Chapter 5

# *Palettes in the ArcView Legend Editor*

Manipulating Markers, Colors, and Patterns in the View

Buried several mouse clicks into the ArcView Legend Editor is an important set of six windows that control most of the appearance of features in the View and therefore your Layout and final map. These six windows (or "palettes") are collectively called the Symbol Window and include the Fill Palette, Pen Palette, Marker Palette, Font Palette, Color Palette, and Palette Manager. These palettes are shown in the following illustration. This chapter examines the use of all of these, except for the Font Palette, which is important enough to be the focus of its own chapter, Chapter 6, Typography on the Map.
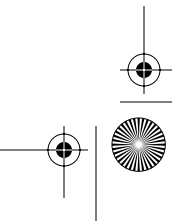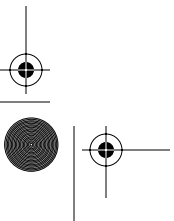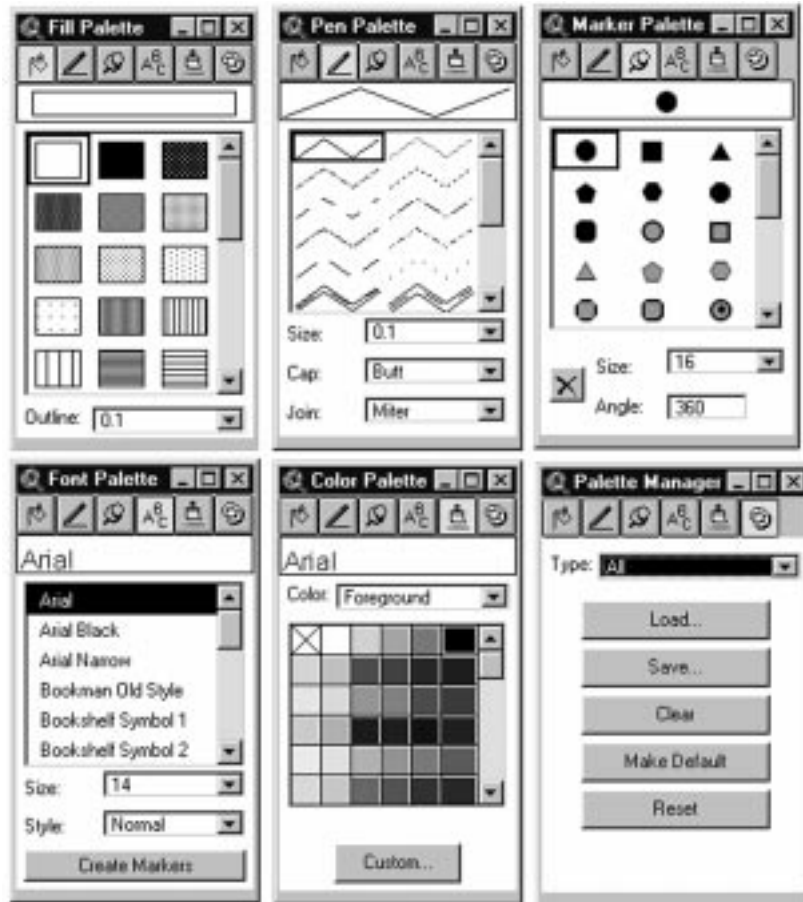
The Symbol Window's six palettes.Learning the technical details of how to use these palettes is relatively easy, being mostly a matter of pointing and clicking. Knowing how to apply the visual tools of shape, size texture, hue, and value in the Fill, Pen, Marker, and Color palettes is more difficult, but becomes second nature as you gain experience in making maps with ArcView. Throughout the discussion of how each palette works, you will see how to apply cartographic design principles with the tools offered in each palette.

Introducing the Palettes

The Symbol Window can be accessed by one of three methods: (1) by double clicking on a symbol within the Legend Editor, (2) by using Show Symbol Window from the Window menu in the View, or (3) by using Control P on the keyboard. The Fill palette appears at first on the screen, and the other five palettes are accessed by pressing their respective buttons, which are displayed in a row below the Fill palette's title bar. Palettes are defined in the ArcView help file as "a collection of symbols or colors stored in a file that you can load or create." The following table summarizes the types of features available in each palette, using the default palette.

Symbol Window Palettes

Palette Name	Basic Features	Additional Features
Fill Palette	47 default polygon fills	Polygon outline weights in points
Pen Palette	28 default line types	Line weights in points
Marker Palette	47 default marker types	Marker weights in points
Color Palette	60 default color swatches	Custom colors using the Hue, Saturation and Value color model
Font Palette	Several dozen font types	9 specialized ESRI fonts that can be made into markers
Palette Manager	5 palette management options	Load and delete additional palettes

Cartographic Design Considerations at Start-up

The Symbol Window and its six palettes can present an overwhelming number of design choices for the beginning cartographer, resulting in a mishmash of colors and symbols on the final map and a confused, if not dazed, map user. Several design cartographic design principles apply to the use of all palettes and are good to keep in mind as you craft the map.

• For all but the most complex reference maps, keep the design simple.

Just because you can print hundreds of colors and dozens of symbols on a map does not mean you have to, or that the map will be understand-able when you do! Maps are always a simplification of real–world geogra–

phy, and a good cartographer simplifies the complex geography to make a point clearly to his or her audience.

- Consider the type of map you are crafting and the type of map product that will result.

