How to understand color management

In working with images, you'll likely move color images from device to device. For example, you might scan an image, view the image on your monitor at home, print the image on an inkjet printer to preview it, and then have it printed professionally by a print vendor.

At each stage in this process, you can end up with color variations. The reason is this: These devices all have a limited color gamut. *Color gamut* refers to the range of colors a device displays. After all, no device can reproduce the full range of colors the human eye can see.

For example, monitors use RGB color. This color is created through a mix of red, green, and blue light. Because it depends on light, RGB tends to be better at bright colors—like those in a neon sign—and less adept with dull colors—blacks and some pastels. CMYK, in contrast, is used by four-color printers, and is a mix of cyan, magenta, yellow, and black. Because it depends on light being reflected off a page, CMYK tends to be better at pastels and pure black.

Colors might vary for one of the following reasons:

- Differences in image sources—whether the image is from a camera or scanned in.
- The way software applications define color.
- Your choice of print media. For example, newsprint paper reproduces a smaller gamut than magazine-quality paper.
- Natural variations between devices—monitors differ based on manufacturer and monitor age.

Each device operates within a specific color space that can produce a certain range, or gamut, of colors. Because of these varying color spaces, colors can shift in appearance as you transfer documents between different devices. For example, a shade of blue with the values R 25, G 200, B 225 might appear slightly different when you scan an image with this color than when you view it on a monitor or print it.

Monitor profiles describe how the monitor is currently reproducing color. You should create this profile first, because you need to view colors accurately on your monitor to make design decisions. If what you see on your monitor does not represent the actual colors in your document, you will not be able to maintain color consistency. For more information on creating monitor profiles, see Monitor Profiles in Photoshop Help.

Input device profiles describe what colors an input device is capable of capturing or scanning. If your digital camera offers a choice of profiles, Adobe recommends selecting Adobe RGB. Otherwise, use sRGB (this is the default for most cameras).

Output device profiles describe the color space of output devices such as a desktop printer or a printing press. If you're printing to your desktop printer, you can set this through the Print dialog box. When you print, the color management system uses output device profiles to properly map the colors in a document to the colors within the gamut of an output device's color space. Ideally, the output profile should also consider specific printing conditions, such as the type of paper and ink. For example, glossy paper can display a different range of colors than matte paper. Most newer inkjet printers include profiles to handle a range of such conditions, and you can often use these profiles to best effect.

Managing color when you open files

You can solve the problem of working with different color spaces by using a color management system, such as the one included with Adobe Photoshop CS5 Extended. This color management system handles a lot of these choices automatically, but it's useful to understand color management so you can address problems as they crop up. Photoshop provides options for you to manage the way color profiles are interpreted when you open files. You set these options through the Color Settings dialog box, available through the Edit menu.

© 2010 Adobe Systems Incorporated

The settings you choose in the Color Settings dialog box determine the way colors are applied for both RGB and CMYK. When you choose RGB or CMYK in the Images > Mode menu, the colors displayed in these modes are determined by the Color Settings dialog box.

Pretested sets of options in the Color Settings dialog box

Although you can customize the options in the Color Settings dialog box, Adobe provides pretested sets of options you can use. These are available in the Settings menu at the top of the Color Settings dialog box.These settings have been tested by Adobe to work with most monitors (for screen output) and printers (for print output) in North America.

Here are three sets of settings you will find useful:

- **North America General Purpose 2** works well if you are exporting to both web and print formats. For example, this setting group uses the sRGB IEC61966-2 setting for the RGB working space. This working space reflects the settings on most computer monitors, low-end printers, and scanners.
- **North America Prepress 2** works well if you are exporting to a printing press. For example, this setting group uses the Adobe RGB (1998) setting for the RGB working space. This working space reflects an RGB range that corresponds more closely to CMYK (which is what printing presses use).
- **North America Web/Internet** works well if you are exporting to the Internet only. All images are converted to the sRGB IEC61966-2 working space.

How Photoshop handles color spaces in opened files

When you open a file, Photoshop compares the colors in the file's color space with the colors defined in the Color Settings dialog box. By selecting the Ask When Opening option, you can have Photoshop ask you how to proceed when it encounters a different color space. If this option is not selected, Photoshop automatically converts these colors to the working space settings in the Color Settings dialog box. For example, if the image you're opening has been created by using an sRGB IEC61966-2 B color space, and the Color Settings dialog box has Adobe RGB (1998) working space for RGB, Photoshop converts the sRGB colors to Adobe RGB.

To use the Color Settings dialog box:

1. Start Photoshop.
2. Choose Edit > Color Settings.

   The Color Settings dialog box appears (**Figure 1**).

   In the Settings menu, you can choose from a series of preset settings. For most print purposes, you can choose North America General Purpose 2.

   These settings have been tested by Adobe to work with most monitors (for screen output) and printers (for print output) in North America.
3. Move the pointer over the menus in the Color Settings dialog box to view more information on these options. Information appears in the Description box at the bottom of the dialog box.
4. Change the Settings to North America Prepress 2 and observe the results. Remember, North American Prepress 2 is best for exporting to a printing press, so Photoshop changes RGB to Adobe RGB (1998). With North American Prepress 2, Ask When Opening is selected to preserve the integrity of colors as you import them.

