Adjusting and Separating Map Colors Using PhotoShop™

As more and more maps are being prepared for display on CRTs, our need for a method to convert them into printable or slide form is increasing. A screen capture of the image can be manipulated in PhotoShop to select appropriate colors. A finishing program such as FreeHand can be used for adding high-quality lettering, placing appropriately on the page, and creating color separations or a slide file. Different applications require creativity in solving specific problems, but the method is versatile and easy to apply.

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THE PROBLEM

You have a map displayed on a CRT. You need a high-quality copy of the map for conventional process-color printing or for making a slide, but a) the program that produces the display does not produce color separations, or b) the color capabilities of the software prevent you from using the colors you need, or c) you are displaying a (copyright-free) GIF image from the World Wide Web and you need to crop and annotate. With the increased use of GIS software and the Web, you may be increasingly finding yourself with images that need transformation. How do you convert the diverse images we can produce on CRTs into high-quality printable form or into slides? And how do you transform the colors into selections of which you can be proud instead of apologetic? The logical choice of software seems to be PhotoShop, but what does one do with it to get the well-colored image in the appropriate format?

I recently had just such a problem. CRT maps had been used in a testing project (Olson and Brewer, 1997) and had been produced on a computer system no longer available. Fortunately, the programs had been written in QuickBASIC, a copy of which was still available, and no map had more than about ten colors on it. Not so fortunately, we had been using a smart terminal that had its own subroutines to produce eight-bit color and we had carefully selected and tweaked the colors to adhere to certain schemes and constraints. The nine standard colors available in QuickBASIC did not even resemble the logical series we had used in the testing project. The problem was to produce a set of color separations for publication that would simulate reasonably well the colors used in the testing project.

A SOLUTION

Here is a method that works to convert CRT-displayed maps into printable or slide form. Readers are spared the many blind alleys taken along the way in developing this sequence.

1) Use a printed color chart to choose the CMYK (cyan, magenta, yellow, black) percentage combinations that will be needed to produce the desired colors. CRT colors cannot be reproduced exactly, and colors that look right on the CRT do not necessarily look right

when printed. There is no substitute for using a good printed color chart.

2)   You will not normally need this step, but in my case I had to revise the QuickBASIC programs to omit calls to subroutines that were specific to the original output terminal. I assigned an arbitrary color to each different color on each map. In cases where the number of colors exceeded 8, I reused colors, making sure that the lines separating units were unique (i.e., I did not reuse the line color for anything else). All lettering (which was fortunately sparse) was omitted by commenting out the relevant lines in the QuickBASIC program.

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3)   Display the map on a CRT and screen capture it using a shareware program such as Graphix or, if it is displayed in a Windows environment, press Print Screen. I used Graphix to capture each map as either a GIF or PCX file; either format worked well. (I could not use the "Screen Display" option in QuickBASIC to display the map for capture but had to display using the Run command. This meant I captured any messages on the screen as well as the map, but I scaled the image so the messages fell outside the map area.)

4)   Open the GIF or PCX capture file in PhotoShop (I used PhotoShop 3.0 residing on a Power Macintosh 8100/100 with 96 Mb of RAM and 650 Mb hard disk). Use the eraser to clean up any unwanted messages or extraneous marginal marks if any.

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5)   Use the Rectangular Marquee from the Toolbox to window the exact area of the graphic that you wish to retain. (My background color was black and I wanted the rectangular area of each of 15 maps to be exactly the same size on the final product, which meant this step was crucial.) Double-click on the Rectangular Marquee to bring up the dialogue box in which you can set the style to Constrained Aspect Ratio and specify a width and height. (In my case, I used 2.6 by 1.75, as the final image was be that size in inches. It is only the ratio that is important here, however. For slides, use 3 by 2 as the aspect ratio.) Use the tool with the Option key pressed for extending from the center of selection. Noting your choice of center on a given try, adjust and retry. If more background area is needed to get the proper window, increase the Canvas Size (Image menu). When the Marquee window is satisfactory, pull down the Edit menu and select Crop.