This principle has been mentioned often before, but in no case is it more important than in the use of colors and patterns, and markers and line symbols. Different types of maps require different amounts of color and symbol complexity. Thematic maps showing the distribution of one or two map features need the simplest color schemes, whereas general reference maps or maps using different types of raster imagery will require the most complex.

A full color map published in a book or atlas can utilize dozens of colors and symbols, whereas maps meant to be viewed on the Internet need to have simple color schemes. If your map will be reproduced on a photocopier or reprinted as black and white in a book or newsletter, your color scheme needs to be simpler still. The following illustration shows the progression from simple to complex types of maps, with their associated symbols and colors.

Color and symbol complexity in different types of maps.

- Always strive to establish a visual hierarchy for symbols, lines, and colors on the map.

Small circles for cities with small populations and larger circles for cities with large populations; thin lines for two-lane country roads and thick lines for major interstate highways; a light colored polygon for low sales figures and a darker colored polygon for high sales figures: These types of

visual hierarchies organize data for the map reader and make the map quickly understandable.

• Always check the symbol legibility on the intended map product before using it on the entire map.

Many pen and point symbols look perfectly intelligible when you are zoomed into a View, but will not print clearly on some printers, or become invisible when used as a GIF on a web page. Save design time by trying a draft with several symbols you want to use on the map before investing a lot of time in production.

✎ **NOTE:** *Remember the golden rule: If the map user cannot read it quickly, you should not use it on the map.*

Using the Palette Manager

The Palette Manager permits the loading and unloading of specialized palettes for the Fill, Pen, Marker, and Color palettes, dozens of which come with the ArcView program (with hundreds more available on the Internet). With certain other software programs or additional ArcView extensions, you can create your own specialized palettes and use them in lieu of the default palettes. The following table lists ArcView specialized palettes, with notes on their features.

ArcView Specialized Palettes

Specialized Palette	Features
Fill Palette	
carto.avp	48 vector fills with transparent backgrounds, based on AI shadeset carto.shd
hatch.avp	60 vector fills; 6 patterns with 10 progressions
raster.avp	33 raster fills used for Unique Value fills by ArcView
Pen Palette	
carto.avp	28 pen symbols
forestry.avp	10 line symbols used on U.S. Forest Service maps
geology.avp	168 line symbols for major geological features
transp.avp	34 highway and railroad lines

Specialized Palette	*Features*
weather.avp	16 line symbols representing weather fronts
Marker Palette	
amfm.avp	24 markers for facility management
colormrk.avp	50 markers with changeable foreground colors
arrows.avp	25 directional arrows
crime.avp	63 markers for crime mapping
envtl.avp	58 markers based on international oil spill cleanups
hazmat.avp	19 symbols for hazardous material warning labels
icons.avp	54 symbols from AI plotter.mrk and template.mrk
mineral.avp	41 mining symbols
municipl.avp	88 municipal activity markers
north.avp	11 north arrows
oilgas.avp	90 USGS oil and gas activity markers
realty.avp	43 symbols used in real estate maps
usgs.avp	43 markers from USGS topographic maps
water.avp	50 USGS water resource management symbols
forestry.avp	21 markers from U.S. Forest Service fire maps
geology.avp	108 USGS geological symbols
raster.avp	135 markers used as default by ArcView
transp.avp	89 highway and street signs
weather.avp	185 USGS weather symbols
Color Palette	
c256.avp	256 colors based on MS Windows 256 color display
colornam.avp	112 colors from AI shadeset colorname.shd
hardware.avp	17 high contrast colors from AI shadeset color.shd
rainbow.avp	259 color ramp based colors
rgbtext.avp	626 colors based on UNIX X windows good on PCs
safety.avp	216 non-ditherable colors safe for web-based maps

    ✎ **NOTE:** *Most of these palettes, except for the Color palettes, are shown in the appendix of the manual that comes with the ArcView software package, called "Using ArcView GIS."*

Palette Management Options

The Load button allows you to load new palette files (files with a .avp suffix) to one or all of the default palettes. Make sure to scroll down in a palette window to see the new palette, which is typically added at the bottom of the existing default palette. The following illustration shows the loading of new palettes with the Palette Manager.

cdch05003.tif

The Use of Color, Patterns and Markers

Type of Map	Amount of Color and Patterns	Number of Markers
Simple Thematic Maps Sales Maps	Fewer than a dozen colors one major color progression	
Grayscale Aerial Photography		Less than half a dozen types of markers one marker hierarchy
Complex Thematic Maps Mutlivariate Thematic Maps		
Color Aerial Photography	Dozens of colors two major color progressions	
Mutlispectral Satellite Imagery		A Dozen types of markers a couple of marker hierarchies
Complex Reference Maps Atlas Maps Shaded Relief Maps Vegetation Maps Landcover Maps	Hundreds to thousands of colors multiple color progressions	Dozens of types of markers mulitple marker hierarchies

Loading new palettes with the Palette Manager.

The Save button will save a new markerset produced by the Create Markers option in the Marker palette or an imported ARC/INFO shadeset or lineset as a new ArcView palette (.avp) file. The Clear button will remove any new added palettes.
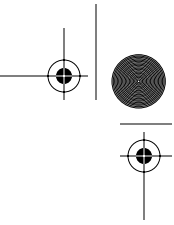
If there are no additional palettes loaded, the Clear button will remove the default palettes. You will know if this is the case when all palettes show up as blanks! To restore the default palettes, use the Load button to locate the default.avp palette file in the ArcView installation directory, which on Windows PCs is typically c:\ esri\av_gis30\arcview\symbols\default.avp.

