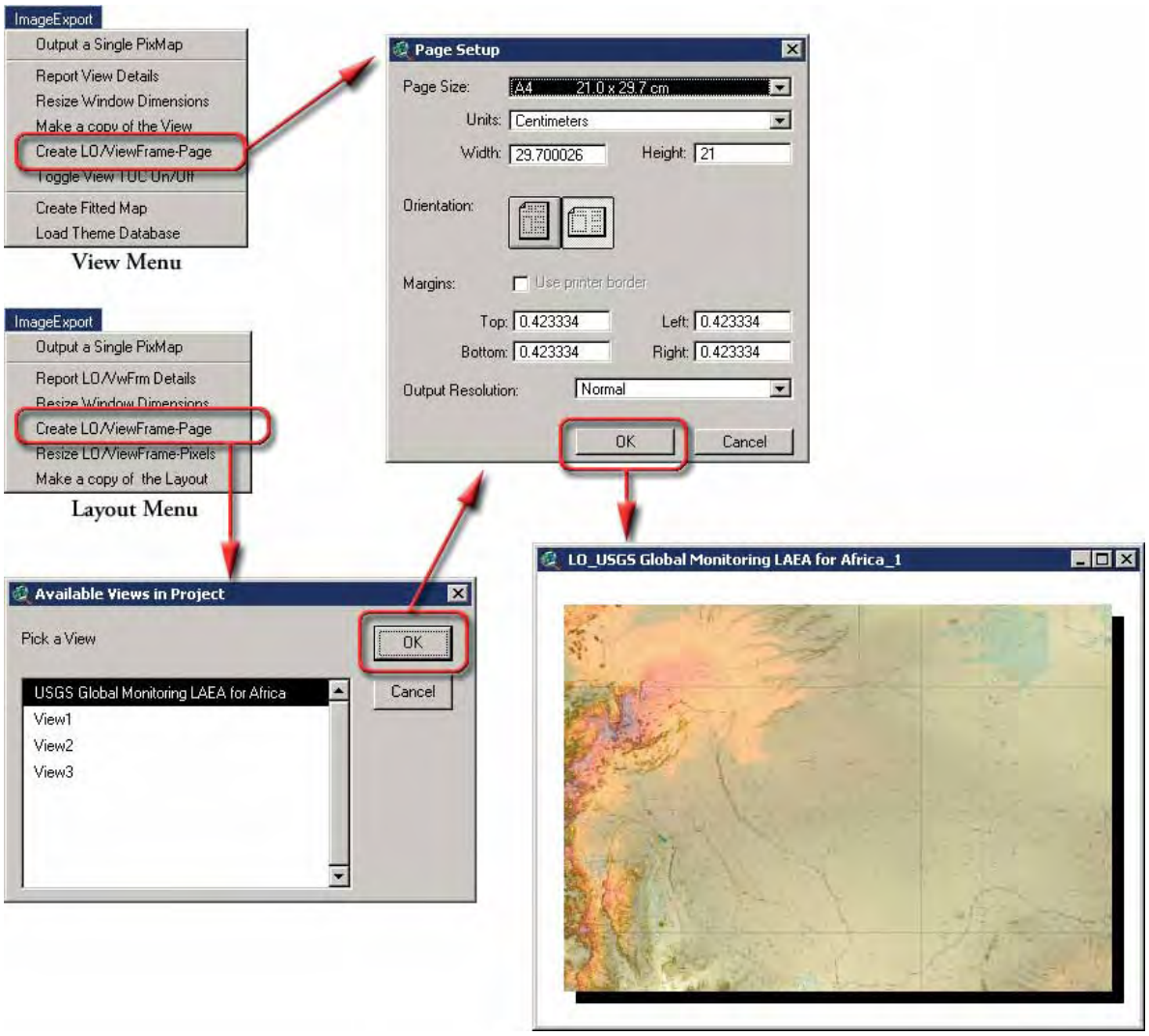
Users should note that if any images were output at DPIs greater than 96, then even though the number of pixels would increase, the relative "measured size" of the images in inches or centimetres would not change.