6)   If you need to add new colors (such as I did when the number exceeded 8), click (once) on the Foreground Color square to open the Color Picker dialogue box. Specify a new (arbitrary at this point) color. Selecting a color that is simply very different from the rest can make this step easier. After closing the Color Picker, double-

click on the Paint Bucket and be sure the Anti-alias feature is deselected (to prevent a blurry map). Click the Paint Bucket in each area to be filled with the new color.

7) Save the file so you do not have to deal with the unwanted lettering, the cropping, or the duplicated colors again.

8) By default, the file opened in "Indexed Color" Mode. It is not possible to accomplish the remaining modifications using that mode. Bring down the Mode menu and select CMYK. Save the file in PhotoShop format with a modified file name so as to preserve the GIF or PCX file as a backup.

9) In CMYK Mode, change the colors as follows:

a) Double-click the Magic Wand to bring up its dialogue box. Make sure the Anti-alias box is deselected and the tolerance is zero.
b) Select a legend box or map unit that is the color you wish to change.
c) In the Select menu, select Similar to pick up all other areas of the same color.
d) Use the Eyedropper tool to sample the selected color. The color then appears as the current Foreground Color in the Toolbox.
e) Single click on the Foreground Color in the lower part of the Toolbox to open the Color-Picker dialogue box. Type in the CMYK values desired and press Return (or click OK).
f) At this stage, the new color is in the Foreground color box only. Press Option and Delete to change the colors in all the selected areas to the new color.
g) Repeat steps *b* through *f* for each of the other colors needing adjustment.
h) Save the file again (still in PhotoShop format) so you have all the changes included. This will serve as a backup file.
i) Use Save As in the File menu and choose the TIFF format and a modified filename. Upon clicking Save, the TIFF dialogue box opens; select LZW compression. Uncompressed files are extremely large (mine were 14-20 times the compressed size), and the compressed versions work well.

10) Use FreeHand (I used version 5.0, on the same Mac) or similar graphics package as the finishing software. In FreeHand, select Place from the File menu and select the TIFF image you saved. Click in some convenient (arbitrary) point on the page for placement. Choosing the Object Inspector (first icon in the Inspector window) you can specify the x,y location of the lower left corner and the size desired (2.6 x 1.75 inches in my case), and press

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Return. Alternatively, you can use the scaling tool and then drag the image to the desired location.

11) Add lettering in a higher layer using the convenient type features in FreeHand or similar software.

12) Be sure to save the file at this stage (FreeHand format), so you have a complete copy of your work.

13) The next step depends on whether your map will be printed or made into a slide.

   a) If the map is to be printed, produce a color proof and examine the colors carefully.
   b) If the map is to be made into a slide and the film recorder is not directly accessible, be sure you have the appropriate printer driver on your machine for whatever film recorder is available. Use it to save the FreeHand file in the new format. In our case, we use the printer driver that produces Binary Lasergraphics™ Language (extension .BLL). The file can then be taken to the film recorder.

14) Make revisions if needed. Use the PhotoShop format files to do so. Save not only the revised PhotoShop file but also the TIFF file with the *same names* you used before. Replacing the originals prevents old versions from becoming confused with new ones, it saves disk space, and (very important) the FreeHand file you created will automatically use the *new* version.

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PITFALLS   In PhotoShop one has to be cautious about duplicate colors. If, for example, the second box in the legend is 100% cyan and one wishes the color in the first box to be 100% cyan, the second legend color must be changed first. Otherwise, both the first and second colors become equal and all of them are selected upon trying to isolate only one of them.