Unfortunately, ArcView does not remember any new palettes loaded when a project is closed and reopened, but reverts to default.avp. If you find yourself using several new palettes in much of your work, it is worthwhile to create a new default palette.

 Before clicking on the Make Default button in the Palette Manager, go to the c:\ esri\av_gis30\arcview\symbols directory and rename default.avp as defaultorig.avp. Now when you use the Make Default button to create a new default.avp file, it will not overwrite the original system setting. Using the Reset button will automatically unload any new palettes, and revert to the default.avp palette file.

Color and Fill Palettes and the Use of Color

You should explore the use of the Fill and Color palettes together, because they work in tandem to control the appearance of any polygon themes in the View. The Fill palette controls the appearance of polygon features in the View by managing area fills, using solid colors, transparent fill, or pattern fills (see the following illustration). In addition, the line weight of the polygon's outline can be set in this palette. When the Fill palette first appears, a solid fill is chosen as the default. This will result in polygons filled with solid colors as selected from the Color palette.

cdch05004.tif

The Fill palette options that control the Color palette.
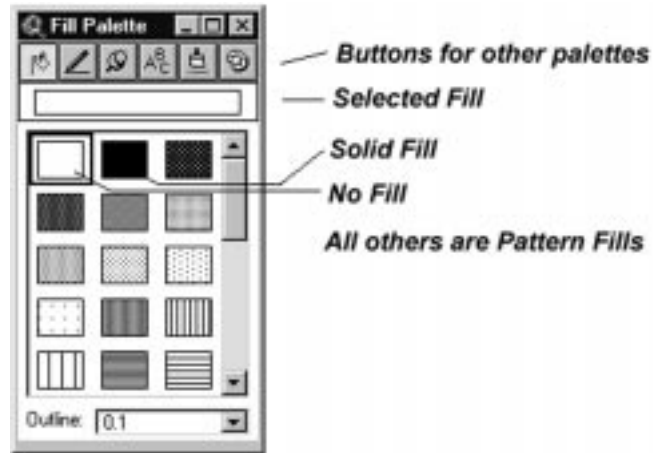
✓ **TIP:** *In the Fill palette, ArcView defaults to a .1 pt line weight for polygon outlines, which is a very thin line weight. Change this weight to at least .5 pt or greater if you want your polygon outlines to be visible on a printed map.*

Colors and Fills

The Color palette provides 60 color patches as a default option for applying to points, lines, polygons, and text, and permits the creation of custom colors, using the hue, saturation, and value (HSV) color model. In general, lighter colors appear on the left side of the palette, whereas darker colors appear on the right, giving the user a quick choice of a simple color progression from left to right. The following illustration shows the Fill and Color palettes and the Specify Color dialog box.
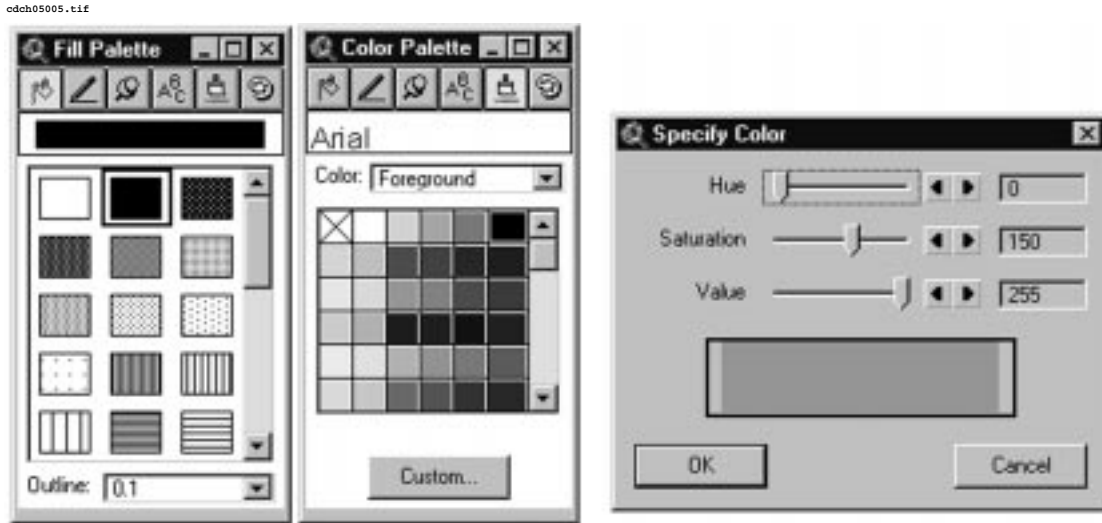
Fill and Color palettes, with the Specify Color dialog box.

> ✓ **TIP:** *Color progressions are very useful in thematic mapping to show differences in magnitude, in that map readers typically view lighter shades of one color to signify "less" of something, whereas darker shades of the same color indicate "more" of something. Use completely different colors to show differences in kind, not magnitude.*

In regard to the previous Tip, for example, in the Legend Editor, choose a Values field that is a numeric field, and use light red colors for low numbers and dark red colors for high numbers. Also for example, when using a Graduated Color legend type, use one of the pre-made color ramps.

> ✓ **TIP:** *Another good use of color in thematic mapping is for enhancing figure-to-ground contrast. You can show the distribution of a feature (the figure), depicted with darker colors, across a map containing light colors in the background (the ground). When done right, the darker features will "float" above the light background, achieving good figure-to-ground contrast.*

In general, thematic maps will use darker, more intense colors to achieve their communication goals than will reference maps, which utilize lighter shades in order make complex detail easily visible to the reader.