Tools only available while working with layouts

Resize Layouts containing a single ViewFrame to exact pixel dimensions
The "Resize LO/ViewFrame-Pixels" tool (available as ImageExport menu option: "*Resize LO/ViewFrame-Pixels*" only in Layouts) is substantively different from the "Resize Window Dimension" tool, in that the tool will resize the actual page extents/size for any existing Layout containing a single ViewFrame to almost exact pixel dimensions. The resulting page size, margins and ViewFrame of the layout will be set based on the dimensions input by the user.

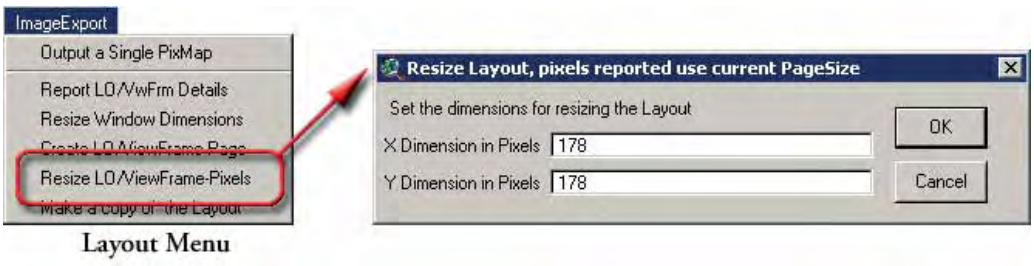
If a user wishes to employ the tool on a Layout not containing a ViewFrame, they must first add a ViewFrame with a valid View reference, run the tool and then delete or resize the ViewFrame to their requirements.

FIGURE 1.129
The Create LO/ViewFrame-Page tool



Like the "Resize Window Dimensions" tool, this tool will report the current size of the layout in pixels based on the default system DPI (Figure 1.130). When used in conjunction with the "Report LO/VwFrm Details" tool to establish the default system DPI, e.g. 96, then if the user again required a 4.7 cm output size, they would need to: divide 4.7 by 2.54 to arrive at 1.85 inches; then multiple 1.85 by 96 to determine a pixel size of 177.6; and lastly enter 178 for the X and Y pixel dimensions in the "Resize Window Dimensions" tool dialog to achieve the required baseline Layout of 4.7 cm.

FIGURE 1.130
The Resize LO/ViewFrame-Pixels tool



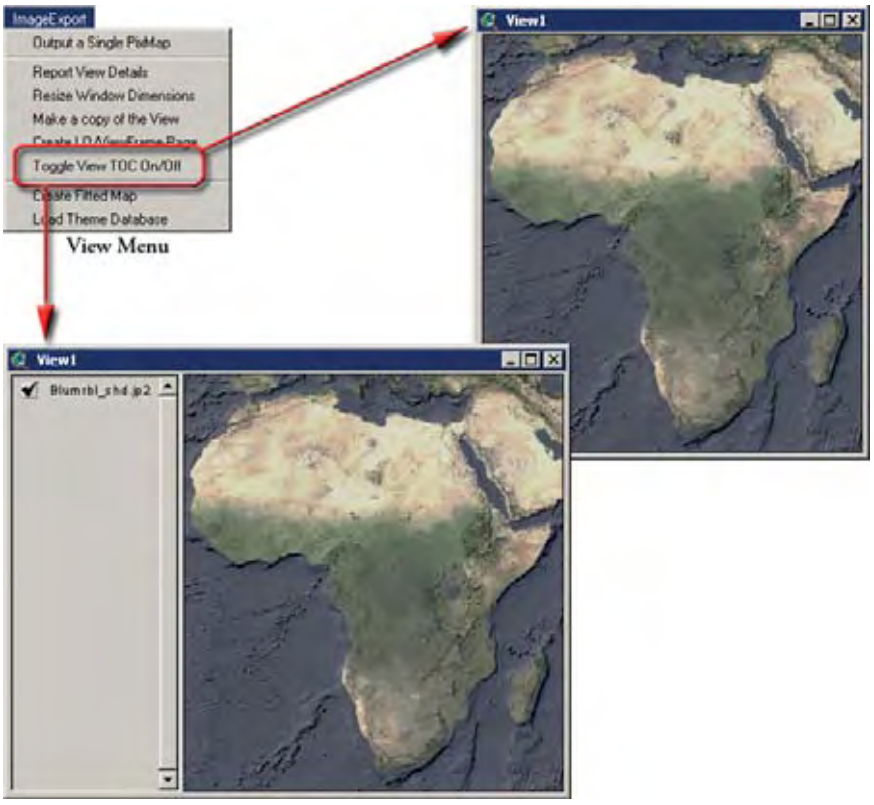
Tools only available while working with views