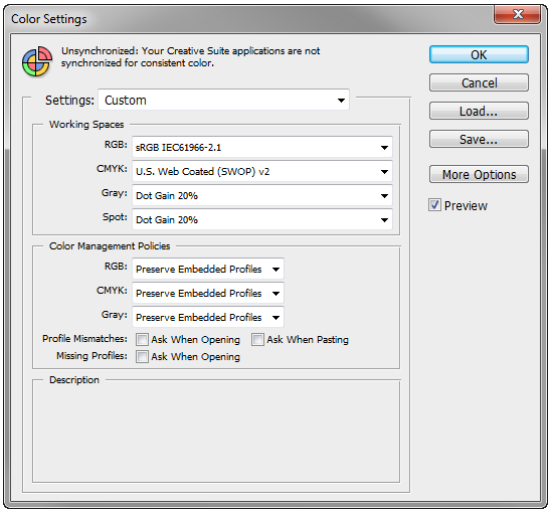

Figure 1 Color Settings dialog box

 © 2010 Adobe Systems Incorporated

Using soft proofing

You can use soft proofing to proof on-screen. *Soft proofing* refers to changing on-screen colors to mimic the colors at actual printing.

To use soft proofing:

1. Start Photoshop and open an image. If possible, open an image with a wide color range, so as to best observe the effects of soft proofing.

   First, you're going to soft proof the image as it would appear with CMYK printing.

2. Choose View > Proof Setup > Working CMYK (**Figure 2**). As you do, look carefully at the image's colors. You should notice a slight shift.

   Note: The amount of color shift depends on the current settings in the Color Settings dialog box, the image's colors, and other factors.

   Now you're going to soft proof an inkjet printer.

3. Choose View > Proof Setup > Custom.

   The Customize Proof Condition dialog box appears (**Figure 3**).

4. Confirm the Preview option is selected.

   This lets you view changes on-screen as you make them.

5. Select Kodak 5205/7205 Printing Density (By Adobe) from the Device To Simulate menu.

   Photoshop soft proofs the image as it would appear when printed with Kodak 5205/7205 film (**Figure 4**).

   Observe the results in the image.

6. Click Cancel to close the Customize Proof Condition dialog box without keeping changes.

Figure 2 Sample CMYK proof

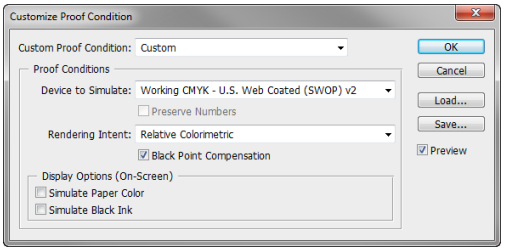

Figure 3 Customize Proof Condition dialog box

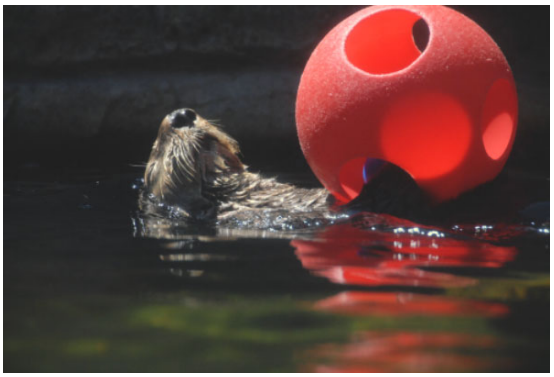

Figure 4 Sample Kodak 5205/7205 proof

Managing colors when printing

You can also set options for color management when you print to your printer. In the Color Management area of the Print dialog box, you can configure whether colors are managed by Photoshop or your printer and specify preferences for how colors are handled.

Most new inkjet photo printers come with fairly accurate profiles built into the driver. You may end up with the best results—and save time—by letting the printer select the profile.

To view the Color Management area of the Print dialog box:

1. Open an image in Photoshop.
2. Choose File > Print. (You do not need to have a printer currently connected to your printer for this exercise.)

   The Print dialog box appears (**Figure 5**).

   The Color Management area should be active on the right side of the dialog box.
3. If Color Management is not selected, select it from the pop-up menu.
4. Move the pointer over the menus in the sections labeled Color Handling, Printer Profile, and Rendering Intent.

   Information on the option selected in each menu appears in the lower-right section of the dialog box. For example, in the section Color Handling, you should see Printer Manages Colors selected in the menu. This option asks your printer to determine how colors are printed.
5. When you've reviewed these options, click Cancel to close the Print dialog box.

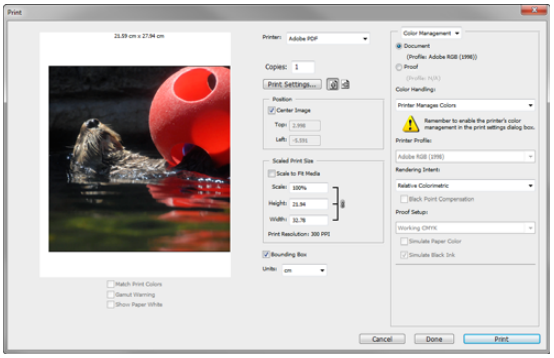

Figure 5 Print dialog box

Rendering intent

Rendering intent refers to the way colors are converted from one system to another. When you print, you're converting from one colorspace (Photoshop) to another (your printer). Rendering intents set the rules that determine how colors are adjusted. The product of a rendering intent depends on the colors in your image and the current settings in the Color Settings dialog box. Some profiles produce identical results for different rendering intents.

Photoshop sets a default rendering intent according to the profile you've selected in the Color Settings dialog box. For example, if you chose a color setting for North America or Europe, the default rendering intent is Relative Colorimetric. Generally, it's a good idea to go with these defaults, especially if you're still learning about color management.

 © 2010 Adobe Systems Incorporated