At the top of the Color palette, below the Palette buttons, is a window showing the currently selected color swatch. Below that is the color drop-down menu, which offers a choice of Foreground, Background, Outline, or Text colors. For solid fills, Foreground Color is the most commonly used option, resulting in a polygon, line, or symbol completely filled with the chosen color.

The Background Color option is used with some, but not all, pattern fills and some symbols, which consist of foreground and background objects. The Outline Color option allows you to make the outline of a polygon different from the foreground fill. Use the Text Color option for coloring the map's text labels something other than black. Below the default color swatches is the Custom button, which brings up the Specify Color dialog box, which allows you to specify a color as visualized in the HSV color model.

Color Models in ArcView

In the printing and publishing world, several types of color models can be used on computers to represent color. ArcView uses an HSV (hue, saturation, and value) color model as its standard to generate colors, but a special ArcView extension gives you access to the more common RGB (red, green, blue) and CYMK (cyan, magenta, yellow, and black) models.

The HSV color model is called a "user oriented" model because it relates to the way people perceive color. Hue is what we commonly refer to as color, representing the various wavelengths of light that make up each color, primarily values of red, green, or blue. Saturation refers to the amount of gray added to a hue. A very saturated hue has very little gray, whereas a desaturated hue has a lot of gray. Value relates to the amount lightness or darkness within a color. Amounts of hue, saturation, and value are measured from 0 to 255. An HSV reading of 0, 0, 0 is black, whereas a reading of 0, 0, 255 is white.

The RGB and CYMK models are called "machine" or "hardware" oriented, because they are based on the way computer monitors and most printers use color. The RGB color model refers to the three electron guns in a cathode ray tube display that make up computer monitors and television screens. Each of the three guns hits the inside of the computer screen and excites different phosphors, which result in different additive

colors on the screen. Amounts of red, green, and blue are measured from 0 to 255. An RGB value of 0, 0, 0 is black, whereas an RGB value of 255, 255, 255 is white.

The RGB color model is typically used by computer photo editing software, and is appropriate to use when designing maps intended for use on the Internet, where most graphics will be viewed on a computer monitor. The CMYK color model is frequently called the process color model, referring to the four-process ink colors of cyan, magenta, yellow, and black. The values of each ink range from 0 to 100, with a CYMK value of 0, 0, 0, 0 equaling white and 0, 0, 0, 100 representing black.

CYMK process colors are the most common method of specifying ink colors in the publishing industry, whereas HSV colors are never used in the printing process. A host of books are available with CYMK color charts, allowing the user to see what a particular CYMK color will look like when printed on paper, and giving the user the CYMK values to dial into their software. This cannot be done in ArcView without using a special extension, called the Color Picker Extension, discussed in the following material.

Using the HSV, RGB, and CYMK Color Picker Extension

Because ArcView uses the HSV color model, which is not used in printing, it is necessary to use another software extension to specify RGB or CYMK colors. Luckily, ESRI has done just that by producing the HSV, RGB, or CYMK Color Picker extension.

> 🖋 **NOTE:** *This extension can be found on the World Wide Web on the ArcScripts page at the address* http://www.esri.com. *A copy of this extension is found on the companion CD-ROM.*

To use the extension, download the compressed file from the web and uncompress it (easily done using Winzip on the PC, from *http://www.winzip.com*). Make sure ArcView is not running, and copy the actual extension file, named createcolors.avx, into the ArcView installation directory for extensions, usually found at c:\esri\avgis_30\arcview\ext32. To use the extension from the companion CD-ROM, simply copy it from the CD into the c:\esri\avgis_30\arcview\ext32 directory. Then start ArcView, open a

project, and go to Extensions in the File menu to load the HSV, RGB, or CYMK Color Picker by checking the respective box.

The extension appears as a multi-colored icon to the right of the Help icon on the Button bar when the ArcView Project Window is active. Clicking on the multi-colored icon brings up the HSV, RGB, or CYMK Color Picker dialog box, shown in the following illustration.

cdch0500 6.tif
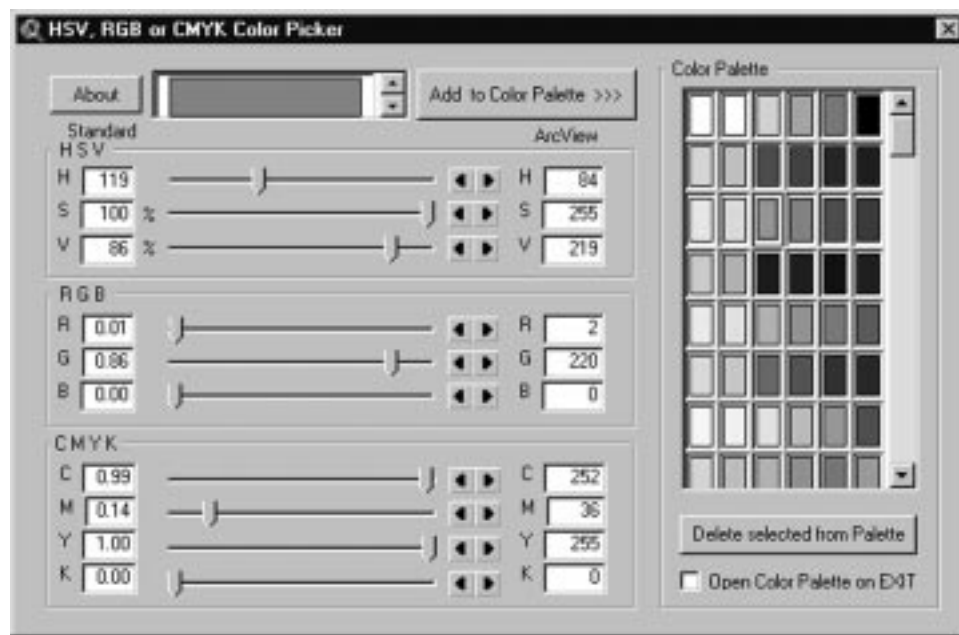
HSV, RGB, or CYMK Color Picker dialog box.