The View-specific base mapping tools of the AWRD are: "*Toggle View TOC On/Off*" "*Create Fitted Map*" and "*Load Theme Database*". The last two allow users to: create a theme-based mask of any relevant polygonal reference theme; create a Layout with a fitted ViewFrame "zoomed" to the extent of this mask; and import precompiled sets of themes into their reference project. The latter of these tools allows users to seamlessly integrate the baseline DBCs of the AWRD archive for reporting and analysis.

Set the TOC of the current View "On" or "Off"

The IEBM extension contains a tool named "*Toggle View TOC On/Off*", which sets the Table of Contents (TOC) of the current source View to be visible (On) or invisible (Off) (Figure 1.131).

FIGURE 1.131
The Toggle View TOC On/Off tool



Note Users should be advised that this tool does not "remember" the width of the current TOC; when turned back "On", the tool resets the TOC to a standard 150 pixels.

Create a layout and a fitted ViewFrame

The "*Create Fitted Map*" tool employs a two step process starting with the potential creation of a polygonal masking theme, followed by on-the-fly creation of a layout and fitted ViewFrame with an extent matching either any non-masked area created or the current extent of the source View. The page orientation of the layout created will be set automatically to either portrait or landscape based on the relative dimensions of the page. The tool is optimized to produce a generic A4/Letter size Layout.

This tool is designed to use the current selection set from the active theme, if that theme is a polygon theme, to create a polygonal mask. For this reason, if a mask is to be created, only one theme can be active in the TOC for the source View. In other cases,

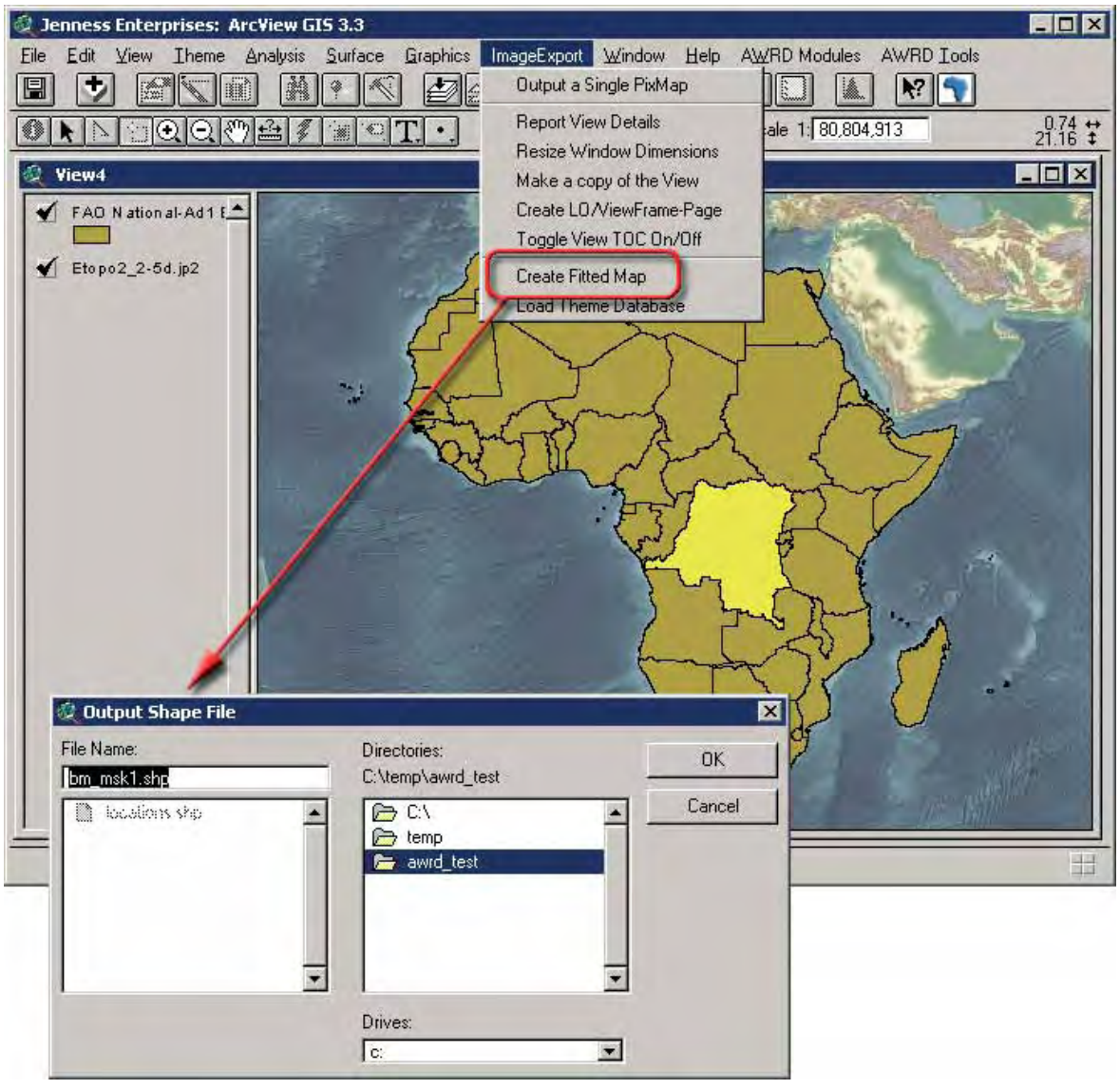
since no mask can be created and used as a basis for determining a "fitted" extent and scale, the current extent of the source view is used to determine the fitted extent of the combined Layout/ViewFrame created.