Due to the conversion from vector to bitmap format when a screen capture is made, lines are not consistent in width. Most of ours were one pixel but some were two. I used the pen tool in PhotoShop to correct

	C	M	Y	K	B&W
background:	0	0	0	100	0
No harvest:	0	10	30	0	10
0.1-49:	0	40	60	0	20
50-99:	0	65	85	10	35
100-399:	0	80	95	40	50
400-999:	0	100	100	50	70

Table 1.

some of them, but the variation was not particularly bothersome in the case of these maps because the final size of each map was small.

The illustrations I was producing had several maps (7 or 8) on each final page. The FreeHand file plus all the associated TIFF files for each page fit onto one 1.44 Mb diskette. Had we not used the LZW compression, file size of some individual TIFFs, much less the whole set, would have been too large for a single diskette.

Although readers are generally spared the blind alleys here, there is one that is so tempting that I must warn you against it. When you are in Index Color mode in PhotoShop, you can open up the Color Table and change several colors at once before closing it. It lures one into thinking this is an easier means of color adjustment, but it is fraught with problems. The worst is that the color designations change automatically (without warning to you; you have to reopen the color table and read the numbers to see that it did not accept what you typed in). Although the automatically-modified color may look fine on the screen, the resulting color proofs can be a huge disappointment. The use of the Color Table process in Index Color mode turns out to be wasted time.

To try the steps outlined above to modify a map in PhotoShop, we offer a sample file that can be downloaded from the internet: pilot.msu.edu/user/olsonj/nwestmap.gif. The colors in the original file are arbitrary. There is no need for adding colors (Step 6 above), but you may want to try that with just one map unit and then undo the Paint Bucket fill. FreeHand or similar software can be used to finish the map with lettering. Table 1 shows some potential specifications for the map. The CMYK values

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Timber Harvest
Pacific Northwest
1981

Harvest by County
(Million Board Feet)
400-999
100-399
50-99
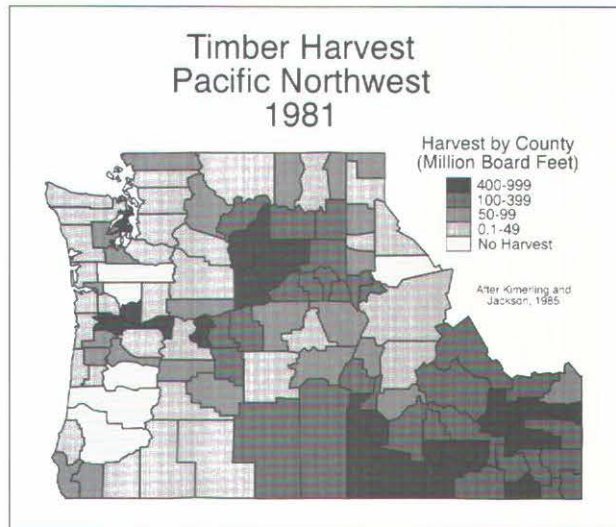0.1-49
No Harvest

After Kimerling and
Jackson, 1985

Figure 1. A printed map prepared using the methods outlined.

would be used for a color version; the B&W values produced the black-and-white version shown in Figure 1.

As it becomes more and more important to transform maps from one format to another, we need to know the combinations of commands that allow us to reach our goals. It was a significant investment of time and effort in manual reading, trial and error, and asking questions of others who use PhotoShop before I succeeded in understanding how simple a

process can be employed to convert CRT maps into printable form or into a form suitable for good slides. Perhaps the summary of steps involved will save time on the part of others attempting similar conversions. Perhaps, too, the maps we see in print and projected on screens during professional presentations will meet higher quality standards than the compromises to which we have had to become accustomed of late.

REFERENCES

Kimerling, A. Jon, and P. L. Jackson. 1985. *Atlas of the Pacific Northwest*, 7th ed. Corvallis, OR: Oregon State University Press.

Olson, Judy M. and Cynthia A. Brewer. 1997. An Evaluation of Color Selections to Accommodate Users with Color-Vision Impairments," *Annals of the Association of American Geographers*, 87(1), pp. 103-134.

ACKNOWLEDGMENTS

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