The Color Picker operates from this single window. The box at the top shows the current color selected, below which are displayed the three common color models: HSV, RGB, and CMYK. To the left of the color models is the default ArcView Color palette, with blank spaces on the bottom for new color swatches. The following table compares color model standard values and ArcView color values.

Color Model Standard Values Versus ArcView Color Values

Color Model	*Standard Color Value*	*ArcView Color Value*
HSV Model		
Hue	0–360	0– 255
Saturation	0–100%	0–255
Value	0–100%	0–255
RGB Model		
Red	0–1.00	0–255
Green	0–1.00	0–255
Blue	0–1.00	0–255
CMYK Model		
Cyan	0–1.00	0–255
Magenta	0–1.00	0–255
Yellow	0–1.00	0–255
Black	0–1.00	0–255

The user can type in color values in the standard boxes on the far left, or use the sliders to select a color. As one slider or value is dialed in, all sliders and values change to show how that color is represented in each of the three color models. Likewise, you can double click on a color in the palette to the right, and the colors values will appear in the color models to the left. If you check the box on the lower right, the Symbol Window's Color palette will open when you exit, showing your new color swatches added to your default palette.

This is a very powerful method of creating your own color palettes and swatches. You can experiment and enter your own color swatches, or more commonly, create specialized color palettes from color values found in reference books, technical articles, and presentations.

When you are finished using the Color Picker, make sure to save your new Color palette by using the Save command in the Palette Manager. The new palette must have an .avp suffix, but once it has been saved to your hard drive, it can be loaded into any other ArcView project.

Calibrating Your Computer Monitor to Your Printer

WSYIWG, or "What you see is what you get," continues to be the holy grail of computer graphics, and in no instance is it more crucial than matching the color on your computer monitor to the color on your color printer.Computer graphics professionals in publishing operations or advertising firms will use specialized high-end software and pricey printers to ensure a close match between screen and paper, but most ArcView users do not have access to these luxuries.

Luckily, ESRI has provided an ArcView project called calibrat.apr that contains a Layout document offering CYMK color combinations and progressions that can be printed on almost any color printer. Using calibrat.apr and a few tricks can make the color matching job a lot faster and easier.

At the start, let your computer monitor warm up for 20 to 30 minutes, which ensures that your display will show the same colors consistently. Then make sure your computer's monitor is set for the highest number of colors your video card will allow. On a Windows 95 (or higher) computer, select Start menu ➡ Settings ➡ Control Panel ➡ Display. In the Display panel, click on the Settings tab and set the Color palette for the largest amount possible. Heftier video cards will allow 65,536 colors or "true" color (32,000,000 colors).

If possible, try to view your monitor and printed map under natural lighting conditions or incandescent light rather than under fluorescent lighting. Most fluorescent lighting will add a distinct blue tint to printed materials, although some fluorescent tubes offer "full spectrum" light that obviates this problem.

Next, find the ArcView project calibrat.apr, and open it in ArcView. Calibrat.apr is usually found under Samples in the ArcView installation directory. With Windows operating systems, it is c:\ESRI\AV_GIS30\ARCVIEW\Samples\other\calibrat.apr.

> ✎ **NOTE:** *If you cannot find it on your machine, a sample copy is included on the companion CD-ROM.*

When the project opens, it contains just one document, a layout named Color Test, shown in the following illustration. Open Color Test, which is an 8.5-inch by 11-inch page, and print it to your color printer.

cdch05007.tif

*The Color Test layout
provided by calibrat.apr.*
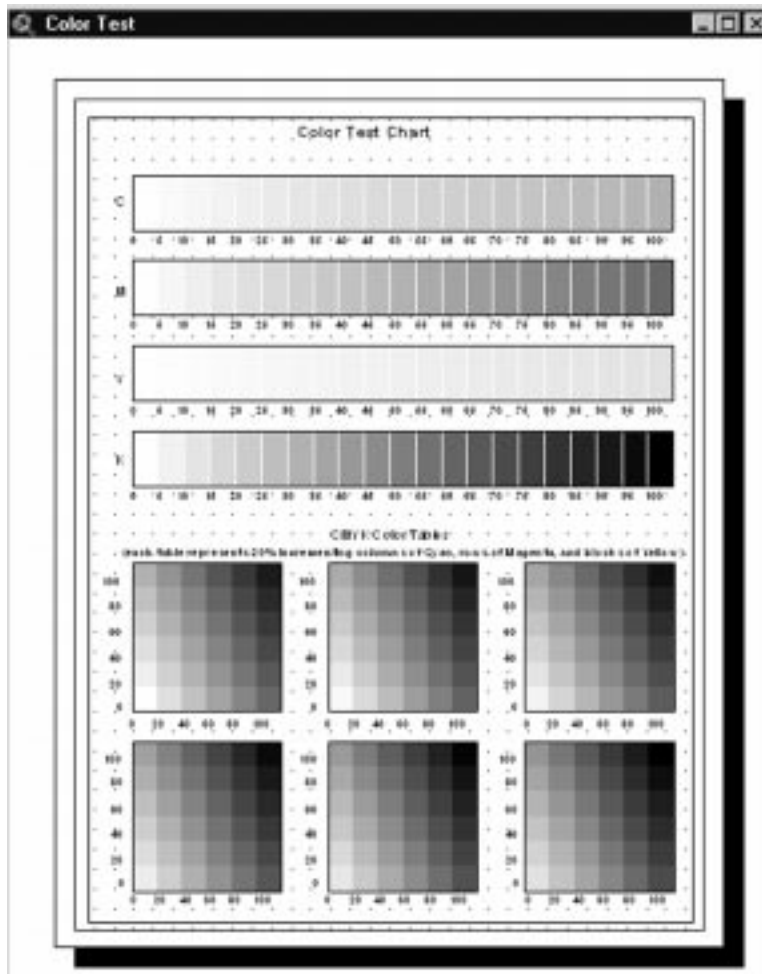
After printing the layout, hold the printed page next to your monitor with the layout displayed and compare screen and printer colors. This is a crude, but fast and inexpensive, means of calibrating the computer screen to your printer's color.
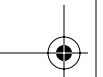
# *Fill Palettes and the Use of Patterns*