1. Click on the "Data Inventory" button 

to load one of the administrative boundary themes (e.g. "FAO National-Ad1 Boundaries", or "Ad1_Py.shp") from the Additional Vector database component.
2. Click on the "Select Feature"icon  from the ArcView top menu bar and click on "the Republic of the Congo". This selection will automatically highlight this country in yellow.
3. Select "Image Export"and then "Create Fitted Map" from the list.
4. Provide an Output shapefile name. By default, these are named bm_msk#.shp and BaseMap#, where the # represents a number one greater than any existing name with the same root. Then click "OK" (Figure 1.132a)

Note Users are advised that, because the creation of the mask theme is dependant on dissolving all of the polygons in both the selected and then unselected feature sets, the process can be lengthy for complex or large datasets such as the H1k_Lev6 watershed data layer.

FIGURE 1.132A
The Create Fitted Map and Polygonal Mask Theme tool

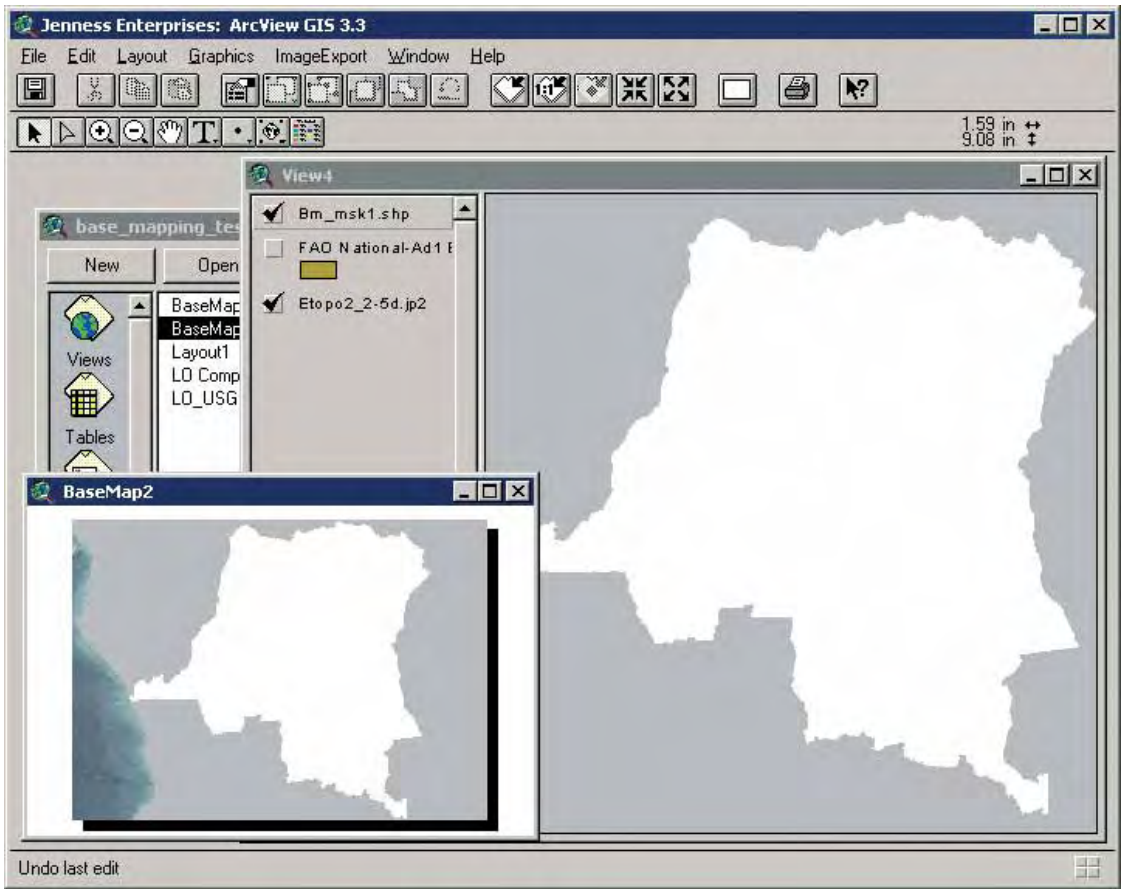


In the output mask theme, a polygon representing the selected set will be encoded with a 0 and a polygon representing the unselected features will be encoded with a 1.

After the processing of the masking theme is completed, a fitted layout will be created based on the extent of the 0-value non-mask polygon. The layout scale will also be maximized to one where this extent can be mapped onto a generic A4/Letter size page. The "Resize LO/ViewFrame-Pixels" tool can be used afterwards to set the resulting Layout to any dimensions required. The basic results of the masking and layout creation process are shown in Figure 1.132b.

FIGURE 1.132B

Basic layout resulting from the Create Fitted Map tool



After potentially creating a polygonal mask and then a fitted Layout/ViewFrame, the user may want to use the "Load Theme Database" tool to import one of the base mapping theme databases.

Load Theme Database

The "*Load Theme Database*" tool allows users to import pre-compiled sets of themes based on the data contained within the AWRD archive into their projects. In addition to the import of base mapping specific sets of themes, this tool provides a means for users to import theme sets seamlessly into their projects by DBC.

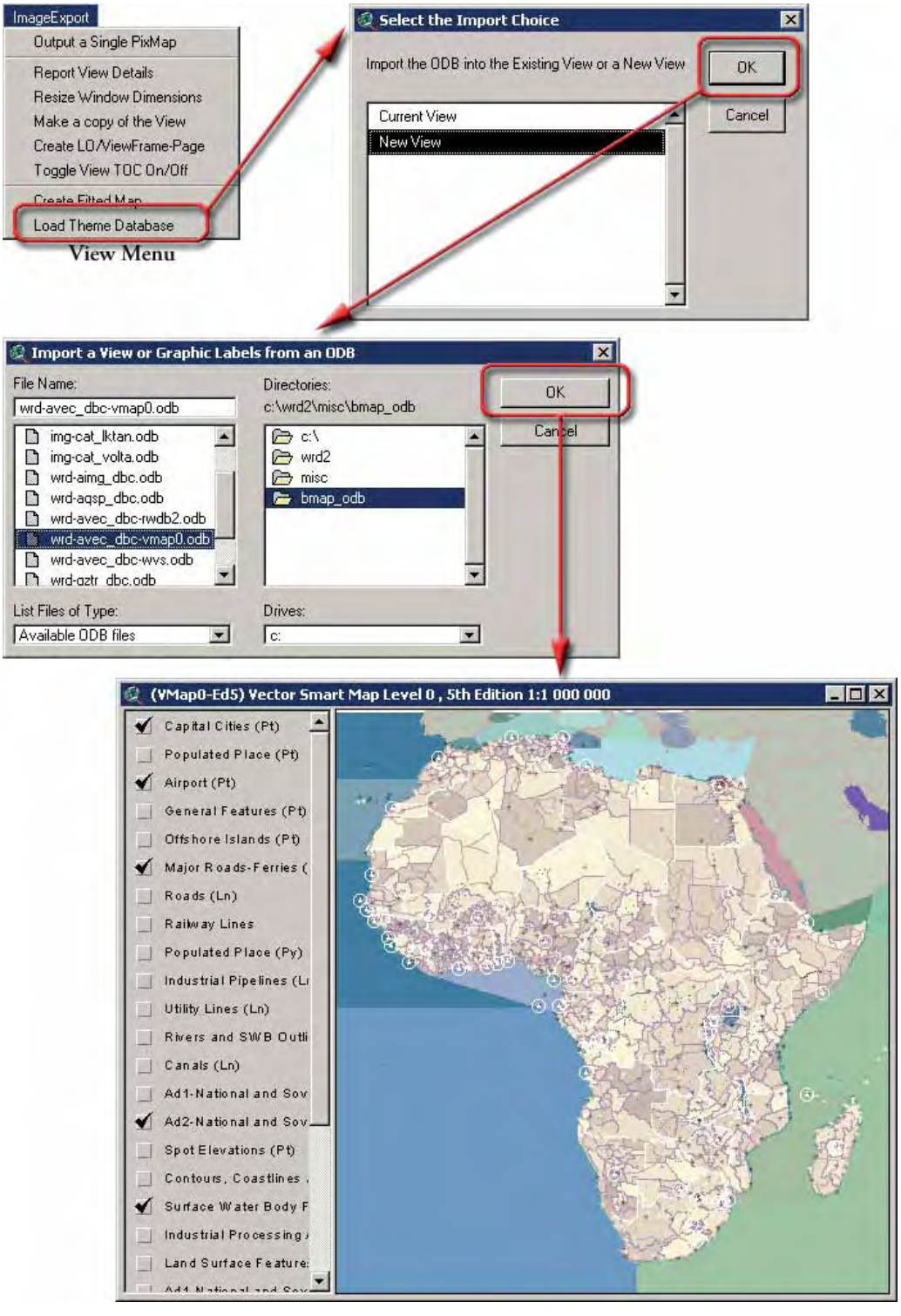
The use of the tool is very straight forward, and it opens with a prompt requesting the user to specify whether the themes contained within the source Object Database[1] (ODB) should be added into the current view or if a new view should be created.

[1] An Object Database is a special type of file used by ArcView 3.x. It stores Avenue "objects" in a text file on the hard drive. In regards to the Load Theme Database tool, the "objects" stored are theme references, graphics, legends and scales at which themes are viewable. Loading the ODB causes all these objects to be loaded simultaneously. For additional information on Object Databases or Avenue Objects in general, please refer to the ArcView help items "Obj", "Script" and "ODB".

This prompt is followed by another requesting the user to select a database to load. Example:

1. Click on the "Image Export" tool in view menu and select "Load Theme Database".
2. Select "New View" as the import choice.
3. Select "avec_bdc.odb" from the Import a View or Graphic Labels from an ODB dialog, then click "OK" (Figure 1.133a).