The Fill palette presents three basic polygon fill choices for the cartographer: solid fills (the solid black swatch in the middle at the top of the default fill palette), no fills (the white, empty swatch in the upper left), and pattern fills (everything else in the fill palette). Most commonly, you will click on the solid fill option, and go on to the Color palette to choose an appropriate color for the area on the map. Using pattern fills well in cartographic design is more difficult.

In many ways, pattern fills are a holdover from the days of traditional cartography, with hand-drawn maps using pens and paste-on fills. In those days, (as recently as the 1980s!), putting color on maps was a difficult process, and getting good color reproduction on the final copies an expensive proposition. Rather than using color to show differences between areas on a map, you would use press-on black-and-white patterns cut to size for each polygon with an exacto knife, and jiggered into place. Once you were able to place the patterns correctly, the black-and-white map tended to reproduce well when photocopied.

Today, with inexpensive color printers and color photocopiers, patterns are used far less frequently on maps, being replaced by color coding. This is a good move, because color is a better tool for showing differences in map features than patterns. For example, color is a much better tool when used in a color progression (different shades of one color) to show differences in magnitude for a map feature's attribute, such as population size or sales figures. In addition, patterns need to be used with relatively large areas, because the map reader will have difficulty discerning a pattern filling a small polygon.

However, pattern fills still have a place in digital cartography, especially in the creation of geologic maps, landcover maps, and vegetation maps. In these cases, patterns are used to indicate differences in kind, among different rock types or vegetation communities, not differences in magnitude.

Once you choose a pattern fill in the Fill palette, you can use the Color palette, shown in the following illustration, to change the pattern's foreground and background color. With some pattern fills, such as ArcView's default pattern fills, you cannot make the background transparent in order to see through the pattern to an underlying theme. This is because the default Fill palette is a raster- or bitmap-generated pattern.
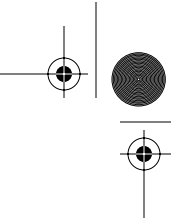
cdch05008.tif

Color drop-down menu in the Color palette.
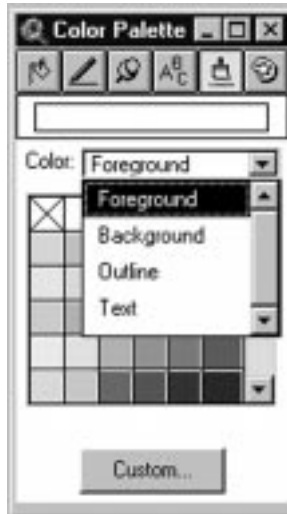
> ✓ **TIP:** *To create polygon fills with crisp patterns and a transparent background, load the carto.avp palette file using the Palette Manager from the ArcView symbols directory.*
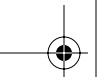
Another useful palette is hatch.avp, which contains six patterns with several progressions created by increasingly dense patterns. These pattern fills can be used to show differences in magnitude for map features, and are useful if your final map must be produced in black and white only.

Always make sure to print out pattern fills before you commit to using them on a map, to see how they reproduce on your printer. The technique described in the "Printing ArcView Palettes with the Symbol Dump Script" section in this chapter is invaluable in this case.

The Marker Palette and Point Symbology

The Marker palette manipulates marker or point symbols in the View, providing the largest variety of symbols for many types of specialized mapping needs. The default Marker palette features 47 point markers, but hundreds more are available from the ArcView samples directory and the from the Internet. Below the default pen window are options for changing marker size (measured in points) and marker angles (measured in degrees). Marker sizes range from 2 pt to 72 pt, but any size or frac-

tion of a size can be manually typed into the size box. Make sure to press the Enter key to ensure that the manually entered size is accepted by ArcView.

Many, but not all, markers can be rotated using the Angle option. This feature is useful when you need a particular point symbol to stand out in distinctive fashion, using a flag symbol example to point to a particular location.

Marker symbols have design concerns that involve visual organization and legibility. Just because you have access to hundreds of different types of point symbols does not mean you should use all of them on the same map! Only the most complex maps, such as geological maps, industrial facility mapping, and the like use dozens of symbol sets. Most thematic maps can get by with a handful of different marker types to communicate their message.