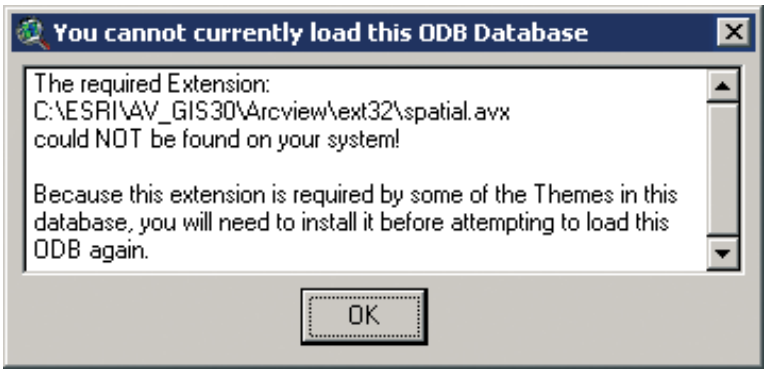
FIGURE 1.133A
Importing a precompiled theme database by database component or for base mapping



If a new view is to be created, the default name of the view contained within the ODB will be used as a baseline for the new view's name. If a view already exists with that name, the new view will have a number added to its end one greater than any existing view of the same name.

Some themes and images in these ODB files require certain additional extensions to be loaded in ArcView (i.e. Grid data requires Spatial Analyst, MrSID Image files require the MrSID extension), and therefore the ODB cannot be opened if these extensions are not loaded. This tool will automatically load any necessary extensions if they are available, and otherwise will alert the user about any missing extensions before terminating. (Figure 1.133b).

FIGURE 1.133B
Object Database Import failure due to missing dependency



When importing themes from an ODB into an existing view, all active themes will be shifted to the top of the TOC and all imported themes will be placed directly below them. Otherwise all imported themes will be placed at the top of the TOC. Also, if the ODB themes are added to an existing view, the projection and measuring parameters of that view are maintained. Otherwise, the new view created will be set to the same projection and any other parameters set for the view at the time the ODB was created.

Adjusting polygon borders and patterns

When ArcView adds new polygon themes to a view, they are typically added with a simple symbology where each polygon is represented by a random color and a solid black background. If you wish to change the symbology, such as making the symbol hollow or semi-transparent, or to change the border color, then it is simple to edit the symbol using the Legend Editor.

However, if you change the legend such that you have multiple classifications, where different polygons might be represented differently, then ArcView will automatically reset the outlines to black, and set all the colors to solid. This may be a problem if the polygon outlines if you do not want outlines (Figure 1.134a), or if you want all polygons to have a particular transparency (Figure 1.134b). It can be a tedious process to modify each symbol separately. In some cases you might have hundreds of classifications, and it can be very time-consuming to modify all the separate symbols to set their transparency or border color.