> ✓ **TIP:** *Make sure to establish an understandable visual hierarchy. Use different types of markers to indicate qualitative differences (differences in kind). Use differences in symbol size to indicate differences in magnitude. A common example is varying sizes of circles to show the differences in population sizes for cities.*

The legibility of the line work that makes up individual symbols is a chief concern. Many symbols are attractively drawn on the screen, but are not robust enough to hold ink when printed on paper. As with lines and colors, you must try several drafts with different marker types and sizes to see if they reproduce well on the final map.

You can also change the foreground color of the markers in the Color palette. Most marker sets will not permit you to change the outline color (or the background color, if the symbol has one). Keep in mind that most symbols are small compared to the entire map, and subtle changes in colors may not be noticeable on paper, because the markers hold little ink.

A unique tool found in the Font palette, called Create Markers, allows you to change any font in the Font palette to a markerset for use in the Marker palette. Many symbol fonts are available commercially or for free on the Internet and can be made into point symbols with the Create Markers option.
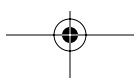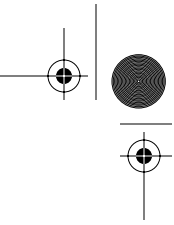
Finding and Creating Specialized Palettes

Extra palettes are available in the ArcView samples directory, and hundreds more are available on the World Wide Web. A good place to start is the ArcScripts page accessed from the ESRI homepage at *http://www.esri.com*. Once there, search for "palettes" using the page's search feature, or just browse the hundreds of scripts, palettes, and utilities listed for ArcView 3.x.

One of the best ArcView resources on the web is the Unofficial ARC/INFO and ArcView Symbol Page (see the following illustration), created by Brian Sheahan and found at *http://www.ifas.ufl.edu/~bts/gis/symbols.html*. This page has a wealth of information and links to non-copyrighted specialized palettes and utilities for use with ArcView. There are many unique symbol sets for representing highway shields, public land ownership such as national parks, international symbols for recreation areas, and military symbols.

Of particular interest are the palettes such as Artist, produced by Jim Mossman. The Artist palette loads 800 RGB colors in dozens of progressions to the color palette, giving the ArcView user virtually any color combination you would ever need.

For those cartographers migrating from ARC/INFO to ArcView, it is possible to load certain ARC/INFO shadeset and lineset files into the ArcView Symbol Window. Use the Palette Manager's load option to load shadesets or linesets, or use AIshd to Avcolor, a script from the Unofficial AI and AV Symbol page, to convert ARC/INFO shadesets to ArcView palettes.

cdch05009.tif

Unofficial ArcView Symbol Page.

The Pen Palette and Line Symbology

The Pen palette controls the appearance of line features in the View, offering various types of solid, dashed, or dotted lines, as well as the option of changing line weights. This is by far the simplest of the five main palettes, but similar design guidelines apply to its use.

Consider the geographical features represented by the line theme, and establish a visual hierarchy. For example, interstates can be represented by thick double lines; U.S. routes by thinner, single lines; and state and county roads as the thinnest lines. In a similar fashion, you can establish a visual hierarchy of rivers by representing those with the largest volumes with thick lines and their tributaries with thinner line weights.

Legibility is always a consideration with line work. Print out a few draft maps before setting line weights to ensure that your printer can show the smallest line weight used on the map, and that the largest line weight does not obscure other important map features.

> ✓ **TIP:** *When showing themes with a lot of lines, use lighter gray shades or lighter colors to "drop back" lines, rather than through the use of solid black or dark colors. This reduces the visual confusion of a lot of dark lines resembling a "ball of yarn."*

The default window for the Pen palette offers 28 basic line types. Below this window, there are drop-down menus for Size (in points), Cap, and Join. Size determines line thickness, and ArcView defaults to a near invisible tenth of a point. For most mapping purposes, you will use between .5 pt to 3 pt width lines, and can manually enter any size between, such as 2.5 pt, 2.6 pt, and so on.

Cap determines how ArcView draws the end of lines, either as Butt, Round, or Square, which are options found in the drop-down menu. Butt is the default, which terminates the line at right angles to its direction at the last vertex. Round adds a half circle at the last vertex, whereas the Square option squares the line off by half the line width beyond the final vertex.

Join determines how the line appears not at its ends but between vertices, as Miter, Round, or Bevel. A Miter join results in the line being sharp and angular at each vertex where the line changes direction. A Round or Bevel
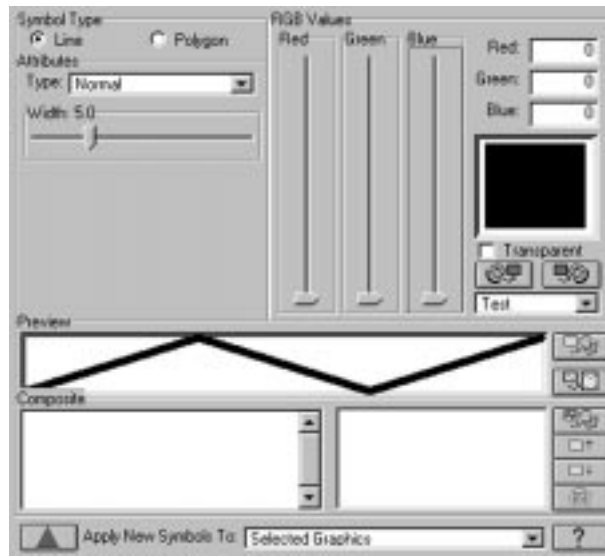
join results in a smooth, curved path at each vertex where the line changes direction. The Cap and Join menus are shown in the following illustration.

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Cap and Join drop-down menus and their results.

The Cap and Join options are used infrequently, but are very useful in particular circumstances. An example is how roads are depicted on a map. If a theme containing road locations with coarse resolution has vertices representing actual control points on the road centerline, the road's line can appear quite jagged. Few roads actually jerk from one point on the landscape to another, and the resulting line on the map can be very misleading. You can control this feature by changing the Butt and Join options to Round, which will depict the road as a smoothly curving feature.

Pipelines, in contrast to roads, are used for utilities, and frequently do suddenly change direction as they pass underground from one building to another. In this case it would be inappropriate to change the Butt and Join options from their square defaults.

✓ **TIP:** *Specialized lines and point markers used in the Geology palette are presented in a layout document that comes with ArcView. Navigate to the ArcView samples directory, which is normally found on Windows PCs in the c:\ESRI\AV_GIS30\ARCVIEW\Samples\other\aisym.apr directory. The aisym.apr project has an attractively designed E-size layout with pen and marker symbols explained in detail for use in geological mapping.*

## Using Symbolizer to Create Line, Polygon, and Pattern Symbols

Symbolizer is a free ArcView extension produced by Flat World Technologies and available on the web at *http://spatial-online.com*. Rather than endlessly searching the web for palette files that contain just the symbol you want for a mapping project, you can quickly produce from Symbolizer.

Once Symbolizer, shown in the following illustration, is downloaded from the web and the extension file, symbolizer.avx, placed in the usual extensions folder found at c:\esri\av_gis30\arcview\ext32, you can start ArcView, open a project, and activate Symbolizer from the Extensions dialog box found in the File menu. Symbolizer adds one button to the left of the Help button in both the View and the Layout document windows. Clicking on either button gives you access to the Symbolizer controls, starting with line symbols.

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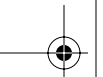*Symbolizer extension showing line symbol options.*
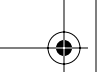
Symbolizer allows you to choose from 14 line types, such as dashed, dotted, and zig-zag, and control the line width, pen size, and spacing of dashed lines. RGB colors can be assigned to the lines with the use of three color value sliders, or can be typed in as numeric values ranging from 0 to 255. A nifty advanced feature allows you to construct composite line symbols, which consist of multiple line symbol types laid on top of one another.

When you are finished constructing your line symbol, you can apply it to the active theme's legend, a graphic in the View or Layout, or to the Pen palette in the Symbol Window. If applied to the Pen palette, you can use the Palette Manager to save the new palette as an ArcView palette file (an .avp file), which can be loaded into other ArcView projects.

Symbolizer also solves one of the ArcView problems of not being able to apply dashed or dotted lines to the outline of a polygon theme. Create a dashed or dotted line in Symbolizer, and apply it to the active theme's legend, making sure your active theme is a polygon. Previously without Symbolizer, you had to convert the polygon theme to a line theme in the View before dashed lines could be used.

With polygon features, Symbolizer allows you to create custom RGB colors for fills and lines (similar to the Color Picker extension). Symbolizer also offers the ability to create custom patterns by loading common raster files such as GIF or TIFF files and applying them to a pattern type. This is very handy for many types of specialized maps, such as geologic maps. Once the custom fill has been created, it can be applied to the active theme's legend, to a graphic, or to the Fill palette. Symbolizer, shown with polygon symbol options in the following illustration, is a great tool to add to your cartographic toolbox.
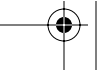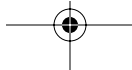
cdch05012.tif

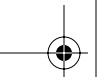*Symbolizer extension showing
polygon symbol options.*

Printing ArcView Palettes
with the Symbol Dump Script

As previously mentioned, one of the continuing problems with map production is the pursuit of WYSIWYG, trying get what you see on the computer screen to match what you get on the printed page. When you start to design a map, it is often difficult to determine what exact symbols or colors to use, and much time can be wasted revising colors and changing symbols after you discover they do not print clearly and legibly on the final copy.

One way to get around this problem is to print entire ArcView symbol palettes before you use them on the map, and then choose the symbols or colors that look best for your purposes from the printed copy. To do this, you need a handy Avenue script called symdump.ave, available from the ArcScripts page on the web at *http://www.esri.com/arcscripts* or from the companion CD-ROM.

Download symdump.ave from the web or copy it to your computer's hard drive from the companion CD-ROM. Unlike ArcView extensions, Avenue scripts do not need to be put

in any particular directory on your hard drive. However, it is a good idea to create an avscripts directory to which you can save useful script tools. Open an ArcView project, and add any new palette files you are interested in using with the Palette Manager's Load option. To print the default palettes, do not load anything.

In the ArcView Project Window, click on Scripts and select New. A blank script window appears. Go to the Script menu and go down to Load Text File. Use the dialog box to find the location of symdump.ave, and click on OK. The Avenue code making up the script should appear in the window. Go to the Script menu and drop down to Properties. In the Properties box, change the name of the script from Script 1 to Layout.Symbol-Dump.

Next, go up to the Script button bar and click on the Compile button. Now you are ready to run symbol dump. Go to the button bar and click on the Run button.

After the Run button is pressed, a dialog box will prompt you to choose which of the Symbol Window palettes (Color, Fill, Marker, Pen, or Text) you want to put in a layout. Each symbol or color will be placed as an individual graphic in a layout. Complicated palettes may result in 5 to 20 or more layout documents. You can now print the palettes you are interested in from the Layout window, and decide which symbols or colors would work best in your map.