FIGURE 1.134A
Comparison of a polygon theme with and without polygon borders

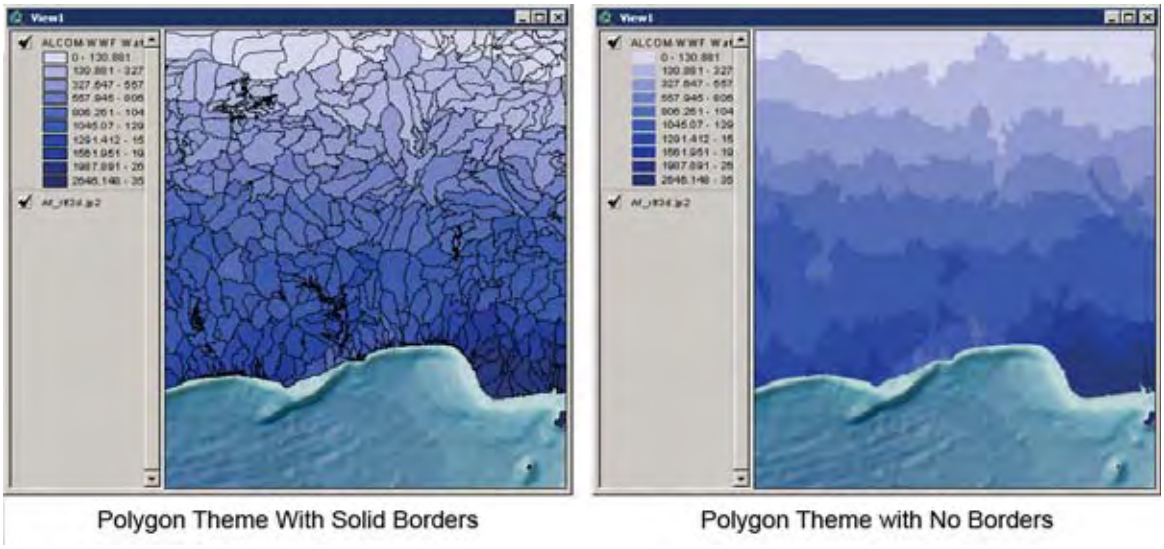
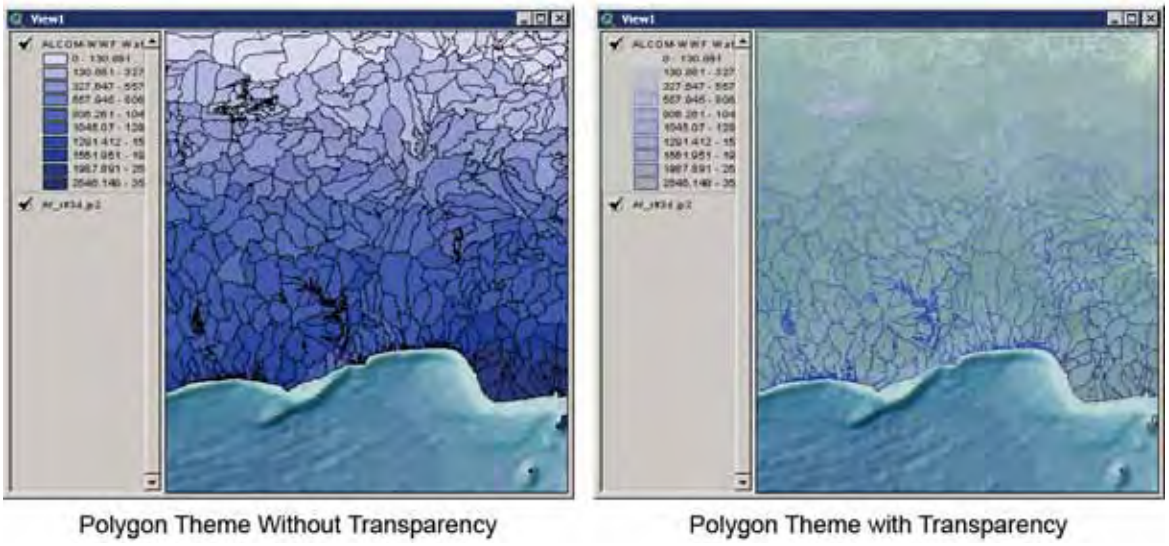
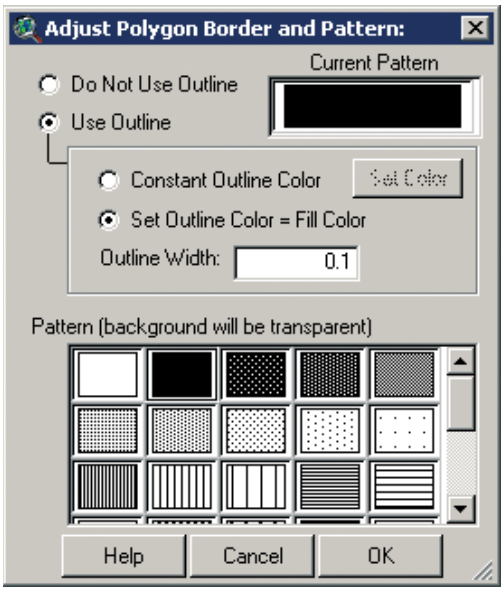


FIGURE 1.134B
Comparison of a polygon theme with and without polygon transparency



Therefore the AWRD provides a tool to automatically set the border color or transparency patter of all classifications in a particular theme legend. Click the View "Theme" menu, and then "Adjust Polygon Border and Pattern" to open the tool (Figure 1.134c):

FIGURE 1.134C
Adjust polygon border and pattern tool



If you wish to eliminate all polygon borders from all classification polygon symbols, simply select the "Do Not Use Outline" option. If you wish to have borders, you have the option to set the border color equal to the internal polygon color, or to set it as a constant color.

You may also choose from a number of patterns. In all cases, the background color of the pattern will be transparent so you will be able to see other features underneath the polygons.